ABSTRACT

RIKARD, ROBERT VANN. Looking Upstream, Downstream, and Between: Examining Health Literacy in the Stream of Health Disparities Research. (Under the direction of Dr. Maxine Seaborn Thompson).

Population health research reveals a consistent and robust graded relationship between socioeconomic status (i.e., income level, educational attainment, and/or occupational status) and the risk of illness/disease (i.e., morbidity) and life expectancy (i.e., mortality). The fundamental social cause framework emphasis on the importance of flexible resources guides the present research. Critiques of the framework point out the need to clearly delineate what is and is not a flexible resource and an intervening theoretical mechanism linking a fundamental cause to health. Integrating a multidimensional heuristic framework from development economics addresses the first critique. Incorporating metamechanisms are a conduit for distributing disparities in health that occur "downstream" addresses the latter critique. The present research posits that health literacy is a possible metamechanism in the fundamental social cause framework. The overarching purpose of the present research is to examine if and/or how health literacy, as a metamechanism, connects an expanse of fundamental causes (i.e., age, race, sex, socioeconomic status) to health outcomes. Health literacy is the outcome of interest to examine the connection and magnitude of potential disparities in the first core empirical chapter. Health insurance status (i.e., health insurance coverage or no health insurance) is the outcome of interest in Chapter 3 given the substantive link to health disparities. Self-rated health is the outcome of interest in Chapter 4. The data for the project come from the household sample of adults in the 2003 National Assessment of Adult Literacy (NAAL). The results in Chapter 2 provide strong evidence that disparities in health literacy level cut across demographic groups, socioeconomic status, political

participation, and social resources. Specifically, the present research contributes a conceptual refinement of health literacy: health literacy refers to social interaction that shapes access to health information, the social resources to understand the information, and the scope of possible health decision making options. The results in Chapter 3 reveal that health literacy directly impacts health insurance status. The results in the third core empirical chapter (Chapter 4) indicates that the addition of health literacy score eliminates the significant difference in the likelihood to report poor/fair health between females and males. The findings also support the contention that health literacy is a metamechanism as well as a social determinate of health. The overall project offer theoretical, substantive, and methodological contributions. First, integrating the resource domain framework from development economics provides an opportunity to include measures of knowledge, power, prestige, social support and social networks. The results in each empirical chapter provide support to add an expanse and level of specificity to the array of flexible resources. Substantively, the present research refines and accentuates the importance of social interaction as a key component of health literacy. Health literacy lays midstream between upstream social process and downstream health outcomes. Third, the Item Response Theory (IRT) based measure of health literacy is a methodological contribution to sociology. The implications of the research impact interventions to increase health literacy as well as imminent changes in the United States health care system. The contributions in the present project are a long awaited step to examine and understand the importance of health literacy in the stream of health disparities.

Looking Upstream, Downstream, and Between: Examining Health Literacy in the Stream of Health Disparities Research

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

Sociology

Raleigh, North Carolina

2013

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DEDICATION

I dedicate this body of work to the experiences that continue to shape my worldview. I hope that these ideals and beliefs serve to, in some small way, improve the human condition. First and foremost, perseverance against all odds. Second, tenacity even in the face of failure. Third, the process of learning through trial and error. Fourth, patience. Fifth, collaboration over isolation.

BIOGRAPHY

Born on the eighth day of the eighth month of the seventy-fifth year of the Twentieth Century to Robert Vann (R.V.) Rikard Sr. and Barbara Moring Rikard; Robert Vann (R.V.) Rikard, Jr. is a native of Black Mountain, North Carolina. R.V. earned his Bachelors of Science in Anthropology and graduated Suma Cum Laude from Appalachian State University. R.V. returned to Appalachian State University and earned a Masters of Arts in Social Science.

ACKNOWLEDGMENTS

My father would often say, “son, if you can count all your friends on one hand when you leave this world then consider yourself lucky.” I consider myself more than lucky – I am fortunate and genuinely grateful. There are many people I wish to acknowledge and thank as I did not earn a doctorate without the support, encouragement, and genuine kindness of others. I apologize should I forget any person who I owe my thanks.

My thanks to my professors, colleagues, and friends during my undergraduate and graduate studies at Appalachian State University: Dr. Larry Kimball, Dr. Ed Folts, Dr. Ken Mullen, Dr. Ed Rosenberg, Dr. Lorin Baumhover, Andrew and Lee Ann Ferguson, Rob Claiborne, Ben Emery, Daniel Burley, Jason Leonard, Dr. Harvard Ayers, Dr. William Bennett, Dr. Beth Davidson, and Dr. Martha Shockey. While my home town is Black Mountain, North Carolina; I will always consider Boone, North Carolina my home.

My family are the people who are genuine, honest (even when I would prefer to not hear what they say), and above all know me for the person I am. After a nearly twenty year period, I reconnected with my aunt Dr. Linda G. Rikard and her partner my aunt Mary Jo Tarallo. My aunts are amazing and credible women! Their love, support, and encouragement continues to make the difference in my life.

In the fall of 2003, a factious pompous nincompoop professor lauded to my first year graduate cohort that he alone knew the “stars” of the graduate program in Sociology at North Carolina State University. May he stand corrected as I am fortunate to know that the “stars” are my colleagues and friends from the 2003 graduate cohort: Gretchen Thompson, Sara Rushe, Olena Annocio, Heather Shay Bostwick, Dustin Avent, Elizabeth (“Lizzy”) Seale,

Kylie Parrotta, Brandy Farrar, and Kendra Jason. I respect each of these nine people as we worked together, cried together, supported each other, and critiqued each other as professionals.

My sincere appreciation to alumni of my graduate who created and instilled the professional values of collaboration and cohesion over competition and self-benefit: Dr. Shelia Cotton, Dr. William (Bill) Hall, Dr. Shannon Davis, Dr. Mathew ("Zip") Irwin, Dr. Jennifer Nooney Dr. Greg Fulkerson, and Dr. Marlee Moore. As a result of collaboration, I am fortunate and honored to co-author and publish Ed Rosenberg, Monica Williams, Christine Mair, Rachel Head, Andrew Pleasant, and Julie McKinney.

I owe a great deal of my success to Dr. William (Bill) Carruthers who gave me a "million dollar" education in the art and science of grantsmanship. I also appreciate my colleagues and friends Brent Ward and Dr. Sharlani Sankrana from my tenure as the North Carolina Green Business Fund Grant Administrator. I consider myself very fortunate to be a student of the late Dr. Ronald Wimberely. I attribute my appreciation and understanding of rural and community development to Dr. Bob Moxley and Dr. Steve Lilly. I continue to receive support from my colleagues and friends at the North Carolina Rural Economic Development Center: Dr. Yolanda Burwell, Art Jackson, Brett Altman, and Nicole Sue. I am most fortunate to know and work with another "data bulldog" who I admire, respect, and call my friend – Dr. Betty McGrath.

In my journey to understand, examine, and contribute to the field of health literacy; I thank my estimable colleagues Dr. Andrew Pleasant, Julie McKinney, Erin Aegeson, Evelyn McElhinney, and Dr. Jennifer Dillaha. In addition, if I am fortunate to be counted among the

next generation of health literacy researchers/practitioners then I am fortunate to know Amina Patton, Lottie Barnes, and Sandra Pares.

My genuine gratitude to my friends and co-hosts of the Health Communication, Health Literacy, & Social Science #hchlitss tweet chat: Dr. Kathleen Hoffman and Alisa Hughely.

Many thanks to my present colleagues with the Center for Family and Community Engagement at North Carolina State University: Dr. Joan Pennell, Marianne Latz, Stacy Comey, Sonia Meeks, and Jenny King. I am thankful to Tia Sanders and Jasmin Vokel for the opportunity to serve as a mentor.

I am deeply moved by the support of Dr. Karen Bullock, Dr. Jodi Hall, and Dr. Marcie Fisher-Borne. As my tenure comes to an end in the Department of Sociology, I am grateful for friendships with David Craig, Chelli Plummer, Aysha Bodenhamer, Ryan Thompson, and Jennifer Buchan.

My sincere thanks to the members of my dissertation committee who gave of their time to guide me at the last leg of this journey: Dr. William (Bill) Smith, Dr. Michael Schulman, and Dr. Adam Meade. Finally, I am indebted to my chair, adviser, mentor, coauthor, and friend Dr. Maxine S. Thompson. I am the scholar and person I am today because of Maxine Thompson.

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CHAPTER 1

Looking Upstream to Examine Health Literacy

Population health research reveals a consistent and robust graded relationship between socioeconomic status (i.e., income level, educational attainment, and/or occupational status) and 1) the risk of illness/disease (i.e., morbidity) and 2) life expectancy (i.e., mortality) (Chang & Lauderdale, 2009; Link, 2008; Link, Phelan, Miech, & Westin, 2008; Lutfey & Freese, 2005; Marmot & Smith, 1991; Warren & Hernandez, 2007; David R. Williams & Collins, 1995). Specifically, as an individual's level of income, educational attainment, and/or occupational status increases the probability of illness/disease decreases. Thus, a negative gradient exists between socioeconomic status and the risk of illness/disease. Conversely, there is a positive graded relationship between socioeconomic status and life expectancy (Phelan & Link, 2005b; Phelan, Link, Diex-Roux, Kawachi, & Levin, 2004). Individuals with higher levels of income, educational attainment, and/or occupational status are expected to live longer.

Link & Phelan (1995; also see Phelan, Link, & Tehranifar, 2010) posit that the socioeconomic gradients outlined above are "fundamental causes" that create health disparities. Explained in brief here and elaborated in full below; the fundamental social cause framework guides the current research. In essence, access to flexible resources (e.g., money, knowledge, power, prestige, social support and social networks) decreases the risk of being at risk for illness and early death (Link & Phelan, 1995). Accumulating research (Graham, 2004; David R. Williams & Collins, 1995) makes a persuasive case for broadening fundamental causes to take into account other social positions (e.g., age, race/ethnicity, sex) that represent enduring dimensions of both social and health inequality. Moreover, there is a need to clearly articulate the theoretical mechanism(s) (Freese & Lutfey, 2010; Lutfey & Freese, 2005; J. Lynch et al., 2004) that link fundamental causes to disparities in health outcomes. Lynch & colleagues (2004) argue that the fundamental social cause framework stands mute on the fundamental mechanisms linking social disadvantage to differential health outcomes.

The overarching purpose of the present research is to examine if and/or how a theoretical mechanism connects an expanse of fundamental causes (i.e., age, race, sex, socioeconomic status) to health outcomes. Freese & Lutfey (2010) propose inclusion of metamechanisms as the theoretical connection in the fundamental social cause framework. In brief, and expanded below, a metamechanism is an abstract process that describes the production of multiple concrete mechanisms that reproduce a specific relationship across different places and times. Metamechanisms are a conduit for distributing disparities in health that occur "downstream." The present research posits that health literacy is a possible metamechanism in the fundamental social cause framework. Health literacy represents "health directed" human agency that connects to health outcomes. Instead of focusing on a specific health outcome or a set of outcomes; health insurance status and individual self-rated health are the outcomes of interest in the present research. Thus, the primary contribution of the present research is two-fold. First, the scope of fundamental causes widens to include social positions (e.g., age, race/ethnicity, sex) with legacies of social and health inequality. Second, metamechanisms are included in the fundamental social cause framework to examine how fundamental causes connect to health inequalities.

The present research consists of five chapters: an introduction, three core empirical chapters, and a conclusion. The purpose of the introductory chapter (i.e., Chapter 1) is five-fold. First, the fundamental social cause framework and the importance of flexible resources are elaborated in full. Critiques of the framework point out the need to clearly delineate 1) what is and is not a flexible resource and 2) an intervening theoretical mechanism linking a fundamental cause to health. Integrating a multidimensional heuristic framework to organize flexible resources into flexible resource domains addresses the first critique. Integrating metamechanisms (Freese & Lutfey, 2010) into the fundamental social cause framework addresses the second critique. Second, the chapter turns to the substantive reasons to examine health insurance status and self-rated health as outcomes of interest. Third, to avoid repetition in each of the three core empirical chapters the data source, sampling design, analytical samples, variables and measures are described in full. In addition, descriptive statistics are estimated for all variables as well as correlations for the flexible resource and social resource measures, respectively. Fifth, the present chapter concludes by outlining the focus, analyses, and research question in each core empirical chapter.

The Fundamental Social Cause Framework

The fundamental social cause framework contextualizes (Link & Phelan, 1995) the reason people are exposed to risk or protective factors and the social conditions that put people at risk of risks. The causes are "fundamental" because the health effects cannot be eliminated by addressing the mechanisms that appear to link the cause to the risk of disease and death (Link & Phelan, 1995). Thus, the fundamental social cause framework focuses on social processes and conditions that are distal or “upstream” (McKinlay, 1975) from the individual. The earliest articulation of the fundamental social cause framework accounts for the relationship between socioeconomic status and differences in health outcomes. Individuals who have access to flexible resources are able to decrease their risk of illness/disease and increase their life expectancy (Link & Phelan, 1995). Link, Phelan & colleagues (1995; Link, Northridge, Phelan, & Ganz, 1998 Ganz, 1998; Link & Phelan, 1996, 2002; Link et al., 2008; Phelan & Link, 2005a, 2005b; Phelan et al., 2004) broadly define flexible resources to include money, knowledge, power, prestige, and interpersonal resources such as social networks and social support. Stated concisely, health disparities result from differential access to flexible resources.

Resources are salient for, at minimum, two reasons. First, resources directly shape individual health behaviors by influencing whether people know about, have access to, can afford, and are supported in their efforts to engage in health-enhancing behaviors. Second, resources shape access to broad contexts such as neighborhoods, occupations, and social networks that vary in associated profiles of risk and protective factors (Link & Phelan, 2002). The former reason suggests that the concept of fundamental causes encapsulates more than simply individual access to financial resources. Taken a step further, an examination of the fundamental social cause framework requires considering the impact of multiple social statuses (e.g., age, race/ethnicity, sex). The latter reason points to the importance of examining the influence of social context on health outcomes. In other words, empirical research employing the fundamental social cause framework should include both individual and social context as fundamental causes (see Appendix G).

Most recently, Phelan, Link, & Tehranifar (2010) provide the clearest articulation of the fundamental social cause framework. According to Phelan, Link, & Tehranifar (also see Link & Phelan, 1995; 2010) there are four features of a fundamental social cause. A fundamental social cause: 1) influences multiple disease outcomes and health problems; 2) affects disease outcomes and health problems through multiple risk factors; 3) involves access to resources to avoid risks or curtail the consequences of disease; and 4) reproduces disease/health outcomes over time through the replacement of intervening mechanisms.

While Phelan & colleagues (2010) clearly specify the features of the fundamental social cause framework; they fall short on two points. First, an underlying assumption exists that the components of flexible resources (i.e., money, knowledge, power, prestige, social networks, and social support) equally contribute to reduce the risk of risk. Therefore, a priori, equivalent contribution assumes automatic access to the spectrum of flexible resource components. For example, knowledge that reduces the risk of illness/disease and/or increases life expectancy may not translate into access to money, power, prestige, social networks, and/or social support. In addition, Young (2009) points out that terms, such as knowledge, power, prestige, etc., are abstract and provide few limits on acceptable measures. The present research addresses these concerns by integrating a heuristic framework from development economics (V. Johnson, Currie, & Stanley, 2010; A. K. Sen, 1999a; Sumner, 2004; Wagle, 2005, 2008, 2012; Yusuf & Deaton, 2009) to provide a structure for flexible resources into flexible resource domains.

Second, Phelan & colleagues (2010) do not clearly articulate the theoretical characteristics of an intervening mechanism to link fundamental causes to differential health outcomes (J. Lynch et al., 2004). Angell (2000, p. 44) points out that “it is inconceivable that money in the bank or a sheepskin on the wall could directly affect health.” Therefore, even with access to all possible resources to avoid risks and find protective strategies; Phelan & colleagues (2010) do not account for how resources avoid risk and how individuals make (or do not make) successful choices (Adler & Ostrove, 1999a; Angell, 2000; Young, 2009). Freese & Lutfey (2010; also see Lutfey & Freese, 2005) propose that metamechanisms, as a theoretical construct, clarifies the fourth feature of the fundamental social cause framework.

Flexible Resource Domains

Development economics emerged as a distinct sub-discipline from mainstream economics and humanism (Sumner, 2004; Yusuf & Deaton, 2009). Unlike mainstream economics unidimensional conception of poverty as the lack of economic resources; development economics approaches the meaning and measurement of poverty as multidimensional. As a multidimensional construct, poverty refers to a lack of monetary, achievement, and social integration resources. The common thread connecting development economics and the fundamental social cause framework is an emphasis on access to (or lack of) resources. Development economics provides a heuristic framework to organize and examine flexible resources into three flexible resource domains. The three domains are not mutually exclusive and serve to delineate flexible resources into economic, capability, and inclusion domains.

The flexible economic resource domain refers to monetary resources that enable the consumption of basic necessities such as food, housing, clothing, and transportation (Douthitt, Macdonald, & Mullis, 1992; Sumner, 2004; Wagle, 2008). The economic domain encompasses more than current personal income and includes potential monetary resources such as income from savings, investments, and other components of financial security (Douthitt et al., 1992). Flexible capability resources are the second domain. In the present research, capability means the freedom or choice to achieve "functionings" that are valued by individuals in a society (Sen, 1993; A. K. Sen, 1999a, 1999b). Functionings are the states of being or the resulting ends made possible through achievement. In other words, capabilities have instrumental value to attain valued functionings (Wagle, 2002). For example, a given level of educational attainment or occupational prestige provides the freedom to earn a given level of income or participate in a desired lifestyle. Thus, educational attainment and/or occupational prestige provide the ability to attain the valued functionings of income and/or type of lifestyle (Wagle, 2005, 2008, 2009).

The third domain is inclusion or the social processes that either promote or prevent participation in the acquisition of valued resources (Wagle, 2005, 2009). Therefore, the degree of integration with the broader society either promotes or denies access to flexible resources. Wagle (2008) points out that some individuals, by virtue of group membership, are denied the opportunity to attain valued resources. Flexible inclusion resources are further delineated into economic, political, and civic/cultural sub-domains. The degree of economic inclusion, such as participation in the labor market or employment status, either grants or denies individuals access to needed resources. Level of political participation; for example, voting and holding political positions, is directly tied to the development and implementation of large scale public policy (Verba, Schlozman, Brady, & Nie, 1993). Civic/cultural inclusion provides an opportunity to benefit from extended social networks. Volunteer activities and use of public resources, for example, are essential to build informal ties that may lead to job opportunities, securing credit, and enrolling children into better schools (Wagle, 2005). Integrating the heuristic framework serves to structure flexible resources into domains. Attention in the present research turns to expanding upon metamechanisms as a theoretical link in the fundamental social cause framework.

Metamechansims

Integrating metamechanisms into the fundamental social cause framework provides a theoretical link that elucidates how flexible resources (or lack thereof) connect to disparities in health outcomes. Freese & Lutfey (2010) point out that metamechanisms are distinct from differential access to flexible resources (i.e., money, power, prestige, knowledge, social networks, and social support) and provide a robust explanation of health disparities. Metamechanisms take into account actual routes that may or may not be taken by deliberate agents to account for differential health outcomes. Figure 1.1 presents a heuristic model of the fundamental social cause framework that incorporates Freese & Lutfey's (2010) theoretical concept of metamechanisms.

FIGURE 1.1 ABOUT HERE

Freese & Lutfey (2010) provide three examples of metamechanisms that demonstrate socioeconomic status differences: 1) spillover, 2) habitus, and 3) institutions. In the interest of brevity and for illustrative purposes, the first and second examples are defined and the third metamechanism, institutions, is expanded here. Spillover refers to the unintended health benefits as a result of the purposive actions of others in one's social network (Freese & Lutfey, 2010). Habitus is the differential preference some individuals may or may not exhibit for future good health. Institutions, such as the health care industry, are dynamic entities that may or may not respond directly to an individual's efforts to mobilize resources for health, but may either amplify or mitigate those same efforts. As a dynamic institution, the health care industry may respond directly to an individual's efforts to harness resources for their health. However, the health care industry may expand the individual's efforts or diminish those same efforts (Freese & Lutfey, 2010; Lutfey & Freese, 2005). Metamechanisms clarify how the relationship between fundamental causes and health and/or health related outcomes are recurrent over time once new means develop to control disease and death. In the present research health literacy is a possible metamechanisms in the fundamental social cause framework.

Health Literacy as a Metamechanism

Freese & Lutfey (2010) point out that a metamechanism: 1) is an abstract process, 2) explains the generation of multiple concrete mechanisms, and 3) is distinct from differential access to flexible resources. Health literacy meets each of the theoretical conditions of a metamechanism. First, Pleasant (2009a, p. 21) clearly states that "health literacy should be treated as a latent construct. Health literacy is not explicit, that is, one cannot 'see' health literacy, and it varies across individuals and contexts." Thus, health literacy is an abstract process. Second, health literacy explains the generation of multiple concrete mechanisms. Health literacy encompasses a wide range of skills that permit and improve the ability of people to act on information in order to live healthier lives. These skills include finding, understanding, reading, writing, listening, speaking, navigating, numeracy, evaluating and critical analysis, as well as communication and interaction skills (Coleman et al., 2009;

Pleasant, 2009a). Third, health literacy is distinct from differential access to flexible resources. Recall that flexible resources refer to money, knowledge, power, prestige, social networks, and social support. Hence, health literacy is **not** a flexible resource; instead, health literacy generates or creates the paths to flexible resources. The centrality of health literacy segues attention to the research question in the three core empirical chapters.

Research Questions

To restate, the present research examines if and/or how health literacy, as a metamechanism, connects the fundamental social cause framework to health outcomes. The first core empirical chapter (Chapter 2) addresses the following research question: is there a relationship between respondents' demographic, socioeconomic (i.e., flexible resource domains), social resources and level of health literacy? Health literacy is the outcome of interest to examine the connection and magnitude of potential disparities. Health insurance status (i.e., health insurance coverage or no health insurance) is the outcome of interest in Chapter 3 given the substantive link to health disparities. Franks & Fiscella (2008) point out that when access to healthcare (i.e., health insurance coverage) is a commodity; individuals who are able to purchase care receive the most care although they have the least amount of need. Conversely, individuals with the greatest amount of need receive the least amount of care. Consistent with the fundamental social cause framework, health disparities are the hallmark of unequal access to healthcare in the United States. The research question addressed in Chapter 3 is dual prong. First, are there differential relationships based on demographic characteristics and/or access to flexible resources (i.e., socioeconomic status) and health insurance status? Second, if disparities exist, does health literacy level account for the observed differences?

Self-rated health is the outcome of interest in Chapter 4. In alignment with the fundamental social cause framework, previous research reveals consistent racial/ethnic (Cummings & Braboy Jackson, 2008; Ferraro & Farmer, 1999), sex (Cummings & Braboy Jackson, 2008; McGee, Liao, Cao, & Cooper, 1999), and socioeconomic (Shi, Starfield, Politzer, & Regan, 2002) disparities in individuals' self-rated health. Chapter 4 addresses the following research question: if disparities in self-reported health status exist between demographic and/or socioeconomic groups, is health literacy responsible for explaining the differential associations? The data, sampling design, variables, and measures are described in the following section.

