

ABSTRACT

KUTCH, MATTHEW DAVID. Cost-Effectiveness Analysis of Complementary and Alternative Medicine in Treating Mental Health Disorders. (Under the direction of Alvin E. Headen, Jr.)

Using survey data, this study produces estimates of incremental cost-effectiveness ratios (ICERs) and measures of uncertainty, regarding use of complementary and alternative medicine (CAM) combined with traditional therapies (pharmacotherapy and/or psychotherapy) in the treatment of five common mental health disorders. **BACKGROUND:** A recent, large-scale nationally representative survey estimated the 12-month prevalence for any mental health disorder at over 25% of the adult population (Kessler et al., 2005). Traditional therapies include both psychotherapy and pharmacotherapy. Past studies indicate that patients with mental health disorders use complementary and alternative medicines, such as acupuncture, chiropractics, herbal remedies, massage therapy, homeopathy, energy healing, and biofeedback, at a greater rate than the general population. Unlike past cost-effectiveness analyses that use either a narrow definition of CAM or randomized controlled trials, this study uses a broad definition of CAM and survey data. A secondary question is how well this self-reported survey data produces cost-effectiveness analysis results for CAM. **METHODS:** This analysis uses the Medical Expenditure Panel Survey (MEPS), a panel survey of medical use, expenditure, and health status for the civilian noninstitutionalized U.S. population. The primary measure of effect is based on self-perceived mental health status. Secondary measures of effect include functional limitations, instrumental activities of daily living (IADL) limitations, social limitations, and cognitive limitations. Cost-effectiveness is determined by estimation of the incremental cost-effectiveness ratios and construction of bootstrapped cost-effectiveness acceptability curves (CEAC). The incremental net benefit (INB) method is estimated to investigate potential self-selection bias using observable characteristics, propensity score matching, inverse propensity score weighting, and the primary sampling unit complementary and alternative medicine use as an instrument. **RESULTS AND DISCUSSION:** The evidence suggests a high probability that CAM is cost-effective for a large range of values of effect for anxiety and neurotic disorders. The evidence strongly suggests that CAM is not cost-effective for depression (NOS) disorders.

The evidence suggests that CAM is more cost-effective for user of psychotherapy than for users of pharmacotherapy. The effectiveness of CAM treatment is equivalent to 0.75 - 1.02 less days of work missed for individuals with neurotic disorders using psychotherapy. The effectiveness of CAM treatment is equivalent to a 2.99 – 4.64 increase in the EQ-5D Index score for individuals with neurotic disorders using psychotherapy. Attempts to mitigate potential self-selection bias in this observational data indicate an upward bias in the estimate of incremental net benefit for the anxiety and neurotic disorders. However, for these disorders, the psychotherapy samples are least affected by self-selected bias.

CONCLUSION: CAM is a cost-effective additional treatment for anxiety and neurotic disorders. CAM is more cost-effective for psychotherapy users than for pharmacotherapy users. CAM is not a cost-effective addition to treatment for depression (NOS) disorders. The net benefit method for estimating cost-effectiveness analysis provides a useful framework in which common econometric techniques of addresses self-selection can be incorporated. In general, survey data provide another type of data that policy-makers can use to inform decisions regarding adoption of new treatments.

Cost-Effectiveness Analysis of Complementary and Alternative Medicine in
Treating Mental Health Disorders

by
Matthew David Kutch

A dissertation submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements of the Degree of
Doctor of Philosophy

Economics

Raleigh, North Carolina

2010

APPROVED BY:

Alvin E. Headen, Jr.
Chair of Advisory Committee

Stephen E. Margolis

Tamah C. Morant

Melinda Sandler Morrill

DEDICATION

Dedication (ded-i-ca-tion): a name and often a message prefixed to a literary, musical, or artistic production in tribute to a person or cause

Tribute (trib-ute): something (as material evidence or a formal attestation) that indicates the worth, virtue, or effectiveness of the one in question

To all who have, would, and will think to make the world more you name is virtue. This work is dedicated to you in all your forms.

BIOGRAPHY

Matthew Kutch received his B.S. in Economics from Central Michigan University in Mount Pleasant, MI. He has been an Instructor of Economics at Elon University in Elon, NC. He received his Masters in Economics from North Carolina State University. He enjoys running, practicing yoga, reading, following politics, and eating ice cream.

On numerous occasions he has claimed the following:

To have run a marathon in under 4 hours

To have won a hula hooping competition in the Pacific Northwest in early 2007

To have been asked to hula hoop on stage while an Indy band performed

To have taught himself to tie his own shoes

To have had three significant nemeses in the last decade

To have created award-winning green bean casserole

To have trained for two years as a trapeze artist

To have become an ordained minister

To have cheated to beat his 5 year old niece at Candy Land

To have played a bit part in a crime drama series

To have volunteered for Hurricane Katrina rebuilding efforts

To have created an award winning zombie survival app

To have befriended and traveled extensively with a sea captain

To have the energy of a turtle and the wisdom of a bear

ACKNOWLEDGEMENTS

I would like to express my gratitude to each of my committee member for their guidance, help, and support throughout this process.

Dr. Alvin E. Headen, Jr. (for sticking with me through this process, for giving me excellent advice, and for your sharp humor toward life),

Dr. Steven Margolis (for guiding me through the correct placement of my work in an economic framework and for your support and encouragement),

Dr. Tamah Morant (for guiding me through the byzantine of graduate school logistic, for excellent advice on the big picture on this project, and for the support and encouragement),

Dr. Melinda Sandler Morrill (for guiding me through the mess of my empirical argument and for the support and encouragement), and

I would also like to express my gratitude to *Dr. Alistair Hall* for exemplifying a true professional in academia. His example has influenced my conduct in the classroom in countless ways.

I would also like to express my gratitude to the faculty of Elon University (*Drs. James Barbour, Thomas Tiemann, Tina Das, Steve DeLoach, Casey DiRienzo, Mark Kurt, Greg Lilly, Jen Platania, Douglas Redington, Katy Rouse, and Vitaliy Strohush*). Their guidance and support in my development as a professional, their inspirational commitment to excellence in teaching and scholarship, and friendship will be missed.

I would especially like to thank *Dr. Douglas Redington* for his constant, unwavering belief in me, and friendship.

I would like to thank my parents, *David and Laurann Kutch* for their love and support throughout this entire process, for their unwavering belief in me, for their constant pride in me, and for instilling in me the values that I will carry with me for a lifetime.

I would like to thank my brother, *Chris Kutch*, and his family, *Linda Jackson, Samantha LeHotan, Tyler Jackson, and Halie Turner* (Why did the elephant paint his toenails red?) for their love and support over the years. Their knowledge and curiosity (in all its many different forms) will continue to be an inspiration.

I would also like to thank my grandparents, *Godfred and Nora Hilda Moffett Suppes* and *Herbert William and Mildred Dorothy Kutch* for their love and support and for raising such amazing and caring kids.

I would also like to thank the members of my extended family for the love and support throughout my life.

I would also like to thank the friends that have believed in me and helped me through this journey: *Rick Gigandet* (TheRickShow—for being my most ferocious supporter), *Christina Zenker* (for being so Awesommme!!! for always believing in me and supporting me through this process and for eating half the M&Ms), *Mark Kurt* (for the best carpool, friendship, and sagely advice—and I don't even hold a grudge over that 4 minute and 12 second stop for gas on September 9th, 2009), *Mack* (for always being there to listen to and support me—except that one time we played intense phone tag for four months and you stopped answering your phone when I'd call. So this hippopotamus, giraffe, and llama walk into a soccer arena, both wearing tuxedos...), *the Mack Family* (for the encouragement, support, and generous

ideas (the next dissertation will be about a chicken in every pot)), *the Tiger Family* (for the support, encouragement, inspiration, and good times), *Angela Pohlman* (for the support and friendship), *Anne Spain, Dar Rosteck, and Margaret Fedder* (for the inspiration, friendship, love, and support through the years and for not living in Ohio), *Neil Ward* (for the friendship and mental health breaks), *Mitch Dudley* (for being an inspiring educator and for being such a positive Christian example), *Nasim Lari* (for being one of my biggest cheerleaders in getting through this process), *Rotua Lumbantobing* (for being an excellent companion as we work through the final stages of this process—sit by me at graduation?), *Levi Timar* (for being the all-around best Hungarian economist I personally know and for all the good times at the beach), *Andrea Mannino* (for the friendship, support, and being my #1 (tied) supporter during that first transition year), *Richard Sawyer* (for the friendship, support, and being my #1 (tied) supporter during that first transition year), *Birgit Schuette* (for the friendship and support, great energy and fun times), *Dave Carlson* (for the friendship, support, and the tremendous example of what a good father should be), *Todd Morman* (for the one of the most positive inspirations in the world), and *Tiffany Owle* (for the love, support, and good times).

I would also like to thank certain students over the years that have had a significant impact on my life: *Grady Rose, Hal Martin, Lisa Denny, James Pieper, Sarah Katie Coale, and Kristine Silvestri*. I thank them for their inspiration and friendship.

I would like to thank *Sandra Day O'Connor* for her attention to split infinitives.

And finally I would like to acknowledge *Robert Louis Stevenson* for his story, *Treasure Island*. Without it, the world would not know how to write book reports.

TABLE OF CONTENTS

LIST OF TABLES	xi
LIST OF FIGURES	xvii
LIST OF ABBREVIATIONS.....	xxiv
CHAPTER 1 INTRODUCTION TO THE QUESTION	1
1.1 The Question	2
1.2 The Contribution	2
1.3 Overview of the Chapters.....	3
CHAPTER 2 INTRODUCTION TO COMMON MENTAL HEALTH DISORDERS	6
2.1 Depression.....	6
2.2 Bipolar Disorders	8
2.3 Generalized Anxiety Disorder (GAD) and Panic Disorder.....	9
CHAPTER 3 INTRODUCTION TO COMPLEMENTARY AND ALTERNATIVE MEDICINE (CAM)	11
3.1 Complementary and Alternative Medicine Classification Systems.....	11
3.2 Complementary and Alternative Medicine Users	12
CHAPTER 4 ECONOMIC JUSTIFICATION FOR COST-EFFECTIVENESS ANALYSIS	14
4.1 Introduction to the Basic Tools of Cost-Effectiveness Analysis (CEA).....	14
4.2 Cost-Minimizing Mental Health Production.....	16
4.3 ICER in Input Space.....	18
4.4 The ICER Decision Rule in Input Space.....	25
CHAPTER 5 ON MEASURING MENTAL HEALTH EFFECT.....	31
5.1 Introduction and Some Organization	31
5.2 Mental Health Disorders Symptoms, Causes, and Treatment.....	32
5.2.1 Depression.....	32
5.2.2 Bipolar Disorder.....	33
5.2.3 Generalized Anxiety Disorder (GAD) and Panic Disorder	34
5.3 Ideal Measures of Mental Health	35
5.3.1 Depression.....	36

5.3.2	Bipolar Disorders	37
5.3.3	Anxiety and Panic Disorders	37
5.4	Actual Measures of Mental Health from the Clinical Literature	38
5.4.1	Depression.....	38
5.4.2	Bipolar Disorder.....	39
5.4.3	Anxiety and Panic Disorder	41
5.5	Current Mental Health Measures under Consideration.....	42
5.6	Guideline Driven Treatment.....	43
5.6.1	Major Depressive Disorder	43
5.6.2	Bipolar Disorder.....	44
5.6.3	Panic Disorder.....	45
5.7	Clinical Evidence on the Effectiveness of Treatment	46
5.7.1	Depression.....	47
5.7.2	Bipolar Disorder.....	53
5.7.3	Anxiety and Panic Disorder	58
5.8	Comparing the Results to Other Research	60
CHAPTER 6 ON MEASURING MENTAL HEALTH COSTS.....		64
6.1	Ideal Measures of Cost.....	64
6.2	Discussion of Potential Empirical Bias	66
6.3	Differences in Direct Expenditure.....	67
6.4	Differences in Direct Nonmonetary Costs	69
6.5	Differences in Indirect Costs.....	71
CHAPTER 7 REVIEWING COST-EFFECTIVENESS TECHNIQUES		73
7.1	Incremental Cost-Effectiveness Ratio (ICER) and Space.....	73
7.2	Incremental Net Benefit	76
7.3	Incremental Net Health Benefit.....	80
7.4	Statistical Properties of the Incremental Cost-Effectiveness Ratio Estimate.....	81
7.4.1	Best-Case and Worst-Case ICERs	83
7.4.2	Second Order Approximation of Variance	85
7.4.3	Bootstrapping the ICER.....	85
7.4.4	Cost-Effectiveness Acceptability Curves (CEAC).....	90

7.5	Statistical Properties of the Net Benefit Estimate	93
7.6	Differences in the Cost-Effectiveness by Observable Demographics	96
CHAPTER 8 DESCRIPTION OF THE DATA		101
8.1	The Structure of MEPS	101
8.2	Description of Information Available in the MEPS.....	102
8.2.1	Medical Conditions.....	102
8.2.2	Utilization and Expenditure	103
8.2.3	Prescription Drugs	103
8.2.4	Health Status	104
8.2.5	Complementary and Alternative Medicine.....	104
8.3	Construction of Variables for the Cost-Effectiveness Analysis.....	105
8.3.1	Identification of Individuals with Mental Health Disorders.....	105
8.3.2	Construction of Measures of Cost.....	106
8.3.3	Construction of Measures of Effect	107
8.3.4	Construction of Demographic Variables	108
8.3.5	Construction of Samples of Individuals with Mental Health Disorders.....	109
8.4	Description of the Samples	109
8.4.1	Rates of CAM Use	111
8.4.2	Descriptive Statistics of the Samples.....	113
8.4.3	Models to Describe CAM Use In Terms of Observable Characteristics	136
8.4.4	Description of CAM Use in Terms 1997 MEPS Information	154
8.4.5	Defining Useful Measures of Effect	157
CHAPTER 9 EMPIRICAL RESULTS		161
9.1	Outlining the Results.....	161
9.2	Incremental Cost-Effectiveness Ratio Estimates	163
9.3	Bootstrapped Cost-Effectiveness Acceptability Curves	173
9.4	Investigating Potential Self-Selection Bias	184
9.4.1	Controls for Observable Characteristics	184
9.4.2	Propensity Score Matching.....	196
9.4.3	Inverse Propensity Score Weighting.....	207
9.4.4	Instrumental Variables	218

9.5	Comparing the Results to Other Research	230
CHAPTER 10 DISCUSSION AND CONCLUSION		241
10.1	Summary and Discussion of Main Results.....	241
10.2	Policy Implications.....	242
10.3	Future Research	242
REFERENCES		248
APPENDICES		261
Appendix A.....		262
Appendix B.....		282
Appendix C.....		302

LIST OF TABLES

ECONOMIC JUSTIFICATION FOR COST-EFFECTIVENESS ANALYSIS

Table 4.1 A Control Treatment and Three Combinations of Mixed Treatments.....	20
---	----

DESCRIPTION OF THE DATA

Table 8.1 Sample Size by Mental Health Disorders and Sample Definition.....	111
Table 8.2 Rates of Treatment Use for Individuals with Mental Health Disorders	112
Table 8.3 Rate of Exclusive Treatment within Pharmacotherapy and Psychotherapy Use by Mental Health Disorders	112
Table 8.4 Rates of CAM Use by Mental Health Disorders and Sample Definition	113
Table 8.5 Rates of Comorbidity of Disorders by Condition Identifier	113
Table 8.6 Descriptive Statistics for Affective Disorders by Condition Identifier	116
Table 8.7 Descriptive Statistics for Affective Disorders by Pharmacotherapy Use	117
Table 8.8 Descriptive Statistics for Affective Disorders by Psychotherapy Use	118
Table 8.9 Descriptive Statistics for Affective Disorders by Either Use	119
Table 8.10 Descriptive Statistics for Anxiety Disorder by Condition Identifier	120
Table 8.11 Descriptive Statistics for Anxiety Disorders by Pharmacotherapy Use	121
Table 8.12 Descriptive Statistics for Anxiety Disorders for Psychotherapy Use	122
Table 8.13 Descriptive Statistics for Anxiety Disorders by Either Use	123
Table 8.14 Descriptive Statistics for Neurotic Disorders by Condition Identifier	124
Table 8.15 Descriptive Statistics for Neurotic Disorders by Pharmacotherapy Use	125
Table 8.16 Descriptive Statistics for Neurotic Disorders by Psychotherapy Use.....	126
Table 8.17 Descriptive Statistics for Neurotic Disorders by Either Use	127
Table 8.18 Descriptive Statistics for Acute Stress Disorders by Condition Identifier	128
Table 8.19 Descriptive Statistics for Acute Stress Disorders by Pharmacotherapy Use	129
Table 8.20 Descriptive Statistics for Acute Stress Disorders by Psychotherapy Use	130
Table 8.21 Descriptive Statistics for Acute Stress Disorders by Either Use	131

Table 8.22 Descriptive Statistics for Depression (NOS) Disorders by Condition Identifiers	132
Table 8.23 Descriptive Statistics for Depression (NOS) Disorders by Pharmacotherapy Use	133
Table 8.24 Descriptive Statistics for Depression (NOS) Disorders by Psychotherapy Use.	134
Table 8.25 Descriptive Statistics for Depression (NOS) Disorders by Either Use.....	135
Table 8.26 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Affective Disorders	137
Table 8.27 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Affective Disorders.....	137
Table 8.28 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Anxiety Disorders	138
Table 8.29 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Anxiety Disorders.....	139
Table 8.30 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Neurotic Disorders	140
Table 8.31 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Neurotic Disorders.....	140
Table 8.32 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Acute Stress Disorders	141
Table 8.33 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Acute Stress Disorders.....	142
Table 8.34 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Depression (NOS) Disorders..	143
Table 8.35 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Depression (NOS) Disorders	144
Table 8.36 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Affective Disorders	145

Table 8.37 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Affective Disorders.....	146
Table 8.38 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Anxiety Disorders	147
Table 8.39 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Anxiety Disorders.....	148
Table 8.40 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Neurotic Disorders	149
Table 8.41 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Neurotic Disorders.....	150
Table 8.42 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Acute Stress Disorders	151
Table 8.43 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Acute Stress Disorders.....	152
Table 8.44 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Depression (NOS) Disorders..	153
Table 8.45 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Depression (NOS) Disorders	154
Table 8.46 Proportion of 1998 Samples with 1997 Sample Identifier for Affective Disorders	155
Table 8.47 Proportion of 1998 Samples with 1997 Sample Identifier for Anxiety Disorders	155
Table 8.48 Proportion of 1998 Samples with 1997 Sample Identifier for Neurotic Disorders	156
Table 8.49 Proportion of 1998 Samples with 1997 Sample Identifier for Acute Stress Disorders.....	156
Table 8.50 Proportion of 1998 Samples with 1997 Sample Identifier for Depression (NOS) Disorders.....	157

Table 8.51 Logistic Model of Fitting Sample Definitions of Affective Disorders in Terms Of Effect Measures Full MEPS Sample.....	158
Table 8.52 Logistic Model of Fitting Sample Definitions of Anxiety Disorders in Terms Of Effect Measures for Full MEPS Sample.....	159
Table 8.53 Logistic Model of Fitting Sample Definitions of Neurotic Disorders in Terms Of Effect Measures for Full MEPS Sample.....	159
Table 8.54 Logistic Model of Fitting Sample Definitions of Acute Stress Disorders in Terms Of Effect Measures for Full MEPS Sample.....	160
Table 8.55 Logistic Model of Fitting Sample Definitions of Depression (NOS) Disorders in Terms Of Effect Measures for Full MEPS Sample	160

EMPIRICAL RESULTS

Table 9.1 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Affective Disorders	165
Table 9.2 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Anxiety Disorders	167
Table 9.3 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Neurotic Disorders	169
Table 9.4 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Acute Stress Disorders	171
Table 9.5 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Depression (NOS) Disorders	172
Table 9.6 Estimation of Incremental Net Benefit (With and Without Controls) For Affective Disorders	187
Table 9.7 Estimation of Incremental Net Benefit (With and Without Controls) For Anxiety Disorders	189
Table 9.8 Estimation of Incremental Net Benefit (With and Without Controls) For Neurotic Disorders	191

Table 9.9 Estimation of Incremental Net Benefit (With and Without Controls) For Acute Stress Disorders	193
Table 9.10 Estimation of Incremental Net Benefit (With and Without Controls) For Depression (NOS) Disorders	195
Table 9.11 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Affective Disorders	198
Table 9.12 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Anxiety Disorders	200
Table 9.13 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Neurotic Disorders	202
Table 9.14 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Acute Stress Disorders	204
Table 9.15 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Depression (NOS) Disorders	206
Table 9.16 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Affective Disorders	209
Table 9.17 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Anxiety Disorders	211
Table 9.18 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Neurotic Disorders	213
Table 9.19 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Acute Stress Disorders	215
Table 9.20 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Depression (NOS) Disorders	217
Table 9.21 Logistic Model of CAM Use in Terms Of CAM Use by Primary Sampling Unit for Affective, Anxiety, and Neurotic Disorders	219
Table 9.22 Logistic Model of CAM Use In Terms Of CAM Use by Primary Sampling Unit for Acute Stress and Depression (NOS) Disorders	219

Table 9.23 Estimation of Incremental Net Benefit (Without Controls and IV) For Affective Disorders	221
Table 9.24 Estimation of Incremental Net Benefit (Without Controls and IV) For Anxiety Disorders	223
Table 9.25 Estimation of Incremental Net Benefit (Without Controls and IV) For Neurotic Disorders	225
Table 9.26 Estimation of Incremental Net Benefit (Without Controls and IV) For Acute Stress Disorders	227
Table 9.27 Estimation of Incremental Net Benefit (Without Controls and IV) For Depression (NOS) Disorders	229
Table 9.28 Estimated Transformation of Primary and Secondary Measures to Other Health Outcome Measures.....	231
Table 9.29 Estimated Transformation of Primary and Secondary Measures to Other Health Outcome Measures.....	231
Table 9.30 Estimated Days of Work Missed by Mental Health Disorder	232
Table 9.31 Estimated Probability of Long-Term Work Missed	234
Table 9.32 Estimated SF-12 Index Score	236
Table 9.33 Estimated EQ-5D Index Score.....	238
Table 9.34 Estimated ICER from EQ-5D.....	240

LIST OF FIGURES

ECONOMIC JUSTIFICATION FOR COST-EFFECTIVENESS ANALYSIS

Figure 4.1 Quadrants of the Incremental Cost-Incremental Effectiveness Space	16
Figure 4.2 Quadrants of the Incremental Cost-Incremental Effectiveness Space in Input Space	18
Figure 4.3 Optimal Expansion Path	19
Figure 4.4 Three Treatments Schemes against an Initial Standard Treatment Scheme in Incremental Cost-Incremental Effectiveness Space.....	20
Figure 4.5 Three Treatment Schemes against an Initial Standard Treatment Scheme in Input Space	21
Figure 4.6 Input-ICER Space (Quadrant I Perspective)	23
Figure 4.7 Input-ICER Space (Quadrant III Perspective).....	24
Figure 4.8 ICERs below WTP = 180 in Input-ICER Space	26
Figure 4.9 ICERs below WTP = 150 in Input-ICER Space	27
Figure 4.10 ICERs below WTP = 135 in Input-ICER Space	28
Figure 4.11 ICERs below WTP = 126 in Input-ICER Space	29

REVIEWING COST-EFFECTIVENESS TECHNIQUES

Figure 7.1 The Four Quadrants of the Incremental Cost-Incremental Effectiveness Space... 75	
Figure 7.2 Positive and Negative Incremental Net Benefits in the Incremental Cost-Incremental Effectiveness Space	77
Figure 7.3 Incremental Net Benefit as the Vertical Distance between and Incremental Cost-Effectiveness Ray and a Value of a Unit of Incremental Effect Ray.....	79
Figure 7.4 "Best-Case" and "Worse-Case" Incremental Cost-Effectiveness Ratios	84

DESCRIPTION OF THE DATA

Figure 8.1 Timing of Panels 2 and 3 in the 1998 MEPS	102
--	-----

EMPIRICAL RESULTS

Figure 9.1 Bootstrap Replicates for Affective Disorders by Psychotherapy Use with Two Values of a Unit of Effect	175
Figure 9.2 CEAC for Affective Disorders by Psychotherapy Use with Two Values of a Unit of Effect	176
Figure 9.3 Bootstrap Replicates for Affective Disorders by Psychotherapy Use.....	177
Figure 9.4 CEAC for Affective Disorders by Psychotherapy Use	177
Figure 9.5 Bootstrap Replicates for Anxiety Disorders by Psychotherapy Use.....	178
Figure 9.6 CEAC for Anxiety Disorders by Psychotherapy Use.....	179
Figure 9.7 Bootstrap Replicates for Neurotic Disorders by Psychotherapy Use.....	180
Figure 9.8 CEAC for Neurotic Disorders by Psychotherapy Use	180
Figure 9.9 Bootstrap Replicates for Acute Stress Disorders by Psychotherapy Use.....	181
Figure 9.10 CEAC for Acute Stress Disorders by Psychotherapy Use	182
Figure 9.11 Bootstrap Replicates for Depression (NOS) Disorders by Psychotherapy Use	183
Figure 9.12 CEAC for Depression (NOS) Disorders by Psychotherapy Use.....	183

APPENDICES

Figure A.1 Bootstrap Replicates for Affective Disorders by Condition Identifier.....	262
Figure A.2 CEAC for Affective Disorders by Condition Identifier	262
Figure A.3 Bootstrap Replicates for Affective Disorders by Pharmacotherapy Use	263
Figure A.4 CEAC for Affective Disorders by Pharmacotherapy Use	263
Figure A.5 Bootstrap Replicates for Affective Disorders by Psychotherapy Use.....	264
Figure A.6 CEAC for Affective Disorders by Psychotherapy Use	264
Figure A.7 Bootstrap Replicates for Affective Disorders by Either Use.....	265
Figure A.8 CEAC for Affective Disorders by Either Use	265

Figure A.9 Bootstrap Replicates for Anxiety Disorders by Condition Identifier	266
Figure A.10 CEAC for Anxiety Disorders by Condition Identifier.....	266
Figure A.11 Bootstrap Replicates for Anxiety Disorders by Pharmacotherapy Use.....	267
Figure A.12 CEAC for Anxiety Disorders by Pharmacotherapy Use	267
Figure A.13 Bootstrap Replicates for Anxiety Disorders by Psychotherapy Use	268
Figure A.14 CEAC for Anxiety Disorders by Psychotherapy Use.....	268
Figure A.15 Bootstrap Replicates for Anxiety Disorders by Either Use.....	269
Figure A.16 CEAC for Anxiety Disorders by Either Use	269
Figure A.17 Bootstrap Replicates for Neurotic Disorders by Condition Identifier	270
Figure A.18 CEAC for Neurotic Disorders by Condition Identifier	270
Figure A.19 Bootstrap Replicates for Neurotic Disorders by Pharmacotherapy Use.....	271
Figure A.20 CEAC for Neurotic Disorders by Pharmacotherapy Use	271
Figure A.21 Bootstrap Replicates for Neurotic Disorders by Psychotherapy Use.....	272
Figure A.22 CEAC for Neurotic Disorders by Psychotherapy Use.....	272
Figure A.23 Bootstrap Replicates for Neurotic Disorders by Either Use.....	273
Figure A.24 CEAC for Neurotic Disorders by Either Use	273
Figure A.25 Bootstrap Replicates for Acute Stress Disorders by Condition Identifier.....	274
Figure A.26 CEAC for Acute Stress Disorders by Condition Identifier	274
Figure A.27 Bootstrap Replicates for Acute Stress Disorders by Pharmacotherapy Use	275
Figure A.28 CEAC for Acute Stress Disorders by Pharmacotherapy Use	275
Figure A.29 Bootstrap Replicates for Acute Stress Disorders by Psychotherapy Use.....	276
Figure A.30 CEAC for Acute Stress Disorders by Psychotherapy Use	276
Figure A.31 Bootstrap Replicates for Acute Stress Disorders by Either Use.....	277
Figure A.32 CEAC for Acute Stress Disorders by Either Use	277
Figure A.33 Bootstrap Replicates for Depression (NOS) Disorders by Condition Identifier	278
Figure A.34 CEAC for Depression (NOS) Disorders by Condition Identifier.....	278

Figure A.35 Bootstrap Replicates for Depression (NOS) Disorders by Pharmacotherapy Use	279
Figure A.36 CEAC for Depression (NOS) Disorders by Pharmacotherapy Use	279
Figure A.37 Bootstrap Replicates for Depression (NOS) Disorders by Psychotherapy Use	280
Figure A.38 CEAC for Depression (NOS) Disorders by Psychotherapy Use	280
Figure A.39 Bootstrap Replicates for Depression (NOS) Disorders by Either Use	281
Figure A.40 CEAC for Depression (NOS) Disorders by Either Use	281
Figure A.41 CEAC with Controls for Affective Disorders by Condition Identifier	282
Figure A.42 CEAC with Controls for Affective Disorders by Pharmacotherapy Use	282
Figure A.43 CEAC with Controls for Affective Disorders by Psychotherapy Use	283
Figure A.44 CEAC with Controls for Affective Disorders by Either Use	283
Figure A.45 CEAC with Controls for Anxiety Disorders by Condition Identifier	284
Figure A.46 CEAC with Controls for Anxiety Disorders by Pharmacotherapy Use	284
Figure A.47 CEAC with Controls for Anxiety Disorders by Psychotherapy Use	285
Figure A.48 CEAC with Controls for Anxiety Disorders by Either Use	285
Figure A.49 CEAC with Controls for Neurotic Disorders by Condition Identifier	286
Figure A.50 CEAC with Controls for Neurotic Disorders by Pharmacotherapy Use	286
Figure A.51 CEAC with Controls for Neurotic Disorders by Psychotherapy Use	287
Figure A.52 CEAC with Controls for Neurotic Disorders by Either Use	287
Figure A.53 CEAC with Controls for Acute Stress Disorders by Condition Identifier	288
Figure A.54 CEAC with Controls for Acute Stress Disorders by Pharmacotherapy Use	288
Figure A.55 CEAC with Controls for Acute Stress Disorders by Psychotherapy Use	289
Figure A.56 CEAC with Controls for Acute Stress Disorders by Either Use	289
Figure A.57 CEAC with Controls for Depression (NOS) Disorders by Condition Identifier	290
Figure A.58 CEAC with Controls for Depression (NOS) Disorders by Pharmacotherapy Use	290
Figure A.59 CEAC with Controls for Depression (NOS) Disorders by Psychotherapy Use	291

Figure A.60 CEAC with Controls for Depression (NOS) Disorders by Either Use.....	291
Figure A.61 Incremental Net Benefit Confidence Interval for Affective Disorders by Condition Identifier.....	292
Figure A.62 Incremental Net Benefit Confidence Interval for Affective Disorders by Pharmacotherapy Use	292
Figure A.63 Incremental Net Benefit Confidence Interval for Affective Disorders by Psychotherapy Use.....	293
Figure A.64 Incremental Net Benefit Confidence Interval for Affective Disorders by Either Use	293
Figure A.65 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Condition Identifier.....	294
Figure A.66 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Pharmacotherapy.....	294
Figure A.67 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Psychotherapy Use.....	295
Figure A.68 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Either Use	295
Figure A.69 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Condition Identifier.....	296
Figure A.70 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Pharmacotherapy Use	296
Figure A.71 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Psychotherapy Use.....	297
Figure A.72 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Either Use	297
Figure A.73 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Condition Identifier.....	298

Figure A.74 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Pharmacotherapy Use	298
Figure A.75 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Psychotherapy Use.....	299
Figure A.76 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Either Use.....	299
Figure A.77 Incremental Net Benefit Confidence Interval for Depression (NOS) Disorders by Condition Identifier.....	300
Figure A.78 Net Benefit Confidence Interval for Depression (NOS) Disorders by Pharmacotherapy Use	300
Figure A.79 Net Benefit Confidence Interval for Depression (NOS) Disorders by Psychotherapy Use.....	301
Figure A.80 Net Benefit Confidence Interval for Depression (NOS) Disorders by Either Use	301
Figure A.81 CEAC with IPS Weighting and IV for Affective Disorders by Condition Identifier.....	302
Figure A.82 CEAC with IPS Weighting and IV for Affective Disorders by Pharmacotherapy Use	302
Figure A.83 CEAC with IPS Weighting and IV for Affective Disorders by Psychotherapy Use	303
Figure A.84 CEAC with IPS Weighting and IV for Affective Disorders by Either Use	303
Figure A.85 CEAC with IPS Weighting and IV for Anxiety Disorders by Condition Identifier	304
Figure A.86 CEAC with IPS Weighting and IV for Anxiety Disorders by Pharmacotherapy Use	304
Figure A.87 CEAC with IPS Weighting and IV for Anxiety Disorders by Psychotherapy Use	305
Figure A.88 CEAC with IPS Weighting and IV for Anxiety Disorders by Either Use.....	305

Figure A.89 CEAC with IPS Weighting and IV for Neurotic Disorders by Condition Identifier.....	306
Figure A.90 CEAC with IPS Weighting and IV for Neurotic Disorders by Pharmacotherapy Use	306
Figure A.91 CEAC with IPS Weighting and IV for Neurotic Disorders by Psychotherapy Use	307
Figure A.92 CEAC with IPS Weighting and IV for Neurotic Disorders by Either Use.....	307
Figure A.93 CEAC with IPS Weighting and IV for Acute Stress Disorders by Condition Identifier.....	308
Figure A.94 CEAC with IPS Weighting and IV for Acute Stress Disorders by Pharmacotherapy Use	308
Figure A.95 CEAC with IPS Weighting and IV for Acute Stress Disorders by Psychotherapy Use	309
Figure A.96 CEAC with IPS Weighting and IV for Acute Stress Disorders by Either Use	309
Figure A.97 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Condition Identifier.....	310
Figure A.98 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Pharmacotherapy Use	310
Figure A.99 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Psychotherapy Use.....	311
Figure A.100 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Either Use	311

LIST OF ABBREVIATIONS

AHRQ	Agency for Healthcare Research and Quality
APA	American Psychiatric Association
AT	Autogenic Therapy
CAM	Complementary and Alternative Medicine
CBT	Cognitive-Behavioral Therapy
CEA	Cost-Effectiveness Analysis
CEAC	Cost-Effectiveness Acceptability Curves
DSM-IV-TR	Diagnostic and Statistical Manual, Fourth Edition, Text Revision
ECT	Electroconvulsive Therapy
GAD	Generalized Anxiety Disorder
HRQL	Health-Related Quality of Life
ICD-9	International Statistical Classification of Diseases and Related Health Problems
ICER	Incremental Cost-Effectiveness Ratio
INB	Incremental Net Benefit
INHB	Incremental Net Health Benefit
IPT	Interpersonal Psychotherapy
MADRS	Montgomery-Åsberg Depression Rating Scale
MAOI	Monoamine Oxidase Inhibitor
MEPS	Medical Expenditure Panel Survey
MRS	Mania Rating Scale
NASSA	Noradrenergic and Specific Serotonergic Antidepressant
NCCAM	National Center for Complementary and Alternative Medicine
NDRI	Norepinephrine-Dopamine Reuptake Inhibitor
NHIS	National Health Interview Survey
NOS	Not Otherwise Specified

NRI	Noradrenaline Reuptake Inhibitors
RCT	Randomized Control Trials
SNRI	Serotonin-Norepinephrine Reuptake Inhibitor
SSRI	Selective Serotonin Reuptake Inhibitor
TCA	Tricyclic Antidepressants
WTA	Willingness-To-Accept
WTP	Willingness-To-Pay
YMRS	Young Mania Rating Scale

Chapter 1

INTRODUCTION TO THE QUESTION

Mental health disorders affect a significant portion of the population at any given time and account for a significant portion of overall health spending in the United States. A recent, large-scale nationally representative survey estimated 12-month prevalence for any mental health disorder at over 25% of the adult population (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Anxiety disorders and mood disorders (depression disorder and bipolar disorder) were disorders with particularly high rates of prevalence (18.1% and 9.5% respectively) (2005).

Expenditure on mental health services account for a significant portion of U.S. medical spending, reaching \$121 billion (in 2003) or 7.5 percent of all health spending (Levit, et al., 2008). Mental health disorders were recognized as one of the most expensive conditions to treat, behind only heart disease, cancer, and trauma-related disorders (Cohen & Krauss, 2003). Antidepressant prescriptions prevalence nearly doubled between 1996 and 2005 (Olfson & Marcus, 2009).

Mental health disorders affect a large number of people in the population and represent a large portion of medical spending. In an environment of constrained healthcare dollars, both in terms of individual patient budget constraints and an economy-wide budget constraint, it is necessary to find methods of treatment that are the best use of healthcare resources. In a system that cares not only for positive clinical outcomes but for the best clinical outcomes given the resource constraints, cost-effectiveness analysis (CEA) is a meaningful tool to inform health policy. The recent interest in comparative effectiveness research as part of President Obama's healthcare reform demonstrates the importance of this line of research in managing best economic practices in medicine.

Mental health resources, like all other healthcare resources, are finite. How should scarce mental healthcare resources be used to treat mental health disorders? While there is some clinical evidence to suggest the use of complementary and alternative medicine (CAM) in treating mental health disorders, is the use of CAM by individuals with mental health disorders an efficient use of scarce mental healthcare resources?

1.1 The Question

This study attempts to answer the following, narrowly-defined question: Is complementary and alternative medicine (broadly defined) a cost-effective addition to traditional treatment for the common mental health disorders of affective, anxiety, acute stress, neurotic, and depression (NOS) using the primary measure of the probability of good self-reported mental health status and four secondary measures of health limitations using observational data on individual treatment and characteristics?

1.2 The Contribution

Past cost-effectiveness analyses have used randomized controlled trials (RCTs) to examine the efficacy of specific complementary and alternative treatments or a narrow definition of CAM, finding generally favorable, but mixed results. This study differs from past research in that it uses nationally representative survey data and a broad definition of CAM that includes a number of different treatments. Randomized controlled trials have strong internal validity, but may not have strong external validity. The outcome of treatment for a specific sample in a controlled environment (i.e., the efficacy of treatment) may not generalize to the broader population in an uncontrolled environment. This study uses the Medical Expenditure Panel Survey (MEPS), a panel survey of medical use, expenditure, and health status for the civilian noninstitutionalized U.S. population to investigate the outcome of complementary and alternative medicine in an uncontrolled environment (i.e., the effectiveness of treatment).

The primary measure of effect for this research is based on self-reported mental health status from a five-point Likert scale. Secondary measures of effect include social, cognitive, and physical limitations to reflect the different health domains that these mental health disorders may influence. This research will address the degree to which the self-reported measures of mental health in the Medical Panel Expenditure Survey can produce evidence of the cost-effectiveness of complementary and alternative medicine for treating mental health disorders. Both the incremental cost-effectiveness ratio method and incremental net benefit methods of estimating cost-effectiveness are used in this research. The results are compared to four other measures used in the literature: number of days of work missed, the probability of long-term work missed, the SF-12 Index score, and the EQ-5D Index score. The SF-12 Index score and the EQ-5D Index score are common global health measures used in past research for a variety of health conditions.

A significant concern for using observational data is the potential for self-selection into the treatment group. After investigating for evidence of selection bias, this research will investigate the potential self-selection bias through four methods: including observable heterogeneity, propensity score matching, inverse propensity score weighting, and using primary sampling unit CAM use as an instrument for the decision to seek treatment. These methods are easily incorporated into the incremental net benefit framework.

1.3 Overview of the Chapters

The following summarizes the organization of the rest of this research.

Chapter 2 summarizes the symptoms, causes and treatments for the mental health disorders that are considered (affective, anxiety, neurotic, acute stress, and depression (NOS) disorders). This provides an introduction to the mental health disorders considered in this research.

Chapter 3 summarizes some basic information about complementary and alternative medicine including different classification systems and characteristics of common users from past studies.

Chapter 4 connects the familiar economic concepts of isoquants and isocosts in production to the primary tool of cost-effectiveness analysis, the incremental cost-effectiveness ratio. Individuals choose different bundles of treatments (pharmacotherapy, psychotherapy, and complementary and alternative medicine) to produce mental health. This section demonstrates that cost-effectiveness analysis is consistent with cost-minimizing production of mental health.

Chapter 5 discusses measures of mental health effect. The symptoms, causes, and treatments for the mental health disorders are reviewed. The clinical diagnostic criteria for each mental health disorder are presented. These would form the basis the ideal measure of mental health. A brief summary and classification of previous measures used in previous research are presented for each mental health disorder. The measures of mental health effect used in this research are described, including their relationship to the clinical diagnostic criteria for each mental health disorder. There is a lengthy summary of the clinical evidence on the effectiveness of different forms of mental health treatments. This section provides a conceptual justification for the measures of effect used in this research.

Chapter 6 discusses the measures of cost, starting with a description of ideal cost measures for economic analysis, followed by a discussion of potential bias when using less than ideal data. This section provides a conceptual justification for the measures of mental health cost used in this research.

Chapter 7 lays out the tools of cost-effectiveness analysis: the incremental cost-effectiveness ratio (ICER), the incremental net benefit (INB), and the cost-effectiveness acceptability curves (CEAC) created with either bootstrapping or hypothesis testing. This section also describes how the incremental net benefit method can be extended to control for observable characteristics. These tools form the basis of how this analysis will evaluate cost-effectiveness of CAM.

Chapter 8 includes a description of the MEPS overlapping panel construction and variables of interest (measures of effect and cost, treatment variables, and observable health and demographic characteristics). This section briefly describes the four sample definitions

used for the analysis: by individuals by a condition identifier based on diagnostic criteria, by individuals using pharmacotherapy, by individuals using psychotherapy, and by individuals using either pharmacotherapy or psychotherapy. This chapter concludes with a statistical description of the samples. This chapter provides background information on the data that this analysis uses to evaluate the cost-effectiveness of CAM.

Chapter 9 presents the results, including estimated costs, effects, and incremental cost-effectiveness ratio, measures of uncertainty, estimation to investigate potential self-selection, and generalization to measures used in other research. These results are the evidence on the cost-effectiveness of CAM.

Chapter 10 concludes this research with a discussion of the results, including an overview of important finding of this research, potential policy implications, and areas for future research.

Chapter 2

INTRODUCTION TO COMMON MENTAL HEALTH DISORDERS

The following chapter briefly summarizes the symptoms, causes, and treatment for the common mental health disorders under consideration in order to provide a background on the disorders considered in this research. The symptoms would form the basis of idea measures of mental health. The treatments represent the inputs to the mental health production function.

2.1 Depression

The symptoms of depression may include both emotional and physical symptoms. Emotional symptoms may include persistent sadness, anxious or "empty" feelings, feelings of hopelessness and/or pessimism, feelings of guilt, worthlessness and/or helplessness, irritability, loss of interest in activities or hobbies once pleasurable, including sex, difficulty concentrating, remembering details, and making decisions (National Institute of Mental Health, 2008). Physical symptoms may include restlessness, fatigue and decreased energy, insomnia, early-morning wakefulness, or excessive sleeping, overeating, or appetite loss, thoughts of suicide, suicide attempts, persistent aches or pains, headaches, cramps or digestive problems that do not ease even with treatment (2008). Men are more likely than women to acknowledge the physical symptoms of depression such as fatigue, irritability, loss of interest in once-pleasurable activities, and sleep disturbances, whereas women are more likely than men to acknowledge the emotional symptoms of depression such as of sadness, worthlessness and/or excessive guilt (Pollack, 1998).

A combination of genetic, biochemical, environmental, and psychological factors are the cause of depression. Areas of the brain related to mood, thinking, sleep, appetite, and behavior appear to function differently in individuals with depression (National Institute of

Mental Health, 2008). Past research indicates that multiple genes together with environmental or other factors influence the risk for depression (Tsuang, Bar, Stone, & Faraone, 2004).

There are four main categories of treatment for major depressive disorder: pharmacotherapy (antidepressants), psychotherapy, electroconvulsive therapy, and complementary and alternative medicine (CAM).

Antidepressants are psychiatric medications that are used to treat depression and a wide range of other mental health disorders. There are four main classes of antidepressants: Monoamine oxidase inhibitors (MAOIs), Tricyclic antidepressants (TCAs), Selective serotonin reuptake inhibitors (SSRIs), and Serotonin-noradrenaline reuptake inhibitors (SNRIs).

Antidepressant use began following two unintentional discoveries of compounds that had favorable outcomes in terms of reducing depression symptoms. In the early 1950's, favorable mental health outcomes were observed for patients in anti-tuberculosis trials taking the pharmaceutical compounds under consideration (Lieberman, 2003). This discovery led to the Monoamine oxidase inhibitors (MAOIs) use as an antidepressant. Tricyclic compounds were also observed to have favorable outcomes for patients suffering from depression (2003). MAOIs and Tricyclics often are referred to as first generation antidepressants.

Fluoxetine (Prozac), developed by Eli Lilly in the 1970's, represent the first large-scale commercial success of the Selective serotonin reuptake inhibitors (SSRIs). Older SSRIs and SNRIs are referred as second generation antidepressants. More recent compounds in this family are referred to as third generation antidepressants.

Other types of antidepressants include the Noradrenaline reuptake inhibitors (NRIs), Noradrenaline-dopamine reuptake inhibitors (NDRIs), and Noradrenergic and specific serotonergic antidepressants (NASSAs), though none of these represent a large share of the market for prescription antidepressants (Stagnitti, 2008).

In 2002, there were over 154 million antidepressant prescription purchases in the U.S. civilian noninstitutionalized population, and by 2005 purchases had increased to nearly 170 million (Stagnitti, 2008).

Psychotherapy or "talk therapy" includes two main types of psychotherapies: cognitive-behavioral therapy (CBT) and interpersonal therapy (IPT). CBT includes the teaching of new ways of thinking and behaving, while IPT includes the understanding and working through troubled personal relationships that may cause depression (National Institute of Mental Health, Depression, 2008).

Electroconvulsive therapy (ECT) is the use of electric currents deliberately passed through the brain in order to trigger a seizure. It is used for pharmacotherapy and/or psychotherapy treatment-resistant patients and typically is reserved for patients with severe depression (National Institute of Mental Health, 2008).

A common complementary and alternative medicine is St John's wort (*Hypericum perforatum*), a folk and herbal remedy for treating depression.

2.2 Bipolar Disorders

The symptoms of bipolar disorder include a shift in individual's mood, energy, and ability to function. The behavioral changes associated with a manic episode may include talking very fast, jumping from one idea to another, racing thoughts, being easily distracted, taking on new projects, restlessness, sleeping little, unrealistic believe in one's abilities, behaving impulsively, or taking on high-risk behaviors. The behavioral changes associated with a depressive episode may include feeling tired or "slowed down", problems concentrating or remembering, trouble making decisions, restless or irritable, or thinking of death or suicide (National Institute of Mental Health, Bipolar Disorder, 2009). Some bipolar individuals may also experience psychotic symptoms, such as hallucinations or delusions.

Many risk factors acting together lead to bipolar disorder. Bipolar disorder tends to run in families, suggesting that genetics may play a role (National Institute of Mental Health, Bipolar Disorder, 2009). Brain functioning studies suggest that the brains of individuals with

bipolar disorder may differ from brains of healthy individuals or from individuals with other mental disorders (Soares & Mann, 1997).

There is no cure for bipolar disorder; treatment focuses on better control of mood swings and related symptoms. Common treatment includes a combination of pharmacotherapy and psychotherapy. Common pharmacotherapy used to treat bipolar disorder include mood stabilizing medications (lithium, valproic acid, and anticonvulsants), atypical antipsychotic medications (olanzapine, aripiprazole, quetiapine, and risperidone), and antidepressant medications (National Institute of Mental Health, Bipolar Disorder, 2009).

Psychotherapy can include cognitive-behavioral therapy, family-focused therapy, interpersonal and social rhythm therapy, or psychoeducation (National Institute of Mental Health, Bipolar Disorder, 2009).

2.3 Generalized Anxiety Disorder (GAD) and Panic Disorder

A patient with generalized anxiety disorder (GAD) worries excessively about a variety of everyday problems. The physical symptoms may include fatigue, headaches, muscle tension, muscle aches, difficulty swallowing, trembling, twitching, irritability, sweating, nausea, lightheadedness, having to go to the bathroom frequently, feeling out of breath, and hot flashes that last at least 6 months (National Institute of Mental Health, Anxiety Disorders, 2009). Many individuals with mild anxiety can function normally in most social settings and hold down a job.

Panic Disorder is a type of anxiety disorder that includes feelings of terror that strike suddenly and repeatedly. The physical symptoms of a panic attack may include heart pounding, feeling sweaty, weak, faint, or dizzy, hands may tingle and feel numb, sensation of smothering, unreality, fear of impending doom, or loss of control (National Institute of Mental Health, Anxiety Disorders, 2009).

Mental anxiety disorders are a complex combination of genetic, environmental, psychological, and developmental factors (National Institute of Mental Health, Anxiety Disorders, 2009). The amygdala and the hippocampus are important to anxiety disorders. The

hippocampus appears smaller in victims of child abuse or soldiers that served in military combat (Bremner, Randall, & Scott, 1995).

Anxiety disorders are treated with medication or cognitive-behavioral therapy. Pharmacotherapy cannot cure anxiety disorders, but can keep them under control while receiving psychotherapy. Pharmacotherapy includes antidepressants, anti-anxiety drugs, and beta-blockers.

Major antidepressant classes used for anxiety symptoms include the SSRIs, Tricyclics, and MAOIs (National Institute of Mental Health, Anxiety Disorders, 2009). Common SSRIs used in GAD pharmacotherapy include fluoxetine, sertraline, escitalopram, paroxetine, and citalopram. MAOIs (phenelzine, tranylcypromine, and isocaroxazid) are used for treating anxiety disorders, but require significant diet and prescription restrictions (2009).

Anxiety drugs are also known as anxiolytic, antipanic or antianxiety agents. Benzodiazepines used to treat different types of anxiety disorders include clonazepam (Klonopin), lozapam (Ativan), and alprazolam (Xanax); however, these drugs can exhibit both tolerance and withdrawal (National Institute of Mental Health, Anxiety Disorders, 2009). Cognitive-behavioral therapy is used to treat anxiety. In CBT the patient changes their thinking patterns that support their fears and changes the way they react to anxiety-provoking situations (2009). Exposure techniques may be used to desensitize patients to situations that trigger their anxieties. CBT may often incorporate deep-breathing exercises to relieve anxiety and encourage relaxation, similar to different types of CAMs.

Chapter 3

INTRODUCTION TO COMPLEMENTARY AND ALTERNATIVE MEDICINE (CAM)

The following chapter briefly summarizes relevant information on complementary and alternative medicine (CAM), including different classification systems and the findings of previous research related to CAM users. This chapter provides a background of the treatment that will be evaluated in this research.

3.1 Complementary and Alternative Medicine Classification Systems

Complementary and alternative medicines are forms of treatment that are used in addition to (complementary) or instead of (alternative) standard treatment (National Cancer Institute). CAM is a group of diverse medical and healthcare systems, practices, and products that presently are not considered to be part of conventional medicine. Conventional medicine is medicine as practiced by holders of M.D. or D.O. degrees, and their allied health professionals, such as physical therapists, psychologists, and registered nurses (National Center for Complementary and Alternative Medicine).

The National Center for Complementary and Alternative Medicine (NCCAM), established in 1997, is the leading branch of the National Institute of Health commissioned to study complementary and alternative medicine. The NCCAM classification system identifies five broad categories of CAMs: whole medical systems, mind-body medicine, biologically-based practices, manipulative and body-based practices, and energy medicine. Complementary and alternative medicine (CAM) covers a heterogeneous spectrum of ancient to new-age approaches that purport to prevent or treat disease (Barnes, Bloom, & Nahin, 2008). Practices are considered unconventional when they are either not widely taught in

medical schools or when they are not widely practiced in hospitals or outpatient facilities (Unützer, et al., 2000).

Kaptchuk and Eisenberg (2001) created another much used system to categorize different types of unconventional care that uses a broader domain of health practices (though the authors recognize that imperfect and transitory nature of any classification system for unconventional medical practices). There is not complete exclusivity between the categories. Kaptchuk and Eisenberg classification system includes professional or distinct medical systems, popular health reforms, new age healing, psychological interventions, and non-normative scientific enterprises.

Professional or Distinct Medical Systems include Chiropractics, acupuncture, homeopathy, naturopathy, massage, and medicine by dual-trained MDs. Popular health reforms include the use of mega-vitamins, nutritional supplements, botanicals, macrobiotics, organic food, and the use of a vegan diet as medicine. New age healing includes esoteric energies, crystals and magnets, spirits and mediums, Reiki, and qigong. Psychological interventions include books by Deepak Chopra or Bernie Siegel, biofeedback, hypnosis, guided imagery, and relaxation response. Non-normative scientific enterprises include chelation, antineoplaston, pleomorphic bacteria cancer vaccine, iridology, and hair analysis.

3.2 Complementary and Alternative Medicine Users

Many individuals use CAM to improve health and well-being, including the relief of symptoms associated with chronic illness or the side-effects to conventional treatment. Barnes, et al., (2008) used the 2007 National Health Interview Survey (NHIS) to describe patterns of CAM users' characteristics and use. They found CAM users are more likely to be more female, middle-aged, white or Native American, more educated, more affluent, more likely to be covered by private health insurance, and more likely to live in the west. Common diseases and conditions for which people use CAM includes back, neck, or joint pain, arthritis, and mental health disorders (anxiety, depression, ADHA/ADD) (Barnes, Bloom, & Nahin, 2008). Overall, 38% of adults had used complementary and alternative

medicine in the previous 12 month, most commonly nonvitamin, nonmineral, natural products, deep breathing exercises, meditation, chiropractic or osteopathic manipulation, massage therapy, and yoga (2008). Recent increases in CAM use may be due to the greater number of states that license for certain practices and an increase in the awareness of the population from increased favorable press coverage (Barnes, Bloom, & Nahin, 2008).

Past studies demonstrate the increased use of CAM for individuals with mental health disorders (Unützer, et al., 2000), (Kessler, et al., 2001), (Roy-Byrne, Bystritsky, Russo, Craske, Sherbourne, & Stein, 2005), (Druss & Rosenheck, 2000), (Silvers & Scott, 2002).

Kessler, et al., (2001) using a 1997-1998 nationally representative survey suggests that the majority of people in the United States with self-defined anxiety attacks or severe depression use some form of CAM as part of their treatment. This assumes a broadly drawn definition of CAM that includes prayer as spiritual healing, relaxation techniques, and imagery. The authors find no statistical difference in the observable characteristics of individuals with anxiety attacks or severe depression that use CAM and individuals without anxiety attacks or severe depression that use of CAM.

Unützer, et al., (2000) using 1997-1998 nationally representative survey found individuals who reported use of alternative medicine were more likely to meet diagnostic criteria for at least one of the mental disorders under consideration (depression, dysthymia, panic disorder, generalized anxiety disorder, bipolar disorder, or psychosis).

In the 1997 update of their seminal nationally representative estimates of complementary and alternative care use, Eisenberg, et al., (1998) found that 40.9% of individuals reporting severe depression and 42.7% of individuals with anxiety attacks used alternative therapy in the previous year. Their findings were based on a broad definition of CAM. While they found a decrease in the percent of individuals who used complementary and alternative medicine that paid the full price out of their own pocket between 1992 and 1997, they still represented a majority (58.3%) of survey respondents (Eisenberg, et al., 1998). They estimated total expenditure on CAM for 1997 at \$21.2 billion, with estimated out-of-pocket expenditures totally \$9.1 billion (1998).

Chapter 4

ECONOMIC JUSTIFICATION FOR COST-EFFECTIVENESS ANALYSIS

Cost-effectiveness analysis (CEA) is used in the public health arena to help determine the appropriateness of replacing an existing treatment scheme with a new treatment scheme. Comparing the incremental cost to the incremental effect of a proposed new treatment sounds like a concept that borrows from economics. The mantra of equating the marginal benefit to the marginal cost is paramount in the collective economist psyche. Is CEA a public health method that fits easily into the economics tool box? This chapter will consider the tools of CEA in the familiar economic framework of production functions (using isoquants and isocosts).

4.1 Introduction to the Basic Tools of Cost-Effectiveness Analysis (CEA)

CEA determines the appropriateness of replacing an existing treatment scheme with a new treatment scheme. As in randomized controlled trials, the control group is the group of individuals with the standard method of treatment scheme. The treatment group is the group of individuals with the new treatment scheme under consideration. The treatment scheme can be either two completely distinct treatment schemes (e.g., only drug-therapy against only complementary and alternative-therapy) or the treatment can be two "mixed" treatment scheme with varying intensity (e.g., a drug-intensive therapy with some complementary and alternative medicine against a complementary and alternative medicine-intensive therapy with some drug therapy). The following discussion will consider "mixed" treatment scheme to the mental health production function.

The workhorse of CEA is the incremental cost-effectiveness ratio (ICER) where the difference in cost between treatment and control is normalized by the difference in effect between treatment and control.

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

The difference in cost and the difference in effect of an associated ICER are plotted in incremental cost-incremental effectiveness space. Four quadrants define the difference in cost and the difference in effect. A difference in cost and a difference in effect in quadrant IV imply an unambiguous favorable treatment (greater effect and lower cost with treatment group). A difference in cost and a difference in effect in quadrant II imply an unambiguous unfavorable treatment (less effect and higher cost with treatment group). A difference in cost and a difference in effect in either quadrant I or III may imply a favorable treatment, depending of the value placed on a unit of effect.

Moreover, if there are two treatment scheme compared to a common control both with a difference in cost and a difference in effect located in quadrant I, the treatment with the lower ICER is the more cost-effective treatment.

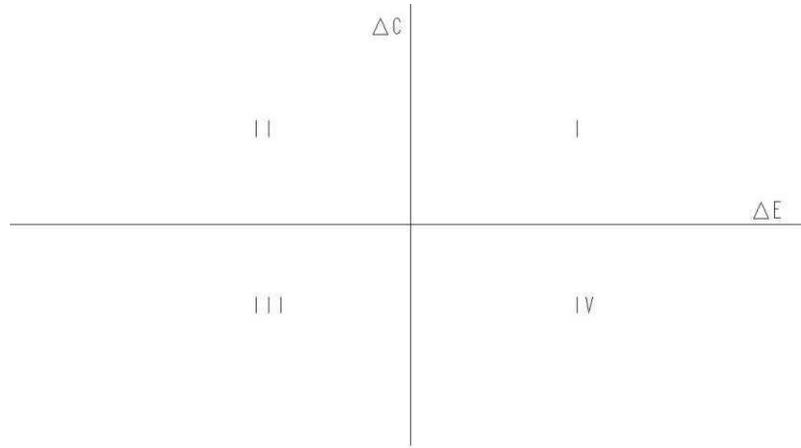


Figure 4.1 Quadrants of the Incremental Cost-Incremental Effectiveness Space

4.2 Cost-Minimizing Mental Health Production

In bringing this incremental cost-effectiveness ratio (ICER) into the familiar economic framework of production functions (using isoquants and isocosts), it would appear at first pass that the ICER is nothing more than a manipulation of the first-order conditions from the optimal mental health cost-minimization.

Consider the minimization of a linear cost function subject to the production of a given level of mental health (MH). Mental health is produced using treatment scheme of a bundle of traditional therapy (Tr) and complementary and alternative therapy (CAM).

$$\begin{aligned} \min_{Tr, CAM} \quad & P_{Tr}Tr + P_{CAM}CAM \\ \text{s. t.} \quad & MH(Tr, CAM) = \overline{MH} \end{aligned}$$

The following are the first-order conditions for mental health cost-minimization.

$$\begin{aligned} P_{Tr} - \lambda MH_{Tr} &= 0 \\ P_{CAM} - \lambda MH_{CAM} &= 0 \end{aligned}$$

$$MH(Tr, Alt) - \overline{MH} = 0$$

Noting that $C_{Tr} \stackrel{\text{def}}{=} \frac{\partial C}{\partial Tr} = P_{Tr}$ and $C_{CAM} \stackrel{\text{def}}{=} \frac{\partial C}{\partial CAM} = P_{CAM}$ the first-order conditions can be rewritten to imply:

$$\frac{P_{Tr}}{P_{CAM}} = \frac{MH_{Tr}}{MH_{CAM}}$$

$$\frac{MH_{Tr}}{P_{Tr}} = \frac{MH_{CAM}}{P_{CAM}}$$

$$\frac{P_{Tr}}{MH_{Tr}} = \frac{P_{CAM}}{MH_{CAM}}$$

$$\frac{C_{Tr}}{MH_{Tr}} = \frac{C_{CAM}}{MH_{CAM}}$$

The final form of the manipulation of the first-order conditions appears to be similar to the ICER. At the optimum ratio of the marginal cost to the marginal effect of each input in the mental health production process must be equal.¹ This is a familiar result to economists and is often presented using an isoquant and isocost in input space.

This condition of optimal ratio of marginal cost to marginal effect across inputs will hold for treatment schemes at the optimum. However, there is no *a priori* reason to believe that the control treatment scheme will be an optimum. Researchers choose to examine treatment schemes precisely because they do not know which are best.

¹ This assumes a twice continuously differentiable strictly concave production function.

4.3 ICER in Input Space

It is helpful to first consider a control treatment (T_0) that is a non-optimal combination of inputs to the mental health production process.

Note that all combinations of treatment schemes located in the IV region of Figure 4.2 correspond to quadrant IV of the incremental cost-incremental effectiveness space Figure 4.1 and imply an unambiguous favorable treatment (higher mental health production and lower cost)—though not all treatment schemes will represent optimal behavior. Note that all combinations of treatment schemes located in the II region of Figure 4.2 correspond to quadrant II in the incremental cost-incremental effectiveness space in Figure 4.1 and imply an unambiguous unfavorable treatment (lower mental health production and higher cost).

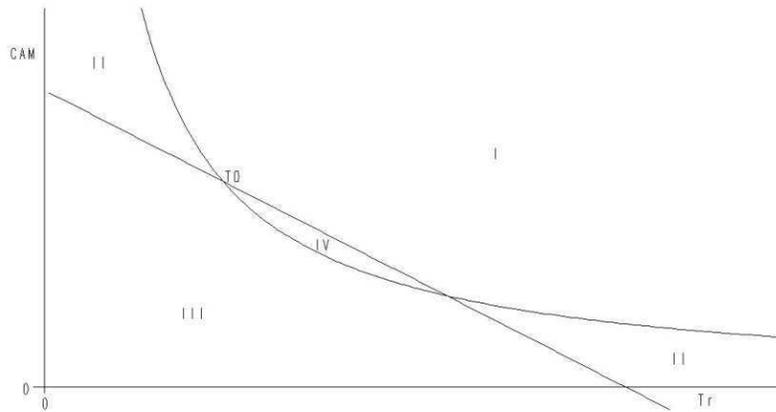


Figure 4.2 Quadrants of the Incremental Cost-Incremental Effectiveness Space in Input Space

Note that combinations of treatment schemes located in the I or III regions in Figure 4.2 correspond to their respective quadrants in the incremental cost-incremental effectiveness space in Figure 4.1. Some, but not all, of these combinations of treatment schemes will represent optimal behavior under different levels of cost. The treatment schemes along the expansion path in Figure 4.3 will represent optimal combinations.

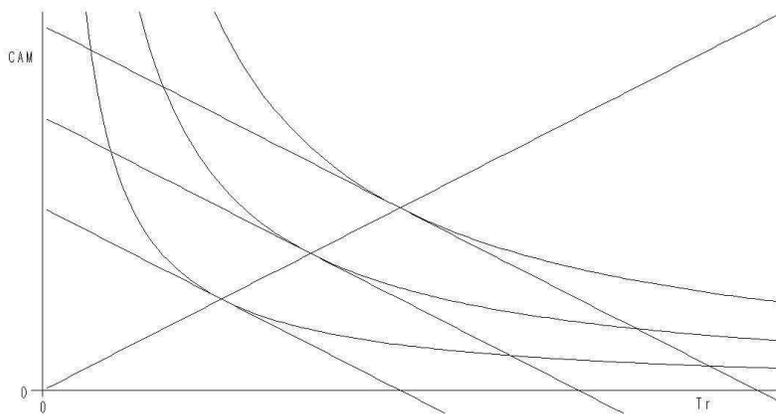


Figure 4.3 Optimal Expansion Path

Some of the combinations of treatment schemes with a difference in cost and a difference in effect located in quadrants I or III will represent improved (but not optimal) outcomes for certain values of a unit of effect (λ), i.e., either a willingness-to-pay more resources for additional mental health or a willingness-to-accept lower resource cost for lower mental health. These values of a unit of effect are exogenous to the health production decision process—they are informed by preferences for mental health, other health, and other consumption.²

The following example illustrates the link between the production space and the incremental cost-incremental effectiveness space. Again, consider a non-optimal initial standard treatment scheme (T_0) compared to three proposed treatment schemes (T_1, T_2, T_3).

² In focusing on optimal production of mental health and not utility maximization, there is an implicit assumption that the inputs to mental health production only enter utility through their impact on mental health production ($U(X, MH(Tr, CAM))$), i.e., that consumers only derive utility from the improved mental health production. Consumers do not derive utility from complementary and alternative medicines outside of their impact on mental health ($U(X, MH(Tr, CAM), CAM)$). People only go to yoga for the improvements in mental health, not for the enjoyment of the sport, not for any social benefits, not for any physical health spill-over effects.

Note that the initial standard treatment scheme is the least traditional-intensive. Each of the proposed treatment schemes are increasingly more traditional-intensive.³

Table 4.1 A Control Treatment and Three Combinations of Mixed Treatments

Treatment Scheme	Tr	CAM
T_0	20	45
T_1	29	42
T_2	32	32
T_3	38	10

These three proposed treatment schemes can be compared to the initial standard treatment in terms of mental health production and total cost with either the public health tool of ICER or the standard economic production function framework.

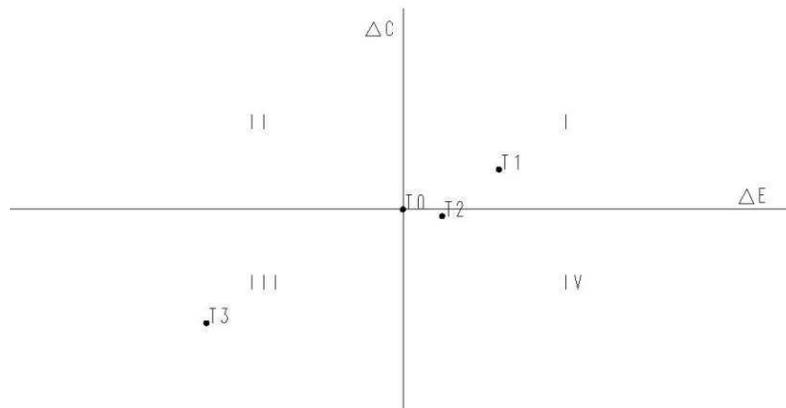


Figure 4.4 Three Treatments Schemes against an Initial Standard Treatment Scheme in Incremental Cost-Incremental Effectiveness Space

³ For convenience a simple Cobb-Douglas mental health production function was assumed ($MH = Tr^{0.5}CAM^{0.5}$) with a simple linear cost function ($C = 75Tr + 50CAM$) (similar to (Machnes, 1999)). Other functional forms assumed in past literature includes linear (Leigh, 1983), additive logs (Kema, 1987), and multiplicative inputs (Dardanoni & Wagstaff, 1990).

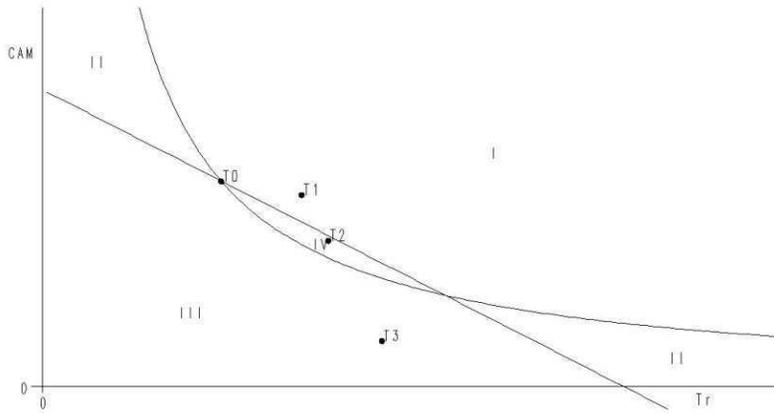


Figure 4.5 Three Treatment Schemes against an Initial Standard Treatment Scheme in Input Space

The ICER for any treatment scheme can be found from the total differential of the mental health production function and the cost function. This result can easily be conceptualized in the input space.

$$C(Tr, CAM)$$

$$dC(Tr, CAM) = C_{Tr}dTr + C_{CAM}dCAM$$

$$MH(Tr, CAM)$$

$$dMH(Tr, CAM) = MH_{Tr}dTr + MH_{CAM}dCAM$$

$$ICER(Tr, CAM) = \frac{dC(Tr, CAM)}{dMH(Tr, CAM)}$$

$$ICER(Tr, CAM) = \frac{C_{Tr}dTr + C_{CAM}dCAM}{MH_{Tr}dTr + MH_{CAM}dCAM}$$

With this formulation of ICER, it is possible to calculate the ICER for any treatment scheme in input space using a common control treatment scheme. Figure 4.6 presents the ICERs in input-ICER space as viewed from the quadrant I perspective. The inputs (CAM and Traditional therapy) are measured on the x and y axis with the same range as Figure 4.5. The ICER is measured on the z axis using the range (0, 200).

Treatment schemes with a difference in cost and a difference in effect that correspond to quadrant I will have positive ICERs. The mixed treatment schemes with positive ICERs below 200 are shown. The mixed treatment schemes with positive ICERs above 200 are not shown (they are above the range of the ICER axis shown as the plane at ICER = 200). As the mixed treatment schemes with a difference in cost and a difference in effect that correspond to quadrant I approach the initial standard treatment scheme isoquant (i.e., as $\Delta MH \rightarrow 0$), the ICERs asymptote to positive infinity. The treatment schemes with a difference in cost and a difference in effect that correspond to quadrant IV will have negative ICERs that asymptote to negative infinity as the inputs approach the initial standard treatment scheme isoquant (i.e., as $\Delta MH \rightarrow 0$).

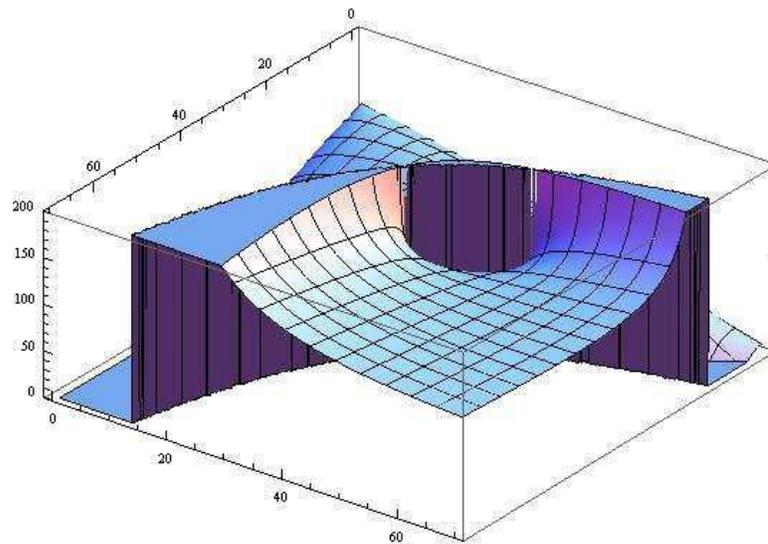


Figure 4.6 Input-ICER Space (Quadrant I Perspective)

Figure 4.7 presents the ICERs in input-ICER space as viewed from the quadrant III perspective. Treatment schemes with a difference in cost and a difference in effect that correspond to quadrant III will have positive ICERs. The treatment schemes with positive ICERs below 200 are shown. The treatment schemes with positive ICERs above 200 are not shown (they are above the range of the ICER axis and are shown as then plane at ICER = 200). As the treatment schemes with a difference in cost and a difference in effect that correspond to quadrant III approach the control treatment isoquant (i.e., as $\Delta MH \rightarrow 0$), the ICERs asymptote to positive infinity. The treatment schemes with a difference in cost and a difference in effect that correspond to quadrant II will have negative ICERs and are not shown (they are below the range of the ICER axis and are shown as the plane at ICER = 0).

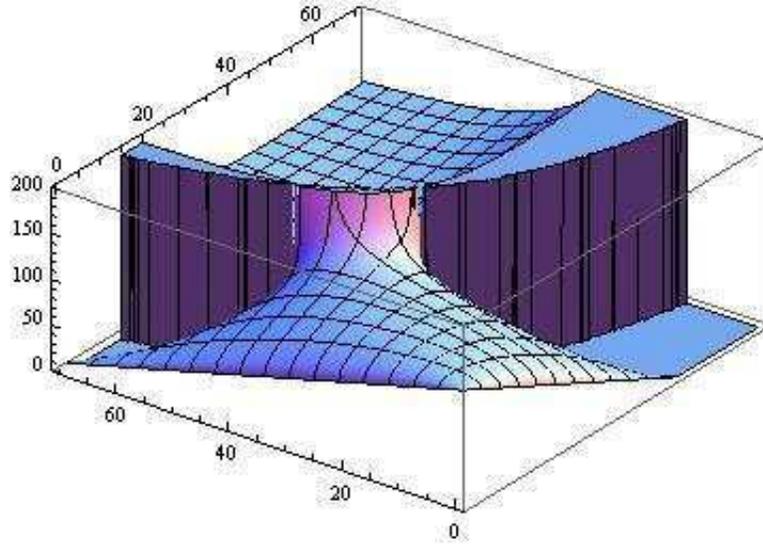


Figure 4.7 Input-ICER Space (Quadrant III Perspective)

With this formulation, it is also possible to examine how the ICER would change with other factors that may influence health production (e.g., schooling(S) similar to Koç (2004)).

$$ICER(Tr, CAM, S) = \frac{C_{Tr}(Tr, CAM)dTr + C_{CAM}(Tr, CAM)dCAM}{MH_{Tr}(Tr, CAM, S)dTr + MH_{CAM}(Tr, CAM, S)dCAM}$$

The effect on the ICER of a change in schooling will depend on the second partial derivatives of the mental health production function.⁴ Do higher levels of school have an impact on the marginal productivity of traditional therapy or complementary and alternative therapy? Are more educated people more likely to know the gains from consistent traditional therapy, choosing to better adhere to therapy, producing a greater mental health production? Is level of schooling unimportant? These are empirical questions beyond the theoretical scope of this research.

⁴ It is possible that the cost function depends on other factors ($C(Rx, Alt, S)$) but that possibility will be not be considered here.)

4.4 The ICER Decision Rule in Input Space

Consider two treatment schemes with incremental cost-effectiveness ratios (ICERs) below an exogenously determined willingness-to-pay (WTP) (and both with a difference in cost and a difference in effect located in quadrant I). If the ICER of one treatment scheme under consideration is lower than the other treatment scheme, then adopting the lower ICER treatment scheme will represent a movement toward the optimal combination of mental health production inputs. Not surprisingly, the lowest ICER along a given isoquant will be at the optimal combination of mental health production inputs. Moreover, lower ICERs will, in most cases, represent a movement toward the optimal expansion path of production inputs.⁵

As the requirements for cost-effectiveness become more stringent (i.e., as the value of improved effect used to evaluate the new treatment schemes is decreased), the set of cost-effective treatments schemes more closely approximates the expansion path. Figure 4.8 - Figure 4.11 shows the ICERs for treatment schemes with a difference in cost and a difference in effect located in quadrant I bounded above by a decreasing value of a unit of effect to demonstrate this result.

⁵ Actually, the lowest values of ICER are located infinitesimally close to the isocost curves of the control (near zero numerator). If costs are statistically different, then the movement toward the optimal expansion path is much clearer.

Figure 4.8 uses the same range for the CAM and traditional therapy axes as Figure 4.6. The range of the ICER axis is (0, 180). If the upper bound of the ICER axis is equal to the value of willingness-to-pay for an additional unit of effect (i.e., $WTP = 180$), then treatment schemes shown on the graph represent cost-effective mixed treatment schemes.

Treatment schemes located at the plane at $ICER = 180$ are not cost-effective for this value of a unit of effect.

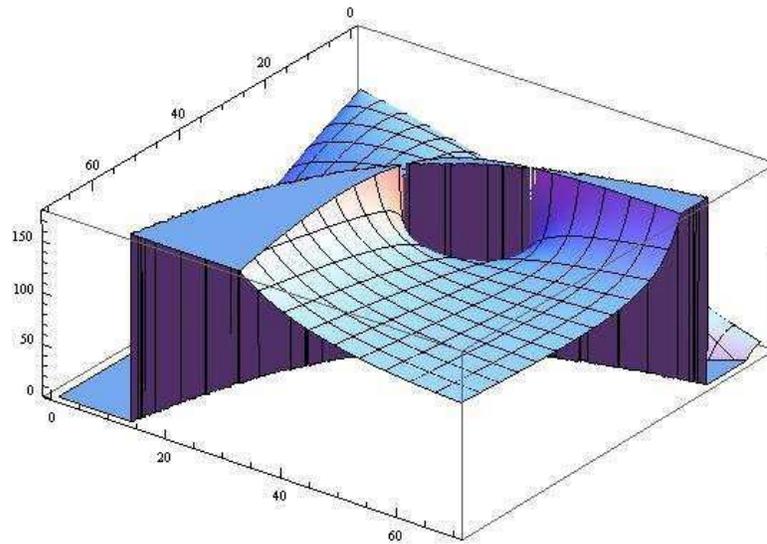


Figure 4.8 ICERs below $WTP = 180$ in Input-ICER Space

Figure 4.9 uses the same range for the CAM and traditional therapy axes as Figure 4.6. The range of the ICER axis is now (0, 150). If the upper bound of the ICER axis is equal to the value of willingness-to-pay for an additional unit of effect (i.e., $WTP = 150$), then treatment schemes shown on the graph represent cost-effective mixed treatment schemes.

Treatment schemes located at the plane at $ICER = 150$ are not cost-effective for this value of a unit of effect.

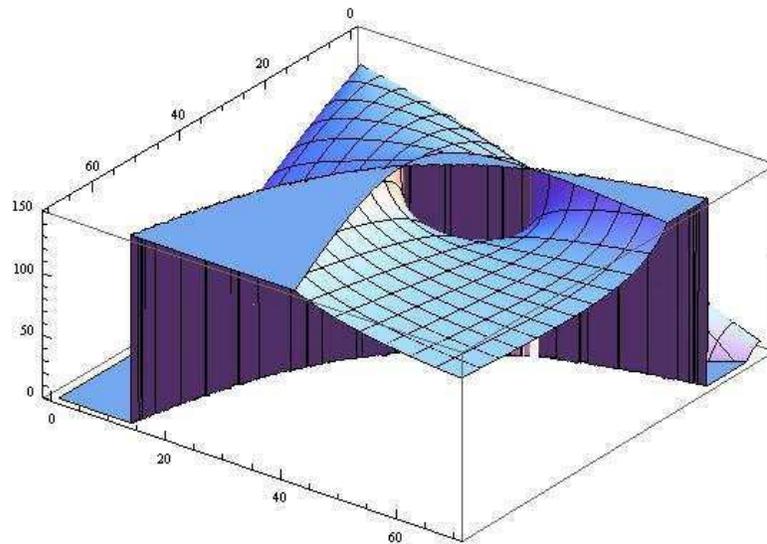


Figure 4.9 ICERs below $WTP = 150$ in Input-ICER Space

Figure 4.10 uses the same range for the CAM and traditional therapy axes as Figure 4.6. The range of the ICER axis is now (0, 135). If the upper bound of the ICER axis is equal to the value of willingness-to-pay for an additional unit of effect (i.e., $WTP = 135$), then the treatment schemes shown on the graph represent cost-effective mixed treatment schemes.

Treatment schemes located at the plane at $ICER = 135$ are not cost-effective for this value of a unit of effect.

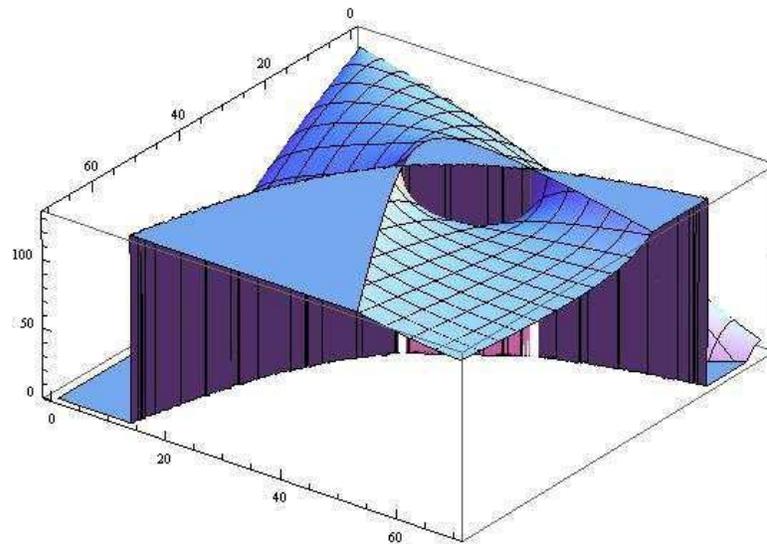


Figure 4.10 ICERs below $WTP = 135$ in Input-ICER Space

Figure 4.11 uses the same range for the CAM and traditional therapy axes as Figure 4.6. The range of the ICER axis is now (0, 126). If the upper bound of the ICER axis is equal to the value of willingness-to-pay for an additional unit of effect (i.e., $WTP = 126$), then treatment schemes shown on the graph represent cost-effective mixed treatments schemes.

Treatment schemes located at the plane at $ICER = 126$ are not cost-effective for this value of a unit of effect.

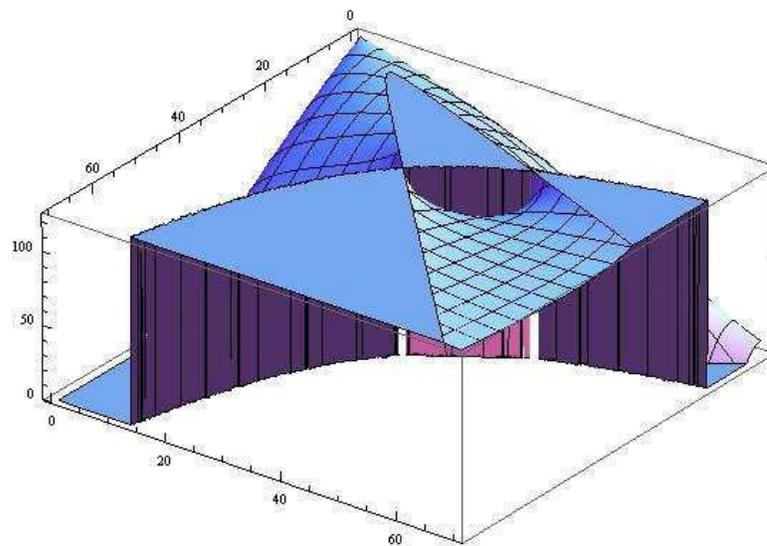


Figure 4.11 ICERs below $WTP = 126$ in Input-ICER Space

Note that as the requirements for cost-effectiveness become more stringent (i.e., as the value of an additional unit of effect used to evaluate the new treatment is decreased), the set of cost-effective treatment schemes more closely approximates the expansion path of optimal mental health production inputs. As the willingness-to-pay for a unit of effect decrease, an increasing number of treatment schemes are no longer considered cost-effective. It is only the treatment schemes that are close to the optimal expansion path that will continue to be cost-effective.

Note that as the value of a unit of effect decreases, an increasing number of treatments in quadrant III also are no longer considered cost-effective. The treatment schemes with ICERs that are above the value of a unit of effect are considered cost-effective (i.e., that the cost savings per unit of effect is greater than the value of a unit of effect). As the value of cost savings per unit of effect becomes lower (less stringent), an increasing number of treatment schemes with a lower cost and lower effect will be considered cost-effective.

Cost-effectiveness analysis (CEA) is used in the public health arena to help determine the appropriateness of replacing an existing treatment scheme with a new treatment scheme. This chapter places the ICER in the familiar economic framework of isoquants and isocosts to demonstrate that the CEA quadrant decision rules will represent movements toward the optimal inputs expansion path.

Chapter 5

ON MEASURING MENTAL HEALTH EFFECT

5.1 Introduction and Some Organization

The following discussion is meant to place the concept of mental health effect into a more developed context. This analysis implicitly rests on a production function framework, similar to Grossman's (1972) conceptualization of health production. In viewing mental health through a production framework, there are a number of essential questions to be addressed at the outset.

The first set of questions involves measurement of effect (i.e., the output of the mental health production function). What is the theoretical composition is the output (good mental health)? In the absence of measurement constraints, what is the most ideal theoretical measure of mental health effect? What are the measures of mental health effect currently employed in the literature? What are the proposed measures of mental health effect for this research? How do the proposed measures of mental health effect relate the theoretical concept of mental health output? The ideal measure would be a multi-faceted measure of each diagnostic criterion. As such the discussion will begin with characterizing the symptoms, causes, and treatment for each mental health disorder.

The second set of questions involves identifying and measuring treatments (i.e., the inputs of the mental health production function). What are the different forms of treatment for each mental health disorder? What are the treatments with strong professional recommendations (e.g., the American Psychiatric Association or the National Institute of Mental Health)?

The third set of questions involves the evidence in the clinical literature to inform the relationship between treatment and effect. What is the clinical evidence on the different

treatments for producing mental health effect? Meta-analyses for each treatment modality for each disorder are reviewed.

The fourth set of questions involves comparing the results of this research to results from previous work. How do the results of this research using the proposed measures of effect compare to the results of previous work using different research strategies (i.e., measures of effect, type of data)? To inform this question there is a brief discussion of global health measures. It is possible to link previously established global health measures (SF-12 Index score, EQ-5D Index score) and other measures (days of work missed, long-term days of work missed) to the results of this research.

5.2 Mental Health Disorders Symptoms, Causes, and Treatment

The following section briefly summarizes the symptoms, causes, and treatment for the common mental health disorders under consideration. The ideal measure of mental health status would be based on diagnostic criterion. The treatments represent the inputs to the mental health production function.

5.2.1 Depression

The symptoms of depression include both emotional and physical symptoms. Emotional symptoms may include persistent sadness, anxious or "empty" feelings, feelings of hopelessness and/or pessimism, feelings of guilt, worthlessness and/or helplessness, irritability, loss of interest in activities or hobbies once pleasurable, including sex, difficulty concentrating, remembering details, and making decisions (National Institute of Mental Health, 2008). Physical symptoms may include restlessness, fatigue and decreased energy, insomnia, early-morning wakefulness, or excessive sleeping, overeating, or appetite loss, thoughts of suicide, suicide attempts, persistent aches or pains, headaches, cramps or digestive problems that do not ease even with treatment (2008).

A combination of genetic, biochemical, environmental, and psychological factors are the cause of depression. Areas of the brain related to mood, thinking, sleep, appetite, and

behavior appear to function differently in individuals with depression (National Institute of Mental Health, 2008).

There are four main categories of treatment for major depressive disorder: pharmacotherapy (antidepressants), psychotherapy, electroconvulsive therapy, and complementary and alternative medicine (CAM).

Psychotherapy or "talk therapy" includes two main types of psychotherapies: cognitive-behavioral therapy (CBT) and interpersonal therapy (IPT). CBT includes the teaching of new ways of thinking and behaving, while IPT includes the understanding and working through troubled personal relationships that may cause depression (National Institute of Mental Health, Depression, 2008)

Electroconvulsive therapy (ECT) is the use of electric currents deliberately passed through the brain in order to trigger a seizure. It is used for pharmacotherapy and/or psychotherapy treatment-resistant patients and typically reserved for patients with severe depression (National Institute of Mental Health, 2008).

A common complementary and alternative medicine is St John's wort (*Hypericum perforatum*), a folk and herbal remedy for treating depression. A number of studies have considered the effectiveness of St. John's wort as a treatment of depression and will be discussed in later sections.

5.2.2 Bipolar Disorder

The symptoms of bipolar disorder include a shift in individual's mood, energy, and ability to function. The behavioral changes associated with a manic episode may include talking very fast, jumping from one idea to another, racing thoughts, being easily distracted, taking on new projects, restlessness, sleeping little, unrealistic believe in one's abilities, behaving impulsively, and taking on high-risk behaviors. The behavioral changes associated with a depressive episode may include feeling tired or "slowed down", problems concentrating, remembering, trouble making decisions, restlessness or irritable, and thinking of death or suicide (National Institute of Mental Health, Bipolar Disorder, 2009). Some

bipolar individuals may also experience psychotic symptoms, such as hallucinations or delusions.

Many risk factors acting together lead to bipolar disorder. Bipolar disorder tends to run in families, suggesting that genetics may play a role (National Institute of Mental Health, Bipolar Disorder, 2009). Brain functioning studies suggest that the brains of individuals with bipolar disorder may differ from brains of healthy individuals or from individuals with other mental disorders (Soares & Mann, 1997).

There is no cure for bipolar disorder; treatment focuses on better control of mood swings and related symptoms. Common treatment includes a combination of pharmacotherapy and psychotherapy. Common pharmacotherapy used to treat bipolar disorder include mood stabilizing medications (lithium, valproic acid, and anticonvulsants), atypical antipsychotic medications (olanzapine, aripiprazole, quetiapine, and risperidone), and antidepressant medications (National Institute of Mental Health, Bipolar Disorder, 2009)

5.2.3 Generalized Anxiety Disorder (GAD) and Panic Disorder

A patient with generalized anxiety disorder (GAD) worries excessively about a variety of everyday problems. The physical symptoms may include fatigue, headaches, muscle tension, muscle aches, difficulty swallowing, trembling, twitching, irritability, sweating, nausea, lightheadedness, having to go to the bathroom frequently, feeling out of breath, and hot flashes that last at least 6 months (National Institute of Mental Health, Anxiety Disorders, 2009). Most patients with mild anxiety can function normally in most social settings and hold down a job.

Panic Disorder is a type of anxiety disorder that includes feelings of terror that strike suddenly and repeatedly. The physical symptoms of a panic attack may include heart pounding, feeling sweaty, weak, faint, or dizzy, hands may tingle and feel numb, sensation of smothering, unreality, fear of impending doom, or loss of control (National Institute of Mental Health, Anxiety Disorders, 2009).

Mental anxiety disorders are a complex combination of genetic, environmental, psychological, and developmental factors (National Institute of Mental Health, Anxiety Disorders, 2009).

Anxiety disorders are treated with medication or cognitive-behavioral therapy. Medications cannot cure anxiety disorders, but can keep them under control while receiving psychotherapy. Medications include antidepressants, anti-anxiety drugs, and beta-blockers.

Major antidepressant classes used for anxiety symptoms include the SSRIs, Tricyclics, and MAOIs (National Institute of Mental Health, Anxiety Disorders, 2009). Common SSRIs used for GAD include fluoxetine, sertraline, escitalopram, paroxetine, and citalopram. MAOIs (phenelzine, tranylcypromine, and isocarboxazid) are used to for treating anxiety disorders, but require significant diet and prescription restrictions (2009).

Anxiety drugs are also known as anxiolytic, antipanic or antianxiety agents. Benzodiazepines used to treat different types of anxiety disorders include clonazepam (Klonopin), lozapam (Ativan), and alprazolam (Xanax); however, these drugs can exhibit both tolerance and withdrawal (National Institute of Mental Health, Anxiety Disorders, 2009). Cognitive-behavioral therapy is used to treat anxiety. In CBT the patient changes their thinking patterns that support their fears and changes the way they react to anxiety-provoking situations (2009). Exposure techniques may be used to desensitize patients to situations that trigger their anxieties. CBT may often incorporate deep-breathing exercises to relieve anxiety and encourage relaxation, similar to different types of CAMs.

5.3 Ideal Measures of Mental Health

The following section describes ideal measures of the mental health disorders under consideration. Each is based on a measure of length, severity, and frequency of current and all past episodes to reflect the frequent chronic nature of these common mental health disorders.

5.3.1 Depression

An ideal measure of depression would be a multi-faceted measure that includes the length, severity, and frequency of current episode and lifetime depression, including the length, severity, and frequency of each of the nine symptoms used for diagnosis of major depressive disorders in the Diagnostic and Statistical Manual, 4th Edition, Text Revised (DSM-IV-TR).

The nine symptoms for major depressive disorders in the DSM-IV-TR are (American Psychiatric Association, 2000):

1. Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feeling sad or empty) or observation made by others (e.g., appearing tearful)
2. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observations made by others)
3. Significant weight loss when not dieting or weight gain, or decrease or increase in appetite nearly every day
4. Insomnia or hypersomnia nearly every day
5. Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down)
6. Fatigue or loss of energy nearly every day
7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick)
8. Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others)
9. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

Note that the symptoms of weight loss, difficulty sleep, psychomotor agitation and fatigue are physical symptoms, while the others are emotional symptoms of major depressive disorders.

5.3.2 Bipolar Disorders

An ideal measure of bipolar disorders would be a multi-faceted measure that includes the length, severity, and frequency of all lifetime cycles of depression and mania, including the length, severity, and frequency of the major depressive disorders symptoms and manic symptoms used for diagnosis of bipolar disorder in the DSM-IV-TR.

The seven symptoms for a manic episode in the DSM-IV-TR are (American Psychiatric Association, 2000):

1. Inflated self-esteem or grandiosity, potentially including grandiose delusions
2. Decreased need for sleep or persistent difficulty falling asleep
3. More talkative than usual or pressure to keep talking
4. Flight of ideas or subjective experience that thoughts are racing
5. Distractibility
6. Increase in goal-directed activity (either socially, at work or school, or sexually) or psychomotor agitation
7. Excessive involvement in pleasurable activities that have a high potential for painful consequences

Note that the symptoms of decreased need for sleep and psychomotor agitation are physical symptoms, while the others are emotional symptoms of a manic episode of bipolar disorders.

5.3.3 Anxiety and Panic Disorders

An ideal measure of anxiety would be a multi-faceted measure that includes the length, severity, and frequency of current episode and lifetime anxiety, including the length, severity, and frequency of the symptoms used for diagnosis in the DSM-IV-TR.

The six symptoms for anxiety disorders in the DSM-IV-TR are (American Psychiatric Association, 2000):

1. Feeling wound-up, tense, or restless
2. Easily becoming fatigued or worn-out
3. Concentration problems
4. Irritability
5. Significant tension in muscles
6. Difficulty with sleep

Note that the symptoms of muscle tension and difficulty sleeping are physical symptoms, while the others are emotional symptoms of anxiety disorders.

5.4 Actual Measures of Mental Health from the Clinical Literature

The following are actual measures of mental health used in the clinical literature. They fall into a three broad categories: instrument-based measurements, symptom-based measurements, and treatment-based measurements.

5.4.1 Depression

The instrument-based measurements are based on validated surveys to summarize the assessment of the physical and emotional symptoms of major depressive disorders. These measurements include:

- Montgomery-Åsberg Depression Rating Scale (MADRS)
- Hamilton Depression Scale (HAMD)
- Beck Depression Inventory (BDI)
- Center for Epidemiological Study of Depression Scale (CED-D)
- Zung Self-Rating Depression Scale (Zung)
- Minnesota Multiphasic Personality Inventory D Scale (MMPI-D)
- Multiple Affect Adjective Check List-Depression Subscale (MAACL-D)
- Sheehan Disability Scale (SDS)

The symptom-based measurements are based on the level, permanence, and length of relief from symptoms and how these symptoms influence other observable outcomes of major depressive disorders. These measurements include:

- Symptom levels
- Symptom-free days
- Remission rate
- Core emotional symptoms
- Painful physical symptoms
- Relapse
- Days of work missed

Treatment-based measurements are based on how strictly individuals adhere to different types of treatment regimen for major depressive disorders. These measurements include:

- Treatment completer
- Withdrawals due to adverse reactions
- Withdrawals due to lack of efficacy
- Dropout rate (psychotherapy)
- Medication consumption (rate of recommended consumption)
- Medication adherence

5.4.2 Bipolar Disorder

The following measures are actual measures of mental health used in the clinical literature. They fall into three broad categories: instrument-based measurements, symptom-based measurements, and treatment-based measurements.

The instrument-based measurements are based on validated surveys to summarize the assessment of the physical and emotional symptoms of bipolar disorders. These measurements include:⁶

- Young Mania Rating Scale
- Mania Rating Scale

The symptom-based measurements are based on the level, permanence, and length of relief from symptoms and how these symptoms influence other observable outcomes of bipolar disorders. These measurements include:

- Risk of relapse (total, manic, depressive)
- Recurrence
- Relative risk of relapse
- Psychosocial functioning
- Weight change
- Time to recovery
- Symptom severity
- Extrapyramidal effects

Treatment-based measurements are based on how strictly individuals adhere to different types of treatment regimen for bipolar disorders. These measurements include:

- Adverse events
- Total withdrawal rate
- Withdrawal lack of efficacy
- Withdrawal adverse event
- Medication adherence

⁶ These are the mania instruments. The depressive instruments are listed in the major depressive disorders section.

- Frequency of hospitalization
- Length of stay

5.4.3 Anxiety and Panic Disorder

The following measures are actual measures of mental health used in the clinical literature. They fall into three broad categories: instrument-based measurements, symptom-based measurements, and treatment-based measurements.

The instrument-based measurements are based on validated surveys to summarize the assessment of the physical and emotional symptoms of anxiety and panic disorders. These measurements include:

- Sheehan Disability Scale (SDS)
- Hopkins Symptoms Checklist (SCL-90)
- Hospital Anxiety Depression Scale (HAD)
- State-Trait Anxiety Inventory for Adults (STAI)
- Panic and Anticipatory Anxiety Scale
- Hamilton Scale for Anxiety (HAM-A)

The symptom-based measurements are based on the level, permanence, and length of relief from symptoms and how these symptoms influence other observable outcomes of anxiety and panic disorders. These measurements include:

- Overall effect size
- Percentage clinical improvement
- Overall mean effect
- Rate of response
- Remission

Treatment-based measurements are based on how strictly individuals adhere to different types of treatment regimen for anxiety and panic disorders. These measurements include:

- Side effects
- Withdrawal total
- Withdrawal lack of efficacy
- Withdrawal adverse event

5.5 Current Mental Health Measures under Consideration

The primary measure of mental health for this analysis is a global measure of self-reported mental health status for each mental health disorders under consideration. This global mental health measure would include changes in both physical and emotional health from the mental health disorders.

Secondary measures of mental health status include self-reported limitations on instrumental activities of daily living, functional limitations, social limitations, and cognitive limitations.

Limitations on the instrumental activities of daily living are measured by difficulty with using the telephone, paying bills, taking medication, preparing light meals, laundry, or shopping. Functional limitations are measured by difficulties walking, climbing stairs, grasping objects, reaching overhead, lifting, bending, stooping, or standing for long periods. Cognitive limitations are measured by confusion or memory loss, problems making decisions, to the point that it interferes with daily activities or requiring supervision for one's own safety. Social limitations are measured by limitations participating in social, recreational, or family activities.

For major depressive disorders the instrumental activities of daily living and functional limitations could capture changes to the physical symptoms, mostly notably with fatigue or loss of energy. The cognitive limitations and social limitations could capture the

changes in the emotional symptoms, most notably with the depressed mood, diminished interest in activities, and diminished ability to think or concentrate.

For bipolar disorders none of these secondary measures could capture changes to the physical symptoms. The cognitive limitations could capture changes in the emotional symptoms, most notably with the flight of ideas (difficulty concentrating).

For panic and anxiety disorder none of these secondary measures could capture changes to the physical symptoms. The cognitive limitations and social limitations could capture changes in the emotional symptoms, most notably with the feeling restless and difficulty concentrating.

5.6 Guideline Driven Treatment

The American Psychiatric Association (APA) publishes public use practice guidelines for a variety of mental health disorders, including the mental health disorders under consideration.

From the guidelines (American Psychiatric Association, 2002):

"The American Psychiatric Association (APA) Practice Guidelines are not intended to be construed or to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual patient and are subject to change as scientific knowledge and technology advance and practice patterns evolve. These parameters of practice should be considered guidelines only." (5)

5.6.1 Major Depressive Disorder

Treatment for major depressive disorder consists of three stages—an acute phase, during which remission is induced; a continuation phase, during which remission is preserved; and a maintenance phase, during which the susceptible patient is protected against the recurrence of subsequent major depressive episodes.

In the acute phase of treatment (6-8 weeks), the psychiatrist may choose between several initial treatment modalities, including pharmacotherapy, psychotherapy, combination therapy, or ECT, dictated by clinical factors (severity of symptoms) and patient preferences (American Psychiatric Association, 2002). Initial selection is a function of anticipated side

effects, safety or tolerability, patient preference, and cost. APA guidelines suggest SSRIs for patients as initial treatment medication. MAOIs should be restricted to patients that do not respond to other treatments.

The optimal frequency of psychotherapy has not been studied in randomized controlled trials (RCTs) (American Psychiatric Association, 2002). The frequency of psychotherapy should take into account specific goals of psychotherapy, need to create and maintain a therapeutic relationship, need to ensure treatment adherence, and need to monitor and address suicidality.

In the continuation phase (16-20 weeks following remission), the APA suggests continuing antidepressant treatment at same acute treatment dose (2002). There is little attention given to use of psychotherapy or ECT in continuation phase. The proportion of patients with major depressive disorder who respond to ECT is 80-90% of those treated showing improvement (Weiner, 1995).

In general, the treatment for the individual patient that was effective in the acute and continuation phases should be used in the maintenance phase (American Psychiatric Association, 2002).

There has been little research done formally to evaluate the level of antidepressant medication doses or frequency of cognitive behavioral or interpersonal therapy, but maintenance phase usually involves a decreased frequency of visits (American Psychiatric Association, 2002).

5.6.2 Bipolar Disorder

The following concerns the APA treatment guidelines for bipolar disorder (American Psychiatric Association, 2002).

For a manic or mixed episode in the acute phase, the first-line pharmacological treatment for more severe manic or mixed episode is lithium plus an antipsychotic or valproate plus an antipsychotic (American Psychiatric Association, 2000). Short-term adjunctive treatment with benzodiazepine is suggested. Psychosocial therapy should be

combined with pharmacotherapy. When first-line medication treatment at optimal doses fails, recommended treatment includes addition of another first-line medication or ECT for severe or treatment-resistant mania.

For a depressive episode in the acute phase, the first-line pharmacological treatment is lithium or lamotrigine (American Psychiatric Association, 2002). Antidepressant monotherapy is not recommended. ECT may be reasonable for severe depression during pregnancy, life-threatening inanition, suicidality, or psychosis. Use of psychotherapy is supported for unipolar depression and it may be useful with bipolar depression.

The same psychiatric management for depressive episode is recommended as major depressive disorder.

5.6.3 Panic Disorder

The following concerns the APA treatment guidelines for panic disorder (American Psychiatric Association, 2002).

Psychiatric management for panic disorder consists of establishing a therapeutic alliance, performing the psychiatric assessment, tailoring the treatment plan for the individual patient, evaluating the safety of the patient, evaluating types and severity of functional impairment, establishing goals for treatment, monitoring the psychiatric status of the patient, providing education to the patient and, (when appropriate) to the family, coordinating the care with other clinicians, enhancing treatment adherence, and working with the patient to address early signs of relapse (American Psychiatric Association, 2002).

Treatment of panic disorder is conducted most frequently on an outpatient basis. Both psychosocial and pharmacological interventions have demonstrated efficacy in RCTs (American Psychiatric Association, 2002). Pharmacological interventions for panic disorder include SSRIs, SNRIs, TCAs, and benzodiazepine (as a monotherapy in the absence of a comorbid mood disorder), while cognitive-behavioral therapies also are a supported form of treatment (2002).

The introduction of the APA guidelines state "Medications discussed in this practice guideline may not have an indication from the U.S. Food and Drug Administration for the disorder or condition for which they are recommended. Off-label use of medications by individual physicians is permitted and common" (American Psychiatric Association, 2002).

The different domains for psychiatry management to evaluate treatment includes frequency and intensity of panic attacks, level of anticipatory anxiety, degree of agoraphobic avoidance, and severity of interference and distress related to panic disorder (American Psychiatric Association, 2002). Nonresponse to first-line treatment should result in either augmenting or switching (either modality or pharmacotherapy).

Self-directed CBT may include psychoeducation, self-monitoring, countering anxious beliefs, exposure to fear cues (exposure therapy), modification of anxiety-maintaining behaviors, and relapse prevention (American Psychiatric Association, 2002). Couples or family therapy alone is not recommended as a treatment for panic disorder (though may be helpful for comorbid relationship dysfunction) (2002).

5.7 Clinical Evidence on the Effectiveness of Treatment

The following section presents the relevant clinical-based evidence for treatments of mental health based on a number of meta-analyses. The method of meta-analysis, first pioneered over a century ago, combines a number of related studies to assess the effect of a treatment. An advantage of the meta-analyses is the increase in the sample size through aggregation of patient observation.

Each meta-analysis summary has the following information (where available): the specific treatment, the specific control, the specific patient group, primary and secondary measures of treatment effect, the number and type of studies included, the number of patient observations, and relevant results.⁷

⁷ All age-specific studies were excluded. While most included randomized controlled trials (RCTs), a small number included retrospective database analyses or quasi-experimental studies.

These are meant as a representative, but certainly not exhaustive, summaries of the clinical evidence on the effectiveness of different treatments for the common mental health disorders under consideration.

5.7.1 Depression

The following section presents the relevant clinical evidence for major depressive disorder by different types of treatments. The treatments considered include the four main classes of antidepressants (the SSRIs, SNRIs, TCAs, and MAOIs), psychotherapy, and complementary and alternative medicine (CAM), including St. John's wort, acupuncture, massage therapy, and biofeedback.

Concerning the use of SSRIs

Anderson, et al., (1998) conducted a meta-analysis of the efficacy and tolerability of SSRIs against TCAs in patients with depression. The treatment difference was measured by relative efficacy as measured by HAMD, discontinued treatment, and adverse effects (Anderson I. , 1998). The results were based on 25 RCTs. The initial results suggest TCAs more effective than SSRIs though sensitivity analysis using another large study calls this into question (1998). Only dual-action TCAs had greater efficacy than SSRIs. While more patients discontinued treatment under TCAs than with SSRIs due to adverse events, there was no difference for treatment failure (1998).

Kennedy, et al., (2006) conducted a meta-analysis of the efficacy of escitalopram (an SSRI) against other antidepressants in patients with major depressive disorder. The primary measure of treatment difference was MADRS score with the secondary measures of response to treatment and remission. The results were based on 10 studies with 2687 patient observations (escitalopram = 1345, SSRIs = 1102, venlafaxine = 240). Escitalopram had greater treatment effect against all comparators (Kennedy, Andersen, & Lam, 2006). Escitalopram was superior to SSRIs and comparable to venlafaxine (2006). The results were

similar for severely depressed population. There was a lower withdrawal rate due to adverse events for escitalopram (2006).

Kennedy, et al., (2009) conducted a meta-analysis of escitalopram to other SSRIs and SNRIs for patients with major depressive disorder. The primary measure of treatment difference was 8 week MADRS score with the secondary measure of response and remission ($\text{MADRS} \leq 12$). The results were based on 16 RCTs with 4549 patient observations (escitalopram = 2272, SSRIs = 1750, SNRIs = 537). Escitalopram was significantly more effective in overall treatment with mean difference of 1.1 points on MADRS, in response (63.7 vs. 58.3), and in remission (53.1 vs. 49.4) (Kennedy, Andersen, & Thase, 2009). The Hamilton Depression Scale was used in sensitivity analysis (2009).

Concerning the use of SNRIs

Nakagaw, et al., (2008) conducted a meta-analysis of the efficacy and tolerability of milnacipran against other antidepressants in patients with major depressive disorder under monotherapy. The results were based on 16 RCTs with 2277 patient observations. No differences were found in clinical improvement, remission or tolerability compared to other antidepressants (Nakagawa, Watanage, Omori, Barbui, & Cipriani, 2008). There were fewer withdrawals due to adverse events compared to TCAs (2008).

Frampton, et al., (2007) conducted a meta-analysis on duloxetine against placebo and other antidepressants in patients with major depressive disorder. The primary measure of treatment difference was core emotional symptoms and painful physical symptoms with a secondary measure of tolerability. Duloxetine improved primary measures with highest recommended dosage and was noninferior with fixed or flexible dosages at lower levels (Frampton & Plosker, 2007). There were similar global benefit-risk profiles. Duloxetine had higher discontinuation due to adverse events at lower dosage compared to escitalopram and venlafaxine (2007).

Concerning the use of TCAs

Steffens, et al., (1997) conducted a meta-analysis of TCAs and SSRIs. The primary measures of treatment difference were treatment completer or withdrawals due to adverse reactions or lack of efficacy. The results were based on 21 studies. While response rates were similar, more TCA patients withdrew due to lack of effect or adverse reaction (Steffens, Krishan, & Helms, 1997).

Concerning the use of MAOIs

Thase, et al., (1995) conducted a meta-analysis on MAOIs, placebo, and TCAs in patients with major depressive disorders. The intent-to-treat treatment difference was measured by efficacy. The results were based on 55 RCTs. While generally there were comparable efficacies within the MAOI class, MAOIs were superior to placebo, and TCAs were superior to two MAOIs (Thase, Trivedi, & Rush, 1995). However, MAOIs were effective for outpatients that failed TCA treatment (1995). There is evidence to suggest the MAOI patient group was different than TCA patient group (1995). Severely depressed inpatients respond better to TCAs (Thase, Trivedi, & Rush, 1995).

Concerning the use of Psychotherapy

da Maat, et al., (2006) conducted a meta-analysis on pharmacotherapy and psychotherapy for patients with depression by severity. The primary measures of treatment difference were remission and relapse. The results were based on 10 RCTs. Rates of remission were 38% for psychotherapy and 35% for pharmacotherapy (da Maat, Dekker, Schoever, & de Jonghe, 2006). There were no differences for chronic, non-chronic, mild, or moderate depression (2006). Both treatments were better in mild than in moderate depression. There was a larger rate of dropout in pharmacotherapy and a higher rate of relapse in pharmacotherapy (57% vs. 27%) (2006).

da Maat, et al., (2007) conducted a meta-analysis on psychotherapy and combined therapy for patients in acute phase of major depressive disorder. The primary measure of

treatment difference was dropout rate with a secondary measure of remission rate. The results were based on 7 RCTs with 903 patient observations. There was no difference in dropout rate (da Maat, Dekker, Schoevers, & de Jonghe, 2007). Combined therapy had a significantly higher remission rate than moderate depression, not statistically different remission rate than mild or major depression, and a statistically higher remission rate than chronic major depression (2007).

Cuijpers, et al., (2008) conducted a meta-analysis on different forms of psychotherapies (CBT, nondirective supportive treatment, behavioral activation treatment, psychodynamic treatment, problem-solving therapy, interpersonal psychotherapy, and social skill training) for patients with mild to moderate depression. The primary measures of treatment difference were efficacy and dropout rate. The results were based on 53 RCTs. There was no significant difference in efficacy between psychotherapy types (Cuijpers, van Straten, Andersson, & van Oppen, 2008). The dropout rate was significantly higher in CBT and significantly lower in problem-solving therapy (2008).

Imel, et al., (2008) conducted a meta-analysis on psychotherapy and medication for patients with different levels of severity of depression. The treatment difference measures include efficacy and discontinued treatment. The results were based on 28 RCTs with 3381 patient observations. They found no difference in terms of efficacy (Imel, Malterer, McKay, & Wampold, 2008). There was no association between severity and relative efficacy (2008). Psychotherapy had a higher efficacy at follow-up, with a positive relationship between advantage and length of follow-up. Discontinued treatment rates were no different between groups (2008).

Ekers, et al., (2008) conducted a meta-analysis on behavioral therapies for patients with depression. The treatment differences were symptom-level and recovery/dropout. The results were based on 17 RCT with 1109 patient observations. Behavioral therapies were superior to brief psychotherapy, supportive therapy, and equal to CBT (Ekers, Richard, & Gilbody, 2008).

Concerning the use of St. John's Wort

Rahimi, et al., (2009) conducted a meta-analysis on St John's wort and SSRIs for patients with major depressive disorder. The focus was on efficacy and tolerability, thus, measures include relative risk for clinical response, relative risk for remission, and relative risk for effect size (HAMD score), any adverse events, and withdrawals due to adverse events (Rahimi, Nikfar, & Abdollahi, 2009). The results were based on 13 RCTs between 1966 and 2008. St John's wort against SSRIs showed nonsignificant relative risk for clinical response of 1.22, nonsignificant relative risk for remission 0.96, and a nonsignificant weighted mean difference for reduction in HAMD score from baseline, a nonsignificant relative risk for adverse events of 0.85, and a significant relative risk for withdrawals due to adverse events 0.53. St John's wort was different from SSRIs according to efficacy and adverse events, with lower withdrawals due to adverse events (2009).

Kasper, et al., (2002) conducted a meta-analysis on Hypericum extract against a placebo for patients with mild to moderate depression. The primary measure of treatment difference was change in HAMD with a secondary focus on a cluster analysis of individual HAMD items for baseline and treatment end. The results were based on 3 double-blind, RCTs with 544 patient observations. Hypericum extract reduced symptoms more than placebo, but were particularly significant in reducing the core depression symptom cluster of HAMD (Kasper & Dienel, 2002).

Linde, et al., (2005) conducted a meta-analysis on Hypericum against antidepressants or placebo for patients with depressive disorders. The treatment difference measure was Hamilton Rating Scale response (level or response). The results were based on 37 RCTs that were mostly from German-speaking countries. The evidence was mixed. While some studies indicate no greater response than placebo, others show similar benefit compared to antidepressants (Linde, Berner, Egger, & Mulrow, 2005).

Reddy (2004) conducted two meta-analyses examined Hypericum against placebo for patients with depression. The treatment difference measure was a 50% reduction in HAMD

score. The results were based on 15 and 18 RCTs respectively. In both, St John's wort was more effective than placebo (Reddy, 2004).

Concerning the use of Acupuncture

Wang, et al., (2008) conducted a meta-analysis on acupuncture in treating depression. The primary measure of treatment difference was the difference in Hamilton or Beck Depression Inventory. The results were based on 8 RCT with 477 patient observations. Acupuncture significantly reduced the severity of depression, but there was no significant effect of active acupuncture on the response rate and remission rate (Wang, et al., 2008).

Smith and Hay (2005) conducted a meta-analysis on acupuncture against sham acupuncture, no treatment, pharmacological treatment, or structured psychological treatment in patients with depression or dysthymic disorder. The primary measures of treatment difference were relative risk, reduction in depression scales, and remission. The results were based on 7 RCTs with 517 patient observations. There was no evidence that medication was better than acupuncture in reducing severity or in improving remission (Smith & Hay, 2005).

Mukaino, et al., (2005) conducted a meta-analysis on acupuncture or electroacupuncture against any control procedure in patients with depression. The treatment difference was specific to comparison group (four comparison groups considered). The results were based on 7 RCTs with 509 patient observations. There were inconsistent results between acupuncture and sham acupuncture, but electroacupuncture was significantly better than antidepressant medication (Mukaino, Park, White, & Ernst, 2005). There was inconclusive evidence for acupuncture when used as a complement to antidepressant (2005).

Concerning the use of Massage Therapy (MT)

Moyer, et al., (2004) conducted a meta-analysis on both single and multiple application massage therapy for a variety of patients. The treatment difference measures included stated anxiety, blood pressure, heart rate, negative mood, pain, and cortisol level. The results were based on 37 RCTs. Results indicate a single application reduced stated

anxiety, blood pressure, heart rate, but not negative mood, pain, or cortisol level (Moyer, Rounds, & Hannum, 2004). Reductions in anxiety and depression with a course of massage treatment were similar in magnitude to psychotherapy (2004).

Concerning the use of Biofeedback

Nestoriuc, et al., (2008) conducted a meta-analysis on the efficacy of biofeedback for headache conditions. The primary measure of treatment difference was headache frequency with secondary measures of self-efficacy, symptoms of anxiety and depression, and medication consumption. The results were based on 94 RCTs and uncontrolled quasi-experimental designs. There were significant effects for symptoms of anxiety and depression for biofeedback (Nestoriuc, Martin, Rief, & Andrasik, 2008).

Stetter and Kupper (2002) conducted a meta-analysis on autogenic training (AT), a self-relaxation procedure, against control for a variety of disorders. Treatment differences measure was effect size. The results were based on 66 RCTs across a number of disorders. There were positive effects and greater than control effects found for tension headache/migraine, mild-to-moderate essential hypertension, coronary heart disease, asthma bronchial, unspecified somatoform pain disorder, anxiety disorder, mild-to-moderate depression and dysthymia, and functional sleep disorder (Stetter & Kupper, 2002).

5.7.2 Bipolar Disorder

The following section presents the relevant clinical evidence for bipolar disorder by different types of treatments. The treatments considered include pharmacotherapy (including lithium, atypical antipsychotics, antidepressant, or combination drug therapy), psychotherapy, and CAM.

Concerning the use of Lithium

Bauer (2004) conducted a meta-analysis on lithium against placebo in patients with bipolar disorder. The primary measure of treatment difference was risk of relapse (total,

manic, depressive) with a secondary measure of adverse events. The results were based on 5 RCTs with 770 patient observations from 11 months to 4 years. Results indicate lithium prevented significantly more relapses than placebo (Bauer, 2004). There were significantly fewer manic episodes with lithium (2004). There was no significant difference in depressive relapses (2004). Lower withdrawals were found in trials with lithium, with adverse effects more common with lithium (2004).

Davis, et al., (1999) conducted a meta-analysis on the efficacy of mood stabilizers (lithium, valproate, and carbamazepine) in bipolar and unipolar mood disorders. The treatment difference was measured with recurrence. The results were based on 19 RCTs with 865 patient observations. Lithium was highly effective in reducing recurrence (74% vs. 29%) (Davis, Janicak, & Hogan, 1999).

Goodwin, et al., (2003) conducted a meta-analysis examined lithium against active comparators in patients with bipolar disorder. The treatment difference was measured with relative risk of relapse. The results were based on lamotrigine bipolar trials. Lithium showed significantly more efficacy than placebo in preventing relapse, significantly more efficacy against manic relapse, and an increase in efficacy (though not statistically significant) against depressive relapse (Goodwin & Geddes, 2003).

Geddes, et al., (2004) conducted a meta-analysis on the efficacy and acceptability of lithium in patients with bipolar disorder. The treatment difference was measured with risk of relapse (manic, depressive, and total), risk of adverse effects, and total withdrawal rates. The results were based on 5 RCTs with 770 patient observations. Lithium was more effective than placebo in preventing all relapses and manic relapses (Geddes, Burgess, Hawton, Jamison, & Goodwin, 2004). Lithium showed an improved effect on depressive relapses, but this improvement was not statistically significant (2004).

Concerning the use of Atypical Antipsychotics

Jones (2007) conducted a systematic review and meta-analysis on atypical antipsychotics as a monotherapy or adjunctive therapy in patients with bipolar disorder. The

treatment differences were changes in the Young Mania Rating Scale (YMRS) or the Mania Rating Scale (MRS) from baseline to endpoint. The results were based on 18 RCTs with 3114 patient observations for monotherapy and 1190 patient observations for adjunctive therapy. Atypical antipsychotic monotherapy significantly improved mania symptoms against placebo (Jones, 2007). Individually, olanzapine, risperidone, quetiapine, aripiprazole, and ziprasidone monotherapy improved mania symptoms against placebo (2007). As adjunctive therapy, atypical antipsychotics significantly improved mania symptoms compared to placebo (2007).

Concerning the use of Antidepressants

Ghaemi, et al., (2008) conducted a meta-analysis on long-term antidepressant treatment against combination treatment (antidepressants and mood stabilizers) and placebo for patients with bipolar disorder. The treatment difference was relative risk of new depression recurrence or new mania recurrence. The results were based on 7 RCT with 350 patient observations. Long-term treatment that included antidepressants had decreased risk of depression recurrence against mood stabilizers or placebo (pooled); however, there was an increased risk of mania recurrence (Ghaemi, Wingo, Filkowski, & Baldessarini, 2008). Long-term treatment that included antidepressants had no statistically significant difference in depression or mania risk against mood stabilizer therapy (2008).

Gijsman, et al., (2004) conducted a systematic review and meta-analysis on the efficacy and safety of antidepressants against placebo, mood stabilizers, or atypical antipsychotics for short-term treatment of patients with bipolar disorder. The primary measures of treatment difference were proportion of patients with clinical response to treatment and rate of switching to mania. The results were based on 12 RCTs with 1088 patient observations. Antidepressants were more effective than placebo for not switching to mania (Gijsman, Geddes, Rendell, Nolen, & Goodwin, 2004). However, the rate of switching for TCAs was greater than other antidepressants (2004)

Concerning the use of Combination Drug Therapy

Beynon, et al., (2009) conducted a systematic review and meta-analysis on all clinically relevant pharmacological interventions for the prevention of relapse of patients with bipolar disorder. The treatment difference was measured with risk of relapse. The results were based on 34 RCTs and quasi-randomized controlled trials. The evidence supports the efficacy of lithium, valproate, and lamotrigine against placebo-controlled therapy (Beynon, Soares-Weiser, Woolacott, Duffy, & Geddes, 2009). Lithium, olanzapine, and aripiprazole showed a significant prevention of manic relapses (2009). Valproate, lamotrigine, and imipramine showed a significant prevention of depressive symptoms (2009). Despite widespread use in clinical practice, there is little evidence to support the efficacy of combination therapy (2009).

Smith, et al., (2007a) conducted a systematic review and meta-analysis on co-therapy against monotherapy for patients with bipolar disorder. The treatment differences were relative risks and mean difference mania outcomes on Young Mania Rating Scale (YMRS), withdrawals, and extrapyramidal symptoms. The results were based on 8 RCTs with 1124 patient observations. Haloperidol, olanzapine, risperidone, and quetiapine as co-therapy significantly reduced YMRS scores against monotherapy with a mood stabilizer (Smith, Cornelius, Warnock, Tacchi, & Taylor, 2007a). Significantly more patients with co-therapy met the response criteria of 50% reduction in YMRS score (2007a).

Concerning all Drug Therapies

Smith, et al., (2007b) conducted a systematic review and meta-analysis on drug treatments of mania against placebo in patients with bipolar disorder. The treatment differences were change in the Young Mania Rating Scale score, attrition, extrapyramidal effects, and weight change. The results were based on 13 RCTs. The drugs considered include carbamazepine, haloperidol, lithium, olanzapine, quetiapine, risperidone, valproate semisodium and aripiprazole. All drugs showed significant reduction in mania score against placebo. All antipsychotics (pooled) had significant response to treatment compared to

placebo (Smith, Cornelius, Warnock, Tacchi, & Taylor, 2007b). All mood stabilizers (pooled) had an even greater significant response to treatment compared to placebo (2007b). Withdrawals were fewer with antipsychotics (34%) and mood stabilizers (26%) (2007b). Extrapyramidal side effects were significant in risperidone and aripiprazole (2007b).

Concerning the use of Psychotherapy

Miklowitz and Scott (2009) conducted a meta-analysis on adjunctive psychotherapy for patients with bipolar disorder. The treatment difference measures were time to recovery, relapse or recurrence, symptom severity, medication adherence, and psychosocial functioning. The results were based on 19 RCTs. Disorder-specific psychotherapies combined with mood stabilizers reduced relative risk of relapse over 1-2 years. Disorder-specific therapies mechanism include increasing medication adherence, improved self-monitoring, early intervention with emergent episodes, enhanced interpersonal functioning, and family communication (Miklowitz & Scott, 2009).

Lam, et al., (2009) conducted a systematic review and meta-analysis on psychological therapies on patients with bipolar disorder. The primary measure of treatment difference was relative risk of relapse. The results were based on a systematic search of electronic databases and reference lists of existing reviews. Psychological therapy specifically designed for bipolar disorder was effective in preventing or delaying relapses in bipolar disorder (Lam, Burbeck, Wright, & Pilling, 2009). There was no evidence that number of previous episodes moderates this effect (2009).

Concerning the use of CAM

Sarris and Kavanagh (2009) conducted a systematic review on kava and St. John's wort for evidence of efficacy, mode of action, pharmacokinetics, safety, and use in major depressive disorder, bipolar disorder, seasonal affective disorder, generalized anxiety disorder, social phobia, panic disorder, obsessive-compulsive disorder, and post-traumatic stress disorder. A systematic review was conducted with MEDLINE, CINAHL, and the

Cochrane Library. The evidence supports the use of St. John's wort in treating mild to moderate depression and kava in treating generalized anxiety disorder (Sarris & Kavanagh, 2009).

5.7.3 Anxiety and Panic Disorder

The following section presents the relevant clinical evidence for anxiety and panic disorder by different types of treatments. The treatments considered include pharmacotherapy, psychotherapy, and CAM.

Concerning the use of Drug Therapy

Hoffman and Matthews (2008) conducted a meta-analysis on pharmacological treatment of generalized anxiety disorder, panic disorder, social anxiety disorder, and post-traumatic stress disorder. The evidence supported the use of SSRIs as a first-line pharmacotherapy. Benzodiazepines were effective in treatments for anxiety disorders (Hoffman & Matthew, 2008).

Stein (2006) reviewed the evidence on SSRIs and SNRIs on the treatment of generalized anxiety disorders. SSRIs and SNRIs are the current first-line pharmacotherapy treatment guideline for generalized anxiety disorder. The efficacy and tolerability of escitalopram (an SSRI) has been demonstrated for patients with generalized anxiety disorder and social anxiety disorder. It exhibited a better tolerability profile as lower discontinuation, emergent signs, and symptoms. Escitalopram also had greater relapse prevention for social anxiety disorder (Stein, 2006).

Chiesa, et al., (2009a) conducted a meta-analysis on noradrenergic antidepressants against placebo for patients with panic disorder. The treatment differences were rate of response, remission, and side effects with the mean number of panic attacks, the Panic and Anticipatory Anxiety Scale, and the Hamilton Scale for Anxiety values. The results were based on 14 RCTs. Noradrenergic antidepressants demonstrated a higher rate of response, remission, and side effects (Chiesa, Serretti, Calati, Perna, Bellodi, & De Ronchi, 2009a).

Also, the number of panic attacks and intensity of panic disorder were significantly lower with noradrenergic antidepressants (2009a).

Concerning the use of Benzodiazepines

Martin, et al., (2007) conducted a systematic review and meta-analysis on benzodiazepines (diazepam, lorazepam, and alprazolam) against placebo for patients with generalized anxiety disorder. The primary measure of treatment difference was relative risk of treatment discontinuation (for any reason) with secondary measures for withdrawal for lack of efficacy and withdrawal for adverse event. The results were based 23 RCTs. Benzodiazepines had less risk of treatment discontinuation due to lack of efficacy than placebo (Martin, Sainz-Pardo, Toshiaki, Marín-Sánchez, Seoane, & Galán, 2007). However, 74% of the variation in the log of relative risk was explained by year of publication (a possible publication bias) (2007).

Concerning the use of Psychotherapy

Haby, et al., (2006) conducted a meta-analysis on cognitive-behavioral therapy against attention placebo and pill placebo for patients with depression and anxiety. The treatment difference was overall effect size. The results were based on 33 RCTs. Cognitive behavioral therapy was slightly less effective for severe patients (Haby, Connelly, Corry, & Vos, 2006). Cognitive behavioral therapy against wait-list control had a larger effect than CBT against attention placebo, but not for CBT against pill placebo (2006).

Öst (2008) conducted a meta-analysis on cognitive-behavior therapies across decades for patients with anxiety disorders. The treatment differences included within-group effect or percentage clinical improvement using independent assessor rating, self-reports and behavior approach. The results were based on 432 RCTs. The treatment effects were greater in modern studies. No significant change in proportion of clinical improvement (Öst, 2008). When considering the single studies that gave the highest effect size each decade, all anxiety

disorders, except panic and obsessive-compulsive disorder, showed a positive development (2008).

Cuijpers, et al., (2009) conducted a meta-analysis on computer-aided psychotherapy against face-to-face psychotherapy for patients with anxiety disorders. The treatment difference was overall mean effect. The results were based on 23 RCTs. Computer-aided psychotherapy and face-to-face psychotherapy did not differ significantly in any group of anxiety or phobia group (Cuijpers, Marks, van Straten, Cavanagh, Gega, & Andersson, 2009).

Concerning the use of CAM

Chiesa and Serretti (2009b) conducted a meta-analysis on mindfulness-based stress reduction for efficacy of stress reduction. The treatment difference was effect size between meditators and controls considering stress reduction and spirituality enhancement. The results were based on 10 studies. Mindfulness-based stress reduction showed a nonspecific effect on stress reduction against inactive control (Chiesa & Serretti, 2009b). There was an equal effect against standard relaxation training. Mindfulness-based stress reduction was able to reduce ruminative thinking and trait anxiety, as well as increase empathy and self-compassion (2009b).

Manzoni, et al., (2008) conducted a meta-analysis on relaxation training (Jacobson's progressive relaxation, autogenic training, applied relaxation and meditation) for patients with anxiety problems and disorders. The treatment difference was overall effect size. The results were based on 27 RCTs. Relaxation training showed a medium-large effect size in treatment in anxiety (Manzoni, Pagnini, Castelnuovo, & Molinari, 2008). There was higher efficacy for meditation and for longer treatments (2008).

5.8 Comparing the Results to Other Research

In order to compare the results of this analysis to past research the measures of effect considered here are transformed to other measures considered in past research. The other

measures are days of work missed, the probability of long-term work missed, the SF-12 Index score, and the EQ-5D Index score.

The measure of days of work missed is not directly available in the 1998 Medical Expenditure Panel Survey (MEPS) associated with complementary and alternative medicine (CAM) use, but it was used as a measure in later years. It is possible to consider the correlation between these mental health status measures and days of work missed in later panels of MEPS to proxy the relationship between CAM use and days of work missed in the 1998 MEPS. By similar logic, it is possible to proxy the relationship between CAM use and self-reported global health measures, namely the SF-12 Index score and EQ-5 Index score by using later years of MEPS.

Global health measures are an attempt to summarize in a significant measure the different domains of health. What aspects of the human experience define "health"? What does it mean to lose "health"? Global health measures attempt to combine the different aspects of health in a single, meaningful metric. The following section briefly discussed the construction and reliability of a common global health measure.

The primary measure of mental health for this analysis is a simple global self-reported mental health status based on a 5-point Likert scale. Previous work has considered the properties of an overall global health status based on a 5-point Likert scale.

There is a question of how meaningful self-reported global health measures are in terms of capturing clinically- or epidemiologically-meaningful aspects of health.

In a review of studies related to the validity of self-rating of health, 23 of 27 studies found self-rating of health reliably predicted survival in populations even while accounting for known health risk factors. The results were consistent and effect size was large. The discrepancies between global self-ratings and clinically obtained health status information were associated with social and demographic factors such as gender or age. There was a difference between men and women where the effect of self-rated global health on mortality was greater for men than women (Idler & Benyamini, 1997).

Ried, et al., (2006) found that self-reported health status were moderately correlated with subjective well-being ($\gamma = 0.41$, $t = 11.3$, $p < 0.0001$), but the two were different constructs. Collapsing both measures to dichotomous variables also showed a statistically significant correlation (0.63 , $p < 0.0001$), but a difference in construct (Ried, Tueth, Handberg, & Nyanteh, 2006).

Recently developed global health measures include the Short Form-36 (SF-36) and the abridged Short Form-12 (SF-12). The SF-36 and SF-12 were surveys designed to capture significant variation in health domains. The eight domains of health in the SF-36 and SF-12 Index scores include physical functioning, role limitations because of physical health problems, bodily pain, social functioning, general mental health (psychological distress and psychological well-being), role limitations (from emotional problems), vitality (energy/fatigue), and general health perceptions.

The mental health scales of the SF-36 and SF-12 Index scores are based on the five-item Mental Health Inventory (MHI) that best predict summary score for the 38-item MHI, covering four major mental health dimensions (anxiety, depression, loss of behavioral or emotional control, and psychological well-being) (Ware & Sherbourne, 1992). The MHI has been successfully evaluated in clinical trials comparing quality of life outcomes and compared favorably with emotional reactions score from the Nottingham Health Profile and the summary SIP Psychosocial scale. The MHI discriminates psychiatric patients from those with other medical conditions (Ware & Sherbourne, 1992).

The validity of the SF-36 Index score was investigated early in its development. Results from psychometric and clinical tests of validity agreed with one another and converged. The authors find a good basis for establishing guidelines for the interpretation of score differences for each scale as a measure of physical and/or mental health effects. When observed differences are found in the physical functioning and mental health scales are found, physical or mental causes can be attributed with a high degree of confidence (McHorney, Ware, & Raczek, 1993).

McCollum, et al., (2007) linked the SF-12 Index score to the self-reported health status measure used in this research for patients with diabetes and minor depression. Using the 2001 MEPS, they found that diabetes patients with minor depression had a lower mental health summary score (from SF-12), greater cognitive limitation, and lower mental health status as measured by a 5-point Likert scale controlling for relevant demographics and underlying health (McCollum, Hanse, Ghushchyan, & Sullivan, 2007).

Given the SF-12 Index score has been demonstrated as a reliable and valid measure of health status, an algorithm of mapping the SF-12 Index scores to the EQ-5D Index score (a preference-based scale) for cost-effectiveness analysis was constructed. The EQ-5D measures five dimensions of health (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression and has been used much more extensively in European countries. The authors present a US-specific mapping algorithm (Sullivan & Gushchyan, 2006).

Other researchers have linked the SF-36 Index score to QALY using the Brazier and other methods (Pyne, Rost, Zhang, Williams, Smith, & Fortney, 2003).

A set of nationally representative U.S. values for a number of standardized Health-Related Quality-of-Life (HRQL) measures, including self-reported health status, EQ-5D Index scores for the UK, EQ-5D Index scores for the US, the mental and physical component summaries from the SF-12 Index score were collected and stratified by age. There was a strong association between the different values of the different measures of health (Hammer, Lawrence, Anderson, Kaplan, & Fryback, 2006).

Another outcome measure used in previous research is the number of days of work missed. Given the association between depression and work place absenteeism and lower productivity, Egede, considers the effect of depression on both the average number of days worked and the probability of extended work missed (greater than 7 days missed) (2004). He found that depression was associated with a statistically higher average number of missed work days.

Using primary care patients, Simon, et al., (2002) find that recovery from depression is associated with a significant decrease in the average number of days of work missed.

Chapter 6

ON MEASURING MENTAL HEALTH COSTS

Any cost-effectiveness analysis should attempt to approximate most closely the ideal measure of incremental economic cost. This chapter lays out a conceptual framework for the economic measure of cost. The ideal measure of incremental economic cost would be a full accounting of the change in the economic value all resources related to mental health production. In the absence of complete information regarding the economic value of all resources related to mental health production, researchers should utilize the information available and present qualified results. The utility of these results is contingent on the lack of significant bias from the information available.

6.1 Ideal Measures of Cost

The true economic cost of a treatment includes the change in resources that are directly related to the production of mental health (direct costs) and the change in resources that are indirectly related to the production of mental health (indirect costs).

Direct costs include the change in all goods, services, and other resources that are consumed in the provision of an intervention or in dealing with the side effects or other current and future consequences linked to it (Gold, Siegel, Russell, & Weinstein, 1996). Direct costs can take the form of both direct outlays of resources involved in treatment and resources involved in acquisition of treatment (i.e., time costs).

Indirect costs include the change in resources not directly related to treatment. These include the change in a loss or impairment of ability to work or engage in leisure activities ("morbidity costs") or changes in life expectancy resulting from intervention ("mortality costs"). Gold, et al., (1996) suggest handling both types of indirect costs in the denominator of the incremental cost-effectiveness ratio, i.e., converting the differences of the indirect

costs into a corresponding difference in QALY. However, Garber and Phelps (1997) demonstrate the conditions under which the treating of time costs as an increase in costs in the numerator of the incremental cost-effectiveness ratio is consistent with treating time costs as a reduction in the measure of effect.

The true economic cost of a treatment (either the existing treatment or the proposed treatment) used to produce mental health is the economic value of the resources related to the production of mental health. The proper measure of economic cost of the resources includes the value of the next best alternative—i.e., the level of those resources if treatment had not been pursued.

The true economic cost of a treatment can be conceptualized as a function of the change direct outlays of goods and services (D_{D1}), the change in the direct nonmonetary resources (D_{D2}), and the change in the indirect impact of treatment (D_{IN}).

$$\text{Economic Cost} = f(D_{D1}, D_{D2}, D_{IN})$$

The incremental economic cost of a new treatment compares the economic cost of an existing treatment scheme to the economic cost of a proposed treatment. The incremental economic cost of a proposed treatment is the difference in the change in the economic value. The incremental economic cost is the difference in the resource use of the existing treatment and the proposed treatment so long as the alternative of the existing and proposed treatment scheme is equal.

$$\text{Incremental Economic Cost} = \text{Economic Cost}_{\text{New}} - \text{Economic Cost}_{\text{Old}}$$

$$\text{Incremental Economic Cost} = f(\Delta D_{D1}, \Delta D_{D2}, \Delta D_{IN})$$

6.2 Discussion of Potential Empirical Bias

In the absence of full information on these three components to the incremental economic cost (given constraints of available data), researchers should be aware of the implications of potential bias. The following reformulations of the incremental cost-effectiveness ratio (ICER) and incremental net benefit (INB) help to illustrate the source of potential bias (where λ is the value of a unit of effect).

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

$$ICER = \frac{f(\Delta D_{D1}, \Delta D_{D2}, \Delta D_{IN})}{\Delta Effect}$$

$$INB(\lambda) = \lambda * \Delta Effect - \Delta Cost$$

$$INB(\lambda) = \lambda * \Delta Effect - f(\Delta D_{D1}, \Delta D_{D2}, \Delta D_{IN})$$

Either an understating of the economic cost of a proposed treatment or an overstating of the economic cost of the economics cost of existing treatment will create a downward bias in the estimate of the incremental economic cost. This bias will decrease the magnitude of the incremental cost-effectiveness ratio (ICER). If the incremental cost-effectiveness ratio is positive (with a difference in cost and a difference in effect in either quadrants I or III) this bias of incremental economic cost could lead to a false claims of cost-effectiveness for the new treatment. If the incremental cost-effectiveness ratio is negative (with a difference in cost and a difference in effect in either quadrants II or IV) this bias could lead to false claim of cost-effectiveness for the new treatment.

A downward bias in the incremental economic cost will have an upward bias on the incremental net benefit. This would also lead to a possible false claim of cost-effectiveness for the new treatment.

An upward bias of the incremental economic cost (either from an overstating of the economic cost of the new proposed treatment or an understating of the economic cost of the old, existing treatment) will have the opposite effect, possibly leading to a false rejection of cost-effectiveness for the new treatment.

Each of the three components of the true economic cost is a potential source of bias in the incremental economic cost measure. Each will be discussed in turn.

6.3 Differences in Direct Expenditure

The true economic cost of a treatment includes the direct outlays of goods and services (D_{D1}). This includes the outlays of expenditures for the goods and services involved in treatment such as payments for prescriptions, psychotherapy, outpatient services, goods and services related to mitigating the side-effects of treatment. Gold, et al., (1996) suggest using a societal perspective, i.e., the broadest perspective, when considering differences in resource use. There are two unique challenges to this research worth considering—the use of charges (instead of payments by individuals) for mental health services and the use of final charges (instead of resource costs) for measures of direct outlays.

The use of charges instead of payments is recommended for this cost-effectiveness analysis. The advantage of using charges is that it captures the broadest measure of direct outlays of goods and services by all parties (individual, insurance companies, other third party payers); this measure is closest to capturing the full economic impact of treatment. However, this requires an assumption that individuals choose treatment while considering these full charges instead of their individual payment. It is possible that patient choice of treatment based on individual payments would lead to different outcomes than choice of treatment based on all charges if there is significant difference in the payment to charges ratio between different treatments.

Define (γ_{Tr}) as the individual payment to charges ratio for traditional treatment and (γ_{CAM}) as the individual payment to charges ratio for complementary and alternative treatment. The first order conditions of cost-minimization (from Chapter 4) can be reformulated as follows:

$$\begin{aligned}\gamma_{Tr}P_{Tr} - \lambda MH_{Tr} &= 0 \\ \gamma_{CAM}P_{CAM} - \lambda MH_{CAM} &= 0 \\ MH(Tr, Alt) - \overline{MH} &= 0\end{aligned}$$

Rearranging the first order conditions implies:

$$\frac{\gamma_{Tr}P_{Tr}}{\gamma_{CAM}P_{CAM}} = \frac{MH_{Tr}}{MH_{CAM}}$$

Note that if $\gamma_{Tr} = \gamma_{CAM}$, then the first order conditions can be reformulated as before.

$$\frac{P_{Tr}}{P_{CAM}} = \frac{MH_{Tr}}{MH_{CAM}}$$

Under these conditions, patient choice of treatment would be unaffected. However, this may still results in a false claim or rejection of cost-effectiveness of treatment.

There is also a concern when using final prices instead of the final cost of production. A significant markup of final price can bias the measure of incremental economic cost of treatment. However, the direction of the bias is difficult to assign without detailed information on the extent of markup.

Define the final price of treatment (P) as a scaled measure of the final cost of production($Cost$):

$$P_{Tr} = \theta_{Tr}Cost_{Tr}$$

$$P_{CAM} = \theta_{CAM} Cost_{CAM}$$

$$\begin{aligned} \Delta P &= P_{CAM} - P_{Tr} \\ &= \theta_{CAM} Cost_{CAM} - \theta_{Tr} Cost_{Tr} \end{aligned}$$

The following is a reformulation of the incremental cost-effectiveness ratio and the incremental net benefit to highlight the importance of a markup in price:

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

$$ICER = \frac{\theta_{CAM} Cost_{CAM} - \theta_{Tr} Cost_{Tr}}{\Delta Effect}$$

$$INB(\lambda) = \lambda * \Delta Effect - \Delta Cost$$

$$INB(\lambda) = \lambda * \Delta Effect - (\theta_{CAM} Cost_{CAM} - \theta_{Tr} Cost_{Tr})$$

The impact of the markup (θ) depends on the difference in the levels of final costs, the relative magnitude of the markups ($\frac{\theta_{CAM}}{\theta_{Tr}}$), and the difference in effect ($\Delta Effect$). The markup could produce either an upward or downward bias in the estimates, leading to either a false claim or rejections of cost-effectiveness of treatment.

6.4 Differences in Direct Nonmonetary Costs

The true economic cost of treatment also includes the change in the direct nonmonetary resources (D_{D2}). This would include all time costs associated with acquiring treatment (travel to and from appointments, days of work missed to due treatment or side-

effects associated with treatment (Han & Wang, 2005) (Fernandez, Montgomery, & Francois, 2006)).

The following is a reformulation of the incremental cost-effectiveness ratio and the incremental net benefit to highlight the importance these direct nonmonetary costs(D_2) independent of the other aspects of the economic costs(C):

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

$$ICER = \frac{(C_{CAM} + D_{D2CAM}) - (C_{Tr} + D_{D2Tr})}{\Delta Effect}$$

$$ICER = \frac{(C_{CAM} - C_{2CAM}) + (D_{D2CAM} - D_{D2Tr})}{\Delta Effect}$$

$$INB(\lambda) = \lambda * \Delta Effect - \Delta Cost$$

$$INB(\lambda) = \lambda * \Delta Effect - ((C_{CAM} + D_{D2CAM}) - (C_{Tr} + D_{D2Tr}))$$

$$INB(\lambda) = \lambda * \Delta Effect - ((C_{CAM} - C_{Tr}) + (D_{D2CAM} - D_{D2Tr}))$$

The impact of the difference in nonmonetary direct costs on the incremental cost-effectiveness ratio and incremental net benefit is fairly straightforward. The incremental difference in the difference in nonmonetary direct costs has a positive effect on the incremental cost-effectiveness ratio and a negative impact on the incremental net benefit. The absence of this information could bias the estimates.

If $D_{2CAM} > D_{2Tr}$, i.e., that the additional nonmonetary direct costs of the proposed treatment are greater than the additional nonmonetary direct costs of existing treatment, then

the incremental cost-effectiveness ratio be biased downward and the incremental net benefit will be biased upward, possibly resulting in false claims of cost-effectiveness of the new treatment. If $D_{2CAM} < D_{2Tr}$, i.e., that the additional nonmonetary direct costs of the proposed treatment are less than the additional nonmonetary direct costs of existing treatment, then the incremental cost-effectiveness ratio be biased upward and the incremental net benefit will be biased downward, possibly resulting in false rejection of cost-effectiveness of the new treatment.

If $D_{2CAM} = D_{2Tr}$, i.e., that there is no difference in the additional nonmonetary costs of the proposed treatment and the existing treatment, then there will be no bias in either the incremental cost-effectiveness ratio or the incremental net benefit. This is the implicit assumption in research that does not include nonmonetary costs.

6.5 Differences in Indirect Costs

The true incremental economic cost also includes the change in the indirect impact of treatment (IN). The indirect impact of treatment includes the value of resources not directly related to treatment, including a loss or impairment of ability to work or engage in leisure activities ("morbidity costs") or changes in life expectancy resulting from intervention ("mortality costs") (Wu, et al., 2006).

The following is a reformulation of the incremental cost-effectiveness ratio and the incremental net benefit to highlight the importance these indirect costs (D_{IN}) independent of the other aspects of the economic costs (C):

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

$$ICER = \frac{(C_{CAM} + D_{INCAM}) - (C_{Tr} - D_{INCAM})}{\Delta Effect}$$

$$ICER = \frac{(C_{CAM} - C_{2CAM}) + (D_{INCAM} - D_{INTR})}{\Delta Effect}$$

$$INB(\lambda) = \lambda * \Delta Effect - \Delta Cost$$

$$INB(\lambda) = \lambda * \Delta Effect - ((C_{CAM} + D_{INCAM}) - (C_{Tr} + D_{INTR}))$$

$$INB(\lambda) = \lambda * \Delta Effect - ((C_{CAM} - C_{Tr}) + (D_{INCAM} - D_{INTR}))$$

The impact of the difference in indirect costs is fairly straightforward. The incremental difference in the difference in indirect costs has a positive effect on the incremental cost-effectiveness ratio and a negative impact on the incremental net benefit. The absence of this information could bias the estimates.

If $IN_{CAM} > IN_{Tr}$, i.e., that the additional indirect costs of the proposed treatment are greater than the additional indirect costs of existing treatment, then the incremental cost-effectiveness ratio be biased downward and the incremental net benefit will be biased upward, possibly resulting in false claims of cost-effectiveness of the new treatment.

If $IN_{CAM} < IN_{Tr}$, i.e., that the additional indirect costs of the proposed treatment are less than the additional indirect costs of existing treatment, then the incremental cost-effectiveness ratio be biased upward and the incremental net benefit will be biased downward, possibly resulting in false rejection of cost-effectiveness of the new treatment.

If $IN_{CAM} = IN_{Tr}$, i.e., that there is no difference in the indirect costs of the proposed treatment and the existing treatment, then there will be no bias in either the incremental cost-effectiveness ratio or the incremental net benefit. This is the implicit assumption in research that does not include measures of indirect costs.

Chapter 7

REVIEWING COST-EFFECTIVENESS TECHNIQUES

This chapter formally lays out the methods researchers developed in the past few decades to implement cost-effectiveness analyses, specifically, the incremental cost-effectiveness ratio (ICER), the graphical representation of the ICER in incremental cost-incremental effectiveness space, incremental net benefit (INB) method, and incremental net health benefit (INHB) method. Statistical issues of uncertainty are discussed and construction of the cost-effectiveness acceptability curve (CEAC) using either bootstrap replicates or hypothesis testing are presented. The CEAC is the most common method for presenting uncertainty in the literature. This chapter will lay out the tools for assessing the cost-effectiveness of complementary and alternative medicine (CAM) in treating mental health disorders.

7.1 Incremental Cost-Effectiveness Ratio (ICER) and Space

Consider a control group and treatment group with associated distributions of costs (C) and effects (E). Let μ_{C0} be the expected level of cost for the control group, μ_{C1} be the expected value of cost for the treatment group, μ_{E0} be the expected level of effect for the control group, μ_{E1} be the expected level of effect for the treatment group, σ_{C0}^2 be the variance of cost for the control group, σ_{C1}^2 be the variance of cost for the treatment group, σ_{E0}^2 be the variance of effect for the control group, σ_{E1}^2 be the variance of effect for the treatment group, $\sigma_{C0,E0}$ be the covariance of cost and effect for the control group, and $\sigma_{C1,E1}$ be the covariance of cost and effect for the treatment group.

Define the difference in the expected level of cost between the treatment and control and the difference in the expected level of effect between the treatment and control as the following:

$$\mu_{\Delta C} = \mu_{C1} - \mu_{C0}$$

$$\mu_{\Delta E} = \mu_{E1} - \mu_{E0}$$

The incremental cost-effective ratio (ICER) is the ratio of the difference in the expected cost between the treatment and control over the difference in the expected effect between the treatment and control.

$$ICER = \frac{\mu_{\Delta C}}{\mu_{\Delta E}}$$

The ICER represents the difference in cost (resource use) of the treatment associated with a unit difference in effect of the treatment.

There are four possible combinations of differences in expected costs and effects. These four possible combinations correspond to the quadrants of the incremental cost-incremental effectiveness space, where the difference in effect is measured on the horizontal axis and the difference in cost is measured on the vertical axis (Figure 7.1).

$\mu_{\Delta C} > 0, \mu_{\Delta E} > 0$	Quadrant I
$\mu_{\Delta C} > 0, \mu_{\Delta E} < 0$	Quadrant II
$\mu_{\Delta C} < 0, \mu_{\Delta E} < 0$	Quadrant III
$\mu_{\Delta C} < 0, \mu_{\Delta E} > 0$	Quadrant IV

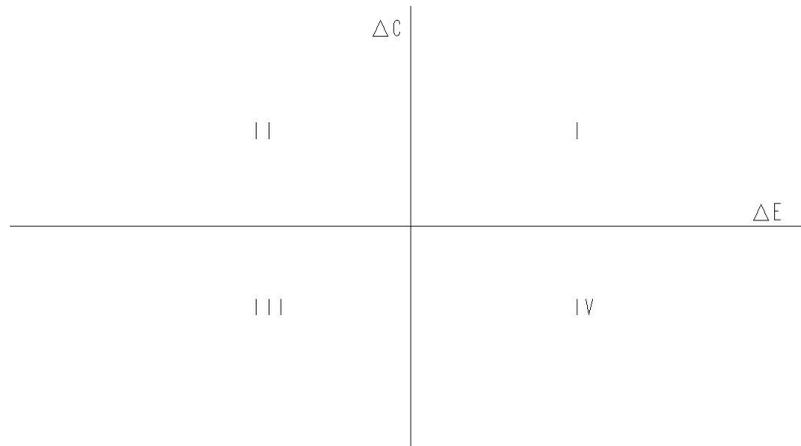


Figure 7.1 The Four Quadrants of the Incremental Cost-Incremental Effectiveness Space

The treatment is said to dominate the control with a difference in cost and a difference of effect in quadrant IV, where $\mu_{\Delta C} < 0$ and $\mu_{\Delta E} > 0$. Here the treatment is both less costly and more effective than the control. The treatment is said to be dominated by the control with a difference in cost and a difference in effect in quadrant II, where $\mu_{\Delta C} > 0$ and $\mu_{\Delta E} < 0$. Here the treatment is both more costly and less effective than the control.

Note that the ICER will be negative in both quadrants II and IV. The ICER will be negative when either the treatment dominates the control or when the treatment is dominated by the control. This major drawback of the ICER requires careful attention to the associated quadrant. Negative ICERs do not obey the law of transitivity; unambiguous preference ordering is not possible in quadrants II and IV in the incremental cost-effectiveness space (Hoch, Briggs, & Willan, 2002).

A similar ambiguity exists for a difference in cost and a difference in effect located in quadrants I and III. In quadrant I a treatment is more effective and more costly. O'Brien, et al., (1994) refer to this as a “tradeoff” region, where higher effects are achieved at the expense of greater use of resources. Here the ICER will be positive and represents the additional cost per unit of effect from treatment.

In quadrant III a treatment is less effective and less costly. In this tradeoff region, smaller effects are achieved through the use of fewer resources. Again, the ICER will be positive, not represents the resources savings per unit of effect.

If the difference in cost and the difference in effect are located in quadrant I, where the treatment is more effective and more costly, then the question of adopting a treatment to replace a control hinges on the relationship between the ICER and the willingness-to-pay (WTP) for a unit increase of effect. If the ICER is less than the maximum one is willing-to-pay for a unit increase of effect, then treatment is said to be cost-effective and that there is evidence to support the adoption of treatment in place of the control.

If the difference in cost and difference in effect is located in quadrant III, where a treatment is both less costly and less effective, then the question of adopting a treatment to replace a control hinges on the relationship between the ICER and the willingness-to-accept (WTA) less effective treatment for resource savings. If the ICER is greater than the minimum one is willing-to-accept for a unit less of effect, then the treatment is said to be cost-effective and that there is evidence to support the adoption of the treatment in place of the control.

7.2 Incremental Net Benefit

Recently, a reformulation of the problem has been suggested (Stinnett & Mullahy, 1998). Define the incremental net (monetary) benefit as the monetized difference in effect less the difference in the cost where λ is the value of a unit of effect (either gained or lost).

$$INB(\lambda) = \lambda * \mu_{\Delta E} - \mu_{\Delta C}$$

A positive incremental net benefit is equivalent to a treatment being cost-effective and is evidence to support the adoption of the new treatment in place of the control.

This finding is independent of the quadrant. All treatments beneath the value of incremental effect line ($WTP * \Delta E$) in the incremental cost-incremental effectiveness space

will have a positive incremental net benefit.⁸ All treatments above the value of incremental effect line in the incremental cost-incremental effectiveness space will have a negative incremental net benefit.⁹

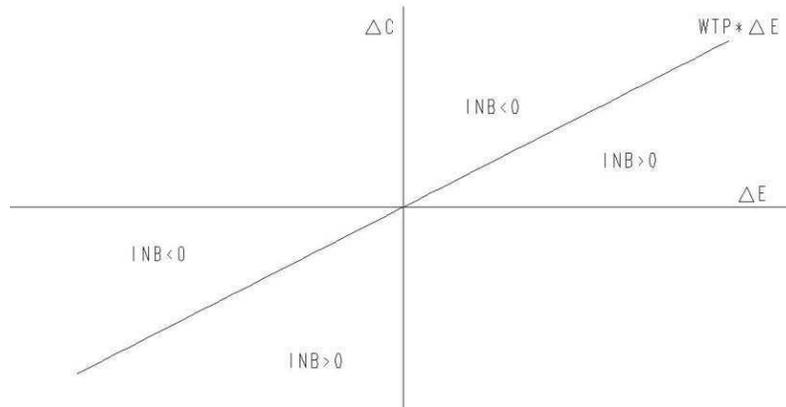


Figure 7.2 Positive and Negative Incremental Net Benefits in the Incremental Cost-Incremental Effectiveness Space

A subtle point illustrated by Löthgren and Zethraeus (2000) helps illustrate a property of the incremental net benefit formulation in the incremental cost-incremental effectiveness space. Any two points on a ray from the origin in the incremental cost-incremental effectiveness space represent treatments with equal ICERs. However, as long as the value of a unit of incremental effect does not equal the ICER, any two points on a ray from the origin in the incremental cost-effectiveness space will represent treatments with different incremental net benefits.

⁸ The value of a unit of effect is often referred to as the “price line” or the “WTP line”—though the term willingness-to-pay should be reserved for treatment with increased cost and increased effect and willingness-to-accept (WTA) should be reserved for treatment with decreased cost and decreased effect.

⁹ Much of the previous literature uses the terms *net benefit* and *incremental net benefit* as if they were interchangeable. They are not. Strictly speaking, a positive *incremental* net benefit implies that the net benefit of treatment is greater than the net benefit of the control. The treatment will be below the value of a unit of effect line in the *incremental* cost-effectiveness space. It is possible to have a positive *incremental* net benefit for a treatment and a negative net benefit of treatment (if the net benefit of control is even more negative). This distinction is can be seen in the intercept of the price line in the (total, not incremental) cost-effectiveness space.

Note that a given incremental cost-effectiveness ratio ($ICER_0$) results from *any* combination of the expected difference in costs or effects that satisfy the following:

$$\mu_{\Delta C} = \mu_{\Delta E}(ICER_0)$$

Substituting this information into the incremental net benefit equation yields:

$$INB(\lambda) = \lambda * \mu_{\Delta E} - \mu_{\Delta E}(ICER_0)$$

$$INB(\lambda) = \mu_{\Delta E} * (\lambda - ICER_0)$$

The incremental net benefit of a treatment is equal to the value of a unit of incremental effect less the incremental cost-effectiveness ratio of the treatment scaled by the expected difference in the effect.

In the incremental cost-effectiveness space, the value of the incremental net benefit of treatment is equal to the vertical distance at expected difference in the effect between the ray extending from the origin that corresponds to the incremental cost-effective ratio for the treatment and the ray extending from the origin that corresponds to the value of an incremental unit of effect.

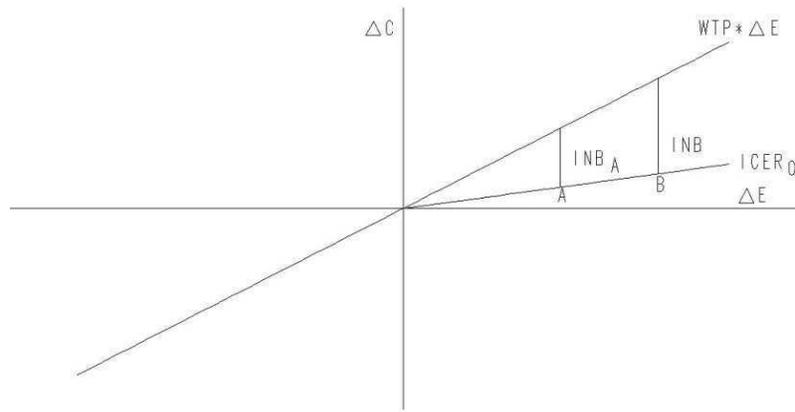


Figure 7.3 Incremental Net Benefit as the Vertical Distance between and Incremental Cost-Effectiveness Ray and a Value of a Unit of Incremental Effect Ray

This graphical representation of incremental net benefit is valid for treatments that are either more or less effective than the control (i.e., independent of the quadrant).

If the ICER is equal to the value of a unit of incremental effect, then the incremental net benefit of the treatment will be zero. Graphically, the rays that correspond to the ICER and the value of a unit of incremental effect will be equal. The vertical distance between the two rays will be zero.

Note that the magnitude of ICER does not necessarily imply anything about the desirability of a treatment, but that a larger incremental net benefit does. For a rational allocation of scarce resources for health, preferences are monotonic for the incremental net benefit, but not for the incremental cost-effectiveness ratio (Stinnett & Mullahy, 1998).

Hoch, et al., (2002) note that the difference in the average net benefit between a treatment and control will equal the incremental net benefit.

Define the average net benefit for the control and treatment as:

$$\overline{NB}_0(\lambda) = \lambda * \mu_{E0} - \mu_{C0}$$

$$\overline{NB}_1(\lambda) = \lambda * \mu_{E1} - \mu_{C1}$$

Then,

$$\overline{NB}_1(\lambda) - \overline{NB}_0(\lambda) = (\lambda * \mu_{E1} - \mu_{C1}) - (\lambda * \mu_{E0} - \mu_{C0})$$

$$\overline{NB}_1(\lambda) - \overline{NB}_0(\lambda) = \lambda * (\mu_{E1} - \mu_{E0}) - (\mu_{C1} - \mu_{C0})$$

$$\overline{NB}_1(\lambda) - \overline{NB}_0(\lambda) = \lambda * \mu_{\Delta E} - \mu_{\Delta C}$$

$$\overline{NB}_1(\lambda) - \overline{NB}_0(\lambda) = INB(\lambda)$$

7.3 Incremental Net Health Benefit

The incremental net health benefit is a similar reformulation handling the quadrant problem of the difference in cost and difference in effect of an associated incremental cost-effectiveness ratio (ICER) (Stinnett & Mullahy, 1998). Define the incremental net health benefit (INHB) as the difference in effect less the effect equivalent of the difference in the cost.

$$INHB(\lambda) = \mu_{\Delta E} - \frac{\mu_{\Delta C}}{\lambda}$$

The effect equivalent of the difference in cost is equal to the amount of effect that the difference in cost would produce for a given value of a unit of incremental effect. Put differently, the second term represents the incremental health gain that could have been attained by instead investing the additional resources from the treatment in a marginally cost-effective program (i.e., where $ICER = \lambda$).