Data & Measurement

The data for the project come from the 2003 National Assessment of Adult Literacy (NAAL) managed by the National Center for Education Statistics (NCES) under restricted access. To examine health literacy as a theoretically abstract concept requires measuring health literacy as an abstract or latent trait (Pleasant, 2009b). To date, the NAAL is the only data set that contains a latent measure of health literacy (Baldi et al., 2009; Jin, Greenberg, & Baer, 2007).

The 2003 NAAL is a national multi-stratified cluster sample of: 1) adults 16 years of age and older living in household and 2) inmates 16 years of age and older in federal and state prisons (Jin et al., 2007; Kutner, Greenberg, Jin, Boyle, et al., 2006). The NAAL includes a variety of measures that assess an adult's skills for understanding health-related materials and forms. Most importantly, the NAAL restricted data file is unique as it contains individual level demographic information, a latent measure of health literacy, and health outcomes. The household and prison samples were combined and each sample was weighted, 99 percent for the household sample and 1 percent for the prison sample, to represent its portion of the total United States population. The present research employs data from the household sample.

Household Sampling Design

The household sample consists of 35,365 households (see Appendix A). Households were selected through a four-stage, stratified area sample. The first stage of sampling consisted of counties or groups of contiguous counties as primary sampling units (PSUs)[1]. In total, 160 unique PSUs were selected in the first stage of sampling. The second stage of sampling consisted of census blocks or groups of blocks, referred to as segments, within the PSUs[2]. To increase the number of African-Americans and Hispanics in the sample, segments with high concentrations of African-Americans and Hispanics (i.e., 25 percent or more of the population), were oversampled at a rate up to three times that of the remainder of the segments (Jin et al., 2007). A total of 2,818 unique segments were selected in the second stage of sampling.

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[1] PSU selection occurred within state boundaries to improve state-level estimates; with one PSU selected per stratum using probabilities proportionate to their population within households (Jin et al., 2007).
[2] Segments were selected with a probability proportionate to the size; the measure of size (MOS) for a segment was a function of the number of year-round housing units within the segment.

In the third stage, housing units were selected with equal probability within each segment[3]. Of the 35,365 households sampled, 4,671 were either vacant or not a dwelling unit; resulting in a sample of 30,694 selected households. Of the selected households, 25,123 completed the screener used to select a survey respondent. The fourth stage of selection consisted of listing household members 16 years of age and older; then random selection of one person if the household had three or fewer eligible members or two individuals if the household had four or more eligible individuals. Based on the screener data, 23,732 respondents were selected to complete the background questionnaire and the literacy assessment (see Baldi et al., 2009 for more information).

The Complete NAAL Sample

Of the 23,732 selected respondents, the complete sample contains 18,102 respondents. Figure 1.2 is a flowchart detailing the composition of the complete sample. Jin et al. (2007) considered responses complete if the respondent completed: 1) the screening instrument, 2) the background questionnaire, 3) at least one question on the three literacy scales (i.e., prose, document, and quantitative) of the assessment, and 4) if the respondent was unable to answer any questions because of language barriers or mental disability (see Appendix A). Therefore, all other cases were considered missing or incomplete. Of the 23,732 selected respondents, 18,186 respondents completed only the background questionnaire and 5,546 completed only the screener. Of the 5,546 who did not complete the

[3] The national component includes an exception for nonminority households within high-minority segments. After screening, the national sample of households were subsampled so that the sampling rates for nonminority persons would be approximately the same in the high-minority segments as in other segments. Expected losses were accounted for (i.e., vacant housing units, non-housing units, and expected response rates) in the overall housing units sample size.

background questionnaire, 355 respondents could not communicate in English or Spanish or were mentally disabled. The weighted response rate for the screener was 82.2 percent. Moreover, the final response rate for the background questionnaire was 75.6 percent weighted; which includes respondents who completed the background questionnaire and respondents who could not complete the background questionnaire because of language barriers or mental disability (see Baldi et al., 2009 for more information).

FIGURE 1.2 ABOUT HERE

The response rates for both the screener and background questionnaire fell below unit response rate of 85 percent required by NCES. Therefore, Jin & colleagues (2007) conducted a nonresponse bias analysis to determine if differences existed in the background characteristics of respondents who participated in the literacy assessment compared to those who refused. The analyses revealed that the lowest response rates for the screener occurred among housing units in segments with high median income, small average household size, and a large number of renters. At the background questionnaire stage, the lowest response rates occurred among males age 30 and older in segments with high median income. Bivariate unit-level and multivariate analyses revealed that the potential amount of nonresponse bias at the screener and background questionnaire stages was likely to be negligible as the weighted adjustments effectively reduced nonresponse bias (see Baldi et al., 2009 for more information).

Of the 18,186 respondents who completed only the background questionnaire, 17,178 completed at least one question on the prose, document, and quantitative literacy scales of the assessment. Of the remaining 1,008 respondents, 859 completed the background questionnaire but refused to complete the literacy assessment for reasons other than language barriers or mental disability and 149 of the respondents were unable to answer at least one question on each of the three scales for literacy related reasons. Literacy assessment responses were imputed for the respondents who completed the background questionnaire but refused to complete the literacy assessment (n=859).

Of the remaining 149 respondents, 65 answered at least one question from one of the three literacy scales; while the remaining 84 respondents did not answer any questions on any of the scales but did not refuse to answer the assessment. The final response rate for the literacy assessment was 95.6 percent weighted, which includes respondents who answered at least one question on each of the three scales (n=17,178) plus respondents who were unable to answer at least one question on each of the three scales for literacy related reasons (n=149). In summary, the complete household sample is the sum of: 1) respondents who answered at least one question on each of the three scales (17,178), 2) respondents who completed the background questionnaire but refused to complete the literacy assessment (17,178 + 859), and 3) respondents who answered at least one question from one of the three literacy scales (17,178 + 859 + 65 = 18,102). The analyses in the present chapter and core empirical chapters further reduce the complete sample to an analytical sample.

Analytic Samples

In Chapters 2 the complete sample is limited to adults 18 years of age or older and individuals with complete data on the independent variables. Thus, the sample is reduced to 15,309 respondents. The sample is further limited in Chapter 3 and 4 to adults 18 to 64 years of age as the outcome of interest is health insurance status. Older adults (i.e., 65 and older) are not included given retirement from the labor force and automatic qualification for health insurance under Medicare. Thus, the sample in both chapters is reduced to 13,080. Given the multi-stratified cluster sampling design, all analyses are conducted in STATA 12 (StataCorp, 2011) to include sample weights.

Measures

Dependent Variables

The present research investigates distinct empirical models for each of the health outcomes. Health literacy is positioned as a mediating variable for the effect of measures representing the fundamental cause perspective on the health outcomes in the heuristic model (see Figure 1.1.). These data provide a unique opportunity to explore the predictors of health literacy which is the first dependent variable. Previous health literacy research employ health literacy assessments that provide "true score" values (i.e., the sum of items or questions answered correctly) to determine individual health literacy levels (see Appendix D & E for examples). "True score" assessments rest on the assumptions of Classical Test Theory (CTT) (R. F. DeVellis, 2003; Robert F. DeVellis, 2006). However, the present research uses an Item Response Theory (IRT) based measure of health literacy (Hambleton, Swaminathan, & Rogers, 1991). In brief, Item Response Theory focuses on the level of difficulty for a given question or item and an individual's performance (i.e., answering the question correctly) in relation to the item (F. B. Baker, 1985) (see Appendix B for a detailed explanation of Item Response Theory and Classical Test Theory).

Baldi & colleagues (2009) developed the question items to measure *health literacy* in the 2003 NAAL. The NAAL literacy assessment consists of 152 items[4]. Following Baldi & colleagues (2009) scoring criteria (see Appendix B), items scored as omitted or not reached are recoded as incorrect. The Graded Response Model (GRM) may be considered a more general IRT model for dichotomous response options (Meade & Lautenschlager, 2004) and serves to estimate health literacy scores from the 28 health literacy items (see Appendix F for examples of health literacy items). The NCES provides the *a* or discrimination parameter and *b* or difficulty parameters for all items in the NAAL (Jin et al., 2007) and preliminary Classical Test Theory and Item Response Theory descriptive statistics are presented in Table F1 (in Appendix F). The *a* parameters, *b* parameters, and recoded item responses are entered into Meade's (2010) VisualDF program to compute theta values (θ) for the 28 items. Baldi & colleagues (2009) provide the following formula to transform health literacy theta values (θ) into a common scale value:

$$\theta = A\theta^{*} + B$$

where θ* is the provisional scale from item calibration, *A* is the standard deviation, *B* is the mean, and θ is the health literacy scale value with a range of 0 – 500. Health literacy scale values or scores are treated as continuous instead of categorical groups (i.e., Below Basic, Basic, Intermediate, and Proficient) as reported by the NCES (Baldi et al., 2009).

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[4] Twenty eight of the 152 items were developed to assess level of health literacy (see Data Collection section in Appendix A). Responses to 23 of the 28 items are scored correct, incorrect, omitted, or not reached (1 = correct, 0 = incorrect, 8 = omitted, and 9 = not reached) and fit a two Parameter Logistic (2PL) Item Response Theory (IRT) Model (see Appendix B for a discussion of Classical Test Theory and Item Response Theory). Responses to 5 items (i.e., C020901, C030101, C04050, C071101, and C080101) are scored correct, partially correct, incorrect, omitted, or not reached (1 = correct, 2 = partially correct, 0 = incorrect, 8 = omitted, and 9 = not reached) and fit a Graded Response IRT Model (GRM) (see Appendix B) (Samejima, 1969, 1970, 1997).

Health Insurance Status

Health insurance status is the dependent health outcome in Chapter 3. Responses to a single question provide the measure of *health insurance status*. The question asks, “Do you have any kind of medical insurance or are you enrolled in any kind of program that helps to pay for your health care?” The dichotomous response options (i.e., 1 = Yes, 2 = No) are recoded for the analyses (i.e., 0 = No, 1 = Yes) and an affirmative answers is the included category.

Self-Rated Health Status

Self-rated health is the dependent outcome in Chapter 4 and is assessed by responses to the following question: “How would you rate your overall health?” The response options included: Excellent, Very good, Good, Fair, and Poor and coded in descending order (i.e., 1 = Excellent, 2 = Very good, 3 = Good, 4 = Fair, and 5 = Poor). Response options are first reverse coded (i.e., 5 = Excellent, 4 = Very good, 3 = Good, 2 = Fair, and 1 = Poor) so that higher values indicate a higher level of self-rated health. Second, response options are recoded and collapsed into a dichotomous dummy variable (i.e., 0 = Excellent/Very good/Good and 1 = Fair/Poor). In the multivariate analyses, Excellent/Very good/Good is the excluded comparison category.

Independent Variables

There is an important caveat in the following section. In Chapter 2, income from savings and investments is a scale measure and employment status, voting in the 2000 election, library use, volunteer activity, language spoken, and marital status are multi-categorical measures. However, to improve the parsimony of the analyses in Chapters 3 and

4, income from savings and investments, employment status, voting in the 2000 election, library use, volunteer activity, language spoken, and marital status are recoded into dichotomous measures.

Demographic

Age of the respondent is treated as a continuous variable and is the number of years between the respondents' date of birth and the date of the assessment. Responses to three questions determine *race/ethnicity*. The first question asks: "Are you Hispanic or Latino?" The second question asks respondents their country of birth. Hispanic or Latino respondents' born in the United States are native born Hispanic/Latino while respondents' born outside the United States are foreign born Hispanic/Latino.

If the respondent indicated that they were not Hispanic or Latino, then the third question asked "Which groups on this card [hand card listing] best describes you? Choose one or more." Response options include White, Black or African-American, Asian, American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander.

Responses to the first and third questions produce a derived variable with the following racial/ethnic groups: White, African-American, Asian/Pacific Islander, American Indian/Alaskan Native, and Multiracial. Responses to the first and second questions delineate native born and foreign born Hispanic/Latino respondents. Sudano & Baker (also see Hummer, 1996; 2006) employ the same methodology above to operationalize race/ethnicity as a social status. To an extent race/ethnicity "marks" the social context of an individual's life opportunities. The seven racial/ethnic categories are recoded into dummy variables (i.e., 0 / 1) and White respondents are the excluded category. Interviewers coded the s*ex* of the respondent at the time of the interview as either female or male. Sex is recoded as a dichotomous dummy variable (i.e., 0 = Male, 1 = Female) and Male respondents are the excluded category.

Flexible Resources

Integrating the multidimensional resource framework from the developmental economics literature, *flexible resource* measures are categorized into three domains: flexible economic resources, flexible capability resources, and flexible inclusion resources.

Economic Resources

Two measures are employed to account for flexible economic resources. First, household income encompasses both the respondent's income as well as access to other resources. A single item asks: "Which letter on this card corresponds to your approximate total household income for the past 12 months?" The original fifteen categories for household income are collapsed and recoded into eight categories that include: 1) no personal income (i.e., $0), 2) less than $10,000, 3) $10,000 - $14,999, 4) $15,000 - $24,999, 5) $30,000 - $49,999, 6) $50,000 - $74,999, 7) $75,000 - $99,999, and 8) $100,000 or more. Following Christ & colleagues (2012) approach, household income is recoded to the median value of each category and rescaled in thousands of dollars ($1,000). Christ (2012) notes that there is a loss of information since the exact amount may fall anywhere in the range for a given dollar value category for each household are unknown. However, recoding and rescaling household income provides an intuitive interpretation for the effect of household income in thousands of dollars rather than in units of the categories (Christ, 2012). Thus, the recoded values of household income serve as a measure of *median household income*.

Second, to determine *income from savings and investments*, two questions asks if in the past 12 months the respondent or anyone in the respondent's household received: 1) interest from savings or other bank accounts (other than dividends) and 2) dividend income from stocks or mutual funds or income from rental property, royalty, estates, or trusts. Response options for both questions are 1) Yes, me, 2) Yes, someone else, 3) Yes, someone else and me, and 4) No (i.e., 1 = Yes, me, 2 = Yes, someone else, 3 = Yes, someone else and me, 4 = No). In Chapter 2, responses to the two questions are summed and recoded into the response categories None, One Source, Two Sources (i.e., 0 = None, 1 = One Source, 2 = Two Sources). In Chapters 3 and 4, affirmative responses to either question are recoded into a single dichotomous dummy variable (i.e., No = 0, Yes = 1) and negative responses serve as the excluded category. Instead of a multi-categorical measure, as employed in Chapter 2, the dichotomous measure improves the overall parsimony of the analyses by reducing the number of categorical response options.

Capability Resources

To briefly restate, capability refers to an individual's degree of freedom to achieve valuable "functionings" or the resources that the individual is able to do or be (Douthitt et al., 1992; A. Sen, 1999; Wagle, 2008). Responses to two questions serve as measures of flexible capability resources. The first question asks: "What is the highest level of public or private education that you have completed?" A derived measure of *educational attainment* includes eleven response options (i.e., 1 = Less Than High School (0-8 Years), 2 = Some High School (9-12 Years - Did Not Graduate), 3 = GED or High School Equivalency, 4 = High School Graduate, 5 = Vocational/Trade/Business Degree, 6 = Less Than 2 Years, 7 = Associates

Degree (A.A.), 8 = Two Years or More/No Degree, 9 = College Graduate (B.S. or B.A.), 10 = Postgraduate/No Degree, 11 = Postgraduate Degree). In the analyses, the eleven options serve as a continuous measure of educational attainment.

Occupational status is determined from responses to two questions: "What (is/was) your occupation – what (is/was) your job called?" and "What (are/were) the most important activities or duties at this job?" NCES staff recoded responses into four digit 2000 Census Occupational Codes. In the analyses the 2000 Census Occupational Code categories are recoded to their respective Nam-Powers-Boyd Occupational Status Scale value (Nam & Boyd, 2004). In addition, 2000 Census Occupational Codes not included in the Nam-Powers-Boyd Occupational Status Scale are cross checked (Deane & Shin, 2002; Meyer & Osborne, 2005; Nam, 2000) to ensure that they are coded correctly. The Nam-Powers-Boyd Occupational Status Scale ranges from 1 (lowest status) to 100 (highest status) and is treated as a continuous variable.

Inclusion Resources

Inclusion refers to the relationship of an individual with their broader social institutions and identifying one's social and relational resources (Wagle, 2008). As a dimension of flexible resources, there are three inclusion sub-dimensions: economic, political, and civic/cultural (see Douthitt et al., 1992; Verba et al., 1993; Wagle, 2002). *Employment status* is a derived variable and serves as the measure of economic inclusion. The original six categories of employment status are: 1) Employed Full Time, 2) Employed Part Time, 3) Employed Not at Work, 4) Unemployed looking for work, 5) Unemployed not looking for work, and 6) Out of Labor Force. For the analyses in Chapter 2, the fourth and fifth response options are collapsed into a single unemployed category resulting in five employment status categories. The five employment status categories are then recoded into dummy variables (i.e., 0 / 1) and employed full-time is the comparison category in Chapter 2. In Chapters 3 and 4, the initial six response options are recoded into a dichotomous dummy variable indicating full time employment status (i.e., 0 = Employed Less Than Full Time, 1 = Employed Full Time) and respondents employed less than full time are the excluded comparison category. Instead of a multi-categorical measure, as employed in Chapter 2, the dichotomous measure improves the overall parsimony of the analyses by reducing the number of categorical response options.

There are two measures of political inclusion: *voting in the 2000 election* and *current affairs/political/government information sources*. Respondents indicated if they voted in the 2000 election and if the respondent could vote in the 2000 election. The response categories for the derived variable are: 1) Not a Citizen 2) Did Not Vote, 3) Voted, and 4) Do Not Remember. Response categories are recoded into dummy variables (i.e., 0 / 1) for the analyses in Chapter 2 and respondents who voted are the comparison category. In Chapters 3 and 4, the first, second, and fourth response options are collapsed to indicate that the respondent did not vote; while the third response option is recoded to indicate that the respondent voted. Thus, voting in the 2000 election is a dichotomous dummy variable (i.e., Did Not Vote = 0, Voted = 1) in the analysis and respondents who did not voted are the comparison category. To increase the precision of the analyses in Chapters 3 and 4 voting in the 2000 election is a dichotomous variable in the analyses.

The second measure asked how much information about current events, public affairs and the government the respondent obtained from: 1) Newspapers, 2) Magazines, 3) Internet, 4) Radio and Television, 5) Books or Brochures, and 6) Family Members, Friends, or Co-workers. The response options for each source of information are: 1) A Lot, 2) Some, 3) A Little, and 4) None (i.e., 1 = A Lot, 2 = Some, 3 = A Little, and 4 = None). The response options are reverse coded so higher values indicate the amount of information from the six sources. The answers from each respondent are averaged across the six sources of information for only non-missing values. In the analyses, the measure of *current events/public affairs/government information sources* is a scale measure.

Library use and *volunteer activity* are measures of civic/cultural inclusion. The question, “How often do you use the services of a library for any reason?” includes the response options: 1) Daily, 2) Weekly, 3) Monthly, 4) Once or Twice a Year, and 5) Never (i.e., 1 = Daily, 2 = Weekly, 3 = Monthly, 4 = Once or Twice a Year, and 5 = Never). The frequency of library use response options are recoded into dummy variables (i.e., 0 / 1) for the analyses in Chapter 2 and daily library use is the comparison category. However, in Chapters 3 and 4 the library use response options are recoded into a dichotomous dummy variable indicating library use (i.e., 0 = Never Use Library, 1 = Use Library) and respondents who never use the library are the excluded comparison category.

Responses to two questions provide the measure of volunteer activity. First, “During the past year, did you give any UNPAID time as a volunteer to a group or organization?” The response option (i.e., Yes = 1, No = 2) are recoded into a dichotomous dummy variable (i.e., 0 = No, 1 = Yes) and an affirmative answers is the included category for the analyses in

Chapters 3 and 4. Second, if the respondent indicated that they had volunteered a follow up questions asks: "How often do you volunteer?" and includes the response options: 1) Most days, 2) A few days a week, 3) About once a week, and 4) Less than once a week. Thus, the combined response options (i.e., 1) Most days, 2) A few days a week, 3) About once a week, 4) Less than once a week, and 5) Never) are reverse coded so higher values indicate a higher level of volunteer activity (i.e., 5 = Most days, 4 = A few days a week, 3 = About once a week, 2 = Less than once a week, and 1 = Never) and serve as a continuous measure in Chapter 2.

Social Resources

Language spoken is a derived measure from responses to two questions: "When you were growing up, what language or languages were usually spoken in your home?" and "Which language do you often speak now?" Respondents who indicate English for both questions are recoded as only English speaking and serve as the excluded category in Chapter 2. Respondents who spoke Spanish growing up and now speak English are recoded as Spanish/English as Second Language (ESL). Respondents who spoke Spanish growing up and only speak Spanish are recoded as Speaking Spanish Only. The remaining respondents who speak any other language growing up and now speak English are recoded as Other Language Spoken ESL. Thus, the response categories include Native English Speaker, Spanish/ESL, Speaks Only Spanish, Other Language Spoken ESL. In Chapters 3 and 4, respondents who indicate English for both questions are recoded as speaking only English while all other responses are recoded as learning or not English speaking (i.e., 0 = Non-native English Speaker, 1 = Native English Speaker). In the analyses, native English speaking respondents are the included category. Unlike Chapter 2, language spoken is dichotomized to improve the fidelity of the analyses.

Marital status is a derived variable from the background questionnaire. Respondents are categorized as either: 1) Never Married, 2) Married or Living as Married, and 3) Separated/Divorced/Widowed. The three categories are recoded into dummy variables (i.e., 0 / 1) and respondents who are married or living as married are the excluded category for the analyses in Chapter 2. However, in Chapters 3 and 4 the three response categories are recoded into a single dichotomous dummy variable indicating if the respondent is married or living as married or not (i.e., 0 = Not Married or Living as Married, 1 = Married or Living as Married). Respondents who are married or living as married are the included category in the analyses. Moreover, treating marital status as a dichotomous variable reduces the number of categorical options and increases the analytical precision.

Respondents are asked how much *information about health issues* they obtained from: 1) newspapers, 2) magazines, 3) internet, 4) radio and television, 5) books or brochures, and 6) family members, friends, or co-workers. The response options for each source of information are: 1) A lot, 2) Some, 3) A little, and 4) None (i.e., 1 = A lot, 2 = Some, 3 = A little, or 4 = None). Cronbach's alpha analysis reveals that responses to newspapers, magazines, and books or brochures are a reliable measure ($\alpha = 0.71$) source of health information. Response options are reverse coded so higher values indicate the amount of information from the three sources (i.e., newspapers, magazines, and books or brochures) and then averaged across the three sources of information for only non-missing values. In the analyses, *health information source* is a scale measure.