Similar to the net (monetary) benefit, a positive net health benefit indicates there is evidence to support adoption of the treatment to replace the control. A positive net health benefit implies that the effect gains from the treatment are greater than the effect gains from

using the resources in the control. A negative health benefit implies that forgoing the intervention in question and investing the resources in the control could attain greater health improvement. A treatment with a positive incremental net health benefit is said to be cost-effective.

The net health benefit for a treatment compares the effect of a treatment with the minimum health effect that an individual would demand in return for an investment of the difference in costs.

7.4 Statistical Properties of the Incremental Cost-Effectiveness Ratio Estimate

Uncertainty in cost-effective analysis will arise when either the true difference in cost or the true difference in effect are unknown and estimated. The focus here will be when both difference in cost and difference in effect are unknown and estimated. The sections briefly discuss different methods to assess the uncertainty of the incremental cost-effectiveness ratio (ICER), namely, a best- and worst-case ICER, a second-order approximation of variance, bootstrapping for either an empirical distribution or to create cost-effectiveness acceptability curves (CEAC).

Consider the sample analog for each of the unknown population parameters. Define n_0 as the number of observations in the control group and n_1 as the number of observations in the treatment group.

$$\hat{\mu}_{C0} = \frac{1}{n_0} \sum_i^{n_0} C_{0,i}$$

$$\hat{\mu}_{C1} = \frac{1}{n_1} \sum_i^{n_1} C_{1,i}$$

$$\hat{\mu}_{E0} = \frac{1}{n_0} \sum_i^{n_0} E_{0,i}$$

$$\hat{\mu}_{E1} = \frac{1}{n_1} \sum_i^{n_1} E_{1,i}$$

$$\hat{\mu}_{\Delta C} = \hat{\mu}_{C1} - \hat{\mu}_{C0}$$

$$\hat{\mu}_{\Delta E} = \hat{\mu}_{E1} - \hat{\mu}_{E0}$$

$$\hat{\sigma}_{C0}^2 = \frac{1}{n_0 - 1} \sum_i^{n_0} (C_{0,i} - \hat{\mu}_{C0})^2$$

$$\hat{\sigma}_{C1}^2 = \frac{1}{n_1 - 1} \sum_i^{n_1} (C_{1,i} - \hat{\mu}_{C1})^2$$

$$\hat{\sigma}_{E0}^2 = \frac{1}{n_0 - 1} \sum_i^{n_0} (E_{0,i} - \hat{\mu}_{E0})^2$$

$$\hat{\sigma}_{E1}^2 = \frac{1}{n_1 - 1} \sum_i^{n_1} (E_{1,i} - \hat{\mu}_{E1})^2$$

The incremental cost-effectiveness ratio point estimate (\widehat{ICER}) is the estimated difference in cost over the estimated difference in effect.

$$\widehat{ICER} = \frac{\hat{\mu}_{\Delta C}}{\hat{\mu}_{\Delta E}}$$

Stinnett, et al., (1998) emphasize the importance of taking the ratio of incremental cost to the incremental effect approach over the difference in cost to effectiveness ratios.

$$\frac{\hat{\mu}_{C1}}{\hat{\mu}_{E1}} - \frac{\hat{\mu}_{C0}}{\hat{\mu}_{E0}} \neq \frac{\hat{\mu}_{C1} - \hat{\mu}_{C0}}{\hat{\mu}_{E1} - \hat{\mu}_{E0}}$$

The difference between the average cost per unit of effect between a treatment and control is not equivalent to the ICER.

7.4.1 Best-Case and Worst-Case ICERs

Following O'Brien, et al., (1994) a $(100 - \alpha)\%$ confidence interval can be constructed for a difference in cost or a difference in effect.

$$\hat{\mu}_{\Delta C} \pm t_{\frac{\alpha}{2}, n_0 + n_1 - 2} \sqrt{\frac{\hat{\sigma}_{C0}^2}{n_0} + \frac{\hat{\sigma}_{C1}^2}{n_1}}$$

$$\hat{\mu}_{\Delta E} \pm t_{\frac{\alpha}{2}, n_0 + n_1 - 2} \sqrt{\frac{\hat{\sigma}_{E0}^2}{n_0} + \frac{\hat{\sigma}_{E1}^2}{n_1}}$$

The confidence intervals define the upper and lower bounds of cost and effect. A graphical presentation of the two confidence intervals together shows a box region. Two corners of the box represent the best and worst case values of the ICER. The north-west corner defines the ICER using the upper bound of cost and the lower bound of effect (i.e., the “worst-case”). The south-east corner defines the ICER using the lower bound of cost and the upper bound of effect (i.e., the “best-case”).

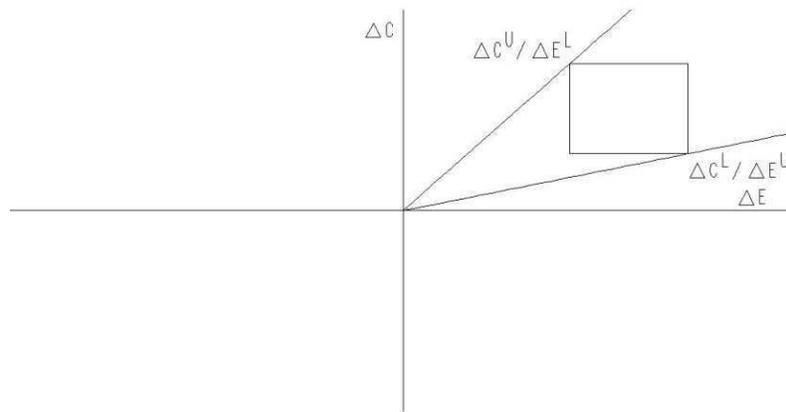


Figure 7.4 "Best-Case" and "Worse-Case" Incremental Cost-Effectiveness Ratios

While the difference between these best- and worst- case measure of ICER is a very simply way to capture the uncertainty, the ICER values are not informative if the confidence interval for either the difference in cost or the difference in effect includes zero (i.e., cross either the horizontal or vertical axis). Furthermore, the bounds determined by a 95% confidence interval for the difference in cost and a 95% confidence interval for the difference in effect do not imply a 95% confidence interval of the ICER. Bounds defining a 95% confidence interval for a bivariate distribution of cost and effect would be smaller than this box.

Many authors use ellipses around the ICER point estimate that represents the bounds of a 95% confidence interval for a bivariate distribution of cost and effect. Formally, the ellipse of equal probability is based on the empirical join probability density of cost and effect, where the slopes of the tangents to the ellipse are the $100(1 - \alpha)\%$ confidence limit (Willan & O'Brien, 1996). However, if the ellipse crosses quadrants the numerical values of the slopes corresponding to the best- and worst- ICERs may be misleading.

7.4.2 Second Order Approximation of Variance

One method of dealing with the uncertainty of an ICER is to follow a Taylor's series approximation of the variance. The variance is estimated using the sample estimates for the mean, variance, and covariance of cost and effect of control and treatment.

$$\begin{aligned} \text{var}(\widehat{ICER}) \cong & \left(\frac{1}{\hat{\mu}_{\Delta E}^2} \right) \left[\frac{\hat{\sigma}_{C1}^2}{n_1} + \frac{\hat{\sigma}_{C0}^2}{n_0} \right] + \left(\frac{\hat{\mu}_{\Delta C}^2}{\hat{\mu}_{\Delta E}^4} \right) \left[\frac{\hat{\sigma}_{E1}^2}{n_1} + \frac{\hat{\sigma}_{E0}^2}{n_0} \right] \\ & - 2 \left(\frac{\hat{\mu}_{\Delta C}}{\hat{\mu}_{\Delta E}^3} \right) \left[\frac{\hat{\rho}_1 \hat{\sigma}_{C1} \hat{\sigma}_{E1}}{n_1} + \frac{\hat{\rho}_0 \hat{\sigma}_{C0} \hat{\sigma}_{E0}}{n_0} \right] \end{aligned}$$

O'Brien, et al., (1994) note that having information on the point estimate and a measure of variability leads to the possibility of formal hypothesis testing. This is based on the assumption that the ICER follows some well-behaved parametric distribution with a large sample size. This is a fairly questionable assumption. As pointed out by Stinnet and Mullahy, if incremental cost and incremental effects are distributed independent unit-normal, then the incremental cost-effectiveness ratio follows a Cauchy distribution (a t-distribution with one degree of freedom) with no mean and infinite variance (1998).

7.4.3 Bootstrapping the ICER

The most popular recent method to estimate the uncertainty surrounding the ICER is bootstrapping. In bootstrapping, observed data are treated as an empirical probability distribution that is resampled with replacement many times. The bootstrap approach treats the observed random sample as an empirical estimate of the probability distribution of an unobserved probability distribution (F) that weights each observation in a random sample, x , by equal probability, $1/n$. Successive random samples of size n are then drawn from x *with replacement* to produce a large number of bootstrap replicates. Relevant statistics are calculated for each replicate and make up the empirical estimate of the distribution of the

statistic. The empirical estimate of the distribution is then used to make inference about the statistic.

Briggs, et al., (1997) formally lay out a three-step process for nonparametric bootstrapping of the ICER from cost and health effect data for a control group of size n_0 and a treatment group of size n_1 .

- 1.) Sample *with replacement* n_0 cost/effect pairs from the control group and use these to calculate μ_{C0}^* and μ_{E0}^* , a pair of bootstrap replicates for $\hat{\mu}_{C0}$ and $\hat{\mu}_{E0}$.
- 2.) Sample *with replacement* n_1 cost/effect pairs from the treatment group and use these to calculate μ_{C1}^* and μ_{E1}^* , a pair of bootstrap replicates for $\hat{\mu}_{C1}$ and $\hat{\mu}_{E1}$.
- 3.) Calculate the bootstrap estimate of the ICER for replication i :

$$ICER_i^* = \frac{\mu_{\Delta C}^*}{\mu_{\Delta E}^*}$$

Where $\mu_{\Delta C}^* = \mu_{C1}^* - \mu_{C0}^*$ and $\mu_{\Delta E}^* = \mu_{E1}^* - \mu_{E0}^*$.

Repeating the above three-step process B times produces an empirical sampling distribution of the ICER statistic.

The expected value of the ICER from the empirical sampling distribution is calculated as:

$$\hat{\mu}_{ICER}^* = \frac{1}{B} \sum_i^B ICER_i^*$$

The bootstrap estimate of standard error for the ICER is the standard deviation of the empirical sampling distribution calculated as:

$$\hat{\sigma}^*_{ICER} = \sqrt{\frac{1}{B-1} \sum_i^B (ICER_i^* - \hat{\mu}^*_{ICER})^2}$$

In the bootstrapping approach it does not matter if the ICER follows a well-behaved distribution because it forms its own probability density function (O'Brien, Drummond, Roberta, & Willan, 1994). Historically, the most significant drawback to this method was the computing power necessary for creating a large number of replicates. The recent advance in computing negates this problem.

The bootstrap estimate of the ICER point estimate is valid with two asymptotic properties; that as the original sample size approaches the population size so that sample distribution tends to the population distribution, and that given this, as the number of bootstrap replicates (B) approaches infinity so the bootstrap estimate of the sampling distribution of a statistic approaches the true sampling distribution (Briggs, Wonderling, & Mooney, 1997).

Any estimate of the ICER based on a finite number of bootstrap replicates will differ from the asymptotic ICER. Efron and Tibshirani suggest that 50 bootstrap replications are adequate to provide an informative estimate of the point estimate (1993). Given the relative ease of re-sampling due to the increase in computing power, many researchers use 2000 to 10000 replications (see (Bosmans, et al., 2006), (Fenwick, Claxton, & Sculpher, 2001)).

Briggs, et al., (1997) use 5000 bootstrap replicates to assess the stability of the expected value and standard deviation of the empirical sampling distribution using clinical trial data. They found that while the bootstrapped estimate of the expected value stabilized between 50 and 200 replications, the standard error did not converge, even over a larger number of replications when the probability of a zero denominator was non-negligible (leading to an unidentified moment). If the coefficient of variation of the difference in effect is large, the lack of convergence may persist, even with a large number of bootstrap replications.

$$CV_{\Delta E}^* = \frac{\hat{\sigma}_{\Delta E}^*}{\hat{\mu}_{\Delta E}^*}$$

One use of the bootstrap replicates has been to report a $100(1-\alpha)\%$ confidence interval based on the estimates of the expected value and the standard error of the empirical sampling distribution assuming normality.

$$\hat{\mu}_{ICER}^* \pm t_{\frac{\alpha}{2}, n_0+n_1-2} * \hat{\sigma}_{ICER}^*$$

This confidence interval is based on the assumption of normality for the incremental cost-effectiveness ratio empirical distribution. This is a questionable assumption that seems invalid for many published results using bootstrap replications to create the empirical distribution, especially when a significant portion of the bootstrap replicates cross the incremental effect axis in the incremental cost-incremental effectiveness space.

The percentile method is a more direct use of the bootstrap replicates. The $(100-\alpha/2)$ and $(\alpha/2)$ percentiles of a descending ranking the ICER bootstraps are used to define the upper and lower bound. The advantages of this method are that it is simple and there is no need to calculate a bootstrap estimate of the standard error.

This method of bootstrapping holds constant the number of observations in the control group and the number of observations in the treatment group constant for each replicate, i.e., the proportion of the overall sample that is in the treatment group is held constant for each replicate.

When the above bootstrap method is used on observational data, where the choice of treatment is endogenous, the replicates of the control group and the treatment group will always have the same number of observations, i.e., the proportion of observations in control and in treatment are held constant. The bootstrap replicates are produced *within* control group and *within* treatment group, rather than *within* sample.

It is easy to relax this assumption of constant treatment proportion of the bootstrap replicates. Combine data on cost and health effect for both control and treatment group, along with a control/treatment identifier into a single sample of size n_T (where $n_T = n_0 + n_1$).

- 1.) Sample *with replacement* n_T cost/effect/identifier observations from the full sample.
- 2.) Separate the full sample by the control/treatment identifier. Let n_0^* be the number of observations in the replicate with a control identifier and n_1^* be the number of observations in the replicate with a treatment identifier.^μ
- 3.) Calculate the bootstrap estimate for the control and treatment average cost and effect.

10

$$\begin{aligned} \mu_{C0}^* &= \sum \frac{C_0^*}{n_0^*} & \mu_{E0}^* &= \sum \frac{E_0^*}{n_0^*} \\ \mu_{C1}^* &= \sum \frac{C_1^*}{n_1^*} & \mu_{E1}^* &= \sum \frac{E_1^*}{n_1^*} \end{aligned}$$

- 4.) Calculate the bootstrap estimate of the ICER for replication i :

$$ICER_i^* = \frac{\mu_{\Delta C}^*}{\mu_{\Delta E}^*}$$

It has been shown that a fixed proportion of control to treatment group for the replicates will produce an asymptotically unbiased estimate of cost and effect for both the control and treatment groups. Allowing the proportion of control to treatment group to vary for each replicate should also produce an unbiased estimator.

¹⁰ Though some algorithm is needed to calculate the ICER estimates for bootstrap replicates with zero observations in either control or treatment.

It is possible to create a measure of bias for the expected value of effect and cost for both the control and treatment groups and to measure how that value of bias changes for different values of replicates, the initial difference between effect and cost, and the initial proportion of control to treatment.

In an experimental setting, demographic proportions can be controlled to reduce this potential source of bias. If using observations data, it seems more reasonable to allow the proportions of demographics to vary. The question of potential bias should be further investigated.¹¹

7.4.4 Cost-Effectiveness Acceptability Curves (CEAC)

Recently, the preferred method of presenting the uncertainty of the incremental cost-effectiveness ratio (ICER) uses the cost-effectiveness acceptability curves (CEAC). First proposed by Van Hout, et al., (2006) the CEAC provides an estimate of the proportion of the ICER bootstrap replicates that fall below a given value of unit of incremental effect in the incremental cost-incremental effectiveness space. The value of a unit of effect in the incremental cost-effectiveness space is thought of as the willingness-to-pay (WTP) for a unit increase of effect ($WTP = \lambda_{WTP}$) or as the willingness-to-accept (WTA) a unit decrease of effect ($WTA = \lambda_{WTA}$). Following convention, these values are treated as equal ($\lambda_{WTP} = \lambda_{WTA} = \lambda$).

The standard presentation of the CEAC is with different values of a unit of effect on the horizontal axis and the corresponding proportion of ICER bootstrap replicates below this value of a unit of incremental effect line in the incremental cost-incremental effectiveness space (either below the willingness-to-pay in quadrant I or above the willingness-to-accept in quadrant III) on the vertical axis.

¹¹ This issue of the choice of fixed or variable proportions of the control to treatment group is related to the choice of fixed or variable proportions of groups of observable characteristic when bootstrapping with observable characteristics. Is it appropriate to hold fixed the proportion of males in the treatment group and the effect group? Or is it appropriate to allow the proportion of males in the control group and the treatment group to vary for each bootstrap replicate?

There is not universal agreement for the interpretation of the CEAC. Many researchers explain the curve as the probability that an intervention is cost-effective for different prices (Van Hout, Maiwenn, Gordon, & Rutten, 2006), (Löthgren & Zethraeus, 2000), (Sendi & Briggs, 2001). This Bayesian interpretation, that the CEAC is the probability that an intervention is cost-effective, is only appropriate by treating the parameters of the model as random variables (Fenwick, O'Brien, & Briggs, 2004). Elsewhere Briggs interprets the curves in terms of confidence intervals (1997).

Formally, the CEAC is defined as:

$$CEAC(\lambda) = Prob(ICER < \lambda_{WTP} | \mu_{\Delta E} > 0) + Prob(ICER < \lambda_{WTA} | \mu_{\Delta E} < 0)$$

Where $\lambda = \lambda_{WTP} = \lambda_{WTA}$.

The above formulation follows from the aforementioned issues with the different relationship between the ICER and the willingness-to-pay for a unit increase of effect (in quadrant I) or the willingness-to-accept for a unit decrease in effect (in quadrant III). In the incremental cost-effectiveness space, the above formulation corresponds to any points below a given value of unit of incremental effect line.

Define $f_{\mu_{\Delta C}, \mu_{\Delta E}}(\mu_{\Delta C}, \mu_{\Delta E})$ as the bivariate distribution of the difference in cost and effect between a control and treatment. Then the CEAC can also be defined as:

$$CEAC(\lambda) = \int_{-\infty}^{\infty} \int_{-\infty}^{\lambda * \hat{\mu}_{\Delta E}} f_{\mu_{\Delta C}, \mu_{\Delta E}}(\mu_{\Delta C}, \mu_{\Delta E}) d\mu_{\Delta C} d\mu_{\Delta E}$$

The cost-effectiveness acceptability curve can be estimated either through parametric methods (which requires a distributional assumption for the difference in cost and effect) or through nonparametric methods (bootstrapping).

Not surprisingly, the most commonly used assumption for the difference in cost and effect is that of a bivariate normal distribution. Calculation of the CEAC can be calculated directly from the integral definition. Any parametric estimation of the CEAC will be open to the criticism of appropriate distribution.

Löthgren and Zethraeus (2000) present a formal method for calculation of the CEAC based on B bootstrap replicates from a set of control and treatment group.

$$CEAC^*(\lambda) = \frac{1}{B} \sum_i^B [I\{ICER_i^* < \lambda, \mu_{\Delta E}^* > 0\} + I\{ICER_i^* > \lambda, \mu_{\Delta E}^* < 0\}]$$

Where $I\{A\}$ is an indicator function that takes the value 1 if the statement A is true and 0 otherwise.

Varying the value of a unit of effect over a relevant range produces the CEAC. The values of a unit of effect are measured on the horizontal axis and the values of the $CEAC^*(\lambda)$ function are used on the vertical axis. By construction, the range of the $CEAC^*(\lambda)$ function is $[0, 1]$.

The ‘textbook’ example of a cost-effectiveness acceptability curve found through nonparametric bootstrapping has all bootstrap replicates are located in quadrant I (where treatment is more costly, but also more effective). The CEAC for these bootstrap replicates will cut the vertical axis at zero, asymptote to 1, and will monotonically increase with respect to willingness to pay. However, many CEA have bootstrap replicates outside of quadrant I (often straddling multiple quadrants).

Fenwick, et al., (2004) summarize some important properties of CEAC that cause confusion for some policymakers. CEACs:

- 1.) do not necessarily cut the vertical axis at zero,
- 2.) do not asymptote to 1,
- 3.) are not always monotonically increasing with respect to the value of a unit of effect (λ), and
- 4.) do not represent cumulative distribution functions.

Additional issues identified in Fenwick, et al., (2004) are the proper interpretation (Bayesian or frequentist), the difference between individual significance (of cost or effect) and joint significance (of the ICER), and the lack of identifying the probability of a dominant treatment (in quadrant IV).

Sendi and Briggs (2001) introduce the concept of a cost-effectiveness affordability curve based on treatments that are not perfectly divisible. The cost-effectiveness affordability curve is a function of both the willingness-to-pay for an additional unit of effect and of the budget constraint. They introduce the innovation of using the specifically identified program that would be eliminated in the adoption of the new treatment as the opportunity cost of the program.

7.5 Statistical Properties of the Net Benefit Estimate

Uncertainty in either the difference in cost or the difference in effect between a control and treatment will produce uncertainty in the measure of incremental net benefit. However, unlike the incremental cost-effectiveness ratio, the incremental net benefit is a straightforward linear combination of difference in cost and effect and, thus, is quite amenable to familiar estimation techniques (Stinnett & Mullahy, 1998).

$$\widehat{INB}(\lambda) = \lambda * \hat{\mu}_{\Delta E} - \hat{\mu}_{\Delta C}$$

Following logic similar to Stinnett and Mullahy, it easily follows from $E[\hat{\mu}_{\Delta E}] = \mu_{\Delta E}$ and $E[\hat{\mu}_{\Delta C}] = \mu_{\Delta C}$ that (1998):

$$E[\widehat{INB}(\lambda)] = E[\lambda * \hat{\mu}_{\Delta E} - \hat{\mu}_{\Delta C}]$$

$$E[\widehat{INB}(\lambda)] = \lambda * E[\hat{\mu}_{\Delta E}] - E[\hat{\mu}_{\Delta C}]$$

$$E[\widehat{INB}(\lambda)] = \lambda * \mu_{\Delta E} - \mu_{\Delta C} = INB(\lambda)$$

The incremental net benefit estimator is an unbiased estimator of the incremental net benefit.

Similar to Stinnett and Mullahy (1998), the variance of the incremental net benefit is:

$$\sigma_{INB(\lambda)}^2 = \lambda^2 * \sigma_{\Delta E}^2 + \sigma_{\Delta C}^2 - 2 * \lambda * \sigma_{\Delta E, \Delta C}$$

This assumes independence between the treatment and control group, though not between the cost and effect for both treatment and control.

Similar to Stinnett and Mullahy (1998), the distribution of incremental net benefit is:

$$\widehat{INB}(\lambda) \sim N(INB(\lambda), \sigma_{INB(\lambda)}^2)$$

Provided a sufficiently large sample.

Similar to Stinnett and Mullahy (1998), a 100(1- α)% confidence interval is:

$$\widehat{INB}(\lambda) \pm t_{\frac{\alpha}{2}, n_0 + n_1 - 2} * \hat{\sigma}_{INB(\lambda)}$$

Where $t_{\frac{\alpha}{2}}$ denoted the 1- $\alpha/2$ percentile of the student-t cumulative distribution function.

Similar to Stinnett and Mullahy (1998), the following hypothesis testing of a positive incremental net benefit of treatment is:

$$H_0: INB(\lambda) \leq 0$$

$$H_1: INB(\lambda) > 0$$

Where the relevant t-test statistic is calculated as usual.

Adopting a frequentist approach, the p-value associated with the test statistic is the probably of a non-positive incremental net benefit. The mirror image of the p-value, (1 – p-value), is the probability of a positive incremental net benefit (Fenwick, O'Brien, & Briggs, 2004).

The above hypothesis test is conditional on a value of a unit of incremental effect. By varying the value of a unit of incremental effect, information on the probability of a positive net benefit can be used to construct a CEAC based the incremental net benefit estimate (Briggs A. , 2000). Researchers still refer to these curves as cost-effectiveness acceptability curves, though a more appropriate name might be the incremental net benefit curve or the incremental net benefit gradient.

Löthgren and Zethraeus (2000) lay out steps for constructing either a parametric or nonparametric CEACs based on the incremental net benefit estimator.

To estimate incremental net benefit for given value of effect(λ), net benefit is calculated for each observation in the control and treatment:

$$NB_i(\lambda) = \lambda * Effect_i - Cost_i$$

The following linear model estimates net benefit as a function of a treatment dummy variable (CAM_i) identifying observations in the treatment group.

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \varepsilon_i$$

The coefficient on the treatment dummy variable (β_1) is the estimate of the incremental net benefit of treatment. The 1- (p-value) of the hypothesis test on a positive coefficient on the treatment dummy yields an estimate of the cost-effectiveness-acceptability curves that is asymptotically equivalent to the nonparametric bootstrapping approach.

7.6 Differences in the Cost-Effectiveness by Observable Demographics

Many researchers recently examined handling subgroup differences in evaluation of cost-effectiveness((Nixon & Thompson, 2005), (Vázquez-Polo, Hernández, & López - Valcárcel, 2005), (Willan, Briggs, & Hoch, 2004), (Willan, Lin, & Manca, 2005), (Shih, Bekele, & Xu, 2007), (Hoch, Briggs, & Willan, 2002) Important differences in cost and effect across subgroups could have a potential impact on policy. It is possible that one subgroup of individuals may have a different effect or cost from a treatment would not appear in a pooled estimate of the incremental cost-effectiveness ratio (ICER).

If there is reason to suspect the effect, cost, ICER, or incremental net benefit (INB), could differ across subgroups in important ways, then some method of accounting for subgroup differences is required. Some important subgroups where this may be of concern are with gender, race, age, clinical severity, functional limitation, and center of treatment (in a multicenter study) (Nixon & Thompson, 2005).

One simplistic method for examining subgroup differences is to simply estimate the ICER for each individual subgroup. However, the aforementioned problem of associated quadrant identification presents a concern.

The ICERs of difference in cost and differences in effect in both quadrants II and IV are both negative. Quadrant II is associated with a positive difference in cost and a negative difference in effect; the control is said to dominate the new treatment. Quadrant IV is associated with a negative difference in cost and a positive difference in effect; the treatment is said to dominate the control. It is possible to have two subgroups with negative estimates of ICERs (that are not significantly different) but with two entirely different policy recommendations.

The ICERs of a difference in cost and a difference in effect in both quadrants I and III are both positive. Quadrant I is associated with a positive difference in both cost and effect; there is evidence to support the claim that treatment should be adopted if the ICER is less than the willingness-to-pay (WTP) for a unit increase of effect. Quadrant III is associated with negative differences in both cost and effect; there is evidence to support the claim that

treatment should be adopted if the ICER is greater than a willingness-to-accept (WTA) a unit less of effect.

If the willingness-to-pay for a unit increase of effect is equal to the willingness-to-accept a unit decrease of effect (a constant value of a unit of effect line), then it is possible to have two subgroups with the same positive point estimates of ICER. While the policy implication is the same (adopt the proposed the treatment), it will change the mix of health and resources between the two subgroups. The subgroup in quadrant I will have more health, but less resources. The subgroup in quadrant III will have less health, but more resources. Is resource-health tradeoff between different subgroups preferable in a larger societal context? A concern of policy-maker should not just be the average level of health of a population, but also the distribution of health within a population.

One potential problem with this method of examining subgroup differences is the how to identify a statistically significant difference between subgroups. This naturally follows from the earlier discussion of the difficulty of interpreting ICER value independent of associated quadrant. Use of either parametric or nonparametric techniques for estimating the variance of the ICER can help identify significant differences.

Difference in the ICER, the associated quadrant of the estimate, and the variability of the estimate will show up as differences in the cost-effectiveness acceptability curves for the subgroups.

Following the discussion in Fenwick, et al., (2004) of the shape of the CEAC, the quadrant of the estimate is easily identified. A CEAC that is entirely above 0.50 will correspond to a point estimate associated with quadrant IV. A CEAC that is entirely below 0.50 will correspond to a point estimate associated quadrant II. An increasing CEAC that crosses 0.50 will correspond to a point estimate associated quadrant I. A decreasing CEAC that crosses 0.50 will correspond to a point estimate associated quadrant III.

Given the use of regression techniques in estimating the net benefit, it is quite simple to add controls and interaction terms for observable characteristics to the estimation. If individual observable heterogeneity (X_i) is correlated with the error term (ε_i), failure to

model these differences would result in a biased estimator the incremental net benefit of treatment.

A simple extension of the earlier net benefit model could include observable characteristics:

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \Gamma X_i + \varepsilon_i$$

Where CAM_i is a treatment dummy variable (0 if individual i is in the control group, 1 if individual i is in the treatment group), X_i is a vector of observable characteristics for patient i , and ε_i is the error term for patient i .

Estimation using a range of values of a unit of effect would produce estimate of the incremental net benefit of treatment. Again, the mirror image the p-value from the hypothesis testing of a positive incremental net benefit could be used to construct a cost-effectiveness acceptability curve (CEAC) that controls for observable characteristics.

Another simple extension with the earlier net benefit model could include both observable characteristics and interaction terms between treatment and observable characteristics.

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \Gamma X_i + \Upsilon X_i CAM_i + \varepsilon_i$$

Where $(X_i CAM_i)$ is the interaction of observable characteristics and treatment.

This formulation of net benefit allows for a difference in the incremental net benefit of the treatment for different subgroups. The hypothesis test of a significant difference in incremental net benefit for different subgroups is fairly straightforward. Estimation for a range of values of a unit of effect will only show if there is a difference in the incremental net benefit of treatment between groups, but will not indicate if treatment is cost-effective.

As an illustrative example, consider the net benefit of a treatment using a single control, gender.

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \Gamma X_{Gender,i} + \Upsilon X_{Gender,i} CAM_i + \varepsilon_i$$

Where $NB_i(\lambda)$ is the net benefit to patient i for a given value of willingness to pay for an additional unit of effect for individual i calculated as $\lambda E_i - C_i$, CAM_i is a treatment dummy variable that takes a value of one if individual i was in the treatment group and zero otherwise, $X_{Gender,i}$ is a dummy variable that takes a value of one if individual i was a male and zero otherwise, and $CAM_i X_{Gender,i}$ is a treatment interaction term that takes a value of one if patient i was both in the treatment group and a male and zero otherwise.

The coefficients of this regression have a straightforward explanation. Consider the following:

$$\frac{\partial NB_i(\lambda)}{\partial CAM_i} = \beta_1 + \Upsilon X_{Gender,i}$$

This expression tells the marginal impact of the treatment on the net benefit and is a function of gender. So that:

$$\left. \frac{\partial NB_i(\lambda)}{\partial CAM_i} \right|_{X_{Gender,i}=0} = \beta_1$$

$$\left. \frac{\partial NB_i(\lambda)}{\partial CAM_i} \right|_{X_{Gender,i}=1} = \beta_1 + \Upsilon$$

It is clear that the coefficient Υ measures the difference in incremental net benefit of treatment. A statistically insignificant coefficient on this interaction term implies there is not a statistically significant difference in the average incremental net benefit between males and

females.¹² A plot of the mirror image of the p-values associated with the hypothesis test for a range of values of effect would show any significant differences between the male and female marginal impact of treatment on incremental net benefit.

A more useful graphical presentation of the subgroups is to plot the CEAC for each subgroup based on the incremental net benefit approach. There are two steps to this process. First, using the above treatment interaction regression, plot the mirror image of the p-values of the following hypothesis test over a range of values of a unit of effect.

$$H_0: \beta_1 \leq 0$$

$$H_1: \beta_1 > 0$$

Note that this will produce the CEAC based on net benefit regression for females.

Second, reverse the values of the gender dummy so that $X_{Gender,i} = 1$ if individual i is a female and zero otherwise.¹³ Again, plotting the mirror image of the p-values with the same hypothesis test from above over some range of values of a unit of effect(λ) will produce the CEAC based on the incremental net benefit method for males.

Combing the CEACs for males and females succinctly conveys a large amount of information on the cost-effectiveness of treatment for both males and females, including the ICER point estimates and the associated quadrant of the of point estimates. Most importantly is the easy identification of any differences by gender in any of these pieces of information.

¹² Also, a statistically insignificant value of γ would suggest that this source of patient heterogeneity is unrelated to incremental net benefit subgroup differences and that a simplified model will produce an unbiased marginal effect of treatment (Occam's razor).

¹³ The coefficient γ will again measure the difference in the incremental net benefit of treatment (male from female). The coefficients γ for the two incremental net benefit regressions should have the same magnitude, but opposite signs.

Chapter 8

DESCRIPTION OF THE DATA

The following chapter describes the data set used in this analysis to evaluate the cost-effectiveness of complementary and alternative medicine (CAM) as an additional form of treatment for common mental health disorders. This chapter describes the structure of the Medical Expenditure Panel Survey (MEPS), describes the construction of the variables of interest used in this research, and presents a variety of statistics to describe the relevant samples under consideration. This chapter provides background information on the data that this analysis uses to evaluate the cost-effectiveness of CAM.

8.1 The Structure of MEPS

The data used in the empirical analysis of this research is from the Medical Expenditure Panel Survey (MEPS) for 1998. The MEPS is a nationally representative stratified random survey of the civilian noninstitutionalized population of the United States. The MEPS is conducted by the Agency for Healthcare Research and Quality (AHRQ) (part of the U.S. Department of Health and Human Services). The survey includes demographic characteristics, health conditions, health status, use of medical care services, charges and payments, access to care, satisfaction with care, health insurance coverage, income, and employment.

Each household in a MEPS panel is interviewed for five rounds covering a two year period. Panel 2 covers calendar years 1997 and 1998 and panel 3 covers calendar years 1998 and 1999 (Figure 8.1). The MEPS consists of three surveys components; a Household Component (HC), a Medical Provider Component (MPC), and an Insurance Component (IC).

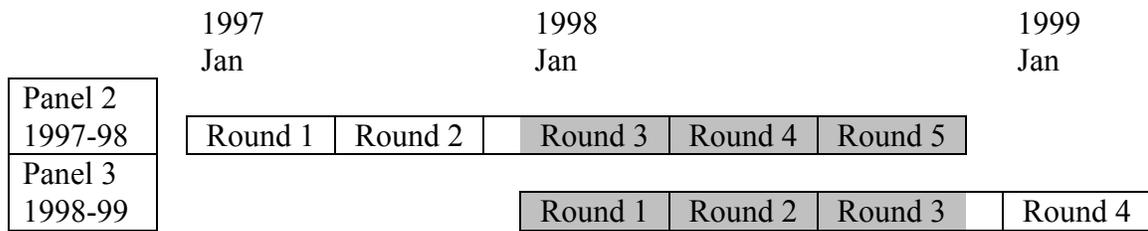


Figure 8.1 Timing of Panels 2 and 3 in the 1998 MEPS

8.2 Description of Information Available in the MEPS

The following describes the relevant variables used in this analysis.

8.2.1 Medical Conditions

The MEPS Household Component (HC) collects information on medical conditions for each round of the panels. Survey respondents report “any health problems, including physical conditions, accidents, or injuries that affect any part of the body as well as mental or emotional health condition, such as feeling sad, blue, or anxious about something” (MEPS). These conditions are recorded by the interviewer as verbatim text and then coded by professional coders to the fully-specified ICD-9 Code (including the V codes) (International Classification of Diseases, 9th edition) or equivalently, the DSM-IV TR Code (Diagnostic and Statistical manual of Mental Disorders, 4th edition). The fully-specified 5-digit ICD-9 Codes are collapsed to the 3-digit code category (e.g., 296.12 become 296). Respondents are questioned if conditions in previous rounds are still present.

While individual coder error rate did not exceed 2.5% and the AQHR suggests that household respondents may not be able to report condition data that can be coded accurately, the collapsed 3-digit ICD-9 code is widely used in a variety of other studies (Druss & Rosenheck, 2000).

8.2.2 Utilization and Expenditure

The MEPS Household Component (HC) collects data in each round on use and expenditures for office and hospital-based care, home health care, dental services, vision aids, and prescribed medicines. The Medical Provider Component (MPC), which generally is regarded as more accurate, contains data from a sample of medical providers and pharmacies that were used by individuals in the Household Component (HC) and is used to improve the expenditure data in the Household Component.

Expenditure in the MEPS are defined as the sum of direct payments for medical care provided during the year, including out-of-pocket payments and payments by private insurance, Medicaid, Medicare, and other sources (AHRQ). Payments for over the counter drugs and payments for alternative care services are not included in the MEPS total expenditure, but the information is available elsewhere in the dataset.

8.2.3 Prescription Drugs

Data on prescription drugs are obtained through both the household questionnaire and a pharmacy survey. The MEPS collects information on the name of any prescribed medication purchased or otherwise obtained, the strength (amount and unit) and quantity (package size) of the prescribed medications, the name of any health condition the medication was prescribed for, the number of times the prescription drug was obtained, the year, month, and day the medication was first used, and if the person sent in claim forms for the prescription (self-filer) or if their pharmacy providers did this at the point of purchase (non-self-filers). For non-self-filers, charge and payment information was collected in the pharmacy component survey. For self-filers, charge and payment information are collected in the household questionnaire. Prescription drugs are coded according to the national drug code (NDC) that indicates medication name, strength, and quantity.

8.2.4 Health Status

The MEPS also collects data on health status. Perceived health status and perceived mental health status is self-reported on a 5-point Likert scale (1-Excellent, 2-Very Good, 3-Good, 4-Fair, and 5-Poor). Previous research demonstrates this perceived health status as a meaningful measure for overall health. Given similar distributional patterns between the perceived health and perceived mental health status variables, the analysis here assumes the mental health status variable is capturing important variation in true mental health.

The MEPS also collects secondary, more specific measures of health status. Respondents are questioned if they have any difficulty with Instrumental Activities of Daily Living (using the telephone, paying bills, taking medication, preparing light meals, doing laundry, shopping), Activities of Daily Living (bathing, dressing, getting around the house), have any functional limitation (walking, climbing stairs, grasping objects, reaching overhead, bending, or standing for long period), have any work, school, or housework limitations, have any cognitive limitations (memory loss, problems with decision making, requires supervision for own safety), or use assistive technology (walker, grab bars in bathtub) functional limitations, social/recreational limitations, limitation in work, housework, or school, or any cognitive limitations.

8.2.5 Complementary and Alternative Medicine

The 1998 MEPS includes a section of questions about complementary and alternative medicine (CAM). The MEPS definition of complementary and alternative medicine includes acupuncture, nutritional advice, massage therapy, herbal remedies, bio-feedback, imagery or relaxation techniques, homeopathic treatments, spiritual healing or prayer, hypnosis, or traditional medicine such as Chinese or American Indian medicine. While the treatments are different forms of CAM, the MEPS refers to them as alternative medicine.

The MEPS definition of CAM does not include a number of treatments that other classification systems consider as CAM. The MEPS gathers information from individuals on chiropractics use and expenditure, but does not classify this with complementary and

alternative medicine. The MEPS does not specifically gather information from individuals on a number of complementary and alternative medicines included in Kaptchuk and Eisenberg's classification system including naturopathy medicine, esoteric energies, crystals and magnets, Reiki, qigong, chelation, antineoplaston, iridology, or hair analysis (Kaptchuk & Eisenberg, 2001). However, it is possible that individuals would associate these treatments as a specific form of the more general terms used in the MEPS (e.g., crystals and magnets are a specific type of spiritual healing).

An initial screening question asked if the individual had received complementary or alternative care. The individuals that indicated use of CAM were asked a series of follow up questions to determine if the use of CAM was ever discussed with the individual's regular doctor, if the individual was ever referred for CAM by a physician or other medical provider, if the individual consulted the CAM practitioner for a specific physical or mental health problem. Also indicated was how many times the individual visited an CAM practitioner, an estimate of the total amount spent by the person for CAM, if the health insurance of the individual paid for any of the CAM, an estimate of the percent paid by the health insurance, and an estimate of the total amount spent by the individual on CAM.

8.3 Construction of Variables for the Cost-Effectiveness Analysis

The following describes the construction of the relevant variable used in this analysis of the cost-effectiveness of complementary and alternative medicine (CAM) in treating common mental health disorders.

8.3.1 Identification of Individuals with Mental Health Disorders

Five groups of individuals with reported mental health issues were considered. The Medical Expenditure Panel Survey (MEPS) uses a set of condition identifiers which aggregates clinically similar conditions by 5-digit DSM-IV TR Codes. Two groups of individuals were identified through a condition identifier. Three groups of individuals were identified through the DSM-IV TR.

The Affective Disorder condition identifier includes a number of affective disorders, including the different forms of Bipolar Disorders, Major Depressive Disorders, other mood disorders (not otherwise specified), Dysthymic Disorder, and Cyclothymics Disorder.

The Anxiety Disorder condition identifier includes many different types of Anxiety Disorders (Generalized Anxiety Disorder (GAD), Obsessive-Compulsive Disorder (OCD), Panic Disorder, Agoraphobia), as well as clinically related Somatoform, Dissociative Identity Disorder, Personality Disorders (the Schizoid Personality Disorder, the Schizotypal Personality Disorder, Obsessive-Compulsive Personality Disorder, Histrionic Personality Disorder, Dependent Personality Disorder, Antisocial Personality Disorder, Narcissistic Personality Disorder, Avoidant Personality Disorder, and Borderline Personality Disorder), Posttraumatic Stress Disorder, and Impulse-Control Disorder.

The Acute Stress Disorder identifier (DSM-IV TR 308) includes the classifications for the Acute Reactions to Stress.

The Neurotic Disorder identifier (DSM-IV TR 300) includes the Anxiety-related and Dissociative Disorders of the Anxiety Disorder condition identifier, including Anxiety Disorder, Panic Disorder, Generalized Anxiety Disorders, and the dissociative disorders. The Neurotic Disorder identifier also includes the Dysthymic Disorder.

The Depression (Not Otherwise Specified) (DSM-IV TR) identifier includes Depressive Disorder (not elsewhere classified), Depressive State (NOS), and Depression (NOS).

8.3.2 Construction of Measures of Cost

The measure of cost for this analysis is the total charges associated with the mental health disorder. There are four main sources of charges considered in this analysis including pharmacotherapy charges, office-based charges, outpatient-based charges, and complementary and alternative medicine charges. The pharmacotherapy, office-based, and outpatient-based charges are linked to a specific condition identifier in the MEPS. Only the

charges related to the mental health disorders under consideration are included in this analysis.

The MEPS identifies other sources of charges that are not considered as part of this analysis. The other sources of charges include home health-based charges, emergency room-based charges, and dental visit-based charges. Charges with mental health disorders from these sources would not represent typical treatment for the common mental health disorders under consideration, and thus, are excluded from this analysis.

As discussed in Chapter 6, this measure of cost is important to view the results of this analysis as qualified results given the limited nature of this measure of cost. This direct measure of resource use uses the value of charges instead of the cost of production as a measure of direct resource outlays. Given the length and available information in the MEPS, it is not possible to construct measures of direct nonmonetary and indirect measures of cost.

8.3.3 Construction of Measures of Effect

The primary measure of mental health for this analysis is the probability of good mental health. Using the self-reported measure of mental health on a 5-point Likert scale (1-Excellent, 2-Very Good, 3-Good, 4-Fair, and 5-Poor), any self-reported health status of “Good” or better is considered good mental health. “Fair” or “Poor” mental health is considered not good mental health.

The secondary measures of mental health for this analysis are the probability of instrumental activities of daily living (IADL) limitations, functional limitations, social limitations, and cognitive limitations.

For major depressive disorder the instrumental activities of daily living and functional limitations could capture changes to the physical symptoms, mostly notably with fatigue or loss of energy. The cognitive limitations and social limitations could capture the changes in the emotional symptoms, most notably with the depressed mood, diminished interest in activities, and diminished ability to think or concentrate.

For bipolar disorder none of these secondary measures could capture changes to the physical symptoms. The cognitive limitations could capture changes in the emotional symptoms, most notably with the flight of ideas (difficulty concentrating).

For panic and anxiety disorder none of these secondary measures could capture changes to the physical symptoms. The cognitive limitations and social limitations could capture changes in the emotional symptoms, most notably with the feeling restless and difficulty concentrating.

8.3.4 Construction of Demographic Variables

A number of self-reported demographic variables were considered including age, gender, race and ethnicity, marital status, educational attainment, income (value and distribution), and presence of children in the household. Gender was a dichotomous variable of male or female. Race and ethnicity included categories for White, Black, Asian, Eskimo, Native American, and Hispanic. For simplicity, race was aggregated white, black, Hispanic, and other for estimating descriptive statistics. Further aggregation to White and Nonwhite was necessary from small cell size in estimation of logistic models.

Marital status included categories for married, widowed, divorced, separated, and never married, but was aggregated to married, widowed/never married, and divorced/separated for estimating descriptive statistics. Further aggregation to married and nonmarried was necessary from small cell size in estimation of logistic models.

Educational attainment included categories for less than high school diploma, high school diploma, bachelors, masters, doctorate, or other degree. For simplicity, educational attainment was aggregated into less than a high school diploma, attained high school diploma, some college, and college graduate. Further aggregation to college and noncollege graduates was necessary from small cell size in estimation of logistic models.

Income is expressed both in terms of a value and distribution (low, middle, high income). Given the potential of bias from households not reporting income, secondary measures of income (based on reported rather than imputed values) and distribution were

included in the descriptive statistics. The middle and high income categories were aggregated due to small cell size in estimation of logistic models.

The presence of children in the household was determined for each household and is included in the descriptive statistics.

For this analysis, the sample was restricted to adults (individuals over 18). A small number of observations were excluded for missing values on alternative medicine use, health status measures, and demographic variables,

8.3.5 Construction of Samples of Individuals with Mental Health Disorders

There are a number of ways to define the sample for this analysis from the MEPS. This analysis will consider the following four sample definitions for each of the mental health disorders groups:

- 1.) By the 1998 condition identifiers (Responses in survey are coded by professional to correspond to DSM-IV-TR diagnosis)
- 2.) By healthcare use (3 sample definitions):
 - a. Including pharmacotherapy users
 - b. Including psychotherapy users
 - c. Including either pharmacotherapy or psychotherapy users

Given the five common mental health disorders under consideration (affective, anxiety, neurotic, acute stress, and depression (NOS)) and the four ways to define a sample (by condition identifier, by pharmacotherapy use, by psychotherapy use, by either pharmacotherapy or psychotherapy use) there is a total of twenty different constructions of samples considered.

8.4 Description of the Samples

The following estimates describe the underlying characteristics of the sample. Given the use of observational data and the associated potential for self-selection bias, it is important to develop an understanding of the characteristics of the complementary and

alternative (CAM) users and nonusers to identify important differences based on observable characteristics that may be related to unobservable heterogeneity. The following summarizes of the organizational structure of the description of the sample.

The rate of CAM use is estimated for each sample definition. Again, samples are defined on two characteristics, mental health disorders and treatment use. Samples are defined for each of the five mental health disorders groups (affective disorders, anxiety disorders, neurotic disorders, acute stress disorders, and depression (NOS) disorders) and for the treatment use (by diagnostic criteria, pharmacotherapy use, psychotherapy use, and by either pharmacotherapy or psychotherapy use). For each sample, the sample size, the rate of CAM use, and the exclusivity of treatment choice is presented.

The descriptive statistics of the underlying health and demographics of the overall survey and each sample definition are described. This helps to inform the composition of the relevant samples in relation to the sample of healthy individuals, in relation to other mental health disorders, and in relation to other types of treatment. Differences in observable characteristics may indicate a difference in unobservable heterogeneity related to the decision to seek CAM treatment.

Given the potential that observable characteristics are correlated, logistic models of CAM use as a function of mental health, overall health, and demographics are presented. Again, these observable characteristics may be related to unobservable heterogeneity related to the decision to seek CAM treatment. These logistic models help inform the extent of self-selection on observable characteristics.

The proportion of each sample that fit the sample definition in the previous year is estimated. If CAM users are more likely than CAM nonusers to fit the sample definition in the previous year, this may indicate that CAM users are more likely to suffer from a chronic form of mental health disorders. This unobservable characteristic may be related to the decision to seek CAM treatment.

Using the full Medical Expenditure Panel Survey (MEPS) sample logistic models of the condition identifiers as a function of the primary and secondary measures of effects are

presented. This is done to show the usefulness of the primary and secondary measures of mental health in discriminating between a patient with a mental health disorder and a patient without a mental health disorder. The results establish the usefulness of the measures considered in this analysis.

8.4.1 Rates of CAM Use

Table 8.1 presents the size for each of the sample definitions considered in this research, broken down by CAM users and nonusers. Again, the condition ID sample includes the observations in MEPS that fit the clinical definition of the relevant disorder group (as determined by professional coders). The pharmacotherapy use and psychotherapy use samples include the observations in MEPS that fit the clinical definition of the relevant disorder group and use that form of treatment. The either use sample includes the observations in MEPS that fit the clinical definition of the relevant disorder group and use any form of treatment. Note there are a number of observations where the individual fits the clinical definition of a mental health disorder group but does not seek any form of treatment.

Table 8.1 Sample Size by Mental Health Disorders and Sample Definition

Disorders Groups	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM	CAM	NonCAM	CAM	NonCAM	CAM	NonCAM	CAM
Affective	104	20	69	16	64	15	78	17
Anxiety	682	96	326	48	246	37	410	59
Neurotic	439	63	258	39	176	26	307	47
Acute Stress	306	51	97	12	101	18	144	21
Depression (NOS)	1030	116	600	66	380	60	673	77

Table 8.2 shows the rates of treatment use for individuals that fit the condition identifier for each the sample definitions for each of the mental health disorders. The highest rates of pharmacotherapy use are found in the affective disorders sample. The highest rates of psychotherapy use also are found in the affective disorders sample. The lowest rates of

pharmacotherapy use are found in the acute stress disorders sample. The lowest rates of psychotherapy use also are found in the acute stress disorders sample.

Table 8.2 Rates of Treatment Use for Individuals with Mental Health Disorders

Disorder Group	Of Condition ID			
	Pharmacotherapy Use	Psychotherapy Use	Either Use	Neither Use
Affective	0.6635	0.6154	0.7500	0.2500
Anxiety	0.4780	0.3607	0.6012	0.3988
Neurotic	0.5877	0.4009	0.6993	0.3007
Acute Stress	0.3170	0.3301	0.4706	0.5294
Depression (NOS)	0.5825	0.3689	0.6534	0.3466

Table 8.3 shows the rate of exclusive treatment, i.e., the pharmacotherapy users that only use pharmacotherapy as a form of treatment or the psychotherapy users that only use psychotherapy as a form of treatment. Not surprising, the lowest rates of exclusive treatment are found in the affective disorders and depression (NOS) disorders samples. Over half of the anxiety and neurotic disorders samples use pharmacotherapy as an exclusive form of therapy. For most disorders, exclusive psychotherapy is less common than exclusive pharmacotherapy.

Table 8.3 Rate of Exclusive Treatment within Pharmacotherapy and Psychotherapy Use by Mental Health Disorders

Disorder Group	Of Pharmacotherapy Use	Of Psychotherapy Use
	% Only Pharmacotherapy Use	% Only Psychotherapy Use
Affective	0.2029	0.1406
Anxiety	0.5031	0.3415
Neurotic	0.5078	0.2784
Acute Stress	0.4433	0.4653
Depression (NOS)	0.4883	0.1921

Table 8.4 shows the rate of CAM use for each of the sample definitions. The lowest rate of CAM use is in the depression (NOS) disorders pharmacotherapy user sample (9.91%).

The highest rate of CAM use is in the affective disorders psychotherapy user sample (18.99%). The overall rate of CAM use in the MEPS adult sample (4.48%) is significantly lower than each of the sample definitions. Note that for affective, anxiety, acute stress, and depression (NOS) disorders, the highest rate of CAM is in the psychotherapy users.

Table 8.4 Rates of CAM Use by Mental Health Disorders and Sample Definition

Disorders Groups	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM	CAM	NonCAM	CAM	NonCAM	CAM	NonCAM	CAM
Affective	0.8387	0.1613	0.8118	0.1882	0.8101	0.1899	0.8211	0.1789
Anxiety	0.8766	0.1230	0.8717	0.1283	0.8693	0.1307	0.8742	0.1258
Neurotic	0.8745	0.1255	0.8687	0.1313	0.8713	0.1287	0.8672	0.1328
Acute Stress	0.8571	0.1429	0.8899	0.1101	0.8487	0.1513	0.8727	0.1273
Depression (NOS)	0.8988	0.1012	0.9009	0.0991	0.8636	0.1364	0.8973	0.1027

Overall adult rate of CAM use is in MEPS is 4.48%

Table 8.5 presents the comorbidity of the mental health disorders groups considered in this analysis using the mental health condition identifiers.

Table 8.5 Rates of Comorbidity of Disorders by Condition Identifier

	Affective (n=124)	Anxiety (n=778)	Neurotic (n=502)	Acute Stress (n=357)	Depression (NOS) (n=1146)
Affective	-	0.033	0.108	0.017	0.026
Anxiety	0.210	-	0.837	1.000	0.173
Neurotic	0.436	0.540	-	0.090	0.128
Acute Stress	0.048	0.459	0.064	-	0.058
Depression (NOS)	0.242	0.255	0.293	0.185	-

8.4.2 Descriptive Statistics of the Samples

A significant concern for any evaluation of a treatment (with both experimental and observational data) is the potential for significant differences in the control and treatment groups in terms of unobserved heterogeneity. To investigate the concern of potential bias from unobserved heterogeneity the differences between the CAM users and nonusers in

terms of the observed heterogeneity are explored. The following section describes the self-reported health and demographics for CAM and CAM nonusers to evaluate the observable evidence of individual heterogeneity to investigate the assumption that there is no significant unobservable heterogeneity that would bias the estimate of the treatment outcomes.

Table 8.6 - Table 8.25 present the descriptive statistics for a number of demographic variables for the five mental health disorders by the four sample definitions (by condition identifier, by pharmacotherapy use, by psychotherapy use, and by either pharmacotherapy or psychotherapy use).

For each of the disorders groups, each sample definition shows worse health outcomes than the overall adult MEPS sample using the primary measure of effect (the probability of good mental health for each of the three rounds) and the secondary measures of effect (the probability of limitations), with the only exception of the probability of instrumental activities of daily living (IADL) limitations for the acute stress disorders CAM users. The affective disorders samples tend to be more female, more white, and more married, more divorced or separated, more low income, more high income, less work the full year, more not work, less retired, and more disabled than the overall MEPS adult sample.

The anxiety disorders samples tend to be more female, more white, less black, less married, less widowed or never married, more divorced, and more disabled. Than the overall MEPS adult sample

The neurotic disorders samples tend to be more female, more white, less married, more divorced or separated, less work for the full year, more not work, and more disabled than the overall MEPS adult sample.

The acute stress disorders samples tend to be more female and more divorced than the overall MEPS adult sample.

The depression (NOS) disorders samples tend to be more female, more white, less black or Hispanic, less married, more divorced or separated, more low income, more disabled, and more no children in the household than the overall MEPS adult sample.

The affective disorders and depression (NOS) disorders samples tend to be more female, more white, less married, more divorced or separated, more low income, and more disabled than the overall MEPS adult sample.

The anxiety and neurotic disorders tend to be more female, more white, less married, more divorced or separated, and more disabled than the overall MEPS adult sample.

For the affective disorders samples, CAM users tend to be younger and more likely to be widowed or never married than CAM nonusers. For the anxiety disorders samples, CAM users tend to be younger, more likely to be female, less likely to have less than a high school diploma, and more likely to have a college degree than CAM nonusers. For the neurotic disorders samples, CAM users tend to be younger, more likely to be female, less likely to have less than a high school diploma, more likely to have a college degree, more likely to work the full year, and less likely to not work than CAM nonusers. For the acute stress disorders samples, CAM users tend to be younger, more likely to be female, more likely to be white, less likely to be black or Hispanic, less likely to have less than high school diploma, more likely to have a college degree, more likely to work the full year and less likely to not work than CAM nonusers.

Table 8.6 Descriptive Statistics for Affective Disorders by Condition Identifier

Affective Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=104) SE	CAM MEAN	(n=20) SE	Difference
Overall Good Health Rd 1	0.84	0.63	0.48	0.50	0.51	-0.13
IADL Limitations	0.04	0.13	0.34	0.20	0.41	0.07
Functional Limitations	0.13	0.26	0.44	0.40	0.50	0.14
Social Limitations	0.06	0.25	0.44	0.35	0.49	0.10
Cognitive Limitations	0.05	0.29	0.46	0.40	0.50	0.11
Age	45.26	45.18	13.12	36.50	10.53	-8.68 **
Male	0.46	0.30	0.46	0.25	0.44	-0.05
White	0.63	0.79	0.41	0.75	0.44	-0.04
Black	0.14	0.09	0.28	0.10	0.31	0.01
Hispanic	0.18	0.10	0.30	0.15	0.37	0.05
Other Race	0.05	0.03	0.17	0.00	0.00	-0.03
Less Than HS Diploma	0.24	0.20	0.40	0.20	0.41	0.00
HS Diploma	0.34	0.35	0.48	0.25	0.44	-0.10
Some College	0.18	0.17	0.38	0.10	0.31	-0.07
College Graduate	0.24	0.28	0.45	0.45	0.51	0.17
Married	0.58	0.48	0.50	0.30	0.47	-0.18
Widow/Never Married	0.29	0.17	0.38	0.50	0.51	0.33 **
Divorce/Separated	0.13	0.35	0.48	0.20	0.41	-0.15
Income	24704	20696	23880	14714	15482	-5982
Low Income	0.32	0.45	0.50	0.65	0.49	0.20
Middle Income	0.32	0.25	0.44	0.20	0.41	-0.05
High Income	0.36	0.30	0.46	0.15	0.37	-0.15
Income (Not Imputed)	24440	18369	18295	14928	16800	-3440
Low Income (Not Imputed)	0.30	0.41	0.49	0.55	0.51	0.14
Middle Income (Not Imputed)	0.29	0.22	0.42	0.15	0.37	-0.07
High Income (Not Imputed)	0.32	0.27	0.45	0.15	0.37	-0.12
Income Item No Response	0.09	0.10	0.30	0.15	0.37	0.05
Worked Full Year	0.63	0.43	0.50	0.55	0.51	0.12
Worked Part Year	0.08	0.11	0.31	0.15	0.37	0.04
Did Not Work	0.29	0.46	0.50	0.30	0.47	-0.16
Did Not Work--Retired	0.09	0.03	0.17	0.00	0.00	-0.03
Did Not Work--Disabled	0.04	0.28	0.45	0.10	0.31	-0.18 *
Did Not Work--Other	0.16	0.15	0.36	0.20	0.41	0.05
Presence of Children in Household	0.47	0.40	0.49	0.45	0.51	0.05

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.7 Descriptive Statistics for Affective Disorders by Pharmacotherapy Use

Affective Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=69) SE	CAM MEAN	(n=16) SE	Difference	
Overall Good Health Rd 1	0.84	0.61	0.49	0.38	0.50	-0.23	*
IADL Limitations	0.04	0.13	0.34	0.25	0.45	0.12	
Functional Limitations	0.13	0.28	0.45	0.50	0.52	0.22	*
Social Limitations	0.06	0.29	0.46	0.44	0.51	0.15	
Cognitive Limitations	0.05	0.32	0.47	0.50	0.52	0.18	
Age	45.26	45.80	11.91	36.63	9.26	-9.17	**
Male	0.46	0.29	0.46	0.19	0.40	-0.10	
White	0.63	0.78	0.42	0.69	0.48	-0.10	
Black	0.14	0.12	0.32	0.13	0.34	0.01	
Hispanic	0.18	0.09	0.28	0.19	0.40	0.10	
Other Race	0.05	0.01	0.12	0.00	0.00	-0.01	
Less Than HS Diploma	0.24	0.19	0.39	0.19	0.40	0.00	
HS Diploma	0.34	0.35	0.48	0.25	0.45	-0.10	
Some College	0.18	0.17	0.38	0.13	0.34	-0.05	
College Graduate	0.24	0.29	0.46	0.44	0.51	0.15	
Married	0.58	0.45	0.50	0.31	0.48	-0.14	
Widow/Never Married	0.29	0.19	0.39	0.50	0.52	0.31	**
Divorce/Separated	0.13	0.36	0.48	0.19	0.40	-0.17	
Income	24704	20632	25902	13654	16697	-6977	
Low Income	0.32	0.43	0.50	0.63	0.50	0.19	
Middle Income	0.32	0.26	0.44	0.25	0.45	-0.01	
High Income	0.36	0.30	0.46	0.13	0.34	-0.18	
Income (Not Imputed)	24440	18068	18937	13903	17881	-4165	
Low Income (Not Imputed)	0.30	0.39	0.49	0.56	0.51	0.17	
Middle Income (Not Imputed)	0.29	0.23	0.43	0.19	0.40	-0.04	
High Income (Not Imputed)	0.32	0.28	0.45	0.13	0.34	-0.15	
Income Item No Response	0.09	0.10	0.30	0.13	0.34	0.02	
Worked Full Year	0.63	0.39	0.49	0.44	0.51	0.05	
Worked Part Year	0.08	0.12	0.32	0.19	0.40	0.07	
Did Not Work	0.29	0.49	0.50	0.38	0.50	-0.12	
Did Not Work--Retired	0.09	0.03	0.17	0.00	0.00	-0.03	
Did Not Work--Disabled	0.04	0.33	0.47	0.13	0.34	-0.21	
Did Not Work--Other	0.16	0.13	0.34	0.25	0.45	0.12	
Presence of Children in Household	0.47	0.35	0.48	0.50	0.52	0.15	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.8 Descriptive Statistics for Affective Disorders by Psychotherapy Use

Affective Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=64) SE	CAM MEAN	(n=15) SE	Difference
Overall Good Health Rd 1	0.84	0.56	0.50	0.40	0.51	-0.16
IADL Limitations	0.04	0.16	0.37	0.20	0.41	0.04
Functional Limitations	0.13	0.30	0.46	0.47	0.52	0.17
Social Limitations	0.06	0.31	0.47	0.40	0.51	0.09
Cognitive Limitations	0.05	0.39	0.49	0.47	0.52	0.08
Age	45.26	44.80	11.80	37.53	9.56	-7.26 **
Male	0.46	0.31	0.47	0.27	0.46	-0.05
White	0.63	0.75	0.44	0.80	0.41	0.05
Black	0.14	0.13	0.33	0.13	0.35	0.01
Hispanic	0.18	0.09	0.29	0.07	0.26	-0.03
Other Race	0.05	0.03	0.18	0.00	0.00	-0.03
Less Than HS Diploma	0.24	0.19	0.39	0.13	0.35	-0.05
HS Diploma	0.34	0.30	0.46	0.27	0.46	-0.03
Some College	0.18	0.20	0.41	0.13	0.35	-0.07
College Graduate	0.24	0.31	0.47	0.47	0.52	0.15
Married	0.58	0.41	0.50	0.33	0.49	-0.07
Widow/Never Married	0.29	0.16	0.37	0.53	0.52	0.38 **
Divorce/Separated	0.13	0.44	0.50	0.13	0.35	-0.30 **
Income	24704	20141	26078	15769	17532	-4372
Low Income	0.32	0.45	0.50	0.53	0.52	0.08
Middle Income	0.32	0.27	0.45	0.27	0.46	0.00
High Income	0.36	0.28	0.45	0.20	0.41	-0.08
Income (Not Imputed)	24440	17908	19186	16363	18821	-1544
Low Income (Not Imputed)	0.30	0.41	0.50	0.47	0.52	0.06
Middle Income (Not Imputed)	0.29	0.23	0.43	0.20	0.41	-0.03
High Income (Not Imputed)	0.32	0.27	0.45	0.20	0.41	-0.07
Income Item No Response	0.09	0.09	0.29	0.13	0.35	0.04
Worked Full Year	0.63	0.36	0.48	0.53	0.52	0.17
Worked Part Year	0.08	0.13	0.33	0.13	0.35	0.01
Did Not Work	0.29	0.52	0.50	0.33	0.49	-0.18
Did Not Work--Retired	0.09	0.03	0.18	0.00	0.00	-0.03
Did Not Work--Disabled	0.04	0.34	0.48	0.13	0.35	-0.21
Did Not Work--Other	0.16	0.14	0.35	0.20	0.41	0.06
Presence of Children in Household	0.47	0.42	0.50	0.47	0.52	0.04

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.9 Descriptive Statistics for Affective Disorders by Either Use

Affective Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=78) SE	CAM MEAN	(n=17) SE	Difference
Overall Good Health Rd 1	0.84	0.60	0.49	0.41	0.51	-0.19
IADL Limitations	0.04	0.13	0.34	0.24	0.44	0.11
Functional Limitations	0.13	0.28	0.45	0.47	0.51	0.19
Social Limitations	0.06	0.28	0.45	0.41	0.51	0.13
Cognitive Limitations	0.05	0.33	0.47	0.47	0.51	0.14
Age	45.26	45.36	12.03	37.00	9.10	-8.36 **
Male	0.46	0.29	0.46	0.24	0.44	-0.06
White	0.63	0.78	0.42	0.71	0.47	-0.08
Black	0.14	0.10	0.31	0.12	0.33	0.02
Hispanic	0.18	0.09	0.29	0.18	0.39	0.09
Other Race	0.05	0.03	0.16	0.00	0.00	-0.03
Less Than HS Diploma	0.24	0.19	0.40	0.18	0.39	-0.02
HS Diploma	0.34	0.32	0.47	0.24	0.44	-0.09
Some College	0.18	0.18	0.39	0.12	0.33	-0.06
College Graduate	0.24	0.31	0.46	0.47	0.51	0.16
Married	0.58	0.46	0.50	0.35	0.49	-0.11
Widow/Never Married	0.29	0.17	0.38	0.47	0.51	0.30 **
Divorce/Separated	0.13	0.37	0.49	0.18	0.39	-0.20
Income	24704	19898	24895	14796	16839	-5101
Low Income	0.32	0.45	0.50	0.59	0.51	0.14
Middle Income	0.32	0.27	0.45	0.24	0.44	-0.03
High Income	0.36	0.28	0.45	0.18	0.39	-0.11
Income (Not Imputed)	24440	17699	18534	15181	17927	-2517
Low Income (Not Imputed)	0.30	0.40	0.49	0.53	0.51	0.13
Middle Income (Not Imputed)	0.29	0.24	0.43	0.18	0.39	-0.07
High Income (Not Imputed)	0.32	0.26	0.44	0.18	0.39	-0.08
Income Item No Response	0.09	0.10	0.31	0.12	0.33	0.02
Worked Full Year	0.63	0.38	0.49	0.47	0.51	0.09
Worked Part Year	0.08	0.13	0.34	0.18	0.39	0.05
Did Not Work	0.29	0.49	0.50	0.35	0.49	-0.13
Did Not Work--Retired	0.09	0.03	0.16	0.00	0.00	-0.03
Did Not Work--Disabled	0.04	0.32	0.47	0.12	0.33	-0.20 *
Did Not Work--Other	0.16	0.14	0.35	0.24	0.44	0.09
Presence of Children in Household	0.47	0.38	0.49	0.53	0.51	0.14

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.10 Descriptive Statistics for Anxiety Disorder by Condition Identifier

Anxiety Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=682) SE	CAM MEAN	(n=96) SE	Difference	
Overall Good Health Rd 1	0.84	0.71	0.45	0.73	0.45	0.02	
IADL Limitations	0.04	0.09	0.28	0.07	0.26	-0.02	
Functional Limitations	0.13	0.23	0.42	0.22	0.42	-0.01	
Social Limitations	0.06	0.13	0.33	0.16	0.36	0.03	
Cognitive Limitations	0.05	0.12	0.33	0.11	0.32	-0.01	
Age	45.26	48.13	15.71	44.71	13.98	-3.42	**
Male	0.46	0.31	0.46	0.16	0.36	-0.16	**
White	0.63	0.71	0.46	0.80	0.40	0.10	**
Black	0.14	0.10	0.30	0.06	0.24	-0.04	
Hispanic	0.18	0.16	0.37	0.11	0.32	-0.05	
Other Race	0.05	0.03	0.17	0.02	0.14	-0.01	
Less Than HS Diploma	0.24	0.23	0.42	0.13	0.33	-0.11	**
HS Diploma	0.34	0.29	0.45	0.29	0.46	0.00	
Some College	0.18	0.22	0.41	0.19	0.39	-0.03	
College Graduate	0.24	0.26	0.44	0.40	0.49	0.13	**
Married	0.58	0.54	0.50	0.49	0.50	-0.05	
Widow/Never Married	0.29	0.24	0.43	0.19	0.39	-0.05	
Divorce/Separated	0.13	0.22	0.41	0.32	0.47	0.10	**
Income	24704	24435	25676	28115	27060	3679	
Low Income	0.32	0.34	0.47	0.22	0.42	-0.12	**
Middle Income	0.32	0.30	0.46	0.40	0.49	0.10	*
High Income	0.36	0.36	0.48	0.39	0.49	0.03	
Income (Not Imputed)	24440	23636	24254	28968	27601	5332	*
Low Income (Not Imputed)	0.30	0.32	0.47	0.21	0.41	-0.11	**
Middle Income (Not Imputed)	0.29	0.28	0.45	0.38	0.49	0.09	*
High Income (Not Imputed)	0.32	0.32	0.47	0.35	0.48	0.03	
Income Item No Response	0.09	0.07	0.26	0.06	0.24	-0.01	
Worked Full Year	0.63	0.55	0.50	0.64	0.48	0.08	
Worked Part Year	0.08	0.06	0.25	0.10	0.31	0.04	
Did Not Work	0.29	0.38	0.49	0.26	0.44	-0.12	**
Did Not Work--Retired	0.09	0.07	0.26	0.06	0.24	-0.01	
Did Not Work--Disabled	0.04	0.10	0.29	0.07	0.26	-0.02	
Did Not Work--Other	0.16	0.21	0.41	0.13	0.33	-0.09	**
Presence of Children in Household	0.47	0.44	0.50	0.43	0.50	-0.01	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.11 Descriptive Statistics for Anxiety Disorders by Pharmacotherapy Use

Anxiety Disorders	Overall	Non-CAM	(n=326)	CAM	(n=48)		
Observable Characteristics	MEPS	MEAN	SE	MEAN	SE	Difference	
Overall Good Health Rd 1	0.84	0.63	0.48	0.63	0.49	0.00	
IADL Limitations	0.04	0.11	0.31	0.10	0.31	-0.01	
Functional Limitations	0.13	0.29	0.46	0.27	0.45	-0.02	
Social Limitations	0.06	0.17	0.38	0.23	0.42	0.06	
Cognitive Limitations	0.05	0.16	0.37	0.10	0.31	-0.06	
Age	45.26	51.65	15.99	47.46	14.50	-4.20	*
Male	0.46	0.25	0.44	0.10	0.31	-0.15	**
White	0.63	0.75	0.43	0.83	0.38	0.08	
Black	0.14	0.07	0.25	0.04	0.20	-0.03	
Hispanic	0.18	0.17	0.37	0.13	0.33	-0.04	
Other Race	0.05	0.02	0.12	0.00	0.00	-0.02	
Less Than HS Diploma	0.24	0.29	0.45	0.19	0.39	-0.10	
HS Diploma	0.34	0.28	0.45	0.35	0.48	0.08	
Some College	0.18	0.23	0.42	0.13	0.33	-0.11	*
College Graduate	0.24	0.20	0.40	0.33	0.48	0.13	**
Married	0.58	0.53	0.50	0.46	0.50	-0.07	
Widow/Never Married	0.29	0.23	0.42	0.17	0.38	-0.06	
Divorce/Separated	0.13	0.24	0.43	0.38	0.49	0.13	*
Income	24704	21437	23841	21707	21462	270	
Low Income	0.32	0.35	0.48	0.31	0.47	-0.04	
Middle Income	0.32	0.30	0.46	0.33	0.48	0.03	
High Income	0.36	0.35	0.48	0.35	0.48	0.01	
Income (Not Imputed)	24440	20705	22707	22328	21667	1623	
Low Income (Not Imputed)	0.30	0.34	0.47	0.31	0.47	-0.02	
Middle Income (Not Imputed)	0.29	0.29	0.45	0.33	0.48	0.05	
High Income (Not Imputed)	0.32	0.32	0.47	0.31	0.47	-0.01	
Income Item No Response	0.09	0.06	0.23	0.04	0.20	-0.01	
Worked Full Year	0.63	0.43	0.50	0.50	0.51	0.07	
Worked Part Year	0.08	0.06	0.23	0.10	0.31	0.05	
Did Not Work	0.29	0.52	0.50	0.40	0.49	-0.12	
Did Not Work--Retired	0.09	0.09	0.29	0.06	0.24	-0.03	
Did Not Work--Disabled	0.04	0.14	0.35	0.15	0.36	0.01	
Did Not Work--Other	0.16	0.29	0.45	0.19	0.39	-0.10	
Presence of Children in Household	0.47	0.40	0.49	0.40	0.49	0.00	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.12 Descriptive Statistics for Anxiety Disorders for Psychotherapy Use

Anxiety Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=246) SE	CAM MEAN	(n=37) SE	Difference	
Overall Good Health Rd 1	0.84	0.66	0.48	0.65	0.48	-0.01	
IADL Limitations	0.04	0.09	0.29	0.08	0.28	-0.01	
Functional Limitations	0.13	0.23	0.42	0.27	0.45	0.04	
Social Limitations	0.06	0.17	0.38	0.19	0.40	0.02	
Cognitive Limitations	0.05	0.17	0.38	0.16	0.37	-0.01	
Age	45.26	48.41	15.32	41.51	15.06	-6.89	**
Male	0.46	0.28	0.45	0.14	0.35	-0.14	*
White	0.63	0.72	0.45	0.84	0.37	0.11	
Black	0.14	0.09	0.29	0.05	0.23	-0.04	
Hispanic	0.18	0.16	0.37	0.05	0.23	-0.10	*
Other Race	0.05	0.03	0.17	0.05	0.23	0.03	
Less Than HS Diploma	0.24	0.27	0.45	0.11	0.31	-0.16	**
HS Diploma	0.34	0.24	0.43	0.41	0.50	0.17	**
Some College	0.18	0.22	0.42	0.16	0.37	-0.06	
College Graduate	0.24	0.26	0.44	0.32	0.47	0.06	
Married	0.58	0.49	0.50	0.43	0.50	-0.06	
Widow/Never Married	0.29	0.23	0.42	0.22	0.42	-0.02	
Divorce/Separated	0.13	0.28	0.45	0.35	0.48	0.07	
Income	24704	21139	23954	22384	21253	1245	
Low Income	0.32	0.41	0.49	0.27	0.45	-0.14	*
Middle Income	0.32	0.29	0.46	0.49	0.51	0.19	**
High Income	0.36	0.29	0.46	0.24	0.43	-0.05	
Income (Not Imputed)	24440	21366	24120	22826	21784	1459	
Low Income (Not Imputed)	0.30	0.39	0.49	0.27	0.45	-0.12	
Middle Income (Not Imputed)	0.29	0.27	0.45	0.46	0.51	0.19	**
High Income (Not Imputed)	0.32	0.28	0.45	0.22	0.42	-0.06	
Income Item No Response	0.09	0.06	0.24	0.05	0.23	-0.01	
Worked Full Year	0.63	0.46	0.50	0.59	0.50	0.13	
Worked Part Year	0.08	0.07	0.25	0.11	0.31	0.04	
Did Not Work	0.29	0.47	0.50	0.30	0.46	-0.17	*
Did Not Work--Retired	0.09	0.06	0.24	0.05	0.23	-0.01	
Did Not Work--Disabled	0.04	0.13	0.34	0.14	0.35	0.01	
Did Not Work--Other	0.16	0.28	0.45	0.11	0.31	-0.17	**
Presence of Children in Household	0.47	0.47	0.50	0.49	0.51	0.02	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.13 Descriptive Statistics for Anxiety Disorders by Either Use

Anxiety Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=410) SE	CAM MEAN	(n=59) SE	Difference	
Overall Good Health Rd 1	0.84	0.66	0.47	0.64	0.48	-0.01	
IADL Limitations	0.04	0.10	0.31	0.10	0.30	0.00	
Functional Limitations	0.13	0.27	0.44	0.29	0.46	0.02	
Social Limitations	0.06	0.16	0.37	0.20	0.41	0.04	
Cognitive Limitations	0.05	0.16	0.37	0.14	0.35	-0.02	
Age	45.26	50.92	15.87	45.58	15.09	-5.34	**
Male	0.46	0.28	0.45	0.10	0.30	-0.18	**
White	0.63	0.74	0.44	0.81	0.39	0.07	
Black	0.14	0.08	0.27	0.05	0.22	-0.03	
Hispanic	0.18	0.16	0.37	0.10	0.30	-0.06	
Other Race	0.05	0.02	0.15	0.03	0.18	0.01	
Less Than HS Diploma	0.24	0.27	0.44	0.15	0.36	-0.11	*
HS Diploma	0.34	0.28	0.45	0.36	0.48	0.08	
Some College	0.18	0.23	0.42	0.15	0.36	-0.08	
College Graduate	0.24	0.23	0.42	0.34	0.48	0.11	*
Married	0.58	0.54	0.50	0.44	0.50	-0.10	
Widow/Never Married	0.29	0.23	0.42	0.17	0.38	-0.06	
Divorce/Separated	0.13	0.24	0.43	0.39	0.49	0.15	**
Income	24704	22103	24067	22049	19703	-54	
Low Income	0.32	0.35	0.48	0.27	0.45	-0.08	
Middle Income	0.32	0.31	0.46	0.41	0.50	0.10	
High Income	0.36	0.34	0.47	0.32	0.47	-0.02	
Income (Not Imputed)	24440	21656	23263	22699	19963	1042	
Low Income (Not Imputed)	0.30	0.33	0.47	0.27	0.45	-0.06	
Middle Income (Not Imputed)	0.29	0.30	0.46	0.39	0.49	0.09	
High Income (Not Imputed)	0.32	0.31	0.46	0.29	0.46	-0.03	
Income Item No Response	0.09	0.06	0.24	0.05	0.22	-0.01	
Worked Full Year	0.63	0.46	0.50	0.54	0.50	0.08	
Worked Part Year	0.08	0.06	0.24	0.12	0.33	0.06	
Did Not Work	0.29	0.48	0.50	0.34	0.48	-0.14	**
Did Not Work--Retired	0.09	0.08	0.28	0.07	0.25	-0.02	
Did Not Work--Disabled	0.04	0.12	0.33	0.12	0.33	-0.01	
Did Not Work--Other	0.16	0.27	0.44	0.15	0.36	-0.12	*
Presence of Children in Household	0.47	0.42	0.49	0.41	0.50	-0.01	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.14 Descriptive Statistics for Neurotic Disorders by Condition Identifier

Neurotic Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=439) SE	CAM MEAN	(n=63) SE	Difference	
Overall Good Health Rd 1	0.84	0.67	0.47	0.71	0.46	0.04	
IADL Limitations	0.04	0.13	0.34	0.14	0.35	0.01	
Functional Limitations	0.13	0.26	0.44	0.27	0.45	0.01	
Social Limitations	0.06	0.17	0.37	0.21	0.41	0.04	
Cognitive Limitations	0.05	0.18	0.38	0.17	0.38	0.00	
Age	45.26	49.84	16.11	44.63	14.68	-5.20	**
Male	0.46	0.26	0.44	0.16	0.37	-0.11	*
White	0.63	0.72	0.45	0.73	0.45	0.01	
Black	0.14	0.10	0.29	0.08	0.27	-0.02	
Hispanic	0.18	0.16	0.37	0.17	0.38	0.01	
Other Race	0.05	0.02	0.13	0.02	0.13	0.00	
Less Than HS Diploma	0.24	0.29	0.45	0.14	0.35	-0.14	**
HS Diploma	0.34	0.27	0.44	0.32	0.47	0.05	
Some College	0.18	0.21	0.41	0.17	0.38	-0.04	
College Graduate	0.24	0.23	0.42	0.37	0.49	0.13	**
Married	0.58	0.53	0.50	0.40	0.49	-0.14	**
Widow/Never Married	0.29	0.23	0.42	0.29	0.46	0.05	
Divorce/Separated	0.13	0.23	0.42	0.32	0.47	0.08	
Income	24704	21737	26132	26473	29929	4736	
Low Income	0.32	0.37	0.48	0.33	0.48	-0.04	
Middle Income	0.32	0.30	0.46	0.37	0.49	0.07	
High Income	0.36	0.33	0.47	0.30	0.46	-0.03	
Income (Not Imputed)	24440	21291	24955	27392	30356	6101	
Low Income (Not Imputed)	0.30	0.34	0.47	0.32	0.47	-0.02	
Middle Income (Not Imputed)	0.29	0.27	0.45	0.35	0.48	0.08	
High Income (Not Imputed)	0.32	0.31	0.46	0.29	0.46	-0.02	
Income Item No Response	0.09	0.08	0.27	0.05	0.21	-0.03	
Worked Full Year	0.63	0.47	0.50	0.59	0.50	0.12	*
Worked Part Year	0.08	0.08	0.26	0.11	0.32	0.04	
Did Not Work	0.29	0.46	0.50	0.30	0.46	-0.16	**
Did Not Work--Retired	0.09	0.09	0.28	0.06	0.25	-0.02	
Did Not Work--Disabled	0.04	0.13	0.34	0.10	0.30	-0.04	
Did Not Work--Other	0.16	0.24	0.43	0.14	0.35	-0.10	*
Presence of Children in Household	0.47	0.44	0.50	0.38	0.49	-0.05	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.15 Descriptive Statistics for Neurotic Disorders by Pharmacotherapy Use