Mediating Variables

Need based social support and literacy self-efficacy serve as mediating variables in Chapter 3 and type of health insurance is a potential mediating variable in Chapter 4. Responses to four questions provide the measure of *need based social support*. The question asks respondents how much help they receive from family members or friends with: 1) Filling out forms?, 2) Reading or explaining newspaper articles or other written information?, 3) Writing notes, letters (and email?), and 4) Using basic arithmetic, that is, adding, subtracting, multiplying, or dividing, such as filling out order forms or balancing a checkbook? The response options are A lot, Some, A little, or None (i.e., 1 = A lot, 2 = Some, 3 = A little, or 4 = None) which are reverse coded so that higher values indicate a greater need for social support. The recoded values are then averaged across the four questions for only non-missing values to create a scale measure.

Responses to four questions provide a scale measure of *literacy self-efficacy*. Each question asks how much the respondent thinks a specific skill limits the respondent's job opportunities. The four specific skills are 1) Reading, 2) Writing, 3) Math, and 4) Computer, respectively. The response options for each of the four specific skill questions are: A lot, Some, A little, or None (i.e., 1 = A lot, 2 = Some, 3 = A little, or 4 = None). The response option values are averaged across the four questions for only non-missing values. Thus, a higher value indicates a higher level of literacy self-efficacy (i.e., a respondent's job opportunities are not limited at all by their reading, writing, math, and computer skills).

Responses to two questions provide the measure for *type of health insurance*. The first question asks, "Do you have any kind of medical insurance or are you enrolled in any kind of program that helps to pay for your health care?" with Yes and No as response options (i.e., Yes = 1, No = 2). A follow up question asks affirming respondents: "Is your [health insurance] program…?" The response options include: 1) Health insurance through your work (school) or a family member's work?, 2) Medicare (Medicare is the health insurance for people 65 or older or people with disabilities)?, 3) Health insurance you or someone else in your family purchased directly from an insurance company or other organization that is not related to past or current employment?, 4) Health insurance provided as part of military service?, 5) Medicaid or [if applicable, fill in state name]?, and 6) Other? (Specify). Responses to the first and second questions are combined and recoded into the following categorical variables: No Health Insurance, Employer Provided Health Insurance, Medicare/Medicaid/State Service, Health Insurance from Private Company, and Military/Other Not Specified. Employer Provided Health Insurance serves as the excluded comparison category in the multivariate analyses.

Analytical Technique

Two analytical techniques are employed in the current chapter. First, descriptive statistics are estimated for all independent, mediating, and the dependent variables. Second, correlations are estimated for the flexible resource domain measures and social resource domain measures. In each of the core empirical chapters, correlations are estimated between the predictor variables and dependent variable. In addition, multivariate analyses are conducted and examined in each respective chapter.

Results

Descriptive Statistics

Table 1.1 displays the weighted descriptive statistics for all variables. On average, respondents are 44 years of age. In terms of sex, 48 percent and 52 percent of the sample are males and females, respectively. Moreover, 71 percent of respondents are White, 11 percent are African American, and seven percent are Foreign Born Hispanics.

TABLE 1.1 ABOUT HERE

The average median household income is approximately $52,000; in addition, 51 percent of respondents indicated that they receive additional income from saving and/or investments. In terms of educational attainment, the majority of respondents are high school graduates. Slightly more than half (51 percent) of the respondents are employed full time and slightly more than half voted in the 2000 election (59 percent). On average, respondents obtained a lot of their information about current affairs/political/government from multiple sources. Sixty six percent of respondents use a library while 34 percent never use a library. The vast majority of respondents do not volunteer (61 percent). The overall majority of respondents are native English speakers (84 percent) and 61 percent are married or living as a married couple. On average, respondents obtained a lot of their health information from multiple sources. The vast majority of respondents (81 percent) indicated that they have some form of health insurance. Moreover, fifty percent of respondents received employer provided health insurance; however, 19 percent of respondents did not have health insurance. In addition, respondents, on average, indicated that they need a little social support and have a low level of literacy self-efficacy. The average health literacy score is 244 and the majority of respondents rated their health status as either excellent, very good, or good.

Correlation Matrices

Table F2 (in Appendix F) provides the correlations between the demographic characteristics, flexible domain measures (i.e., Economic, Capability, and Inclusion), and health literacy score. Table F3 (in Appendix F) provides the correlations between the demographic characteristics, flexible domain measures (i.e., Economic, Capability, and Inclusion), health literacy score, need based social support, literacy self-efficacy, and health insurance status. Table F4 (in Appendix F) provides the correlations between the demographic characteristics, flexible domain measures (i.e., Economic, Capability, and Inclusion), health literacy score, need based social support, literacy self-efficacy, type of health insurance, and self-rated health status. In Table F3, there are significant moderate levels of correlation between household income and income from savings and investments (0.419) and between household income and educational attainment (0.465). The correlation coefficient values draw attention to the potential of multicollinearity which violates an assumption of Ordinary Least Squares (OLS) regression. Therefore, Variance Inflation Factor (VIF) values are computed for all the variables in the matrix (analyses available upon request). VIF values range from 1.01 to 3.74 in the diagnostic procedure and are below the acceptable value of 10. Thus, there is little concern for the existence of multicollinearity. The magnitude of the correlation coefficient values presented in Tables F4 does not suggest the existence of multicollinearity between the social resource measures. Attention turns to the chapter conclusion outlining the focus, analyses, and research question in each core empirical chapter.

Dissertation Chapters

The focus of the first core empirical chapter (i.e., Chapter 2) is to examine the connection between the fundamental social cause framework and health literacy level. The focus of Chapters 3 and Chapter 4 is to examine health literacy as a potential metamechanism (Freese & Lutfey, 2010; Lutfey & Freese, 2005; Phelan et al., 2010) connecting an expanse of fundamental social causes to health insurance status and self-reported health status, respectively. Each chapter concludes with a discussion of the analyses in relation to the research question of interest. The final chapter (Chapter 5) summarizes the results from each core empirical chapter and points out the limitations, contributions, and implications of the present research.

CHAPTER 2

Examining Health Literacy in the Fundamental Social Cause Framework

Health literacy is an emerging and vibrant area of study crossing the disciplines of medicine, education, psychology, and public health. Berkman & colleagues (2004) systematic and comprehensive review of the health and literacy literature from 1980 to 2003 yielded approximately 700 articles related to health literacy. Of the approximate 700 articles, nearly two-thirds of the research began in or after 1995. A preliminary update of the health literacy literature from 2003 to 2009 reveals an additional 2,855 published research articles focused on one or more dimensions of health literacy.

Previous research consistently reveals that an individual's level of health literacy varies by demographic and socioeconomic characteristics and is associated with health outcomes. In terms of the former, low levels of health literacy are more prevalent among individuals who are older (i.e., age 65 and over) (Rootman & Ronson, 2003; Sudore et al., 2006), racial/ethnic minorities (Beers et al., 2003; Jeppesen, Coyle, & Miser, 2009), poor or low income (J. A. Gazmararian et al., 1999), male (Jovic-Vranes, Bjegovic-Mikanovic, & Marinkovic, 2009; von Wagner, Knight, Steptoe, & Wardle, 2007), and who have no or low educational attainment (Kalichman et al., 2000; von Wagner et al., 2007) or low occupational prestige (J. A. Gazmararian et al., 1999).

In terms of the latter, individuals with low levels of health literacy have greater risk of mortality (Sudore et al., 2006), increased risk of hospitalization (D. W. Baker et al., 2002), delayed cancer diagnosis (T. C. Davis, Williams, Marin, Parker, & Glass, 2002; Lindau, Basu, & Leitsch, 2006), increased diabetic related health complications (Rosal, Goins, Carbone, & Cortes, 2004; Schillinger et al., 2002), decreased involvement in medical decision-making (DeWalt, 2007). Low health literacy is also associated with higher levels of depressive symptoms (Lincoln et al., 2006), decreased preventive health practices (Howard, Sentell, & Gazmararian, 2006; S. White, Chen, & Atchison, 2008), lower levels of self-reported health (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004; von Wagner et al., 2007; Barry D. Weiss, Hart, McGee, & D'Estelle, 1992), increased health care visits (Sanders, Thompson, & Wilkinson, 2007), decreased knowledge of chronic health conditions (M. V. Williams, Baker, Parker, & Nurss, 1998), and decreased prevention for sexually transmitted infections (STIs) and HIV (Fortenberry et al., 2001; Kalichman et al., 2000).

The present chapter focuses on a central question, is there a relationship between respondents' demographic, access to flexible resources (i.e., socioeconomic), social resources and health literacy level? Link & Phelan's (1995) fundamental social cause framework is an appropriate sociologically based perspective to examine health literacy disparities given the notion of access to flexible resources. Individuals who collect, organize, and employ flexible resources, such as money, wealth, knowledge, power, prestige, and interpersonal resources (e.g., social networks and social support), reduce their risk of illness/disease and increase their life expectancy. By and large, previous fundamental social cause framework research employ socioeconomic status variables as measures of flexible resources (Chang & Lauderdale, 2009; Link et al., 2008; Olafsdottir, 2007; Phelan et al., 2004; Willson, 2009). In general, income, educational attainment, and occupational status are the most common variables to measure socioeconomic status (Adler & Ostrove, 1999b; David R. Williams & Collins, 1995).

However, Williams & Collins (1995) point out that indicators of assets, wealth, and/or relational social class measures may provide more insight about an individual's access to social and economic resources than income, educational attainment, and/or occupational status (also see Adler & Ostrove, 1999b; Duncan, Daly, McDonough, & Williams, 2002; N. Krieger, Williams, & Moss, 1997; Oakes & Rossi, 2003). The present research contributes to the fundamental social cause framework as well as the health literacy disparities research by including measures of wealth (i.e., income from savings and investments) and relational social class (i.e., employment status, library use, and volunteer activity). Specifically, integrating a multidimensional conception of poverty from development economics (see Chapter 1) provides a heuristic structure to organize flexible resources into flexible resource domains. The flexible resource domains enlarge the scope of flexible resources to examine a spectrum of monetary, wealth, knowledge, power, prestige, and interpersonal connection resources.

The present chapter provides a review of the conceptual definitions of health literacy. The review then turns attention to previous research examining the distribution of health illiteracy. Previous research (DeWalt et al., 2004; Reder, 1994; Schnittker, 2005; Wolf et al., 2006) suggests that the unequal distribution ability or capacity to access health information contributes to disparities in decision making or action related to health outcomes. Specifically, higher levels of disparity occur among the elderly, women, racial/ethnic minorities and socioeconomically disadvantaged groups (Link & Phelan, 1995; Link et al., 2008; Phelan & Link, 2005b; T. L. Sentell & Halpin, 2006). Next, the review describes and delineates the difference between first and second generation measures of health literacy as well as the framework for the measure of health literacy in the present research. Based upon the review, a conceptual model depicts the connection between the fundamental social cause framework and health literacy level. The conceptual model serves as a framework to propose the chapter hypotheses. A series of Ordinary Least Squares (OLS) regression analyses examine the relationship between individual demographic characteristics, access to flexible resources, social resources and level of health literacy. The chapter conclusion contributes insights for the fundamental social cause framework and health literacy research.

Defining Health Literacy

Nielsen-Bohlman & colleagues (2004) emphasizes that general literacy, educational level, and health literacy are conceptually distinct. General literacy refers to a set of reading, writing, basic mathematics, speech, and speech comprehension skills and is conceptually broader than health literacy (Lynn Nielsen-Bohlman et al., 2004). Education level refers to the number of years or highest level of formal education (Zarcadoolas, Pleasant, & Greer, 2005). Even individuals who have advanced levels of education may not understand a medical form or doctor's instructions regarding a drug or procedure (Lynn Nielsen-Bohlman et al., 2004). The distinction between general literacy, educational level, and health literacy solidifies as most individuals will encounter health information they cannot understand at some point (Lynn Nielsen-Bohlman et al., 2004). Yet, the conceptual distinctions do not preclude that empirical relationships exist between an individual's level of general literacy, educational level, and health literacy level. Health literacy is conceptually distinct given the technical vocabulary employed in the health care setting.

Pleasant & McKinney (2011; also see Pleasant, McKinney, & Rikard, 2011) point out that there are several variant conceptual definitions of health literacy and that consensus does not exist given the rapid growth of health literacy as a field of study. However, a lack of consensus does not provide a point of reference to develop and test competing operational definitions of health literacy (i.e., alternative hypotheses in the scientific process) (N. Berkman, Davis, & McCormack, 2010; Ishikawa & Kiuchi, 2010; Pleasant, 2009b; Pleasant & McKinney, 2011). A brief review of predominate conceptual definitions of health literacy provides a background to understand the origins of the concept.

Conceptual definitions of health literacy are based in either a clinical perspective or a public health approach (Anita Peerson & Margo Saunders, 2009; Pleasant & Kuruvilla, 2008). The clinical perspective focuses "downstream" (McKinlay, 1975) on individual health outcomes and places "blame" or responsibility for poor health outcomes on the individual. Moreover, a clinical health literacy perspective narrowly focuses on specific health outcomes. Conversely, a public health approach, similar to a sociological approach, focuses on the "upstream" (McKinlay, 1975) or distal social structural forces to account for health disparities. In the United States the clinical perspective serves as the framework for the dominate conceptual definition of health literacy. Outside the United States, however, conceptual health literacy definitions emphasize a public health approach (Ishikawa & Kiuchi, 2010; Kickbusch, 2001; Don Nutbeam, 1998, 1999, 2000b; Pleasant & Kuruvilla, 2008).

The Clinical Perspective of Health Literacy

Williams & colleagues (1995a) articulate the earliest conceptual definition of health literacy (however, Simonds, 1974 provides the first documented use of health literacy). Health literacy is a patients' ability to perform basic reading tasks required to function in the health care environment (M. V. Williams et al., 1995a). Following from Williams & colleagues (1995a), the American Medical Association's Ad Hoc Committee on Health Literacy (1999) defined health literacy as a constellation of skills, including the ability to perform basic reading and numerical tasks required to function in the health care environment. Currently, the definition provided by the National Institutes of Medicine (IOM) (Lynn Nielsen-Bohlman et al., 2004) report, *Health Literacy: A Prescription to End Confusion*, is the most widely cited and employed conceptual definition (N. Berkman et al., 2010; Freedman et al., 2009). The IOM (2004) defines health literacy as the degree to which individuals have the capacity to obtain, process, and understand basic information and services needed to make appropriate decisions regarding their health.

Emerging research calls into question the clinical perspective of health literacy in the United States. Freedman & colleagues (2009), Pleasant & McKinney (2011), and Berkman & colleagues (2010) identify three weaknesses of the dominant clinical health literacy definition. First, the clinical definition limits the problem of low health literacy to the capacity and competence of the individual. Second, a clinical definition does not address root causes of health illiteracy such as socioeconomic disparities and unequal access to high quality education. Pleasant (2009b) explicitly notes that health literacy is a social construction that exists solely as a result of social interaction and should not be treated as a biomedical issue with social roots. Third, the current clinical definition does not consider health literacy as a public health matter. Freedman & colleagues (2009) go a step further by providing a definition of public health literacy that parallels the IOM definition of health literacy. Public health literacy is the degree to which individuals and groups can obtain, process, understand, evaluate and act upon information needed to make public health decisions that benefit the community (Freedman et al., 2009).

A Public Health Approach to Health Literacy

The World Health Organization (WHO) (1998) points out that health literacy is more than the ability to read and make health related decisions. Health literacy means improving access to health information and individual capacity to use health information effectively. In brief, health literacy is critical to empowering individuals to take action to improve personal and community health by changing personal lifestyles and living conditions.

Consistent with the WHO definition, Nutbeam (1998, 1999, 2000a) offers a classification system for health literacy which defines health literacy based upon the level of ability required to navigate the health care system. According the Nutbeam, there are three levels of health literacy: basic/functional literacy, communicative/interactive literacy, and critical literacy. Of the three, Nutbeam (1998, 1999, 2000a) emphasizes developing critical literacy to support effective social and political action. Critical literacy is more advanced cognitive skills which, together with social skills, can be applied to critically analyze information, and to exert greater control over life events and situations (see Jahan, 2000; Kawachi & Kennedy, 1997; Kickbusch, 2001).

The Calgary Charter on Health Literacy provides an inclusive definition of health literacy (Coleman et al., 2009). The Charter's definition of health literacy is a synthesis between researchers and practitioners from Canada, the United States, and the United Kingdom. The Charter contains a broad definition of health literacy that focuses on interaction of the general public and health care professionals to find, understand, evaluate, communicate, and use information. Health literacy encompasses a wide range of skills to improve the ability of people to act on information in order to live healthier lives. These skills include reading, writing, listening, speaking, numeracy, and critical analysis, as well as communication and interaction skills (Coleman et al., 2009). The Calgary Charter bridges the conceptual gap between individual and systemic levels as well as the interaction of the public with health care professionals.

The present research does not: 1) address the "appropriate" unit of analysis for health literacy and/or 2) seek to support or refute the conceptual definitions reviewed above. The present research relies on two consistent components across each of the conceptual definitions: 1) ability or capacity to access or obtain health information and 2) decision making or action related to health. Moreover, the present research employs an Item Response Theory based measure of health literacy to assess individual ability or capacity to obtain health information and decision making. There is a significant difference between the measurement of health literacy in research prior to the NAAL and research using the NAAL. Previous research employs screening assessments designed to assess health literacy level for clinical populations; whereas, the NAAL measure of health literacy provide specific information on individual health literacy levels in the general population (see Appendix B).

Distribution of Health Illiteracy

Two nationally representative studies of literacy and health literacy, respectively, provide estimates of health illiteracy in the United States. The 1992 National Assessment of Literacy Skills (NALS) revealed that nearly half (approximately 40-45%) of the nation's adults 16 years of age or older perform at the lowest levels of literacy proficiency (Reder, 1994). The 2003 National Assessment of Adult Literacy (NAAL) is the update to the NALS. The NAAL suggests that the picture of literacy has not changed over a decade as 90 million adults lack functional health literacy (Kripalani, Paasche-Orlow, Parker, & Saha, 2006). The NAAL operationalizes individual's level of literacy into three specific knowledge and skill domains: prose, document, and quantitative (Kutner, Greenberg, Jin, & Paulsen, 2006). In brief, prose literacy refers to searching, comprehending, and using information from *continuous* texts. Searching, comprehending, and using information from *noncontinuous* texts in various formats is document literacy. Quantitative literacy (or numeracy) is the knowledge and skills needed to identify and perform computations, either alone or sequentially, using numbers embedded in printed materials.

Health literacy assessment items were interwoven throughout the three literacy domains. Scores from assessment items in each domain, including health literacy, fall into four levels: Below Basic, Basic, Intermediate, and Proficient. Below basic literacy translates into the knowledge and skills to identify easy to locate information and simple mathematic computations (e.g., addition and subtraction). Basic literacy means that a person can perform simple and everyday literacy activities such as reading, understanding information, and solving simple one step problems (e.g., step-by-step instructions). Intermediate literacy skills refer to performance of moderately challenging literacy activities such as reading and understanding moderately dense material and solving inferred arithmetic operations (e.g., reading a newspaper article and algebra). Proficient literacy indicates the skills to complete more complex and challenging literacy activities (e.g., reading lengthy and complex material, synthesizing multiple pieces of information, and locating abstract quantitative information to solve complex functions) (Kutner, Greenberg, Jin, & Paulsen, 2006). Using the NAAL data, Kutner & colleagues' (2006) research shows that the majority of adults (53 percent) had Intermediate health literacy level. An additional 12 percent of adults had Proficient health literacy level. Twenty-two percent of adults had Basic health literacy and 14 percent had Below Basic health literacy. Yet, Basic and Below Basic levels of health literacy are not distributed equally in the population.

Women have higher average health literacy compared to men. Specifically, results from the NAAL data indicate that 16 percent of men had Below Basic health literacy compared to 12 percent of women (Kutner, Greenberg, Jin, & Paulsen, 2006). Previous research, employing samples from clinical settings, examine the relationship between sex and health literacy provides mixed support for the NAAL findings. Research conducted by Jovic-Vranes & colleagues (2009), von Wagner & colleagues (2007), Sudore & colleagues (2006), and Ayotte, Allaire,& Bosworth (2009) report that males had lower levels of health literacy. However, Schillinger & colleagues (2002) and Jeppesen & colleagues (2009) findings reveal the opposite. The discrepancy in these findings remains an empirical question addressed in the present chapter.

Multivariate analyses in clinical studies reveal an independent relationship between race/ethnicity and health literacy level (Ayotte et al., 2009; J. A. Gazmararian et al., 1999; Sudore et al., 2006). Specifically, whites, compared to racial/ethnic minorities, have higher levels of health literacy (D. W. Baker, Gazmararian, Sudano, & Patterson, 2000; D. W. Baker et al., 2002; Jeppesen et al., 2009; Kalichman et al., 2000). The average health literacy level of Whites and Asian/Pacific Islanders was higher than that of Black, Hispanic, American Indian/Alaska Native, and Multiracial adults in the NAAL (Kutner, Greenberg, Jin, & Paulsen, 2006; also see Reder, 1994 for NALS results). Moreover, Hispanic adults in the NAAL have the lowest average health literacy level of any racial/ethnic group. A greater prevalence of inadequate health literacy among Hispanics is well documented in previous clinical research (J. A. Gazmararian et al., 1999; Rosal et al., 2004). NAAL respondents who spoke only English before starting school had higher average health literacy than adults who spoke other languages alone or other languages and English. Andrulis & Brach (2007) point out the critical tie between native language, culture, and health. Racial/ethnic minorities who speak limited or no English are less likely to understand medical information and instructions as literacy skills are a stronger correlate to health status than educational attainment (D. W. Baker, Parker, Williams, Clark, & Nurss, 1997; T. C. Davis, Michielutte, Askov, Williams, & Weiss, 1998). As a result, limited or non-English speaking minorities are more likely to experience discrimination in the predominately English speaking U.S. healthcare system (D. W. Baker, Parker, Williams, Clark, & Nurss, 1997; T. C. Davis, Michielutte, Askov, Williams, & Weiss, 1998; Rosal et al., 2004; Barry D. Weiss et al., 1992; M. V. Williams et al., 1995b).

The inverse association between age and health literacy is a consistent finding in research studies. Older adults (age 65 and older) have lower average health literacy than adults in other age groups (Howard et al., 2006; T. L. Sentell & Halpin, 2006; Sudore et al., 2006). The NAAL results indicate that Intermediate and Proficient health literacy levels are lower among adults 65 and older compared to adults in younger age groups (Kutner, Greenberg, Jin, & Paulsen, 2006). Clinical research provides overwhelming support that as age increases an individuals' level of health literacy decreases a result of age-related declines in visual acuity and general cognitive functioning (Benson & Forman, 2002; J. A. Gazmararian et al., 1999; S. White et al., 2008; M. V. Williams, Baker, Honig, Lee, & Nowlan, 1998; M. V. Williams et al., 1995a).