Neurotic Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=258) SE	CAM MEAN	(n=39) SE	Difference	
Overall Good Health Rd 1	0.84	0.59	0.49	0.67	0.48	0.08	
IADL Limitations	0.04	0.14	0.34	0.15	0.37	0.02	
Functional Limitations	0.13	0.32	0.47	0.28	0.46	-0.04	
Social Limitations	0.06	0.21	0.40	0.23	0.43	0.03	
Cognitive Limitations	0.05	0.21	0.40	0.13	0.34	-0.08	
Age	45.26	52.01	16.07	47.00	15.67	-5.01	*
Male	0.46	0.24	0.43	0.10	0.31	-0.14	**
White	0.63	0.76	0.43	0.79	0.41	0.04	
Black	0.14	0.08	0.27	0.08	0.27	0.00	
Hispanic	0.18	0.16	0.36	0.13	0.34	-0.03	
Other Race	0.05	0.01	0.11	0.00	0.00	-0.01	
Less Than HS Diploma	0.24	0.33	0.47	0.21	0.41	-0.13	
HS Diploma	0.34	0.28	0.45	0.31	0.47	0.03	
Some College	0.18	0.21	0.41	0.15	0.37	-0.06	
College Graduate	0.24	0.17	0.38	0.33	0.48	0.16	**
Married	0.58	0.53	0.50	0.41	0.50	-0.12	
Widow/Never Married	0.29	0.21	0.41	0.26	0.44	0.05	
Divorce/Separated	0.13	0.26	0.44	0.33	0.48	0.07	
Income	24704	20457	24205	23793	23598	3336	
Low Income	0.32	0.37	0.48	0.33	0.48	-0.04	
Middle Income	0.32	0.29	0.45	0.31	0.47	0.02	
High Income	0.36	0.34	0.47	0.36	0.49	0.02	
Income (Not Imputed)	24440	20001	23259	24406	23598	4405	
Low Income (Not Imputed)	0.30	0.34	0.48	0.33	0.48	-0.01	
Middle Income (Not Imputed)	0.29	0.27	0.44	0.31	0.47	0.04	
High Income (Not Imputed)	0.32	0.32	0.47	0.33	0.48	0.01	
Income Item No Response	0.09	0.07	0.25	0.03	0.16	-0.04	
Worked Full Year	0.63	0.39	0.49	0.51	0.51	0.13	
Worked Part Year	0.08	0.07	0.26	0.10	0.31	0.03	
Did Not Work	0.29	0.54	0.50	0.38	0.49	-0.15	*
Did Not Work--Retired	0.09	0.10	0.31	0.08	0.27	-0.03	
Did Not Work--Disabled	0.04	0.17	0.37	0.15	0.37	-0.01	
Did Not Work--Other	0.16	0.27	0.44	0.15	0.37	-0.11	
Presence of Children in Household	0.47	0.40	0.49	0.33	0.48	-0.07	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.16 Descriptive Statistics for Neurotic Disorders by Psychotherapy Use

Neurotic Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=176) SE	CAM MEAN	(n=26) SE	Difference	
Overall Good Health Rd 1	0.84	0.61	0.49	0.69	0.47	0.08	
IADL Limitations	0.04	0.13	0.33	0.12	0.33	-0.01	
Functional Limitations	0.13	0.26	0.44	0.23	0.43	-0.02	
Social Limitations	0.06	0.21	0.41	0.12	0.33	-0.09	
Cognitive Limitations	0.05	0.24	0.43	0.15	0.37	-0.08	
Age	45.26	48.39	14.49	39.54	15.40	-8.85	**
Male	0.46	0.24	0.43	0.19	0.40	-0.05	
White	0.63	0.73	0.45	0.77	0.43	0.04	
Black	0.14	0.11	0.32	0.08	0.27	-0.04	
Hispanic	0.18	0.13	0.33	0.12	0.33	-0.01	
Other Race	0.05	0.03	0.18	0.04	0.20	0.00	
Less Than HS Diploma	0.24	0.31	0.46	0.08	0.27	-0.24	**
HS Diploma	0.34	0.22	0.41	0.42	0.50	0.21	**
Some College	0.18	0.25	0.43	0.19	0.40	-0.06	
College Graduate	0.24	0.22	0.42	0.31	0.47	0.09	
Married	0.58	0.49	0.50	0.38	0.50	-0.11	
Widow/Never Married	0.29	0.20	0.40	0.38	0.50	0.18	**
Divorce/Separated	0.13	0.30	0.46	0.23	0.43	-0.07	
Income	24704	18661	21229	27773	32290	9111	
Low Income	0.32	0.45	0.50	0.35	0.49	-0.11	
Middle Income	0.32	0.27	0.45	0.38	0.50	0.11	
High Income	0.36	0.27	0.45	0.27	0.45	0.00	
Income (Not Imputed)	24440	19147	21681	28287	32847	9139	
Low Income (Not Imputed)	0.30	0.41	0.49	0.35	0.49	-0.07	
Middle Income (Not Imputed)	0.29	0.24	0.43	0.35	0.49	0.11	
High Income (Not Imputed)	0.32	0.27	0.45	0.27	0.45	0.00	
Income Item No Response	0.09	0.07	0.26	0.04	0.20	-0.04	
Worked Full Year	0.63	0.40	0.49	0.62	0.50	0.21	**
Worked Part Year	0.08	0.09	0.28	0.08	0.27	-0.01	
Did Not Work	0.29	0.51	0.50	0.31	0.47	-0.20	*
Did Not Work--Retired	0.09	0.05	0.21	0.04	0.20	-0.01	
Did Not Work--Disabled	0.04	0.17	0.38	0.15	0.37	-0.02	
Did Not Work--Other	0.16	0.30	0.46	0.12	0.33	-0.18	*
Presence of Children in Household	0.47	0.49	0.50	0.42	0.50	-0.07	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.17 Descriptive Statistics for Neurotic Disorders by Either Use

Neurotic Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=307) SE	CAM MEAN	(n=47) SE	Difference	
Overall Good Health Rd 1	0.84	0.62	0.49	0.68	0.47	0.06	
IADL Limitations	0.04	0.13	0.34	0.15	0.36	0.02	
Functional Limitations	0.13	0.29	0.45	0.30	0.46	0.01	
Social Limitations	0.06	0.19	0.39	0.19	0.40	0.00	
Cognitive Limitations	0.05	0.20	0.40	0.15	0.36	-0.05	
Age	45.26	51.29	15.81	44.74	15.69	-6.55	**
Male	0.46	0.25	0.43	0.13	0.34	-0.12	*
White	0.63	0.74	0.44	0.74	0.44	0.01	
Black	0.14	0.09	0.28	0.06	0.25	-0.02	
Hispanic	0.18	0.15	0.36	0.17	0.38	0.02	
Other Race	0.05	0.02	0.14	0.02	0.15	0.00	
Less Than HS Diploma	0.24	0.31	0.46	0.17	0.38	-0.14	*
HS Diploma	0.34	0.27	0.44	0.34	0.48	0.07	
Some College	0.18	0.22	0.41	0.17	0.38	-0.05	
College Graduate	0.24	0.21	0.40	0.32	0.47	0.11	*
Married	0.58	0.53	0.50	0.43	0.50	-0.11	
Widow/Never Married	0.29	0.21	0.41	0.26	0.44	0.04	
Divorce/Separated	0.13	0.25	0.44	0.32	0.47	0.07	
Income	24704	20626	23871	24516	26871	3889	
Low Income	0.32	0.37	0.48	0.34	0.48	-0.03	
Middle Income	0.32	0.30	0.46	0.32	0.47	0.02	
High Income	0.36	0.33	0.47	0.34	0.48	0.01	
Income (Not Imputed)	24440	20361	23111	25264	27186	4902	
Low Income (Not Imputed)	0.30	0.35	0.48	0.34	0.48	0.00	
Middle Income (Not Imputed)	0.29	0.28	0.45	0.30	0.46	0.02	
High Income (Not Imputed)	0.32	0.31	0.46	0.32	0.47	0.01	
Income Item No Response	0.09	0.07	0.25	0.04	0.20	-0.03	
Worked Full Year	0.63	0.42	0.49	0.55	0.50	0.14	*
Worked Part Year	0.08	0.07	0.26	0.11	0.31	0.03	
Did Not Work	0.29	0.51	0.50	0.34	0.48	-0.17	**
Did Not Work--Retired	0.09	0.09	0.28	0.06	0.25	-0.02	
Did Not Work--Disabled	0.04	0.15	0.36	0.13	0.34	-0.03	
Did Not Work--Other	0.16	0.27	0.44	0.15	0.36	-0.12	*
Presence of Children in Household	0.47	0.43	0.50	0.38	0.49	-0.05	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.18 Descriptive Statistics for Acute Stress Disorders by Condition Identifier

Acute Stress Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=306) SE	CAM MEAN	(n=51) SE	Difference	
Overall Good Health Rd 1	0.84	0.75	0.44	0.78	0.42	0.04	
IADL Limitations	0.04	0.06	0.24	0.04	0.20	-0.02	
Functional Limitations	0.13	0.20	0.40	0.20	0.40	0.00	
Social Limitations	0.06	0.08	0.27	0.12	0.33	0.04	
Cognitive Limitations	0.05	0.08	0.27	0.14	0.35	0.06	
Age	45.26	46.43	14.96	42.78	11.99	-3.65	*
Male	0.46	0.36	0.48	0.20	0.40	-0.16	**
White	0.63	0.62	0.49	0.80	0.40	0.18	**
Black	0.14	0.16	0.36	0.06	0.24	-0.10	*
Hispanic	0.18	0.18	0.38	0.10	0.30	-0.08	
Other Race	0.05	0.04	0.19	0.04	0.20	0.00	
Less Than HS Diploma	0.24	0.18	0.39	0.10	0.30	-0.08	
HS Diploma	0.34	0.32	0.47	0.25	0.44	-0.07	
Some College	0.18	0.20	0.40	0.22	0.42	0.02	
College Graduate	0.24	0.30	0.46	0.43	0.50	0.13	*
Married	0.58	0.53	0.50	0.51	0.50	-0.02	
Widow/Never Married	0.29	0.25	0.43	0.20	0.40	-0.05	
Divorce/Separated	0.13	0.23	0.42	0.29	0.46	0.07	
Income	24704	27036	24776	30377	24149	3341	
Low Income	0.32	0.34	0.47	0.16	0.37	-0.18	**
Middle Income	0.32	0.31	0.46	0.41	0.50	0.10	
High Income	0.36	0.35	0.48	0.43	0.50	0.08	
Income (Not Imputed)	24440	25684	23559	31336	24748	5651	
Low Income (Not Imputed)	0.30	0.33	0.47	0.14	0.35	-0.19	**
Middle Income (Not Imputed)	0.29	0.30	0.46	0.39	0.49	0.09	
High Income (Not Imputed)	0.32	0.30	0.46	0.39	0.49	0.09	
Income Item No Response	0.09	0.08	0.26	0.08	0.27	0.00	
Worked Full Year	0.63	0.67	0.47	0.73	0.45	0.06	
Worked Part Year	0.08	0.05	0.22	0.08	0.27	0.03	
Did Not Work	0.29	0.28	0.45	0.20	0.40	-0.08	
Did Not Work--Retired	0.09	0.06	0.24	0.04	0.20	-0.02	
Did Not Work--Disabled	0.04	0.05	0.22	0.04	0.20	-0.01	
Did Not Work--Other	0.16	0.17	0.38	0.12	0.33	-0.05	
Presence of Children in Household	0.47	0.46	0.50	0.45	0.50	-0.01	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.19 Descriptive Statistics for Acute Stress Disorders by Pharmacotherapy Use

Acute Stress Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=97) SE	CAM MEAN	(n=12) SE	Difference
Overall Good Health Rd 1	0.84	0.68	0.47	0.58	0.51	-0.10
IADL Limitations	0.04	0.08	0.28	0.00	0.00	-0.08
Functional Limitations	0.13	0.24	0.43	0.25	0.45	0.01
Social Limitations	0.06	0.09	0.29	0.17	0.39	0.07
Cognitive Limitations	0.05	0.09	0.29	0.08	0.29	-0.01
Age	45.26	52.66	14.92	47.08	9.17	-5.58 *
Male	0.46	0.28	0.45	0.17	0.39	-0.11
White	0.63	0.66	0.48	0.83	0.39	0.17
Black	0.14	0.13	0.34	0.00	0.00	-0.13
Hispanic	0.18	0.20	0.40	0.17	0.39	-0.03
Other Race	0.05	0.01	0.10	0.00	0.00	-0.01
Less Than HS Diploma	0.24	0.25	0.43	0.17	0.39	-0.08
HS Diploma	0.34	0.25	0.43	0.33	0.49	0.09
Some College	0.18	0.26	0.44	0.08	0.29	-0.17
College Graduate	0.24	0.25	0.43	0.42	0.51	0.17
Married	0.58	0.51	0.50	0.58	0.51	0.08
Widow/Never Married	0.29	0.27	0.45	0.17	0.39	-0.10
Divorce/Separated	0.13	0.23	0.42	0.25	0.45	0.02
Income	24704	23081	20446	19651	17452	-3430
Low Income	0.32	0.37	0.49	0.25	0.45	-0.12
Middle Income	0.32	0.29	0.46	0.42	0.51	0.13
High Income	0.36	0.34	0.48	0.33	0.49	-0.01
Income (Not Imputed)	24440	21436	19131	20130	18220	-1305
Low Income (Not Imputed)	0.30	0.36	0.48	0.25	0.45	-0.11
Middle Income (Not Imputed)	0.29	0.27	0.45	0.42	0.51	0.15
High Income (Not Imputed)	0.32	0.30	0.46	0.25	0.45	-0.05
Income Item No Response	0.09	0.07	0.26	0.08	0.29	0.01
Worked Full Year	0.63	0.52	0.50	0.50	0.52	-0.02
Worked Part Year	0.08	0.04	0.20	0.00	0.00	-0.04
Did Not Work	0.29	0.44	0.50	0.50	0.52	0.06
Did Not Work--Retired	0.09	0.07	0.26	0.00	0.00	-0.07
Did Not Work--Disabled	0.04	0.06	0.24	0.17	0.39	0.10
Did Not Work--Other	0.16	0.31	0.46	0.33	0.49	0.02
Presence of Children in Household	0.47	0.37	0.49	0.42	0.51	0.05

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.20 Descriptive Statistics for Acute Stress Disorders by Psychotherapy Use

Acute Stress Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=101) SE	CAM MEAN	(n=18) SE	Difference	
Overall Good Health Rd 1	0.84	0.73	0.44	0.67	0.49	-0.07	
IADL Limitations	0.04	0.04	0.20	0.00	0.00	-0.04	
Functional Limitations	0.13	0.20	0.40	0.28	0.46	0.08	
Social Limitations	0.06	0.08	0.27	0.17	0.38	0.09	
Cognitive Limitations	0.05	0.10	0.30	0.17	0.38	0.07	
Age	45.26	48.32	15.27	42.44	13.50	-5.87	*
Male	0.46	0.32	0.47	0.11	0.32	-0.21	*
White	0.63	0.62	0.49	0.72	0.46	0.10	
Black	0.14	0.15	0.36	0.06	0.24	-0.09	
Hispanic	0.18	0.21	0.41	0.11	0.32	-0.10	
Other Race	0.05	0.02	0.14	0.11	0.32	0.09	*
Less Than HS Diploma	0.24	0.22	0.41	0.11	0.32	-0.11	
HS Diploma	0.34	0.27	0.44	0.28	0.46	0.01	
Some College	0.18	0.21	0.41	0.17	0.38	-0.04	
College Graduate	0.24	0.31	0.46	0.44	0.51	0.14	
Married	0.58	0.47	0.50	0.39	0.50	-0.08	
Widow/Never Married	0.29	0.26	0.44	0.28	0.46	0.02	
Divorce/Separated	0.13	0.28	0.45	0.33	0.49	0.06	
Income	24704	25768	25805	20884	13518	-4883	
Low Income	0.32	0.36	0.48	0.22	0.43	-0.13	
Middle Income	0.32	0.33	0.47	0.56	0.51	0.23	*
High Income	0.36	0.32	0.47	0.22	0.43	-0.09	
Income (Not Imputed)	24440	25231	25989	21267	13833	-3964	
Low Income (Not Imputed)	0.30	0.34	0.47	0.22	0.43	-0.11	
Middle Income (Not Imputed)	0.29	0.31	0.46	0.56	0.51	0.25	**
High Income (Not Imputed)	0.32	0.29	0.45	0.17	0.38	-0.12	
Income Item No Response	0.09	0.07	0.26	0.06	0.24	-0.01	
Worked Full Year	0.63	0.58	0.50	0.67	0.49	0.08	
Worked Part Year	0.08	0.06	0.24	0.06	0.24	0.00	
Did Not Work	0.29	0.36	0.48	0.28	0.46	-0.08	
Did Not Work--Retired	0.09	0.08	0.27	0.06	0.24	-0.02	
Did Not Work--Disabled	0.04	0.06	0.24	0.11	0.32	0.05	
Did Not Work--Other	0.16	0.22	0.41	0.11	0.32	-0.11	
Presence of Children in Household	0.47	0.47	0.50	0.50	0.51	0.03	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.21 Descriptive Statistics for Acute Stress Disorders by Either Use

Acute Stress Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=144) SE	CAM MEAN	(n=21) SE	Difference	
Overall Good Health Rd 1	0.84	0.72	0.45	0.67	0.48	-0.05	
IADL Limitations	0.04	0.07	0.26	0.00	0.00	-0.07	
Functional Limitations	0.13	0.22	0.42	0.24	0.44	0.02	
Social Limitations	0.06	0.10	0.31	0.14	0.36	0.04	
Cognitive Limitations	0.05	0.10	0.31	0.14	0.36	0.04	
Age	45.26	50.70	15.36	43.24	13.10	-7.46	**
Male	0.46	0.33	0.47	0.14	0.36	-0.18	*
White	0.63	0.67	0.47	0.76	0.44	0.10	
Black	0.14	0.14	0.35	0.05	0.22	-0.09	
Hispanic	0.18	0.18	0.39	0.10	0.30	-0.09	
Other Race	0.05	0.01	0.12	0.10	0.30	0.08	**
Less Than HS Diploma	0.24	0.22	0.41	0.10	0.30	-0.12	
HS Diploma	0.34	0.28	0.45	0.33	0.48	0.06	
Some College	0.18	0.24	0.43	0.14	0.36	-0.09	
College Graduate	0.24	0.27	0.45	0.43	0.51	0.16	
Married	0.58	0.50	0.50	0.43	0.51	-0.07	
Widow/Never Married	0.29	0.26	0.44	0.24	0.44	-0.02	
Divorce/Separated	0.13	0.24	0.43	0.33	0.48	0.09	
Income	24704	25280	24388	22338	14322	-2941	
Low Income	0.32	0.35	0.48	0.19	0.40	-0.16	
Middle Income	0.32	0.31	0.46	0.52	0.51	0.22	**
High Income	0.36	0.35	0.48	0.29	0.46	-0.06	
Income (Not Imputed)	24440	24234	24051	22736	14574	-1497	
Low Income (Not Imputed)	0.30	0.33	0.47	0.19	0.40	-0.14	
Middle Income (Not Imputed)	0.29	0.29	0.46	0.52	0.51	0.23	**
High Income (Not Imputed)	0.32	0.31	0.46	0.24	0.44	-0.07	
Income Item No Response	0.09	0.07	0.26	0.05	0.22	-0.02	
Worked Full Year	0.63	0.56	0.50	0.62	0.50	0.06	
Worked Part Year	0.08	0.05	0.22	0.05	0.22	0.00	
Did Not Work	0.29	0.39	0.49	0.33	0.48	-0.06	
Did Not Work--Retired	0.09	0.08	0.28	0.05	0.22	-0.04	
Did Not Work--Disabled	0.04	0.06	0.24	0.10	0.30	0.03	
Did Not Work--Other	0.16	0.24	0.43	0.19	0.40	-0.05	
Presence of Children in Household	0.47	0.41	0.49	0.43	0.51	0.02	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.22 Descriptive Statistics for Depression (NOS) Disorders by Condition Identifiers

Depression (NOS) Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=1030) SE	CAM MEAN	(n=116) SE	Difference	
Overall Good Health Rd 1	0.84	0.63	0.48	0.67	0.47	0.04	
IADL Limitations	0.04	0.11	0.31	0.06	0.24	-0.05	
Functional Limitations	0.13	0.29	0.46	0.28	0.45	-0.02	
Social Limitations	0.06	0.16	0.37	0.16	0.37	0.00	
Cognitive Limitations	0.05	0.16	0.36	0.16	0.36	0.00	
Age	45.26	48.49	16.31	45.60	15.45	-2.88	*
Male	0.46	0.29	0.46	0.20	0.40	-0.10	**
White	0.63	0.72	0.45	0.88	0.33	0.16	**
Black	0.14	0.10	0.29	0.04	0.20	-0.05	*
Hispanic	0.18	0.15	0.36	0.05	0.22	-0.10	**
Other Race	0.05	0.03	0.18	0.03	0.16	-0.01	
Less Than HS Diploma	0.24	0.25	0.43	0.11	0.32	-0.13	**
HS Diploma	0.34	0.35	0.48	0.27	0.44	-0.08	*
Some College	0.18	0.18	0.38	0.21	0.41	0.03	
College Graduate	0.24	0.22	0.42	0.41	0.49	0.19	**
Married	0.58	0.48	0.50	0.44	0.50	-0.04	
Widow/Never Married	0.29	0.27	0.45	0.26	0.44	-0.02	
Divorce/Separated	0.13	0.25	0.43	0.30	0.46	0.06	
Income	24704	22250	28528	23893	21877	1642	
Low Income	0.32	0.40	0.49	0.28	0.45	-0.12	**
Middle Income	0.32	0.29	0.45	0.37	0.49	0.08	*
High Income	0.36	0.31	0.46	0.34	0.48	0.03	
Income (Not Imputed)	24440	22174	28620	23404	22366	1230	
Low Income (Not Imputed)	0.30	0.38	0.48	0.27	0.44	-0.11	**
Middle Income (Not Imputed)	0.29	0.27	0.44	0.35	0.48	0.08	*
High Income (Not Imputed)	0.32	0.28	0.45	0.29	0.46	0.02	
Income Item No Response	0.09	0.08	0.26	0.09	0.28	0.01	
Worked Full Year	0.63	0.47	0.50	0.68	0.47	0.21	**
Worked Part Year	0.08	0.10	0.30	0.10	0.31	0.01	
Did Not Work	0.29	0.43	0.50	0.22	0.41	-0.21	**
Did Not Work--Retired	0.09	0.08	0.27	0.05	0.22	-0.03	
Did Not Work--Disabled	0.04	0.13	0.33	0.06	0.24	-0.07	**
Did Not Work--Other	0.16	0.22	0.41	0.10	0.31	-0.12	**
Presence of Children in Household	0.47	0.44	0.50	0.34	0.47	-0.11	**

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.23 Descriptive Statistics for Depression (NOS) Disorders by Pharmacotherapy Use

Depression (NOS) Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=600) SE	CAM MEAN	(n=66) SE	Difference	
Overall Good Health Rd 1	0.84	0.60	0.49	0.55	0.50	-0.05	
IADL Limitations	0.04	0.13	0.34	0.09	0.29	-0.04	
Functional Limitations	0.13	0.33	0.47	0.41	0.50	0.08	
Social Limitations	0.06	0.19	0.39	0.24	0.43	0.05	
Cognitive Limitations	0.05	0.19	0.39	0.21	0.41	0.02	
Age	45.26	51.47	16.02	47.05	13.45	-4.43	**
Male	0.46	0.27	0.44	0.15	0.36	-0.12	**
White	0.63	0.80	0.40	0.89	0.31	0.10	*
Black	0.14	0.06	0.24	0.02	0.12	-0.05	
Hispanic	0.18	0.13	0.33	0.06	0.24	-0.07	
Other Race	0.05	0.02	0.13	0.03	0.17	0.01	
Less Than HS Diploma	0.24	0.22	0.41	0.12	0.33	-0.10	*
HS Diploma	0.34	0.36	0.48	0.27	0.45	-0.09	
Some College	0.18	0.18	0.39	0.15	0.36	-0.03	
College Graduate	0.24	0.24	0.43	0.45	0.50	0.22	**
Married	0.58	0.52	0.50	0.47	0.50	-0.05	
Widow/Never Married	0.29	0.25	0.43	0.18	0.39	-0.06	
Divorce/Separated	0.13	0.23	0.42	0.35	0.48	0.12	**
Income	24704	22542	26953	22324	19978	-217	
Low Income	0.32	0.38	0.49	0.29	0.46	-0.09	
Middle Income	0.32	0.29	0.45	0.35	0.48	0.06	
High Income	0.36	0.34	0.47	0.36	0.48	0.03	
Income (Not Imputed)	24440	22130	26426	22521	20212	390	
Low Income (Not Imputed)	0.30	0.36	0.48	0.26	0.44	-0.10	*
Middle Income (Not Imputed)	0.29	0.28	0.45	0.35	0.48	0.07	
High Income (Not Imputed)	0.32	0.30	0.46	0.33	0.48	0.03	
Income Item No Response	0.09	0.06	0.24	0.06	0.24	0.00	
Worked Full Year	0.63	0.42	0.49	0.62	0.49	0.20	**
Worked Part Year	0.08	0.09	0.28	0.11	0.31	0.02	
Did Not Work	0.29	0.49	0.50	0.27	0.45	-0.22	**
Did Not Work--Retired	0.09	0.10	0.30	0.05	0.21	-0.06	
Did Not Work--Disabled	0.04	0.14	0.35	0.11	0.31	-0.04	
Did Not Work--Other	0.16	0.25	0.43	0.12	0.33	-0.13	**
Presence of Children in Household	0.47	0.40	0.49	0.35	0.48	-0.05	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.24 Descriptive Statistics for Depression (NOS) Disorders by Psychotherapy Use

Depression (NOS) Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=380) SE	CAM MEAN	(n=60) SE	Difference	
Overall Good Health Rd 1	0.84	0.61	0.49	0.58	0.50	-0.02	
IADL Limitations	0.04	0.12	0.33	0.05	0.22	-0.07	*
Functional Limitations	0.13	0.29	0.46	0.33	0.48	0.04	
Social Limitations	0.06	0.19	0.39	0.22	0.42	0.03	
Cognitive Limitations	0.05	0.22	0.42	0.18	0.39	-0.04	
Age	45.26	47.83	15.41	43.33	12.72	-4.50	**
Male	0.46	0.27	0.44	0.17	0.38	-0.10	*
White	0.63	0.75	0.43	0.88	0.32	0.13	**
Black	0.14	0.07	0.26	0.02	0.13	-0.06	*
Hispanic	0.18	0.16	0.37	0.07	0.25	-0.09	*
Other Race	0.05	0.02	0.12	0.03	0.18	0.02	
Less Than HS Diploma	0.24	0.20	0.40	0.10	0.30	-0.10	*
HS Diploma	0.34	0.34	0.47	0.28	0.45	-0.06	
Some College	0.18	0.18	0.39	0.18	0.39	0.00	
College Graduate	0.24	0.28	0.45	0.43	0.50	0.16	**
Married	0.58	0.43	0.50	0.37	0.49	-0.06	
Widow/Never Married	0.29	0.28	0.45	0.23	0.43	-0.05	
Divorce/Separated	0.13	0.28	0.45	0.40	0.49	0.12	*
Income	24704	21285	27125	22888	20433	1602	
Low Income	0.32	0.41	0.49	0.33	0.48	-0.08	
Middle Income	0.32	0.31	0.46	0.32	0.47	0.01	
High Income	0.36	0.28	0.45	0.35	0.48	0.07	
Income (Not Imputed)	24440	21184	26431	22630	20734	1446	
Low Income (Not Imputed)	0.30	0.38	0.49	0.32	0.47	-0.06	
Middle Income (Not Imputed)	0.29	0.30	0.46	0.30	0.46	0.00	
High Income (Not Imputed)	0.32	0.25	0.44	0.32	0.47	0.06	
Income Item No Response	0.09	0.07	0.25	0.07	0.25	0.00	
Worked Full Year	0.63	0.42	0.49	0.62	0.49	0.19	**
Worked Part Year	0.08	0.11	0.31	0.15	0.36	0.04	
Did Not Work	0.29	0.47	0.50	0.23	0.43	-0.24	**
Did Not Work--Retired	0.09	0.07	0.25	0.02	0.13	-0.05	
Did Not Work--Disabled	0.04	0.15	0.36	0.10	0.30	-0.05	
Did Not Work--Other	0.16	0.25	0.43	0.12	0.32	-0.13	**
Presence of Children in Household	0.47	0.43	0.50	0.35	0.48	-0.08	

* Significance at the 0.10 level, ** Significance at the 0.05 level

Table 8.25 Descriptive Statistics for Depression (NOS) Disorders by Either Use

Depression (NOS) Disorders Observable Characteristics	Overall MEPS	Non-CAM MEAN	(n=673) SE	CAM MEAN	(n=77) SE	Difference	
Overall Good Health Rd 1	0.84	0.60	0.49	0.57	0.50	-0.03	
IADL Limitations	0.04	0.13	0.34	0.08	0.27	-0.06	
Functional Limitations	0.13	0.33	0.47	0.36	0.48	0.04	
Social Limitations	0.06	0.19	0.39	0.22	0.42	0.03	
Cognitive Limitations	0.05	0.19	0.39	0.18	0.39	-0.01	
Age	45.26	50.87	15.97	45.75	14.21	-5.12	**
Male	0.46	0.27	0.44	0.17	0.38	-0.10	*
White	0.63	0.78	0.42	0.90	0.31	0.12	**
Black	0.14	0.07	0.25	0.01	0.11	-0.05	*
Hispanic	0.18	0.14	0.34	0.06	0.25	-0.07	*
Other Race	0.05	0.02	0.13	0.03	0.16	0.01	
Less Than HS Diploma	0.24	0.22	0.41	0.12	0.32	-0.10	**
HS Diploma	0.34	0.35	0.48	0.27	0.45	-0.07	
Some College	0.18	0.19	0.39	0.18	0.39	-0.01	
College Graduate	0.24	0.24	0.43	0.43	0.50	0.18	**
Married	0.58	0.50	0.50	0.45	0.50	-0.04	
Widow/Never Married	0.29	0.26	0.44	0.22	0.42	-0.04	
Divorce/Separated	0.13	0.24	0.43	0.32	0.47	0.09	
Income	24704	21997	26588	21989	19151	-8	
Low Income	0.32	0.38	0.49	0.29	0.45	-0.10	*
Middle Income	0.32	0.29	0.46	0.35	0.48	0.06	
High Income	0.36	0.33	0.47	0.36	0.48	0.04	
Income (Not Imputed)	24440	21744	26161	21952	19520	207	
Low Income (Not Imputed)	0.30	0.36	0.48	0.26	0.44	-0.10	*
Middle Income (Not Imputed)	0.29	0.28	0.45	0.34	0.48	0.06	
High Income (Not Imputed)	0.32	0.29	0.46	0.32	0.47	0.03	
Income Item No Response	0.09	0.07	0.25	0.08	0.27	0.01	
Worked Full Year	0.63	0.42	0.49	0.62	0.49	0.20	**
Worked Part Year	0.08	0.09	0.29	0.12	0.32	0.02	
Did Not Work	0.29	0.49	0.50	0.26	0.44	-0.23	**
Did Not Work--Retired	0.09	0.10	0.29	0.05	0.22	-0.04	
Did Not Work--Disabled	0.04	0.14	0.35	0.09	0.29	-0.05	
Did Not Work--Other	0.16	0.25	0.43	0.12	0.32	-0.13	**
Presence of Children in Household	0.47	0.40	0.49	0.34	0.48	-0.06	

* Significance at the 0.10 level, ** Significance at the 0.05 level

8.4.3 Models to Describe CAM Use In Terms of Observable Characteristics

Given the potential that observable characteristics may be correlated across individuals, the following are logistic models that consider multiple observable characteristics simultaneously.

The following is a description of the samples by mental health disorder (based on a statistical significance in a logistic model with all demographic variables) across the four sample definitions (by the condition identifier, by pharmacotherapy use, by psychotherapy use, by either pharmacotherapy or psychotherapy use). Underlying health measures are considered first, followed by observable demographics. Due to the small cell size for certain samples, a reasonable aggregation along certain categories was required.

The following considers the underlying health measures during the first round of the 1998 MEPS for the each of the sample definitions for each of the disorders groups. The measures of underlying health are the probability of good mental health status in round 1, the probability of good overall health status in round 1, and the probability of four limitations (functional, IADL, social, or cognitive) in round 1.

Table 8.26 and Table 8.27 present the estimated odds ratios from the logistic regressions of CAM use in terms of underlying health measures (from round 1) for the affective disorders groups. Only the probability of good mental health and the probability of good overall health are marginally significant for the pharmacotherapy users. The evidence suggests that underlying health is not a significant predictor to explain the decision to seek CAM for the affective disorders groups.

The following tables present the odds ratios from the following logistic models.

$$Prob(CAM_i) = f(Underlying Health_i)$$

Table 8.26 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Affective Disorders

	Condition Identifier (n=124)		Pharmacotherapy Use (n=85)			
Likelihood Ratio	1.26 (0.26)	1.26 (0.26)	2.32 (0.89)	2.87 (0.09)	2.87 (0.09)	5.1 (0.53)
Estimates						
Constant	0.26 (0.00)	0.26 (0.00)	0.21 (0.01)	0.37 (0.01)	0.37 (0.01)	0.30 (0.08)
Good Mental Health Rd1	0.58 (0.26)		0.78 (0.70)	0.39 (0.10)		0.56 (0.44)
Overall Good Health Rd1		0.58 (0.26)	0.82 (0.75)		0.39 (0.10)	0.64 (0.51)
IADL Limitations			1.12 (0.88)			1.23 (0.80)
Functional Limitations			1.45 (0.57)			1.88 (0.37)
Social Limitations			1.02 (0.97)			0.95 (0.94)
Cognitive Limitations			1.14 (0.84)			0.98 (0.98)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.27 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Affective Disorders

	Psychotherapy Use (n=79)		Either Use (n=95)			
Likelihood Ratio	0.12 (0.73)	1.29 (0.26)	2.08 (0.91)	1.51 (0.22)	2.02 (0.12)	3.48 (0.75)
Estimates						
Constant	0.26 (0.00)	0.32 (0.00)	0.21 (0.04)	0.30 (0.00)	0.32 (0.00)	0.23 (0.03)
Good Mental Health Rd1	0.82 (0.73)		1.27 (0.75)	0.51 (0.22)		0.76 (0.70)
Overall Good Health Rd1		0.52 (0.26)	0.58 (0.46)		0.46 (0.16)	0.68 (0.57)
IADL Limitations			0.95 (0.95)			1.39 (0.67)
Functional Limitations			1.73 (0.43)			1.62 (0.47)
Social Limitations			1.05 (0.94)			1.02 (0.98)
Cognitive Limitations			1.02 (0.97)			1.02 (0.98)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.28 and Table 8.29 present the estimated odds ratios from the logistic regressions of CAM use in terms of round 1 underlying health measures for the anxiety disorders groups. The evidence suggests that underlying health is not a significant predictor to explain the decision to seek CAM for the anxiety disorders groups.

Table 8.28 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Anxiety Disorders

Likelihood Ratio	Condition Identifier (n=778)			Pharmacotherapy Use (n=374)		
	0.00 (0.95)	0.10 (0.76)	1.96 (0.92)	0.56 (0.46)	0.00 (0.96)	5.25 (0.51)
Estimates						
Constant	0.14 (0.00)	0.13 (0.00)	0.13 (0.00)	0.18 (0.00)	0.15 (0.00)	0.19 (0.00)
Good Mental Health Rd1	1.02 (0.95)		0.98 (0.95)	0.78 (0.45)		0.64 (0.29)
Overall Good Health Rd1		1.08 (0.76)	1.11 (0.73)		0.98 (0.96)	1.16 (0.71)
IADL Limitations			0.75 (0.55)			1.09 (0.89)
Functional Limitations			0.89 (0.72)			0.68 (0.42)
Social Limitations			1.67 (0.19)			2.20 (0.13)
Cognitive Limitations			0.87 (0.73)			0.40 (0.11)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.29 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Anxiety Disorders

	Psychotherapy Use (n=283)			Either Use (n=469)		
Likelihood Ratio	0.02 (0.89)	0.01 (0.91)	0.54 (1.00)	0.56 (0.45)	0.05 (0.83)	2.14 (0.91)
Estimates						
Constant	0.16 (0.00)	0.15 (0.00)	0.15 (0.00)	0.17 (0.00)	0.15 (0.00)	0.17 (0.00)
Good Mental Health Rd1	0.95 (0.89)		0.94 (0.89)	0.79 (0.45)		0.71 (0.36)
Overall Good Health Rd1		0.96 (0.91)	1.02 (0.97)		0.94 (0.83)	1.11 (0.78)
IADL Limitations			0.79 (0.75)			0.91 (0.87)
Functional Limitations			1.27 (0.61)			1.04 (0.92)
Social Limitations			1.14 (0.82)			1.45 (0.41)
Cognitive Limitations			0.82 (0.73)			0.63 (0.34)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.30 and Table 8.31 present the estimated odds ratios from the logistic regressions of CAM use in terms of round 1 underlying health measures for the neurotic disorders groups. The evidence suggests that underlying health is not a significant predictor to explain the decision to seek CAM for the neurotic disorders groups.

Table 8.30 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Neurotic Disorders

	Condition Identifier (n=502)			Pharmacotherapy Use (n=297)		
Likelihood Ratio	0.00 (0.99)	0.51 (0.48)	2.09 (0.91)	0.20 (0.65)	0.87 (0.35)	4.59 (0.60)
Estimates						
Constant	0.14 (0.00)	0.12 (0.00)	0.11 (0.00)	0.13 (0.00)	0.12 (0.00)	0.14 (0.00)
Good Mental Health Rd1	1.00 (0.99)		0.85 (0.68)	1.19 (0.65)		0.82 (0.67)
Overall Good Health Rd1		1.23 (0.48)	1.51 (0.27)		1.39 (0.36)	1.58 (0.31)
IADL Limitations			1.13 (0.81)			1.80 (0.34)
Functional Limitations			1.01 (0.99)			0.67 (0.45)
Social Limitations			1.55 (0.32)			1.97 (0.24)
Cognitive Limitations			0.80 (0.64)			0.39 (0.13)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.31 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Neurotic Disorders

	Psychotherapy Use (n=202)			Either Use (n=354)		
Likelihood Ratio	2.68 (0.10)	0.61 (0.43)	3.95 (0.68)	0.25 (0.61)	0.61 (0.43)	2.07 (0.91)
Estimates						
Constant	0.09 (0.00)	0.12 (0.00)	0.10 (0.00)	0.14 (0.00)	0.13 (0.00)	0.13 (0.00)
Good Mental Health Rd1	2.16 (0.12)		2.25 (0.22)	1.19 (0.62)		0.91 (0.84)
Overall Good Health Rd1		1.42 (0.44)	0.82 (0.73)		1.30 (0.44)	1.40 (0.42)
IADL Limitations			1.46 (0.63)			1.49 (0.48)
Functional Limitations			1.32 (0.64)			1.12 (0.80)
Social Limitations			0.44 (0.31)			1.14 (0.80)
Cognitive Limitations			0.96 (0.95)			0.59 (0.34)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.32 and Table 8.33 present the estimated odds ratios from the logistic regressions of CAM use in terms of round 1 underlying health measures for the acute stress disorders groups. The evidence suggests that underlying health is not a significant predictor to explain the decision to seek CAM for the acute stress disorders groups.

Table 8.32 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Acute Stress Disorders

	Condition Identifier (n=357)		Pharmacotherapy Use (n=109)			
Likelihood Ratio	0.32 (0.57)	0.37 (0.54)	5.00 (0.54)	6.65 (0.01)	0.44 (0.51)	13.52 (0.04)
Estimates						
Constant	0.20 (0.00)	0.14 (0.00)	0.13 (0.00)	0.40 (0.06)	0.16 (0.00)	0.48 (0.29)
Good Mental Health Rd1	0.80 (0.56)		0.81 (0.64)	0.18 (0.01)		0.09 (0.00)
Overall Good Health Rd1		1.25 (0.55)	1.62 (0.29)		0.66 (0.50)	1.67 (0.56)
IADL Limitations			0.39 (0.29)			0.00 (0.96)
Functional Limitations			0.91 (0.86)			0.82 (0.83)
Social Limitations			2.16 (0.22)			13.87 (0.07)
Cognitive Limitations			1.93 (0.24)			0.13 (0.25)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.33 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Acute Stress Disorders

	Psychotherapy Use (n=119)		Either Use (n=165)			
Likelihood Ratio	2.53 (0.11)	0.32 (0.57)	6.21 (0.40)	4.29 (0.04)	0.21 (0.65)	9.07 (0.17)
Estimates						
Constant	0.33 (0.01)	0.22 (0.00)	0.21 (0.02)	0.32 (0.01)	0.17 (0.00)	0.26 (0.03)
Good Mental Health Rd1	0.41 (0.10)		0.41 (0.19)	0.34 (0.03)		0.31 (0.05)
Overall Good Health Rd1		0.73 (0.57)	1.52 (0.56)		0.79 (0.65)	1.40 (0.61)
IADL Limitations			0.00 (0.98)			0.00 (0.97)
Functional Limitations			1.49 (0.55)			1.17 (0.80)
Social Limitations			2.92 (0.23)			2.51 (0.28)
Cognitive Limitations			1.07 (0.94)			1.09 (0.92)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.34 and Table 8.35 present the estimated odds ratios from the logistic regressions of CAM use in terms of round 1 underlying health measures for the depression (NOS) disorders groups. The evidence suggests that underlying health is not a significant predictor in the decision to seek CAM treatment for the depression (NOS) disorders group with the exception of IADL limitations. Higher IADL limitations have a negative relationship with the CAM treatment.

Table 8.34 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Condition Identifier and Pharmacotherapy Use Samples of Depression (NOS) Disorders

	Condition Identifier (n=1146)			Pharmacotherapy Use (n=666)		
Likelihood Ratio	0.15 (0.70)	0.82 (0.37)	4.69 (0.58)	0.15 (0.70)	0.64 (0.42)	5.17 (0.53)
Estimates						
Constant	0.11 (0.00)	0.10 (0.00)	0.10 (0.00)	0.12 (0.00)	0.12 (0.00)	0.10 (0.00)
Good Mental Health Rd1	1.09 (0.70)		1.04 (0.87)	0.90 (0.70)		1.03 (0.93)
Overall Good Health Rd1		1.20 (0.37)	1.19 (0.47)		0.81 (0.42)	0.91 (0.76)
IADL Limitations			0.45 (0.07)			0.43 (0.09)
Functional Limitations			1.00 (0.99)			1.43 (0.28)
Social Limitations			1.30 (0.42)			1.36 (0.41)
Cognitive Limitations			1.20 (0.58)			1.06 (0.87)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.35 Logistic Regression of CAM Use In Terms Of Round 1 Health Measures for Psychotherapy and Either Use Samples of Depression (NOS) Disorders

	Psychotherapy Use (n=440)		Either Use (n=750)			
Likelihood Ratio	0.21 (0.65)	0.10 (0.75)	6.68 (0.35)	0.04 (0.84)	0.19 (0.66)	5.01 (0.54)
Estimates						
Constant	0.15 (0.00)	0.17 (0.00)	0.15 (0.00)	0.11 (0.00)	0.12 (0.00)	0.11 (0.00)
Good Mental Health Rd1	1.14 (0.65)		1.21 (0.56)	1.05 (0.84)		1.15 (0.64)
Overall Good Health Rd1		0.91 (0.75)	0.88 (0.69)		0.90 (0.66)	0.89 (0.70)
IADL Limitations			0.29 (0.06)			0.41 (0.07)
Functional Limitations			1.48 (0.28)			1.29 (0.42)
Social Limitations			1.42 (0.39)			1.36 (0.38)
Cognitive Limitations			0.75 (0.48)			0.96 (0.90)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

The following jointly considers the role of observable characteristics in the decision to seek CAM treatment for each of the sample definitions for each of the disorders groups. Due to small cell size, the following dichotomous aggregation was used: Male/Female, Nonwhite/white, Any college/No college, Married/Not married, Middle or High Income/Low Income, Did not work full year/Did work full year.

Table 8.36 and Table 8.37 present the estimated odds ratios from the logistic regressions of CAM use in terms of observable characteristics(X) for the affective disorders groups. CAM users are statistically younger than CAM nonusers for each of the sample definitions. For the condition identifier and pharmacotherapy use samples, middle or high income is negatively related to the decision to seek CAM treatment. All other observable characteristics are not statistically significant in the decision to seek CAM treatment for the affective disorders groups. While the college and income variable is not statistically significant for each sample definition, the results indicated a large impact of these variables.

The following tables present the odds ratios of the following logistic models.

$$Prob(CAM_i) = f(Observable\ Demographics_i)$$

Table 8.36 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Affective Disorders

	Condition Identifier (n=124)		Pharmacotherapy Use (n=85)			
Likelihood Ratio	8.68 (0.00)	8.86 (0.03)	16.61 (0.02)	8.77 (0.00)	10.87 (0.01)	16.21 (0.02)
Estimates						
Constant	2.71 (0.29)	2.97 (0.28)	8.16 (0.07)	6.17 (0.12)	10.65 (0.08)	43.99 (0.04)
Age	0.94 (0.01)	0.94 (0.01)	0.93 (0.01)	0.92 (0.01)	0.91 (0.01)	0.90 (0.00)
Male		0.78 (0.67)	0.70 (0.56)		0.35 (0.18)	0.27 (0.11)
Nonwhite		0.98 (0.98)	0.72 (0.60)		1.36 (0.64)	1.07 (0.92)
Any College			2.15 (0.21)			2.33 (0.25)
Married			0.70 (0.53)			1.29 (0.72)
Middle or High Income			0.23 (0.04)			0.19 (0.06)
Did Not Work Full Year			0.41 (0.18)			0.37 (0.24)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.37 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Affective Disorders

	Psychotherapy Use (n=79)		Either Use (n=95)			
Likelihood Ratio	5.26 (0.02)	5.64 (0.13)	9.61 (0.21)	7.67 (0.01)	8.25 (0.04)	12.43 (0.09)
Estimates						
Constant	3.18 (0.33)	3.75 (0.28)	12.89 (0.10)	3.91 (0.21)	4.45 (0.21)	13.77 (0.09)
Age	0.94 (0.03)	0.94 (0.03)	0.93 (0.03)	0.93 (0.01)	0.93 (0.01)	0.92 (0.01)
Male		0.93 (0.92)	0.86 (0.83)		0.63 (0.49)	0.54 (0.37)
Nonwhite		0.66 (0.58)	0.54 (0.42)		1.25 (0.73)	1.04 (0.95)
Any College			1.76 (0.45)			1.90 (0.35)
Married			1.01 (0.99)			1.05 (0.94)
Middle or High Income			0.31 (0.16)			0.27 (0.11)
Did Not Work Full Year			0.34 (0.19)			0.39 (0.23)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.38 and Table 8.39 present the estimated odds ratios from the logistic regressions of CAM use in terms of observable characteristics for the anxiety disorders groups. CAM users are statistically younger, more likely to be female, more likely to be white, and more likely to have middle or high income than CAM nonusers for each of the sample definitions.

Table 8.38 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Anxiety Disorders

	Condition Identifier (n=778)			Pharmacotherapy Use (n=374)		
Likelihood Ratio	4.22 (0.04)	21.81 (0.00)	29.20 (0.00)	3.02 (0.08)	11.32 (0.01)	12.31 (0.09)
Estimates						
Constant	0.28 (0.00)	0.46 (0.04)	0.28 (0.01)	0.35 (0.04)	0.50 (0.20)	0.54 (0.33)
Age	0.99 (0.04)	0.98 (0.02)	0.98 (0.05)	0.98 (0.09)	0.98 (0.07)	0.98 (0.11)
Male		0.38 (0.00)	0.38 (0.00)		0.33 (0.02)	0.35 (0.03)
Nonwhite		0.53 (0.02)	0.59 (0.06)		0.56 (0.16)	0.56 (0.17)
Any College			1.20 (0.46)			0.91 (0.79)
Married			0.78 (0.28)			0.77 (0.42)
Middle or High Income			1.84 (0.04)			1.24 (0.57)
Did Not Work Full Year			0.98 (0.95)			0.92 (0.81)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.39 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Anxiety Disorders

	Psychotherapy Use (n=283)			Either Use (n=469)		
Likelihood Ratio	7.04 (0.01)	14.07 (0.00)	18.77 (0.01)	6.14 (0.01)	18.56 (0.00)	22.39 (0.00)
Estimates						
Constant	0.68 (0.51)	1.04 (0.95)	0.93 (0.92)	0.43 (0.07)	0.65 (0.38)	0.65 (0.45)
Age	0.97 (0.01)	0.97 (0.01)	0.96 (0.01)	0.98 (0.02)	0.98 (0.01)	0.97 (0.01)
Male		0.39 (0.06)	0.42 (0.09)		0.28 (0.00)	0.30 (0.01)
Nonwhite		0.42 (0.07)	0.43 (0.09)		0.59 (0.14)	0.58 (0.14)
Any College			0.68 (0.34)			0.87 (0.65)
Married			0.69 (0.34)			0.64 (0.14)
Middle or High Income			2.40 (0.05)			1.71 (0.12)
Did Not Work Full Year			1.00 (1.00)			1.02 (0.96)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.40 and Table 8.41 present the estimated odds ratios from the logistic regressions of CAM use in terms of observable characteristics for the neurotic disorders groups. CAM users are statistically younger and more likely to be female than CAM nonusers for each of the sample definitions. CAM users in the condition identifier sample are less likely to be married than CAM nonusers. All other observable characteristics are not statistically significant in the decision to seek CAM treatment for the neurotic disorders groups.

Table 8.40 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Neurotic Disorders

	Condition Identifier (n=502)			Pharmacotherapy Use (n=297)		
Likelihood Ratio	6.12 (0.01)	10.38 (0.02)	14.82 (0.03)	3.42 (0.06)	8.72 (0.03)	11.43 (0.12)
Estimates						
Constant	0.40 (0.04)	0.51 (0.14)	0.49 (0.20)	0.42 (0.13)	0.57 (0.34)	0.53 (0.36)
Age	0.98 (0.02)	0.98 (0.01)	0.98 (0.04)	0.98 (0.07)	0.98 (0.05)	0.98 (0.16)
Male		0.49 (0.05)	0.52 (0.08)		0.34 (0.05)	0.36 (0.06)
Nonwhite		0.94 (0.83)	0.95 (0.88)		0.80 (0.60)	0.82 (0.65)
Any College			1.12 (0.70)			1.27 (0.53)
Married			0.56 (0.05)			0.65 (0.24)
Middle or High Income			1.30 (0.42)			1.15 (0.74)
Did Not Work Full Year			0.82 (0.54)			0.78 (0.54)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.41 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Neurotic Disorders

	Psychotherapy Use (n=202)		Either Use (n=354)			
Likelihood Ratio	9.21 (0.00)	9.75 (0.02)	13.96 (0.05)	7.38 (0.01)	11.57 (0.01)	14.47 (0.04)
Estimates						
Constant	1.32 (0.72)	1.47 (0.62)	1.69 (0.55)	0.61 (0.35)	0.75 (0.60)	0.84 (0.78)
Age	0.95 (0.01)	0.95 (0.01)	0.95 (0.01)	0.97 (0.01)	0.97 (0.01)	0.97 (0.02)
Male		0.76 (0.62)	0.91 (0.86)		0.42 (0.06)	0.44 (0.08)
Nonwhite		0.77 (0.61)	0.80 (0.67)		0.96 (0.91)	0.97 (0.93)
Any College			0.70 (0.46)			0.97 (0.92)
Married			0.57 (0.23)			0.64 (0.18)
Middle or High Income			2.05 (0.16)			1.30 (0.49)
Did Not Work Full Year			0.71 (0.51)			0.78 (0.51)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.42 and Table 8.43 present the estimated odds ratios from the logistic regressions of CAM use in terms of observable characteristics for the acute stress disorders groups. CAM users are statistically younger than CAM nonusers for all adults fitting the clinical definition and for users of either pharmacotherapy or psychotherapy. CAM users are more like to be female for each of the sample definitions except the pharmacotherapy user. For the pharmacotherapy users, there is no statistically significant difference on the observable characteristics between CAM users and nonusers.

Table 8.42 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Acute Stress Disorders

	Condition Identifier (n=357)			Pharmacotherapy Use (n=109)		
Likelihood Ratio	2.84 (0.09)	17.90 (0.00)	25.01 (0.00)	1.67 (0.20)	4.31 (0.23)	6.47 (0.49)
Estimates						
Constant	0.37 (0.05)	0.79 (0.66)	0.31 (0.09)	0.52 (0.57)	0.84 (0.89)	0.52 (0.67)
Age	0.98 (0.10)	0.98 (0.05)	0.98 (0.06)	0.97 (0.21)	0.97 (0.21)	0.96 (0.10)
Male		0.38 (0.01)	0.38 (0.01)		0.52 (0.42)	0.53 (0.45)
Nonwhite		0.35 (0.00)	0.42 (0.03)		0.34 (0.18)	0.30 (0.19)
Any College			1.39 (0.34)			0.98 (0.97)
Married			0.85 (0.62)			1.50 (0.56)
Middle or High Income			2.68 (0.04)			1.97 (0.44)
Did Not Work Full Year			1.45 (0.37)			3.15 (0.19)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.43 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Acute Stress Disorders

	Psychotherapy Use (n=119)		Either Use (n=165)			
Likelihood Ratio	2.51 (0.11)	7.29 (0.06)	9.16 (0.24)	4.75 (0.03)	9.56 (0.02)	12.87 (0.08)
Estimates						
Constant	0.67 (0.65)	1.15 (0.89)	0.57 (0.65)	0.80 (0.79)	1.38 (0.71)	0.77 (0.80)
Age	0.97 (0.13)	0.97 (0.14)	0.97 (0.16)	0.96 (0.04)	0.96 (0.04)	0.96 (0.02)
Male		0.26 (0.09)	0.25 (0.08)		0.32 (0.09)	0.33 (0.10)
Nonwhite		0.50 (0.24)	0.49 (0.25)		0.48 (0.19)	0.46 (0.20)
Any College			1.34 (0.62)			1.08 (0.89)
Married			0.68 (0.51)			0.70 (0.50)
Middle or High Income			2.20 (0.29)			2.82 (0.14)
Did Not Work Full Year			1.58 (0.52)			2.14 (0.23)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.44 and Table 8.45 present the estimated odds ratios from the logistic regressions of CAM use in terms of observable characteristics for the depression (NOS) disorders groups. Age is negatively related to the decision to seek CAM treatment and statistically significant at the 0.10 level of significance for each of the sample definitions. However, the magnitude of age is fairly small, possibly indicating statistical, but not economic significance. CAM users are more likely to be female, more likely to be white than CAM nonusers for each of the sample definitions. For the condition identifier use sample, not working the full year is negatively related to the decision to seek CAM treatment. All other observable characteristics are not statistically significant in the decision to seek CAM treatment for the depression (NOS) disorders groups.

Table 8.44 Logistic Regression of CAM Use In Terms Of Demographic Measures for Condition Identifier and Pharmacotherapy Use Samples of Depression (NOS) Disorders

	Condition Identifier (n=1146)			Pharmacotherapy Use (n=666)		
Likelihood Ratio	3.35 (0.07)	27.02 (0.00)	48.15 (0.00)	4.80 (0.03)	14.43 (0.00)	23.35 (0.00)
Estimates						
Constant	0.19 (0.00)	0.31 (0.00)	0.19 (0.00)	0.27 (0.00)	0.37 (0.02)	0.26 (0.01)
Age	0.99 (0.07)	0.99 (0.03)	0.99 (0.49)	0.98 (0.03)	0.98 (0.03)	0.99 (0.25)
Male		0.56 (0.02)	0.57 (0.02)		0.47 (0.03)	0.48 (0.04)
Nonwhite		0.32 (0.00)	0.40 (0.00)		0.42 (0.04)	0.52 (0.12)
Any College			1.78 (0.01)			1.58 (0.12)
Married			0.85 (0.44)			0.83 (0.50)
Middle or High Income			1.11 (0.66)			1.09 (0.79)
Did Not Work Full Year			0.55 (0.01)			0.60 (0.10)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.45 Logistic Regression of CAM Use In Terms Of Demographic Measures for Psychotherapy and Either Use Samples of Depression (NOS) Disorders

	Psychotherapy Use (n=440)			Either Use (n=750)		
Likelihood Ratio	4.82 (0.03)	13.83 (0.00)	18.87 (0.01)	7.47 (0.01)	19.08 (0.00)	27.64 (0.00)
Estimates						
Constant	0.42 (0.06)	0.56 (0.22)	0.44 (0.15)	0.32 (0.00)	0.45 (0.05)	0.31 (0.02)
Age	0.98 (0.03)	0.98 (0.04)	0.99 (0.18)	0.98 (0.01)	0.98 (0.01)	0.98 (0.08)
Male		0.53 (0.09)	0.56 (0.13)		0.53 (0.05)	0.54 (0.05)
Nonwhite		0.39 (0.03)	0.44 (0.06)		0.38 (0.01)	0.44 (0.04)
Any College			1.43 (0.25)			1.51 (0.13)
Married			0.85 (0.59)			0.87 (0.58)
Middle or High Income			0.99 (0.97)			1.13 (0.69)
Did Not Work Full Year			0.65 (0.21)			0.64 (0.13)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

8.4.4 Description of CAM Use in Terms 1997 MEPS Information

The following (Table 8.46 - Table 8.50) present the estimated proportion of each sample that also fits the sample definition in the previous year of MEPS (1997). Panel 2 of the MEPS covers 1997-1998 and Panel 3 of the MEPS covers 1998-1999.

Statistically insignificant differences indicate that fitting the definition of a mental health sample in 1997 does not help explain the decision to seek CAM treatment in 1998. A statistically significant difference might indicates that fitting the definition of a mental health sample in the other year does help to explain the decision to seek CAM treatment in 1998.

Table 8.46 presents the estimated proportion of the 1998 MEPS affective disorders samples that also fit the sample definition in the 1997 MEPS. While only the difference for the condition identifier sample is statistically significant, these restricted samples are quite

small. The magnitude on the difference for the other sample definitions may not be statistically significant, but the magnitude is quite large.

Table 8.46 Proportion of 1998 Samples with 1997 Sample Identifier for Affective Disorders

Sample Definition	Rate of 1997 Identifier		Difference	p-value
	NonCAM	CAM		
Condition Identifier	(n=60) 0.73	(n=12) 1.00	0.27	(0.04)
Pharmacotherapy	(n=37) 0.70	(n=10) 0.50	-0.20	(0.24)
Psychotherapy	(n=33) 0.76	(n=8) 0.50	-0.26	(0.16)
Either Use	(n=42) 0.71	(n=10) 0.50	-0.21	(0.20)

p-value on the difference in parentheses

Table 8.47 - Table 8.49 present the estimated proportion of the 1998 MEPS samples that also fit the sample definition in the 1997 MEPS for the anxiety, neurotic, and acute stress disorders. Fitting the definition of a mental health sample is not strongly related to the decision to seek CAM treatment in 1998 using any of the four sample constructions.

Table 8.47 Proportion of 1998 Samples with 1997 Sample Identifier for Anxiety Disorders

Sample Definition	Rate of 1997 Identifier		Difference	p-value
	NonCAM	CAM		
Condition Identifier	(n=391) 0.67	(n=54) 0.63	-0.04	(0.53)
Pharmacotherapy	(n=187) 0.62	(n=26) 0.50	-0.12	(0.24)
Psychotherapy	(n=141) 0.46	(n=19) 0.42	-.04	(0.74)
Either Use	(n=238) 0.60	(n=31) 0.52	-0.08	(0.37)

p-value on the difference in parentheses

Table 8.48 Proportion of 1998 Samples with 1997 Sample Identifier for Neurotic Disorders

Sample Definition	Rate of 1997 Identifier		Difference	p-value
	NonCAM (n=256)	CAM (n=37)		
Condition Identifier	0.71 (n=149)	0.70 (n=22)	-0.01	(0.88)
Pharmacotherapy	0.61 (n=105)	0.50 (n=13)	-0.11	(0.33)
Psychotherapy	0.47 (n=179)	0.46 (n=25)	-0.02	(0.97)
Either Use	0.61	0.48	-0.13	(0.22)

p-value on the difference in parentheses

Table 8.49 Proportion of 1998 Samples with 1997 Sample Identifier for Acute Stress Disorders

Sample Definition	Rate of 1997 Identifier		Difference	p-value
	NonCAM (n=180)	CAM (n=33)		
Condition Identifier	0.59 (n=57)	0.52 (n=8)	-0.07	(0.40)
Pharmacotherapy	0.56 (n=54)	0.50 (n=12)	-0.06	(0.75)
Psychotherapy	0.37 (n=86)	0.33 (n=14)	-0.04	(0.81)
Either Use	0.52	0.43	-0.09	(0.52)

p-value on the difference in parentheses

Table 8.50 presents the estimated proportion of the 1998 MEP depression (NOS) disorders samples that also fit the sample definition in the 1997 MEPS. The evidence suggests that there is a significant difference between CAM users and nonusers for each of the sample definitions, except the pharmacotherapy users.

Table 8.50 Proportion of 1998 Samples with 1997 Sample Identifier for Depression (NOS) Disorders

Sample Definition	Rate of 1997 Identifier		Difference	p-value
	NonCAM (n=648)	CAM (n=72)		
Condition Identifier	0.79 (n=363)	0.65 (n=42)	-0.14	(0.00)
Pharmacotherapy	0.71 (n=234)	0.56 (n=34)	-0.15	(0.05)
Psychotherapy	0.53 (n=403)	0.59 (n=48)	-0.06	(0.50)
Either Use	0.70	0.58	-0.12	(0.10)

p-value on the difference in parentheses

8.4.5 Defining Useful Measures of Effect

The following (Table 8.51 - Table 8.55) presents the odds ratios of logistic models of the primary and secondary measures of effect for this analysis by the five mental health disorders for the four sample constructions (by condition identifier, by pharmacotherapy use, by psychotherapy use, and by either pharmacotherapy or psychotherapy use) using the full MEPS sample. These measures of effect identify meaningful differences between a random individual and an individual with a mental health disorder. This evidence suggests the measures of effect for this analysis are useful.

This research initially considered the two other measures of effect, the probability of improved self-reported mental health status and the probability of nondecreasing self-reported mental health status. However, these measures of effect do a markedly poor job of differentiating between individuals with a mental health disorder and a random person in MEPS. These measures of effect were replaced by the probability of good self-reported mental health status, a measure that does an excellent job of differentiating between individuals with mental health disorders and a random individual in MEPS.

Note that the sign of the primary and secondary measures of effect have the expected sign. A higher probability of having good self-reported mental health status is related to a lower probability of fitting any of the sample definitions. A higher probability of having a

limitation (IADL, functional, social, or cognitive) in round 1 is related to a higher probability of fitting any of the sample definitions. This empirical finding is consistent with the prior expectations based on the diagnostic criterion of these mental health conditions presented in chapter 5.

The following tables present the odds ratios from the following logistic model.

$$Prob(\text{Sample Definition}_i) = f(\text{Effect}_i)$$

Table 8.51 Logistic Model of Fitting Sample Definitions of Affective Disorders in Terms Of Effect Measures Full MEPS Sample

Effect Measure	Sample Definition			
	Condition ID	Pharmacotherapy Use	Psychotherapy Use	Either Use
Prob(Good MH)	0.18 (0.00)	0.16 (0.00)	0.13 (0.00)	0.17 (0.00)
IADL Limitations	3.67 (0.00)	3.78 (0.00)	3.25 (0.00)	3.63 (0.00)
Function Limitation	2.51 (0.00)	3.25 (0.00)	2.36 (0.00)	2.89 (0.00)
Social Limitation	5.05 (0.00)	5.47 (0.00)	6.55 (0.00)	5.42 (0.00)
Cognitive Limitation	3.71 (0.00)	4.66 (0.00)	4.26 (0.00)	4.14 (0.00)

Estimation using the full adult MEPS data set (n=15216); estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.52 Logistic Model of Fitting Sample Definitions of Anxiety Disorders in Terms Of Effect Measures for Full MEPS Sample

Effect Measure	Sample Definition			
	Condition ID	Pharmacotherapy Use	Psychotherapy Use	Either Use
Prob(Good MH)	0.25 (0.00)	0.20 (0.00)	0.16 (0.00)	0.20 (0.00)
IADL Limitations	2.25 (0.00)	2.89 (0.00)	2.23 (0.00)	2.75 (0.00)
Function Limitation	2.16 (0.00)	2.92 (0.00)	2.18 (0.00)	2.66 (0.00)
Social Limitation	3.25 (0.00)	4.01 (0.00)	4.66 (0.00)	4.22 (0.00)
Cognitive Limitation	2.72 (0.00)	3.78 (0.00)	3.63 (0.00)	3.60 (0.00)

Estimation using the full adult MEPS data set (n=15216); estimated odds ratio shown

Table 8.53 Logistic Model of Fitting Sample Definitions of Neurotic Disorders in Terms Of Effect Measures for Full MEPS Sample

Effect Measure	Sample Definition			
	Condition ID	Pharmacotherapy Use	Psychotherapy Use	Either Use
Prob(Good MH)	0.18 (0.00)	0.16 (0.00)	0.13 (0.00)	0.17 (0.00)
IADL Limitations	3.67 (0.00)	3.78 (0.00)	3.25 (0.00)	3.63 (0.00)
Function Limitation	2.51 (0.00)	3.25 (0.00)	2.36 (0.00)	2.89 (0.00)
Social Limitation	5.05 (0.00)	5.47 (0.00)	6.55 (0.00)	5.42 (0.00)
Cognitive Limitation	3.71 (0.00)	4.66 (0.00)	4.26 (0.00)	4.14 (0.00)

Estimation using the full adult MEPS data set (n=15216); estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.54 Logistic Model of Fitting Sample Definitions of Acute Stress Disorders in Terms Of Effect Measures for Full MEPS Sample

Effect Measure	Sample Definition			
	Condition ID	Pharmacotherapy Use	Psychotherapy Use	Either Use
Prob(Good MH)	0.15 (0.00)	0.14 (0.00)	0.11 (0.00)	0.13 (0.00)
IADL Limitations	2.97 (0.00)	3.71 (0.00)	3.03 (0.00)	3.71 (0.00)
Function Limitation	3.22 (0.00)	3.86 (0.00)	3.06 (0.00)	3.74 (0.00)
Social Limitation	4.90 (0.00)	5.87 (0.00)	6.55 (0.00)	5.87 (0.00)
Cognitive Limitation	3.74 (0.00)	4.53 (0.00)	4.22 (0.00)	4.57 (0.00)

Estimation using the full adult MEPS data set (n=15216); estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 8.55 Logistic Model of Fitting Sample Definitions of Depression (NOS) Disorders in Terms Of Effect Measures for Full MEPS Sample

Effect Measure	Sample Definition			
	Condition ID	Pharmacotherapy Use	Psychotherapy Use	Either Use
Prob(Good MH)	0.38 (0.00)	0.33 (0.00)	0.25 (0.00)	0.31 (0.00)
IADL Limitations	2.97 (0.00)	3.69 (0.00)	3.04 (0.00)	3.70 (0.00)
Function Limitation	1.70 (0.00)	2.18 (0.00)	1.84 (0.01)	2.01 (0.00)
Social Limitation	2.12 (0.00)	2.14 (0.02)	2.61 (0.00)	2.61 (0.00)
Cognitive Limitation	4.92 (0.00)	5.89 (0.00)	6.53 (0.00)	5.90 (0.00)

Estimation using the full adult MEPS data set (n=15216); estimated odds ratio shown; p-values of coefficient estimates in parentheses

Chapter 9

EMPIRICAL RESULTS

9.1 Outlining the Results

This chapter presents the empirical evidence on the cost-effectiveness of complementary and alternative medicine (CAM) for individuals with mental health disorders as well as measures of uncertainty. It is the comparison of costs and effects that is at the heart of this cost-effectiveness analysis and drives any recommendation of CAM as a good use of scarce resources in treating mental health disorders. Given the observational nature of the data, potential self-selection bias is investigated. The results of this analysis are generalized to other measures considered in previous research.

The costs and effects (primary and secondary) are estimated for the five mental health disorders (affective, anxiety, neurotic, acute stress, and depression (NOS)) for each of the sample constructions (condition identifier, pharmacotherapy use, psychotherapy use, either pharmacotherapy or psychotherapy use). The results presented are the unconditional means with no attempt to mitigate potential self-selection bias. The incremental cost-effectiveness ratio (ICER) and associated quadrants in the incremental cost-incremental effectiveness spacer are estimated using the primary measure of effect.

The cost and effect data is bootstrapped to create the 5,000 replicates of the ICER using the primary measure of effect and cost-effectiveness acceptability curves (CEACs) are constructed to describe the uncertainty in the ICER point estimate without attempts to mitigate potential self-selection bias.

The problem of self-selection bias is described. Four methods are used to investigate potential self-selection bias. Each method for investigating potential self-selection bias uses the incremental net benefit framework to estimate cost-effectiveness.

The first method to investigate potential self-selection bias estimates the incremental net benefit with controls for observable characteristics. Both unconditional and conditional estimates of incremental net benefit are presented for different values of a unit of effect each sample definition.

The second method to investigate potential self-selection bias estimates the incremental net benefit using propensity score matching to generate a matched sample of CAM users and nonusers. The effects, cost, and incremental cost-effectiveness ratio are estimated for the matched samples for each mental health disorder sample definition. Both matched and unmatched estimates of incremental net benefit are presented for different values of a unit of effect for each sample definition.

The third method to investigate potential self-selection bias estimates the incremental net benefit using inverse propensity score weighting on the each of the full samples of CAM users and nonusers. Both weighted and unweighted estimates of incremental net benefit are presented for different values of a unit of effect for each sample definition.

The fourth method to investigate potential self-selection bias estimates the incremental net benefit using the proportion of CAM users in a local measure of geography (excluding the individual) as an instrument on the decision to seek CAM treatment. Areas with higher rates of CAM use may indicate a greater availability of CAM providers—a factor that is positively correlated with the decision to seek treatment, but unrelated to the outcome (except through the influence on the decision to seek treatment). Both instrumented and unconditional estimates of incremental net benefit are presented for different values of a unit of effect for each sample definition.

Finally, the results of this analysis are generalized to other measures used in previous research. To generalize the results, a linear transformation of the primary and secondary measures to two measures of global health and two measures of labor market outcomes are estimated using a later year of the Medical Panel Expenditure Survey (MEPS). The results of this analysis are generalized to the EQ-5D, the SF-12 (two global health measures, mean number of days missed, and the probability of long-term days missed).

9.2 Incremental Cost-Effectiveness Ratio Estimates

The following section estimates the costs, effects, incremental cost-effectiveness ratio (ICER), and associated quadrant for each of the mental health disorders groups (affective, anxiety, neurotic, acute stress, and depression (NOS)) and by the four sample definitions (by condition identifier, by pharmacotherapy use, by psychotherapy use, by either pharmacotherapy or psychotherapy use).

Recall the incremental cost-effectiveness ratio is given by:

$$ICER = \frac{\Delta Cost}{\Delta Effect}$$

The quadrants of the incremental cost-incremental effectiveness space for a difference in cost and a difference in effect for an associated ICER are defined as the following:

$\Delta C > 0, \Delta E > 0$	Quadrant I
$\Delta C > 0, \Delta E < 0$	Quadrant II
$\Delta C < 0, \Delta E < 0$	Quadrant III
$\Delta C < 0, \Delta E > 0$	Quadrant IV

Table 9.1 presents the costs, effect, and cost-effectiveness information for the four sample definitions of the affective disorders groups. The primary measure of effect, the probability of good mental health, is lower for individuals with affective disorders than for any other mental health disorders group. The secondary measures of effect, the probability of functional, instrumental activities of daily living (IADL), social, or cognitive limitations, are all higher for complementary and alternative medicine (CAM) users than for CAM nonusers. The total cost is higher for individuals with affective disorders than for the anxiety, neurotic, and acute stress disorders. There is some evidence to suggest an increase

in the primary measure of effect for the individuals with a condition identifier of affective disorders and for affective disorders psychotherapy users, though these differences are not statistically significant at the 0.10 level of significance. There is some evidence to suggest a decrease in the primary measure of effect for affective disorders pharmacotherapy users or either pharmacotherapy or psychotherapy users.

Estimates on pharmacotherapy charges, office-based charges, outpatient-based charges, and CAM charges are presented. Office-based charges represent the largest source of cost for each of the sample definitions of affective disorders. CAM users have higher level of each source of cost and higher total cost than CAM nonusers for each of the sample definitions. Interestingly, affective disorders CAM users have the lowest average CAM charges of all the mental health disorders groups. The psychotherapy-related charges are the most significant source of the difference in total cost between CAM users and nonusers.

Two of the affective disorders samples have a difference in cost and a difference in effect located in quadrant I (where CAM is more effective, but also more costly). For individuals with affective disorders that use psychotherapy the ICER point estimate is 187.14. If individuals are willing-to-pay more than \$187 for a 1 percent increase in the probability of good mental health, than the evidence suggest that CAM is a cost-effective additional form of treatment. The cost per unit of effect is higher for individuals with affective disorders than for individuals with anxiety, neurotic, or acute stress disorders.

For individuals with affective disorders that use pharmacotherapy or either pharmacotherapy or psychotherapy the evidence suggests that CAM is not as effective and also more costly.

Table 9.1 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Affective Disorders

Effects	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM (n=104)	CAM (n=21)	NonCAM (n=69)	CAM (n=16)	NonCAM (n=64)	CAM (n=15)	NonCAM (n=78)	CAM (n=17)
Prob(Good MH)	0.5288	0.5500	0.5217	0.4375	0.4531	0.5333	0.5000	0.4706
IADL Limitations	0.1346	0.2000	0.1304	0.2500	0.1563	0.2000	0.1282	0.2353
Functional Limitations	0.2596	0.4000	0.2754	0.5000	0.2969	0.4667	0.2821	0.4706
Social Limitations	0.2500	0.3500	0.2899	0.4375	0.3125	0.4000	0.2821	0.4118
Cognitive Limitations	0.2885	0.4000	0.3188	0.5000	0.3906	0.4667	0.3333	0.4706
Costs:								
Pharmacotherapy	471.87	581.14	711.23	726.43	677.43	703.32	629.17	683.69
Office-based	864.62	1519.74	1188.76	1894.67	1405.01	2026.32	1152.83	1787.93
Outpatient-based	40.74	649.01	61.40	811.26	66.20	865.35	54.31	763.54
CAM	0.00	96.00	0.00	80.00	0.00	54.67	0.00	77.65
Total Cost	1377.23	2845.89	1961.39	3512.36	2148.63	3649.65	1836.31	3312.81
ICER (with primary)	694.27		-184.11		187.14		-502.01	
Quadrant	I		II		I		II	

Table 9.2 presents the costs, effect, and cost-effectiveness information for the four sample definitions of the anxiety disorders groups. There is some evidence to suggest an increase in the primary measure of effect for individuals with an anxiety disorder and for anxiety disorders psychotherapy users, though these differences are not statistically significant at the 0.10 level of significance. There is some evidence to suggest a decrease in the primary measure of effect for individuals with anxiety disorders pharmacotherapy or either pharmacotherapy users or psychotherapy users. There is mixed evidence to suggest an improvement in the secondary measures of effect (a decrease in the probability of a limitation). There is a decrease in the probability of cognitive or IADL limitations for each of the sample definitions, but an increase in the probability of social limitations for each of the sample definitions for CAM users. None of the differences in either the primary or secondary measures are statistically significant at the 0.10 level of significance.

Office-based charges represent the largest source of cost for each of the sample definitions of anxiety disorders, followed closely by pharmacotherapy charges. CAM users

have lower levels of pharmacotherapy and psychotherapy costs than CAM nonusers for each of the sample definitions. The level of CAM charges is similar to the level of charges for psychotherapy. This evidence implies that CAM users with anxiety disorders are substituting CAM treatment for both pharmacotherapy and psychotherapy treatment.

Two of the anxiety disorders samples have a difference in cost and a difference in effect located in quadrant IV. For anxiety disorders psychotherapy users or either psychotherapy or pharmacotherapy users the evidence suggests that CAM is more effective and less costly. However, a large number of individuals with anxiety disorders do not seek any form of treatment. For all individuals identified with an anxiety disorder CAM treatment is more effective and more costly, though these differences are not statistically significant at the 0.10 level of significance. For this sample (the condition identifier), the incremental cost-effectiveness ratio estimate is 7.72, indicating a very low cost per unit of improved effect.

For anxiety disorders pharmacotherapy users the evidence suggests that CAM is not as effective and also more costly.

Table 9.2 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Anxiety Disorders

	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM (n=682)	CAM (n=96)	NonCAM (n=326)	CAM (n=48)	NonCAM (n=246)	Effect (n=37)	NonCAM (n=410)	CAM (n=59)
Effects:								
Prob(Good MH)	0.7713	0.8125	0.7209	0.7083	0.6748	0.7568	0.7220	0.7458
IADL Limitations	0.0880	0.0729	0.1104	0.1042	0.0894	0.0811	0.1049	0.1017
Functional Limitations	0.2317	0.2188	0.2914	0.2708	0.2317	0.2703	0.2683	0.2881
Social Limitations	0.1276	0.1563	0.1687	0.2292	0.1707	0.1892	0.1634	0.2034
Cognitive Limitations	0.1246	0.1146	0.1595	0.1042	0.1748	0.1622	0.1585	0.1356
Costs:								
Pharmacotherapy	148.23	98.74	310.11	197.47	266.49	153.24	246.57	160.66
Office-based	261.76	150.12	345.38	248.11	725.70	389.49	435.42	244.26
Outpatient-based	21.93	0.68	34.85	1.35	60.79	1.76	36.47	1.10
CAM	0.00	214.22	0.00	251.42	0.00	238.73	0.00	273.95
Total Cost	431.92	463.75	690.34	698.35	1052.98	783.21	718.47	679.96
ICER (with primary)	7.72		-6.39		-32.91		-16.17	
Quadrant	I		II		IV		IV	

Table 9.3 presents the costs, effect, and cost-effectiveness information for the four sample definitions of the neurotic disorders groups. There is some evidence to suggest an increase in the primary measure of effect for the all sample definitions (by condition identifier, by pharmacotherapy use, by psychotherapy use, and by either pharmacotherapy or psychotherapy use) though these differences are not statistically significant at the 0.10 level of significance. There is some mixed evidence to suggest an improvement in the secondary measures of effect (a decrease in the probability of a limitation). There is a decrease in the probability of cognitive limitations for each of the neurotic disorders sample definitions, though this difference is not statistically significant at the 0.10 level of significance. There is an increase in the probability of each of the four limitations for CAM users for neurotic disorders psychotherapy users.

Office-based charges represent the largest source of cost for each of the sample definitions of neurotic disorders, except for the CAM nonusers in the pharmacotherapy use

sample. CAM users have lower level of pharmacotherapy and psychotherapy costs than CAM nonusers for each of the sample definitions. The level of CAM charges is similar to the level of charges for psychotherapy. This evidence implies that CAM users with neurotic disorders are substituting CAM treatment for both pharmacotherapy and psychotherapy treatment. The mean level of CAM use for neurotic disorders groups is higher than the for the affective disorders groups.