Socioeconomic status (i.e., income, educational level, and/or occupational status) is directly tied to individual levels of health literacy. Results from the NAAL suggest that average health literacy levels increase for individual's with higher levels of educational attainment (R. E. Rudd, 2004). For example, approximately 49 percent of adults who never attended or did not complete high school had Below Basic health literacy levels. Comparatively, 15 percent of adults with a high school diploma and 3 percent with a bachelor's degree had Below Basic health literacy levels. Kickbush (2001) and others (Ayotte et al., 2009; Benson & Forman, 2002; J. A. Gazmararian et al., 1999; Schillinger et al., 2002) point out that education has an independent and positive relationship with individual level of health literacy. Therefore, research must consider level of educational attainment as separate from level of health literacy.

There is a positive relationship between individual level of income (or lack thereof) and health literacy. NAAL respondents living below the poverty level had lower average health literacy than adults living above the poverty threshold (Kutner, Greenberg, Jin, & Paulsen, 2006). Previous research reveals that an increase of approximately $5,000 dollars in personal income is associated with a significant increase in personal health literacy levels (D. W. Baker et al., 2002; Foulk, Carroli, & Wood, 2001; Sudore et al., 2006; von Wagner et al., 2007). An independent and significantly positive relationship is also observed between occupational status and level of individual health literacy (J. A. Gazmararian et al., 1999).

To date, two studies employ the NAAL in multivariate analyses. Yin & colleagues (2009) use the subsample of parents in the NAAL data (N ≈ 6,100) to examine: 1) the relationship between parent health literacy and self-reported difficulty with child health-related tasks (i.e., ability to obtain health insurance, interpret over-the-counter medication labels, and read food nutrition labels) and 2) the role of parent health literacy as a potential mediator for education, racial/ethnic, immigrant-status, linguistic, and income-related disparities. Yin & colleagues (2009) find that low parental health literacy independently predicted lack of health insurance for child(ren) in a household and difficulty understanding over-the-counter medication labels. Moreover, parental health literacy levels mediated the effect of educational level and English proficiency for parents of noninsured children as well as mediated the relationship between education, country of birth, poverty level and understanding medication labels.

Ownby & colleagues (2012) focus on NAAL respondents 40 years of age or older (N = 9,103) to examine the relationship between health literacy and self-reported health status as well as other potential predictors. Health literacy and self-rated health status remained significantly associated after accounting for demographic characteristics (e.g., sex, age, and race/ethnicity), socioeconomic status (e.g., household income, educational attainment, and health insurance status), reading frequency, healthcare related behaviors (e.g., annual flu shot, dental exams, and vision checks), and hours watching television or DVDs. In addition, the results lend support to previous research (Howard et al., 2006; T. L. Sentell & Halpin, 2006) that health literacy reduces the magnitude (i.e., mediates) of the association between race/ethnicity and health. However, Ownby & colleagues (2012) note that health literacy did not eliminate the relationship between education and income and health. On the whole, the findings from the two studies are consistent with research prior to the NAAL that reveal the mediating effect of health literacy.

Measuring Health Literacy

The complexity and debate of a conceptual definition of health literacy is also reflected in an operational definition and measurement of health literacy. Pleasant & Kuruvilla (2008) point out that the clinical and public health orientations toward health literacy employ significantly different measures. The clinical approach focuses on helping physicians better communicate information on prescriptions to patients and to help patients better understand and comply with treatment regimens. From the clinical perspective, health literacy is characterized as a problem that patients have and physicians need to overcome (i.e., the “sick” model). Moreover, clinical health literacy assessment questions primarily focus on an individuals’ ability to read and/or correctly pronounce medical terminology such as Germs, Pelvic, Fat, Anemia, and Medication (see the REALM items in Appendix D).

Conversely, the public health approach explicitly connects health literacy with health promotion and social marketing of public health interventions (Pleasant & Kuruvilla, 2008). For example, how often and how much medication a person should take based on medication instructions from a medical professional (see the TOFHLA items in Appendix D). The majority of health literacy screening or assessment questions focus on an individual's ability to comprehend the meaning of words and/or the application of health information in a "real-world" scenario.

Davis & colleagues (1998) characterize health literacy assessment tools as either word recognition or comprehension tests. Word recognition assessments evaluate whether a person can recognize, or read and pronounce, individual words. The rationale behind word recognition tests is that difficulty with word pronunciation indicates severe difficulty with a higher order skill such as word comprehension. In other words, if the difficulty occurs in reading simple words from the list, comprehension is likely to be limited. The Rapid Estimate of Adult Literacy in Medicine (REALM) (T. Davis et al., 1991; Davis TC, 1993; T. Davis et al., 2006) is an example of a word recognition health literacy assessment. Comprehension assessments use a Cloze procedure which requires readers to fill in words that have been systematically deleted from a sample of text. Health literacy comprehension assessments include multiple versions of the Test of Functional Health Literacy in Adults (TOFHLA) (Gong et al., 2007; Parker, Baker, Williams, & Nurss, 1995), the Health Activities Literacy Scale (HALS) (R. Rudd, Kirsch, & Yamamoto, 2004), and the Newest Vital Sign (NVS) (B.D. Weiss et al., 2005). The underlying assumption of the procedure is that better readers understand the context of the text and are able to fill in the missing words in the text.

In addition to the REALM, TOFHLA, HALS, and NVS, health literacy instruments either focus on a specific population, health outcome, literacy skills, and/or proxy measures of health literacy level among the general population. However, it is important to note that specific instruments are less useful to understand the level of health literacy in the general population. For example, the Literacy Assessment for Diabetes (LAD) (Nath, Sylvester, Yasek, & Gunel, 2001), Nutrition Literacy Scale (NLS) (Diamond, 2007), and the Stieglitz Informal Reading Assessment of Cancer Text (SIRACT) (Agre, Steiglitz, & Milstein, 2006) focus specifically on health literacy level of diabetic and cancer patients, respectively. The Short Assessment of Health Literacy for Spanish-speaking Adults (SAHLSA) (S. Lee, Bender, Ruiz, & Cho, 2006) serves to estimate health literacy levels among adults who speak only Spanish. The Wide Range Achievement Test Fourth Edition (WRAT) (Dell, Harrold, & Dell, 2008), Medical Achievement Reading Test (MART) (Hanson-Divers, 1997), and National Adult Reading Test (NART) (Uttl, 2002) are general literacy assessments that focus on the individual's reading and/or numeracy skills but do not directly assess health literacy level. The Demographic Assessment of Health Literacy (DAHL) (Hanchate, Ash, Gazmararian, Wolf, & Paasche-Orlow, 2008) employs data from the Prudential Medicare Study to estimate imputed scores of health literacy level in the general population. However, the DAHL estimate is a proxy measure of health literacy and does not directly measure the health literacy.

The public health emphasis in the Test of Functional Health Literacy in Adults (the TOFHLA is included in Appendix D) (Parker et al., 1995) and the clinically oriented Rapid Estimate of Adult Literacy in Medicine (the REALM is included in Appendix E) (T. Davis et al., 1991) are predominately employed to measure health literacy (N. D. Berkman et al., 2004; L. Nielsen-Bohlman, A. Panzer, & D. Kindig, 2004). Conceptually, the central difference between the clinical and public health test of health literacy lies in the purpose of the tests to either screen or to assess a patient's literacy level (Wallace, Rogers, Roskos, Holiday, & Weiss, 2005). Methodologically, the TOFHAL, REALM, and the other assessments listed above represent a first generation of health literacy assessment tools developed using Classical Test Theory (see Appendix B).

Classical Test Theory health literacy assessments such as the TOFHAL and REALM serve as exemplars of the four "weak" assumptions. Pleasant & McKinney (2011) note that a sample of predominately African-American women with low education levels initially validated the REALM. In addition, the initial validation of the TOFHLA employed a sample of predominately Hispanic and African-Americans with low levels of education. The lack of validation with other populations limits the possibility to generalize health literacy levels from either the REALM or TOFHLA. Moreover, the REALM and TOFHLA are sample dependent assessments that contain an unknown amount of error assumed equal across examinees.

In contrast, an emerging second generation of assessment tools are based on assumptions of Item Response Theory (see Appendix B) to measure health literacy. The second generation of health literacy assessment tools include: items from the NAAL (Baldi et al., 2009), the Health Literacy Skills Instrument (HLSI) (McCormack et al., 2010), and the Mandarian Health Literacy Scale (MHLS) (Tsai, Lee, Tsai, & Kuo, 2011). Pleasant (2009a) points out that a measure of health literacy must: 1) be built explicitly on a testable theory or conceptual framework of health literacy, 2) be multidimensional in content, 3) use multiple methods, 4) clearly distinguish health literacy from communication, 5) treat health literacy as a "latent construct", 7) honor the principle of compatibility, 8) allow comparison, and 9) prioritize social research and public health applications versus clinical use. Health literacy assessment items from the NAAL meet these requirements.

Briefly, Item Response Theory (IRT) is a group of models that establish a correspondence between a latent trait, construct, or characteristic and question items as predictors of observed responses (de Ayala, 2009; Bollen, 2002). There are two important differences between CTT and IRT. First, IRT ability estimates cannot be calculated directly by summing the number of correct responses and computing the percent of examinees who answered the question correctly. Second, the weight of each item differentially contributes to the estimation of individual ability, represented by theta (θ), based on the item's level of difficulty or discrimination. Therefore, an individual's ability (i.e., health literacy level) is not measured in an absolute sense. Instead, the relative position of the individual's ability or health literacy level is measured on a continuum scale relative to the question item difficulty and discrimination.

Research Aim & Hypotheses

Based on the literature reviewed above, Figure 2.1 is a conceptual model depicting the relationship between the fundamental social cause framework and level of health literacy. Age, sex, and race/ethnicity are social positions that represent enduring dimensions

FIGURE 2.1 ABOUT HERE

of social and health inequality and integral components to an expansion of the fundamental social cause framework (Graham, 2004; David R. Williams & Collins, 2001). In the conceptual model, age, sex, and race/ethnicity are directly associated with health literacy level. To state directly:

> Hypothesis 2.1: Increasing age is negatively related with higher levels of health literacy, net of other variables in the model.

> Hypothesis 2.2: Females and Whites health literacy levels are higher than that of males and African-Americans, Native born Hispanics, Foreign born Hispanics, and other ethnic/racial groups, respectively, net of other variables in the model.

Recall that the present research employs a heuristic framework from developmental economics to organize flexible resources into three flexible resource domains: economic, capability, and inclusion. Returning to Figure 2.1, median household income and additional income from savings and investments are monetary resources. Increasing amounts of monetary resources facilitate access to knowledge, information, and social contacts directly associated with higher health literacy level. Higher levels of educational attainment and occupational prestige provide individuals the choice to achieve positions of greater power or influence in society. Increasing educational attainment and occupational prestige are directly associated with higher health literacy level. The degree of economic, political, and civic/cultural integration with the broader society either promotes or prohibits access to flexible resources. Thus, employment, voting, increasing sources information, library use, and volunteer activity signal a higher degree of societal integration as well as access to social connections and information. Increasing societal inclusion is directly associated with higher health literacy level. Stated concisely:

> Hypothesis 2.3: Higher levels of Flexible Economic Resources (i.e., median household income and income from savings and investments), Flexible Capability Resources (i.e., higher level of educational attainment and occupational status, respectively), and Flexible Inclusion Resources (i.e., employment status, voting in the 2000 election, current affairs/political/government information sources, library use, and volunteer activity, respectively) are positively related with higher levels of health literacy, net of other variables in the model.

As depicted in Figure 2.1, social resource measures are also directly associated with health literacy level. Based on the review of literature above, differences in health literacy level are expected for native English, English as a Second Language (ESL), and non-English speakers. Moreover, differences in health literacy level are expected between individuals who are married and not married as well as the amount of health information available to an individual; therefore:

> Hypothesis 2.4: Respondents who speak English and who are married or living as married have health literacy levels higher than respondents' who either speak English as a Second Language (ESL) or do not speak English and respondents' who never married or separated divorced, or widowed, respectively, net of other variables in the model.

> Hypothesis 2.5: Increasing sources of health information are positively related with higher levels of health literacy, net of other variables in the model.

As noted above, race/ethnicity and sex are social positions that represent persistent dimensions of social and health inequality. To an extent, an individuals' race/ethnicity and sex shape the social context of life opportunities and differential access to valued resources. Therefore, race/ethnicity and sex may condition the relationship between flexible resources, social resources, and health literacy level. In other words:

> Hypothesis 2.6: Race/ethnicity and sex, respectively, account for differences in the association between the measures of Flexible Economic, Capability, and Inclusion Resources as well as language spoken, marital status, and sources of health information and health literacy level, net of other variables in the model.

Bivariate Correlations

Table 2.1 displays bivariate correlations between respondent demographic characteristics, flexible resource domains (i.e., economic, capability, and inclusion), social

TABLE 2.1 ABOUT HERE

resources, and health literacy level. The bivariate associations are significant; except for the association between never married and health literacy level. The correlation between health literacy level and educational attainment is the largest (0.404) in magnitude. The bivariate correlations serve as a reference point for the multivariate analyses.

Multivariate Analyses & Results

A series of Ordinary Least Squares (OLS) regression models predicting health literacy level are displayed in Table 2.2. Demographic characteristics (i.e., age, sex, and race/ethnicity) are entered into the analysis first. Next, the measures for each dimension of flexible resources (i.e., Economic, Capability, and Inclusion) are entered separately. Finally, the Social Resource measures are the final block of measures added in the analyses. Looking at the coefficient for respondent demographic characteristics (Model 1), age is significant and negatively associated with health literacy level. Moreover, age maintains a negative, significant, and robust association with health literacy across Models 1-5. Thus, the analyses support Hypothesis 2.1, health literacy level declines as a person ages. Continuing with Model 1, female health literacy scores are nearly five points higher than the scores of males. This pattern too is consistent across Models 1-5. Hence, the results lend support to Hypothesis 2.2; net of other variables in the model(s), females' level of health literacy is higher than that of males.

White respondents serve as the comparison category for the race/ethnic variables in Model 1. African Americans, Foreign Born Hispanic/Latinos, and Native Born Hispanic/Latinos have health literacy scores that are significantly lower compared to Whites and examining the coefficients across the models shows partial support for Hypothesis 2.2 as there is a significant association. Next, the coefficients Asian/Pacific Islanders, Native Americans, and Multiracial respondents are also lower than the scores for Whites, but this pattern is explained by variables in the full model, in particular the social resource measures. In the full model, the baseline coefficient for Asian/Pacific Islanders is reduced 61% and 55% for Native Americans. The overall model accounts for 13.6% of the variation in the health literacy scores.

TABLE 2.2 ABOUT HERE

The measures for flexible economic resources are added into Model 2. Respondent's level of health literacy increases by a quarter of a point for every additional thousand dollars ($1,000) in median household income. Health literacy scores increase six points with each additional source of income from savings and investments. The addition of flexible economic resource measures accounts for 21.3% of the variation in health literacy scores which represents a 56.6% increase over the baseline model. Both measures of economic resources are significant across Models 1-5. The results from Model 2 provide support for Hypothesis 2.3; level of health literacy increases with increasing access to flexible economic resources (i.e., median household income and sources of income from savings and investments).

Model 3 adds the measures of flexible capability resources. Respondents' health literacy scores increase nearly four points for each additional level of educational attainment. As an individual's occupational prestige increases there is approximately half a point increase in health literacy scores. The addition of capability resources in Model 3 reduces the effect of household income and income from savings and investments by half. Overall, the addition of educational attainment and occupational prestige in Model 3 account for 27.0% of the variation in health literacy scores. Moreover, the findings support Hypothesis 2.3; level of health literacy increases with higher levels of education and occupational prestige, net of other variables in the model.

Compared to respondents who voted in the 2000 election, lower health literacy scores are observed for individuals who are either not citizens or did not vote (Model 4). The significant negative association remains consistent for those who did not vote in Model 5. Health literacy scores increase by one point as time spent volunteering increases. Therefore, the analyses provide partial support to the flexible inclusion component of Hypothesis 2.3; health literacy scores are greater for voters and for respondents who frequently volunteer. The model only adds a 1% increase in the explained variance of the dependent variable.

The final model (Model 5) includes social resource measures. Compared to English speaking respondents; health literacy scores are significantly lower for those who grew up speaking Spanish and now speak English, those who speak Spanish only, and respondents who grew up and speak a language other than English or Spanish. Thus, there is support for Hypothesis 2.4. Turning to the effect of marital status, health literacy levels are significantly lower for respondents who never marry compared to married respondents or those living as married. Health literacy levels among respondents who are married or living as married are higher than respondents' who never married, net of other variables in the model. Hypothesis 2.5 is not supported by the analysis as source of health information is not associated with health literacy level. The full model (Model 5) accounts for 28.6% of the variation in health literacy scores which represents 110.3% increase over the baseline model suggesting that flexible resources improve our understanding of disparities in health literacy.

Thus far, the analyses do not address a central tenet of the fundamental social cause framework: that unequal social position result in unequal probabilities of exposure risk factors. Link & Phelan (1996) point out that unequal social position mediates access to valued societal resources; in turn, societal-level resources enter individual's lives unequally. Specifically, the social positions of race/ethnicity and sex qualify as fundamental causes that represent persistent dimensions of social and health inequality (Graham, 2004; N. Krieger, 2000; Mays, Yancey, Cochran, Weber, & Fielding, 2002). Thus, the following subpopulation analyses examine the conditional effects of the influence flexible resources may moderate the association among racial/ethnic groups and by sex, respectively, as social positions that shape access to valued societal resources.

Race/Ethnicity & Sex Subpopulation Analyses

Based on the full model (Model 5) in Table 2.2, subpopulation analyses by race/ethnicity are estimated in Table 2.3 to further examine differences in health literacy level. The subpopulation analyses are limited to Whites, African-Americans, Foreign Born Hispanic, and Native Born Hispanics. In addition, t-tests to determine significant differences are conducted for each variable across the four subpopulations. Subpopulation coefficients shaded in grey are significantly different and interpreted below. Health literacy scores for Whites increase by three and a half points for each additional source of income from savings/

TABLE 2.3 ABOUT HERE

investments. Notice in Table 2.3 that the coefficients for Whites and African-Americans are shaded in grey indicating that there is significant difference in the mean sources of income from savings/investments and health literacy between the two groups. Income from savings/investments has significant payoff in terms of health literacy scores that African-Americans do not share.

The first subdomain of flexible inclusion resources is economic inclusion. Compared to full-time employed respondents, heath literacy scores for Native Born Hispanics employed but not at work are twelve points lower. Note that there is a significant difference in the means between Whites and Native Born Hispanics who are employed but not at work. The third subdomain of flexible inclusion resources is civic/cultural inclusion. As the frequency of volunteer time increases there is slightly more than a one point increase in health literacy scores for Whites. Moreover, a significant difference exists in mean volunteer time between Whites and African-Americans.

Turning to the effect of social resources, the small number of observations for Spanish/ESL, Only Speaking Spanish, and Other Language Spoken/ESL respondents required collapsing the three included categories into non-Native English Speakers compared to the excluded category native English Speakers. Non-native English speaking Whites and Native Born Hispanics have health literacy scores thirteen and five points lower, respectively, when compared to native English speaking Whites and Native Born Hispanics. In addition, there is a significant difference in means between non-native English speaking Whites and Native Born Hispanics. The race/ethnicity subpopulation analyses provide partial support for Hypothesis 2.6; respondents' race/ethnicity account for differences in the relationship between income from savings and investments, employed but not at work, volunteering, non-native English speakers, and health literacy level. Finally, comparing the r^2 values across the four subpopulations reveals that the same amount of variance (24.2 percent) is accounted for Whites and Native Born Hispanics. Approximately 16 percent of the variance is accounted for in the Foreign Born Hispanic subpopulation. In the African-American subpopulation analysis, 15.6 percent of the variance is accounted for. The results of the race/ethnicity subpopulation transition to examine the moderating effect of sex.

Table 2.4 presents two OLS regression models are estimated by sex and based upon the structure of the full model (Model 5) from Table 2.1. Again, the subpopulation coefficients shaded in grey are significantly different and interpreted. Compared to married

TABLE 2.4 ABOUT HERE

or living as married men, health literacy scores for men who are never married are almost 5 points lower. Thus, there is a significant difference between females and males who are never married and mean health literacy level. The results provide partial support for Hypothesis 2.6; respondents' sex accounts for differences in the relationship between never being married and health literacy level. Approximately 29.4 percent of the variance in health literacy scores for female respondents' is accounted for and 28 percent of the variance is account for in the subpopulation analysis for males. The findings for the three sets of analyses (i.e., Tables 2.2-2.4) provide an opportunity to revisit the guiding research question for the current chapter.

Discussion & Chapter Conclusions

The present research offers three contributions. First, returning to the central question in the present chapter, is there a relationship between respondents' demographic characteristics, access to flexible resources, social resources and health literacy level? The answer is yes. Consistent with previous health literacy research, as individuals' age their level of health literacy declines. In addition, consistent with recent health literacy research employing samples from the general population, health literacy levels among women are higher compared to men. Moreover, the finding of a health difference by sex is well supported in the sociological literature (McDonough, Williams, House, & Duncan, 1999; Verbrugge, 1985, 1989). In general, women are exposed to the healthcare system at an earlier age than men given their reproductive needs (Lambrew & Fund, 2001). Compared to their male counterparts, women provide the majority of care for children and aging relatives. In addition, women are more willing to discuss their health and more likely to remember the details of health behaviors compared to men (Verbrugge, 1985). Women's higher levels of health literacy may result from longer duration and frequency of experience with the healthcare system. The sex subpopulation analysis reveals the differential impact of marital status for men and women.

The sex and health literature provides insight on the negative relationship between marital status and health literacy. Marriage, or living as married, confers lower levels of depression and higher levels of life satisfaction compared to individuals who never marry (K. Williams, 2003; K. Williams & Umberson, 2004). In addition, marriage may satisfy the need for social connection and improve both physical and mental health (House, Landis, & Umberson, 1988). Therefore, individuals who never marry are expected to have lower health literacy scores compared to married couples. Marriage may foster social interaction and an expansion of social networks as well as economic support to pay for healthcare services.

The observed lower health literacy levels for racial/ethnic minorities compared to Whites is a consistent finding (Beers et al., 2003; Jeppesen et al., 2009). Learning and speaking a language other than English may account for the observation of no significant effect of health literacy level for Asian/Pacific Islanders in the full model. Moreover, the inclusion of flexible economic resources (i.e., median household income and income from savings and investments) may account for the loss of significance for American Indian/Alaskan Native groups when compared to Whites.

Flexible economic resources at the household level coupled with additional income from savings and/or investments are significantly associated with an increase in health literacy scores. The significant and positive effect of increasing levels of educational attainment concurs with previous research that education has an independent and positive relationship with individual level of health literacy (Ayotte et al., 2009; Benson & Forman, 2002; J. A. Gazmararian et al., 1999; Schillinger et al., 2002). Moreover, coupling the significant positive effects of educational attainment and occupational status clarifies capability as a unique dimension of flexible resources.

Second, the analyses call attention to the limitations of current health literacy definitions and insight for conceptual refinement. The most cited and employed health literacy definition (N. Berkman et al., 2010; Freedman et al., 2009) comes from the National Institute of Medicine (IOM) (2004). Health literacy is "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Lynn Nielsen-Bohlman et al., 2004, p. 32). The IOM definition, as well as prior conceptual incarnations (e.g., American Medical Association Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, 1999; Ratzan & Parker, 2000), does not adequately capture impact of health literacy at any level (Greenberg, 2001). Moreover, the conceptualization does not address the necessary oral communication skills to navigate the complex healthcare system. Therefore, individuals who speak English as a second language are ignored. As noted above, the onus of responsibility for low health literacy assumes a deficiency in an individual's capacity and competence (N. Berkman et al., 2010; Freedman et al., 2009; Greenberg, 2001; Pleasant & McKinney, 2011). In addition, current conceptual definitions do not account for the connection between cultural belief systems (e.g., myths and misinformation) and health (Greenberg, 2001; Rikard, Thompson, Head, McNeil, & White, 2012). In response to these limitations, previous research and the present research offer conceptual refinement.

The World Health Organization (WHO) (1998) advocates expanding (also see Nutbeam 2008; 1999, 2000b) the definition of health literacy to emphasize: 1) empowerment to improve personal and community health and 2) how structural factors such as income, education, social exclusion, and social organizations impact health (i.e., social determinates of health) (CSDH, 2008). Moreover, emerging definitions of health literacy explicitly focus on the ability of individuals and groups to make public health decisions (Freedman et al., 2009); as well as emphasizing the importance of critical analytic skills and collective action (Chinn, 2011). Among "second wave" health literacy scholars consensus exists that the definition of health literacy is multidimensional (Chinn, 2011; Frisch, Camerini, Diviani, & Schulz, 2012; Don Nutbeam, 2000b; Zarcadoolas et al., 2005; Zarcadoolas, Pleasant, & Greer, 2006).

The significant negative effect of not voting is unique in relation to health literacy level. Multidimensional conceptual models of health literacy (see Frisch et al., 2012; Zarcadoolas et al., 2005, 2006) emphasize political or civic literacy; however, there is a vacuum of empirical research examining the connection of political or civic literacy and health literacy. The results suggest that voters are aware of and will act to support or oppose governmental influence on health policy. Moreover, the finding supports the conception that health literacy should specify voting as a means to influence public health decision making.

The significant positive effect of library use once or twice a year and volunteering are also unique for health literacy research in the United States. Wister & colleagues (2010) research reveals significantly higher levels of health literacy among older (i.e., 66 and older) Canadians who use a library once or twice a year and volunteer, respectively. What accounts for the parallel findings? In terms of library use, Wister & colleagues (2010) point out that free Internet may account for the finding. Findings from the 2010 U.S. IMPACT Study (Becker et al., 2010) support the Internet access argument. Specifically, searching for health and wellness information is the most frequently reported use of public Internet access. Moreover, 37 percent of users search for health information, treatment options, care givers, or ways to improve their health. In addition, 56 percent of these users also report seeking out these types of information for relatives, friends, colleagues, and others. Thus, public libraries serve as a point of access for health related information above and beyond the individual patron.

As for volunteering, Wister & colleagues (2010) suggest that older adults may either benefit from social interaction or seniors with higher levels of health literacy prefer to engage volunteer activities. Yet, the present research employs a sample of adults 18 years of age and older. There are two potential explanations that account for the significant relationship between volunteering and health literacy level. First, volunteering increases the benefits of social integration so that individuals with greater well-being invest more volunteer time and volunteering work increases well-being (Borgonovi, 2008; Piliavin & Siegl, 2007; Thoits & Hewitt, 2001). In other words, there is a reciprocal relationship between personal well-being and volunteering. Second, volunteer activity is a means to form new contact that may improve an individual's career opportunities and overall social status. Thus, volunteering is a personal "investment" to learn new skills and create and/or extend social network ties (Hackl, Halla, & Pruckner, 2007; Y. Lee & Brudney, 2009; Menchik & Weisbrod, 1987; Ruiter & De Graaf, 2009; J. Wilson & Musick, 2003). The commonality in either explanation is the connection between of social interaction and health literacy level. In short, volunteering increases social contact and interaction which increases level of health literacy.

As a part of the "second wave" of health literacy research; the present research contributes a conceptual refinement: *health literacy refers to social interaction that shapes access to health information, the social resources to understand the information, and the scope of possible health decision making options.* Notice that social interaction to access health information is central to health literacy. Social interaction is not limited to individual(s) exchange but includes the interface between and across individual(s), group(s), institution(s), and social system(s). Social resources are support systems such as family, friends, medical professionals, and virtual communities that provide culturally competent clarification of health information. The scope of possible health decision making options opens the possibility that decisions and actions can occur at the individual, group, community, and or social structural level. With the support and input of health literacy scholars the conceptual refinement offered above will guide development and refining health literacy measures.

The IRT based measure of health literacy is the third contribution of the present research. The "strong" assumptions underlying IRT and the opportunity to reduce response burden by calibrating the ability and difficulty of question items is a significant improvement over CTT based health literacy measures. For example, Elder & colleagues (2012) examined the parity between the pronunciation of medical terms from the REALM (see Appendix D) and respondents definitions of the medical term. Elder & colleagues (2012, pp. 219-220) research reveals "that the REALM is failing to fully operationalize the health literacy construct and dubious reliance on standard English pronunciation as an indicator of understanding may be a source of bias." Moreover, second generation health literacy measures (i.e., the Health Literacy Skills Instrument and Mandarian Health Literacy Scale) employ IRT. There are, of course, limitations that the present research must acknowledge.

The obvious limitation is the lack of consensus regarding what is and what is not health literacy. It is possible that health literacy is nothing more than "old wine in new bottles" (Tones, 2002). The introduction of health literacy as a concept will span a period of forty years as of 2014. A theoretically driven conceptual definition of health literacy is essential to advance the field of research. As noted above, the NAAL health literacy questions only focus on the functional aspect of health literacy. The question items focused on reading comprehension and do not provide an assessment of oral communication ability and/or critical analytic ability. In other words, the assessment does not reflect the ability to communicate or the ability to determine the quality of health information and how an individual might make decisions based on health information.

In light of these limitations, the present research adds significant value. To date, the present research is the first multivariate analysis of the 2003 NAAL household data which is a nationally representative sample of adult respondents. Simply put, the findings in the present research are generalizable to the general population in the United States. Previous research explicitly points to the connection between health literacy and health disparities (N. Berkman et al., 2010; Don Nutbeam, 2000b; R. Rudd et al., 2004; Zarcadoolas et al., 2006). Yet, previous research consistently employs "weak" (i.e., Classic Test Theory) measures of health literacy. The measure of health literacy in the NAAL, however, is a second generation

IRT measure of health literacy. The results presented herein provide strong evidence that disparities exist and cut across demographic groups, socioeconomic status, political participation, and social resources. Moreover, the subpopulation analyses concentrate attention on specific sex and racial/ethnic differences in health literacy. In sum, health disparities parallel the observed health literacy disparities.

The analyses reveal that flexible resource domains and social resources, respectively, are associated with health literacy level. The results in the present chapter provide the backdrop to empirically examine what role, if any, health literacy serves as an abstract process in the fundamental social cause framework. Thus, Chapter 3 is the next analytical step to potentially connect fundamental social causes and possible differences in health insurance status.

CHAPTER 3

Health Literacy as a Metamechanism for Health Insurance Status

A distinct characteristic of the health care system in the United States, compared to all Western industrialized countries, is the lack of universal or comprehensive health insurance coverage for all citizens (Barlett & Steele, 2005; Mechanic, 1994; Quadagno, 2005). At the end of the first decade in the 21st century, the number of uninsured adults (i.e., age 18 to 64) in the United States increased by 12.9 million to a total 49 million (Blavin, Holahan, Kenney, & McGrath, 2012). The 49 million uninsured represent approximately 25 percent of the nonelderly adult population in 2010 (Carrier, Yee, & Garfield, 2011). The quarter of nonelderly adults (i.e., age 18 to 64) without health insurance belies the disparities in health insurance coverage between demographic and socioeconomic groups.

Whites are consistently more likely than other racial/ethnic groups to have health insurance coverage (Carlisle, Leake, & Shapiro, 1997; Haviland et al., 2012; Lillie-Blanton & Hoffman, 2005; Shone, Dick, Klein, Zwanziger, & Szilagyi, 2005; Zuvekas & Taliaferro, 2003). In 2010, the rate of uninsured nonelderly adult Hispanics (32.1 percent) and African-Americans (22.3 percent) were 2.3 and 1.6 times higher, respectively, than for Whites (13.8 percent). Higher levels of socioeconomic resources (i.e., income from employment and/or savings and investments) increase the likelihood of health insurance coverage. Zuvekas & Taliaferro (2003) note that marital status in conjunction with employment status account for racial/ethnic disparities in health insurance status (also see R. J. Angel, Angel, & Montez, 2009; Sudano & Baker, 2006). Social resources, such as marriage and language spoken, also account for differences in health insurance status. Marriage is a pathway to private health insurance for early and middle age men and women. However, late middle age (i.e., age 55 to 64) married women are more likely to become uninsured when their spouse enrolls Medicare (R. J. Angel et al., 2009; Lambrew & Fund, 2001; Sudano & Baker, 2006). A lack of English fluency among Spanish speaking Hispanics, compared to English speaking Hispanics and non-Hispanic Whites, is associated with reduced access and use of healthcare services (Fiscella, Franks, Doescher, & Saver, 2002). Disparities in health insurance status and health literacy level, by and large, overlap the same demographic and socioeconomic groups.

Low health literacy is disproportionately found among racial/ethnic minorities, the elderly, individuals with few socioeconomic resources and low educational attainment, and those with low English proficiency as well as non-native English speakers (Somers & Mahadevan, 2010). Health insurance eligibility and enrollment as well as low health literacy are associated with availability of employment based insurance, poverty, United States citizenship, and race/ethnicity (T. Sentell, 2012; Yin et al., 2009). Individuals with limited health literacy encounter difficulty understanding basic health information such as health insurance enrollment and benefit forms. Accumulating research points to health literacy as an important contributor to disparities in health insurance coverage (Howard et al., 2006; Osborn, Paasche-Orlow, Davis, & Wolf, 2007; T. L. Sentell & Halpin, 2006; Yin et al., 2009).

The present research employs the fundamental social cause framework to examine disparities in health insurance status. Link & Phelan (1995) propose that individuals purposely benefit their health by employing a broad array of flexible resources. Flexible resources, in this sense, refer to knowledge, money, wealth, and/or social connections. Previous research (Graham, 2004; David R. Williams & Collins, 2001) proposes the inclusion of social positions (e.g., age, sex, race/ethnicity) that represent persistent dimensions of both social and health disparities as fundamental causes. In the present research age, race/ethnicity, sex are fundamental disparities that account for differential access to health insurance. The present chapter addresses a two part research question: are there differential relationships between demographic groups, access to flexible resources, social resources and health insurance status? If disparities exist, does health literacy, as a metamechanism (Lutfey & Freese, 2005), account for the observed differences?

The review of literature presents previous research examining demographic, economic, and social disparities in health insurance status. The review also presents the few studies examining the relationship between health literacy and health insurance status. Based on the review of literature, a conceptual model guides the research hypotheses. Next, a series of multivariate analyses test the research hypotheses and the results are presented in full. The chapter concludes with a discussion of the analyses are implications of the findings.

Literature Review

In 2000, 10 percent of the nonelderly White population did not have health insurance compared to 18.4 percent of African-Americans and 32.9 percent of Hispanics. Over the decade (i.e., 2000 to 2010), the uninsured rate increased by approximately 4 percentage points among nonelderly Whites and African-Americans while the uninsured rate did not significantly change among Hispanics (Blavin et al., 2012; Blumberg, 2012; Carrier et al., 2011). Lillie-Blanton & Hoffman (2005) review a ten year span of research to identify articles that examine the expected amount of improvement in access to care if racial/ethnic differences in health insurance status were eliminated. The studies provide persuasive evidence that lack of health insurance accounts for the majority of the variation in racial/ethnic disparities in access to a usual source of health care (see Hargraves & Hadley, 2003; Waidmann & Rajan, 2000; Weinick, Zuvekas, & Cohen, 2000; Zuvekas & Taliaferro, 2003). Specifically, Hispanics are significantly less likely than Whites to have health insurance. African-Americans are less likely than Whites to have health insurance; yet, the access gap is smaller between African-Americans and Whites than between Hispanics and Whites. Angel & colleagues (2011) and Sudano & Baker's (2006) research notes that the widest gap in health insurance exists between Whites and Spanish speaking Hispanics. Additional research supports access to healthcare and health information disparities are greatest among Spanish speaking Hispanics (Fiscella et al., 2002; Haviland et al., 2012). Differences in health insurance status also occur over the adult (i.e., age 18 to 64) life course.

Early (i.e., age 18 and younger) and late (i.e., age 65 and older) age are eligibility requirements for access to federal and state health insurance coverage. In other words, children and youth (i.e., age 18 and younger) are automatically qualify for health insurance through state Children's Health Insurance Programs (CHIP) and elderly adults (i.e., age 65 and older) receive coverage under Medicare. Shone & colleagues (2005) compare racial/ethnic disparities in healthcare access, continuity, and quality for youth enrolled before and during New York's State Children's Health Insurance Program (SCHIP). Although significant racial/ethnic disparities exist prior to enrollment in SCHIP, enrollment eliminated the preexisting racial/ethnic disparities in access, unmet need, and continuity (Shone et al., 2005). Uninsured rates for 25 to 34, 35 to 44, and 45 to 54 year old adults increased by 7 to 8 percentage points, between 2000 and 2010 (U.S. Census Bureau, 2011). Young adults (i.e., age 25 to 34) account for a disproportionately large share of the uninsured (Streeter et al., 2012) given their short period of time in the labor market. Periods of health insurance coverage are not equally distributed for men and women over the life course.

Marriage is a pathway to private health insurance for young and middle age men and women (Zuvekas & Taliaferro, 2003). However, as a result of an older spouse retiring and enrolling in Medicare, late middle age (i.e., age 55 to 64) women may lose their health insurance and encounter a "window of vulnerability" (J. L. Angel et al., 2011; Lambrew & Fund, 2001). In general, uninsured women are older, more likely to be married, and more likely employed part-time compared to men. As a result, women are less likely to have direct access to employer based health insurance and more likely to purchase health insurance (Lambrew & Fund, 2001). Compared to late middle age African-American and Hispanic women, White women are at greater risk of lacking health insurance (J. L. Angel et al., 2011). In addition, compared to single Whites, low-status employment among single African-Americans and Hispanics accounts for a significant amount of disparity in employer provided health insurance (Zuvekas & Taliaferro, 2003). The observed racial/ethnic differences are attributed to low-status employment and low levels of family income for minority husbands and wives.

The percentage of unemployed uninsured nonelderly adults increased from 43 percent in 2003 to 57 percent in 2010 (Carrier et al., 2011; Streeter et al., 2012). Moreover, the uninsured rates for middle-income groups (i.e., 138-249% and 400% of the federal poverty level (FPL), or $30,844 to $92,200 for a family of four) increased significantly from 19.9 to 27.7 percent and from 11.1 to 16.4 percent between 2003 and 2010, respectively. The lowest income group (i.e., below 138% of the federal poverty level (FPL), or $30,843 for a family of four) account for 30 percent of the uninsured in 2010. In contrast to low and middle income groups, the highest income group (i.e., greater than 400% FPL, or $92,201 or more for a family of four) represents 7.7 percent of the uninsured in 2010. In sum, the 49 million uninsured nonelderly adults are disproportionality young adults (i.e., age 25 to 34), no or low income, racial/ethnic minorities, and non-English speakers. Recent research suggests that disparities in health insurance status occur among groups with low health literacy.

To date, two studies examine the relationship between health literacy and disparities in health insurance coverage. Specifically, the two studies (T. Sentell, 2012; Yin et al., 2009) focus on the importance of health literacy to account for disparities in health insurance status. Sentell's (2012) research reveals that low health literacy predicts lack of health insurance in adults, even when demographic, socioeconomic, employment status, and availability of employer-based insurance are taken into account. Yin & colleagues' (2009) research indicates that health literacy level mediates the relationship between race/ethnicity, educational attainment level, poverty status, and English proficiency and lack of health insurance controlling for other demographic and socioeconomic characteristics. However, health literacy level alone may not sufficiently account for disparities in health insurance coverage.

Lee & colleagues (2004) suggest that social support networks improve the ability of individuals to acquire and understand medical information and/or to negotiate the health care system. Social support, in this sense, refers to an individual's participation in community organizations, maintenance of social contacts, and/or involvement in close social networks. Social support resources are particularly important for those with low health literacy to marshal social networks (i.e., family and friends) to obtain health insurance coverage (S.-Y. D. Lee et al., 2004). In addition to social support, previous research reveals that knowledge and/or skills to accomplish a task require the confidence or self-efficacy to use knowledge and/or skills effectively (DeWalt, 2007; Sarkar, Fisher, & Schillinger, 2006; Sharif & Blank, 2010).

Self-efficacy refers to an individual's confidence or belief in their ability to succeed in specific situations (Bandura, 1997). Self-efficacy is situation specific or domain sensitive as self-perception changes based on the specific behavior (Kurbanoglu, Akkoyunlu, & Umay, 2006). In other words, an individual may exhibit high levels of self-efficacy within one domain and may exhibit low levels of self-efficacy within another domain. Previous research reveals that self-efficacy mediates the relationship between health literacy level and health related outcomes such as health insurance (Donovan-Kicken et al., 2012; Saha, 2006; Wolf et al., 2007). Drawing upon the information literacy self-efficacy research (Akkoyunlu & KurbanoĞLu, 2003; Kurbanoglu, 2003); literacy self-efficacy refers to an individual's sense of competence and confidence to use their health literacy. In sum, the findings from previous research guide the conceptual model in the present research.

Research Aim & Hypotheses

Figure 3.1 is a conceptual model depicting health literacy as a metamechanism in the fundamental social cause framework. The black arrows in Figure 3.1 represent direct effects and the grey arrows represent indirect effects between demographic characteristics, flexible resources, social resources and health insurance status. Respondent demographic

FIGURE 3.1 ABOUT HERE

characteristics (i.e., age, sex, and race/ethnicity) are social positions of enduring social and health inequality (Graham, 2004; David R. Williams & Collins, 2001). The black arrow from demographic characteristics depicts a direct relationship between age, sex, race/ethnicity and health insurance status. In other words:

> Hypothesis 3.1: Respondents are more likely to have health insurance as age increases, net of other variables in the model.

> Hypothesis 3.2: Females and Whites, respectively, are more likely to have health insurance compared to males and African- Americans, Hispanics, and the other ethnic/racial groups. In addition, native born Hispanics are more likely to have health insurance than foreign born Hispanics, net of other variables in the model.

The grey arrow from respondents' demographic characteristics to health literacy level represents mitigation between demographic characteristics and health insurance status. To concisely state:

> Hypothesis 3.3: Age, sex, and racial/ethnic effects on health insurance status are mitigated by including level of health literacy in the model, net of other variables in the model.

The black arrow from flexible economic resources (i.e., median household income and income from savings and investments), flexible capability resources (i.e., educational attainment and occupational prestige), and flexible inclusion resources (i.e., economic, political, and civic/cultural subdomains) portrays a direct relationship between the three flexible resource domains and health insurance status.

> Hypothesis 3.4: Respondents with a higher level of median household, income and extra income from savings and investments, higher level of educational attainment, higher level of occupational prestige, and more sources of current affairs, political, and government information are more likely to have health insurance, net of other variables in the model.

> Hypothesis 3.5: Respondents employed full-time and who voted in the 2000 election, respectively, are more likely to have health insurance than respondents' employed less than full-time and who did not vote, net of other variables in the model.

> Hypothesis 3.6: Respondents who use a library and volunteer are more likely to have health insurance than respondents' who never use a library and do not volunteer, respectively, net of other variables in the model.

However, the grey arrow from the three flexible resource domains to health literacy represents an indirect relationship, mitigated by health literacy, between the flexible resource domains and health insurance status. In other words:

> Hypothesis 3.7: The effects of differences in Flexible Economic, Capability, and Inclusion Resources are mitigated by level of health literacy, net of other variables in the model.

A black arrow from social resources (i.e., language spoken, marital status, and health information source) to health insurance status depicts a direct relationship.

> Hypothesis 3.8: Native English speaking respondents and those who are married or living as married, respectively, are more likely to have health insurance compared to non-native English speakers and respondents who are not married or living as married, net of other variables in the model.

> Hypothesis 3.9: Respondents with more sources of health information are more likely to have health insurance, net of other variables in the model.

In addition, the grey arrow from social resource to health literacy represents an indirect or mitigating relationship with health insurance status; therefore:

> Hypothesis 3.10: Social resources are mitigated by level of health literacy, net of other variables in the model.

In Figure 3.1, the grey arrows from health literacy to literacy self-efficacy and to need based social support represent an indirect or mitigating relationship between health literacy level and health insurance status. To state concisely:

> Hypothesis 3.11: The effects of health literacy level are mitigated by need based social support and literacy self-efficacy, respectively, net of other variables in the model.

Demographic characteristics, such as sex, are social positions of enduring social and health inequality (Graham, 2004; David R. Williams & Collins, 2001). Respondent sex is a social position that represents a persistent dimension of social and health inequality. Moreover, an individual's sex shapes life opportunities and differential access to valued resources and may condition the relationship between flexible resources, social resources, and health insurance status. In other words:

> Hypothesis 3.12: Respondents sex accounts for differences in the likelihood between the measures of Flexible Economic, Capability, and Inclusion Resources as well as language spoken, marital status, sources of health information and health insurance status, net of other variables in the model.

Bivariate Correlations

Table 3.1 displays the bivariate correlations between respondent flexible resource domains (i.e., economic, capability, and inclusion), social resources, health literacy score, literacy self-efficacy, need based social support, and health insurance status. The correlation

TABLE 3.1 ABOUT HERE

between health insurance status and extra income from savings and investments is the largest (0.285) in magnitude. The correlation coefficient value between health insurance status and health literacy is 0.158.

Multivariate Analyses & Results

There are three points to consider for the analyses in Table 3.2. First, the logistic regression coefficients are presented as odds ratios which represent the likelihood of health insurance coverage. Second, to compare significant predictors in the analyses, continuous and scale measures are rescaled by their respective Interquartile Range (IQR). Thus, a significant odds ratio denotes the likelihood of health insurance given a change (i.e., increase or decrease) in the average amount of change in a predictor variable (i.e., the change from the 25^{th} percentile to the 75^{th} percentile observation). Third, the analyses are limited to adults age 18 to 64 to eliminate the confounding effect of guaranteed eligibility for federal and/or state health insurance coverage. Children (i.e., age 18 and younger) qualify for health insurance under the Children's Health Insurance Program (CHIP) and individuals 65 and older are automatically eligible for health insurance coverage through Medicare. The analyses begin by entering demographic characteristics (i.e., age, sex, and race/ethnicity) into the analysis. Next, the measures for each dimension of flexible resources (i.e., economic, capability, and inclusion) are entered separately followed by the social resource measures. Health literacy score enters the analyses to examine the possibility of mitigation. Finally, need based social support and literacy self-efficacy are the final measures in the analyses.