Two of the neurotic disorders samples have a difference in cost and a difference in effect located in quadrant IV. For neurotic disorders psychotherapy users or either psychotherapy or pharmacotherapy users the evidence suggests that CAM is more effective and less costly. For all individuals identified with an anxiety disorder and for pharmacotherapy users CAM treatment is more effective and more costly. None of these differences are statistically significant at the 0.10 level of significance. The incremental cost-effectiveness ratio estimate indicates a higher cost per unit of effect than the anxiety disorders groups, but a lower cost per unit of effect than the affective disorders groups.

Table 9.3 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Neurotic Disorders

	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM (n=439)	CAM (n=63)	NonCAM (n=258)	CAM (n=39)	NonCAM (n=176)	CAM (n=26)	NonCAM (n=307)	CAM (n=47)
Effects:								
Prob(Good MH)	0.7244	0.7619	0.6899	0.7179	0.6193	0.7692	0.6906	0.7234
IADL Limitations	0.1298	0.1429	0.1357	0.1538	0.1250	0.1154	0.1303	0.1489
Functional Limitations	0.2574	0.2698	0.3178	0.2821	0.2557	0.2308	0.2866	0.2979
Social Limitations	0.1663	0.2063	0.2054	0.2308	0.2102	0.1154	0.1889	0.1915
Cognitive Limitations	0.1777	0.1746	0.2054	0.1282	0.2386	0.1538	0.1987	0.1489
Costs:								
Pharmacotherapy	202.78	159.02	345.03	256.87	359.84	278.83	289.96	213.15
Office-based	311.74	214.71	309.89	291.52	777.57	520.25	445.78	287.80
Outpatient-based	40.42	1.03	59.74	1.67	100.82	2.50	57.80	1.38
CAM	0.00	232.05	0.00	254.87	0.00	162.23	0.00	247.83
Total Cost	554.93	606.80	714.67	804.94	1238.23	963.80	793.54	750.16
ICER (with primary)	13.82		32.21		-18.31		-13.20	
Quadrant	I		I		IV		IV	

Table 9.4 presents the costs, effect, and cost-effectiveness information for the four sample definitions of the acute stress disorders groups. There is some evidence to suggest an increase in the primary measure of effect for the all sample definitions, except the pharmacotherapy use sample. None of these differences are statistically significant at the 0.10 level of significance. There is some mixed evidence to suggest an improvement in the secondary measures of effect (a decrease in the probability of a limitation). There is a decrease in the probability of IADL for each of the sample definitions, though this difference is not statistically significant at the 0.10 level of significance. There is an increase in the probability of function and social limitations for each of the sample definitions.

Office-based charges represent the largest source of cost for each of the sample definitions of acute stress disorders. CAM users have lower level of pharmacotherapy and psychotherapy costs than CAM nonusers for each of the sample definitions. This evidence implies that CAM users with acute stress disorders are substituting CAM treatment for both

pharmacotherapy and psychotherapy treatment. The mean level of CAM use for acute stress disorders groups is higher than the for the affective disorders groups.

Two of the acute stress disorders samples have a difference in cost and a difference in effect located in quadrant IV. For acute stress disorders psychotherapy users or either psychotherapy or pharmacotherapy users the evidence suggests that CAM is more effective and less costly. For all individuals identified with acute stress disorder CAM treatment is more effective and more costly, though the differences are not statistically significant at the 0.10 level of significance. The incremental cost-effectiveness ratio estimate indicates a higher cost per unit of effect than the anxiety disorders groups, but a lower cost per unit of effect than the affective disorders groups.

For acute stress disorders pharmacotherapy users the evidence suggests that CAM is less effective, but also less costly (quadrant III). An individual may be willing to accept a lower effect if there are associated reductions in costs. The incremental cost-effectiveness ratio estimate should be interpreted as the cost saved per unit of effect. If the individual is willing to accept treatment if it saves \$10 per unit of effect, than the evidence suggests that CAM treatment is a cost-effective (i.e., the cost savings are greater).

Table 9.4 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Acute Stress Disorders

	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM (n=306)	CAM (n=51)	NonCAM (n=97)	CAM (n=12)	NonCAM (n=101)	CAM (n=18)	NonCAM (n=144)	CAM (n=21)
Effects:								
Prob(Good MH)	0.8366	0.8627	0.7835	0.7500	0.7921	0.8333	0.7917	0.8095
IADL Limitations	0.0621	0.0392	0.0825	0.0000	0.0396	0.0000	0.0694	0.0000
Functional Limitations	0.1961	0.1961	0.2371	0.2500	0.1980	0.2778	0.2222	0.2381
Social Limitations	0.0784	0.1176	0.0928	0.1667	0.0792	0.1667	0.1042	0.1429
Cognitive Limitations	0.0817	0.1373	0.0928	0.0833	0.0990	0.1667	0.1042	0.1429
Costs:								
Pharmacotherapy	83.19	46.36	262.42	197.02	145.73	66.95	176.77	112.58
Office-based	229.65	122.14	506.34	409.52	695.78	346.07	488.01	296.63
Outpatient-based	10.59	0.00	20.38	0.00	32.07	0.00	22.50	0.00
CAM	0.00	199.49	0.00	143.17	0.00	271.83	0.00	261.57
Total Cost	323.42	367.99	789.15	749.70	873.59	684.85	687.28	670.78
ICER (with primary)	17.05		11.77		-45.75		-9.24	
Quadrant	I		III		IV		IV	

Table 9.5 presents the costs, effect, and cost-effectiveness information for the four sample definitions of the depression (NOS) disorders groups. There is some evidence to suggest a decrease in the primary measure of effect for the all sample definitions, except the psychotherapy use sample, though these differences are not statistically significant at the 0.10 level of significance. There is some mixed evidence to suggest an improvement in the secondary measures of effect (a decrease in the probability of a limitation). There is a decrease in the probability of IADL for each of the sample definitions, though this difference is not statistically significant at the 0.10 level of significance. There is an increase in the probability of social limitations for each of the sample definitions.

Pharmacotherapy charges represent the largest source of cost for each of the sample definitions of depression (NOS) disorders, except for the psychotherapy users. CAM users have higher level of pharmacotherapy and psychotherapy costs than CAM nonusers for each of the sample definitions. The mean level of CAM use for depression (NOS) disorders

groups are higher than the for the other mental health disorders groups. For each of the sample definitions CAM users have greater costs than CAM nonusers. The greatest source of cost difference comes from the difference in office-based costs.

All of the depression (NOS) disorders samples have a difference in cost and a difference in effect located in quadrant II, except for adults that use psychotherapy. The evidence suggests that CAM is less effective and more costly.

Table 9.5 Costs, Effects, and Incremental Cost-Effectiveness Ratios for Depression (NOS) Disorders

	Sample Definition							
	Condition ID		Pharmacotherapy Use		Psychotherapy Use		Either Use	
	NonCAM (n=1030)	CAM (n=116)	NonCAM (n=600)	CAM (n=66)	NonCAM (n=380)	CAM (n=60)	NonCAM (n=673)	CAM (n=77)
Effects:								
Prob(Good MH)	0.7039	0.6638	0.6717	0.6061	0.5868	0.6167	0.6642	0.6364
IADL Limitations	0.1087	0.0603	0.1333	0.0909	0.1237	0.0500	0.1337	0.0779
Functional Limitations	0.2932	0.2759	0.3300	0.4091	0.2921	0.3333	0.3254	0.3636
Social Limitations	0.1592	0.1638	0.1883	0.2424	0.1868	0.2167	0.1902	0.2208
Cognitive Limitations	0.1573	0.1552	0.1900	0.2121	0.2211	0.1833	0.1902	0.1818
Costs:								
Pharmacotherapy	278.08	284.65	477.37	500.29	477.10	495.85	425.59	428.82
Office-based	259.79	571.81	387.29	921.49	704.17	1105.50	397.60	861.43
Outpatient-based	31.10	38.49	50.45	62.46	84.31	74.41	47.60	57.98
CAM	0.00	277.37	0.00	367.27	0.00	313.72	0.00	335.44
Total Cost	568.98	1172.32	915.11	1851.51	1265.58	1989.47	870.80	1683.67
ICER (with primary)	-150.50		-142.73		242.72		-292.12	
Quadrant	II		II		I		II	

The evidence suggests that CAM is more likely to be a cost-effective form of treatment for the anxiety, neurotic, and acute stress disorders than for the affective or depression (NOS) disorders.

The evidence suggests that CAM is more likely to be a cost-effective form of treatment for psychotherapy users than for pharmacotherapy users.

9.3 Bootstrapped Cost-Effectiveness Acceptability Curves

To assess the uncertainty of the incremental cost-effectiveness ratio (ICER) 5,000 bootstraps of the cost and effect data for complementary and alternative (CAM) users and nonusers for each of the five mental health disorders (affective, anxiety, neurotic, acute stress, and depression (NOS) disorders) for each of the four sample definitions (condition identifier, pharmacotherapy use, psychotherapy use, and either pharmacotherapy or psychotherapy use) were constructed. The bootstraps are presented in the incremental cost-incremental effect space for a visual presentation of uncertainty. The difference in effect is measured on the horizontal axis and the difference in cost is measured on the vertical axis. The bootstraps for each of the five mental health disorders by each of the four sample definitions are presented in Appendix A.

The cost-effectiveness acceptability curves based on the bootstrap replicates are another method to quantify the uncertainty of the incremental cost-effectiveness ratios. Recall that the cost-effectiveness acceptability curve (CEAC) can be interpreted as the probability that treatment is cost-effective for a given value of a unit of effect(λ).

$$CEAC(\lambda) = Prob(ICER < \lambda_{WTP} | \Delta E > 0) + Prob(ICER < \lambda_{WTA} | \Delta E < 0)$$

The probability of a treatment being cost-effective for a given value of a unit of effect is estimated as the proportion of the 5,000 bootstraps that are cost-effective (i.e., below the value of a unit of effect line in the incremental cost-incremental effectiveness space). Values of a unit of effect (either the willingness-to-pay for greater effect or willingness-to-accept a lower level of effect) are measured on the horizontal axis and the probability that treatment is cost-effective is measured on the vertical axis.

The bootstraps and cost-effectiveness acceptability curves for each of the five mental health disorders by each of the four sample definitions are presented in Appendix A. These serve as a baseline of estimation before the potential self-selection bias is investigated.

The following presents selected evidence on the uncertainty of the cost-effectiveness of CAM for certain mental health disorders. The focus here is on psychotherapy users.

The probability that CAM is cost-effective is estimated by the proportion of the bootstrap replicates that fall below the value of a unit of effect line (determined by the value of a unit of effect). At a zero willingness-to-pay for a unit of effect ($\lambda = 0$), the value of a unit of effect line is horizontal; only bootstrap replicates that are below the horizontal axis (representing lower cost) are considered cost-effective. As the willingness-to-pay for a unit of effect (i.e., the value of a unit of effect) is increased the value of a unit of effect line rotates at the origin. The bootstrap replicates in quadrant I that fall below the value of a unit of effect line now will be considered cost-effective. However, the bootstrap replicates in quadrant III that do not fall below the value of a unit of effect line will no longer be considered cost-effective.

To help establish the connection between the bootstrap replicates and the cost-effectiveness acceptability curves, consider the following two figures. As the value of a unit of effect ($WTP = \lambda$) increases, the slope of the value of a unit of effect line increases (effectively rotating it at the origin). Bootstrap replicates that fall below this value of a unit of effect line are considered cost-effective (equivalently, these bootstraps have a positive incremental net benefit). The proportion of the bootstrap replicates that fall below this value of a unit of effect line is the estimated probability that CAM is cost-effective.

Two values of a unit of effect are considered ($WTP = 100, 500$) both in the incremental cost-incremental effectiveness space and the cost-effectiveness acceptability curve (Figure 9.1 and Figure 9.2). The value of the cost-effectiveness acceptability curve at a given value of a unit of effect is calculated as the proportion of the bootstrap replicates that fall below that value of a unit of effect line.

As the value of a unit of effect increases, the bootstrap replicates in quadrant I will increase the proportion of cost-effective bootstraps that are now considered cost-effective. As the value of a unit of effect increases, the bootstrap replicates in quadrant III will decrease the proportion of cost-effectiveness bootstraps that are still considered cost-effective.

When the value of a unit of effect is zero, the only bootstrap replicates considered cost-effective are those below the horizontal axis (i.e., the treatment has a reduction in cost). These are the cost-effective bootstrap replicates if cost is the only consideration. When the value of a unit of effect is infinitely large, the only bootstrap replicates that are considered cost-effective are those to the right of the vertical axis (i.e., the treatment has an increase in effect). These are the cost-effective bootstrap replicates if effect is the only consideration.

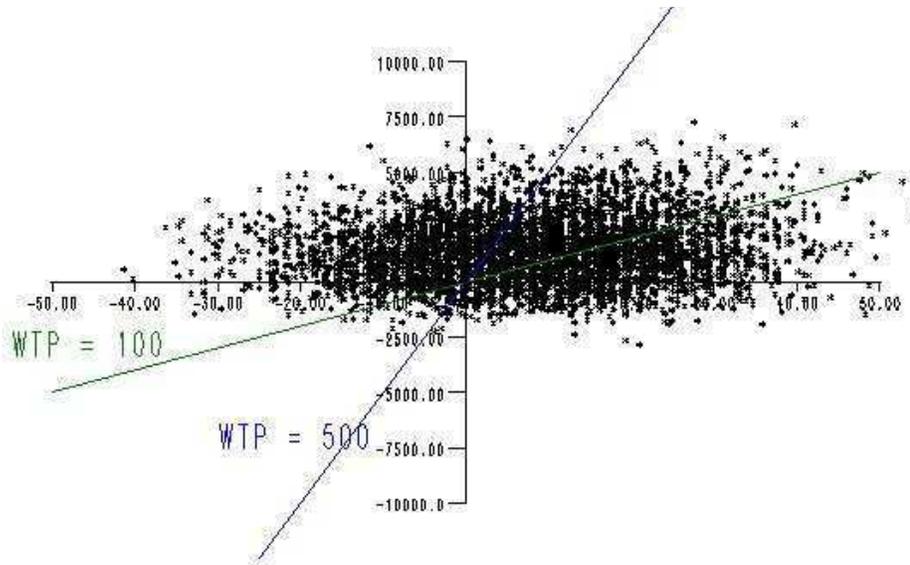


Figure 9.1 Bootstrap Replicates for Affective Disorders by Psychotherapy Use with Two Values of a Unit of Effect

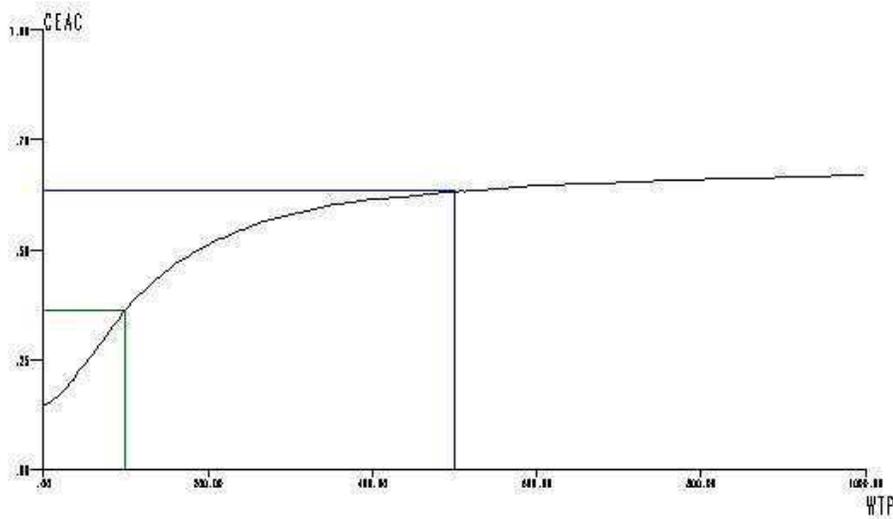


Figure 9.2 CEAC for Affective Disorders by Psychotherapy Use with Two Values of a Unit of Effect

For the affective disorders samples, the psychotherapy use sample has the strongest evidence for CAM as a cost-effective treatment. CAM is more effective, but also more costly for these psychotherapy users. Figure 9.3 plots the 5,000 bootstrap replicates in the incremental cost-incremental effectiveness space. Figure 9.4 graphs the cost-effectiveness acceptability curves, measuring the value of a unit of effect on the horizontal axis and the probability that CAM is cost-effective on the vertical axis.

At the value for a unit of effect of zero ($\lambda = 0$), a very small portion of bootstrap replicates are below the value of a unit of effect line. As the value for a unit of effect is increased, the bootstrap replicates in quadrant I below the value of a unit of effect line now are considered cost-effective. As the value for a unit of effect is increased, the bootstrap replicates in quadrant I that are considered cost-effective more than offset the small number of bootstrap replicates in quadrant III that are no longer considered cost-effective.

As the value for a unit of effect is increased, the probability that CAM is considered cost-effective increases for affective disorders psychotherapy users. However, there is an

upper bound on the probability that CAM is cost-effective around 0.75 (due to the number of bootstrap replicates located in quadrant II that will never be considered cost-effective).

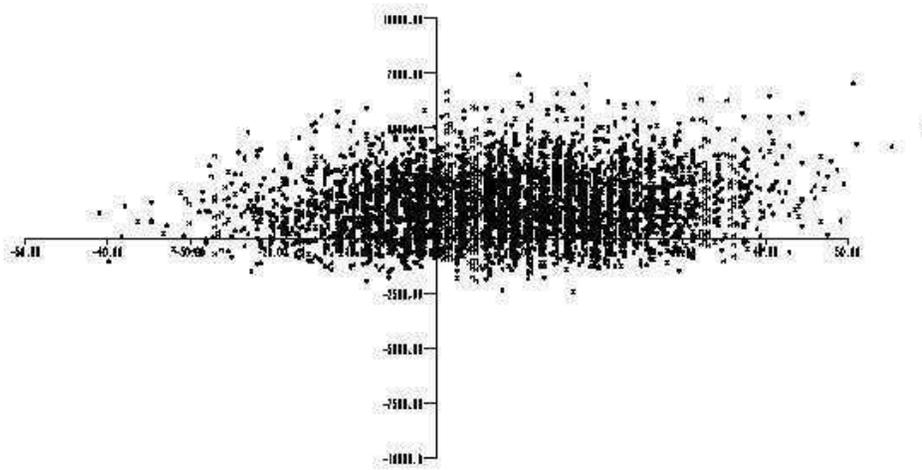


Figure 9.3 Bootstrap Replicates for Affective Disorders by Psychotherapy Use

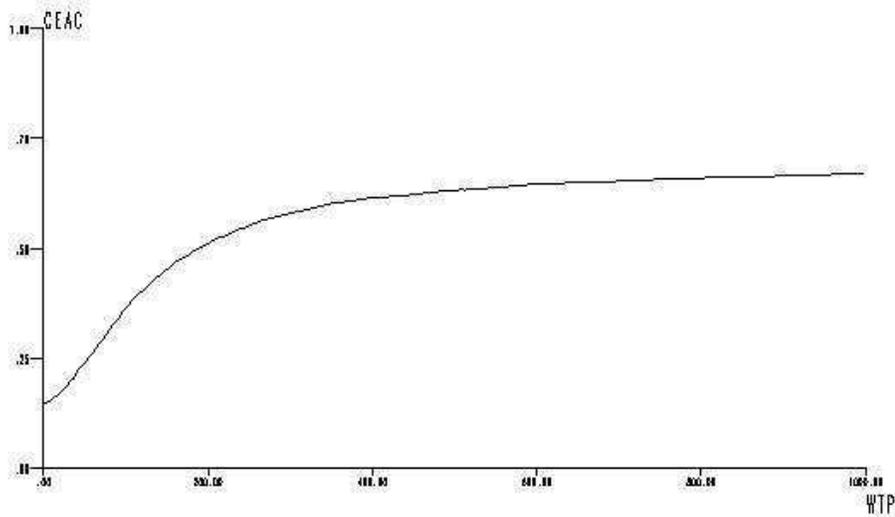


Figure 9.4 CEAC for Affective Disorders by Psychotherapy Use

For the anxiety disorders samples, the psychotherapy use sample has the strongest evidence for CAM as a cost-effective treatment. CAM is more effective and less costly for these psychotherapy users.

Figure 9.5 plots the 5,000 bootstrap replicates in the incremental cost-incremental effectiveness space for the anxiety disorders psychotherapy users. Figure 9.6 graphs the cost-effectiveness acceptability curves, measuring the value of a unit of effect on the horizontal axis and the probability that CAM is cost-effective on the vertical axis. There is a high probability that CAM is cost-effective for anxiety disorders psychotherapy users for a wide range of values of a unit of effect.

As the value of a unit of effect is increased, the probability that CAM is cost-effective decreases due to the bootstrap replicates located in quadrant III (lower effect and lower cost). The bootstrap replicates in quadrant III represent the cost-savings for a given unit of effect for CAM treatment. For this quadrant, as the willingness-to-accept increases, bootstrap replicates with a low cost-savings will no longer be considered cost-effective.

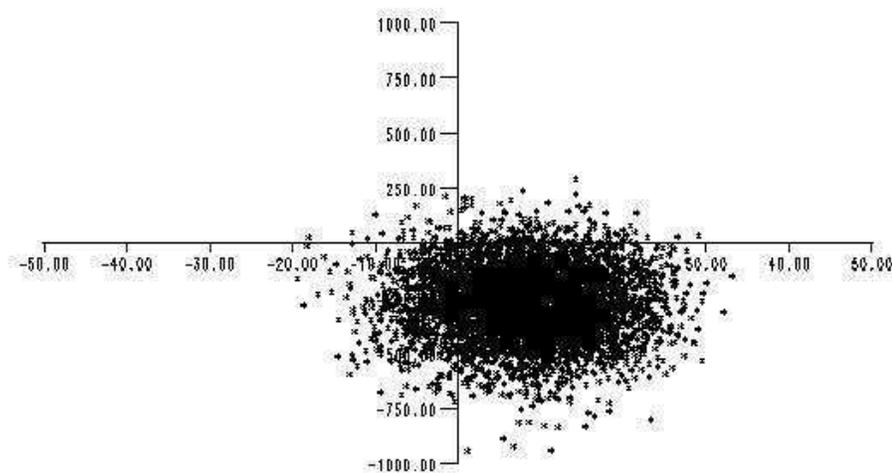


Figure 9.5 Bootstrap Replicates for Anxiety Disorders by Psychotherapy Use

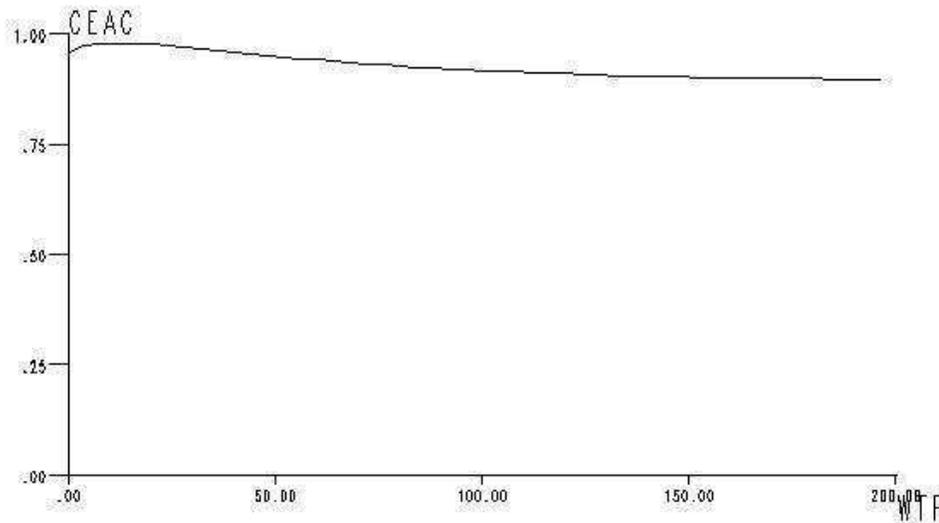


Figure 9.6 CEAC for Anxiety Disorders by Psychotherapy Use

For the neurotic disorders samples, the psychotherapy use sample has the strongest evidence for CAM as a cost-effective treatment. CAM is more effective and less costly for these psychotherapy users.

Figure 9.7 plots the 5,000 bootstrap replicates in the incremental cost-incremental effectiveness space for neurotic disorders psychotherapy users. Figure 9.8 graphs the cost-effectiveness acceptability curves, measuring the value of a unit of effect on the horizontal axis and the probability that CAM is cost-effective on the vertical axis. There is a high probability that CAM is cost-effective for neurotic disorders psychotherapy users for a wide range of values of a unit of effect.

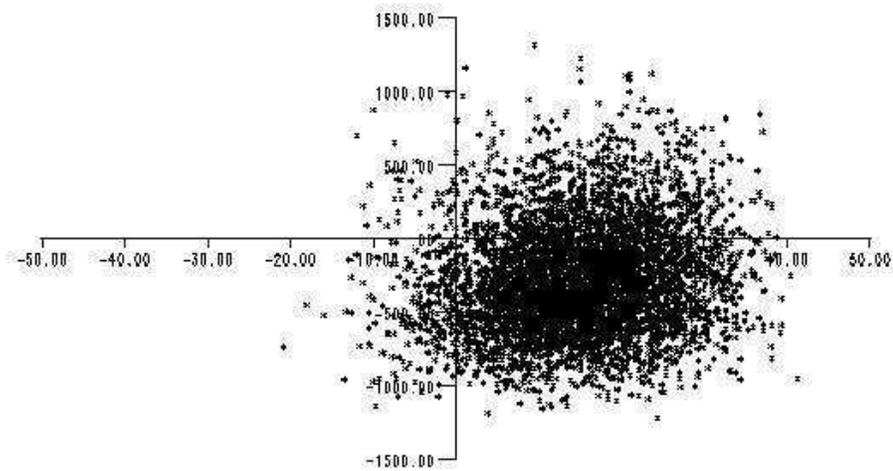


Figure 9.7 Bootstrap Replicates for Neurotic Disorders by Psychotherapy Use

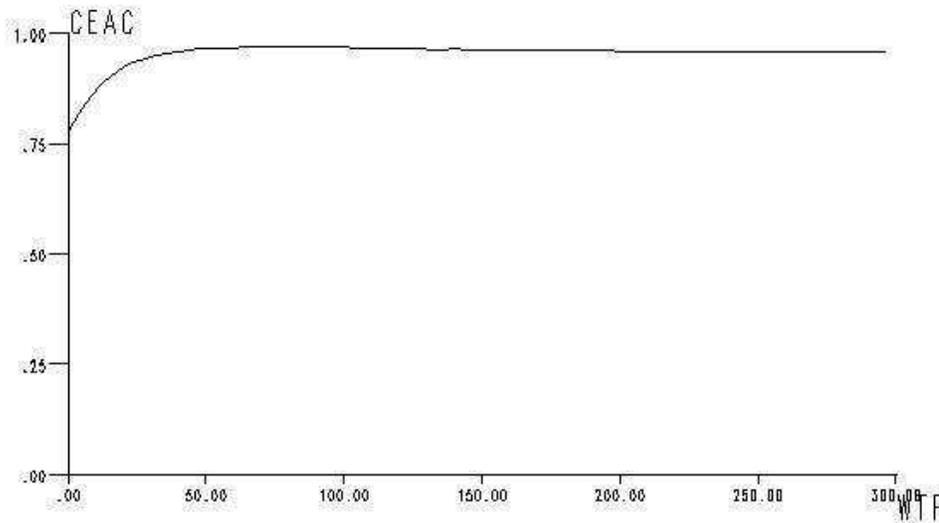


Figure 9.8 CEAC for Neurotic Disorders by Psychotherapy Use

For the acute stress disorders samples, the psychotherapy use sample has the strongest evidence for CAM as a cost-effective treatment. CAM is slightly more effective and more costly for these psychotherapy users.

Figure 9.9 plots the 5,000 bootstrap replicates in the incremental cost-incremental effectiveness space for acute stress disorders psychotherapy users. Figure 9.10 graphs the

cost-effectiveness acceptability curves, measuring the value of a unit of effect on the horizontal axis and the probability that CAM is cost-effective on the vertical axis. The probability that CAM is cost-effective for acute stress disorders psychotherapy users decreases as the value of a unit of effect is increased.

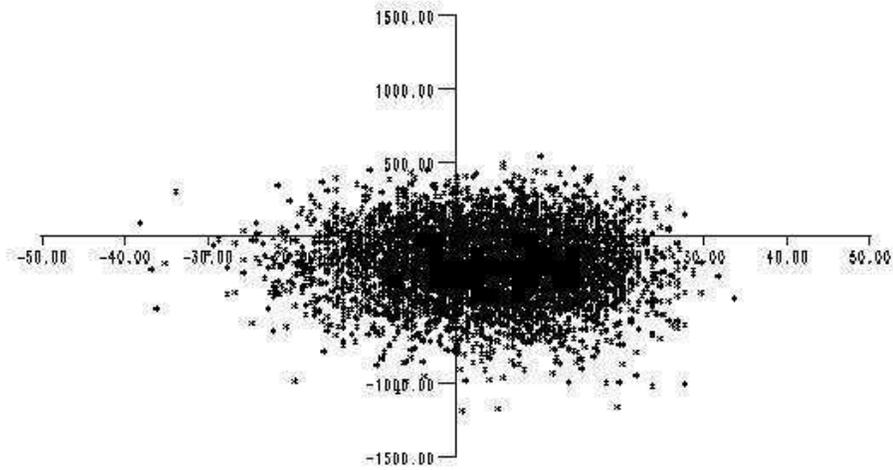


Figure 9.9 Bootstrap Replicates for Acute Stress Disorders by Psychotherapy Use

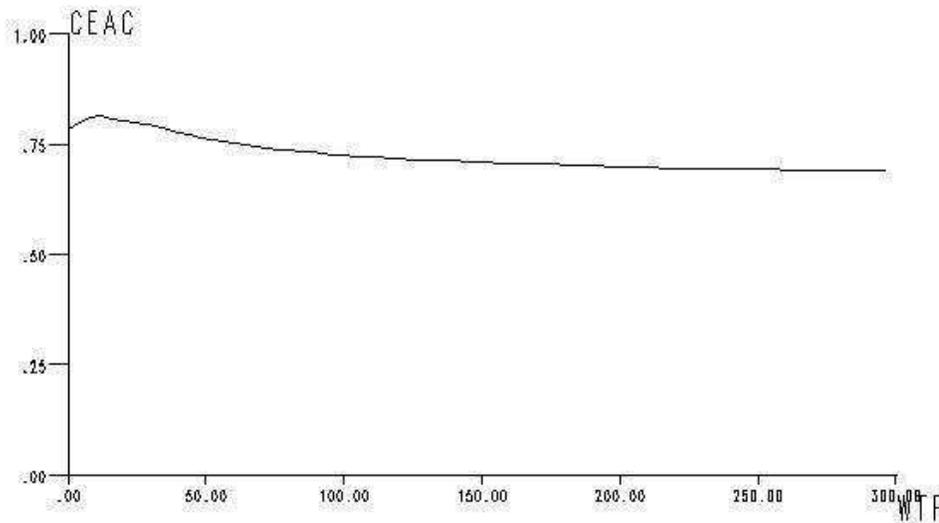


Figure 9.10 CEAC for Acute Stress Disorders by Psychotherapy Use

Figure 9.11 plots the 5,000 bootstrap replicates in the incremental cost-incremental effectiveness space for depression (NOS) disorders. Figure 9.12 graphs the cost-effectiveness acceptability curves, measuring the value of a unit of effect on the horizontal axis and the probability that CAM is cost-effective on the vertical axis.

At the value of a unit of effect of zero, ($\lambda = 0$), the effect of treatment does not matter; only a reduction in cost is relevant. When the value for a unit of effect is zero, there is a high probability that CAM will not reduce costs. As the value for a unit of effect approaches infinity, there is only weak evidence to suggest that CAM is a cost-effective treatment for depression (NOS) disorders psychotherapy users.

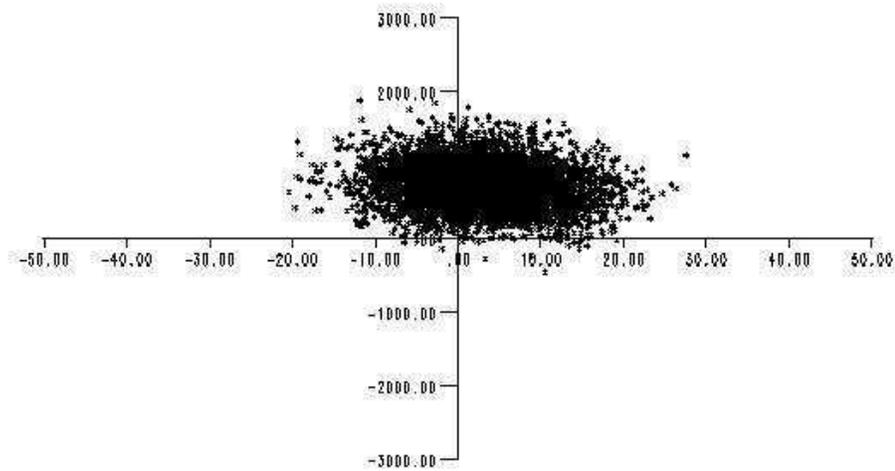


Figure 9.11 Bootstrap Replicates for Depression (NOS) Disorders by Psychotherapy Use

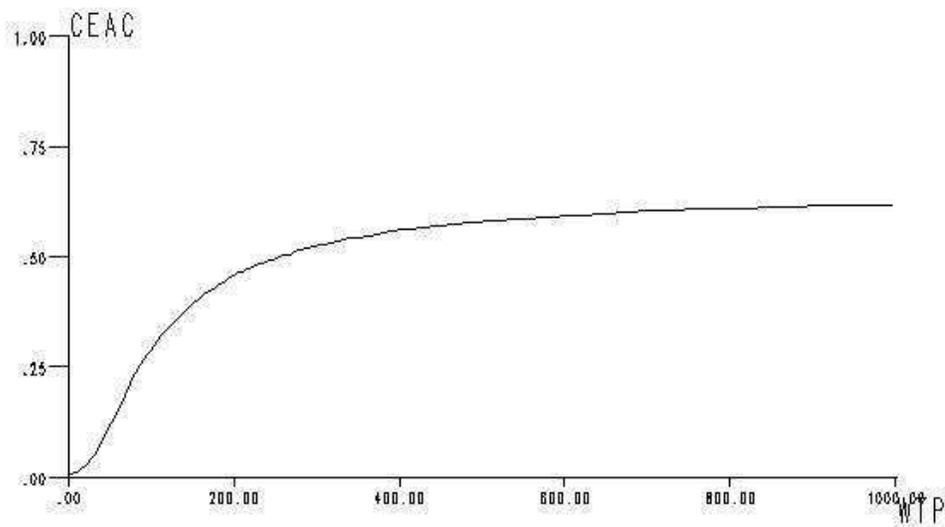


Figure 9.12 CEAC for Depression (NOS) Disorders by Psychotherapy Use

9.4 Investigating Potential Self-Selection Bias

Unlike past cost-effectiveness analyses that use randomized control trials, this analysis uses observational data to estimate cost-effectiveness. Individuals are not randomly assigned to either the control or treatment group, rather, they self-select into either control or treatment group. If the unobserved heterogeneity of the individuals is correlated with the decision to select into either treatment or control group, then the estimates of differences in costs and effects (and, thus, incremental cost-effectiveness ratios) will be biased.

This research investigates the potential self-selection bias in three ways. The first method uses observable characteristics of each of the full samples in the estimation of incremental net benefit (INB). The second method uses propensity score matching to construct samples to estimate incremental net benefit. The third method using inverse propensity score weighting to estimate incremental net benefit. The third method uses the rate of complementary and alternative medicine (CAM) use in a primary sampling unit (a measure of geography) as an instrument for the decision to see treatment in the estimation of incremental net benefit.

9.4.1 Controls for Observable Characteristics

Statistical differences in observable characteristics may be related to the unobservable heterogeneity that influences selection into either treatment or control. Earlier results (Table 8.6 - Table 8.55) present evidence on the extent to which complementary and alternative medicine (CAM) users and nonusers differ across observable characteristics. The following will present estimates of the incremental net benefit controlling for observable characteristics.

To estimate incremental net benefit for given value of effect(λ), net benefit is calculated for each observation in the control and treatment.

$$NB_i(\lambda) = \lambda * Effect_i - Cost_i$$

The following linear model estimates net benefit as a function of a treatment dummy variable(CAM_i) identifying observations in the treatment group.

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \varepsilon_i$$

The mirror image of the p-value (i.e., (1-(p-value))) of the hypothesis test on a positive coefficient on the treatment dummy yields an estimate of the cost-effectiveness-acceptability curves that is asymptotically equivalent to the nonparametric bootstrapping approach.

A simple extension of this basic incremental net benefit method would include observable characteristics(X_i):

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \Gamma X_i + \varepsilon_i$$

The following presents the estimations of incremental net benefit both with and without controls for the each of the mental health disorders by each of the sample definitions. The estimation of incremental net benefit without controls for observable characteristics is asymptotically equivalent to the results from the previous section. The estimation of incremental net benefit with controls for observable characteristics represents the first piece of evidence on the extent of potential self-selection bias related to unobservable heterogeneity.

Appendix B includes the cost-effectiveness acceptability curves (CEAC) with and without controls for each of the mental health disorders by each of the sample definitions. The following tables present different values of effect used in the construction of the cost-effectiveness acceptability curves for each of the mental health disorders samples. The cost-effectiveness acceptability curves are constructed with p-values and convey a measure of the uncertainty of incremental net benefit. Plotting the cost-effectiveness acceptability curves constructed both with and without controls helps demonstrate the importance of including

controls (i.e., about the potential of selection on the observables) on the uncertainty of cost-effectiveness.

Also in Appendix B are graphs of the 95% confidence intervals for the estimate of incremental net benefit estimated with and without controls and with controls. These convey information about the impact of including controls (i.e., about the potential of selection on the observables) on the uncertainty surrounding the incremental net benefit estimates.

For each of the affective disorders samples, including additional controls into the estimation of incremental net benefit slightly increase the probably that CAM is cost-effective for most values of a unit of effect. However, the estimation of incremental net benefit with controls is nearly identical to the estimation without controls for the condition identifier sample. Specific values of a unit of effect are presented in Table 9.6. The related cost-effectiveness acceptability curves and 95% confidence intervals for the estimated incremental net benefit are included in Appendix B and visually present these same results. For the affective disorders samples, the largest impact of adding controls on the probability that CAM is cost-effective is for the pharmacotherapy use sample. For each of the affective disorders samples, there is a tremendous overlap in the 95% confidence intervals for the estimated incremental net benefit.

These results suggest a downward bias in the initial unconditional estimates of incremental net benefit for the affective disorders. A negative correlation between seeking CAM treatment and the individual heterogeneity would produce this downward bias.

Table 9.6 Estimation of Incremental Net Benefit (With and Without Controls) For Affective Disorders

		Condition Identifier (n = 124)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-1468.66	-939.81	-410.96	117.88	646.73
Pr(CE)		(0.03)	(0.39)	(0.47)	(0.51)	(0.52)
With Controls						
Treatment		-1420.33	-960.93	-501.52	-42.12	417.29
Pr(CE)		(0.04)	(0.38)	(0.47)	(0.50)	(0.51)
		Pharmacotherapy Use (n=85)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-1550.96	-3656.94	-5762.92	-7868.90	-9974.88
Pr(CE)		(0.07)	(0.16)	(0.21)	(0.23)	(0.24)
With Controls						
Treatment		-1453.47	-2069.09	-2684.71	-3300.33	-3915.94
Pr(CE)		(0.10)	(0.29)	(0.35)	(0.38)	(0.39)
		Psychotherapy Use (n=79)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-1501.02	504.19	2509.40	4514.61	6519.82
Pr(CE)		(0.09)	(0.55)	(0.63)	(0.66)	(0.67)
With Controls						
Treatment		-1578.75	1234.02	4046.79	6859.57	9672.34
Pr(CE)		(0.09)	(0.63)	(0.71)	(0.74)	(0.75)
		Either Use (n=95)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-1476.50	-2211.80	-2947.09	-3682.38	-4417.68
Pr(CE)		(0.06)	(0.27)	(0.33)	(0.36)	(0.37)
With Controls						
Treatment		-1407.96	-914.80	-421.64	71.52	71.52
Pr(CE)		(0.08)	(0.40)	(0.47)	(0.50)	(0.52)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the anxiety disorders samples, including additional controls into the estimation of incremental net benefit decreases the probably that CAM is cost-effective for most values of a unit of effect. Specific values of a unit of effect are presented in Table 9.7. For the anxiety disorders samples, the largest impact of adding controls on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of adding controls on the probability that CAM is cost-effectiveness is for the pharmacotherapy use sample. For each of the samples, there is a large amount of overlap in the 95% confidence intervals for the estimated incremental net benefit.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for the anxiety disorders. A positive correlation between seeking CAM treatment and the individual heterogeneity would produce this upward bias. If an individual knows that CAM will work better for them, they would be more likely to seek CAM treatment. If that individual heterogeneity is related to the observable characteristics, then controlling for them in the estimation of incremental net benefit will reduce this self-selection bias.

Table 9.7 Estimation of Incremental Net Benefit (With and Without Controls) For Anxiety Disorders

		Condition Identifier (n = 778)				
λ		0.00	50.00	100.00	150.00	200.00
Without Controls						
Treatment		-31.82	174.37	380.57	586.76	792.96
Pr(CE)		(0.40)	(0.74)	(0.78)	(0.79)	(0.80)
With Controls						
Treatment		-48.63	-11.96	24.72	61.39	98.06
Pr(CE)		(0.35)	(0.48)	(0.52)	(0.54)	(0.54)
		Pharmacotherapy Use (n=374)				
λ		0.00	50.00	100.00	150.00	200.00
Without Controls						
Treatment		-8.01	-70.63	-133.26	-195.89	-258.52
Pr(CE)		(0.49)	(0.43)	(0.43)	(0.43)	(0.43)
With Controls						
Treatment		-57.15	-279.45	-501.74	-724.04	-946.34
Pr(CE)		(0.40)	(0.25)	(0.24)	(0.25)	(0.25)
		Psychotherapy Use (n=283)				
λ		0.00	50.00	100.00	150.00	200.00
Without Controls						
Treatment		269.77	679.57	1089.37	1499.17	1908.97
Pr(CE)		(0.80)	(0.89)	(0.88)	(0.87)	(0.87)
With Controls						
Treatment		185.96	370.35	554.74	739.12	923.51
Pr(CE)		(0.72)	(0.76)	(0.74)	(0.72)	(0.71)
		Either Use (n=469)				
λ		0.00	50.00	100.00	150.00	200.00
Without Controls						
Treatment		38.51	157.56	276.62	395.68	514.74
Pr(CE)		(0.58)	(0.66)	(0.66)	(0.66)	(0.66)
With Controls						
Treatment		19.45	-53.76	-126.97	-200.18	-200.18
Pr(CE)		(0.54)	(0.44)	(0.42)	(0.42)	(0.41)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the neurotic disorders samples, including additional controls into the estimation of incremental net benefit decreases the probably that CAM is cost-effective for most values of a unit of effect. However, when the value of a unit of effect is zero (and treatment is cost-effective only if it lower costs), adding controls increases the probability that treatment is cost-effective.

Specific values of a unit of effect are presented in Table 9.8. For the neurotic disorders samples, the largest impact of adding controls on the probability that CAM is cost-effective is for the pharmacotherapy use sample. The smallest impact of adding controls on the probability that CAM is cost-effective is for the psychotherapy use sample. For each of the samples, there is a large amount of overlap in the 95% confidence intervals for the estimated incremental net benefit.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for most values of a unit of effect for the neurotic disorders. Interestingly, the results indicate a downward bias in the initial estimate of cost and an upward bias in the estimate of effect.

Table 9.8 Estimation of Incremental Net Benefit (With and Without Controls) For Neurotic Disorders

		Condition Identifier (n = 502)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		-51.87	229.62	511.10	792.58	1074.07
Pr(CE)		(0.39)	(0.68)	(0.71)	(0.72)	(0.72)
With Controls						
Treatment		-16.88	-54.29	-91.71	-129.12	-166.54
Pr(CE)		(0.46)	(0.46)	(0.46)	(0.46)	(0.46)
		Pharmacotherapy Use (n=297)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		-90.27	119.93	330.12	540.32	750.52
Pr(CE)		(0.34)	(0.57)	(0.61)	(0.62)	(0.62)
With Controls						
Treatment		-28.41	-206.95	-385.48	-564.01	-742.55
Pr(CE)		(0.45)	(0.37)	(0.37)	(0.37)	(0.38)
		Psychotherapy Use (n=202)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		274.43	1398.77	2523.12	3647.46	4771.81
Pr(CE)		(0.75)	(0.94)	(0.94)	(0.94)	(0.94)
With Controls						
Treatment		336.53	962.50	1588.48	2214.46	2840.44
Pr(CE)		(0.79)	(0.87)	(0.85)	(0.83)	(0.83)
		Either Use (n=354)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		43.38	289.76	536.14	782.51	1028.89
Pr(CE)		(0.57)	(0.68)	(0.68)	(0.68)	(0.68)
With Controls						
Treatment		112.90	32.89	-47.13	-127.14	-127.14
Pr(CE)		(0.68)	(0.52)	(0.48)	(0.47)	(0.46)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the acute stress disorders samples, including additional controls into the estimation of incremental net benefit decreases the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.9. For the acute stress disorders samples, the largest impact of adding controls on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of adding controls on the probability that CAM is cost-effective is for the pharmacotherapy use sample. For each of the samples, there is a large amount of overlap in the 95% confidence intervals for the estimated incremental net benefit.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for most values of a unit of effect for the acute stress disorders. A positive correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias. If a person knows that CAM will work better for them, they would be more likely to seek CAM treatment. If that unobserved individual heterogeneity is related to the observable characteristics, then controlling for them in the estimation of incremental net benefit will reduce this self-selection bias.

Table 9.9 Estimation of Incremental Net Benefit (With and Without Controls) For Acute Stress Disorders

		Condition Identifier (n = 357)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		-44.56	151.51	347.59	543.67	739.75
Pr(CE)		(0.40)	(0.63)	(0.66)	(0.66)	(0.67)
With Controls						
Treatment		-132.03	-173.27	-214.51	-255.76	-297.00
Pr(CE)		(0.23)	(0.35)	(0.40)	(0.42)	(0.43)
		Pharmacotherapy Use (n=109)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		39.44	-211.85	-463.14	-714.42	-965.71
Pr(CE)		(0.53)	(0.43)	(0.41)	(0.41)	(0.40)
With Controls						
Treatment		-31.87	-449.01	-866.15	-1283.29	-1700.43
Pr(CE)		(0.48)	(0.35)	(0.33)	(0.33)	(0.33)
		Psychotherapy Use (n=119)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		188.74	498.14	807.55	1116.95	1426.36
Pr(CE)		(0.65)	(0.70)	(0.68)	(0.68)	(0.67)
With Controls						
Treatment		-88.44	-113.84	-139.23	-164.62	-190.02
Pr(CE)		(0.43)	(0.45)	(0.47)	(0.47)	(0.48)
		Either Use (n=165)				
λ		0.00	75.00	150.00	225.00	300.00
Without Controls						
Treatment		16.49	150.42	284.35	418.28	552.21
Pr(CE)		(0.52)	(0.57)	(0.57)	(0.57)	(0.57)
With Controls						
Treatment		-110.76	-253.41	-396.07	-538.72	-538.72
Pr(CE)		(0.39)	(0.38)	(0.39)	(0.40)	(0.40)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the depression (NOS) disorders samples, including additional controls into the estimation of incremental net benefit decreases the probably that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.10. For the depression (NOS) disorders samples, the largest impact of adding controls on the probability that CAM is cost-effective is for the psychotherapy use sample. The smallest impact of adding controls on the probability that CAM is cost-effective is for the pharmacotherapy use sample. For each of the samples, there is a large amount of overlap in the 95% confidence intervals for the estimated incremental net benefit. With or without controls, there is strong evidence to suggest CAM is not cost-effective for depression (NOS) disorders.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for most values of a unit of effect for the depression (NOS) disorders. A positive correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias. If a person knows that CAM will work better for them, they would be more likely to seek CAM treatment. If that unobserved individual heterogeneity is related to the observable characteristics, then controlling for them in the estimation of incremental net benefit will reduce this self-selection bias.

Table 9.10 Estimation of Incremental Net Benefit (With and Without Controls) For Depression (NOS) Disorders

		Condition Identifier (n = 1146)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-603.34	-1605.60	-2607.86	-3610.12	-4612.38
Pr(CE)		(0.00)	(0.08)	(0.13)	(0.14)	(0.15)
With Controls						
Treatment		-558.29	-3176.38	-5794.48	-8412.57	-11030.67
Pr(CE)		(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
		Pharmacotherapy Use (n=666)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-936.40	-2576.55	-4216.70	-5856.85	-7497.01
Pr(CE)		(0.00)	(0.05)	(0.09)	(0.10)	(0.11)
With Controls						
Treatment		-855.96	-3944.87	-7033.78	-10122.69	-13211.61
Pr(CE)		(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
		Psychotherapy Use (n=440)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-723.90	21.72	767.33	1512.95	2258.56
Pr(CE)		(0.00)	(0.50)	(0.59)	(0.62)	(0.63)
With Controls						
Treatment		-653.62	-1041.33	-1429.03	-1816.73	-2204.43
Pr(CE)		(0.01)	(0.27)	(0.34)	(0.36)	(0.37)
		Either Use (n=750)				
λ		0.00	250.00	500.00	750.00	1000.00
Without Controls						
Treatment		-812.88	-1508.54	-2204.21	-2899.87	-3595.53
Pr(CE)		(0.00)	(0.15)	(0.22)	(0.25)	(0.27)
With Controls						
Treatment		-739.28	-2772.38	-4805.48	-6838.59	-6838.59
Pr(CE)		(0.00)	(0.03)	(0.04)	(0.05)	(0.06)

Coefficient on CAM treatment shown; p-values in parentheses

9.4.2 Propensity Score Matching

The second method for investing potential self-selection bias uses propensity score matching to construct samples for estimation of incremental net benefit (INB). Propensity score method is long recognized as a semiparametric approach to mitigate partially the effect of self-selection bias in nonexperimental data (for example see (Dehejia & Wahba, 2002)).

All observations in the control and treatment groups are used to estimate the predicted probability of treatment as a function of observable characteristics. The predicted probabilities of treatment for observations in the treatment group are matched to similar predicted probabilities of treatment for observation in the control group with a similar predicted probability¹⁴. The matched sample of treatment and control observations are used to estimate incremental net benefit. Observations in the control that are not matched to a treatment observation are discarded. Due to this limitation, only partial results are presented.

The following presents the estimations of incremental net benefit both for the unmatched and matched samples for the each of the mental health disorders by each of the sample definitions. The estimation of the unmatched sample is identical to the estimation without controls in the previous section. The estimation of incremental net benefit using matched samples represents the second piece of evidence on the extent of potential self-selection bias related to unobservable heterogeneity.

For each of the affective disorders samples, using propensity score matching for the estimation of incremental net benefit increase the probably that complementary and alternative medicine (CAM) is cost-effective. Specific values of a unit of effect (λ) are presented in Table 9.11. For the affective disorders samples, the largest impact of using propensity score matching on the probability that CAM is cost-effective is for the pharmacotherapy use sample. The smallest impact of using propensity score matching on the probability that CAM is cost-effective is for the either pharmacotherapy or psychotherapy use sample.

¹⁴ There are a number of algorithms for matching a treatment observation to a control observation. Unless otherwise noted, this analysis will consider the one-to-one nearest neighbor matching.

These results suggest a downward bias in the initial unconditional estimates of incremental net benefit for the affective disorders. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.11 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Affective Disorders

λ	Condition Identifier				
	0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=124)				
Treatment	-1468.66	-939.81	-410.96	117.88	646.73
Pr(CE)	(0.03)	(0.39)	(0.47)	(0.51)	(0.52)
Matched Sample	(n=40)				
Treatment	-755.14	4244.86	9244.86	14244.86	19244.86
Pr(CE)	(0.32)	(0.83)	(0.87)	(0.88)	(0.88)
λ	Pharmacotherapy Use (n=85)				
	0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=85)				
Treatment	-1550.96	-3656.94	-5762.92	-7868.90	-9974.88
Pr(CE)	(0.07)	(0.16)	(0.21)	(0.23)	(0.24)
Matched Sample	(n=26)				
Treatment	-2057.31	-134.24	1788.84	3711.92	5634.99
Pr(CE)	(0.12)	(0.49)	(0.58)	(0.60)	(0.62)
λ	Psychotherapy Use (n=79)				
	0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=79)				
Treatment	-1501.02	504.19	2509.40	4514.61	6519.82
Pr(CE)	(0.09)	(0.55)	(0.63)	(0.66)	(0.67)
Matched Sample	(n=30)				
Treatment	-983.24	4016.76	9016.76	14016.76	19016.76
Pr(CE)	(0.32)	(0.78)	(0.82)	(0.84)	(0.84)
λ	Either Use (n=95)				
	0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=95)				
Treatment	-1476.50	-2211.80	-2947.09	-3682.38	-4417.68
Pr(CE)	(0.06)	(0.27)	(0.33)	(0.36)	(0.37)
Matched Sample	(n=30)				
Treatment	-1569.52	-1569.52	-1569.52	-1569.52	-1569.52
Pr(CE)	(0.16)	(0.37)	(0.43)	(0.45)	(0.47)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the anxiety disorders samples, using propensity score matching for the estimation of incremental net benefit increase the probably that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.12. For the anxiety disorders samples, the largest impact of using propensity score matching on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of using propensity score matching on the probability that CAM is cost-effective is for the either pharmacotherapy or psychotherapy use sample.

The estimation of incremental net benefit using propensity matching is nearly identical to the unconditional estimation of incremental net benefit. These results suggest a tremendously slight bias in the initial unconditional estimates of incremental net benefit for the anxiety disorders. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.12 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Anxiety Disorders

λ	Condition Identifier				
	0.00	50.00	100	150.00	200.00
Unmatched Sample	(n=778)				
Treatment	-31.82	-23.58	-15.33	-7.08	1.17
Pr(CE)	(0.40)	(0.43)	(0.45)	(0.48)	(0.50)
Matched Sample	(n=192)				
Treatment	9.42	17.66	25.91	34.16	42.41
Pr(CE)	(0.53)	(0.55)	(0.57)	(0.59)	(0.60)

λ	Pharmacotherapy Use				
	0.00	50.00	100	150.00	200.00
Unmatched Sample	(n=374)				
Treatment	50.65	58.90	67.15	75.40	83.65
Pr(CE)	(0.62)	(0.63)	(0.64)	(0.66)	(0.67)
Matched Sample	(n=96)				
Treatment	91.89	100.14	108.39	116.64	124.88
Pr(CE)	(0.68)	(0.68)	(0.69)	(0.70)	(0.71)

λ	Psychotherapy Use				
	0.00	50.00	100	150.00	200.00
Unmatched Sample	(n=282)				
Treatment	133.13	141.38	149.63	157.88	166.12
Pr(CE)	(0.71)	(0.72)	(0.72)	(0.73)	(0.73)
Matched Sample	(n=74)				
Treatment	174.37	182.62	190.87	199.11	207.36
Pr(CE)	(0.74)	(0.74)	(0.74)	(0.75)	(0.75)

λ	Either Use				
	0.00	50.00	100	150.00	200.00
Unmatched Sample	(n=469)				
Treatment	215.61	223.86	232.11	240.35	248.60
Pr(CE)	(0.75)	(0.75)	(0.76)	(0.76)	(0.76)
Matched Sample	(n=118)				
Treatment	256.85	265.10	273.34	281.59	281.59
Pr(CE)	(0.76)	(0.76)	(0.77)	(0.77)	(0.77)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the neurotic disorders samples, using propensity score matching for the estimation of incremental net benefit increase the probability that CAM is cost-effective for low values of a unit of effect, but decreases the probability that CAM is cost-effective for high values of a unit of effect. Specific values of a unit of effect are presented in Table 9.13. For the neurotic disorders samples, the largest impact of using propensity score matching on the probability that CAM is cost-effective for low values of a unit of effect is for the either pharmacotherapy or psychotherapy use sample. The smallest impact of using propensity score matching on the probability that CAM is cost-effective for low values of a unit of effect is for the condition identifier sample.

For the neurotic disorders samples, the largest impact of using propensity score matching on the probability that CAM is cost-effective for high values of a unit of effect is for the condition identifier sample. The smallest impact of using propensity score matching on the probability that CAM is cost-effective for high values of a unit of effect is for the psychotherapy use sample, though even this difference is substantial.

The estimation of incremental net benefit using propensity matching is quite different than the unconditional estimation of incremental net benefit. These results suggest the potential for a significant (but ambiguous) bias in the initial unconditional estimates of incremental net benefit for the neurotic disorders.

Table 9.13 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Neurotic Disorders

		Condition Identifier				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=502)				
Treatment		-51.87	229.62	511.10	792.58	1074.07
Pr(CE)		(0.39)	(0.68)	(0.71)	(0.72)	(0.72)
Matched Sample		(n=126)				
Treatment		-79.04	-436.18	-793.33	-1150.47	-1507.61
Pr(CE)		(0.39)	(0.25)	(0.25)	(0.25)	(0.25)
		Pharmacotherapy Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=297)				
Treatment		-90.27	119.93	330.12	540.32	750.52
Pr(CE)		(0.34)	(0.57)	(0.61)	(0.62)	(0.62)
Matched Sample		(n=78)				
Treatment		-18.01	-402.63	-787.24	-1171.86	-1556.47
Pr(CE)		(0.47)	(0.31)	(0.30)	(0.30)	(0.30)
		Psychotherapy Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=202)				
Treatment		274.43	1398.77	2523.12	3647.46	4771.81
Pr(CE)		(0.75)	(0.94)	(0.94)	(0.94)	(0.94)
Matched Sample		(n=50)				
Treatment		560.52	860.52	1160.52	1460.52	1760.52
Pr(CE)		(0.86)	(0.80)	(0.73)	(0.70)	(0.69)
		Either Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=354)				
Treatment		43.38	289.76	536.14	782.51	1028.89
Pr(CE)		(0.57)	(0.68)	(0.68)	(0.68)	(0.68)
Matched Sample		(n=94)				
Treatment		556.88	-81.41	-719.71	-1358.01	-1358.01
Pr(CE)		(0.88)	(0.46)	(0.31)	(0.26)	(0.23)

Coefficient on CAM treatment shown; p-values in parentheses

For the acute stress disorders samples, using propensity score matching for the estimation of incremental net benefit produces varied results. This may be due to the small sample size that resulted in the one-to-one matching. Specific values of a unit of effect are presented in Table 9.14. The estimation of incremental net benefit using propensity score matching increases the probability that CAM is cost-effective for the pharmacotherapy use sample, though given the small sample size the robustness of the results is in question. The estimation of incremental net benefit using propensity score matching decreases the probability that CAM is cost-effective for the psychotherapy use sample, but given the small sample size the robustness of the results is in question.

Table 9.14 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Acute Stress Disorders

		Condition Identifier				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=357)				
Treatment		-44.56	151.51	347.59	543.67	739.75
Pr(CE)		(0.40)	(0.63)	(0.66)	(0.66)	(0.67)
Matched Sample		(n=102)				
Treatment		0.00	0.00	0.00	0.00	0.00
Pr(CE)		(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
		Pharmacotherapy Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=109)				
Treatment		39.44	-211.85	-463.14	-714.42	-965.71
Pr(CE)		(0.53)	(0.43)	(0.41)	(0.41)	(0.40)
Matched Sample		(n=24)				
Treatment		168.29	168.29	168.29	168.29	168.29
Pr(CE)		(0.66)	(0.55)	(0.52)	(0.52)	(0.51)
		Psychotherapy Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=119)				
Treatment		188.74	498.14	807.55	1116.95	1426.36
Pr(CE)		(0.65)	(0.70)	(0.68)	(0.68)	(0.67)
Matched Sample		(n=36)				
Treatment		45.82	-370.84	-787.51	-1204.18	-1620.84
Pr(CE)		(0.56)	(0.34)	(0.33)	(0.33)	(0.32)
		Either Use				
λ		0.00	75.00	150.00	225.00	300.00
Unmatched Sample		(n=165)				
Treatment		16.49	150.42	284.35	418.28	552.21
Pr(CE)		(0.52)	(0.57)	(0.57)	(0.57)	(0.57)
Matched Sample		(n=42)				
Treatment		-64.67	1363.90	2792.47	4221.04	4221.04
Pr(CE)		(0.39)	(0.89)	(0.90)	(0.91)	(0.91)

Coefficient on CAM treatment shown; p-values in parentheses

For each of the depression (NOS) disorders samples, using propensity score matching for the estimation of incremental net benefit decreases the probably that CAM is cost-effective, except for the psychotherapy use sample. Specific values of a unit of effect are presented in Table 9.15. For the depression (NOS) disorders samples, the largest impact of using propensity score matching on the probability that CAM is cost-effective is for the psychotherapy use sample. With or without using propensity score matching to estimate the incremental net benefit, there is strong evidence to suggest CAM is not cost-effective for depression (NOS) disorders.

The estimation of incremental net benefit using propensity matching suggests an upward bias in the initial unconditional estimates of incremental net benefit for the depression (NOS) disorders. A positive correlation between seeking CAM treatment and the unobserved heterogeneity would produce this bias.

Table 9.15 Estimation of Incremental Net Benefit (Unmatched and Matched Samples) For Depression (NOS) Disorders

		Condition Identifier				
λ		0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=1146)					
Treatment		-603.34	-1605.60	-2607.86	-3610.12	-4612.38
Pr(CE)		(0.00)	(0.08)	(0.13)	(0.14)	(0.15)
Matched Sample	(n=232)					
Treatment		-617.26	-4065.53	-7513.81	-10962.09	-14410.36
Pr(CE)		(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
		Pharmacotherapy Use				
λ		0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=666)					
Treatment		-936.40	-2576.55	-4216.70	-5856.85	-7497.01
Pr(CE)		(0.00)	(0.05)	(0.09)	(0.10)	(0.11)
Matched Sample	(n=132)					
Treatment		-924.77	-2439.92	-3955.07	-5470.22	-6985.37
Pr(CE)		(0.00)	(0.13)	(0.18)	(0.20)	(0.21)
		Psychotherapy Use				
λ		0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=440)					
Treatment		-723.90	21.72	767.33	1512.95	2258.56
Pr(CE)		(0.00)	(0.50)	(0.59)	(0.62)	(0.63)
Matched Sample	(n=120)					
Treatment		-936.28	-2186.28	-3436.28	-4686.28	-5936.28
Pr(CE)		(0.01)	(0.17)	(0.22)	(0.24)	(0.25)
		Either Use				
λ		0.00	250.00	500.00	750.00	1000.00
Unmatched Sample	(n=750)					
Treatment		-812.88	-1508.54	-2204.21	-2899.87	-3595.53
Pr(CE)		(0.00)	(0.15)	(0.22)	(0.25)	(0.27)
Matched Sample	(n=154)					
Treatment		-764.77	-5310.22	-9855.68	-14401.13	-14401.13
Pr(CE)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Coefficient on CAM treatment shown; p-values in parentheses

9.4.3 Inverse Propensity Score Weighting

The third method for investigating potential self-selection bias uses inverse propensity score weighting in the estimation of incremental net benefit (INB). Inverse propensity score weighting is similar to propensity score matching with the advantage that all observations of the sample are considered in the estimation of incremental net benefit. See Hirano and Imbens (2001) for discussion of the application of propensity score weighting on health data.

All observations in the control and treatment groups are used to estimate the predicted probability of treatment as a function of observable characteristics. The predicted probability of seeking treatment for an observation (PS_i) is used to construct the weight for that observation according to the following:

$$w_i = \frac{1}{PS_i} \quad \text{for observation } i \text{ in the treatment group}$$

$$w_i = \frac{1}{1 - PS_i} \quad \text{for observation } i \text{ in the control group}$$

Observations in the control group with a high propensity of treatment are given a higher weight than observations with a low propensity of treatment. Observations in the treatment group with a low propensity of treatment are given a higher weight than observations with a high propensity of treatment. All observations are considered in the estimation of incremental net benefit.

The following presents the estimations of incremental net benefit both with and without the inverse propensity score weighting for each of the mental health disorders by each of the sample definitions. The estimation of the sample without weighting is identical to the unconditional estimation controls in the initial section. The estimation of incremental net benefit with inverse propensity score weighting represents the third piece of evidence on the extent of potential self-selection bias related to unobservable heterogeneity.

Appendix C includes the cost-effectiveness acceptability curves (CEAC) with and without inverse propensity score weighting for each of the mental health disorders by each of the sample definitions. The following tables present different values of a unit of effect (λ) used in the construction of the cost-effectiveness acceptability curves for each of the mental health disorders samples.

For most of the affective disorders samples, using inverse propensity score weighting in the estimation of incremental net benefit increase the probably that complementary and alternative medicine (CAM) is cost-effective for most values of a unit of effect. The estimation of incremental net benefit using the condition identifier sample shows a slight decrease in the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.16. The related cost-effectiveness acceptability curves are included in Appendix C and visually present these same results. For the affective disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective is for the pharmacotherapy use sample. The smallest impact of using propensity score weighting is for the condition identifier sample.

These results suggest a downward bias in the initial unweighted estimates of incremental net benefit for the affective disorders. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.16 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Affective Disorders

		Condition Identifier (n = 124)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-1468.66	-939.81	-410.96	117.88	646.73
Pr(CE)		(0.03)	(0.39)	(0.47)	(0.51)	(0.52)
IPS Weighting						
Treatment		-1585.78	-1354.24	-1122.71	-891.18	-659.64
Pr(CE)		(0.01)	(0.26)	(0.39)	(0.44)	(0.47)
		Pharmacotherapy Use (n=85)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-1550.96	-3656.94	-5762.92	-7868.9	-9974.88
Pr(CE)		(0.07)	(0.16)	(0.21)	(0.23)	(0.24)
IPS Weighting						
Treatment		-2181.05	-997.97	185.11	1368.19	2551.27
Pr(CE)		(0.01)	(0.36)	(0.51)	(0.57)	(0.60)
		Psychotherapy Use (n=79)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-1501.02	504.19	2509.4	4514.61	6519.82
Pr(CE)		(0.09)	(0.55)	(0.63)	(0.66)	(0.67)
IPS Weighting						
Treatment		-1710.39	983.97	3678.33	6372.70	9067.06
Pr(CE)		(0.04)	(0.64)	(0.76)	(0.79)	(0.81)
		Either Use (n=95)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-1476.5	-2211.8	-2947.09	-3682.38	-4417.68
Pr(CE)		(0.06)	(0.27)	(0.33)	(0.36)	(0.37)
IPS Weighting						
Treatment		-1660.52	-201.88	1256.76	2715.40	4174.04
Pr(CE)		(0.02)	(0.47)	(0.61)	(0.65)	(0.67)

Coefficient on CAM treatment shown; p-values in parentheses

For most of the anxiety disorders samples, using inverse propensity score weighting in the estimation of incremental net benefit decreases the probability that CAM is cost-effective for higher values of a unit of effect, except for the psychotherapy use sample. For low values of a unit of effect, using inverse propensity score weighting increases the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.17. For the affective disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective for low values of a unit of effect is for the psychotherapy use sample. For the affective disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective for high values of a unit of effect is for the condition identifier sample. The smallest impact of using propensity score weighting is on the psychotherapy use sample.

These results suggest a downward bias in the initial unweighted estimates of incremental net benefit using low values of a unit of effect for the anxiety disorders samples. However, the results suggest a downward bias in the initial unweighted estimates of incremental net benefit using higher values of a unit of affect for most of the anxiety disorders samples. This implies a downward bias in the estimate of incremental cost and an upward bias in the estimation of the incremental effect.

Table 9.17 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Anxiety Disorders

		Condition Identifier (n = 778)				
λ		0.00	50.00	100.00	150.00	200.00
No Weighting						
Treatment		-31.82	174.37	380.57	586.76	792.96
Pr(CE)		(0.40)	(0.74)	(0.78)	(0.79)	(0.80)
IPS Weighting						
Treatment		0.96	-66.41	-133.77	-201.13	-268.50
Pr(CE)		(0.51)	(0.34)	(0.33)	(0.32)	(0.32)
		Pharmacotherapy Use (n=374)				
λ		0.00	50.00	100.00	150.00	200.00
No Weighting						
Treatment		-8.01	-70.63	-133.26	-195.89	-258.52
Pr(CE)		(0.49)	(0.43)	(0.43)	(0.43)	(0.43)
IPS Weighting						
Treatment		15.33	-216.46	-448.26	-680.05	-911.85
Pr(CE)		(0.55)	(0.19)	(0.16)	(0.16)	(0.15)
		Psychotherapy Use (n=283)				
λ		0.00	50.00	100.00	150.00	200.00
No Weighting						
Treatment		269.77	679.57	1089.37	1499.17	1908.97
Pr(CE)		(0.80)	(0.89)	(0.88)	(0.87)	(0.87)
IPS Weighting						
Treatment		334.51	807.96	1281.41	1754.86	2228.31
Pr(CE)		(0.98)	(1.00)	(0.99)	(0.99)	(0.99)
		Either Use (n=469)				
λ		0.00	50.00	100.00	150.00	200.00
No Weighting						
Treatment		38.51	157.56	276.62	395.68	514.74
Pr(CE)		(0.58)	(0.66)	(0.66)	(0.66)	(0.66)
IPS Weighting						
Treatment		56.48	-72.00	-200.48	-328.95	-457.43
Pr(CE)		(0.70)	(0.37)	(0.31)	(0.29)	(0.28)

Coefficient on CAM treatment shown; p-values in parentheses

For most of the neurotic disorders samples, using inverse propensity score weighting in the estimation of incremental net benefit decreases the probability that CAM is cost-effective for higher values of a unit of effect, except for the psychotherapy use sample. For low values of a unit of effect, using inverse propensity score weighting increases the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.18. For the neurotic disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective for low values of a unit of effect is for the pharmacotherapy use sample. For the neurotic disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective for high values of a unit of effect is for the pharmacotherapy use sample. The smallest impact of using propensity score weighting is on the psychotherapy use sample.

These results suggest a downward bias in the initial unweighted estimates of incremental net benefit using low values of a unit of effect for the neurotic disorders samples. However, the results suggest a downward bias in the initial unweighted estimates of incremental net benefit using higher values of a unit of effect for most of the anxiety disorders samples. This implies a downward bias in the estimate of incremental cost and an upward bias in the estimation of the incremental effect.

Table 9.18 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Neurotic Disorders

		Condition Identifier (n = 502)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		-51.87	229.62	511.1	792.58	1074.07
Pr(CE)		(0.39)	(0.68)	(0.71)	(0.72)	(0.72)
IPS Weighting						
Treatment		40.20	44.71	49.22	53.74	58.25
Pr(CE)		(0.65)	(0.56)	(0.53)	(0.53)	(0.52)
		Pharmacotherapy Use (n=297)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		-90.27	119.93	330.12	540.32	750.52
Pr(CE)		(0.34)	(0.57)	(0.61)	(0.62)	(0.62)
IPS Weighting						
Treatment		73.14	-94.38	-261.90	-429.42	-596.94
Pr(CE)		(0.70)	(0.41)	(0.37)	(0.35)	(0.35)
		Psychotherapy Use (n=202)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		274.43	1398.77	2523.12	3647.46	4771.81
Pr(CE)		(0.75)	(0.94)	(0.94)	(0.94)	(0.94)
IPS Weighting						
Treatment		456.30	2030.94	3605.57	5180.21	6754.84
Pr(CE)		(0.97)	(1.00)	(1.00)	(1.00)	(1.00)
		Either Use (n=354)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		43.38	289.76	536.14	782.51	1028.89
Pr(CE)		(0.57)	(0.68)	(0.68)	(0.68)	(0.68)
IPS Weighting						
Treatment		157.80	218.55	279.30	340.04	400.79
Pr(CE)		(0.86)	(0.72)	(0.65)	(0.63)	(0.61)

Coefficient on CAM treatment shown; p-values in parentheses

For most of the acute stress disorders samples, using inverse propensity score weighting in the estimation of incremental net benefit decreases the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.19. For the acute stress disorders samples, the largest impact of using propensity score weighting on the probability that CAM is cost-effective is for the either pharmacotherapy or psychotherapy use sample. The smallest impact of using propensity score weighting is on the psychotherapy use sample. For a zero value of effect the probability that CAM is cost-effective is very similar for the weighting and unweighted samples.

These results suggest an upward bias in the initial unweighted estimates of incremental net benefit using low values of a unit of effect for the acute stress disorders. A positive correlation between seeking CAM treatment and the unobserved heterogeneity on incremental net benefit would produce this downward bias

Table 9.19 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Acute Stress Disorders

		Condition Identifier (n = 357)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		-44.56	151.51	347.59	543.67	739.75
Pr(CE)		(0.40)	(0.63)	(0.66)	(0.66)	(0.67)
IPS Weighting						
Treatment		-23.79	-467.09	-910.39	-1353.69	-1796.98
Pr(CE)		(0.40)	(0.06)	(0.06)	(0.06)	(0.06)
		Pharmacotherapy Use (n=109)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		39.44	-211.85	-463.14	-714.42	-965.71
Pr(CE)		(0.53)	(0.43)	(0.41)	(0.41)	(0.40)
IPS Weighting						
Treatment		-9.01	-350.78	-692.55	-1034.32	-1376.09
Pr(CE)		(0.49)	(0.30)	(0.28)	(0.28)	(0.28)
		Psychotherapy Use (n=119)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		188.74	498.14	807.55	1116.95	1426.36
Pr(CE)		(0.65)	(0.70)	(0.68)	(0.68)	(0.67)
IPS Weighting						
Treatment		107.05	109.73	112.40	115.08	117.76
Pr(CE)		(0.66)	(0.58)	(0.54)	(0.53)	(0.52)
		Either Use (n=165)				
λ		0.00	75.00	150.00	225.00	300.00
No Weighting						
Treatment		16.49	150.42	284.35	418.28	552.21
Pr(CE)		(0.52)	(0.57)	(0.57)	(0.57)	(0.57)
IPS Weighting						
Treatment		-32.98	-513.44	-993.91	-1474.37	-1954.84
Pr(CE)		(0.43)	(0.14)	(0.14)	(0.13)	(0.13)

Coefficient on CAM treatment shown; p-values in parentheses

For most of the depression (NOS) disorders samples, using inverse propensity score weighting in the estimation of incremental net benefit decreases the probability that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.20. For the depression (NOS) disorders, the largest impact of using propensity score weighting on the probability that CAM is cost-effective is for the either pharmacotherapy or psychotherapy use sample. The smallest impact of using propensity score weighting is on the pharmacotherapy use.

For a zero value of effect, the probability that CAM is cost-effective is identical between the weighting and unweighted samples. The evidence strongly suggests that CAM does not reduce costs for depression (NOS) disorders. With or without using inverse propensity score weighting to estimate the incremental net benefit, there is strong evidence to suggest CAM is not cost-effective for depression (NOS) disorders.

These results suggest an upward bias in the initial unweighted estimates of incremental net benefit using low values of a unit of effect for the depression disorders. A positive correlation between seeking CAM treatment and the unobserved heterogeneity on incremental net benefit would produce this downward bias

Table 9.20 Estimation of Incremental Net Benefit (Unconditional and IPS Weighted Samples) For Depression (NOS) Disorders

		Condition Identifier (n = 1146)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-603.34	-1605.6	-2607.86	-3610.12	-4612.38
Pr(CE)		(0.00)	(0.08)	(0.13)	(0.14)	(0.15)
IPS Weighting						
Treatment		-539.89	-3214.97	-5890.05	-8565.13	-11240.21
Pr(CE)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
		Pharmacotherapy Use (n=666)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-936.4	-2576.55	-4216.7	-5856.85	-7497.01
Pr(CE)		(0.00)	(0.05)	(0.09)	(0.10)	(0.11)
IPS Weighting						
Treatment		-776.27	-4087.50	-7398.72	-10709.94	-14021.16
Pr(CE)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
		Psychotherapy Use (n=440)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-723.9	21.72	767.33	1512.95	2258.56
Pr(CE)		(0.00)	(0.50)	(0.59)	(0.62)	(0.63)
IPS Weighting						
Treatment		-538.36	-511.15	-483.95	-456.74	-429.53
Pr(CE)		(0.00)	(0.33)	(0.42)	(0.45)	(0.46)
		Either Use (n=750)				
λ		0.00	250.00	500.00	750.00	1000.00
No Weighting						
Treatment		-812.88	-1508.54	-2204.21	-2899.87	-3595.53
Pr(CE)		(0.00)	(0.15)	(0.22)	(0.25)	(0.27)
IPS Weighting						
Treatment		-681.95	-2841.95	-5001.95	-7161.96	-9321.96
Pr(CE)		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Coefficient on CAM treatment shown; p-values in parentheses

9.4.4 Instrumental Variables

The fourth method for investigating potential self-selection bias uses the rate of complementary and alternative medicine (CAM) use in a primary sampling unit (PSU) as an instrument in the estimation of incremental net benefit (INB). The 1998 Medical Expenditure Panel Survey (MEPS) identifies 56 primary sampling units as measures of local geographic units. For each observation, the rate of CAM use in the primary sampling unit (excluding that observation) was calculated. The measure of CAM use in a primary sampling unit is a proxy for a measure of the availability of CAM services in an area. A valid instrument needs to be a good predictor of CAM use, but uncorrelated with the measure of effect except through the effect on the decision to seek treatment. On a conceptual level, availability of CAM services could be related to the decision to seek CAM (the more services in an area, the less travel time cost, resulting in higher CAM use), but unrelated to the outcomes of CAM use.

Table 9.21 and Table 9.22 present the odds ratio results of logistic models of CAM treatment as a function of CAM use in a primary sampling unit (*CAMPSU*) for each of the mental health disorders groups by each of the sample definitions.

$$CAM_i = f(CAMPSU_i, \mathbf{X})$$

For the affective disorders samples, the results indicate a very large (but only marginally significant), positive impact of CAM use in a primary sampling unit on the probability that an individual seeks CAM treatment. The anxiety, neurotic, and acute stress disorders samples show similar patterns; the results indicate a very large (and statistically significant), positive impact of CAM use in a primary sampling unit on the probability that an individual seeks CAM treatment for each sample except for anxiety and neurotic disorders psychotherapy users and acute stress disorders pharmacotherapy users. For each of the depression (NOS) disorders samples, the results indicate a very large (and statistically

significant), positive impact of CAM use in a primary sampling unit on the probability that an individual seeks CAM treatment.

Table 9.21 Logistic Model of CAM Use in Terms Of CAM Use by Primary Sampling Unit for Affective, Anxiety, and Neurotic Disorders

Sample Definition	Coefficient	Disorders					
		Affective		Anxiety		Neurotic	
		Estimate	p-value	Estimates	p-value	Estimates	p-value
Condition ID	CAM PSU	3.22E+34 (n=124)	(0.07)	4.16E+09 (n=778)	(0.01)	2.67E+11 (n=502)	(0.01)
Pharmacotherapy	CAM PSU	1.74E+39 (n=85)	(0.06)	1.04E+12 (n=374)	(0.08)	5.13E+19 (n=297)	(0.04)
Psychotherapy	CAM PSU	4.61E+31 (n=79)	(0.12)	4.99E+05 (n=283)	(0.34)	1.65E+07 (n=202)	(0.23)
Either Use	CAM PSU	4.79E+34 (n=95)	(0.07)	5.73E+09 (n=469)	(0.05)	1.33E+11 (n=354)	(0.03)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

Table 9.22 Logistic Model of CAM Use In Terms Of CAM Use by Primary Sampling Unit for Acute Stress and Depression (NOS) Disorders

Sample Definition	Coefficient	Disorders			
		Acute Stress		Depression (NOS)	
		Estimates	p-value	Estimates	p-value
Condition ID	CAM PSU	6.44E+12 (n=357)	(0.02)	8.26E+16 (n=1146)	(0.00)
Pharmacotherapy	CAM PSU	1.57E+20 (n=109)	(0.27)	7.69E+16 (n=666)	(0.00)
Psychotherapy	CAM PSU	2.80E+47 (n=119)	(0.04)	9.59E+13 (n=440)	(0.01)
Either Use	CAM PSU	1.37E+38 (n=165)	(0.04)	8.19E+15 (n=750)	(0.00)

Estimated odds ratio shown; p-values of coefficient estimates in parentheses

The following presents the estimations of incremental net benefit both without controls and with primary sampling unit CAM use as an instrument for each of the mental health disorders by each of the sample definitions. The estimation of the sample without controls is identical to the unconditional estimation controls in the initial section. The estimation of incremental net benefit with the primary sampling unit CAM use as an

instrument represents the fourth piece of evidence on the extent of potential self-selection bias related to unobservable heterogeneity.