TABLE 3.2 ABOUT HERE

Examining the baseline model (Model 1, Table 3.2); respondents 18 to 64 years of age are 112% more likely to have health insurance as age increases an average amount (from 25^{th} to 75^{th} percentile). Compared to males, females are 21.4% more likely to have health insurance. Inspection of the racial/ethnic groupings indicates that, compared to Whites, foreign born Hispanics have the lowest likelihood (83% less likely) of health insurance coverage. American Indian/Native Alaskans are 67.5% less likely to have health insurance. Native born Hispanics and African-Americans are 47.4% and 45.7% less likely to have health insurance. Thus, Model 1 provides support for Hypotheses 3.1; respondents are more likely to have health insurance as they age. Moreover, the results provide support for Hypotheses 3.3 and 3.5. Females are more likely to have health insurance compared to males and Whites are more likely to have health insurance compared all other ethnic/racial minority groups. Comparing the odds ratios for native and foreign born Hispanics lends support to Hypothesis 3.6. Native born Hispanics are more likely to have health insurance than foreign born Hispanics.

Model 2 introduces the flexible economic resource measures. As the average median household income increases, there is approximately a two-fold increase in the likelihood of health insurance. Respondents from households receiving extra income from savings/investments are 134% more likely to have health insurance compared to households not receiving extra income. The results in Model 2 support Hypothesis 3.8, respondents with higher average median household income and extra income from savings and investments, respectively, are more likely to have health insurance. However, the results attenuate support for Hypotheses 3.5 and 3.6. As age increases an average amount (again, from the 25th percentile to the 75th percentile), respondents are 87.3% more likely to have health insurance. Compared to their male counterparts, females are 40.9% more likely to have health insurance. Foreign born Hispanics are 69% less likely to have health insurance compared to Whites. The significant odds ratios observed in Model 1 for African-Americans, native born

Hispanics, and American Indian/Alaskan Natives are no longer significant with the introduction of the flexible economic resource measures. In addition, there is a 26 percentage decrease in the likelihood of health insurance as age increases an average amount and a 19 percentage increase in the likelihood that females have insurance compared to males controlling for the other variables in the model.

The flexible capability resource measures are entered in Model 3. As level of educational attainment increases an average amount (from the 25th to 75th percentile), health insurance coverage is 70% more likely. However, and unexpectedly, as the Nam Powers Boyd Occupational score increases an average amount, respondents are 26.6% less likely to have health insurance. The results partially support Hypothesis 3.10, respondents with higher educational attainment levels are more likely to have health insurance. There is little change in the significant odds ratios for the demographic and flexible economic resource measures controlling for other variables.

Measures for the three subdomains of flexible inclusion resources enter Model 4. Again, there are some slight changes in the significant odds ratios for the demographic variables. Respondents are 175% more likely to have health insurance as the median household income increases an average amount, which results in a 27 percentage decrease in the likelihood. There is a 22 percentage decrease in the likelihood of health insurance as the average level of educational attainment increases between Models 3 and 4. Full-time employees are 49% more like than respondents employed less than full-time to have health insurance. Respondents who voted in the 2000 election are 43% more likely, compared to non-voters, to have health insurance. In addition, unpaid volunteer activity, versus those who did not volunteer, increases the likelihood of health insurance by approximately 18%. The results provide support for Hypothesis 3.5, respondents employed full-time are more likely to have health insurance than respondents' employed less than full-time. In addition, Hypothesis 3.5 receives partial support as voters in the 2000 election, compared to those who did not vote, are more likely to have health insurance. Hypothesis 3.6 is also partially supported as volunteers are more likely to have health insurance compared to respondents' who do not volunteer.

Social resource measures are entered into Model 5. Little change is observed in the demographic and flexible resource domain in the significant odds ratios between Models 4 and 5. Non-native English speaking adults are 34.2% less likely to have health insurance compared to native English speakers. Couples who are married or living as married are 48.6% more likely to have health insurance controlling for other variables in the model. The results in Model 5 support Hypothesis 3.8. Native English speaking respondents are more likely to have health insurance compared to non-native English speakers and marriage, or living as married, increases the likelihood of health insurance compared to respondents who are not married. However, there is no support for Hypothesis 3.10 that respondents with more sources of health information are more likely to have health insurance, net of other variables in the model.

The addition of health literacy score in Model 6 reduces the effect of unpaid volunteer activity to non-significance. Moreover, controlling for the other variables in the model, as health literacy scores increase an average amount, respondents are 13.1% more likely to have health insurance. The results partially support Hypothesis 3.10. The inclusion of health literacy level mitigates the likelihood of health insurance for those who volunteer. However, there is no support for the mitigating effect for the preceding variables in the analyses.

Need based social support and literacy self-efficacy enter the full model (Model 7). The results partially support Hypothesis 3.11 as literacy self-efficacy reduces, but does not eliminate, the level of significance for health literacy level. However, there is no support that need based social support mitigates the relationship between health literacy and health insurance status. Net of the variables in the model, as respondents' level of literacy self-efficacy increases an average amount (from 25th to 75th percentile) a respondent is 34.3% more likely to have health insurance. Examining the full model; as age increases an average amount participants are 54.6% more likely to have health insurance. Compared to men, women are 41.1% more likely to have health insurance. Foreign born Hispanics are 45.7% less likely to have health insurance compared to Whites. An average increase in median household income translates into a 122% increased likelihood of health insurance coverage. In tandem, household receiving extra income from savings/investments are 105% more likely to acquire health insurance. Respondents are 39.4% more likely to have health insurance as their level of educational attainment increases an average amount. However, as the occupational status score increases from the 25th to 75th percentile, respondents are 35% less likely to have health insurance. Full-time employment, compared to less than full-time, represents a 46.6% increase in the likelihood of health insurance. Voting in the 2000 election, compared to not voting, increases the likelihood of health insurance by 35.2%. Non-native English speakers are 30.9% less likely to have health insurance compared to native English speakers. Marriage, or living as married, confers a 47.6% greater likelihood of health insurance compared to those who are not married. Health literacy score remains significant, although the effect is slightly reduced. As health literacy scores increase an average amount, respondents are 11.5% more likely to have health insurance.

Link & Phelan (1996) point out that unequal social position mediates access to valued societal resources; in turn, societal-level resources enter individual's lives unequally. Thus, unequal social positions, such as sex or gender, are persistent dimensions of social and health inequality and result in unequal probabilities of exposure risk factors (Graham, 2004; N. Krieger, 2000; Mays et al., 2002). Therefore, the following subpopulation analyses examine the conditional influence of sex as a social position that shapes access to valued resources.

Sex Subpopulation Analyses

Table 3.3 displays subpopulation analyses by sex employing the structure of the full model (Model 7) in Table 3.1. Thus, the analyses offer a comparison of the predictors for females and males. Females are 31.7% and males 83.2% more likely to have health insurance as age increases from the 25th to 75th percentile controlling for the other variables in the models. Compared to White females, African-American females are 38.2% more like to have health insurance. The odds ratios for African-American females and males are shaded indicating that a significant difference exists between African-American females and males. Therefore, the mean (or percent) of African-American males who have health insurance is lower than African-American females. Foreign born Hispanic females are 43.4% and males are 47.2% less likely to have health insurance compared to White females and males, respectively. Health insurance coverage is 48.3% less likely for American Indian/Alaskan Native males compared to White males.

There is a 42 percentage difference in the likelihood of health insurance coverage between females (104% more likely) and males (146% more likely) as median household income increases an average amount. Conversely, there is a 43 percentage difference in the likelihood of health insurance coverage between females (129% more likely) and males (86% more likely) when a household member receives extra income from savings/investments compared to household that do not. As level of educational attainment increases, females are 29% and males 50% more likely to have health insurance an average amount. Thus, there is a 21 percentage difference in the likelihood of health insurance between females and males when average median household income increases. As the average occupational status score increases, females are 31.1% and males 39.1% less likely to have health insurance.

TABLE 3.3 ABOUT HERE

Full-time employed males are 58% and females 34% more likely to have health insurance compared to respondents' employed less than full-time. Female voters are 40% and male voters 30% more likely to have health insurance compared to respondents who did not vote. Non-native English speaking females are 26.9% and males are 34.8% less likely to have health insurance than native English speakers. A 12 percentage point difference in the likelihood exists between married females (40% more likely) and married males (52.6% more likely) compared to respondents who are not married. As the average health literacy score increases, females are 17.3% more likely to have health insurance. Note that the odds ratio for females is significant but the odds ratio for males is not. Finally, as average literacy self-efficacy increases, females are 38.2% and males are 30.6% more likely to have health insurance, respectively. The subpopulation analyses provide support and clarification for

Hypothesis 3.12. There are significant sex and racial/ethnic differences in the likelihood of health insurance coverage. Moreover, health literacy level is significant explanatory variable for females but not for males.

Discussion & Chapter Conclusions

The findings in the present research offer five contributions. First, there is clear support for the fundamental social cause framework. Link, Phelan and colleagues (Link, 2008; Link et al., 1998; 1995, 1996, 2002; Link et al., 2008; Phelan & Link, 2005b; Phelan et al., 2004) posit that access to flexible resources (e.g., knowledge, money, power, prestige, and/or social connections) reduce the risk of illness and death. The results demonstrate that individuals with higher median household income and extra income from savings and investments are more likely to have health insurance. As the average level of educational attainment increases, respondents are more likely to have health insurance. Yet, the finding that the likelihood of health insurance coverage decreases as occupational status increases is unexpected.

At first blush, the finding that as average occupational status increases, respondents are less likely to have health insurance is counter intuitive. However, the average Nam Powers Boyd Occupational score is 54 and falls near the middle of the occupational status scale. In addition, a score of 54 includes occupations such as Administrative Aide, Executive Secretary, Home care Coordinator, Security Systems Installer, Office Secretary, School Secretary, and Stewardess Supervisor. While there is a dearth of research connecting occupational status and health insurance status. In general, occupations with higher levels of prestige command higher income levels than occupations with middle or lower levels of prestige (LaVeist, 2005). Himmelstein and colleagues (2005) research reveals that approximately two million Americans and their dependents experience medical bankruptcy. The majority of medical bankruptcy filers are primarily middle class in terms of education and occupational prestige. Moreover, medical bankruptcy filers were more likely to lose their health insurance coverage at the onset of their illness (Himmelstein et al., 2005). Therefore, the relationship between middle income levels and health insurance status may provide insight into the relationship between mid-level occupational status and health insurance status.

The Centers for Disease Control and Prevention (CDC) estimates that 9.7 million (32.1%) adults (i.e., 18-64) with family incomes two to three times the federal poverty level (i.e., approximately $43,000–$65,000 for a family of four) lack health insurance in 2009 (Fox & Richards, 2010). In comparison, 5.2 million (20.6%) adults with family incomes three to four times the federal poverty level (i.e., approximately $65,000–$87,000 for a family of four) were uninsured. From 2006 to 2009, the largest increase of any income group in the number (from 8 to 9.7 million) and percentage (27.8% to 32.1%) without insurance occurred among those with a family income of two to three times the federal poverty level (Fox & Richards, 2010). The CDC estimates provide insight for the present research. Respondents in mid-level occupational status positions earn middle level incomes. As a result, middle income respondents are less likely to have health insurance as they 1) cannot afford private health insurance or 2) earn more than allowed to qualify for Medicaid.

Turning to the impact of social inclusion, increasing inclusion through full-time employment, voting, and volunteer activity increases the likelihood of health insurance coverage. In general, full-time employment increases the likelihood of employer provided health insurance. Verba and colleagues (1993) point out that the economically advantaged are more likely to vote compared to the economically disadvantaged. Moreover, public officials hear less about issues of basic human need from the economically disadvantaged compared to the slightly smaller group of economically advantaged. Thus, in the fundamental social cause framework, voting is a means to express power as a flexible resource to access health insurance.

Wilson & Musick's (2003) research reveals that volunteers do not achieve higher occupational status as a result of a more privileged background, higher levels of education, or higher levels of intelligence. Instead, sustained volunteer activity serves as a means to form new contacts that may improve an individual's career opportunities and overall social status (Hackl et al., 2007; Y. Lee & Brudney, 2009; Menchik & Weisbrod, 1987; Ruiter & De Graaf, 2009; J. Wilson & Musick, 2003). Thus, in the fundamental social cause framework, volunteering is a flexible resource "investment" to create and extend social network connections and increase access to health insurance. In sum, individuals with greater access to an array of flexible resources are more likely to have health insurance.

Second, returning to the first of the two part research question: do differential relationships exist between respondents' demographic characteristics and social resources and the likelihood of health insurance coverage? Overall, the answer is yes. The findings provide strong support to expand the scope of fundamental causes to include social positions (e.g., age, sex, and race/ethnicity) that represent persistent dimensions of both social and health disparities. Recall that the analyses are limited to adults 18-64 years of age thereby eliminating the potential confounding effect of age based means-tested health insurance programs (i.e., the Child Health Insurance Program and Medicaid). Respondents are more likely to have health insurance as their age increases, net of participation in the labor force or being employed. In general, females are more likely to have health insurance when compared to males. On the whole, Whites are more likely to have health insurance compared to racial/ethnic minorities; specifically, foreign born Hispanic/Latinos.

The sex subpopulation analyses (Table 3.2) clarifies the likelihood of health insurance for the minority racial/ethnic groups. African-American females are more likely to have health insurance compared to White females. However, there is no significant difference in the likelihood of health insurance status between African-American and White males. There is a significant difference in the likelihood of health insurance coverage between African-American females and males. In other words, African-American females are more likely to have health insurance compared to their male counterparts. Foreign born Hispanic/Latino females and males are less likely to have health insurance compared to White females and males, respectively. In sum, disparities in health insurance status result from the intersection of sex and race/ethnicity and support social positions as fundamental social causes.

The impact of the social resource measures is consistent with previous research. Non-native English speaking respondents include individuals who speak English as a second language (ESL) and individuals who do not speak English. The findings reveal that non-native English speakers are less likely to have health insurance compared to native English speakers. Previous research (Fiscella et al., 2002) indicates that language fluency is a primary contributor to racial/ethnic disparities in access to healthcare. The present research expands the scope of racial/ethnic disparities to include access to health insurance. Married respondents and those living as married are more likely to have health insurance than respondents who are not married. The finding is consistent with previous research that marriage provides access to health enhancing resources such as health insurance (Carr & Springer, 2010; Lavelle & Smock, 2012). In sum, the findings reveal that health insurance status disparities exist and segue to the second part of the research question.

Third, does health literacy level account for disparities in health insurance status? In other words, is health literacy a metamechanism in the fundamental social cause framework? The findings provide very little support that health literacy is a metamechanism for health insurance coverage. Health literacy level mitigates the relationship between volunteer activity and health insurance status. Given the one mitigating effect, does health literacy directly impact health insurance status? The answer is yes and with interesting differences by sex. In the full model of the main analyses (i.e., Table 3.1, Model 7), respondents are 11 percent more likely to heave health insurance as their average health literacy level increases. The finding is consistent with Sentell's (2012) findings from respondents in the California Health Interview Survey. However, the present research is an improvement over Sentell's (2012) research in two ways. First, the present research employs a nationally representative sample; therefore, the results are generalizable to the United State population. Second, as noted above, the present research employs an Item Response Theory (IRT) based measure of health literacy; whereas, Sentell (2012) employs a three question Classic Test Theory (CTT) health literacy assessment (see L. D. Chew et al., 2008; Lisa D. Chew, Bradley, Flum, Cornia, & Koepsell, 2004).

In the subpopulation analyses, females are 17 percent more likely to have health insurance as their average health literacy level increases. However, average health literacy level does not have a significant effect on the likelihood of males having health insurance. The differential effect of health literacy level by sex parallels the findings of differences in health by sex. In general, differences in men's and women's social structural locations in society and associated resources and opportunities influence health disparities (Blau, Brinton, & Grusky, 2006; Graham, 2000; J. n. Read & B. Gorman, 2011). Specifically, differential social positions shape access resources that promote health or increase exposure to risks that are harmful to health (Bird & Rieker, 1999, 2008; J. n. G. Read & B. K. Gorman, 2011). For example, women occupy a tenuous socioeconomic position as they are more likely to work low wage part-time positions. Women are also often the provide the majority of care for children and aging relatives compared to men (Lambrew & Fund, 2001; Verbrugge, 1985). It is possible that women's higher level of health literacy is a product of greater exposure to the healthcare system given women's presumed care taking role. The consistent finding of higher health literacy levels among women remains an area for future research.

Fourth, the present research adds specificity to the fundamental social cause framework by integrating the resource domain framework from developmental economics to structure flexible resources into flexible resource domains. In general, previous research employs either income (J. W. Lynch & Kaplan, 1997), educational level (Giled & Lleras-Muney, 2008; S. M. Lynch, 2003; Mirowsky & Ross, 2003; Schnittker, 2004), occupation (Blane et al., 1996; Marmot & Smith, 1991; Steenland, Hu, & Walker, 2004), or a combination of the three (Chang & Lauderdale, 2005; Link et al., 1998; Link et al., 2008; J.

W. Lynch & Kaplan, 1997; Mustard & Frohlich, 1995; Pappas, Queen, Hadden, & Fisher, 1993; Phelan et al., 2004; Warren & Hernandez, 2007; Yeracaris & Kim, 1978) as measures of flexible resources. However, employing flexible resource domains contributes to expanding and specifying measures of power, prestige, social support and social networks. Future fundamental social cause research should continue to use the flexible resource domains and refine domain measures.

Finally, discussed here and expanded in Chapter 5, the present research contributes insight for the implementation of the Affordable Care Act (ACA) of 2010. Sentell (2012) points out that low health literacy is associated with many other factors that predict eligibility for health insurance as a result of the ACA. The factors include employment status, poverty, United States citizenship, and race/ethnicity. Therefore, interventions to improve health literacy will require more than a universal "scatter-gun" approach at the individual level (see DeWalt et al., 2011). Recent estimates predict that of the estimated 32 million previously uninsured Americans; more than 10 million low health literate individuals will gain access to insurance under the ACA (T. Sentell, 2012). Health literacy initiatives will require systemic changes in the systems of healthcare, health insurance, and health prevention. Thus, successful initiatives will focus on improving health literacy and increasing access to health insurance by connecting individual needs to health systems resources.

CHAPTER 4

Health Literacy as a Metamechanism for Self-Reported Health Status

Disparities are a defining and unfortunate feature of population health in the United States. In general, health disparities are more prevalent among the elderly (i.e., age 65 and over), women, racial/ethnic minorities, and those of lower socioeconomic status. Health disparities are, in part, due to differences in access to healthcare, health provider biases, poor provider-patient communication, and/or low health literacy ("National Healthcare Disparities Report 2011," 2012). Health disparities exist in a litany of specific health outcomes (e.g., cancer, diabetes, cardiovascular disease, etc.) among Americans. However, the single self-rated health status question (i.e., “How would you rate your overall health?”) provides a comprehensive indicator of health disparities compared to the most extensive list of specific health outcomes (Benyamini & Idler, 1999; Benyamini, Leventhal, & Leventhal, 1999, 2003; E. L. Idler, 1992; Ellen L. Idler & Benyamini, 1997; E. Idler, Leventhal, McLaughlin, & Leventhal, 2004). Three decades ago, Maddox & Douglass (1973, p. 92) noted that self-rated health “clearly measure something more-and something less-than objective medical rating.”

Self-rated health encompasses the impact of disease, disability, and functional limitations (Wan, 1989; Wolinsky & Johnson, 1992a, 1992b) and is a valid predictor of mortality (Benyamini et al., 1999; Ferraro & Farmer, 1999; E. L. Idler, 1992; E. Idler et al., 2004). Johnson & Wolinsky (1993) demonstrate the direct and indirect burden of disease, disability, and functional limitation as dimensions of self-rated health. Thus, self-rated health is a higher level construct in relation to the occurrence of specific diseases.

Ferrraro & Farmer's (1999) research reveals that self-rated health, compared to physician-evaluated morbidity, is a strong prognostic indicator for future mortality. Moreover, Ferrraro & Farmer (1999) findings indicate that physician-evaluated morbidity accurately predicted future mortality for white respondents but not for African-American respondents. Thus, physician-evaluated morbidity may underestimate the true prevalence of disease among African-Americans. In addition, the black/white gap in morbidity may be larger than commonly assumed. Poor self-rated health is a strong indicator of imminent illness and demonstrates predictive validity and sensitivity to health disparities (J. C. Hays, Schoenfeld, Blazer, & Gold, 1996; R. J. Johnson & Wolinsky, 1993; McGee et al., 1999; Shi et al., 2002). Consistent with the fundamental social cause framework (Link & Phelan, 1995), Idler & Benyamini (1997) posit that self-rated health may reflect the presence or absence of resources that can mitigate declining health.

The present research employs the fundamental social cause framework to examine disparities in self-rated health status. The fundamental social cause framework (Link & Phelan, 1995) proposes that access to flexible resources decrease individuals risk of illness/disease. Flexible resources refer to knowledge, money, power, and/or social connections (Link et al., 1998; Link & Phelan, 1996, 2002; Link et al., 2008; Phelan & Link, 2005a, 2005b; Phelan et al., 2004). Resources directly shape individual health behaviors by influencing whether people know about, have access to, can afford, and are supported in their efforts to engage in health-enhancing behaviors. Previous research (Graham, 2004; David R. Williams & Collins, 1995) makes a cogent argument to broaden the scope of fundamental causes to include social positions that represent persistent dimensions of social and health inequality. Therefore, age, race/ethnicity, and sex are fundamental disparities that shape individual health and account for health disparities.

The present chapter addresses a central question: does health literacy account for observed differences in self-reported health status between demographic groups, socioeconomic status, and social resources? The review of literature presents the disparities and self-rated health status literature as well as parallel, albeit limited, findings from the health literacy literature. Based on the review, a proposed conceptual model provides the rationale for the chapter hypotheses. In addition, the conceptual model places health literacy as a potential metamechanism (Freese & Lutfey, 2010; Lutfey & Freese, 2005) in the fundamental social cause framework. A series of bivariate and multivariate analyses are presented in full and expanded in the chapter discussion and conclusion.

Literature Review

Previous research reveals consistent age (Dupre & Goerge, 2011; Verbrugge, 1985, 1989; D. R. Williams, 2003; K. Williams & Umberson, 2004), racial/ethnic (Cummings & Braboy Jackson, 2008; Ferraro & Farmer, 1999), sex (Cummings & Braboy Jackson, 2008; McGee et al., 1999), and socioeconomic (Shi et al., 2002) disparities in individuals' self-rated health. Dupre & George (2011) highlight that despite the robust relationship between socioeconomic status and health, there is considerable heterogeneity within socioeconomic strata; specifically with regard to age. Over a decade ago House and colleagues (1990; also see House et al., 1994) noted that socioeconomic difference in health were small in early adulthood, greatest in middle and early old age, and relatively small again in old age. Moreover, the social stratification of aging and health is due to differential exposure and impact of risk factors across both socioeconomic and age groups. Dupre & George's (2011) research of middle and early old age adults suggests that protective factors (i.e., marriage, number of children, health insurance, etc.) predict exceptional health and protective factors have stronger effects for socially disadvantaged compared to socially advantaged adults. Yet, health disparities over the life course are not equal for women and men (D. R. Williams, 2003; K. Williams & Umberson, 2004).

The relationship between sex and health is best described with Verbrugge's (1985) "iceberg of morbidity" metaphor. The bulk of the sex hues in the "iceberg of morbidity" are feminine at the bottom and gradually fade into intensely masculine shades at the top. In other words, while women live longer they experience higher levels of illness over their life course. Moreover, women's risk of death decreases as a result of either their own or their spouses increased level of education and income (McDonough et al., 1999; Verbrugge, 1989). However, the converse is not supported for men. Examining self-rated health between male and female whites and African-Americans over a thirty year period, Cummings & Braboy Jackson (2008) discover that over the period white men maintain a health advantage over African-American males and females. However, African-American women have experienced the largest increase in self-rated health. Yet, African-American men experienced the largest decline in their perceived health status.

Race/ethnicity is not a "cause" of health disparities. Instead, racial/ethnic groups are socially constructed categories that emerge in the context of social and economic disparities (David R. Williams, 1994, 1996; David R. Williams, Yan, Jackson, & Anderson, 1997). Racial/ethnic categories perpetuate economic, cultural, political, and legal systems of inequality. Research examining the connection between race/ethnicity and health consistently reveals that compared to Whites, racial/ethnic minorities have higher levels of morbidity and mortality (David R. Williams & Collins, 1995). In addition, self-rated health among Whites is consistently higher compared to all racial/ethnic minorities. Research from McGee & colleagues (1999) reveal that African-Americans and Native Americans are more likely to indicate fair or poor health, followed by Hispanics, and near parity between Asian/Pacific Islanders and Whites. Socioeconomic differences between racial/ethnic groups are predominately responsible for racial/ethnic disparities in health status and health outcomes (David R. Williams & Collins, 1995).

The observed socioeconomic differences between racial/ethnic groups systematically channels minorities so that they are deprived of good health compared to whites (M. D. Hayward, Miles, Crimmins, & Yang, 2000; Nancy Krieger, 2003). Williams & Collins (2001; also see David R. Williams, Neighbors, & Jackson, 2003) posit that racial segregation is a fundamental cause of racial disparities in health status. Racial segregation shapes the socioeconomic conditions for racial/ethnic minorities at the individual, household, neighborhood, and community levels (David R. Williams & Collins, 2001). In general, it is more difficult to find health enhancing resources (e.g., access to physician care) in racially segregated communities. Conversely, conditions that present health risks (i.e., environmental degradation, lack of access to healthy food, and lack of access to appropriate outdoor spaces that encourage physical activity) are generally more prevalent in racially segregated communities (Institute of Medicine, 2012).

Previous research reveals a consistently significant negative association between socioeconomic status and self-rated health (McGee et al., 1999; Shi et al., 2002). Lower educational attainment and lower levels of income are associated with fair and poor self-rated health levels. Shi & colleagues (2002) explicitly point out that individuals with a primary-care physician experience better care and self-rated health given their enhanced accessibility and interpersonal relationships. Moreover, for socially disadvantaged individuals experiencing good primary-care buffers, but does not eliminate, the negative impact of income inequality at the state level (Shi et al., 2002).

In general, previous research employs either income (J. W. Lynch & Kaplan, 1997), educational level (Giled & Lleras-Muney, 2008; S. M. Lynch, 2003; Mirowsky & Ross, 2003; Schnittker, 2004), occupation (Blane et al., 1996; Marmot & Smith, 1991; Steenland et al., 2004), or a combination of the three (Chang & Lauderdale, 2005; Link et al., 1998; Link et al., 2008; J. W. Lynch & Kaplan, 1997; Mustard & Frohlich, 1995; Pappas et al., 1993; Phelan et al., 2004; Warren & Hernandez, 2007; Yeracaris & Kim, 1978) as proxy measures for socioeconomic status. However, Williams & Collins (1995) point out that indicators of assets, wealth, and/or relational social class measures may provide more insight about an individual's access to social and economic resources than income, educational attainment, and/or occupational status (also see Adler & Ostrove, 1999b; Duncan et al., 2002; N. Krieger et al., 1997; Oakes & Rossi, 2003). The present research contributes to the fundamental social cause framework as well as the health literacy disparities research by including measures of wealth (i.e., income from savings and investments) and relational social class (i.e., employment status, library use, and volunteer activity). Specifically, integrating a multidimensional conception of poverty from development economics (see Chapter 1) provides a heuristic structure to organize flexible resources into flexible resource domains. The flexible resource domains enlarge the scope of flexible resources to examine a spectrum of monetary, wealth, knowledge, power, prestige, and interpersonal connection resources.

Schnittker & McLeod (2005) contend that the contributions from social psychology may bridge the gap between health disparities research directed “downstream” and “upstream.” Of particular interest is the role that social support and self-efficacy may play to understand differences in health. House and colleagues (1988) report that the absence of social support increases the risk of morbidity and mortality equal to that of smoking and Type A behavior. Taken a step further, Lutfey & Freese (2005) argue that flexible resources can affect not only access to people with health treatment knowledge; resources also facilitate individuals to marshal social support networks to improve health. Self-efficacy, or the lack thereof, is identified as a psychosocial factor that may impact health and well-being. Stated simply, self-efficacy refers to an individual’s belief that they are capable of performing a designated action that exercises influence over events in their own lives (Bandura, 1997; House, 2001; Schnittker & McLeod, 2005).

Parallel findings in the health literacy literature support 1) the inclusion of social support and self-efficacy and 2) health literacy as a mediating mechanism in the fundamental social cause framework. Lee & colleagues (also see J. Gazmararian, Baker, Parker, & Blazer, 2000; 2004) point out that while low health literacy may have adverse health effects, research needs to account for the social support networks that people utilize as they encounter difficulties resulting from their health literacy deficiency. Likewise, the fundamental social cause framework emphasizes the importance of access to flexible resources such as social support networks. Lee and colleagues (2004) posit that social support moderates the relationship between health literacy and health status. Level of self-efficacy may potentially explain the relationship between health literacy level and self-rated health status.

Self-efficacy refers to an individual's belief in their ability to succeed in specific situations (Bandura, 1997). Thus, an individual's sense of self-efficacy can play a major role in how the person approaches goals, tasks, and challenges. In the present research, an individual's self-efficacy to accomplish literacy based tasks may influence the person's health literacy ability. Saha (2006) proposes that low health literacy may reduce an individual's level of self-efficacy. Indeed, research employing clinical populations reveals that individual self-efficacy is not directly associated with health literacy levels (DeWalt, 2007; Sarkar et al., 2006; Sharif & Blank, 2010). Instead, self-efficacy may potentially modify the relationship between health literacy and self-rated health status.

Modeling the Relationship

Berkman and colleagues (2004) highlight that a limitation in the health literacy knowledge base is the lack of appropriate specification of analytic models. Poor specification places variables considered as potential confounders when the variable may actually mediate the effect of health literacy on health outcomes (N. D. Berkman et al., 2004). Findings from three studies, two clinical studies and one secondary analysis, provide clear support that health literacy mediates the relationship between patient demographic and socioeconomic characteristics and health outcomes disparities (Ayotte et al., 2009; C. L.

Bennett et al., 1998). However, the findings from the two studies mentioned are interpreted with caution. Both studies employ small clinical samples; thus, it is not possible to generalize to the population. In addition, both studies employ the REALM (see Appendix E) which only assesses functional health literacy reading ability.

Bennett & colleagues (2009) employ the 2003 National Assessment of Adult Literacy (NAAL) data to examine the contribution of low health literacy to racial/ethnic and education disparities in self-rated health status and receipt of three preventive health services (i.e., influenza vaccination, mammography, and dental care) among older adults (i.e., age 65 and older). These results reveal that health literacy reduces the association of race/ethnicity with self-rated health status and influenza vaccination, as well as the association between educational attainment and all of the health outcomes. Thus, Bennett & colleagues (2009) conclude that health literacy significantly mediates racial/ethnic and education-related disparities in self-rated health status.

However, there are two limitations to the research. First, the findings are not applicable to all adults as the research used a subpopulation of older adults (i.e., age 65 and older). The present research adds value as the analyses employ adults in the sample (i.e., age 18 to 65). Second, Bennett & colleagues (2009) point out that the NAAL health literacy measure, *as well as all assessments of health literacy*, do not measure all the proposed domains of the health literacy construct (e.g., health related oral literacy). In sum, findings from previous research serve as a guide in the present research.

Research Aim & Hypotheses

Based on the literature reviewed above, Figure 4.1 is a conceptual model depicting health literacy as a metamechanism in the fundamental social cause framework. In Figure 4.1, the black arrows represent direct effects and the grey arrows represent indirect effects between demographic characteristics, flexible resources, social resources and self-rated health status. Respondent demographic characteristics (i.e., age, sex, and race/ethnicity)

FIGURE 4.1 ABOUT HERE

are social positions of enduring social and health inequality (Graham, 2004; David R. Williams & Collins, 2001). The black arrow from demographic characteristics to self-rated health is a direct relationship. In other words:

> Hypothesis 4.1: Respondents are more likely to report poor/fair health status as age increases, net of other variables in the model.

> Hypothesis 4.2: Females and Whites are more likely to report poor/fair health status compared to males and African-Americans, Hispanics, and the other ethnic/racial groups, respectively. Moreover, Native born Hispanics are less likely to report poor/fair health status than foreign born Hispanics, net of other variables in the model.

Conversely, the grey arrow from demographic characteristics to self-rated health is an indirect relationship as health literacy level may mediate the relationship between respondents' demographic characteristics and self-rated health status. To concisely state:

> Hypothesis 4.3: Age, sex, and racial/ethnic effects on poor/fair health status are mitigated by including level of health literacy, net of other variables in the model.

The black arrow from the flexible resource domains to self-rated health status is a direct relationship between the three flexible resource domains and self-rated health status. Flexible economic resources (i.e., median household income and income from savings and investments) are directly related to self-rated health status. A direct relationship exists between flexible capability resources (i.e., educational attainment and occupational prestige) and self-rated health status. In addition, flexible inclusion resources (i.e., economic, political, and civic/cultural subdomains) are directly related to self-rated health status.

> Hypothesis 4.4: Respondents with a higher level of median household income, extra income from savings and investments, higher level of educational attainment, higher level of occupational prestige, and more sources of current affairs, political, and government information are less likely to report poor/fair health status, net of other variables in the model.

> Hypothesis 4.5: Respondents employed full-time and who voted in the 2000 election are less likely to report poor/fair health status compared to respondents' employed less than full-time and those who did not vote, respectively, net of other variables in the model.

> Hypothesis 4.6: Respondents who use a library and volunteer are less likely to report poor/fair health status compared to respondents' who never use a library and do not volunteer, respectively, net of other variables in the model.

Yet, the grey arrow from the flexible resource domains predicts an indirect relationship, mediated by health literacy, between the flexible resource domains and self-rated health status.

> Hypothesis 4.7: The effect of differences in Flexible Economic, Capability, and Inclusion Resources are mitigated by level of health literacy, net of other variables in the model, net of other variables in the model.

The black arrow from social resources (i.e., language spoken, marital status, and health information source) and self-rated health status predicts a direct relationship. The grey arrow from social resources to health literacy depicts an indirect relationship, mitigated by health literacy, between social resources and self-rated health status; therefore:

> Hypothesis 4.8: Native English speaking respondents and those who are married or living as married are less likely to report poor/fair health status compared to non-native

> English speakers and respondents who are not married or living as married, respectively, net of other variables in the model.

> Hypothesis 4.9: Respondents with more sources of health information are less likely to report poor/fair health status, net of other variables in the model.

Health literacy level may mitigate the association between social resources and self-rated health status. In other words:

> Hypothesis 4.10: Social resources are mitigated by level of health literacy, net of other variables in the model.

In addition, as depicted in Figure 4.1, literacy self-efficacy, need based social support, and type of health insurance may mitigate the relationship between health literacy level and self-rated health status. To state concisely:

> Hypothesis 4.11: The effect of health literacy level is mitigated by need based social support, type of health insurance, and literacy self-efficacy, respectively, net of other variables in the model.

Bivariate Correlations

Table 4.1 displays bivariate correlations between flexible resource domains (i.e., economic, capability, and inclusion), social resources, health literacy score, literacy self-

TABLE 4.1 ABOUT HERE

efficacy, need based social support, type of health insurance, and self-reported health status. The bivariate correlations coefficients are significant except the coefficient for health insurance from a private company and self-rated health status.

Multivariate Analyses & Results

There are three methodological points to consider prior to considering the substantive interpretation of the analyses in Table 4.2. First, the values presented are odds ratios which represent the likelihood of reporting poor/fair health status compared to reporting excellent/very good/good health status. Second, to compare significant predictors in the analyses, continuous and scale measures are rescaled by their respective Interquartile Range (IQR). Thus, a significant odds ratio denotes the likelihood of reporting poor/fair health status given a change (i.e., increase or decrease) in the average amount of change in a predictor variable (i.e., the change from the 25th percentile to the 75th percentile observation). Third, the analyses are limited to adults age 18 to 64 to eliminate the confounding effect of retirement from the labor force. Specifically, the literacy self-efficacy measure asks how much the respondent thinks a specific skill limits the respondent's job opportunities for a job promotion or a different job. In general, retirement traditionally occurs at or after age 65. Including older adults (i.e., age 65 and older) may produce incorrect estimates given the focus of the literacy self-efficacy measure. The analyses begin with demographic characteristics (i.e., age, sex, and race/ethnicity) entered into the analysis. Next, the measures for each dimension of flexible resources (i.e., economic, capability, and inclusion) are entered separately followed by the social resource measures. Health literacy score enters the analyses to examine the possibility of mitigation. Type of health insurance, need based social support and literacy self-efficacy are the final measures in the analyses.

The demographic variables are first entered into the baseline model (Model 1). The results in Model 1 support Hypothesis 4.1, as age increases respondents are more likely to report poor/fair health status. Respondents' are 215% more likely to report poor/fair health as age increases an average amount (from 25th to 75th percentile), net of the other variables in the model. Compared to Whites, poor/fair health status is 91%, 121%, 79%, 208%, and

170% more likely reported by African-American, foreign born Hispanic, native born Hispanic, American Indian/Alaskan Natives, and Multiracial respondents, respectively. The results in Model 1 partially support Hypothesis 4.2; Whites are less likely to report poor/fair health status compared to all racial/ethnic groups except Asian/Pacific Islanders. Moreover, native born Hispanics are less likely to report poor/fair health status than foreign born Hispanics.

Model 2 adds the flexible resource measures. Respondents' are approximately 207% more likely to report poor/fair health as age increases an average amount (again, from the 25th percentile to the 75th percentile). Compared to the baseline model, the odds ratio for female respondents' is significant and indicates that, when compared to males, females are 16.4% less likely to report poor/fair health. Compared to White respondents, Multiracial respondents' 101% more likely to report poor/fair health status. The analyses in Model 2 do not support the hypothesis that females are more likely to report poor/fair health status. Instead, compared to males, females are less likely to report poor/fair health status. However, there is partial support for Hypothesis 4.2; compared to Whites, Multiracial respondents are more likely to report poor/fair health. Also note that the odds ratios for native and foreign born Hispanics are no longer significant.

An increase in median household income an average amount yields a 46.2% decrease in the likelihood of reporting poor/fair health status. In addition, household members receiving extra income from savings/investments are 21% less likely to report poor/fair health. Both findings provide support for Hypothesis 4.4; respondents with a higher level of median household income and extra income from savings and investments are less likely to report poor/fair health status, respectively. As the level of educational attainment and occupational status increase an average amount, respondents are 54.1% and 28.3% less likely to indicate poor/fair health status, respectively. As predicted in Hypothesis 4.4; respondents with a higher level of educational attainment and occupational prestige, respectively, are less likely to report poor/fair health status. In terms of flexible inclusion resources, full-time employment compared to less than full-time produces a 54.5% decrease in the likelihood of reporting poor/fair health supporting Hypothesis 4.5. As the average amount of information on current affairs, politics, and government increases respondents' are 13.1% less likely to report poor/fair health. Thus, Hypothesis 4.9 is partially supported as respondents with more sources of current affairs, political, and government information are less likely to report poor/fair health status. Hypothesis 4.6 is not supported as the effect of library use and volunteering are not significant.

TABLE 4.2 ABOUT HERE

The social resource measures as well as health literacy score are entered in Model 3. Married respondents are 21.5% less likely to report poor/fair health compared to respondents who are not married providing partial support for Hypotheses 4.8. Hypothesis 4.9 is not supported as there is not a significant effect of health information source. Returning to the demographic variables, as age increases from the 25th to 75th percentile, an individual is 201% more likely to report poor/fair health status[5]. Notice that the odds ratio for female

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[5] Please see Appendix H for a series of weighted multinomial logistic regression analyses. The analyses are not interpreted in the present chapter but serve to highlight the disparities between respondents' who report good health status compared to poor/fair and very good/excellent health status.

respondents' is no longer significant. Also notice that the odds ratio for African-Americans is not significant; yet, Multiracial respondents' are nearly 92% more likely to report poor/fair health. There are slight changes in the significant flexible resource odds ratios between Models 2 and 3 and the odds ratio for extra income from savings and investments is no longer significant. Of particular interest, as health literacy scores increase an average amount, respondents are 23.7% less likely to report poor/fair health status, net of the other variables in the model. The finding is especially interesting given that the model controls for educational attainment.

The full model (Model 4) includes the measures for type of health insurance, need based social support, and literacy self-efficacy. As observed in previous models, as age increases an average amount, an individual is 216% more likely to report poor/fair health status. Moreover, multiracial respondents' are approximately 94% more likely to report poor/fair health and represents the only racial/ethnic group with a significant odds ratio, net of other variables in the model. As the average amount of median household income, educational attainment, occupational status score, and information on current affairs, politics, and government increases respondents are 25.9%, 44.5%, 19.9%, and 13.1% less likely to report poor/fair health, respectively. Full-time employment compared to less than full-time yields a decrease of 42.1% in the likelihood of poor/fair health status.

Health literacy score remains significant in the full model (Model 4). As health literacy scores increase an average amount, respondents are 20.5% less likely to report poor/fair health status, net of educational attainment as well as the other variables in the model. Recall, in Table 2.1, that the bivariate correlation value between educational attainment and health literacy is 0.404 ($p < 0.001$). Taken together, the results highlight that the measure of health literacy is exceedingly unique. Not surprisingly, respondents' who have no health insurance, compared to respondents' with employer provided health care, are 69% more likely to report poor/fair health status. Compared to employer provided health insurance; respondents' covered under Medicare, Medicaid, or a State Service are 313% more likely to report poor/fair health status. Military (i.e., Tricare) and other not specified health insurance coverage increases the likelihood of reporting poor/fair health by 66% compared to employer provided health care plans.

Finally, as literacy self-efficacy increases an average amount, respondents are 32.8% less likely to report poor/fair health status, net of other variables in the model. The results provide partial support for Hypothesis 4.11 and the full model accounts for 22.8% of the variation in reporting poor/fair health status. The implications of analyses are discussed below.

Discussion & Chapter Conclusions

The present research offers five contributions. First, revisiting the research question in the present chapter, does health literacy account for observed differences in self-reported health status between demographic groups, flexible resource domains (i.e., socioeconomic), and social resources? In other words, is health literacy a metamechanism in the fundamental social cause framework? The answer is yes and only for females. In general, respondents are significantly less likely to report poor/fair health status as their health literacy scores increases. Specifically, the addition of health literacy score eliminates the significant difference in the likelihood to report poor/fair health between females and males. In other words, females are no more likely than males to report poor/fair health status once health literacy level is taken into account. The finding lends support that health literacy is a metamechanism as well as a social determinate of health (Chinn & McCarthy, 2012; DeWalt et al., 2004; Schillinger et al., 2002). Yet, it is possible that mitigation occurs between health literacy level and self-reported health status.

Second, the results provide support for the inclusion of social positions of enduring social inequality as fundamental social causes. Respondents are consistently more likely to report poor/fair health status as age increases. In addition, Multiracial respondents are consistently more likely to report poor/fair health status compared to Whites. In the initial model (i.e., Model 1) African-Americans, foreign born Hispanics, native born Hispanics, and American Indian/Alaskan Natives are more likely to report poor/fair health status compared to Whites. Moreover, there is no significant difference in reported health status between women and men in the initial model. However, including the measures of flexible resource domains alters the effect of sex.

The addition of the flexible resource domain measures reveals that women are significantly less likely to report poor/fair health status compared to men. In addition, Multiracial respondents are more likely to report poor/fair health compared to Whites. Notice that once the flexible resource measures are introduced, there is a significant difference in the likelihood of reporting poor/fair health status between women and men. The results suggest that access to flexible resources account for differences in reported health status between men and women.

Consistent with previous research, increasing access to economic resources (i.e., median family income and extra income from savings and investments) (J. W. Lynch & Kaplan, 1997) reduces the likelihood to report poor/fair health status. Also consistent with previous research, increasing educational attainment, occupational status, and full-time employment status significantly reduces the likelihood to report poor/fair health status (Blane et al., 1996; Giled & Lleras-Muney, 2008; S. M. Lynch, 2003; Marmot & Smith, 1991; Mirowsky & Ross, 2003; Schnittker, 2004; Steenland et al., 2004). However, the significant effect of information on current affairs, politics, and government is unique.

Recall that as the amount of information on current affairs, politics, and government increases respondents are less likely to report poor/fair health status. The impact of information on current affairs, politics, and government may represent the importance of knowledge as a flexible resource. Thus, controlling for level of educational attainment, current affairs, political, and government information sources may provide respondents with knowledge resources on a daily basis.

Third, integrating the resource domain framework provides an opportunity to include measures of knowledge, power, prestige, social support and social networks. By and large, previous fundamental social causes research employs either income (J. W. Lynch & Kaplan, 1997), educational level (Giled & Lleras-Muney, 2008; S. M. Lynch, 2003; Mirowsky & Ross, 2003; Schnittker, 2004), occupation (Blane et al., 1996; Marmot & Smith, 1991; Steenland et al., 2004), or a combination of the three (Chang & Lauderdale, 2005; Link et al., 1998; Link et al., 2008; J. W. Lynch & Kaplan, 1997; Mustard & Frohlich, 1995; Pappas et al., 1993; Phelan et al., 2004; Warren & Hernandez, 2007; Yeracaris & Kim, 1978) as measures of flexible resources. However, the present research adds an expanse and level of specificity to the array of flexible resources. As a result, the analyses examine the effect of flexible economic, capability, and inclusion on self-reported health status. Future fundamental social cause research should continue to use the flexible resource domains and refine measures for each domain.