Appendix C includes the cost-effectiveness acceptability curves without controls and with primary sampling CAM use (*CAMPSU*) as an instrument for each of the mental health disorders by each of the sample definitions. The following tables present different values of effect used in the construction of the cost-effectiveness acceptability curves.

$$CAM = f(CAMPSU, X)$$

$$NB_i(\lambda) = \beta_0 + \beta_1 \widehat{CAM}_i + \Gamma X_i + \varepsilon_i$$

For the affective disorders, using primary sampling unit CAM use as an instrument in the estimation of incremental net benefit increases the probability that CAM is cost-effective for low values of a unit of effect (λ) and decreases the probability that CAM is cost-effective for high values of a unit of effect. Specific values of a unit of effect are presented in Table 9.23. The related cost-effectiveness acceptability curves are included in Appendix C and visually present these same results. For the affective disorders samples, the largest impact of using primary sampling unit CAM use as an instrument on the probability that CAM is cost-effective is for the psychotherapy use sample. The smallest impact of using primary sampling unit CAM use as an instrument is for the pharmacotherapy use sample.

The estimates of incremental net benefit are substantially larger when primary sampling CAM use is used as an instrument, ranging from 7 to 1224 times the magnitude of the unconditional estimates. These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for the affective disorders for high values of a unit of effect. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias. Though, given the questionable strength of the instrument, these results may not be very informative.

Table 9.23 Estimation of Incremental Net Benefit (Without Controls and IV) For Affective Disorders

		Condition Identifier (n = 124)				
λ		0.00	250.00	500.00	750.00	1000.00
No Controls						
Treatment		-1468.66	-939.81	-410.96	117.88	646.73
Pr(CE)		(0.03)	(0.39)	(0.47)	(0.51)	(0.52)
PSU CAM IV						
Treatment		25398.47	-31145.47	-87689.42	-144233.36	-200777.30
Pr(CE)		(0.91)	(0.34)	(0.27)	(0.25)	(0.24)
		Pharmacotherapy Use (n=85)				
λ		0.00	250.00	500.00	750.00	1000.00
No Controls						
Treatment		-1550.96	-3656.94	-5762.92	-7868.90	-9974.88
Pr(CE)		(0.07)	(0.16)	(0.21)	(0.23)	(0.24)
PSU CAM IV						
Treatment		7855.05	-27314.79	-62484.63	-97654.46	-132824.30
Pr(CE)		(0.78)	(0.20)	(0.16)	(0.15)	(0.14)
		Psychotherapy Use (n=79)				
λ		0.00	250.00	500.00	750.00	1000.00
No Controls						
Treatment		-1501.02	504.19	2509.40	4514.61	6519.82
Pr(CE)		(0.09)	(0.55)	(0.63)	(0.66)	(0.67)
PSU CAM IV						
Treatment		115397.01	-333320.03	-782037.08	-1230754.12	-1679471.16
Pr(CE)		(0.89)	(0.13)	(0.09)	(0.07)	(0.07)
		Either Use (n=95)				
λ		0.00	250.00	500.00	750.00	1000.00
No Controls						
Treatment		-1476.50	-2211.80	-2947.09	-3682.38	-4417.68
Pr(CE)		(0.06)	(0.27)	(0.33)	(0.36)	(0.37)
PSU CAM IV						
Treatment		13731.30	-51664.30	-117059.90	-182455.50	-182455.50
Pr(CE)		(0.84)	(0.14)	(0.10)	(0.09)	(0.08)

Coefficient on CAM treatment shown; p-values in parentheses

For the anxiety disorders, using primary sampling unit CAM use as an instrument in the estimation of incremental net benefit increases the probability that CAM is cost-effective for low values of a unit of effect and decreases the probability that CAM is cost-effective for high values of a unit of effect. Specific values of a unit of effect are presented in Table 9.24. For the anxiety disorders samples, the largest impact of using primary sampling unit CAM use as an instrument on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of using primary sampling unit CAM use as an instrument is for the psychotherapy use sample.

The estimates of incremental net benefit are substantially larger when primary sampling CAM use is used as an instrument, ranging from 1 to 809 times the magnitude of the unconditional estimates. The strength of primary sampling unit CAM use as an instrument is in question.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for the anxiety disorders for high values of a unit of effect. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.24 Estimation of Incremental Net Benefit (Without Controls and IV) For Anxiety Disorders

		Condition Identifier (n = 778)				
λ		0.00	50.00	100.00	150.00	200.00
No Controls						
Treatment		-31.82	174.37	380.57	586.76	792.96
Pr(CE)		(0.40)	(0.74)	(0.78)	(0.79)	(0.80)
PSU CAM IV						
Treatment		4419.30	-2131.46	-8682.22	-15232.99	-21783.75
Pr(CE)		(0.95)	(0.35)	(0.18)	(0.14)	(0.12)
		Pharmacotherapy Use (n=374)				
λ		0.00	50.00	100.00	150.00	200.00
No Controls						
Treatment		-8.01	-70.63	-133.26	-195.89	-258.52
Pr(CE)		(0.49)	(0.43)	(0.43)	(0.43)	(0.43)
PSU CAM IV						
Treatment		6481.73	1022.17	-4437.39	-9896.95	-15356.51
Pr(CE)		(0.98)	(0.57)	(0.34)	(0.26)	(0.22)
		Psychotherapy Use (n=283)				
λ		0.00	50.00	100.00	150.00	200.00
No Controls						
Treatment		269.77	679.57	1089.37	1499.17	1908.97
Pr(CE)		(0.80)	(0.89)	(0.88)	(0.87)	(0.87)
PSU CAM IV						
Treatment		52090.26	38617.41	25144.57	11671.72	-1801.13
Pr(CE)		(0.99)	(0.85)	(0.66)	(0.55)	(0.49)
		Either Use (n=469)				
λ		0.00	50.00	100.00	150.00	200.00
No Controls						
Treatment		38.51	157.56	276.62	395.68	514.74
Pr(CE)		(0.58)	(0.66)	(0.66)	(0.66)	(0.66)
PSU CAM IV						
Treatment		8084.32	4510.43	936.54	-2637.35	-2637.35
Pr(CE)		(0.99)	(0.76)	(0.53)	(0.43)	(0.38)

Coefficient on CAM treatment shown; p-values in parentheses

For the neurotic disorders, using primary sampling unit CAM use as an instrument in the estimation of incremental net benefit increases the probability that CAM is cost-effective for low values of a unit of effect and decreases the probability that CAM is cost-effective for high values of a unit of effect. Specific values of a unit of effect are presented in Table 9.25. For the neurotic disorders samples, the largest impact of using primary sampling unit CAM use as an instrument on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of using propensity score weighting is for the either pharmacotherapy or psychotherapy use sample, though the impact is still extremely large.

The estimates of incremental net benefit are substantially larger when primary sampling CAM use is used as an instrument, ranging from 0 to 469 times the magnitude of the unconditional estimates. The strength of primary sampling unit CAM use as an instrument is in question.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for the neurotic disorders for high values of a unit of effect. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.25 Estimation of Incremental Net Benefit (Without Controls and IV) For Neurotic Disorders

		Condition Identifier (n = 357)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		-51.87	229.62	511.10	792.58	1074.07
Pr(CE)		(0.39)	(0.68)	(0.71)	(0.72)	(0.72)
PSU CAM IV						
Treatment		3795.38	1970.02	144.66	-1680.70	-3506.05
Pr(CE)		(0.96)	(0.64)	(0.51)	(0.46)	(0.43)
		Pharmacotherapy Use (n=109)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		-90.27	119.93	330.12	540.32	750.52
Pr(CE)		(0.34)	(0.57)	(0.61)	(0.62)	(0.62)
PSU CAM IV						
Treatment		2028.55	1778.88	1529.20	1279.53	1029.85
Pr(CE)		(0.76)	(0.58)	(0.54)	(0.52)	(0.51)
		Psychotherapy Use (n=119)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		274.43	1398.77	2523.12	3647.46	4771.81
Pr(CE)		(0.75)	(0.94)	(0.94)	(0.94)	(0.94)
PSU CAM IV						
Treatment		128663.28	129889.78	131116.28	132342.77	133569.27
Pr(CE)		(0.98)	(0.84)	(0.71)	(0.65)	(0.61)
		Either Use (n=165)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		43.38	289.76	536.14	782.51	1028.89
Pr(CE)		(0.57)	(0.68)	(0.68)	(0.68)	(0.68)
PSU CAM IV						
Treatment		8052.00	7784.11	7516.22	7248.32	7248.32
Pr(CE)		(0.99)	(0.81)	(0.68)	(0.62)	(0.59)

Coefficient on CAM treatment shown; p-values in parentheses

For the acute stress disorders, using primary sampling unit CAM use as an instrument in the estimation of incremental net benefit increases the probability that CAM is cost-effective for low values of a unit of effect and decreases the probability that CAM is cost-effective for high values of a unit of effect. Specific values of a unit of effect are presented in Table 9.26. For the acute stress disorders samples, the largest impact of using primary sampling unit CAM use as an instrument on the probability that CAM is cost-effective is for the condition identifier sample. The smallest impact of using propensity score weighting is for the either pharmacotherapy or psychotherapy use sample, though the impact is still extremely large.

The estimates of incremental net benefit are substantially larger when primary sampling CAM use is used as an instrument, ranging from 6 to 1619 times the magnitude of the unconditional estimates. The strength of primary sampling unit CAM use as an instrument is in question.

These results suggest an upward bias in the initial unconditional estimates of incremental net benefit for the neurotic disorders for high values of a unit of effect. A negative correlation between seeking CAM treatment and the unobserved heterogeneity would produce this downward bias.

Table 9.26 Estimation of Incremental Net Benefit (Without Controls and IV) For Acute Stress Disorders

		Condition Identifier (n = 357)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		-44.56	151.51	347.59	543.67	739.75
Pr(CE)		(0.40)	(0.63)	(0.66)	(0.66)	(0.67)
PSU CAM IV						
Treatment		6782.73	-9672.92	-26128.56	-42584.21	-59039.85
Pr(CE)		(0.94)	(0.20)	(0.11)	(0.09)	(0.08)
		Pharmacotherapy Use (n=109)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		39.44	-211.85	-463.14	-714.42	-965.71
Pr(CE)		(0.53)	(0.43)	(0.41)	(0.41)	(0.40)
PSU CAM IV						
Treatment		63855.41	2222.72	-59409.96	-121042.65	-182675.34
Pr(CE)		(0.99)	(0.52)	(0.26)	(0.18)	(0.15)
		Psychotherapy Use (n=119)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		188.74	498.14	807.55	1116.95	1426.36
Pr(CE)		(0.65)	(0.70)	(0.68)	(0.68)	(0.67)
PSU CAM IV						
Treatment		9401.94	-2920.69	-15243.32	-27565.95	-39888.58
Pr(CE)		(0.98)	(0.37)	(0.16)	(0.11)	(0.09)
		Either Use (n=165)				
λ		0.00	75.00	150.00	225.00	300.00
No Controls						
Treatment		16.49	150.42	284.35	418.28	552.21
Pr(CE)		(0.52)	(0.57)	(0.57)	(0.57)	(0.57)
PSU CAM IV						
Treatment		12748.98	2201.41	-8346.16	-18893.72	-18893.72
Pr(CE)		(0.99)	(0.58)	(0.33)	(0.25)	(0.21)

Coefficient on CAM treatment shown; p-values in parentheses

For the depression (NOS) disorders, using primary sampling unit CAM use as an instrument in the estimation of incremental net benefit increases the probably that CAM is cost-effective. Specific values of a unit of effect are presented in Table 9.27. For the depression (NOS) disorders samples, the largest impact of using primary sampling unit CAM use as an instrument on the probability that CAM is cost-effective is for the pharmacotherapy use sample. The smallest impact of using propensity score weighting is for the either pharmacotherapy or psychotherapy use sample, though the impact is still extremely large.

The use of primary sampling unit CAM use as an instrument in the estimation of the incremental net benefit for depression (NOS) disorders produces results that are inconsistent with the previous evidence. All previous evidence strongly indicates that CAM is not cost-effect for depression (NOS) disorders. The validity of primary sampling unit CAM use as an instrument is in question.

Table 9.27 Estimation of Incremental Net Benefit (Without Controls and IV) For Depression (NOS) Disorders

Condition Identifier (n = 1146)					
λ	0.00	250.00	500.00	750.00	1000.00
No Controls					
Treatment	-603.34	-1605.60	-2607.86	-3610.12	-4612.38
Pr(CE)	(0.00)	(0.08)	(0.13)	(0.14)	(0.15)
PSU CAM IV					
Treatment	591.61	1929.56	3267.51	4605.46	5943.41
Pr(CE)	(0.65)	(0.56)	(0.55)	(0.55)	(0.55)
Pharmacotherapy Use (n=666)					
λ	0.00	250.00	500.00	750.00	1000.00
No Controls					
Treatment	-936.40	-2576.55	-4216.70	-5856.85	-7497.01
Pr(CE)	(0.00)	(0.05)	(0.09)	(0.10)	(0.11)
PSU CAM IV					
Treatment	1118.24	4288.20	7458.16	10628.12	13798.07
Pr(CE)	(0.71)	(0.62)	(0.60)	(0.60)	(0.60)
Psychotherapy Use (n=440)					
λ	0.00	250.00	500.00	750.00	1000.00
No Controls					
Treatment	-723.90	21.72	767.33	1512.95	2258.56
Pr(CE)	(0.00)	(0.50)	(0.59)	(0.62)	(0.63)
PSU CAM IV					
Treatment	1172.16	11304.06	21435.96	31567.86	41699.75
Pr(CE)	(0.65)	(0.72)	(0.71)	(0.71)	(0.71)
Either Use (n=750)					
λ	0.00	250.00	500.00	750.00	1000.00
No Controls					
Treatment	-812.88	-1508.54	-2204.21	-2899.87	-3595.53
Pr(CE)	(0.00)	(0.15)	(0.22)	(0.25)	(0.27)
PSU CAM IV					
Treatment	448.64	-744.18	-1936.99	-3129.81	-3129.81
Pr(CE)	(0.59)	(0.48)	(0.47)	(0.47)	(0.47)

Coefficient on CAM treatment shown; p-values in parentheses

9.5 Comparing the Results to Other Research

To compare the results of this analysis to other research, four linear transformations of the primary and secondary measures were constructed using the 2001 Medical Expenditure Panel Survey (MEPS). The predicted transformations express the primary and secondary measures in terms of four different measures of health outcome (not directly available in the 1998 MEPS): days of work missed, probability of long term work missed, SF-12 Index score, and EQ-5D Index score.

Long-term work missed is defined as greater than 7 days of work missed similar to previous research (Egede, 2004). The SF-12 and EQ-12 Index scores are commonly used measures of global health.

Each of the four transformations was estimated using the three linear models.

$$\text{Other Measure}_i = \beta_0 + \beta_1 \text{Good MH}_i$$

$$\text{Other Measure}_i = \beta_0 + \beta_1 \text{Good MH}_i + \beta_2 \text{SOC Lim}_i + \beta_3 \text{COG Lim}_i$$

$$\text{Other Measure}_i$$

$$= \beta_0 + \beta_1 \text{Good MH}_i + \beta_2 \text{SOC Lim}_i + \beta_3 \text{COG Lim}_i + \beta_4 \text{Func Lim}_i \\ + \beta_5 \text{IADL Lim}_i$$

Table 9.28 and Table 9.29 present the estimated coefficient of the four transformations of the primary and secondary measures of effect used in this analysis using the three linear models. The primary measure of effect, the probability of good mental health, has the expected sign in each of the transformation models. A higher probability of good mental health reduces the number of days of work missed, reduces the probability of long-term missed work, increases the SF-12 Index score (indicating better health), and increases the EQ-5D Index score indicating better health).

Almost all of the secondary measures of effect, social, cognitive, functional, and instrumental activities of daily living (IADL) limitations, have the expected sign in each of the transformation models. Higher probabilities of limitations increase the number of days missed, increase the probability of long-term missed work, decrease the SF-12 Index score, and decrease the EQ-5D Index score. The exception is that a cognitive limitations impact on the number of days missed.

Table 9.28 Estimated Transformation of Primary and Secondary Measures to Other Health Outcome Measures

Variable	Days of Work Missed			Prob(Long-Term Missed Work)		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
Constant	6.59	6.32	5.90	0.14	0.13	0.12
Prob(Good MH)	-4.92	-4.70	-4.42	-0.09	-0.08	-0.08
Social Limitations		4.20	2.10		0.10	0.06
Cognitive Limitations		-0.93	-1.95		0.02	0.00
Functional Limitations			3.50			0.06
IADL Limitations			0.95			0.02

Estimation using the full adult 2001 MEPS data (n=13069)

Table 9.29 Estimated Transformation of Primary and Secondary Measures to Other Health Outcome Measures

Variable	SF-12 Index Score			EQ-5D Index Score		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
Constant	38.47	40.55	40.79	64.20	66.63	68.05
Prob(Good MH)	13.45	11.56	11.43	19.97	17.80	16.84
Social Limitations		-3.62	-2.72		-14.41	-6.85
Cognitive Limitations		-4.56	-4.05		-7.18	-3.53
Functional Limitations			-1.34			-11.63
IADL Limitations			-0.51			-5.77

Estimation using the full adult 2001 MEPS data (n=13069)

Table 9.30 presents the estimated number of days worked for each of the mental health disorders by each of the sample definitions for each of the three transformation models. For each of the disorder groups the psychotherapy users show the greatest improvement in reducing the days of work missed. For the neurotic disorders psychotherapy use sample CAM use is equivalent to a 2.22 - 3.09 reduction in the days of work missed.

Table 9.30 Estimated Days of Work Missed by Mental Health Disorder

Disorders	Sample Definition		Days of Work Missed			Diff (1)	Diff (2)	Diff (3)
			Model (1)	(2)	(3)			
Affective	Condition ID (n=124)	NonCAM	11.97	13.68	13.83			
		CAM	11.64	15.03	14.49	-0.33	1.35	0.66
	Pharmacotherapy (n=85)	NonCAM	12.06	14.01	14.37			
		CAM	13.32	17.67	16.89	1.26	3.66	2.52
	Psychotherapy (n=79)	NonCAM	13.08	14.94	15.42			
		CAM	11.88	15.87	15.18	-1.2	0.93	-0.24
	Either Use (n=95)	NonCAM	12.39	14.22	14.52			
		CAM	12.81	16.89	16.2	0.42	2.67	1.68
Anxiety	Condition ID (n=778)	NonCAM	8.37	10.23	9.33			
		CAM	7.77	9.75	9.15	-0.6	-0.48	-0.18
	Pharmacotherapy (n=374)	NonCAM	9.12	11.64	10.47			
		CAM	9.3	12.27	11.55	0.18	0.63	1.08
	Psychotherapy (n=283)	NonCAM	9.81	11.49	11.1			
		CAM	8.58	10.98	10.2	-1.23	-0.51	-0.9
	Either Use (n=469)	NonCAM	9.12	11.34	10.38			
		CAM	8.76	11.61	10.62	-0.36	0.27	0.24
Neurotic	Condition ID (n=502)	NonCAM	9.06	11.16	10.32			
		CAM	8.52	11.1	10.32	-0.54	-0.06	0
	Pharmacotherapy (n=297)	NonCAM	9.57	12.36	11.25			
		CAM	9.18	12.27	11.37	-0.39	-0.09	0.12
	Psychotherapy (n=202)	NonCAM	10.62	12.45	12.21			
		CAM	8.4	10.08	9.12	-2.22	-2.37	-3.09
	Either Use (n=354)	NonCAM	9.57	11.94	11.04			
		CAM	9.09	12	10.74	-0.48	0.06	-0.3
Acute Stress	Condition ID (n=357)	NonCAM	7.41	8.85	7.92			
		CAM	7.02	8.37	7.89	-0.39	-0.48	-0.03
	Pharmacotherapy (n=109)	NonCAM	8.19	10.08	8.82			
		CAM	8.7	10.95	10.23	0.51	0.87	1.41
	Psychotherapy (n=119)	NonCAM	8.07	9.3	8.49			
		CAM	7.47	9.63	8.82	-0.6	0.33	0.33
	Either Use (n=165)	NonCAM	8.07	9.78	8.82			
		CAM	7.83	9.54	8.94	-0.24	-0.24	0.12
Depression (NOS)	Condition ID (n=1146)	NonCAM	9.39	11.82	10.59			
		CAM	9.96	12.09	11.22	0.57	0.27	0.63
	Pharmacotherapy (n=666)	NonCAM	9.84	12.72	11.31			
		CAM	10.83	14.49	12.87	0.99	1.77	1.56
	Psychotherapy (n=440)	NonCAM	11.1	13.23	12.42			
		CAM	10.65	13.44	12.48	-0.45	0.21	0.06
	Either Use (n=750)	NonCAM	9.96	12.78	11.46			
		CAM	10.38	13.62	12.24	0.42	0.84	0.78

Table 9.31 presents the estimated probability of long-term work missed for each of the mental health disorders by each of the sample definitions for each of the three transformation models. Long-term work missed is defined as seven or more work days missed.

For each of the disorder groups the psychotherapy use sample shows the largest reduction in the probability of long-term work missed. All of the neurotic disorders samples show a decrease in the probability of long-term day work missed for at least one of the transformation models. For the neurotic disorders psychotherapy use sample CAM use is equivalent to a 0.0141 - 0.0235 reduction in the probability of long-term work missed.

Table 9.31 Estimated Probability of Long-Term Work Missed

Disorders	Sample		Prob(Long-Term Work Missed)			Diff (1)	Diff (2)	Diff (3)
			(1)	(2)	(3)			
Affective	Condition ID (n=124)	NonCAM	0.1824	0.2176	0.2222			
		CAM	0.1790	0.2384	0.2397	-0.0034	0.0208	0.0174
	Pharmacotherapy (n=85)	NonCAM	0.1835	0.2251	0.2302			
		CAM	0.1969	0.2726	0.2733	0.0134	0.0475	0.0430
	Psychotherapy (n=79)	NonCAM	0.1944	0.2410	0.2480			
		CAM	0.1817	0.2546	0.2530	-0.0127	0.0136	0.0050
	Either Use (n=95)	NonCAM	0.1870	0.2290	0.2335			
		CAM	0.1916	0.2626	0.2634	0.0047	0.0335	0.0299
Anxiety	Condition ID (n=778)	NonCAM	0.1439	0.1658	0.1616			
		CAM	0.1373	0.1614	0.1584	-0.0066	-0.0044	-0.0031
	Pharmacotherapy (n=374)	NonCAM	0.1519	0.1819	0.1761			
		CAM	0.1539	0.1829	0.1806	0.0020	0.0010	0.0045
	Psychotherapy (n=283)	NonCAM	0.1592	0.1849	0.1839			
		CAM	0.1462	0.1785	0.1737	-0.0130	-0.0065	-0.0102
	Either Use (n=469)	NonCAM	0.1517	0.1796	0.1752			
		CAM	0.1479	0.1798	0.1748	-0.0038	0.0002	-0.0004
Neurotic	Condition ID (n=502)	NonCAM	0.1513	0.1784	0.1767			
		CAM	0.1453	0.1765	0.1760	-0.0060	-0.0018	-0.0008
	Pharmacotherapy (n=297)	NonCAM	0.1568	0.1927	0.1882			
		CAM	0.1523	0.1817	0.1813	-0.0045	-0.0111	-0.0069
	Psychotherapy (n=202)	NonCAM	0.1680	0.1996	0.2012			
		CAM	0.1442	0.1655	0.1627	-0.0238	-0.0341	-0.0385
	Either Use (n=354)	NonCAM	0.1567	0.1885	0.1857			
		CAM	0.1515	0.1811	0.1776	-0.0052	-0.0074	-0.0081
Acute Stress	Condition ID (n=357)	NonCAM	0.1335	0.1489	0.1434			
		CAM	0.1293	0.1531	0.1487	-0.0042	0.0042	0.0053
	Pharmacotherapy (n=109)	NonCAM	0.1419	0.1604	0.1533			
		CAM	0.1472	0.1751	0.1659	0.0053	0.0148	0.0126
	Psychotherapy (n=119)	NonCAM	0.1405	0.1574	0.1510			
		CAM	0.1340	0.1719	0.1608	-0.0066	0.0145	0.0098
	Either Use (n=165)	NonCAM	0.1406	0.1602	0.1544			
		CAM	0.1378	0.1682	0.1595	-0.0028	0.0081	0.0050
Depression (NOS)	Condition ID (n=1146)	NonCAM	0.1546	0.1836	0.1772			
		CAM	0.1609	0.1902	0.1831	0.0064	0.0065	0.0059
	Pharmacotherapy (n=666)	NonCAM	0.1597	0.1941	0.1876			
		CAM	0.1701	0.2176	0.2047	0.0104	0.0235	0.0171
	Psychotherapy (n=440)	NonCAM	0.1732	0.2044	0.2016			
		CAM	0.1684	0.2078	0.1980	-0.0047	0.0034	-0.0036
	Either Use (n=750)	NonCAM	0.1609	0.1949	0.1888			
		CAM	0.1653	0.2066	0.1956	0.0044	0.0118	0.0068

Table 9.32 presents the estimated SF-12 Index score for each of the mental health disorders by each of the sample definitions for each of the three transformation models. For each of the disorder groups the psychotherapy use sample shows the largest increase in the SF-12 Index score. All of the neurotic disorders samples show an increase in the SF-12 Index score for each of the transformation models. For the neurotic disorders psychotherapy use sample CAM use is equivalent to a 2.02 - 2.46 increase in the SF-12 Index score.

Table 9.32 Estimated SF-12 Index Score

Disorders	Sample		SF-12 Index Score			Diff (1)	Diff (2)	Diff (3)
			Model					
			(1)	(2)	(3)			
Affective	Condition ID (n=124)	NonCAM	45.58	44.57	44.45			
		CAM	45.86	43.87	43.82	0.28	-0.70	-0.63
	Pharmacotherapy (n=85)	NonCAM	45.48	44.24	44.08			
		CAM	44.35	41.78	41.75	-1.13	-2.46	-2.33
	Psychotherapy (n=79)	NonCAM	44.56	43.06	42.88			
		CAM	45.64	43.18	43.14	1.08	0.12	0.26
	Either Use (n=95)	NonCAM	45.19	43.94	43.79			
		CAM	44.79	42.39	42.36	-0.40	-1.55	-1.44
Anxiety	Condition ID (n=778)	NonCAM	48.84	48.40	48.44			
		CAM	49.39	48.86	48.86	0.55	0.46	0.42
	Pharmacotherapy (n=374)	NonCAM	48.16	47.48	47.55			
		CAM	47.99	47.42	47.44	-0.17	-0.05	-0.11
	Psychotherapy (n=283)	NonCAM	47.54	46.97	46.94			
		CAM	48.64	47.86	47.88	1.10	0.89	0.94
	Either Use (n=469)	NonCAM	48.17	47.54	47.59			
		CAM	48.49	47.77	47.82	0.32	0.23	0.24
Neurotic	Condition ID (n=502)	NonCAM	48.21	47.48	47.52			
		CAM	48.71	47.79	47.82	0.50	0.31	0.30
	Pharmacotherapy (n=297)	NonCAM	47.74	46.79	46.85			
		CAM	48.12	47.39	47.44	0.38	0.60	0.58
	Psychotherapy (n=202)	NonCAM	46.79	45.92	45.87			
		CAM	48.81	48.28	48.33	2.02	2.35	2.46
	Either Use (n=354)	NonCAM	47.75	46.91	46.95			
		CAM	48.19	47.46	47.55	0.44	0.55	0.60
Acute Stress	Condition ID (n=357)	NonCAM	49.72	49.51	49.57			
		CAM	50.07	49.49	49.48	0.35	-0.02	-0.09
	Pharmacotherapy (n=109)	NonCAM	49.00	48.75	48.85			
		CAM	48.55	48.23	48.24	-0.45	-0.52	-0.61
	Psychotherapy (n=119)	NonCAM	49.12	48.94	48.97			
		CAM	49.67	48.81	48.83	0.55	-0.13	-0.15
	Either Use (n=165)	NonCAM	49.11	48.80	48.86			
		CAM	49.35	48.75	48.75	0.24	-0.04	-0.11
Depression (NOS)	Condition ID (n=1146)	NonCAM	47.93	47.32	47.40			
		CAM	47.39	46.90	46.93	-0.54	-0.41	-0.47
	Pharmacotherapy (n=666)	NonCAM	47.50	46.67	46.77			
		CAM	46.62	45.60	45.72	-0.88	-1.07	-1.06
	Psychotherapy (n=440)	NonCAM	46.36	45.64	45.66			
		CAM	46.76	46.03	46.06	0.40	0.39	0.41
	Either Use (n=750)	NonCAM	47.40	46.59	46.68			
		CAM	47.02	46.20	46.28	-0.37	-0.39	-0.39

Table 9.33 presents the estimated EQ-5D Index score for each of the mental health disorders by each of the sample definitions for each of the three transformation models. For each of the disorder groups the psychotherapy use sample shows the largest increase in the EQ-5D Index score. All of the neurotic disorders samples show an increase in the EQ-5D Index score for each of the transformation models. For the neurotic disorders psychotherapy use sample CAM use is equivalent to a 2.99 - 4.64 increase in the EQ-5D Index score.

Table 9.33 Estimated EQ-5D Index Score

Disorders	Sample		EQ-5D Index Score			Diff (1)	Diff (2)	Diff (3)
			Model					
			(1)	(2)	(3)			
Affective	Condition ID (n=124)	NonCAM	74.76	70.43	70.37			
		CAM	75.18	67.70	68.50	0.42	-2.73	-1.86
	Pharmacotherapy (n=85)	NonCAM	74.62	69.78	69.45			
		CAM	72.94	63.40	64.52	-1.68	-6.37	-4.93
	Psychotherapy (n=79)	NonCAM	73.25	67.81	67.39			
		CAM	74.85	66.07	67.01	1.60	-1.74	-0.38
	Either Use (n=95)	NonCAM	74.18	69.35	69.07			
		CAM	73.60	64.67	65.69	-0.59	-4.68	-3.38
Anxiety	Condition ID (n=778)	NonCAM	79.60	76.53	77.62			
		CAM	80.42	77.30	78.02	0.82	0.77	0.39
	Pharmacotherapy (n=374)	NonCAM	78.59	74.45	75.88			
		CAM	78.34	74.30	75.19	-0.25	-0.15	-0.70
	Psychotherapy (n=283)	NonCAM	77.67	74.42	74.92			
		CAM	79.31	75.32	76.21	1.64	0.90	1.28
	Either Use (n=469)	NonCAM	78.61	74.81	75.99			
		CAM	79.09	74.81	76.00	0.48	0.00	0.01
Neurotic	Condition ID (n=502)	NonCAM	78.66	74.75	75.85			
		CAM	79.41	74.89	75.96	0.75	0.15	0.11
	Pharmacotherapy (n=297)	NonCAM	77.98	73.06	74.47			
		CAM	78.53	73.95	75.16	0.56	0.88	0.69
	Psychotherapy (n=202)	NonCAM	76.57	72.51	72.91			
		CAM	79.56	76.33	77.55	2.99	3.82	4.64
	Either Use (n=354)	NonCAM	77.99	73.60	74.77			
		CAM	78.64	74.08	75.68	0.66	0.47	0.90
Acute Stress	Condition ID (n=357)	NonCAM	80.90	78.68	79.80			
		CAM	81.43	78.79	79.30	0.52	0.11	-0.50
	Pharmacotherapy (n=109)	NonCAM	79.84	77.05	78.57			
		CAM	79.17	76.34	76.98	-0.67	-0.71	-1.59
	Psychotherapy (n=119)	NonCAM	80.01	77.97	78.87			
		CAM	80.84	77.13	77.86	0.82	-0.84	-1.01
	Either Use (n=165)	NonCAM	80.01	77.32	78.47			
		CAM	80.36	77.44	77.95	0.36	0.11	-0.52
Depression (NOS)	Condition ID (n=1146)	NonCAM	78.25	74.23	75.73			
		CAM	77.45	74.01	74.97	-0.80	-0.22	-0.76
	Pharmacotherapy (n=666)	NonCAM	77.61	72.80	74.51			
		CAM	76.30	70.57	72.40	-1.31	-2.23	-2.11
	Psychotherapy (n=440)	NonCAM	75.92	71.77	72.79			
		CAM	76.51	72.14	73.17	0.60	0.38	0.37
	Either Use (n=750)	NonCAM	77.46	72.71	74.34			
		CAM	76.91	71.94	73.47	-0.56	-0.77	-0.88

Table 9.34 uses the estimated difference in the EQ-5D Index scores in Table 9.33 to construct incremental cost-effectiveness ratios. These generalizations of the cost-effectiveness of CAM treatment can then be compared to the results in previous research to better understand the impact of CAM treatment.

For neurotic disorders pharmacotherapy users CAM use produces a greater effect, but at a higher cost. The estimated incremental cost-effectiveness ratios in terms of EQ-5D Index score indicated that the cost ranges from 102.30 to 161.33 per 1 point increase in the Index score.

Table 9.34 Estimated ICER from EQ-5D

Disorders	Sample		ICER		
			Model 1	Model 2	Model 3
Affective	Condition ID (n=124)	ICER	3477.44	-537.53	-787.59
		Quadrant	I	II	II
	Pharmacotherapy (n=85)	ICER	-922.18	-243.41	-314.82
		Quadrant	II	II	II
	Psychotherapy (n=79)	ICER	937.34	-860.87	-3961.53
		Quadrant	I	II	II
Either Use (n=95)	ICER	-2514.44	-315.58	-437.18	
	Quadrant	II	II	II	
Anxiety	Condition ID (n=778)	ICER	38.65	41.29	81.01
		Quadrant	I	I	I
	Pharmacotherapy (n=374)	ICER	-32.02	-51.95	-11.50
		Quadrant	II	II	II
	Psychotherapy (n=283)	ICER	-164.86	-300.25	-210.19
		Quadrant	IV	IV	IV
Either Use (n=469)	ICER	-81.00	9528.90	-3054.64	
	Quadrant	IV	III	IV	
Neurotic	Condition ID (n=502)	ICER	69.22	348.37	459.49
		Quadrant	I	I	I
	Pharmacotherapy (n=297)	ICER	161.33	102.30	131.20
		Quadrant	I	I	I
	Psychotherapy (n=202)	ICER	-91.69	-71.85	-59.11
		Quadrant	IV	IV	IV
Either Use (n=354)	ICER	-66.14	-91.60	-47.94	
	Quadrant	IV	IV	IV	
Acute Stress	Condition ID (n=357)	ICER	85.38	415.22	-89.41
		Quadrant	I	I	II
	Pharmacotherapy (n=109)	ICER	58.96	55.46	24.76
		Quadrant	III	III	III
	Psychotherapy (n=119)	ICER	-229.15	224.09	186.62
		Quadrant	IV	III	III
Either Use (n=165)	ICER	-46.27	-143.44	31.89	
	Quadrant	IV	IV	I	
Depression (NOS)	Condition ID (n=1146)	ICER	-753.79	-2763.11	-789.54
		Quadrant	II	II	II
	Pharmacotherapy (n=666)	ICER	-714.90	-420.17	-444.72
		Quadrant	II	II	II
	Psychotherapy (n=440)	ICER	1215.71	1920.27	1946.42
		Quadrant	I	I	I
Either Use (n=750)	ICER	-1463.17	-1054.05	-928.25	
	Quadrant	II	II	II	

Chapter 10

DISCUSSION AND CONCLUSION

This chapter concludes this research by summarizing the results of the evidence for the cost-effectiveness of complementary and alternative medicine (CAM) in treating mental health disorders and discusses future areas of related research.

10.1 Summary and Discussion of Main Results

For affective disorders, there is not strong evidence to suggest that complementary and alternative medicine (CAM) is cost-effective. CAM is more cost-effective for psychotherapy users than for pharmacotherapy users. Efforts to investigate potential self-selection bias in the data show a downward bias in the initial, unconditional estimates of incremental net benefit (INB) for each of the sample definitions considered. The smallest self-selection bias is with psychotherapy users.

For anxiety and neurotic disorders, there is some evidence to suggest that CAM is cost-effective for a large range of values of a unit of effect(λ). CAM is more cost-effective for psychotherapy users than for pharmacotherapy users for both disorders. There is strong evidence to suggest that CAM is cost-effective for anxiety and neurotic psychotherapy users. Efforts to investigate potential self-selection bias in the data show an upward bias in the initial, unconditional estimates of incremental net benefit. The smallest self-selection bias is with the psychotherapy users for both disorders.

For acute stress disorders, there is weak evidence to suggest that CAM is cost-effective. CAM is more cost-effective for psychotherapy users than for the pharmacotherapy users. Efforts to investigate the potential self-selection bias in the data show an upward bias in the initial, unconditional estimates of incremental net benefit. The smallest self-selection bias is with the psychotherapy users. Given the relatively small sample size, the evidence that CAM is cost-effective is not convincing.

For depression (NOS) disorders, there is strong evidence to suggest that CAM is not cost-effective. CAM is more cost-effective for psychotherapy users than for pharmacotherapy users. However, even for psychotherapy users the evidence is not convincing. Efforts to investigate the potential self-selection bias in the data show an upward bias in the initial, unconditional estimates of incremental net benefit.

10.2 Policy Implications

Interested parties to this research include individuals with a mental health disorder, insurance providers, and mental health care professionals. It is reasonable to assume that individuals with a mental health disorder would want to choose treatments in a way that is consistent with minimizing the cost to produce mental health. Individuals with mental health disorders could incorporate information on the cost-effectiveness of CAM in treatment decisions.

In a competitive insurance market, if individuals care about choosing treatment in a way that is consistent with minimizing the cost to produce a given level of mental health and individuals choose insurance provider based on CAM coverage, then insurers should be aware of potential gains from CAM use for anxiety and neurotic disorders. However, CAM coverage would not be an incentive for purchasing insurance for individuals with depression (NOS) disorders.

As cost-effective forms of treatment become a more significant concern for mental health care professionals in treating common mental health disorders, the results of this research provide some insight into potential gains for anxiety and neurotic disorders. Mental health care professionals should be aware of the types of individuals that may and may not benefit from CAM treatment.

10.3 Future Research

This research provides information on a very specific research question: Is complementary and alternative medicine (broadly defined) a cost-effective addition to

traditional treatment for the common mental health disorders of affective, anxiety, acute stress, neurotic, and depression (NOS) using the primary measures of the probability of good self-reported mental health status and four secondary measures of health limitations using observational data on patient treatment and characteristics?

Within this area of research, there are related questions for future research to consider. Is complementary and alternative medicine (CAM) more cost-effective for certain demographic groups? The analysis herein uses demographic characteristics in their relationship to unobservable heterogeneity in the decision to seek CAM treatment. However, it is possible that the outcome of interest, the cost-effectiveness of CAM treatment, differs along observable characteristics (\mathbf{X}_i). Estimation of incremental net benefit could easily incorporate this innovation by including treatment interaction terms ($\mathbf{X}_i \text{CAM}_i$).

$$NB_i(\lambda) = \beta_0 + \beta_1 \text{CAM}_i + \mathbf{\Gamma} \mathbf{X}_i + \mathbf{Y} \mathbf{X}_i \text{CAM}_i + \varepsilon_i$$

The estimated coefficient on the treatment interaction terms would estimate the demographic-specific cost-effectiveness of CAM treatment. However, this would decrease the number of degrees of freedom by the number of characteristics considered. Given the small sample size, this is a significant concern some of the disorders considered.

Is CAM more cost-effective for certain classes of drugs (SSRIs versus MAOIs)? This analysis considers any form of pharmacotherapy treatments as equal. However, it is possible that different classes of pharmacotherapy may result in differences in the cost-effectiveness of CAM. Given the detailed information available in the MEPS regarding pharmacotherapy treatment, it would be possible to identify the pharmacotherapy class for individuals. However, the common practice of drug-switching throughout the treatment process would complicate interpretation of results and raise additional question of unobservable heterogeneity related to drug class selection. Rates of provider class prescribing could possibly instrument for the decision on drug class selection (Leslie & Ghomrawi, 2008).

Does the intensity of CAM use influence the cost-effectiveness? Due to missing value for a number of individuals on the intensity of CAM use this analysis treats all levels of intensity as the same. An individual using a single herbal remedy once in 1998 is treated identically as an individual using a weekly herbal remedy throughout 1998. One imperfect measure of intensity of CAM use available in the data is the annual CAM expenditure. Estimation would take the following form:

$$NB_i(\lambda) = \beta_0 + \beta_1 CAM_i + \varepsilon_i$$

Where (CAM_i) would measure the level of CAM expenditure. However, the analysis would be restricted to include only CAM users and the interpretation of the incremental net benefit framework would need to be reformulated (CAM expenditure would be both on the right hand and left hand side of the above estimation).

Are particular forms of CAM more cost-effective? Due to missing values for a number of individuals on the specific type of CAM used, this analysis treats all types of CAM as the same. Use of herbal therapy is treated the same as use of biofeedback. Given the limitations of the data disaggregated estimation of cost-effectiveness was not attempted. However, aggregation along similar treatment categories could be explored (possibly aggregation along the categories in Kaptchuk and Eisenberg (2001)).

Is CAM cost-effective with certain comorbid disorders? Given the high prevalence of mental health comorbidities, especially for chronic conditions, it is possible the CAM is more cost-effective for mental health conditions when other disorders are present. It is possible that an individual with arthritis and depression have a different response to chiropractic treatment than an individual that only has depression. Comorbidity information is available in the MEPS; however, concerns regarding small sample size might make this estimation infeasible.

What impact does better specification of cost have on the measure of cost-effectiveness? This analysis makes a number of assumptions on the measure of cost due to the constraints of the data.

The true economic cost of a treatment can be conceptualized as a function of the change in direct outlays of goods and services(D_{D1}), the change in direct nonmonetary resources(D_{D2}), and the change in the indirect impact of treatment(D_{IN}).

$$Cost = f(D_{D1}, D_{D2}, D_{IN})$$

This analysis uses the measure of total charges in the Medical Expenditure Panel Survey (MEPS) is the appropriate measure of direct outlays(D_{D1}). This implicitly assumes that individuals use the total charges for treatment as the relevant measure of cost in their decision-making. This analysis follows the advice of Gold, et al., in using the broadest measure of cost; a patient-incurred level of cost could be constructed to estimate the cost-effectiveness of CAM treatment (1996).

This analysis also assumes that the use of charges instead of the cost of production does not bias the results in a systematic way. Implicitly, producer mark-up over the cost of production is assumed zero for pharmacotherapy, psychotherapy, and CAM treatment. Given the use of patent-protected pharmacotherapy treatments and the lack of perfectly competitive markets for each form of treatment, this assumption is questionable. However, it is not possible to assign an *a priori* expectation to this potential bias. Given the available data in the MEPS, there is not a feasible method for addressing this potential source of bias.

This analysis assumes that there is no difference in the level of direct nonmonetary resources and the indirect impact of treatment for CAM users and nonusers. The MEPS does include information regarding employment and compensation. If information on treatment acquisition time was available, it would be possible to construct a proxy for nonmonetary resource cost for this analysis. Most likely, acquisition time would vary by the of CAM treatment. Given the lack of detailed information on specific CAM treatment use, the lack of

precise treatment acquisition time, and the limitations of employment compensation as a measure of time cost, this extension does not seem feasible for the current dataset.

While the MEPS is panel data, individuals are only followed over a two-year period. The long-term impact of CAM use in 1998 on measures of health (morbidity and mortality) can only be assessed one-year out. Are there long-term impacts (either in terms of cost or effect) of CAM that are not captured in this analysis? A longer panel would be necessary to answer this question.

Is there a better instrument for the decision to seek CAM treatment available? Primary sampling unit CAM use was a statistically significant predictor of CAM use for most of the sample definitions considered, however there was a marked difference in the estimates of incremental net benefit with this instrument than with other methods to investigate potential self-selection bias. The incremental net benefit estimates were up to 1619 times the unconditional estimates, indicating a potentially weak instrument. State-level differences in reimbursement rates could serve as another potential instrument. However, state identifiers are not available in the publically available MEPS used in this analysis.

Other extensions of this research could include a more rigorous proof of the impact of using the incremental cost-incremental effectiveness four quadrant framework for treatment adoption could be explored. This research presents a graphical argument that the four quadrant incremental cost-incremental effectiveness framework will lead to the optimal expansion path of cost-minimizing levels of treatment.

A minor consideration raised in this research concerns the use of fixed proportions for bootstrapping observational data. It is standard to sample with replacement from *within the control* and from *within the treatment* to produce the bootstrap replicates. This research lays out a simple method to sample with replacement from *within sample* to produce the bootstrap replicates. Monte Carlo simulations could investigate potential bias of the standard framework with observational data where the choice of treatment is endogenous.

Another extension of the basic cost-effectiveness method is to allow for a difference in the willingness-to-pay (WTP) for a unit more of effect and the willingness-to-accept

(WTA) for a unit less of effect. This analysis assume an equal value between the two (*i. e.*, $\lambda = \lambda_{WTP} = \lambda_{WTA}$), however, often there is observed a substantial difference in consumer behavior ($WTA > WTP$). Willan, et al., (2001) lay out a method for incorporating this into a cost-effectiveness analysis using the incremental net benefit method, however, the long-term implication of allowing for this difference on health spending has not been investigated.

REFERENCES

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Health Disorders* (4th, text revision ed.). Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2002). *Practice Guidelines for the Treatment of Psychiatric Disorders*. Washington, DC: American Psychiatric Association.

Anderson, I. M., & Tomenson, B. M. (1995). Treatment Discontinuation with Selective Serotonin Reuptake Inhibitors Compared with Tricyclic Antidepressants Meta-Analysis. *British Medical Journal* , 310, 1433-1438.

Anderson, I. (1998). SSRIs versus Tricyclic Antidepressants in Depressed Inpatients: A Meta-Analysis of Efficacy and Tolerability. *Depression & Anxiety* , 7 (S1), 11-7.

Arroll, B., Macgillivray, S., Ogston, S., Reid, I., Sullivan, F., Williams, B., et al. (2005). Efficacy and Tolerability of Tricyclic Antidepressants and SSRIs Compared With Placebo for Treatment of Depression in Primary Care: A Meta-Analysis. *Annals of Family Medicine* , 3 (5), 449-456.

Barnes, P., Bloom, B., & Nahin, R. (2008). *Complementary and Alternative Medicine Use Among Adults and Children: United States, 2007*. U.S. Department of Health and Human Services. Atlanta, GA: National Center for Health Statistics.

Bauer, M. (2004). Review: Lithium Reduces Relapse Rates in People with Bipolar Disorder. *Evidence-Based Mental Health* , 7 (3), 72.

Beynon, S., Soares-Weiser, K., Woolacott, N., Duffy, S., & Geddes, J. (2009). Pharmacological Interventions for the Prevention of Relapse in Bipolar Disorder: A Systematic Review of Controlled Trials. *Journal of Psychopharmacology* , 23 (5), 574-91.

Bosmans, J., de Bruijne, M., van Hout, H., van Marwijk, H., Beekman, A., Bouter, L., et al. (2006). Cost-Effectiveness of a Disease Management Program for Major Depression in Elderly Primary Care Patients. *Journal of General Internal Medicine* , 21 (10), 1020-6.

Bremner, J., Randall, P., & Scott, T. (1995). MRI-Based Measurement of Hippocampal Volume in Combat-Related Posttraumatic Stress Disorder. *American Journal of Psychiatry*, *152*, 973-81.

Briggs, A. (2000). Handling Uncertainty in Cost-Effectiveness Models. *Pharmacoeconomics*, *17* (5), 479-500.

Briggs, A., Wonderling, D., & Mooney, C. (1997). Pulling Cost-Effectiveness Analysis up by its Boostraps: A Non-Parametric Approach to Confidence Interval Estimation. *Health Economics*, *6*, 327-340.

Chiesa, A., & Serretti, A. (2009b). Mindfulness-Based Stress Reduction for Stress Management in Healthy People: A Review and Meta-Analysis. *Journal of Alternative Copmlimentary Medicine*, *15* (5), 593-600.

Chiesa, A., Serretti, A., Calati, R., Perna, G., Bellodi, L., & De Ronchi, D. (2009a). P01-112 Are Noradrenergic Antidepressants a Valuable Choice in the Treatment of Panic Disorder: A Review and Meta Analysis. *European Psychiatry*, *24* (1), S500.

Cohen, J., & Krauss, N. (2003). Spending and Service Use among People with the Fifteen Most Costly Medical Conditions, 1997. *Health Affairs*, *22* (2), 129-138.

Cuijpers, P., Marks, I., van Straten, A., Cavanagh, K., Gega, L., & Andersson, G. (2009). Computer-Aided Psychotherapy for Anxiety Disorders: A Meta-Analytic Review. *Cognitive Behaviour Therapy*, *38* (2), 66-83.

Cuijpers, P., van Straten, A., Andersson, G., & van Oppen, P. (2008). Psychotherapy for Depression in Adults: A Meta-Analysis of Comparative Outcome Studies. *Journal of Consulting Clinical Psychology*, *76* (6), 909-22.

da Maat, S., Dekker, J., Schoever, R., & de Jonghe, F. (2006). Relative Efficacy of Psychotherapy and Pharmacotherapy in the Treatment of Depression: A Meta-Analysis. *Psychotherapy Research*, *16* (5), 566-78.

da Maat, S., Dekker, J., Schoevers, R., & de Jonghe, F. (2007). Relative Efficacy of Psychotherapy and Combined Therapy in the Treatment of Depression: A Meta-Analysis. *European Psychiatry*, *22* (1), 1-8.

- Dardanoni, W., & Wagstaff, A. (1990). uncertainty and the Demand for Medical Care. *Journal of Health Economics* , 9, 23-38.
- Davis, J., Janicak, P., & Hogan, D. (1999). Mood Stabilizers in the Prevention of Recurrent Affective Disorders: A Meta-Analysis. *Acta Psychiatrica Scandinavica* , 100 (6), 406-17.
- Dehejia, R., & Wahba, S. (2002). Propensity Score-Matching Methods for Nonexperimental Causal Studies. *The Review of Economics and Statistics* , 84 (1), 151-61.
- Druss, B., & Rosenheck, R. (2000). Use of Practitioner-Based Complementary Therapies by Persons Reporting Mental Conditions in the United States. *Archives of General Psychiatry* , 47, 708-714.
- Druss, B., & Rosenheck, R. (2000). Use of Practitioner-Based Copmlimentary Therapies by Persons Reporting Mental Conditions in the United States. *Archives of General Psychiatry* , 57, 708-714.
- Efron, B., & Tibshirani, R. (1993). *An Introduction to the Bootstrap*. Boca Raton, FL: Chapman & Hall/CRC.
- Egede, L. (2004). Effects of Depression on Work Loss and Disability Bed Days in Individuals with Diabetes. *Diabetes Care* , 27 (7), 1751-1753.
- Eisenberg, D., Davis, R., Ettner, S., Appel, S., Wilkey, S., Van Rompay, M., et al. (1998). Trends in Alternative Medicine Use in the United States, 1990-1997. *Journal of the American Medical Association* , 280 (18), 1569-1575.
- Ekers, D., Richard, D., & Gilbody, S. (2008). A Meta-Analysis of Randomized Trials of Behavioural Treatment of Depression. *Psychological Medicine* , 38 (5), 611-23.
- Fenwick, E., Claxton, K., & Sculpher, M. (2001). Representing Uncertainty: The Role of Cost-Effectiveness Acceptability Curves. *Health Economics* , 10, 779-787.
- Fenwick, E., O'Brien, B., & Briggs, A. (2004). Cost-Effectiveness Acceptability Curves - Facts, Fallacies, and Frequently Asked Questions. *Health Economics* , 13, 405-415.

Fernandez, J., Montgomery, S., & Francois, C. (2006). Evaluation of the Cost Effectiveness of Escitalopram versus Venlafaxine XR in Major Depressive Disorder. *Pharmacoeconomics* , 23 (2), 155-167.

Fernandez, J.-L., Montgomery, S., & Francois, C. (2006). Evaluation of the Cost Effectiveness of Escitalopram versus Venlafaxine XR in Major Depressive Disorder. *Pharmacoeconomics* , 23 (2), 155-167.

Forder, J., Kavanagh, & Fenyo, S. (1996). A Comparison of the Cost-Effectiveness of Sertraline versus Tricyclic Antidepressants in Primary Care. *Journal of Affective Disorders* , 38, 97-111.

Frampton, J., & Plosker, G. (2007). Duloxetine: A Review of its Use in the Treatment of Major Depressive Disorder. *CNS Drugs* , 21 (7), 581.

Garber, A., & Phelps, C. (1997). Economic Foundations of Cost-Effectiveness Analysis. *Journal of Health Economics* , 16 (1), 1-31.

Gardiner, J., Huebner, M., Jetton, J., & Bradley, C. (2000). Power and Sample Size Assessments for Tests of Hypotheses on Cost-Effectiveness Ratios. *Health Economics* , 9, 227-234.

Geddes, J., Burgess, S., Hawton, K., Jamison, K., & Goodwin, G. (2004). Long-Term Lithium Therapy for Bipolar Disorder: Systematic Review and Meta-Analysis of Randomized Controlled Trials. *American Journal of Psychiatry* , 161 (2), 217-22.

Ghaemi, S., Wingo, A., Filkowski, M., & Baldessarini, R. (2008). Long-Term Antidepressant Treatment in Bipolar Disorder: Meta-Analyses of Benefits and Risks. *ACT Psychiatrica Scandinavica* , 118 (5), 347-56.

Gijssman, H., Geddes, J., Rendell, J., Nolen, W., & Goodwin, G. (2004). Antidepressants for Bipolar Depression: A Systematic Review of Randomized, Controlled Trials. *American Journal of Psychiatry* , 161 (9), 1537-47.

Gold, M., Siegel, J., Russell, L., & Weinstein, M. (1996). *Cost-Effectiveness in Health and Medicine*. New York: Oxford University Press.

Goodwin, G., & Geddes, J. (2003). Latest maintenance Data on Lithium in Bipolar Disorder. *European Neuropsychopharmacology: The Journal of the European College of Neuropsychopharmacology* , 13 (2), S51-5.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *The Journal of Political Economy* , 80 (2), 223-55.

Haby, M., Connelly, M., Corry, J., & Vos, T. (2006). Cognitive Behavioural Therapy for Depression, Panic Disorder and Generalized Anxiety Disorder: A Meta-Regression of Factors that may Predict Outcome. *Australian New Zealand Journal of Psychiatry* , 40 (1), 9-19.

Hammer, J., Lawrence, W., Anderson, J., Kaplan, R., & Fryback, D. (2006). Report of Nationally Representative Values for the Noninstitutionalized US Adult Population for 7 Health-Related Quality-of-Life Scores. *Medical Decision Making* , 26, 391-400.

Han, D., & Wang, E. (2005). Remission from Depression: A Review of Venlafaxine Clinical and Economic Evidence. *Pharmacoeconomics* , 23 (6), 567-81.

Heitjan, D. (2000). Fieller's Method and Net Health Benefits. *Health Economics* , 9, 327-335.

Hirano, K., & Imbens, G. (2001). Estimation of Causal Effects using Propensity Weighting: An Application to Data on Right Heart Catheterization. *Health Services & Outcomes Research Methodology* , 2, 259-278.

Hoch, J., Briggs, A., & Willan, A. (2002). Something Old, Something New, Something Borrowed, Something Blue: A Framework for the Marriage of Health Econometrics and Cost-Effectiveness Analysis. *Health Economics* , 11, 415-30.

Hoch, J., Rockx, M. A., & Krahn, A. (2006). Using the Net Benefit Regression Framework to Construct Cost-Effectiveness Acceptability Curves: An Example using Data from a Trial of External Loop Recorders versus Holter Monitoring for Ambulatory Monitoring of "community Acquired" Syncope. *BMC Health Services Research* , 6 (68).

Hoffman, E., & Matthew, S. (2008). Anxiety Disorders: A Comprehensive Review of Pharmacotherapies. *Mount Sinai Journal of Medicine* , 75 (3), 248-62.

- Hylan, T., Crown, W., & Meneades, L. (1998). Tricyclic Antidepressant and Selective Serotonin Reuptake Inhibitors Antidepressant Selection and Health Care Costs in the Naturalistic Setting: A Multivariate analysis. *Journal of Affective Disorders* , 47, 71-79.
- Idler, E., & Benyamini, Y. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior* , 38, 21-37.
- Imel, Z., Malterer, M., McKay, K., & Wampold, B. (2008). A Meta-Analysis of Psychotherapy and Medication in Unipolar Depression and Dysthymia. *Journal of Affective Disorders* , 110 (3), 197-206.
- Iqbal, S. U., & Prashker, M. (2005). Pharmacoeconomic Evaluation of Antidepressants: A Critical Appraisal of Method. *Pharmacoeconomics* , 23 (6), 595-606.
- Jones, R. (2007). Review: Atypical Antipsychotics are Effective for Treating Bipolar Mania. *Evidence-Based Mental Health* , 10 (1), 11.
- Kaptchuk, T., & Eisenberg, D. (2001). Varieties of Healing. 2: A Taxonomy of Unconventional Healing Practices. *Annals of Internal Medicine* , 135 (3), 196-204.
- Karasu, T., Gelenger, A., Merriam, A., & Wang, P. (2000). *Practice Guideline for the Treatment of Patients with Major Depressive Disorder, 2nd Ed.* Arlington, VA: American Psychiatric Association.
- Kasper, S., & Dienel, A. (2002). Cluster Analysis with Hypericum Extract in Mildly to Moderately Depressed Out-Patients. A Meta-Analysis of Data from Three Randomized, Placebo-Controlled Trials. *Psychopharmacology* , 164 (3), 301.
- Kema, H. (1987). Working Conditions and the Relationship Between Schooling and Health. *Journal of Health Economics* , 6, 189-210.
- Kennedy, S., Andersen, H., & Lam, R. (2006). Efficacy of Escitalopram in the Treatment of Major Depressive Disorder Compared with Conventional Selective Serotonin Reuptake Inhibitors and Venlafaxine XR: A Meta-Analysis. *Journal of Psychiatric Neuroscience* , 31 (2), 122-31.

Kennedy, S., Andersen, H., & Thase, M. (2009). Escitalopram in the Treatment of Major Depressive Disorder: A Meta-Analysis. *Current Medical Research Opinion* , 25 (1), 161-75.

Kessler, R., Chiu, W., Demler, O., Merikangas, K., & Walters, E. (2005). Prevalence, Severity, and Comorbidity of 12-Month DSM-IV Disorders In The National Comorbidity Survey Replication. *Archives of General Psychiatry* , 62 (6), 617-27.

Kessler, R., Soukup, J., Davis, R., Foster, D., Wilkey, S., Van Rompay, M., et al. (2001). The Use of Complementary and Alternative Therapies to Treat Anxiety and Depression in the United States. *American Journal of Psychiatry* , 158 (2), 289-294.

Koç, Ç. (2004). The Productivity of Health Care and Health Production Functions. *Health Economics* , 13, 739-47.

Lam, D., Burbeck, R., Wright, K., & Pilling, S. (2009). Psychological Therapies in Bipolar Disorder: The Effect of Illness History on Relapse Prevention - A Systematic Review. *Bipolar Disorders* , 11 (5), 474-82.

Laska, E., Meisner, M., Siegel, C., & Wanderling, J. (2002). Statistical Determination of Cost-Effectiveness Frontier Based on Net Health Benefits. *Health Economics* , 11, 240-264.

Leigh, J. (1983). Direct and Indirect Effects of Education on Health. *Social Science Medicine* , 17, 227-234.

Lenox-Smith, A., Conway, P., & Knight, C. (2004). Cost Effectiveness of Representatives of Three Classes of Antidepressants Used in Major Depression in the UK. *Pharmacoeconomics* , 22 (5), 311-319.

Leslie, R., & Ghomrawi, H. (2008). The Use of Propensity Scores and Instrumental Variable Methods to Adjust For Treatment Selection Bias. *SAS Global Forum* (pp. 1-8). San Antonio, Tx: SAS.

Levit, K., Kassed, C., Coffey, R., Mark, T., McKusick, D., King, E., et al. (2008). *Projections of National Expenditures for Mental Health Services and Substance Abuse Treatment, 2004-2014*. Substance Abuse and Mental Health Services Administration. Rockville, MD: SAMHSA Publication No. SMA 08-4326.

Liberman, J. (2003). History of the Use of Antidepressants in Primary Care. *Primary Care Companion Journal of Clinical Psychiatry* , 5 (S7), 6-10.

Linde, K., Berner, M., Egger, M., & Mulrow, C. (2005). St John's Wort for Depression. *British Journal of Psychiatry* , 186, 99-107.

Löthgren, M., & Zethraeus, N. (2000). Definition, Interpretation and Calculation of Cost-Effectiveness Acceptability Curves. *Health Economics* , 9, 623-630.

Machnes, Y. (1999). Incentive and Production of Mental Health Services. *European Journal of Political Economy* , 12 (3), 459-466.

Manzoni, G., Pagnini, F., Castelnuovo, G., & Molinari, E. (2008). Relaxation Training for Anxiety: A Ten-Years Systematic Review with Meta-Analysis. *BMC Psychiatry* , 8, 1-12.

Martin, J., Sainz-Pardo, M., Toshiaki, A., Marín-Sánchez, E., Seoane, T., & Galán, C. (2007). Benzodiazepines in Generalized Anxiety Disorder: Heterogeneity of Outcomes Based on a Systematic Review and Meta-Analysis of Clinical Trials. *Journal of Psychopharmacology* , 21 (7), 774-82.

McCollum, M., Hanse, L., Ghushchyan, V., & Sullivan, P. (2007). Inconsistent Health Perceptions for US Women and Men with Diabetes. *Journal of Women's Health* , 16 (10), 1421-8.

McHorney, C., Ware, J., & Raczek, A. (1993). The MOS 36-Item Short-Form Health Survey (SF-36) II: Psychometric and Clinical Tests of Validity in Measuring Physical and Mental Health Construct. *Medical Care* , 31 (3), 247-63.

Miklowitz, D., & Scott, J. (2009). Psychosocial Treatments for Bipolar Disorder: Cost-Effectiveness, Mediating Mechanisms, and Future Directions. *Bipolar Disorders* , 11 (S2), 110-22.

Moyer, C., Rounds, J., & Hannum, J. (2004). A Meta-Analysis of Massage Therapy Research. *Psychological Bulletin* , 130 (1), 3-18.

Mukaino, Y., Park, J., White, A., & Ernst, E. (2005). The Effectiveness of Acupuncture for Depression--A Systematic Review of randomised Controlled Trials. *Acupuncture in Medicine: Journal of the British Medical Acupuncture Society* , 23 (2), 70-6.

Nakagawa, A., Watanage, N., Omori, I., Barbui, C., & Cipriani, A. (2008). Efficacy and Tolerability of Milnacipran in the Treatment of Major Depression in Comparison with Other Antidepressants: A Systematic Review and Meta-Analysis. *CNS Drugs* , 22 (7), 587-603.

National Institute of Mental Health. (2009). *Anxiety Disorders*. Bethesda, MD: NIH Publication No. 09-3879.

National Institute of Mental Health. (2009). *Bipolar Disorder*. Bethesda, MD: NIH Publication No. 09-3679.

National Institute of Mental Health. (2008). *Depression*. National Institute of Health. Bethesda, MD: NIH Publication No. 08-3561.

Nestoriuc, Y., Martin, A., Rief, W., & Andrasik, F. (2008). Biofeedback Treatment for Headache Disorders: A Comprehensive Efficacy Review. *Applied Psychophysiology and Biofeedback* , 33 (3), 125-40.

Nixon, R., & Thompson, S. (2005). Methods for Incorporating Covariate Adjustment, Subgroup Analysis and Between-Centre Differences into Cost-Effectiveness Evaluations. *Health Economics* , 14, 1217-1229.

O'Brien, B., Drummond, M., Roberts, L., & Willan, A. (1994). In Search of Power and Significance: Issues in the Design and Analysis of Stochastic Cost-Effectiveness Studies in Health Care. *Medical Care* , 32 (2), 150-163.

Olfson, M., & Marcus, S. (2009). National Patterns in Antidepressant Medication Treatment. *Archives of General Psychiatry* , 66 (8), 848-56.

Öst, L. (2008). Cognitive Behavior Therapy for Anxiety Disorders: 40 Years of Progress. *Nordic Journal of Psychiatry* , 47 (62), 5-10.

Pollack, W. (1998). Mourning, Melancholia and Masculinity: Recognizing and Treating Depression in Men. In W. Pollack, & R. Levant, *New Psychotherapy for Men* (pp. 147-166). New York: Wiley.

Pyne, J., Rost, K., Zhang, M., Williams, K., Smith, J., & Fortney, J. (2003). Cost-Effectiveness of a Primary Care Depression Intervention. *Journal of Affective Disorder* , 74 (1), 23-32.

Rahimi, R., Nikfar, S., & Abdollahi, M. (2009). Efficacy and Tolerability of Hypericum Perforatum in Major Depressive Disorder in Comparison with Selective Serotonin Reuptake Inhibitors: A Meta-Analysis. *Progress in Neuro-Psychopharmacology & Biological Psychiatry* , 33 (1), 118-27.

Reddy, Y. (2004). Review: St John's Wort May Be Less Effective than Previously Thought in People with Depression. *Evidence-Based Mental Health* , 7 (4), 109.

Ried, L., Tueth, M., Handberg, E., & Nyanteh, H. (2006). Validating a Self-Report Measure of Global Subjective Well-Being to Predict Adverse Clinical Outcomes. *Quality of Life Research* , 15, 675-86.

Roy-Byrne, Bystritsky, A., Russo, J., Craske, M., Sherbourne, C., & Stein, M. (2005). Use of Herbal Medicine in Primary Care Patients With Mood and Anxiety Disorders. *Psychosomatics* , 46 (2), 117-122.

Sarris, J., & Kavanagh, D. (2009). Dava and St. John's Wort: Current Evidence for Use in Mood and Anxiety Disorders. *Journal of Alternative and Complementary Medicine* , 15 (8), 827-36.

Sclar, D., Robison, L., & Skaer, T. (1994). Antidepressant Pharmacotherapy: Economic Outcomes in a Health Maintenance Organization. *Clinical Therapy* , 16, 715-730.

Sendi, P., & Briggs, A. (2001). Affordability and Cost-Effectiveness: Decision-Making on the Cost-Effectiveness Plane. *Health Economics* , 10, 675-680.

Shih, Y.-C. T., Bekele, N., & Xu, Y. (2007). Use of Bayesian Net Benefit Regression Model to Examine the Impact of Generic Drug Entry on the Cost-Effectiveness of Selective Serotonin Reuptake Inhibitors in Elderly Depressed Patients. *Pharmacoeconomics* , 25 (10), 843-862.

- Silvers, K., & Scott, K. (2002). Fish Consumption and Self-Reported Physical and Mental Health Status. *Public Health Nutrition* , 5 (3), 427-431.
- Simon, G., & Fishman, P. (1998). Cost Implications of Initial Antidepressant Selection in Primary Care. *Pharmacoeconomics* , 13, 61-70.
- Simon, G., Revicki, D., Heiligenstein, J., Grothaus, L., VonKorff, M, et al. (2002). Recovery from Depression, Work Productivity, and Health Care Costs among Primary Care Patients. *General Hospital Psychiatry* , 22 (3), 153-162.
- Smith, C., & Hay, P. (2005). Acupuncture for Depression. *Cochrane Database of Systematic Review (Online)* , 2.
- Smith, L., Cornelius, V., Warnock, A., Tacchi, M., & Taylor, D. (2007a). Acute Bipolar Mania: A Systematic Review and Meta-Analysis of Co-Therapy vs. Monotherapy. *Acta Psychiatrica Scandinavica* , 115 (1), 12-20.
- Smith, L., Cornelius, V., Warnock, A., Tacchi, M., & Taylor, D. (2007b). Pharmacological Interventions for Acute Bipolar Mania: A Systematic Review of Randomized Placebo-Controlled Trials. *Bipolar Disorders* , 9 (6), 551-60.
- Soares, J., & Mann, J. (1997). The Functional Neuroanatomy of Mood Disorders. *Journal of Psychiatric Research* , 31 (4), 393-432.
- Stagnitti, M. (2008). *Antidepressants Prescribed by Medical Doctors in Office Based and Outpatient Settings by Specialty for the U.S. Civilian Noninstitutionalized Population, 2002 and 2005*. Rockville, MD: Agency for Healthcare Research and Quality.
- Steffens, D., Krishan, R., & Helms, M. (1997). Are SSRIs better than TCAs: A Meta-Analysis. *Depression & Anxiety* , 6 (1), 10-8.
- Stein, D. (2006). Evidence-Based Treatment of Anxiety Disorders. *International Journal of Psychiatry in Clinical Practice* , 10 (S1), 16-21.
- Stetter, F., & Kupper, S. (2002). Autogenic Training: A Meta-Analysis of Clinical Outcome Studies. *Applied Psychophysiology Biofeedback* , 27 (1), 45-98.

Stinnett, A., & Mullahy, J. (1998). Net Health Benefits: A New Framework for the Analysis of Uncertainty in Cost-Effectiveness Analysis. *Medical Decision Making* , 18 (2), S68-S80.

Sullivan, P., & Gushchyan, V. (2006). Mapping the EQ-5D Index from the SF-12: US General Population Preferences in a Nationally Representative Sample. *Medical Decision Making* , 26, 401-9.

Thase, M., Trivedi, M., & Rush, A. (1995). MAOIs in the Contemporary Treatment of Depression. *Neuropsychopharmacology* , 12 (3), 185-219.

Tsuang, M., Bar, J., Stone, W., & Faraone, S. (2004). Gene-Environmental Interactions in Mental Disorders. *World Psychiatry* , 3 (2), 78-83.

Unützer, J., Klap, R., Sturm, R., Young, A., Marmon, T., Shatkin, J., et al. (2000). Mental Disorders and the Use of Alternative Medicine: Results From a National Survey. *American Journal of Psychiatry* , 157 (11), 1851-1857.

Van Hout, B., Maiwenn, J., Gordon, G., & Rutten, F. (2006). Costs, Effects, and C/E-Ratios Alongside a Clinical Trial. *Health Economics* , 3 (5), 309-19.

Vázquez-Polo, F., Hernández, M. A., & López -Valcárcel, B. G. (2005). Using Covariates to Reduce Uncertainty in the Economic Evaluation of Clinical Trial Data. *Health Economics* , 14, 545-557.

Wang, H., Qi, H., Wang, B., Cui, Y., Zhu, L., Rong, Z., et al. (2008). Is Acupuncture Beneficial in Depression: A Meta-Analysis of 8 Randomized Controlled Trials? *Journal of Affective Disorder* , 111 (2-3), 125-34.

Ware, J., & Sherbourne, C. (1992). The MOS 36-Item Short-Form Health Survey (SF-36) I: Conceptual Framework and Item Selection. *Medical Care* , 30 (6), 473-83.

Weiner, R. (1995). Electroconvulsive Therapy. In G. Gabbard, & G. Gabbard (Ed.), *Treatments of Psychiatric Disorders* (pp. 1237-62). Washington, DC: American Psychiatric Press.

Wilde, M., & Benfield, P. (1998). Fluoxetine: A Pharmacoeconomic Review of its Use in Depression. *Pharmacoeconomics* , 5 (1), 543-561.

Willan, A., & O'Brien, B. (1996). Confidence Intervals for Cost-Effectiveness Ratios: An Application of Fieller's Theorem. *Health Economics* , 5, 297-305.

Willan, A., Briggs, A., & Hoch, J. (2004). Regression Methods for Covariate Adjustment and Subgroup Analysis for Non-Censored Cost-Effectiveness Data. *Health Economics* , 13, 461-475.

Willan, A., Lin, D., & Manca, A. (2005). Regression Methods for Cost-Effectiveness Analysis with Censored Data. *Statistics in Medicine* , 24, 131-145.

Willan, A., O'Brien, B., & Leyva, R. (2001). Cost-Effectiveness Analysis When the WTP is Greater than the WTP. *Statistics in Medicine* , 20 (21), 3251-3259.

Wu, E., Birnbaum, H., Mareva, M., Parece, A., Huang, Z., Mallett, D., et al. (2006). Interstitial Cystitis: Cost, Treatment, and Co-morbidities in an Employed Population. *Pharmacoeconomics* , 24 (1), 55-65.

Zethraeus, N., Johannesson, M., Jönsson, B., Löthgren, M., & Tambour, M. (2003). Advantages of Using the Net-Benefit Approach for Analysing Uncertainty in Economic Evaluation Studies. *Pharmacoeconomics* , 21 (1), 39-48.

APPENDICES

Appendix A

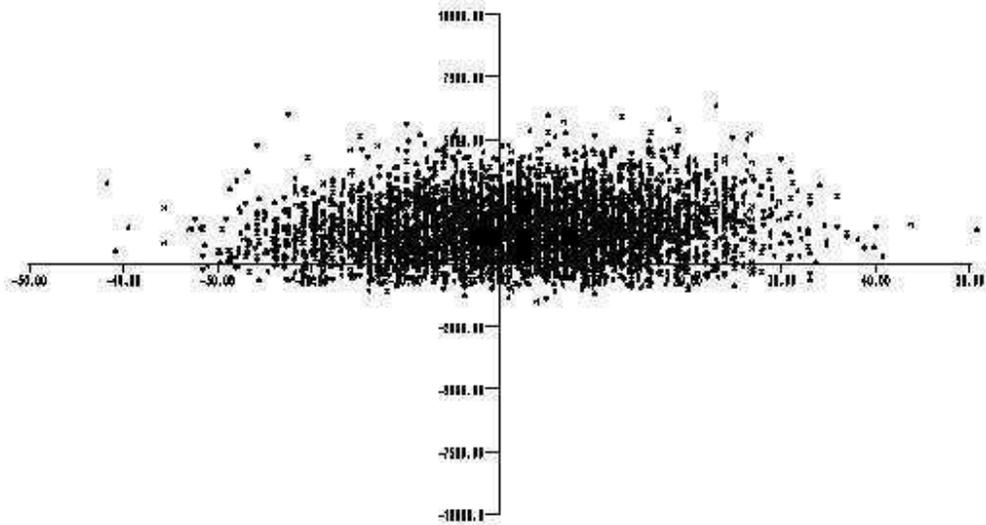


Figure A.1 Bootstrap Replicates for Affective Disorders by Condition Identifier

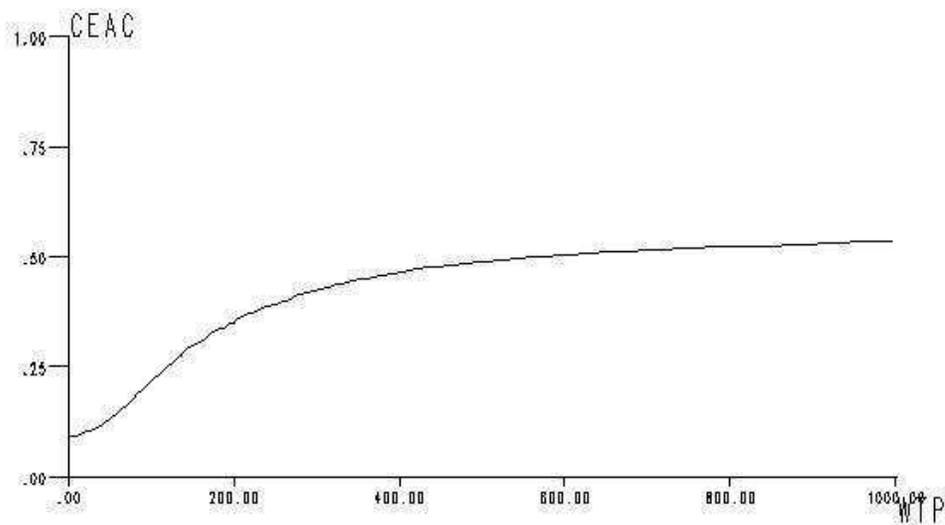


Figure A.2 CEAC for Affective Disorders by Condition Identifier

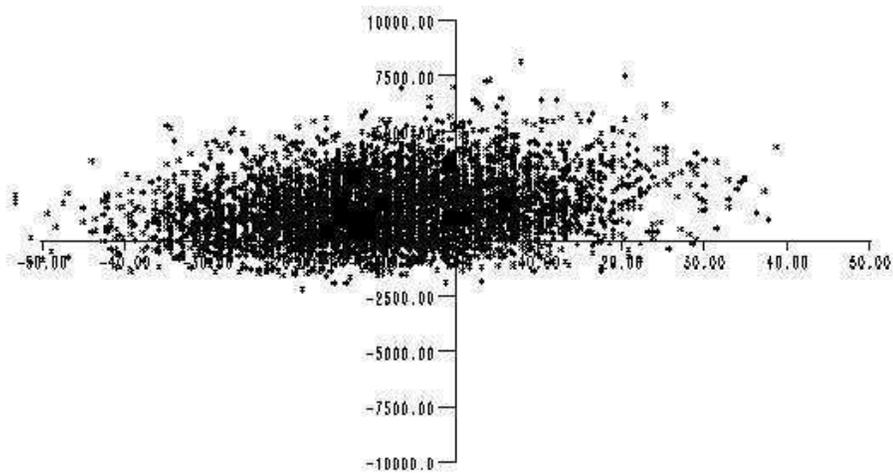


Figure A.3 Bootstrap Replicates for Affective Disorders by Pharmacotherapy Use

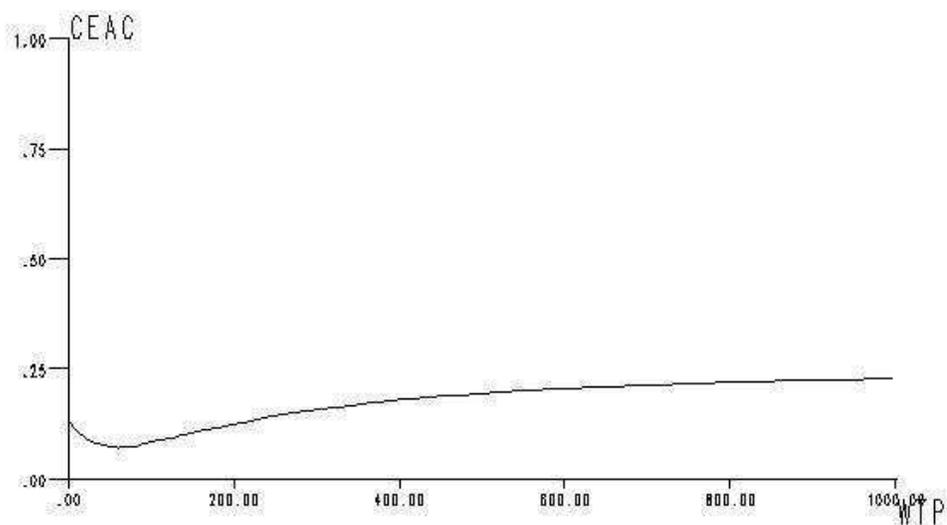


Figure A.4 CEAC for Affective Disorders by Pharmacotherapy Use

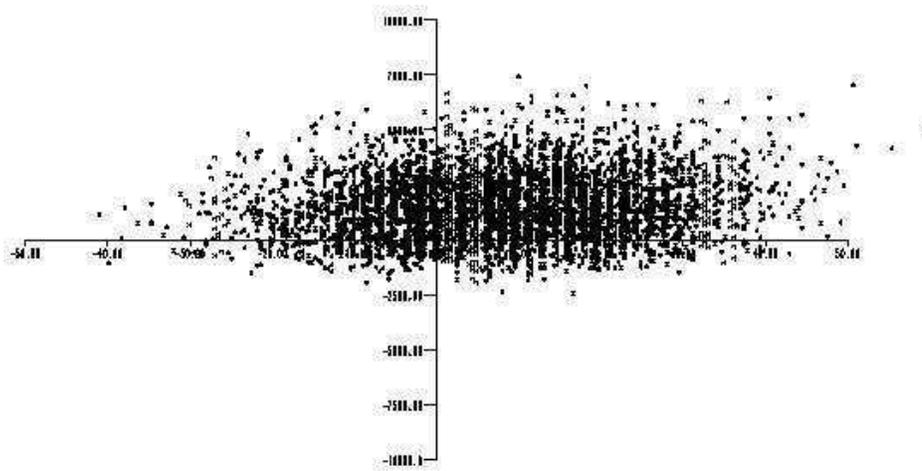


Figure A.5 Bootstrap Replicates for Affective Disorders by Psychotherapy Use

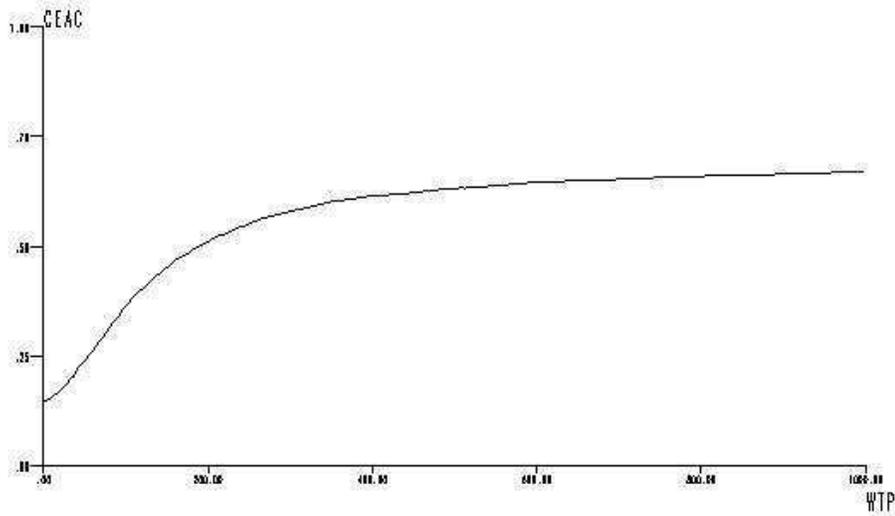


Figure A.6 CEAC for Affective Disorders by Psychotherapy Use

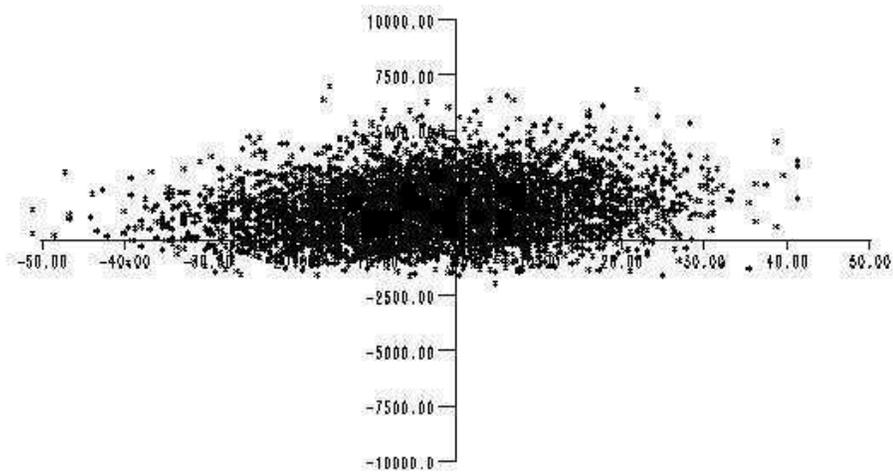


Figure A.7 Bootstrap Replicates for Affective Disorders by Either Use

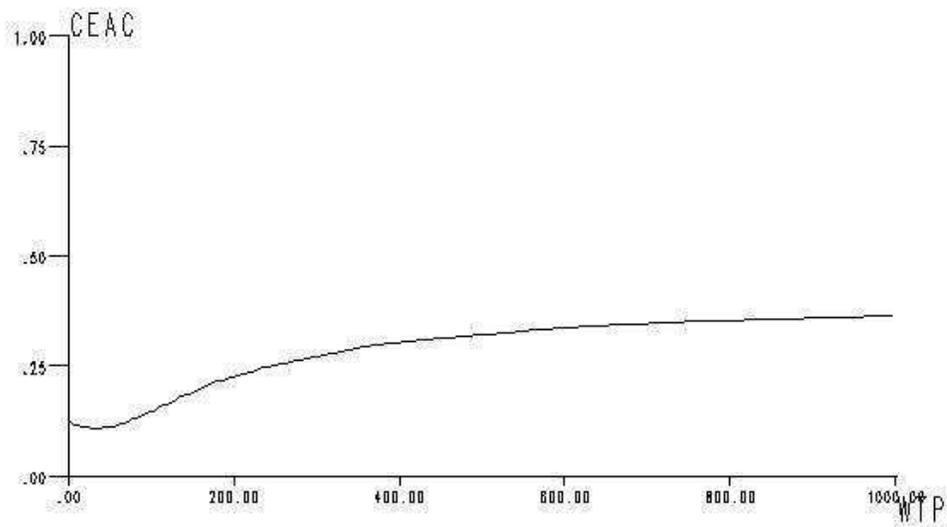


Figure A.8 CEAC for Affective Disorders by Either Use

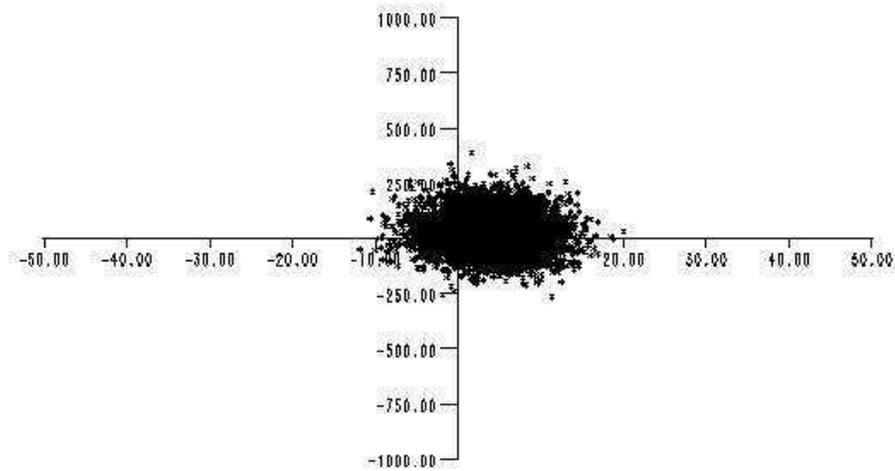


Figure A.9 Bootstrap Replicates for Anxiety Disorders by Condition Identifier

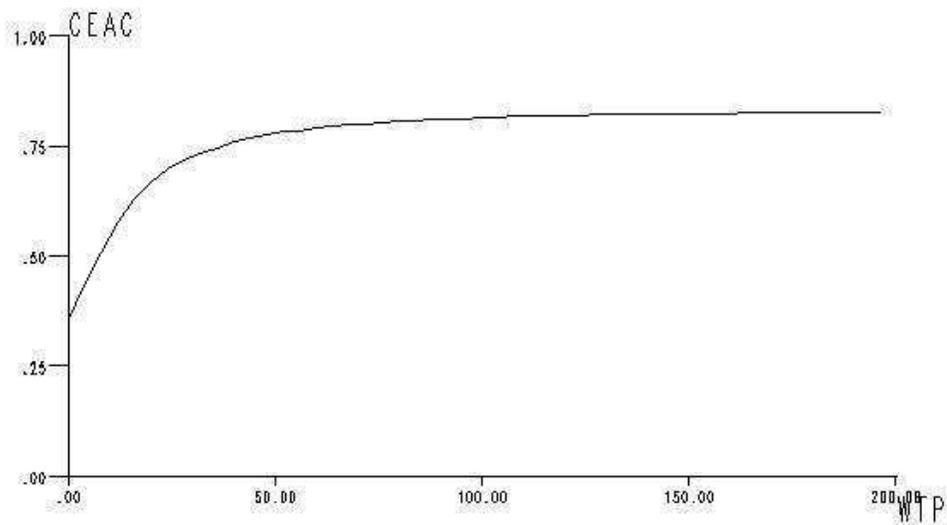


Figure A.10 CEAC for Anxiety Disorders by Condition Identifier

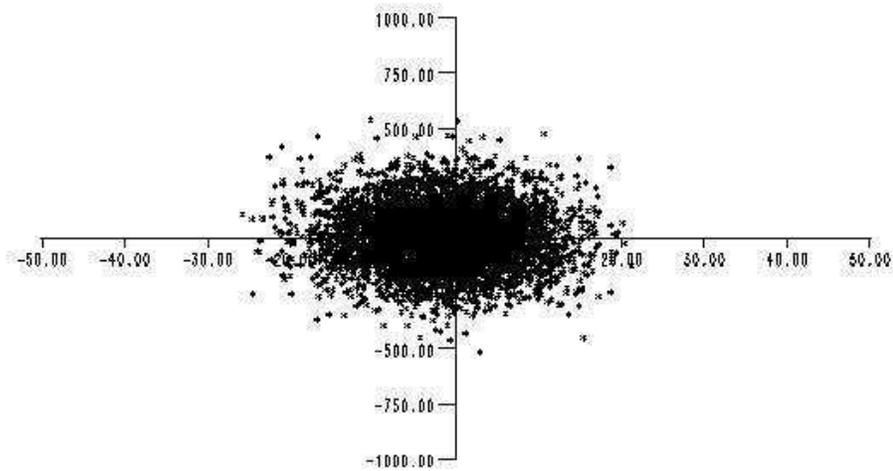


Figure A.11 Bootstrap Replicates for Anxiety Disorders by Pharmacotherapy Use

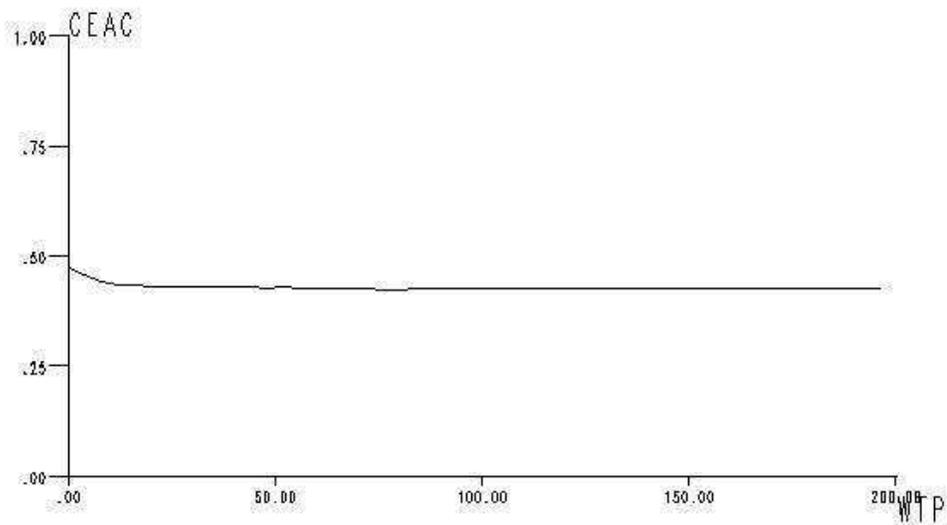


Figure A.12 CEAC for Anxiety Disorders by Pharmacotherapy Use

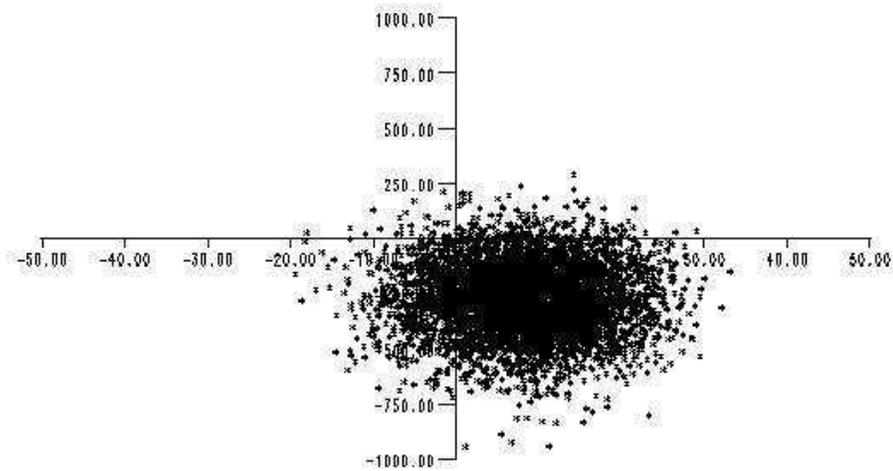


Figure A.13 Bootstrap Replicates for Anxiety Disorders by Psychotherapy Use

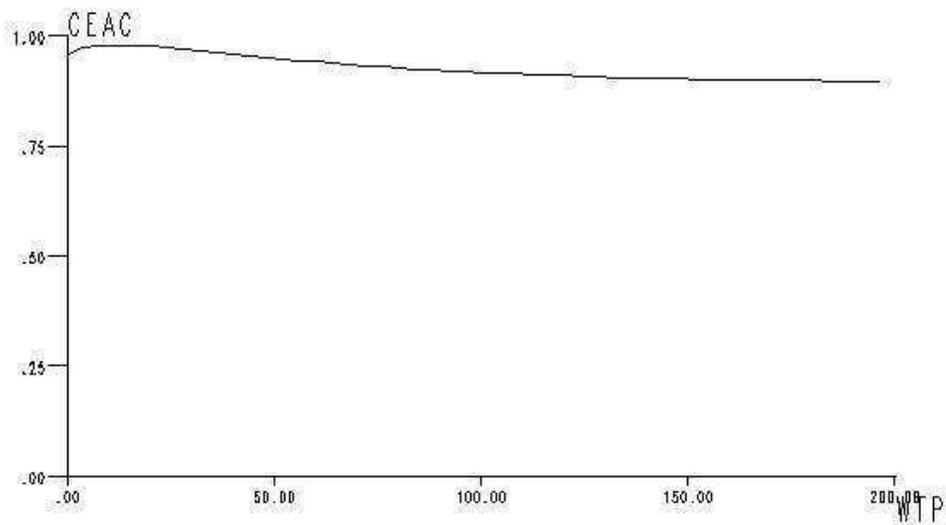


Figure A.14 CEAC for Anxiety Disorders by Psychotherapy Use

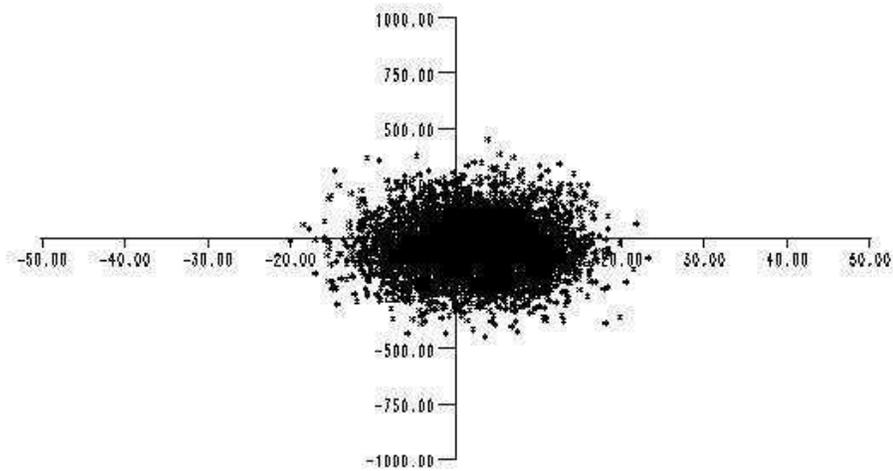


Figure A.15 Bootstrap Replicates for Anxiety Disorders by Either Use

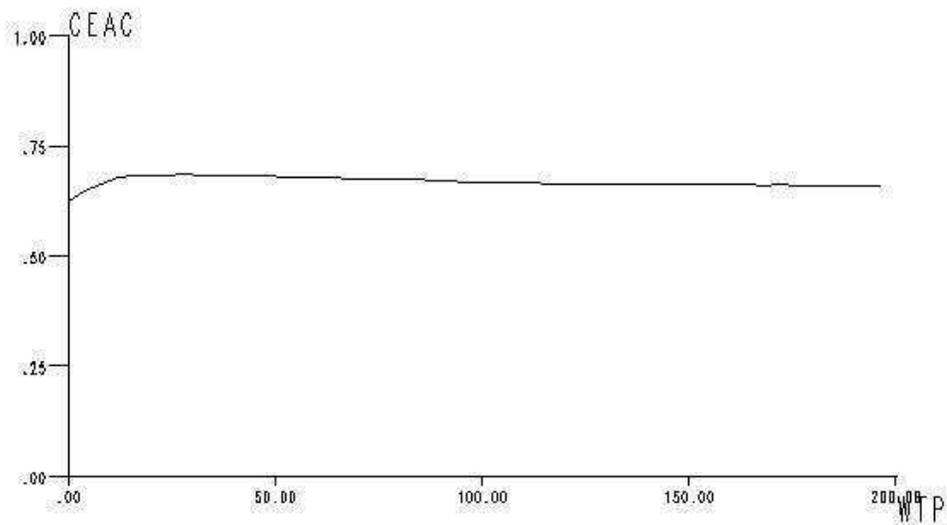


Figure A.16 CEAC for Anxiety Disorders by Either Use

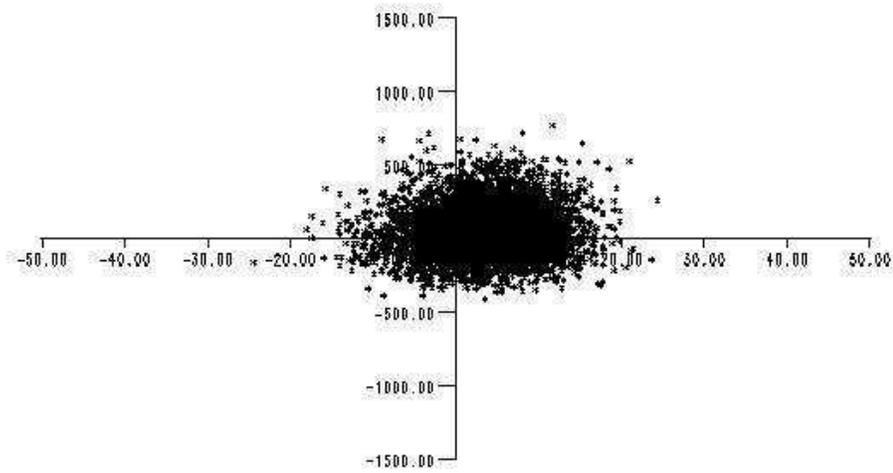


Figure A.17 Bootstrap Replicates for Neurotic Disorders by Condition Identifier

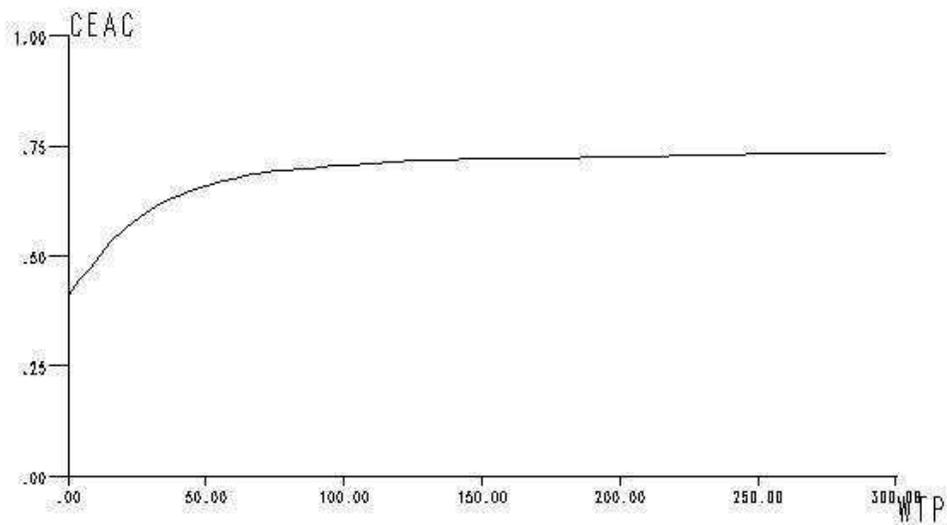


Figure A.18 CEAC for Neurotic Disorders by Condition Identifier

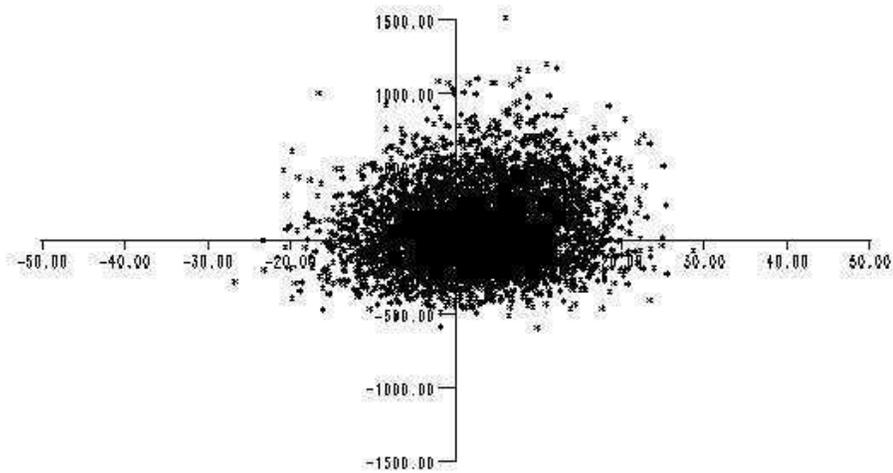


Figure A.19 Bootstrap Replicates for Neurotic Disorders by Pharmacotherapy Use

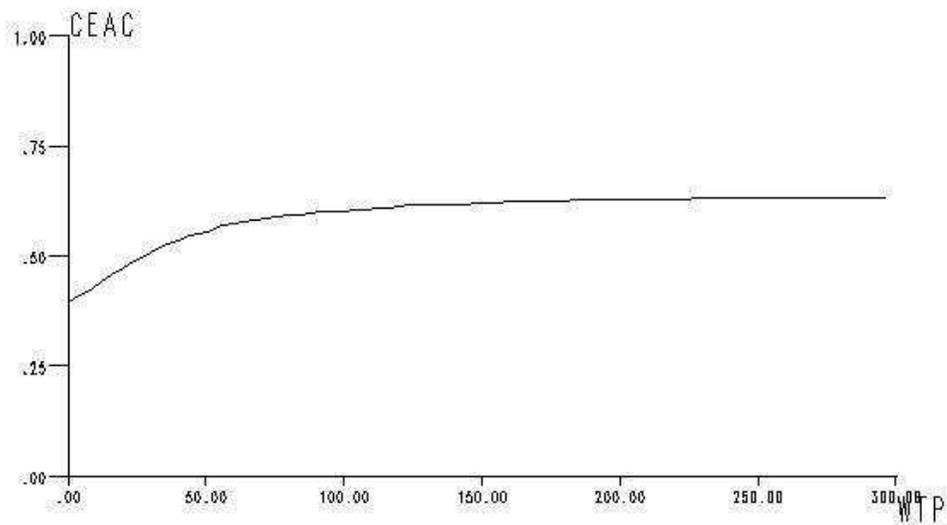


Figure A.20 CEAC for Neurotic Disorders by Pharmacotherapy Use

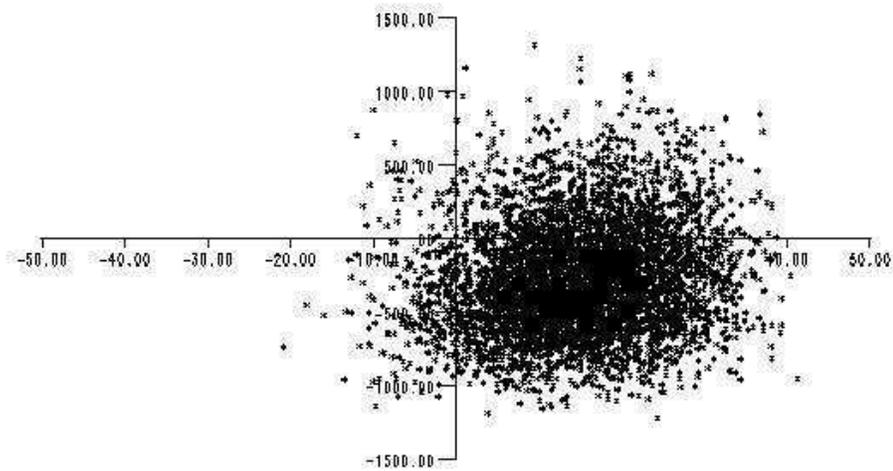


Figure A.21 Bootstrap Replicates for Neurotic Disorders by Psychotherapy Use

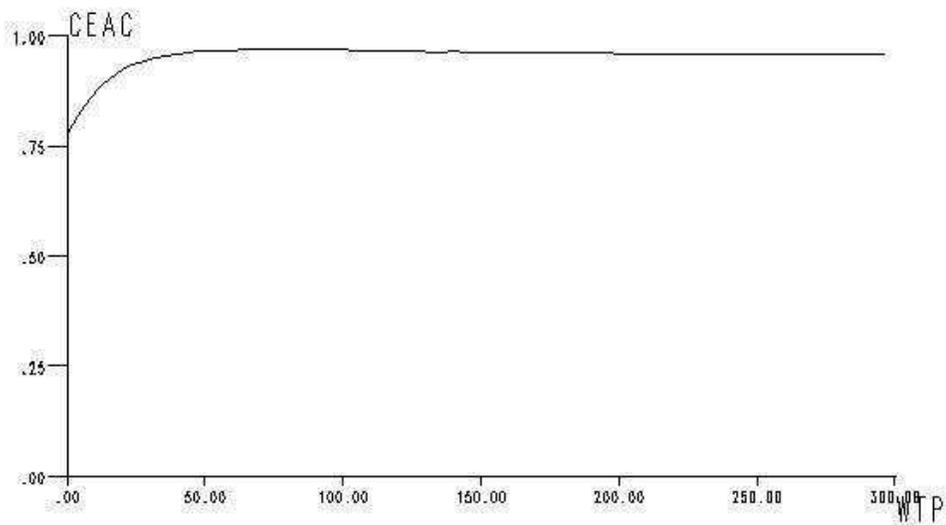


Figure A.22 CEAC for Neurotic Disorders by Psychotherapy Use

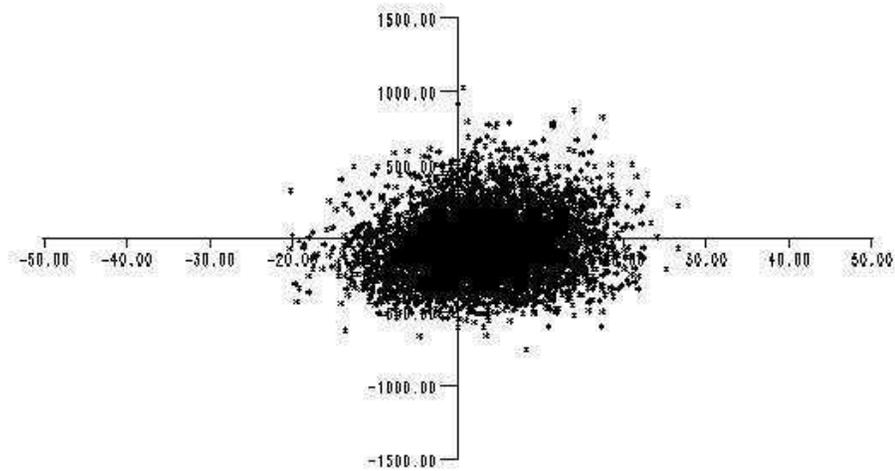


Figure A.23 Bootstrap Replicates for Neurotic Disorders by Either Use

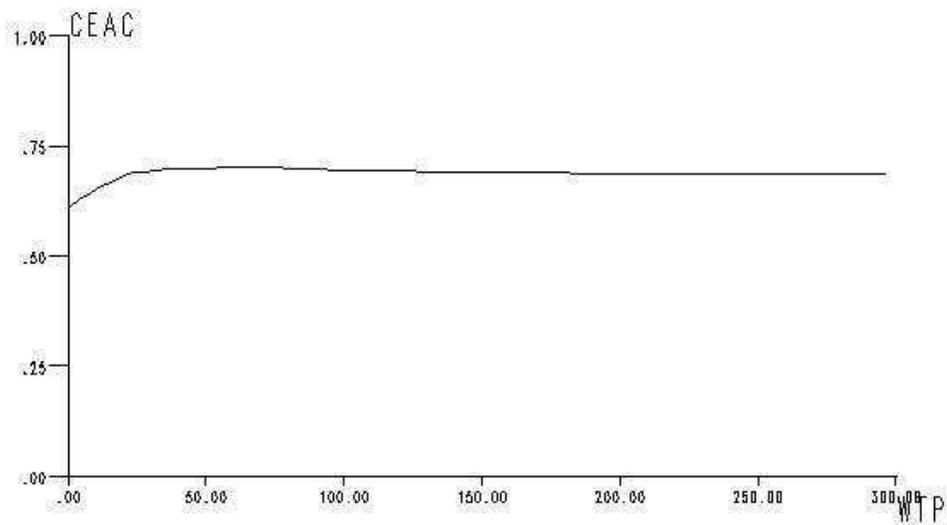


Figure A.24 CEAC for Neurotic Disorders by Either Use

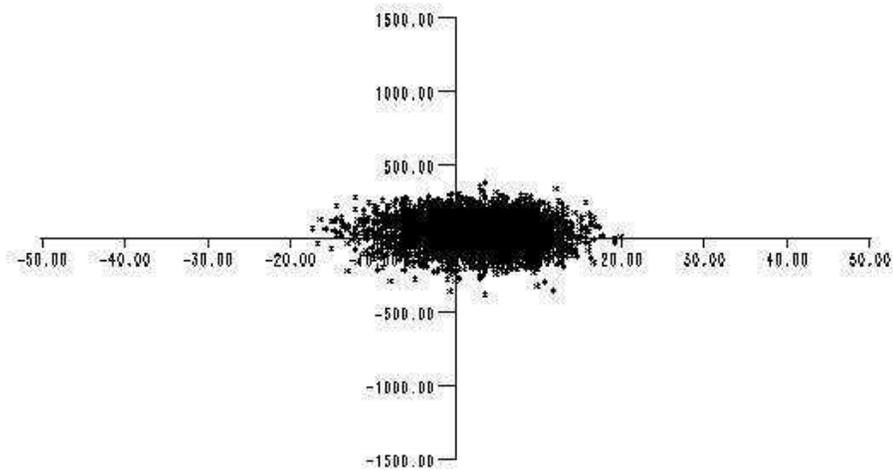


Figure A.25 Bootstrap Replicates for Acute Stress Disorders by Condition Identifier

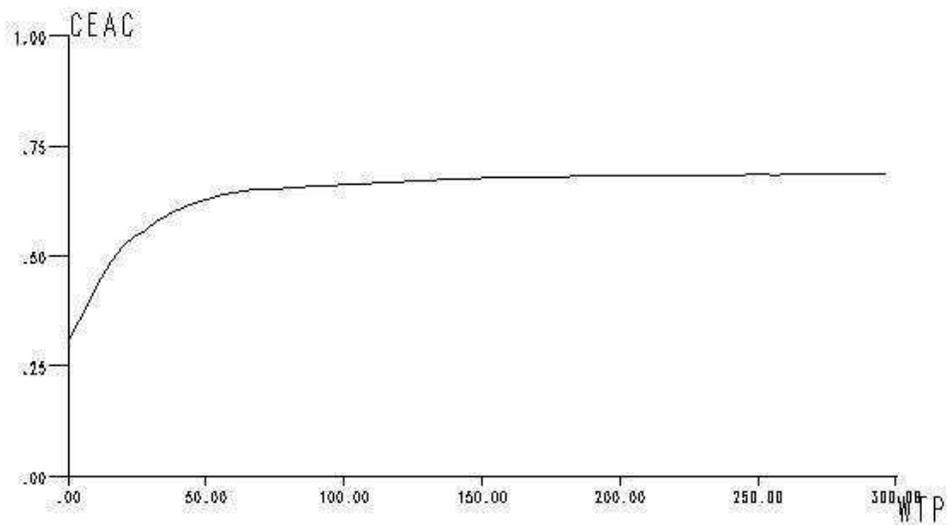


Figure A.26 CEAC for Acute Stress Disorders by Condition Identifier

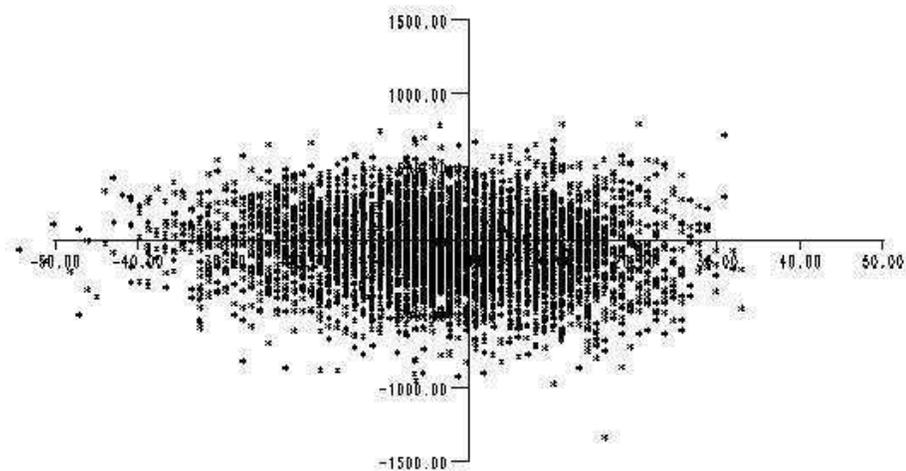


Figure A.27 Bootstrap Replicates for Acute Stress Disorders by Pharmacotherapy Use

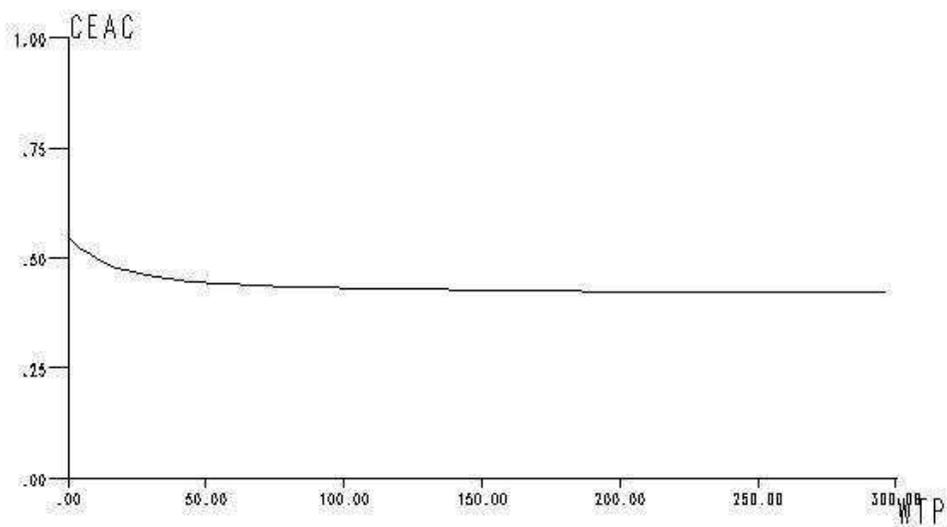


Figure A.28 CEAC for Acute Stress Disorders by Pharmacotherapy Use

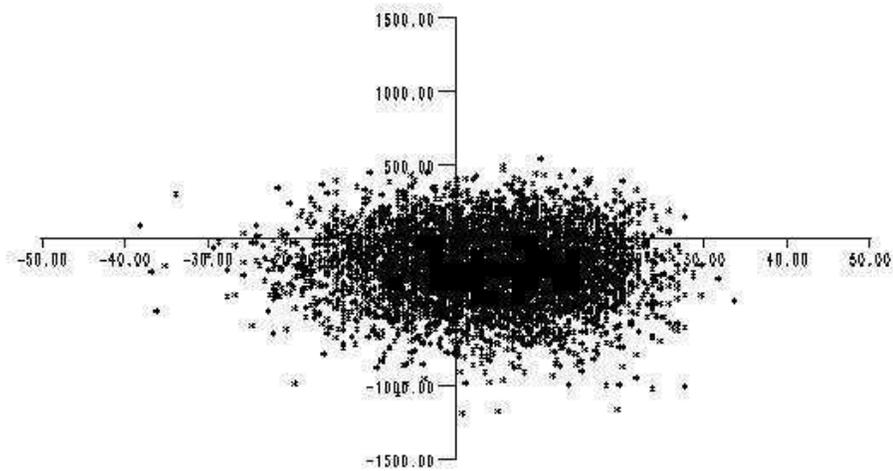


Figure A.29 Bootstrap Replicates for Acute Stress Disorders by Psychotherapy Use

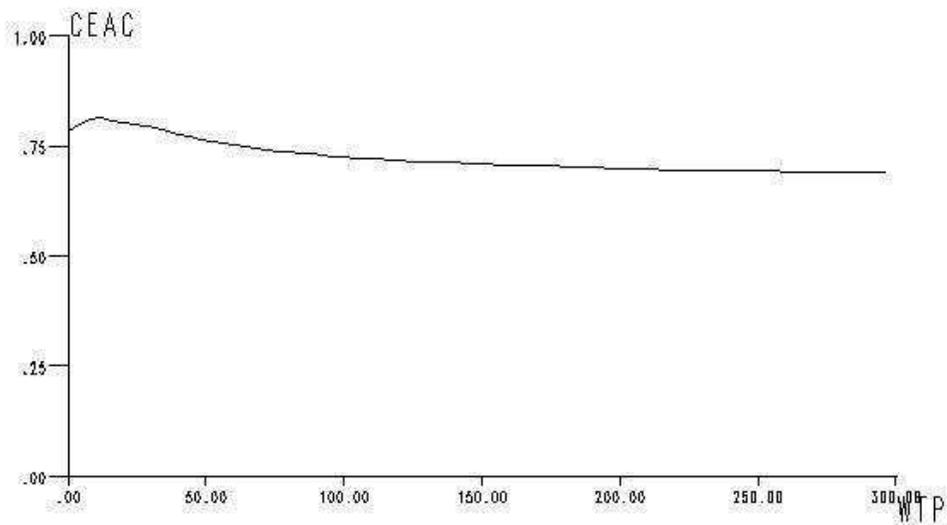


Figure A.30 CEAC for Acute Stress Disorders by Psychotherapy Use

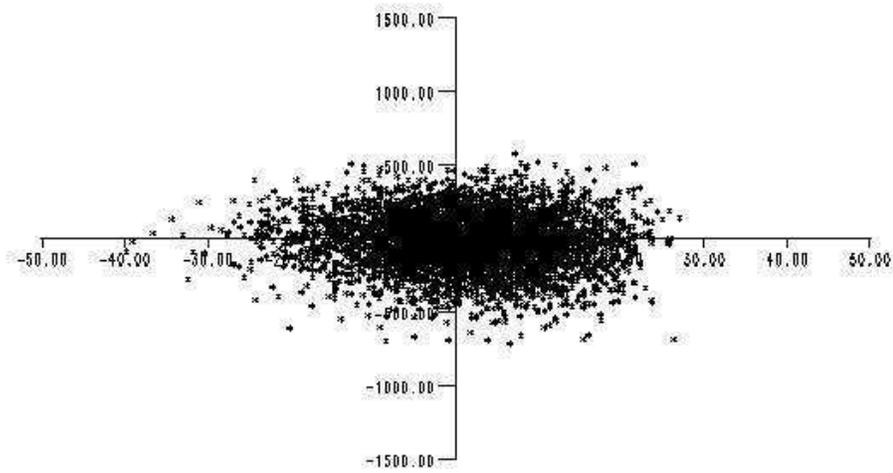


Figure A.31 Bootstrap Replicates for Acute Stress Disorders by Either Use

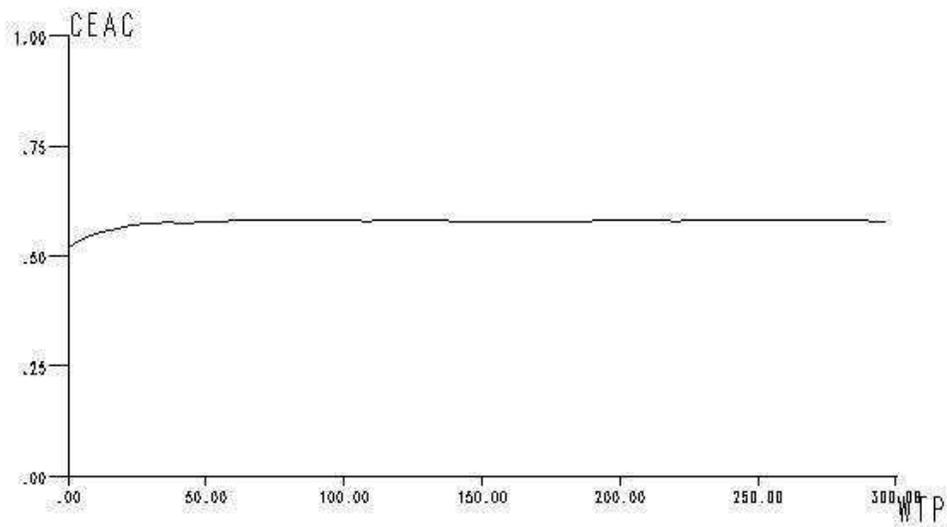


Figure A.32 CEAC for Acute Stress Disorders by Either Use

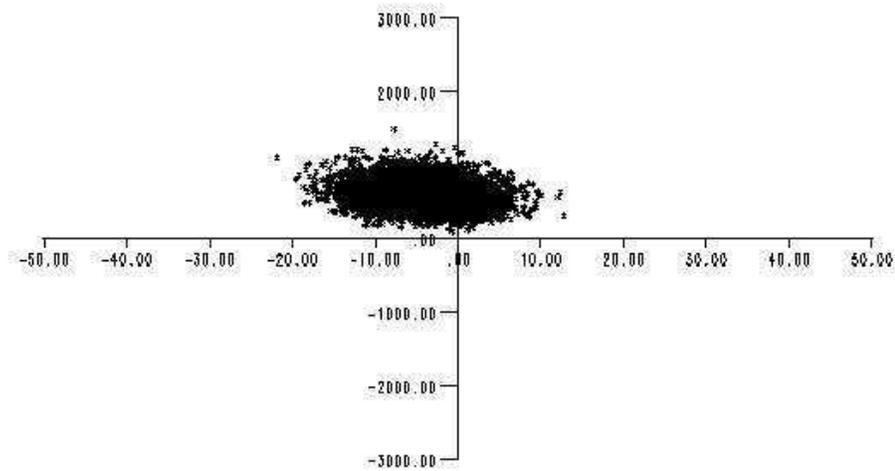


Figure A.33 Bootstrap Replicates for Depression (NOS) Disorders by Condition Identifier

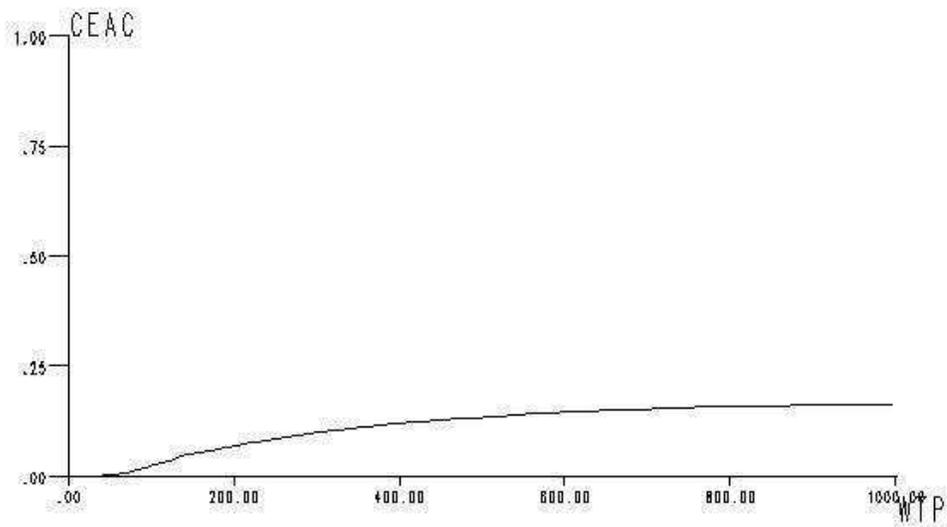


Figure A.34 CEAC for Depression (NOS) Disorders by Condition Identifier

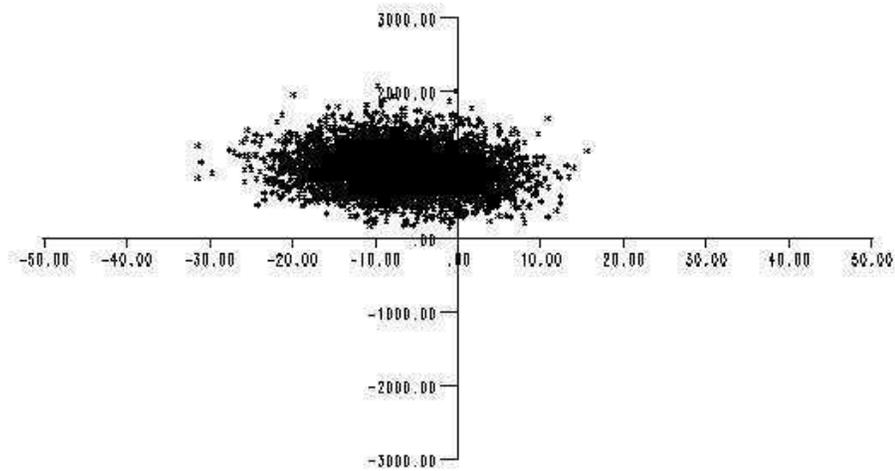


Figure A.35 Bootstrap Replicates for Depression (NOS) Disorders by Pharmacotherapy Use

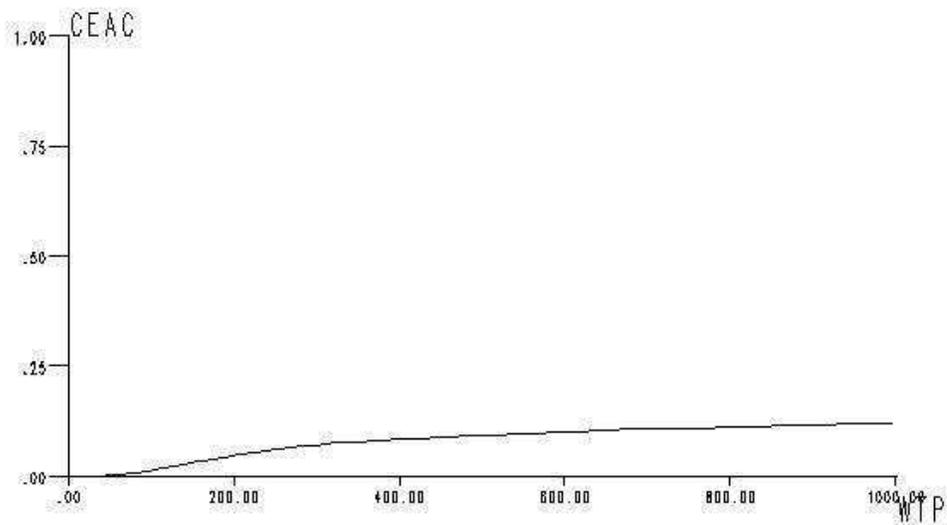


Figure A.36 CEAC for Depression (NOS) Disorders by Pharmacotherapy Use

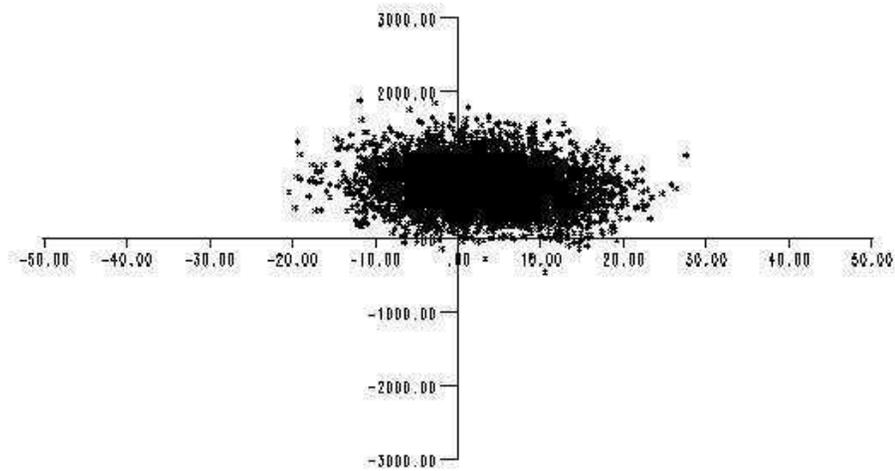


Figure A.37 Bootstrap Replicates for Depression (NOS) Disorders by Psychotherapy Use

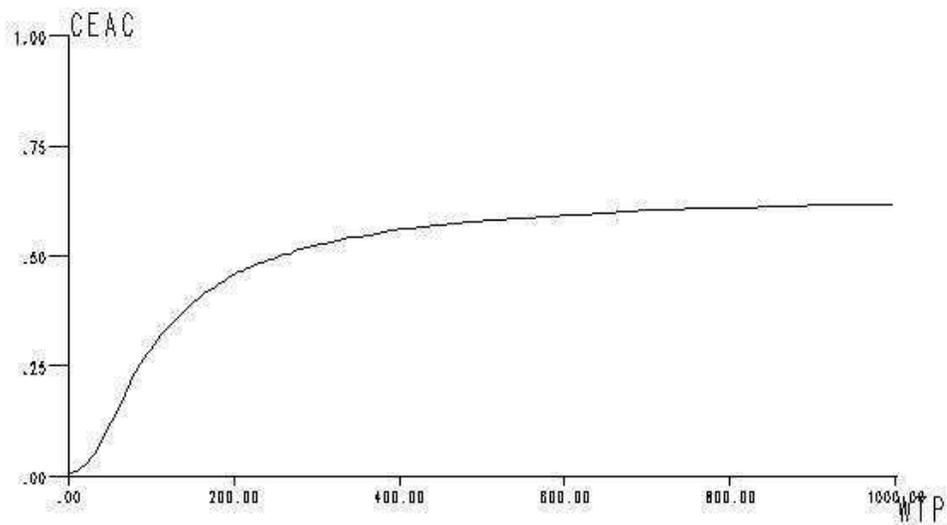


Figure A.38 CEAC for Depression (NOS) Disorders by Psychotherapy Use

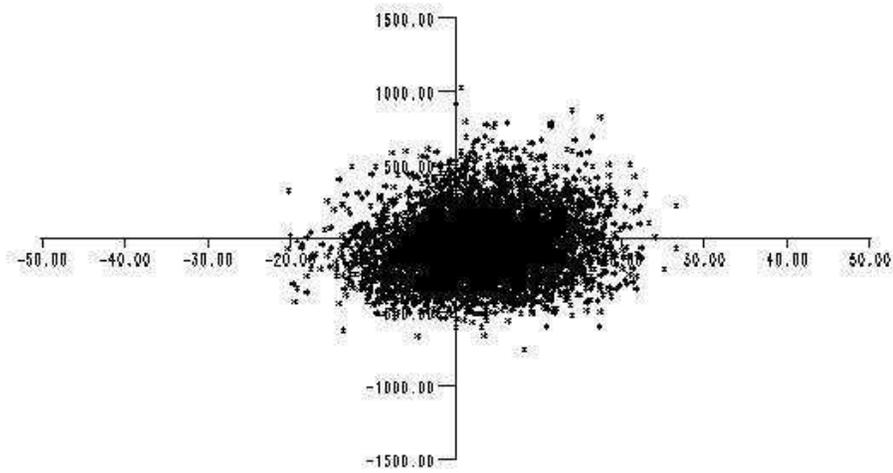


Figure A.39 Bootstrap Replicates for Depression (NOS) Disorders by Either Use

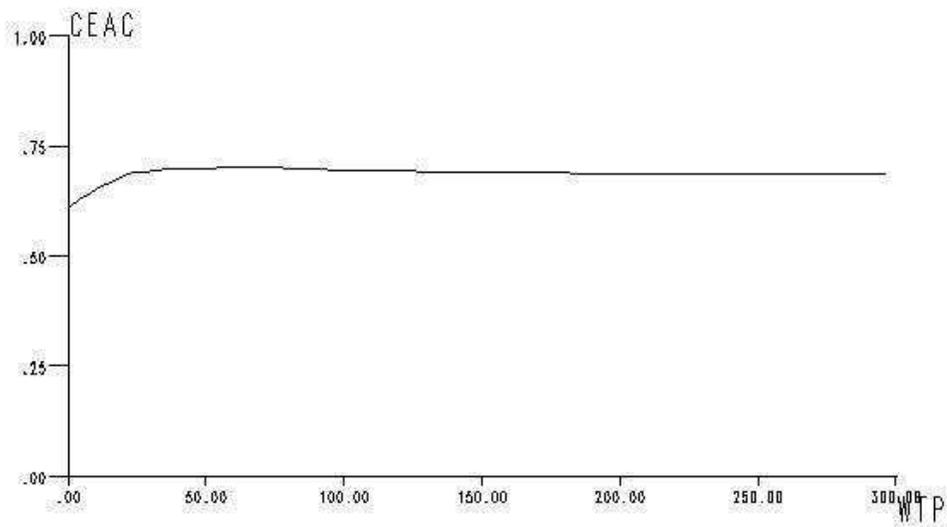
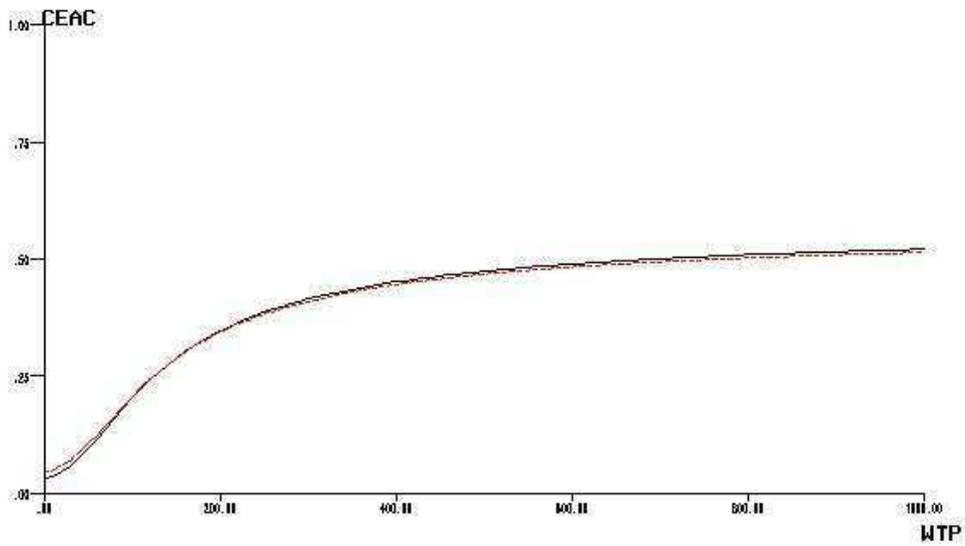


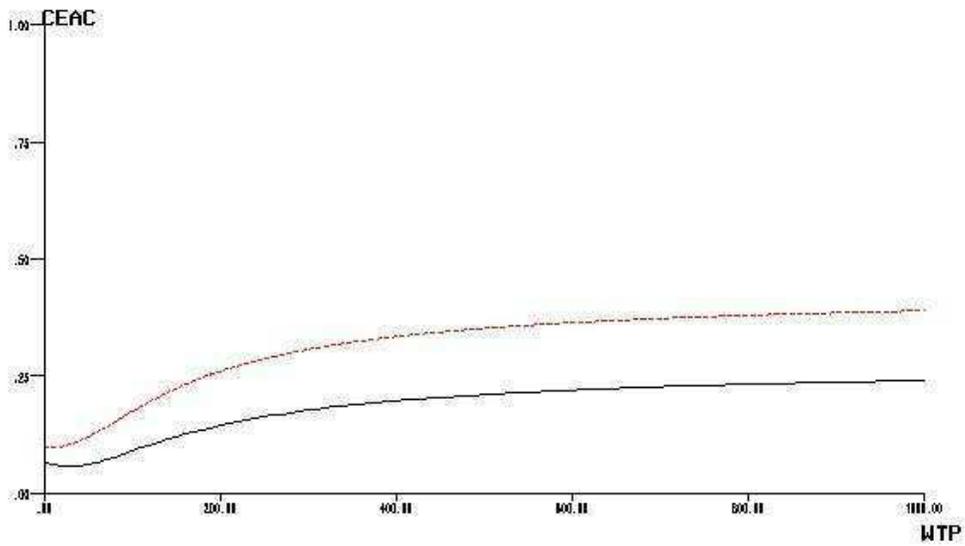
Figure A.40 CEAC for Depression (NOS) Disorders by Either Use

Appendix B



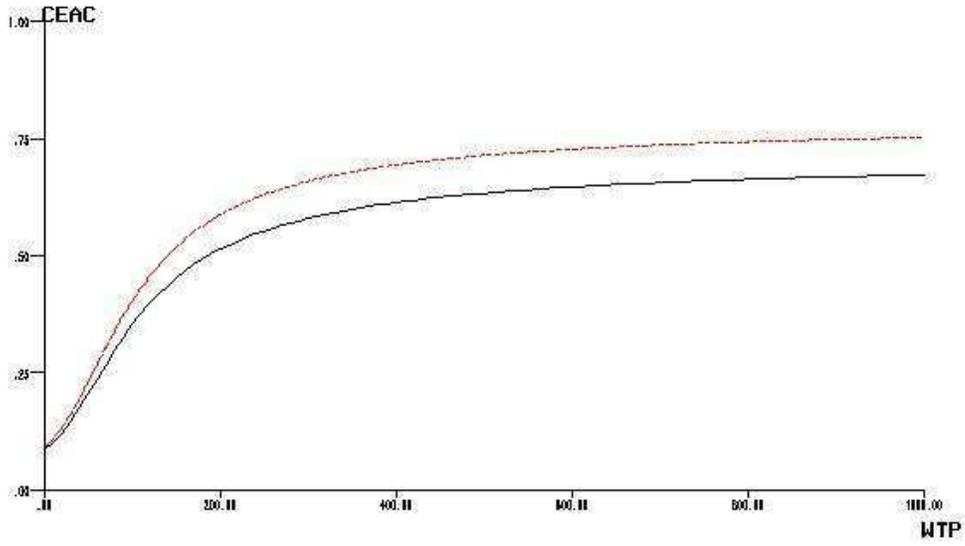
— Without controls; - - Without controls

Figure A.41 CEAC with Controls for Affective Disorders by Condition Identifier



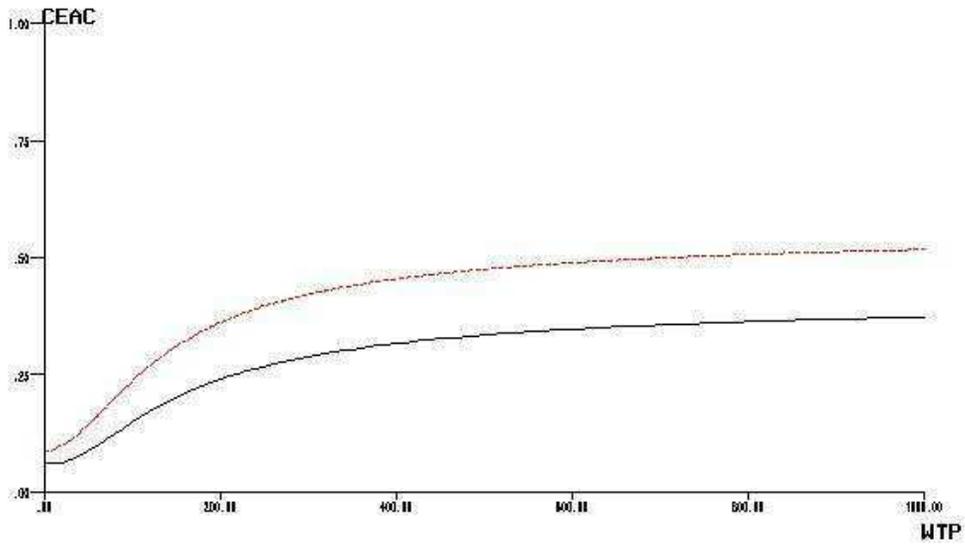
— Without controls; - - Without controls

Figure A.42 CEAC with Controls for Affective Disorders by Pharmacotherapy Use



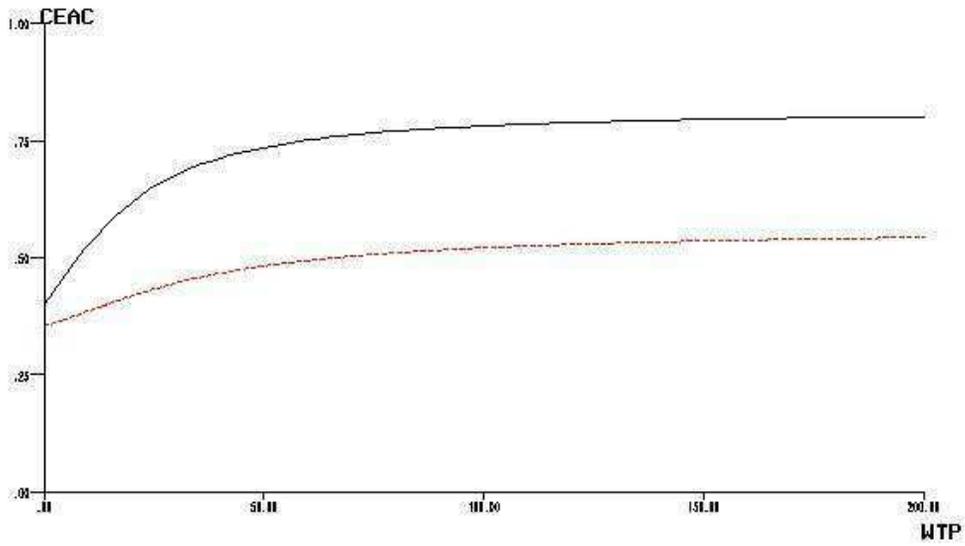
— Without controls; - - Without controls

Figure A.43 CEAC with Controls for Affective Disorders by Psychotherapy Use



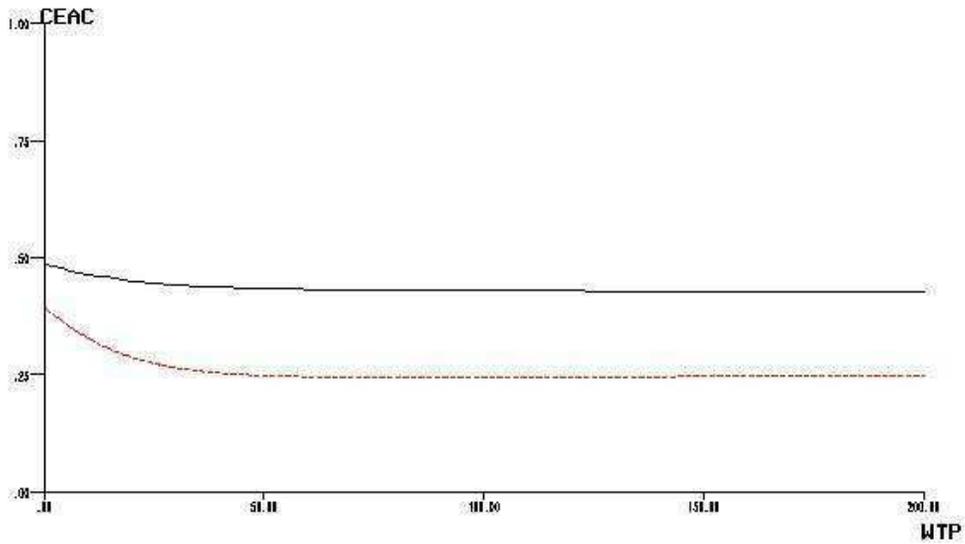
— Without controls; - - Without controls

Figure A.44 CEAC with Controls for Affective Disorders by Either Use



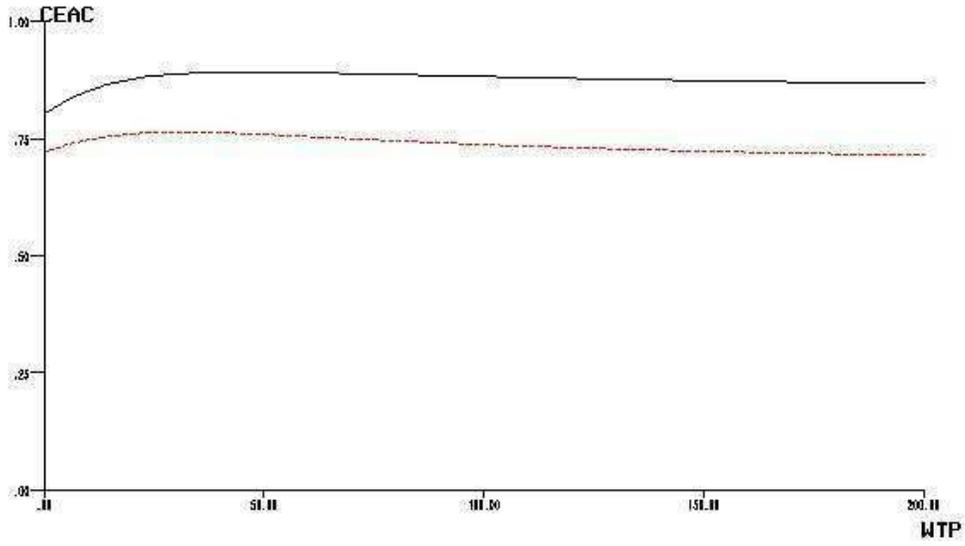
— Without controls; - - Without controls

Figure A.45 CEAC with Controls for Anxiety Disorders by Condition Identifier



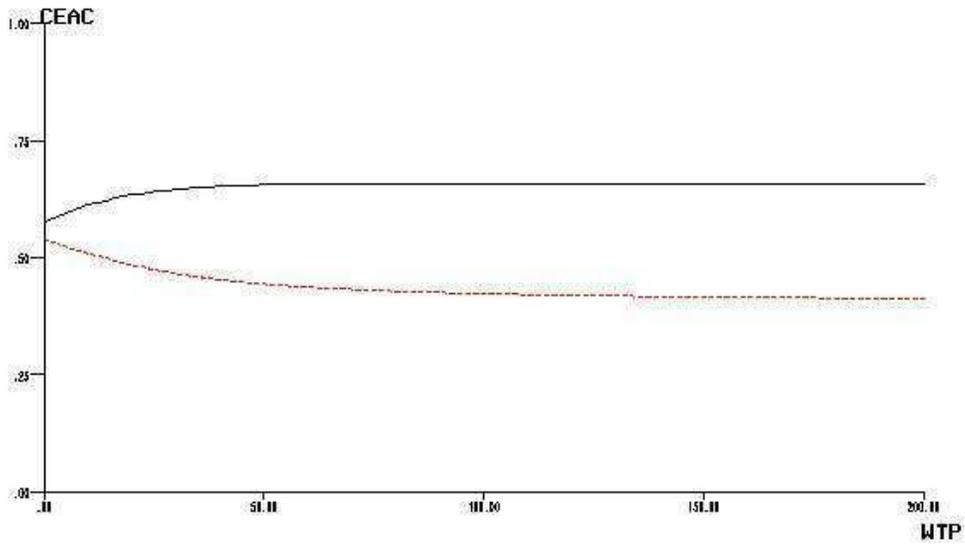
— Without controls; - - Without controls

Figure A.46 CEAC with Controls for Anxiety Disorders by Pharmacotherapy Use



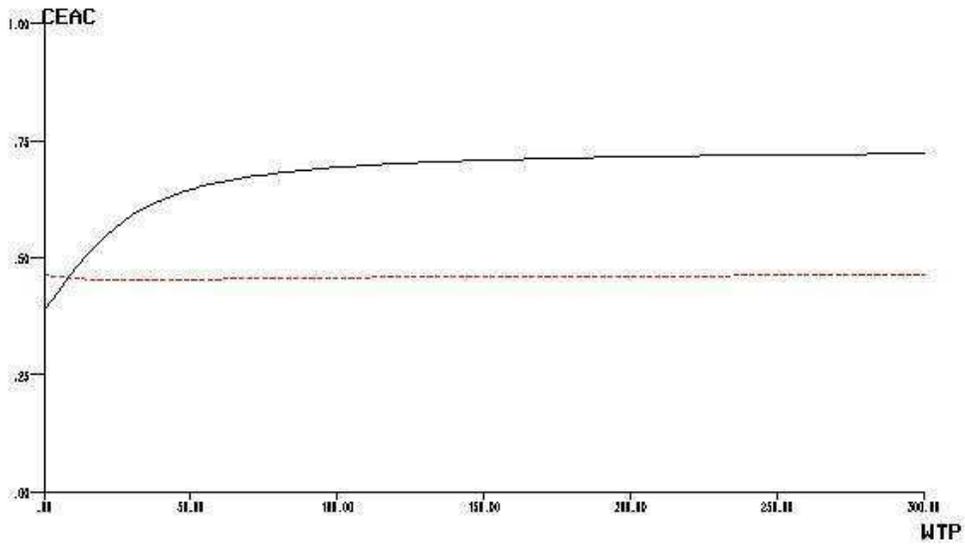
— Without controls; - - Without controls

Figure A.47 CEAC with Controls for Anxiety Disorders by Psychotherapy Use



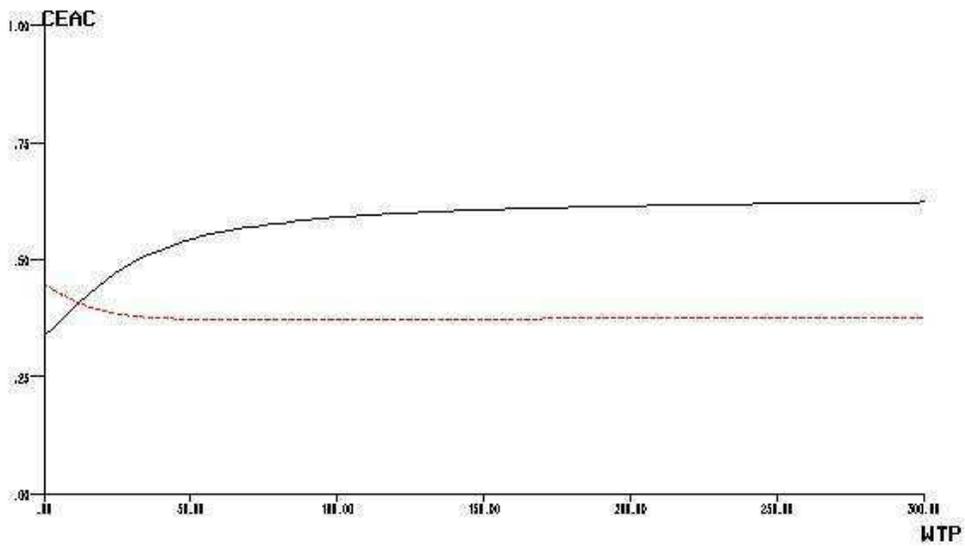
— Without controls; - - Without controls

Figure A.48 CEAC with Controls for Anxiety Disorders by Either Use



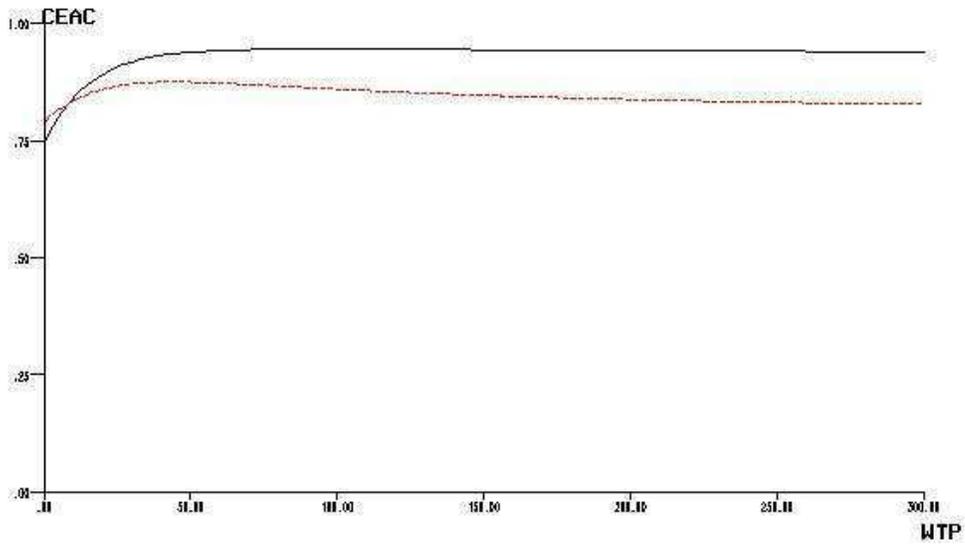
— Without controls; - - Without controls

Figure A.49 CEAC with Controls for Neurotic Disorders by Condition Identifier



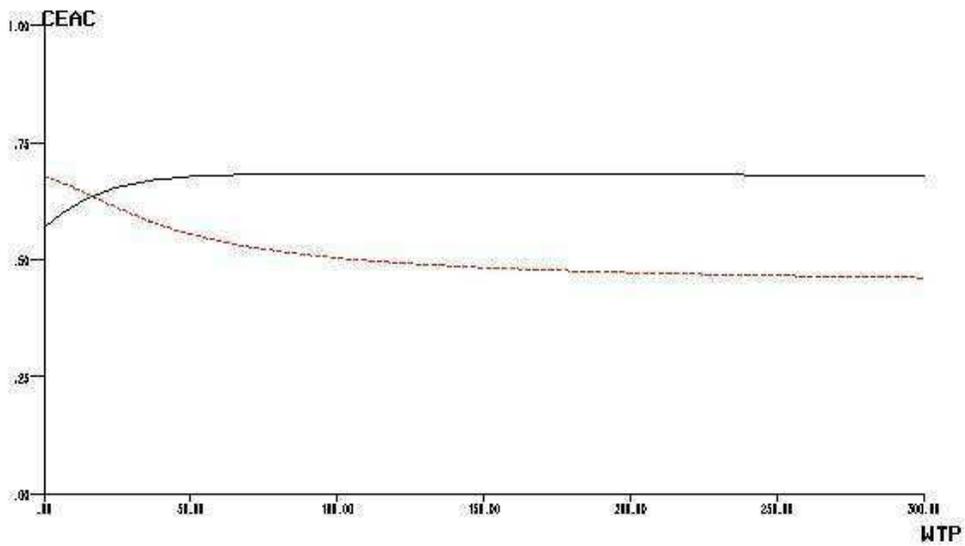
— Without controls; - - Without controls

Figure A.50 CEAC with Controls for Neurotic Disorders by Pharmacotherapy Use



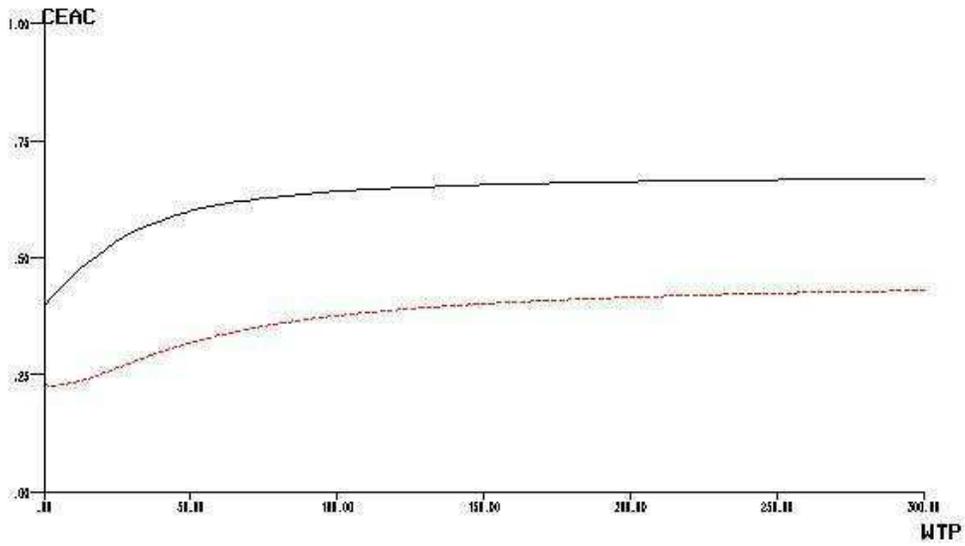
— Without controls; - - Without controls

Figure A.51 CEAC with Controls for Neurotic Disorders by Psychotherapy Use



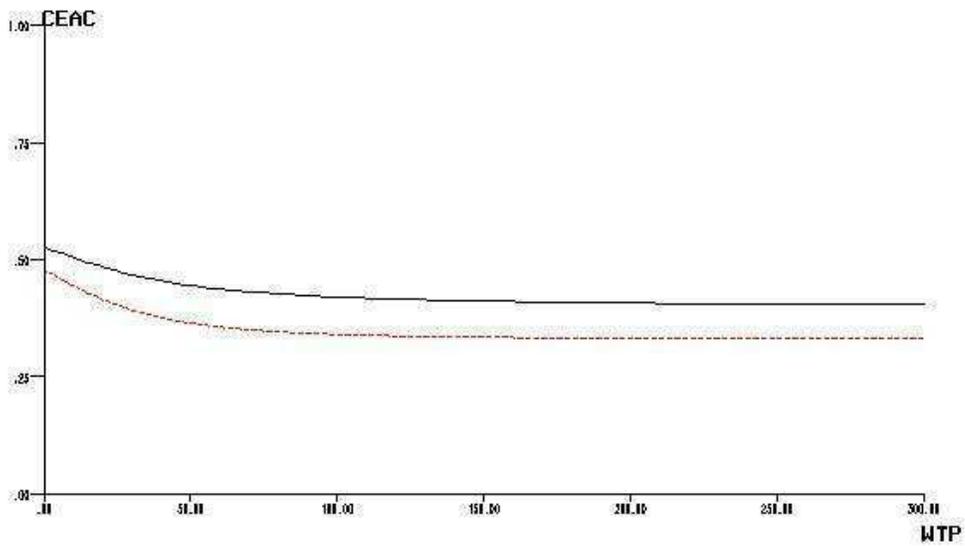
— Without controls; - - Without controls

Figure A.52 CEAC with Controls for Neurotic Disorders by Either Use



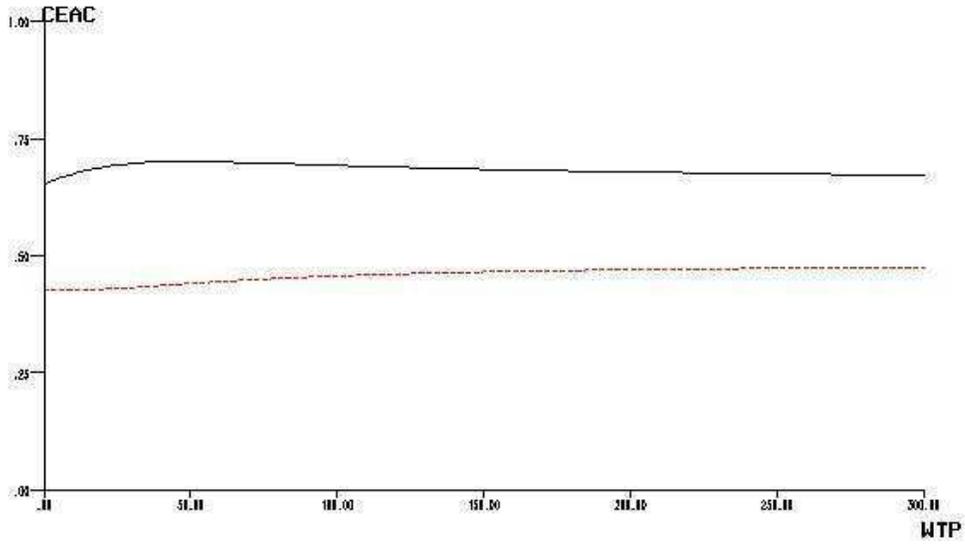
— Without controls; - - Without controls

Figure A.53 CEAC with Controls for Acute Stress Disorders by Condition Identifier



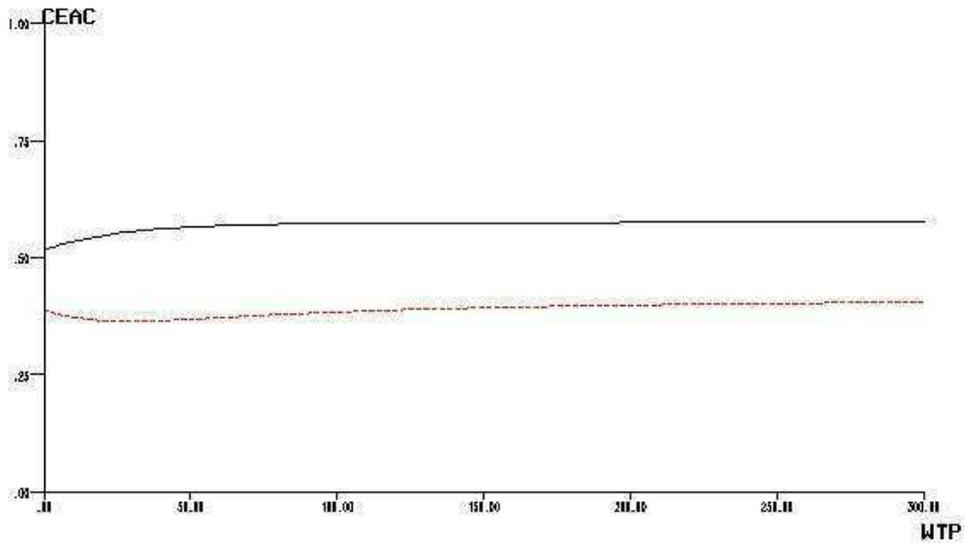
— Without controls; - - Without controls

Figure A.54 CEAC with Controls for Acute Stress Disorders by Pharmacotherapy Use



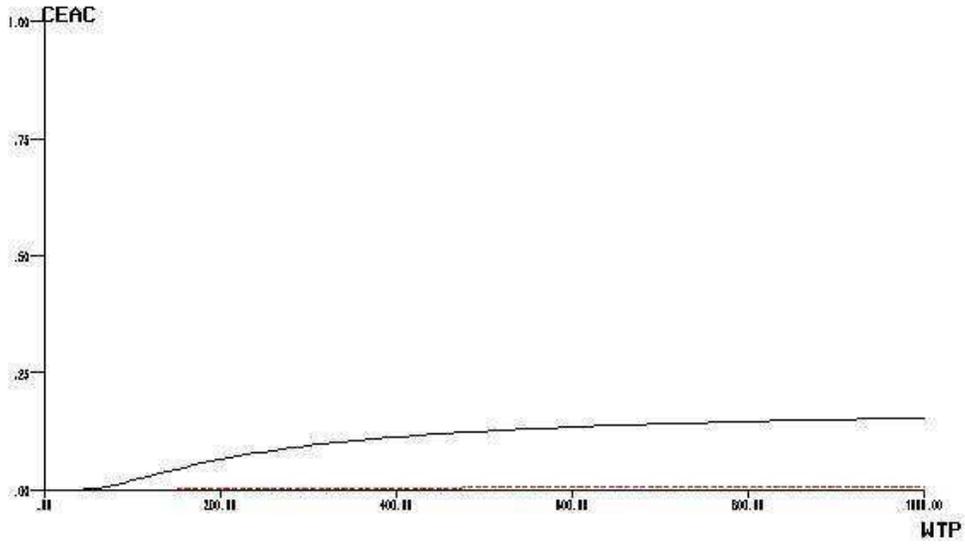
— Without controls; - - Without controls

Figure A.55 CEAC with Controls for Acute Stress Disorders by Psychotherapy Use



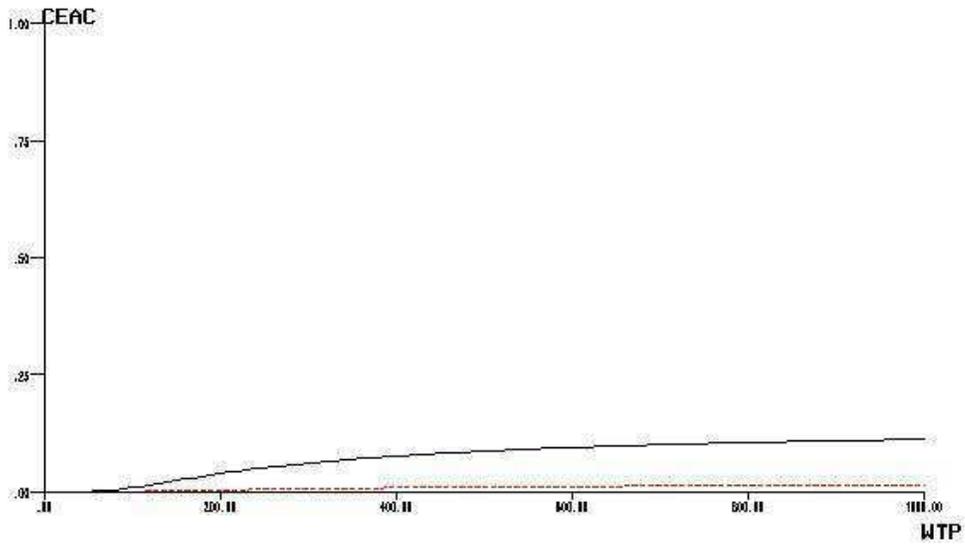
— Without controls; - - Without controls

Figure A.56 CEAC with Controls for Acute Stress Disorders by Either Use



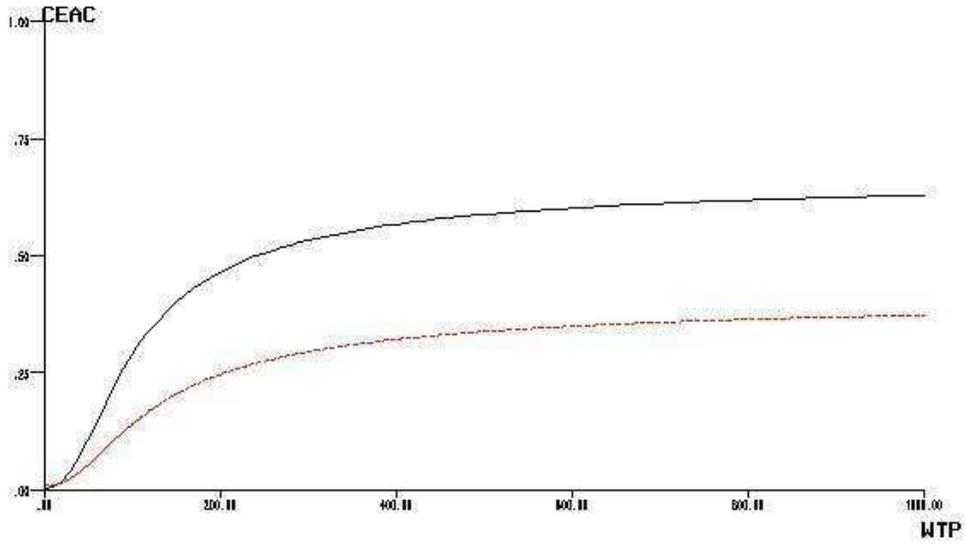
— Without controls; - - Without controls

Figure A.57 CEAC with Controls for Depression (NOS) Disorders by Condition Identifier



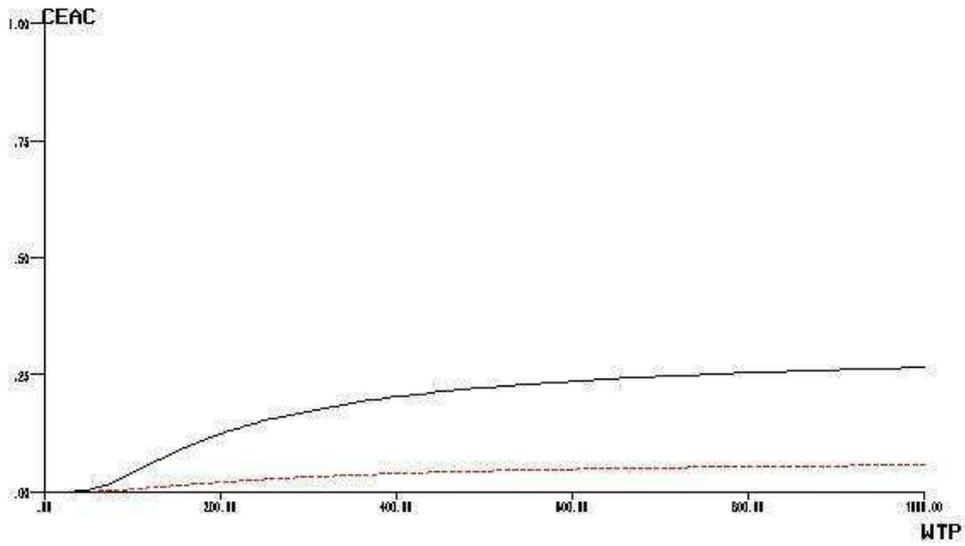
— Without controls; - - Without controls

Figure A.58 CEAC with Controls for Depression (NOS) Disorders by Pharmacotherapy Use



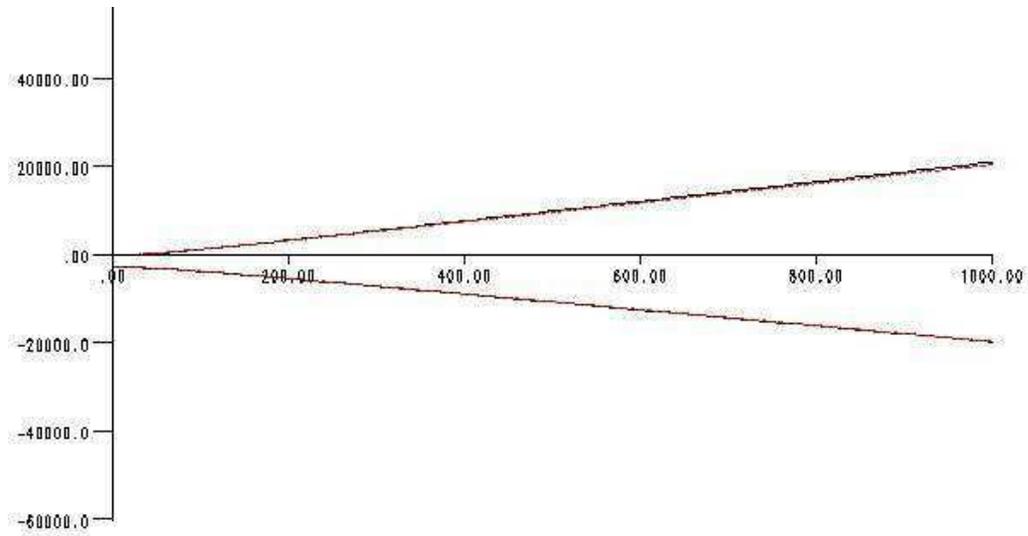
— Without controls; - - Without controls

Figure A.59 CEAC with Controls for Depression (NOS) Disorders by Psychotherapy Use



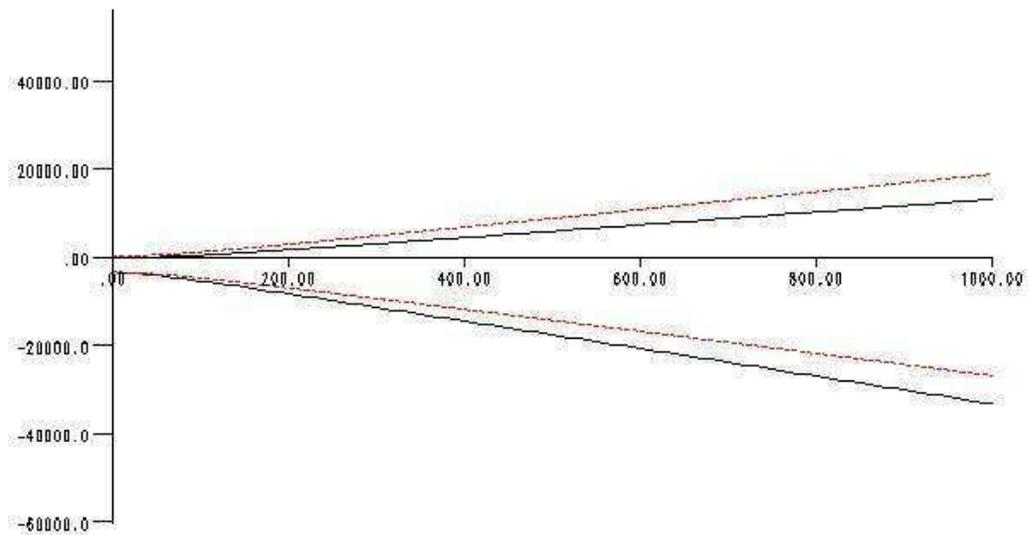
— Without controls; - - Without controls

Figure A.60 CEAC with Controls for Depression (NOS) Disorders by Either Use



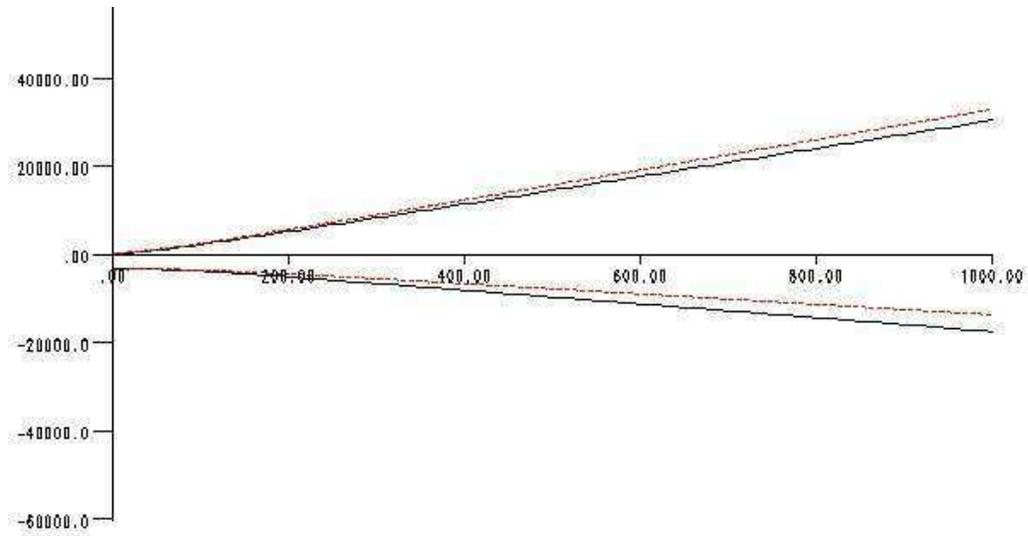
— Without controls; - - Without controls

Figure A.61 Incremental Net Benefit Confidence Interval for Affective Disorders by Condition Identifier



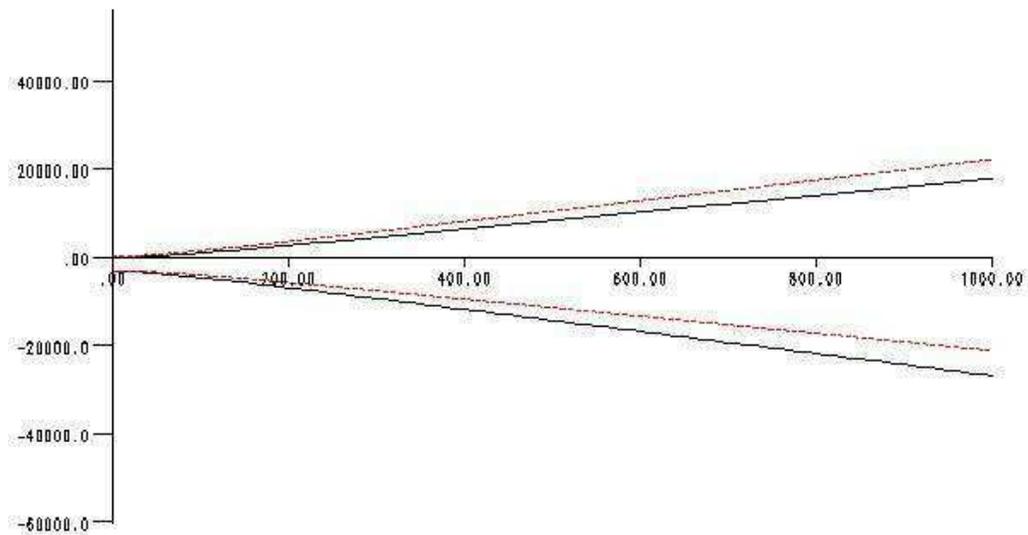
— Without controls; - - Without controls

Figure A.62 Incremental Net Benefit Confidence Interval for Affective Disorders by Pharmacotherapy Use



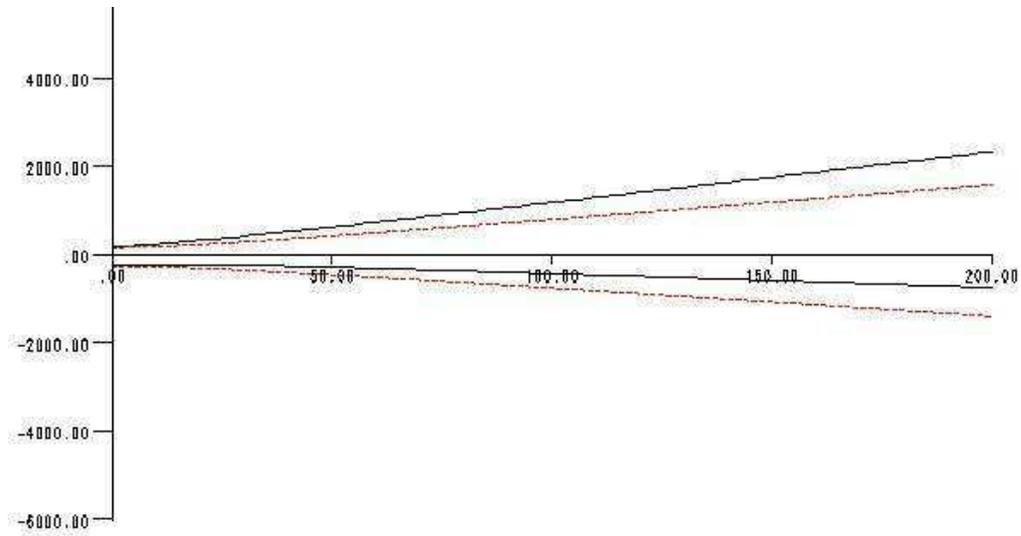
— Without controls; - - Without controls

Figure A.63 Incremental Net Benefit Confidence Interval for Affective Disorders by Psychotherapy Use



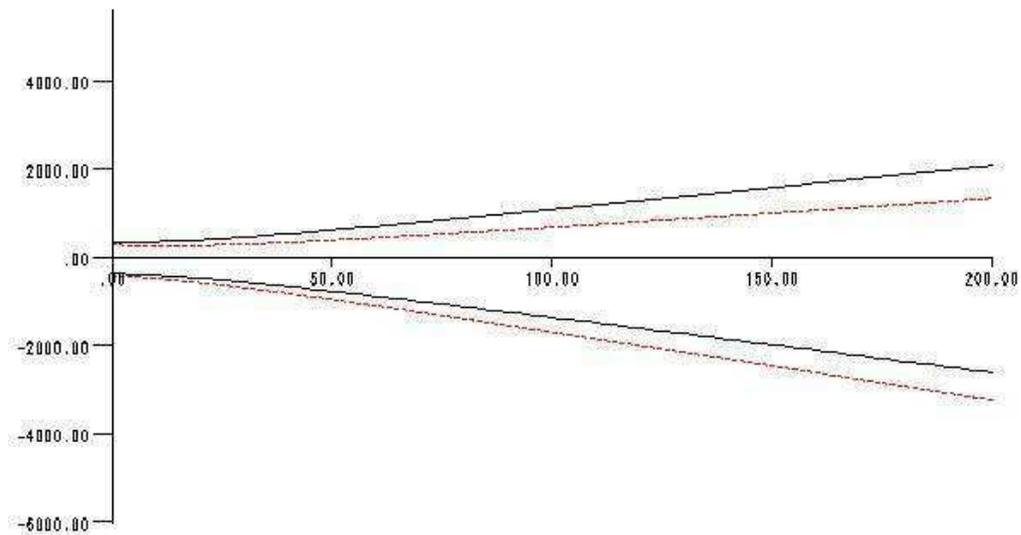
— Without controls; - - Without controls

Figure A.64 Incremental Net Benefit Confidence Interval for Affective Disorders by Either Use



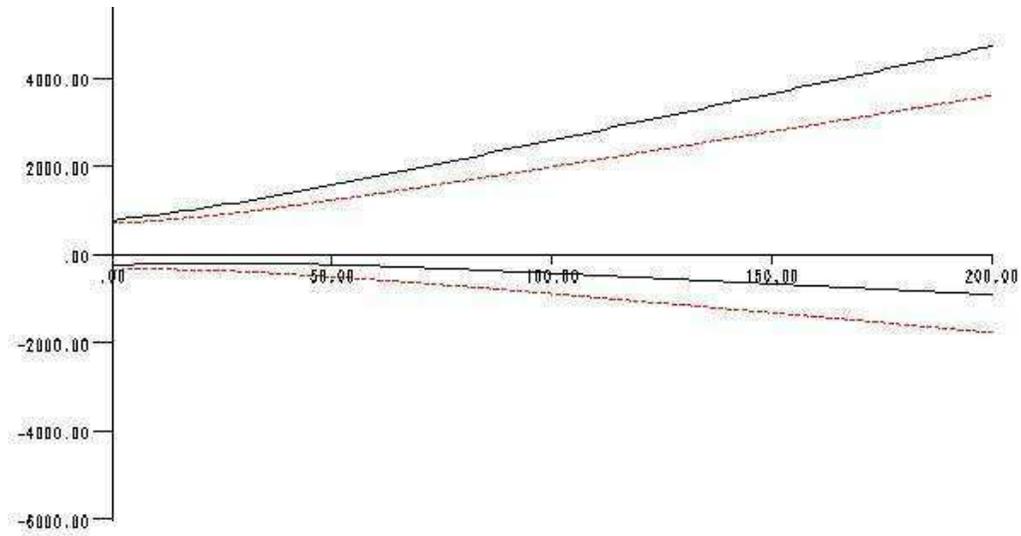
— Without controls; - - Without controls

Figure A.65 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Condition Identifier



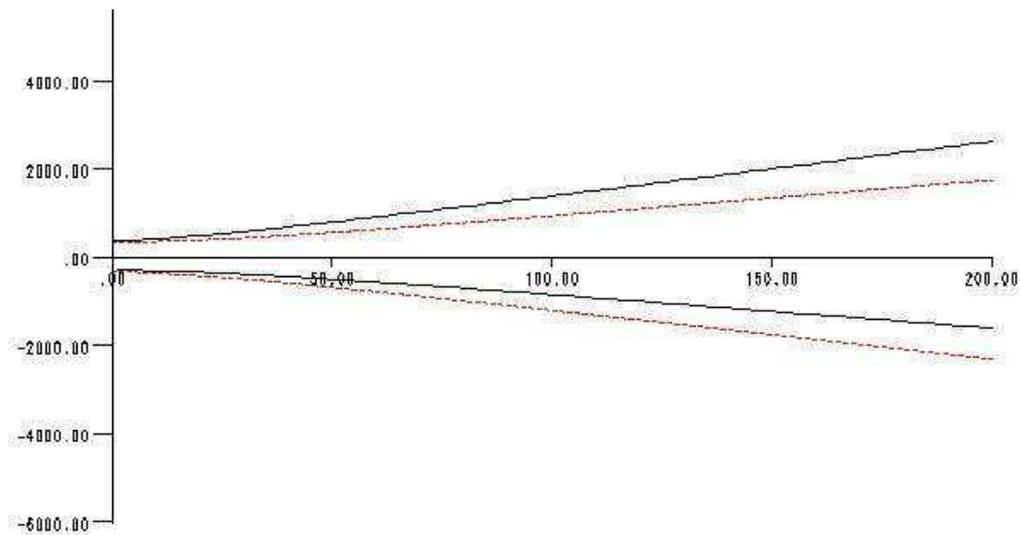
— Without controls; - - Without controls

Figure A.66 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Pharmacotherapy



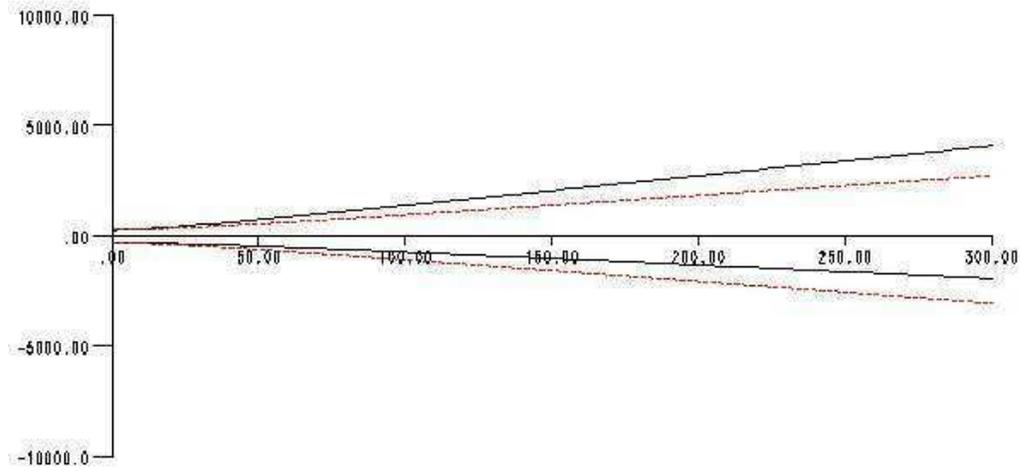
— Without controls; - - Without controls

Figure A.67 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Psychotherapy Use



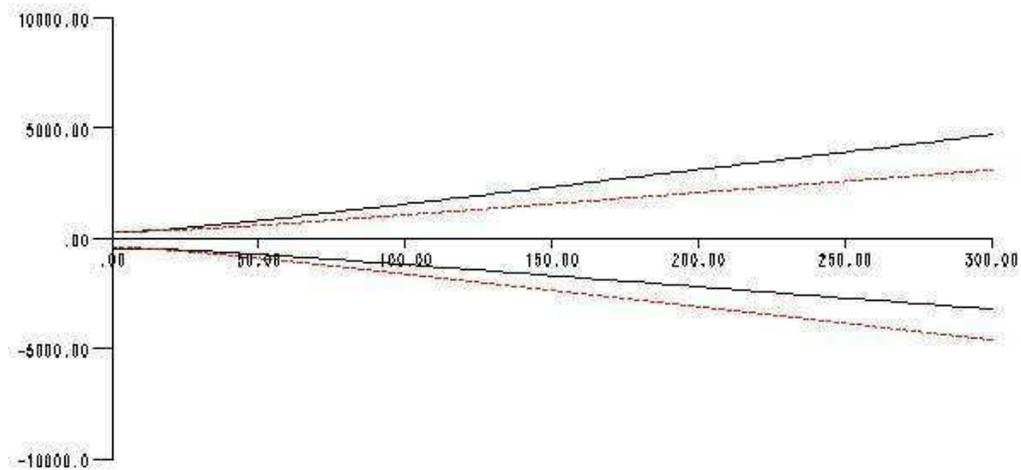
— Without controls; - - Without controls

Figure A.68 Incremental Net Benefit Confidence Interval for Anxiety Disorders by Either Use



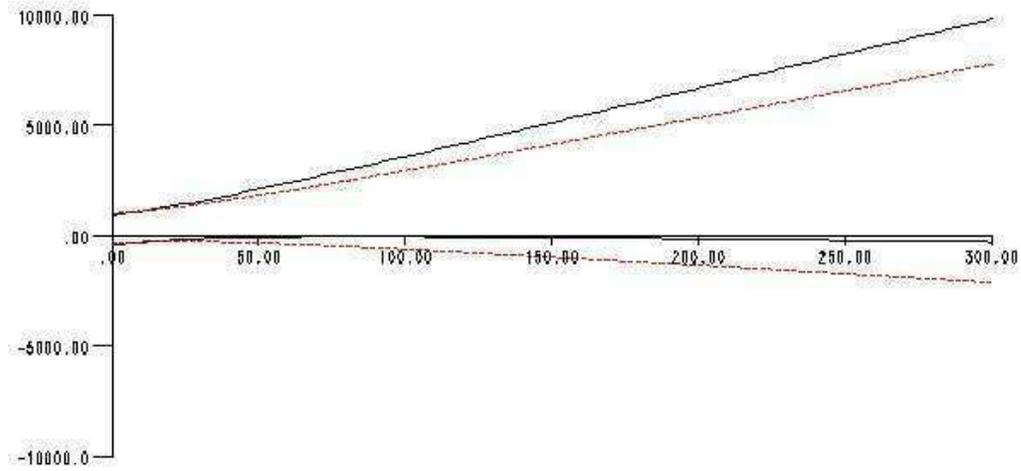
— Without controls; - - Without controls

Figure A.69 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Condition Identifier



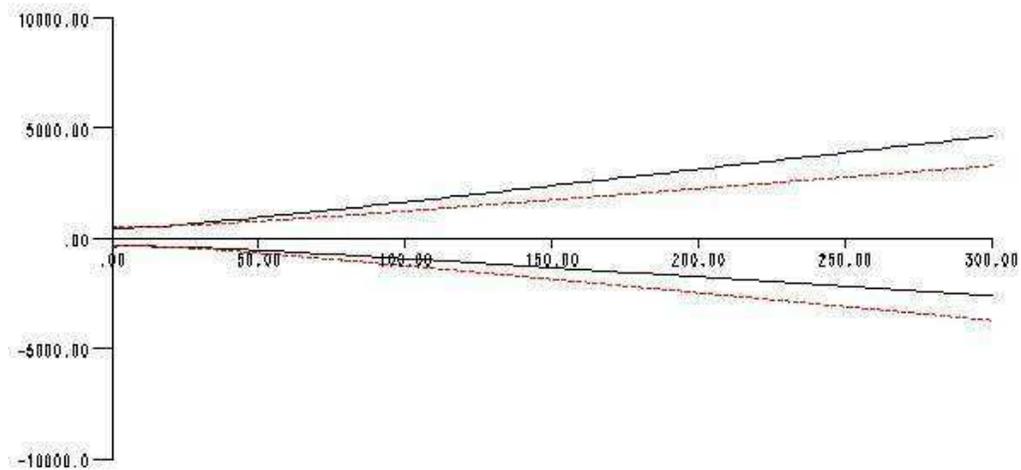
— Without controls; - - Without controls

Figure A.70 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Pharmacotherapy Use



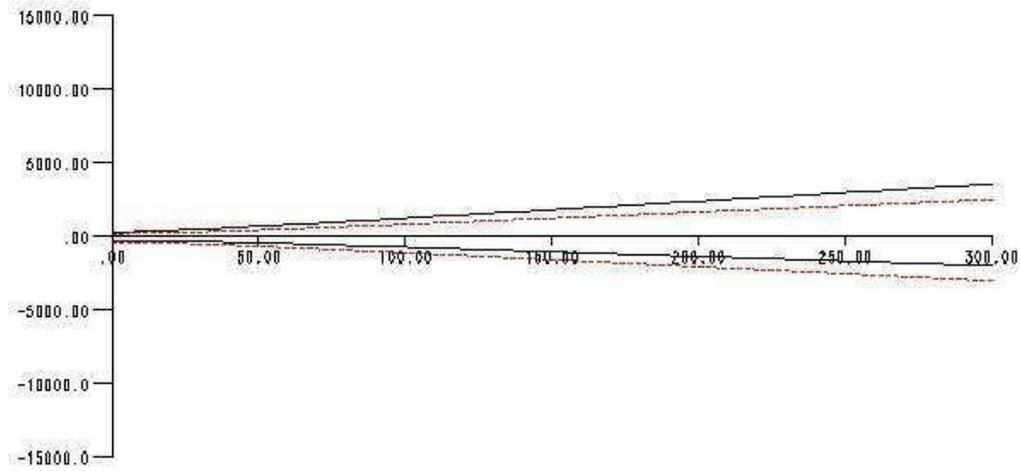
— Without controls; - - Without controls

Figure A.71 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Psychotherapy Use



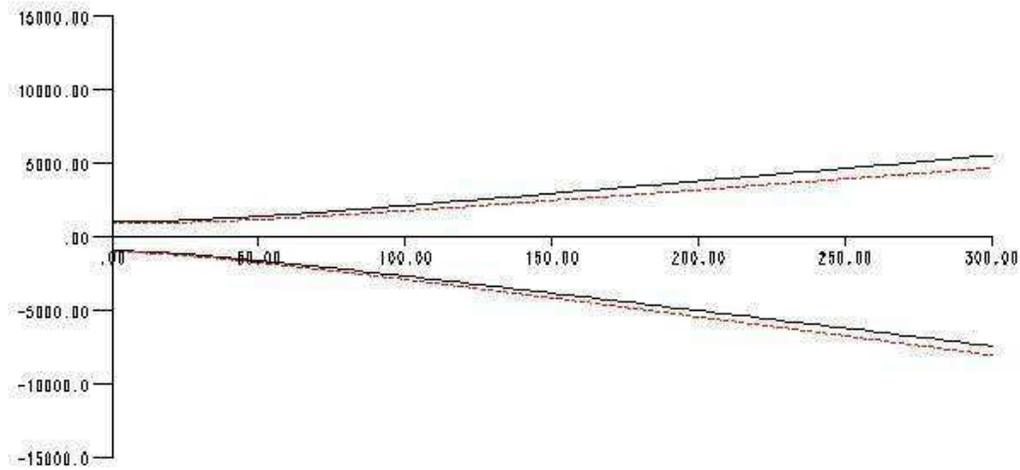
— Without controls; - - Without controls

Figure A.72 Incremental Net Benefit Confidence Interval for Neurotic Disorders by Either Use



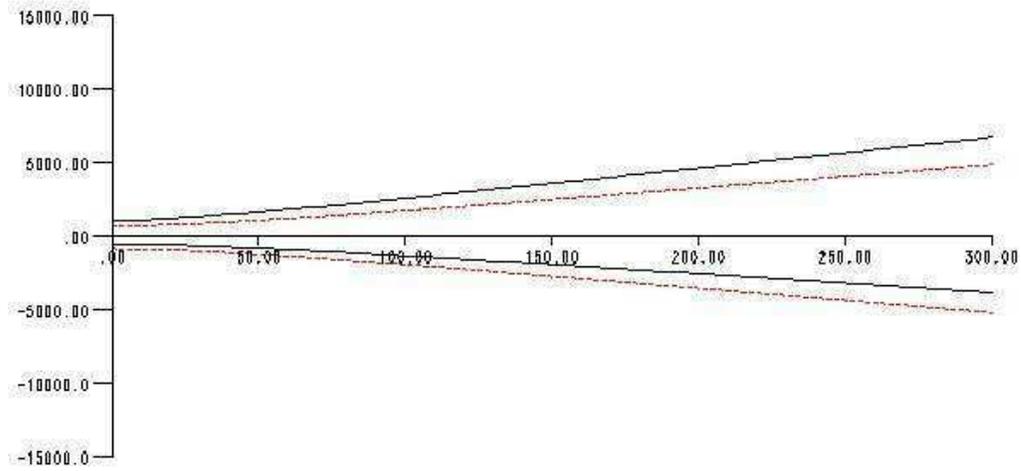
— Without controls; - - Without controls

Figure A.73 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Condition Identifier



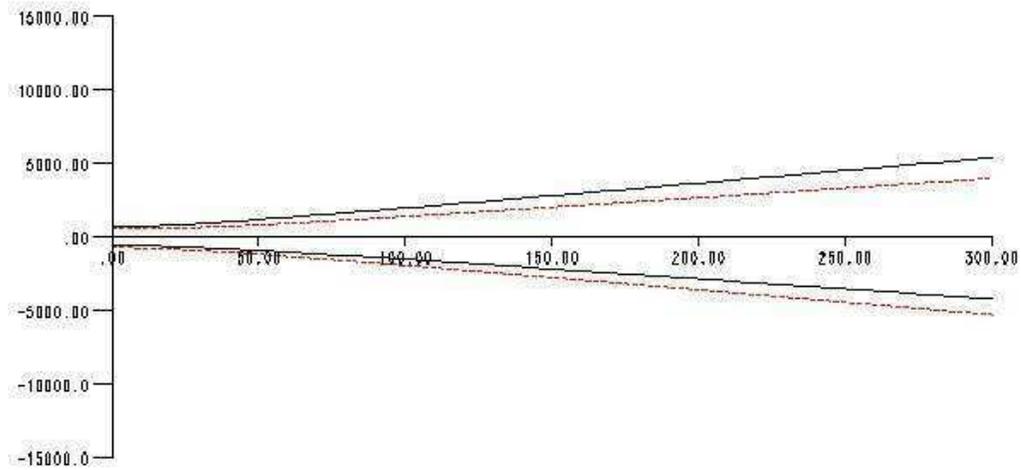
— Without controls; - - Without controls

Figure A.74 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Pharmacotherapy Use



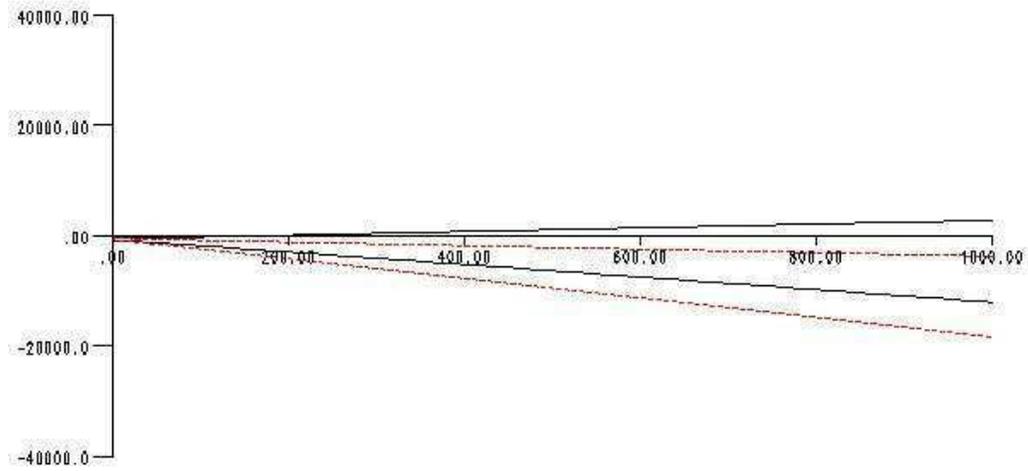
— Without controls; - - Without controls

Figure A.75 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Psychotherapy Use



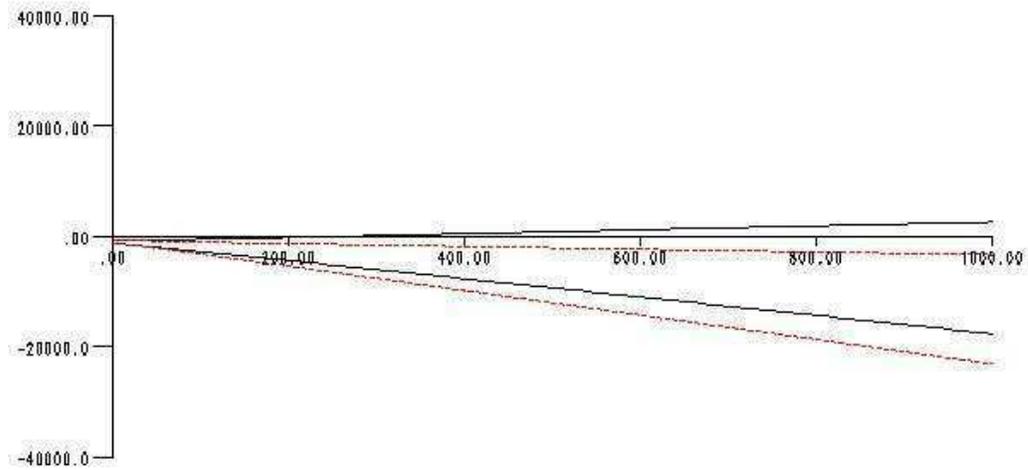
— Without controls; - - Without controls

Figure A.76 Incremental Net Benefit Confidence Interval for Acute Stress Disorders by Either Use



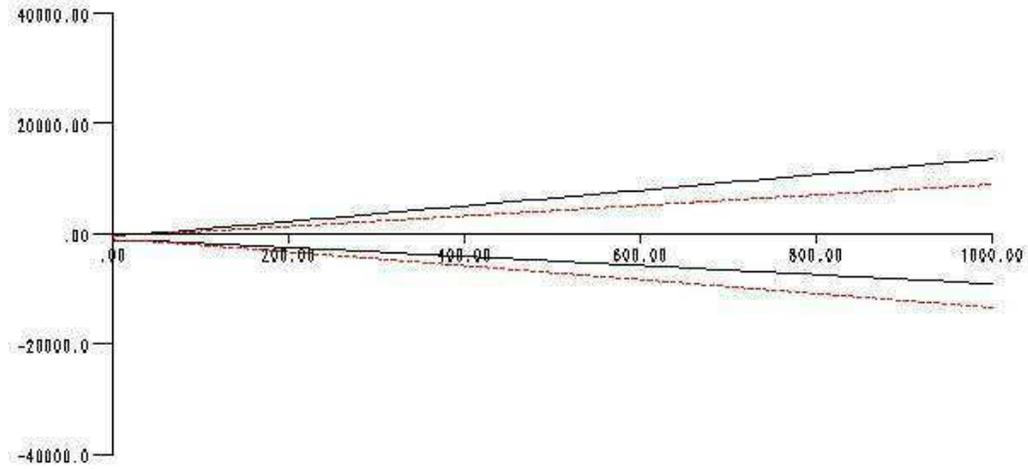
— Without controls; - - Without controls

Figure A.77 Incremental Net Benefit Confidence Interval for Depression (NOS) Disorders by Condition Identifier



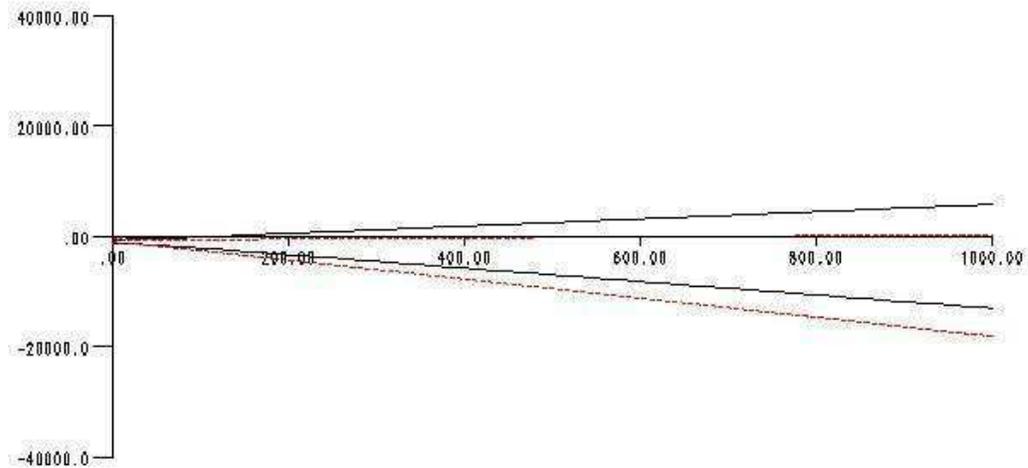
— Without controls; - - Without controls

Figure A.78 Net Benefit Confidence Interval for Depression (NOS) Disorders by Pharmacotherapy Use



— Without controls; - - Without controls

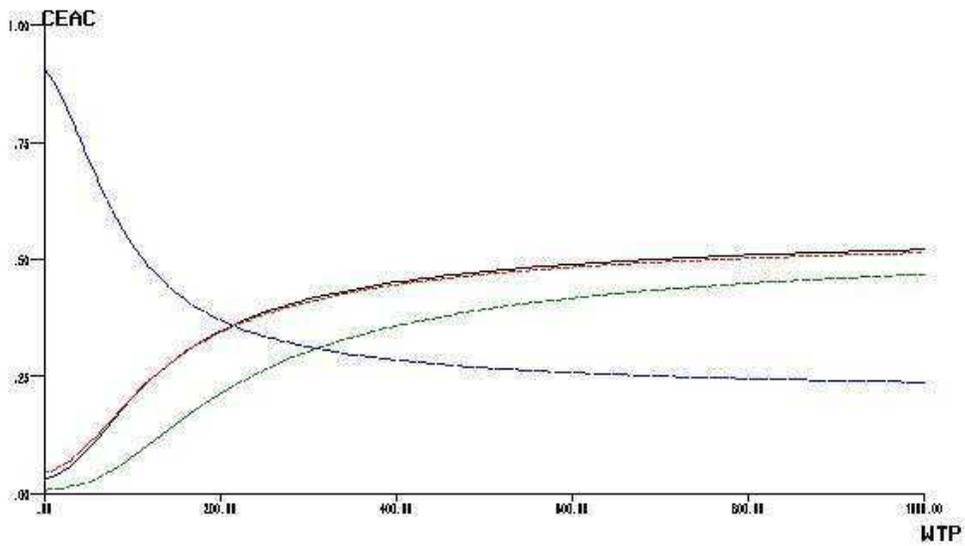
Figure A.79 Net Benefit Confidence Interval for Depression (NOS) Disorders by Psychotherapy Use



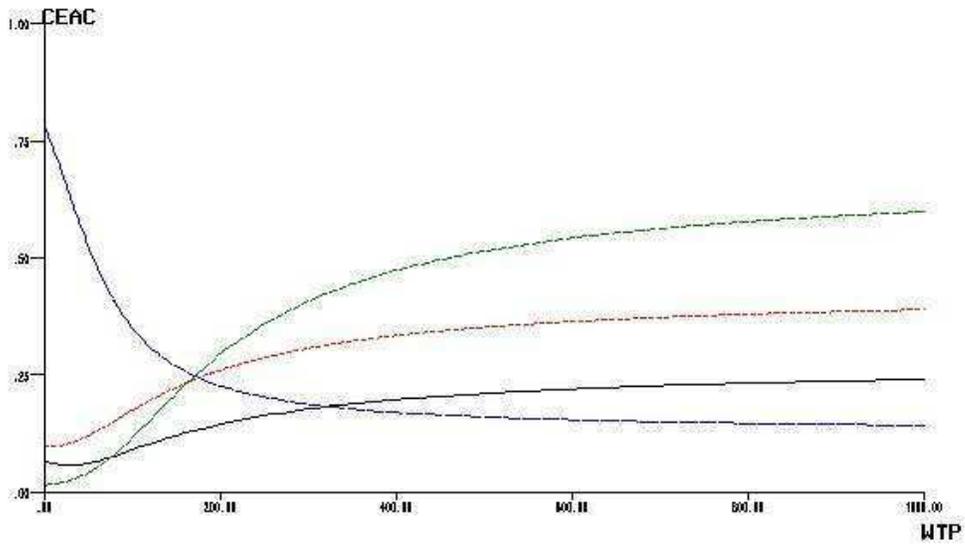
— Without controls; - - Without controls

Figure A.80 Net Benefit Confidence Interval for Depression (NOS) Disorders by Either Use

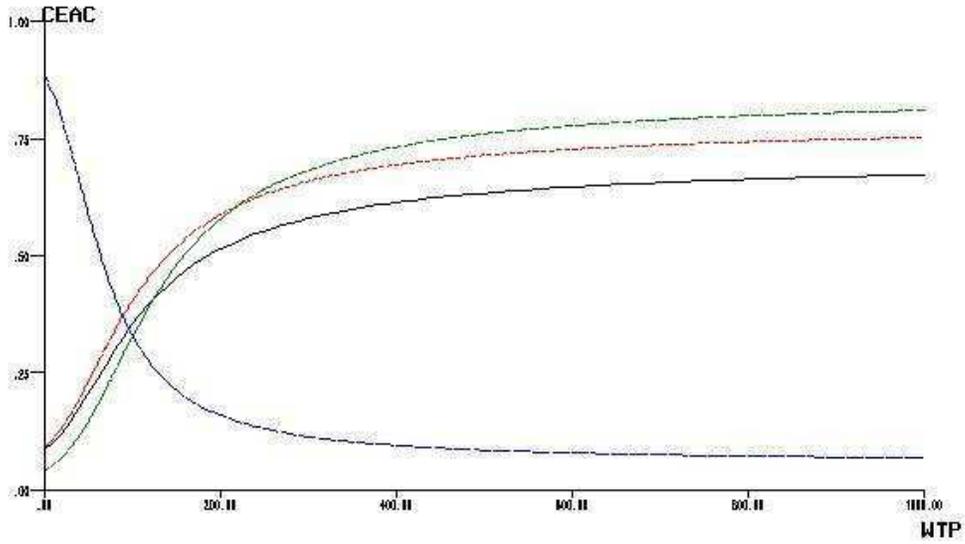
Appendix C



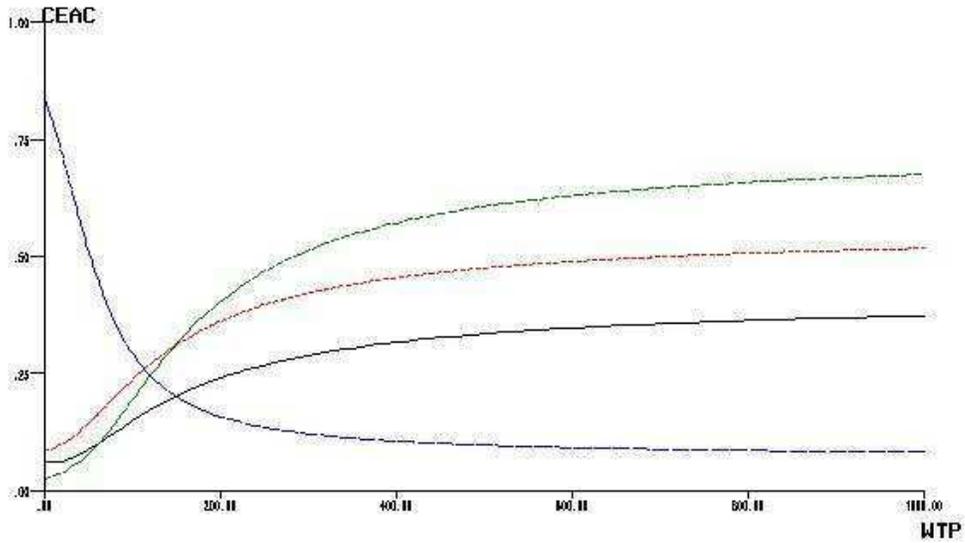
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - PSU CAM IV
 Figure A.81 CEAC with IPS Weighting and IV for Affective Disorders by Condition Identifier



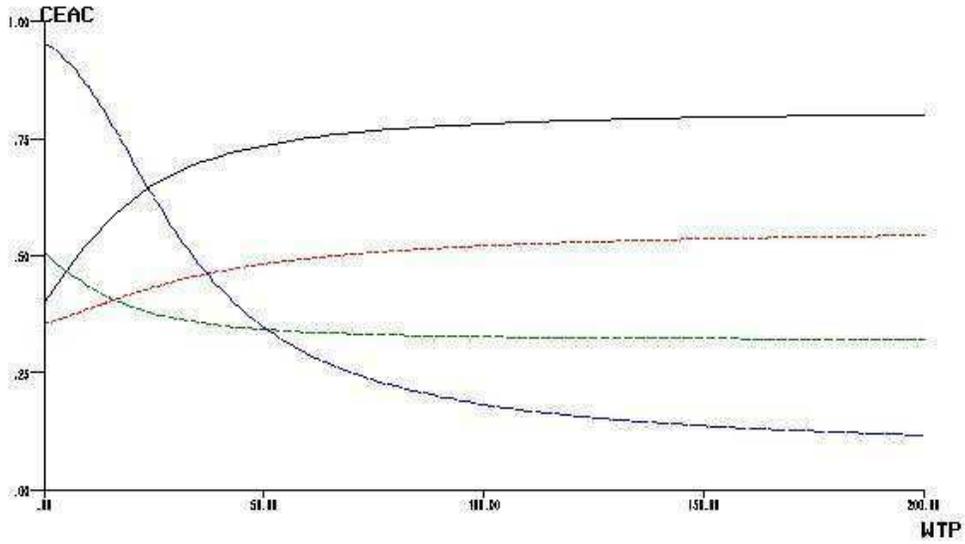
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - PSU CAM IV
 Figure A.82 CEAC with IPS Weighting and IV for Affective Disorders by Pharmacotherapy Use



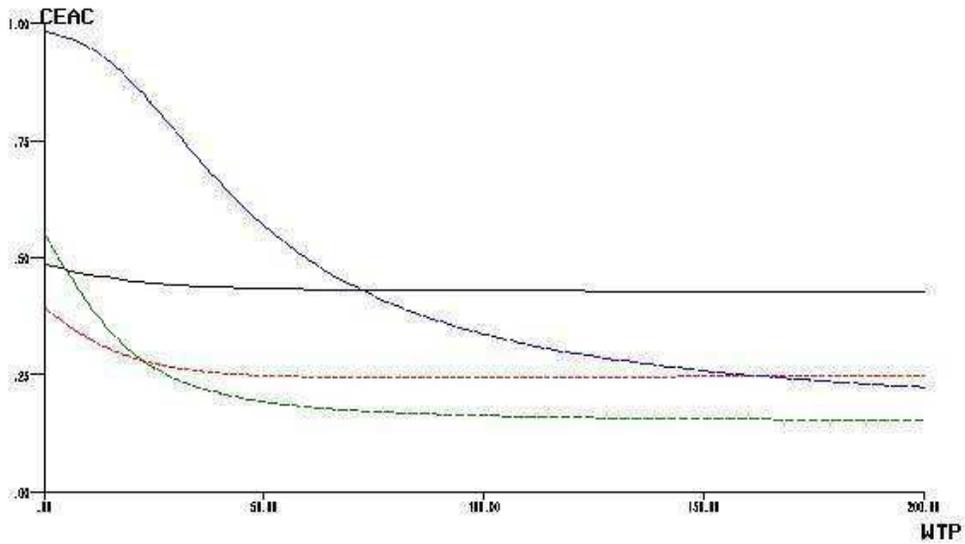
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.83 CEAC with IPS Weighting and IV for Affective Disorders by Psychotherapy Use



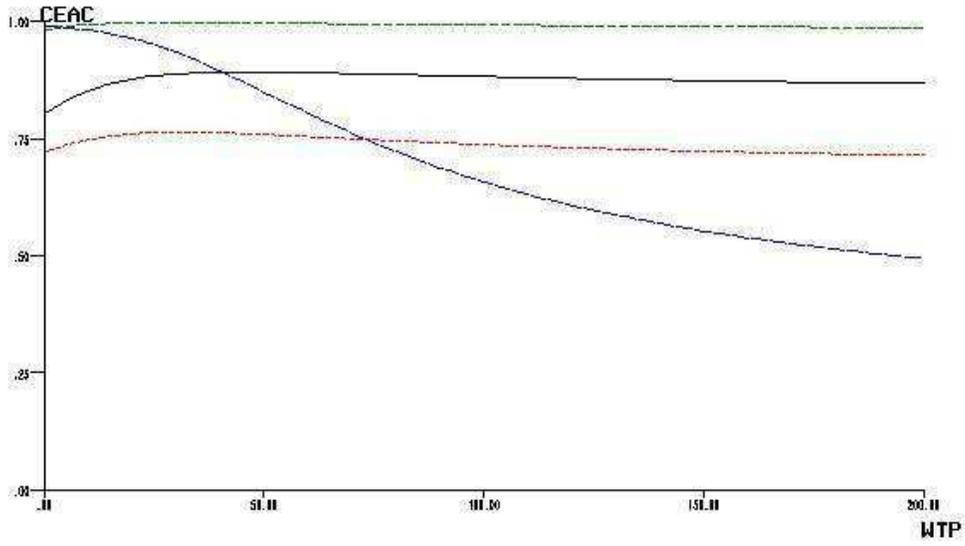
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.84 CEAC with IPS Weighting and IV for Affective Disorders by Either Use



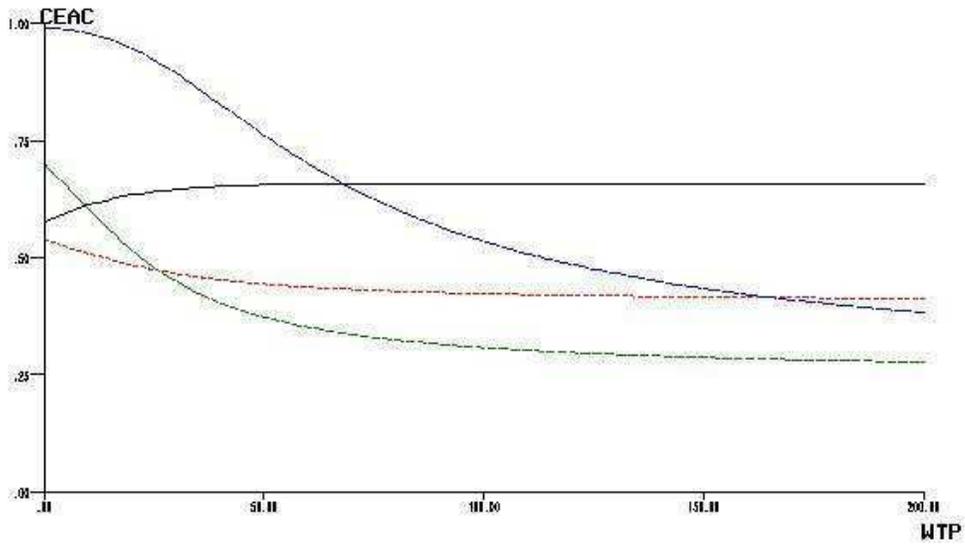
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.85 CEAC with IPS Weighting and IV for Anxiety Disorders by Condition Identifier



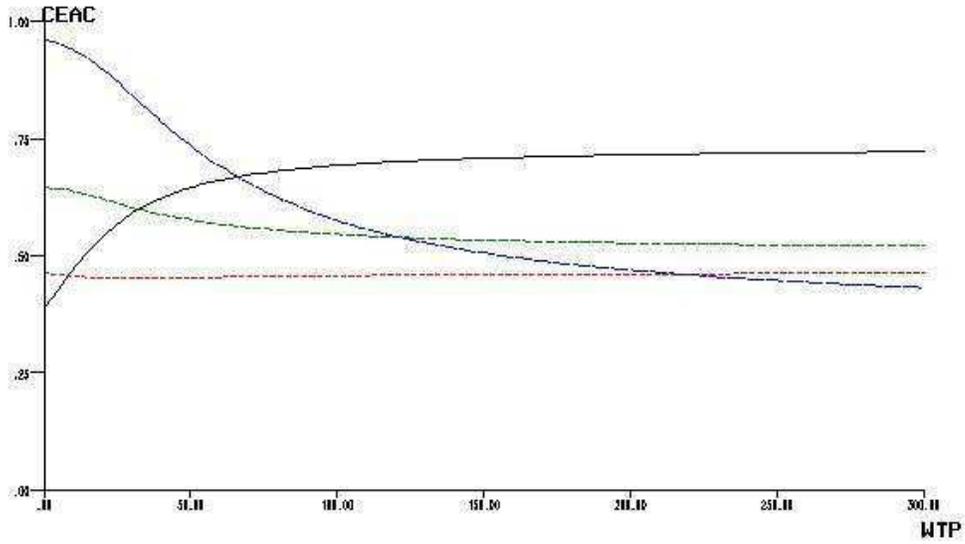
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.86 CEAC with IPS Weighting and IV for Anxiety Disorders by Pharmacotherapy Use



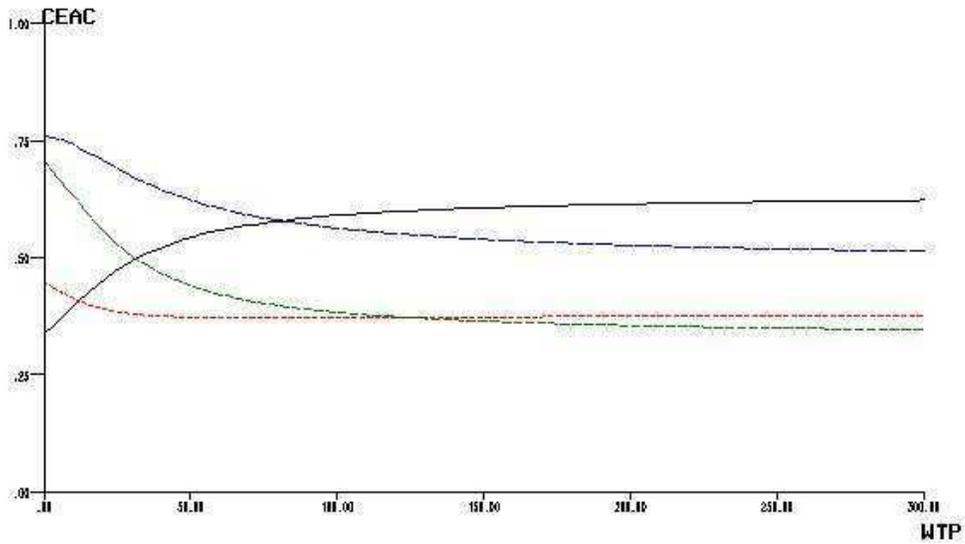
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.87 CEAC with IPS Weighting and IV for Anxiety Disorders by Psychotherapy Use



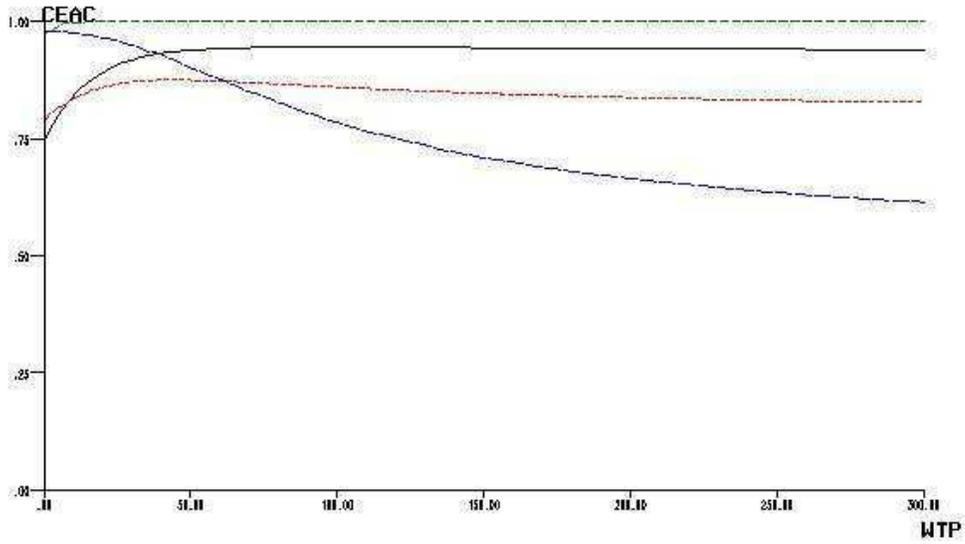
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.88 CEAC with IPS Weighting and IV for Anxiety Disorders by Either Use



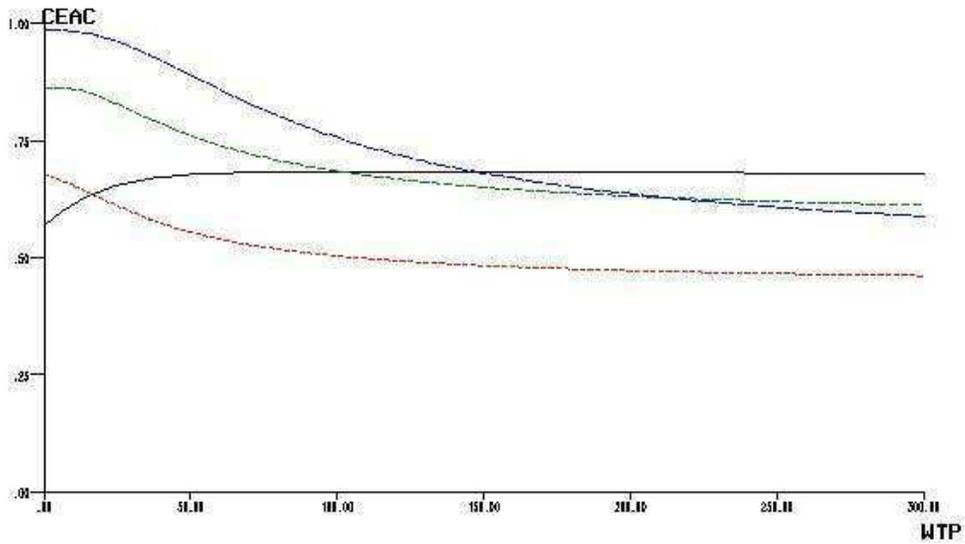
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.89 CEAC with IPS Weighting and IV for Neurotic Disorders by Condition Identifier



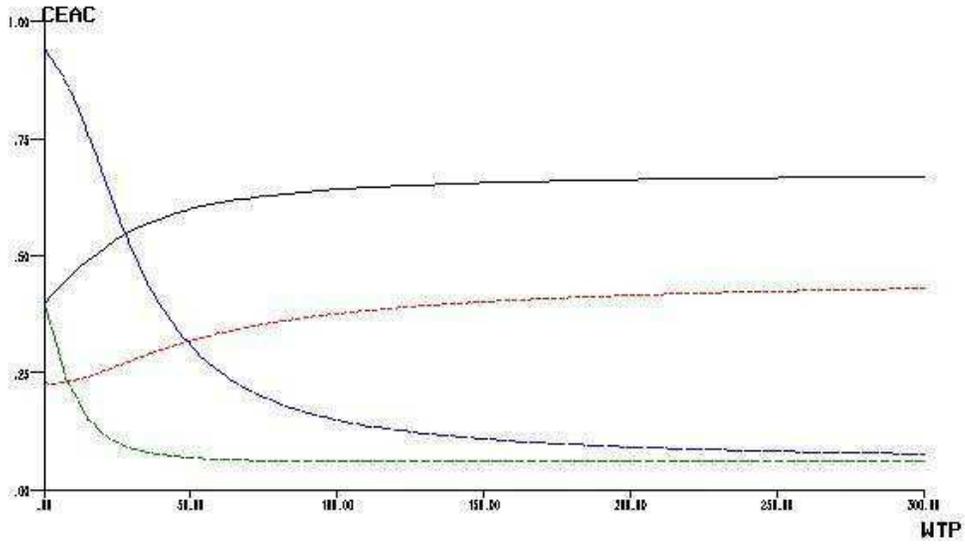
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.90 CEAC with IPS Weighting and IV for Neurotic Disorders by Pharmacotherapy Use



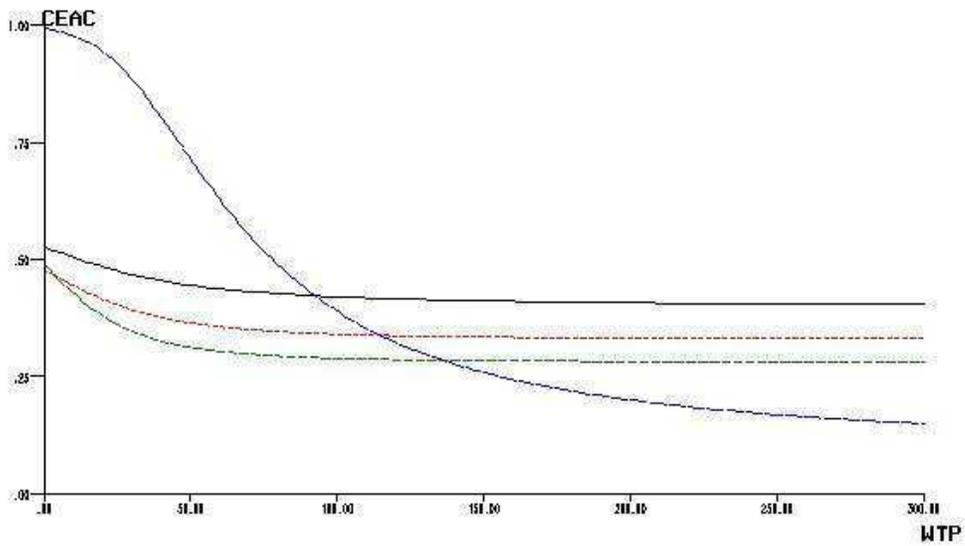
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.91 CEAC with IPS Weighting and IV for Neurotic Disorders by Psychotherapy Use



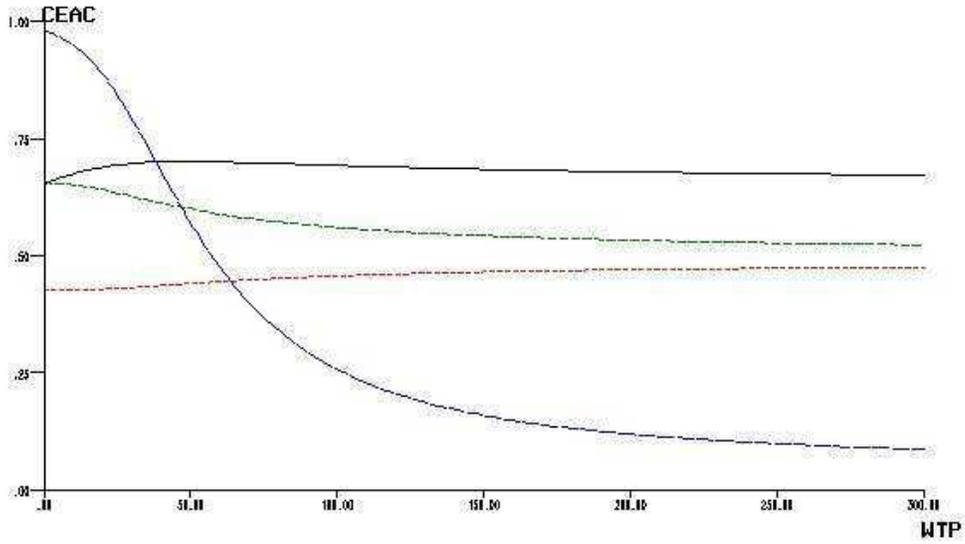
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.92 CEAC with IPS Weighting and IV for Neurotic Disorders by Either Use



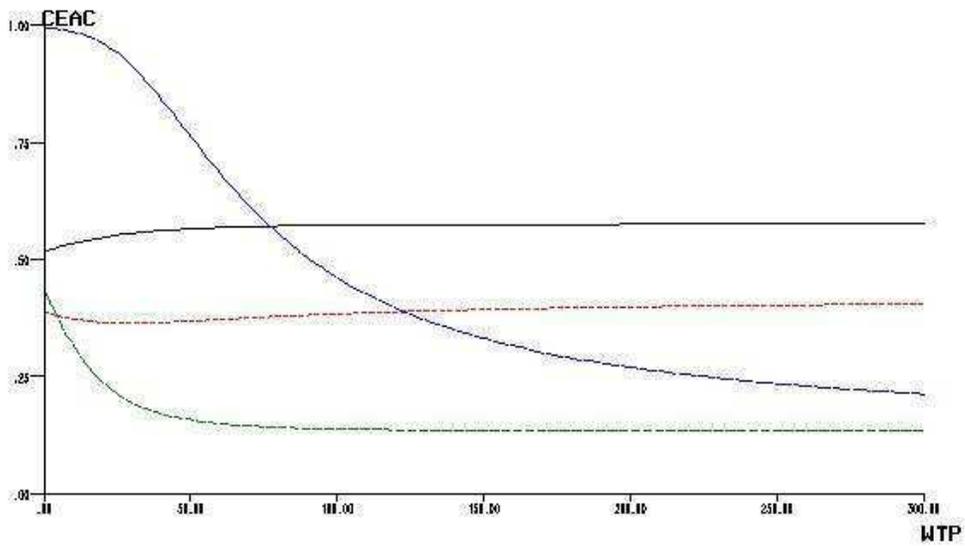
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.93 CEAC with IPS Weighting and IV for Acute Stress Disorders by Condition Identifier



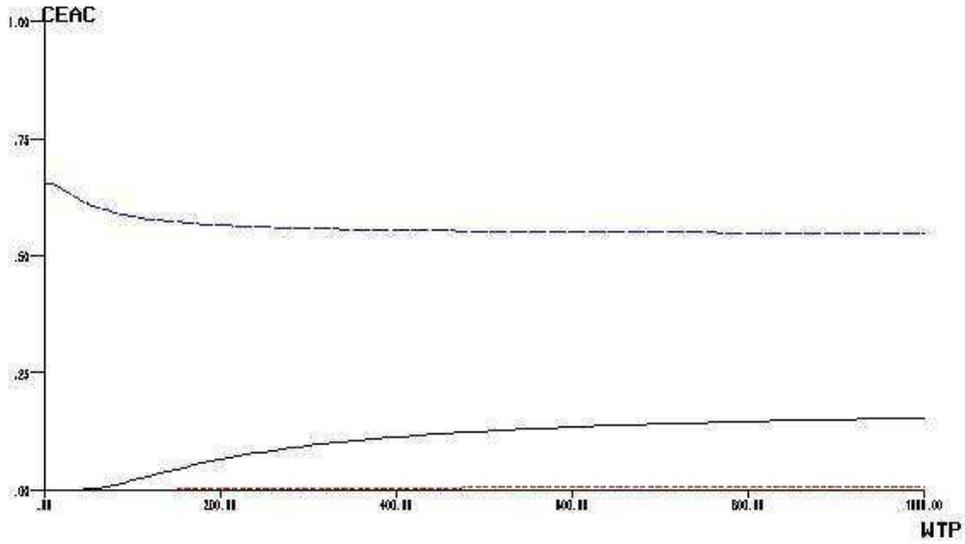
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.94 CEAC with IPS Weighting and IV for Acute Stress Disorders by Pharmacotherapy Use



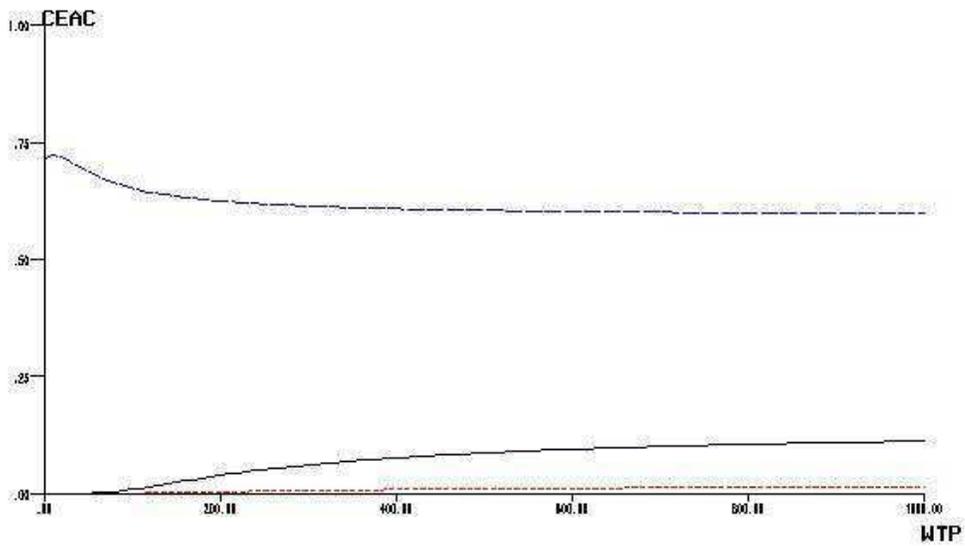
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.95 CEAC with IPS Weighting and IV for Acute Stress Disorders by Psychotherapy Use



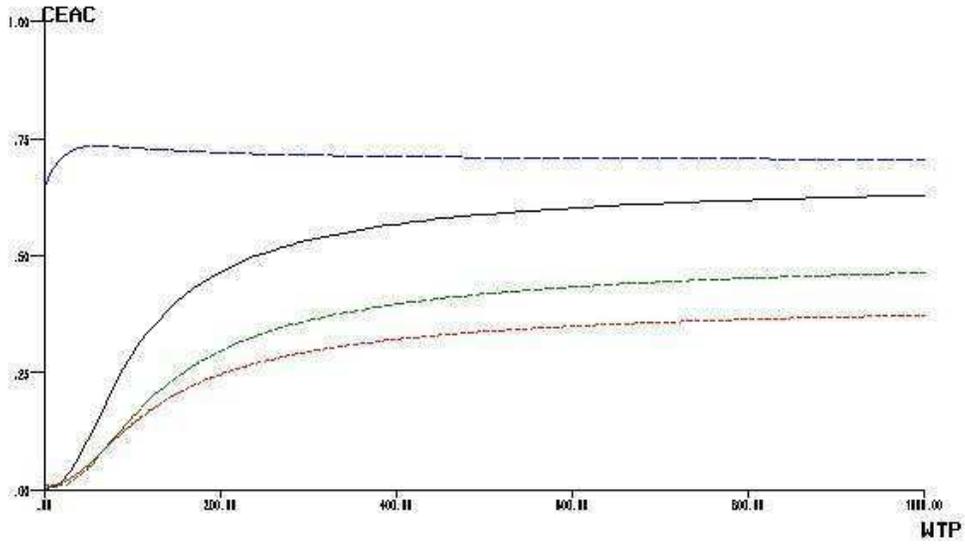
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - - - PSU CAM IV
 Figure A.96 CEAC with IPS Weighting and IV for Acute Stress Disorders by Either Use



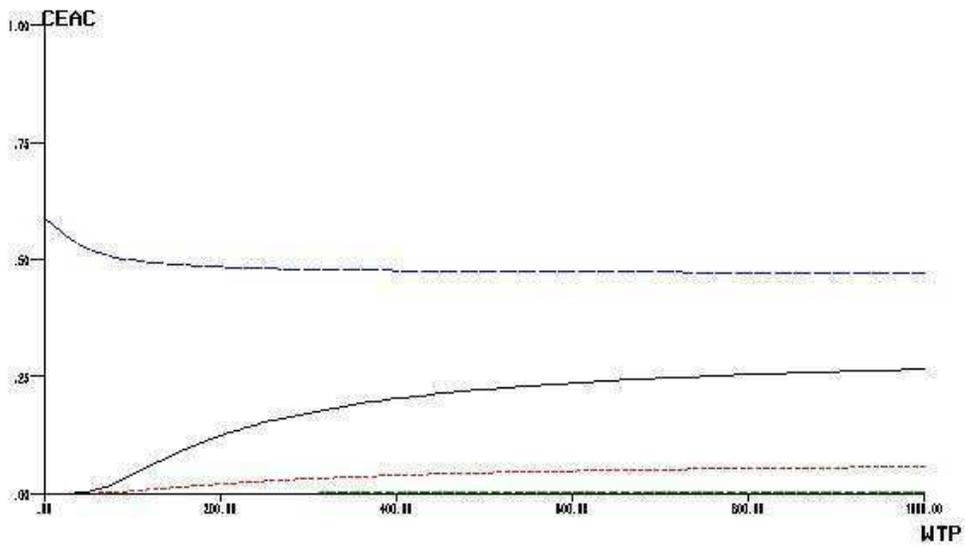
— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.97 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Condition Identifier



— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.98 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Pharmacotherapy Use



— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.99 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Psychotherapy Use



— Without controls; - - Without controls; - - Inverse Propensity Score Weighting; - - PSU CAM IV
 Figure A.100 CEAC with IPS Weighting and IV for Depression (NOS) Disorders by Either Use