Fourth, type of health insurance does not mitigate the relationship between health literacy and self-reported health status. However, there is an association between type of health insurance and self-reported health status. Compared to employer provided health insurance, respondents with no health insurance, Medicare or Medicaid/State Service, and Military and other insurance not specified are more likely to report poor/fair health status. Of the three health insurance types, respondents covered under Medicare or Medicaid/State Service plans are the most likely (313%) to report their health status as poor/fair when compared to respondents covered by employer provided health insurance. The finding stands in contrast to Quesnel-Vallée's (2004) research findings that lack of health insurance has a strong cumulative negative effect on adult health when compared to publicly insured (i.e., Medicaid) adults. More importantly, yet outside the scope of the present research, the finding should alert policy makers as the provisions of the 2010 Affordable Care Act (ACA) will expand Medicaid coverage to an estimated thirty-two million Americans. Therefore, policy makers will need to monitor self-reported health status in the following years.

Finally, need based social support and literacy self-efficacy do not mitigate the relationship between health literacy and self-reported health status. Yet, as the level of literacy self-efficacy increases respondents are less likely to report poor/fair health status.

Respondents with greater feelings of being efficacious to complete literacy based tasks are less likely to report their self-rated health as poor/fair. In sum, the multiple forms of resources are essential to improve poor/fair self-reported health status. Yet, unequal access to resources remains a challenge.

CHAPTER 5

Discussion & Conclusion

The present project began with two observations. First, there is a consistent and robust negative relationship between socioeconomic status (i.e., income level, educational attainment, and/or occupational status) and the risk of illness/disease (i.e., morbidity). Second, there is a positive relationship between socioeconomic status and life expectancy (i.e., mortality). The title of the project as well as throughout the three empirical chapters' reference examining health disparities either "upstream" or "downstream." The "upstream" metaphor refers to examining disparities resulting from social processes and conditions that are distal or away from individuals. Conversely, "downstream" refers to examining disparities resulting from health behaviors that are proximal to an individual. The present project places health literacy in "midstream" or the middle of the "stream" to understand if and/or how health literacy level mediates differences in health outcomes. To this end, the purpose of the present chapter is four-fold.

First, the chapter presents the etiology of the "upstream"/"downstream" metaphor and elaborated upon in the context of the present research. The research question from the three core empirical chapters and summary results support the location of health literacy in "midstream." Second, the theoretical, substantive, and methodological contributions are described. Third, the chapter presents the conceptual and pragmatic implications of the overall project. Fourth, as in all research, the chapter concludes by articulating the limitations of the project.

The importance and distinction between examining “upstream” and “downstream” sources of health disparities began four decades ago. In his address to the United Ostomy Association, Irving Zola (1970) recounts the story of a physician explaining problems that beset the practice of medicine:

> “’You know,’ he said, ‘sometimes it feels like this. There I am, standing by the shore of a swiftly flowing river and I hear the cry of a drowning man. So I jump into the river, put my arms around him, pull him to shore and apply artificial respiration. Just when he begins to breathe, there is another cry for help. So I jump into the river, reach him, pull him to shore, apply artificial respiration, and then just as he begins to breathe, another cry for help. So back in the river again, reaching, pulling, applying, breathing and then another yell. Again and again, without end, goes the sequence. You know, I am so busy jumping in, pulling them to shore, applying artificial respiration, that I have no time to see who the hell is upstream pushing them all in.’”

Five years later, John B. McKinlay (1975, p. 7) began his address at the American Heart Association’s Conference on Applying Behavioral Science to Cardiovascular Risk by recounting Zola’s story and then arguing:

> First, it [the story] highlights the fact that a clear majority of our resources and activities in the health field are devoted to what I term "downstream endeavors" in the form of superficial, categorical tinkering in response to almost perennial shifts from one health issue to the next, without really solving anything. I am, of course, not suggesting that such efforts are entirely futile, or that a considerable amount of short-term good is not being accomplished. Clearly, people and groups have important immediate needs which must be recognized and attended to. Nevertheless, one must be wary of the short-term nature and ultimate futility of such downstream endeavors.
>
> Second, the story indicates that we should somehow cease our preoccupation with this short-term, problem-specific tinkering and begin focusing our attention upstream, where the real problems lie. Such a reorientation would minimally involve an analysis of the means by which various individuals, interest groups, and large-scale, profit-oriented corporations are "pushing people in", and how they subsequently erect, at

> some point downstream, a health care structure to service the needs which they have had a hand in creating, and for which moral responsibility ought to be assumed.

Note that Zola (1970) and McKinlay (1975) highlight that the focus “downstream” places a limitation on focusing “upstream” to examine the source of health disparities. However, previous research cited above and the present research offer an opportunity to elaborate on the “upstream”/”downstream” metaphor.

Looking upstream there is not a single source or origin of health disparities. Instead, there are multiple sources or headwaters that contribute to the stream of health disparities. The headwaters differentially pour groups into the stream based on, but not limited to, sex, race/ethnicity, income, wealth, educational attainment, political participation, native language, and marital status. The disparity current increases in speed and propels some groups quickly into midstream. Health literacy level generates the skills to find, navigate, and decide on a means to escape the stream of disparities, but not for all the groups in midstream. High levels of health literacy increase the opportunity to reach a shallow part of the stream or to a backwater area unaffected by the current of disparity and wade to the banks of the stream. Conversely, low health literacy increases the risk of drowning from rapids and/or whirlpools. Overwhelmed physicians downstream save some people floating by; while other individuals cascade over and down the waterfall of mortality. The results for the three empirical chapters support locating of health literacy in “midstream.”

The inquiry in the first core empirical chapter (i.e., Chapter 2) examines if disparities exist in the relationship between respondents’ demographic, access to flexible resources (i.e., socioeconomic), social resources and health literacy level. The results indicate that, indeed, health literacy disparities are stronger for men, racial/ethnic minorities, non-native English speakers, as well as for groups not married and without access to flexible resources. The lack of connection, whether economic, social, linguistic, civic, and/or political, is the undercurrent or commonality between the groups. Health literacy disparities impact those who are isolated as a result of under or unemployment, racial segregation, no or low educational attainment, beliefs about masculinity, lack of political/civic participation, and/or cultural differences (A. Peerson & M. Saunders, 2009; Robinson & Robertson, 2013; D. R. Williams, Costa, Odunlami, & Mohammed, 2008; D. R. Williams, 2003). When individuals' lack connections to others and/or access to resources increases the risk for being at risk (Link & Phelan, 1995).

The second core empirical chapter (i.e., Chapter 3) examines if health literacy accounts for differential relationships between demographic groups, access to flexible resources, social resources and health insurance status. The findings provide very little support that health literacy accounts for disparities in health insurance coverage. However, health literacy level does not impact the probability of health insurance status for men. There is an increasing awareness to reexamine men's health, access to healthcare, and health literacy needs (Payne, 2004; Pease, 2009; A. Peerson & M. Saunders, 2009; Richardson & Carroll, 2009; D. R. Williams, 2003). The renewed interest points to cultural beliefs about masculinity and social institutions as barriers that reinforce men's level of health literacy as well as the importance of health insurance as a means to access healthcare (Payne, 2004; A. Peerson & M. Saunders, 2009; D. R. Williams, 2003). Future research and health literacy interventions should target access to health insurance and other measures of health status.

The central question in Chapter 4 examines if health literacy explains observed differences in self-reported health status between demographic groups, socioeconomic status, and social resources. The findings reveal that, once health literacy level is taken into account, women are no more likely than men to report poor/fair health status. In addition, higher health literacy levels translate into a reduced likelihood to report poor/fair health status. The two findings suggest that health literacy interventions may reduce the disparities in self-rated health as well as disparities in mortality between females and males (Benyamini et al., 1999; Ferraro & Farmer, 1999). The findings are consistent with forty years of previous research that access to economic and social resources improve self-rated health status (Quesnel–Vallée, 2007). In sum, the results from the three core chapters offer theoretical, substantive, and methodological contributions.

Contributions

The present research refines the fundamental social cause framework by integrating a heuristic framework to organize flexible resources into three domains. In addition, the present research incorporates a theoretical mechanism to link fundamental causes to health outcomes. Integrating the multidimensional approach to the meaning and measurement of poverty from developmental economics provides structure to examine the contribution of a wide range of flexible resources. Link & Phelan's (1995) proposition that flexible resources include money, wealth, knowledge, power, prestige, social support and social networks crystalizes when resources are organized into flexible resource domains. The second contribution is the incorporation of Freese & Lutfey's (2010) metamechanism as a theoretical mechanisms or process linking fundamental social causes to health disparities. Specifically, the present research empirically examines health literacy as a metamechanism or abstract (i.e., latent) process that is distinct from access to flexible resources. Third, health literacy is a "critical path" to understand the occurrence of health disparities[6]. In this sense, critical does not refer to a process that is essential or vital or of extreme importance. Instead, critical refers to a primary or main process to explain the differential impact of health disparities.

Substantively, the present research refines and accentuates the importance of social interaction as a key component of health literacy. Health literacy refers to social interaction that shapes access to health information, the social resources to understand the information, and the scope of possible health decision making options. Health literacy lays midstream between upstream social process and downstream health outcomes. Social resources are support systems such as family, friends, medical professionals, and virtual communities that provide culturally competent clarification of health information. The scope of possible health decision making options opens the possibility that decisions and actions can occur at the individual, group, community, and or social structural level.

The IRT based measure of health literacy is a methodological contribution. The "strong" assumptions underlying IRT and the opportunity to reduce response burden by calibrating the ability and difficulty of question items is a significant improvement over CTT based health literacy measures. Recent research indicates that CTT based assessments, such as relying on standard pronunciation of health and medical terminology (i.e., the REALM found in Appendix D), are not accurate measures of health literacy (Elder et al., 2012). The

[6] Please reference the Project Management Institute. (2013). *A Guide to the Project Management Body of Knowledge: PMBOK(R) Guide* (5th ed.): Project Management Institute for the meaning of critical path in the field of project management.

majority of health literacy measures provide only a descriptive indicator of individuals who are and are not health literate (Pleasant, 2008). In an initial NAAL report from the NCES, Kutner & colleagues (2006) caution that the majority of analyses of health literacy and self-reported background factors use categorical "cut points" to determine health literacy level (i.e., Below Basic, Basic, Intermediate, and Proficient). The NAAL health literacy scores provide a continuous measure that reveals the nuances of health literacy undiscovered by categorical measures. The implications of the overall project reach beyond the findings presented above.

Implications

First, recall that the most widely cited definition of health literacy: the degree to which individuals have the capacity to obtain, process, and understand basic information and services needed to make appropriate decisions regarding their health (Lynn Nielsen-Bohlman et al., 2004). The results herein provide damning evidence that calls into question the National Institute of Medicine (IOM) definition of health literacy. Notice that there is no reference to the role of social interaction, communication, and/or civic participation in the twenty-five word definition. The definition implicitly assumes that individuals exist in a social vacuum and makes no reference to social structural disparities. Moreover, the IOM definition guides the two dominate approaches to address low health literacy in the United States.

The first approach assumes that simplification of information will increase patient/public comprehension and, in turn, improve health literacy and health outcomes. However, transforming medical jargon into "plain language" is not effective and may perpetuate limited access to information necessary to make informed decisions (Zarcadoolas, 2011). The second approach, referred to as "universal precautions," emphasizes the need for health care providers to approach all individuals under the assumption that individuals are at risk of not understanding information relevant to maintaining and improving their health (DeWalt et al., 2011; Easton, Entwistle, & Williams, 2010; Koh, Brach, Harris, & Parchman, 2013). Yet, the "universal precautions" approach places medical decision-making solely at the discretion of health care providers.

Second, the Affordable Care Act will extend the availability of health insurance to an estimated thirty-two million uninsured Americans in 2014. Individuals with incomes up to 133 percent of the federal poverty level will qualify for Medicaid. In addition, individuals with incomes above 133 percent but not more than 400 percent of the federal poverty level are eligible for premium subsidies. Previous research (Kutner, Greenberg, Jin, & Paulsen, 2006; T. Sentell, 2012; Somers & Mahadevan, 2010) and the findings from the present research reveal an overlapping pattern between economic marginalization and low health literacy level. Health literacy is an important component in the expansion of health insurance to individuals' inexperienced with health insurance coverage and healthcare system (T. Sentell, 2012; Somers & Mahadevan, 2010). Significant consumer education and assistance is essential for the newly insured to understand eligibility guidelines, provide supplemental identification and documentation for enrollment, understand which services are and are not covered, recognize cost-sharing and premium responsibilities; and choose a health care provider (Somers & Mahadevan, 2010). In sum, health literacy initiatives will need to focus at both the individual and system level (Koh, Baur, Brach, Harris, & Rowden, 2013; Koh et al., 2012; Koh, Brach, et al., 2013).

Finally, health literacy is a focus of research across the disciplines of social epidemiology, communication, health promotion, adult education, medicine, and sociology. The present research is a small step to address the significance of health literacy and health disparities. Future research, policy initiatives, and interventions should avoid approaching health literacy and health disparities from a single disciplinary perspective. Instead, an interdisciplinary approach is a necessity to understand the depth and breadth of health literacy and health disparities. Convening multiple perspectives, theories, and methodological approaches is no easy task; yet, there is an authentic opportunity to improve the health of all people. In light of the contributions and implications, limitations exist in the present research.

Limitations

There are limitations to the present research. First, casual inference is not possible as the NAAL data are cross-sectional. Therefore, it is not possible to examine if changes in health literacy level over a period of time cause changes in health insurance status and/or self-rated health. Second, in his comments at the National Institute of Medicine Roundtable on Health Literacy, Weiss (2009) criticized four aspects of the NAAL data. Weiss (2009) describes his efforts to contact the top ten health literacy researchers in the country through email to inquire about the NAAL data. Based solely on the opinions of six of the ten researchers; Weiss (2009) notes that: 1) it is difficult to access the NAAL data[7], 2) the NAAL data are not natively housed in a standard statistical program (e.g., SAS, Stata, or SPSS), 3) the health literacy scores do not correspond to grade level equivalents and are, therefore, not easily understood, and 4) the NAAL questions are not public domain for researchers to review the questions content[8].

Weiss's criticisms are unfounded and unwarranted. First, Weiss's criticisms are based on anecdotal evidence from six of the top ten researchers in the United States. Moreover, the researchers are, at least in Weiss's opinion, the top ten and only one (1) of the six researchers obtained access to the restricted NAAL data and could, therefore, provide an informed opinion. Second, as the present research demonstrates; it is possible to import the NAAL data into a standard statistical program for analysis. Third, the NAAL health literacy score values are conceptually and methodologically distinct from grade level (e.g., fifth grade reading level). Fourth, withholding the content of IRT based assessment items is a standard procedure in the field of educational testing (De Ayala, 2008) as items require a considerable amount of time to develop, calibrate, and field test. An assessment item is often reused multiple times before being discarded. There exists a limitation to the type of health literacy skills assessed in the NAAL.

Bennett & colleagues (2009) point out a third limitation. The NAAL health literacy measure, *as well as all health literacy assessments*, does not measure all the proposed

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[7] There is anecdotal evidence to support this criticism as acquisition of the NAAL data for the current project required eight months.
[8] The NCES released 38 example items from the NAAL. Examples of the health literacy items are found in Appendix F.

domains of health literacy. For example, oral health literacy is a potential major component of health literacy. Oral communication is not entirely independent of print literacy and is important for interaction with the health care delivery system (I. M. Bennett et al., 2009). However, to date, there is no previous research assessing oral health literacy skills. The limitations, contributions, and results in the present project are a long awaited step to examine and understand the importance of health literacy.

REFERENCES

Adler, Nancy E., & Ostrove, Joan M. (1999a). Socioeconomic Status and Health: What We Know and What We Don't. In N. E. Adler, M. G. Marmot, B. S. McEwen & J. Stewart (Eds.), *Annals of the New York Academy of Sciences* (Vol. 896, pp. 3-15).

Adler, Nancy E., & Ostrove, Joan M. (1999b). Socioeconomic Status and Health: What We Know and What We Don't. *Annals of the New York Academy of Sciences, 896*(1), 3-15. doi: 10.1111/j.1749-6632.1999.tb08101.x

Agre, Patricia, Steiglitz, Ezra, & Milstein, Glen. (2006). The case for development of a new test of health literacy. *Oncology Nursing Forum, 33*(2), 283-289.

Akkoyunlu, Buket, & KurbanoĞLu, Serap. (2003). ÖĞRETMEN ADAYLARININ BİLGİ OKURYAZARLIĞI VE BİLGİSAYAR ÖZ-YETERLİK ALGILARI ÜZERİNE BİR ÇALIŞMA A STUDY ON TEACHER CANDIDATES'PERCEIVED INFORMATION LITERACY SELF-EFFICACY AND PERCEIVED COMPUTER SELF-EFFICACY. *24*, 1-10.

American Medical Association Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs. (1999). Health Literacy: Report of the Council on Scientific Affairs. *JAMA, 281*(6), 552-557.

Andrich, David. (2004). Controversy and the Rasch Model: A Characteristic of Incompatible Paradigms? *Medical Care, 42*(1), I7-I16-I17-I16.

Andrulis, D. P., & Brach, C. (2007). Integrating literacy, culture, and language to improve health care quality for diverse populations. *American Journal of Health Behavior, 31*, S122-133-S122-133.

Angel, Jacqueline L., Montez, Jennifer Karas, & Angel, Ronald J. (2011). A Window of Vulnerability: Health Insurance Coverage Among Women 55 to 64 Years of Age. *Women's Health Issues, 21*(1), 6-11. doi: 10.1016/j.whi.2010.07.011

Angel, Ronald J., Angel, Jacqueline L., & Montez, Jennifer Karas. (2009). The Work/Health Insurance Nexus: A Weak Link for Mexican-Origin Men*. *Social Science Quarterly, 90*(5), 1112-1133. doi: 10.1111/j.1540-6237.2009.00649.x

Angell, M. (2000). Pockets of poverty. In N. Daniels, B. Kennedy & I. Kawachi (Eds.), *Is inequality bad for our health* (pp. 42-47).

Ayotte, Brian J., Allaire, Jason C., & Bosworth, Hayden. (2009). The Associations of Patient Demographic Characteristics and Health Information Recall: The Mediating Role of Health Literacy. *Aging, Neuropsychology, and Cognition, 16*(4), 419 - 432.

Baker, David W., Gazmararian, Julie A., Sudano, Joseph, & Patterson, Marian. (2000). The Association Between Age and Health Literacy Among Elderly Persons. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 55*(6), S368-S374-S368-S374.

Baker, David W., Gazmararian, Julie A., Williams, Mark V., Scott, Tracy, Parker, Ruth M., Green, Diane, . . . Peel, Jennifer. (2002). Functional Health Literacy and the Risk of Hospital Admission Among Medicare Managed Care Enrollees. *American Journal of Public Health, 92*(8), 1278-1283.

Baker, David W., Parker, Ruth M., Williams, Mark V., Clark, W. Scott, & Nurss, Joanne. (1997). The Relationship of Patient Reading Ability to Self-Reported Health and Use of Health Services. *American Journal of Public Health, 87*(6), 1027-1030.

Baker, Frank B. (1985). *The basics of item response theory*: For full text: http://ericae. net/irt/baker.

Baldi, Stéphane, Kutner, Mark, Greenberg, Elizabeth, Jin, Ying, Baer, Justin, Moore, Elizabeth, . . . White, Sheida. (2009). Technical Report and Data File User's Manual for the 2003 National Assessment of Adult Literacy (NCES 2009-476). (United States Department of Education National Center for Education Statistics, Trans.).

Bandura, A. (1997). *Self-efficacy: The exercise of control*: Worth Publishers.

Barlett, D. L., & Steele, J. B. (2005). *Critical condition: how health care in America became big business--and bad medicine*: Broadway.

Becker, Samantha, Crandall, Michael D., Fisher, Karen E., Kinney, Bo, Landry, Carol, & Rocha, Anita. (2010). Opportunity for All: How the American Public Benefits from Internet Access at U.S. Libraries. Washington, D.C.: Institute of Museum and Library Services.

Beers, BB, McDonald, VJ, Quistberg, DA, Ravenell, KL, Asch, DA, & Shea, JA. (2003). Disparities in health literacy between African American and non-African American primary care patients. *J Gen Intern Med, 18*(suppl 1), 169.

Bennett, C. L., Ferreira, M. R., Davis, T. C., Kaplan, J., Weinberger, M., Kuzel, T., . . . Sartor, O. (1998). Relation between literacy, race, and stage of presentation among low- income patients with prostate cancer. *Journal of Clinical Oncology, 16*(9), 3101-3104.

Bennett, Ian M., Chen, Jing, Soroui, Jaleh S., & White, Sheida. (2009). The Contribution of Health Literacy to Disparities in Self-Rated Health Status and Preventive Health Behaviors in Older Adults. *The Annals of Family Medicine, 7*(3), 204-211.

Benson, Jennifer Gausman, & Forman, Walter B. (2002). Comprehension of Written Health Care Information in an Affluent Geriatric Retirement Community: Use of the Test of Functional Health Literacy. *Gerontology, 48*(2), 93-97.

Benyamini, Yael, & Idler, Ellen L. (1999). Community Studies Reporting Association between Self-Rated Health and Mortality: Additional Studies, 1995 to 1998. *Research on Aging, 21*(3), 392-401.

Benyamini, Yael, Leventhal, Elaine A., & Leventhal, Howard. (1999). Self-Assessments of Health: What Do People Know that Predicts their Mortality? *Research on Aging, 21*(3), 477-500.

Benyamini, Yael, Leventhal, Elaine A., & Leventhal, Howard. (2003). Elderly people's ratings of the importance of health-related factors to their self-assessments of health. *Social Science & Medicine, 56*(8), 1661-1667. doi: 10.1016/S0277-9536(02)00175-2

Berkman, N.D., DeWalt, D.A., Pignone, M.P., Lohr, K.N., Lux, L., Sutton, S.F., . . . Bonito, A.J. (2004). Evidence Report/Technology Assessment No. 87 (Prepared by RTI International-University of North Carolina Evidence-based Practice Center). In A. f. H. R. a. Quality (Ed.). Rockville, MD: Agency for Healthcare Research and Quality.

Berkman, Nanacy, Davis, Terry C., & McCormack, Lauren. (2010). Health Literacy: What Is It? *Journal of Health Communication, 15*, 9-19.

Bird, C. E., & Rieker, P. P. (1999). Gender matters: an integrated model for understanding men's and women's health. *Social Science & Medicine, 48*(6), 745-755.

Bird, C. E., & Rieker, P. P. (2008). *Gender and health: The effects of constrained choices and social policies*: Cambridge University Press.

Bjorner, Jakob B., & Ware, John E. (1998). Using Modern Psychometric Methods to. Measure Health Outcomes. *Medical Outcomes Trust Monitor, 3*, 12-16.

Blane, D., Hart, C. L., Smith, G. Davey, Gillis, C. R., Hole, D. J., & Hawthorne, V. M. (1996). Association Of Cardiovascular Disease Risk Factors With Socioeconomic Position During Childhood And During Adulthood. *BMJ: British Medical Journal, 313*(7070), 1434-1438.

Blau, F. D., Brinton, M. C., & Grusky, D. B. (2006). *The declining significance of gender?* : Russell Sage Foundation Publications.

Blavin, Frederic, Holahan, John, Kenney, Genevieve M., & McGrath, Megan. (2012). Uninsurance Is Not Just a Minority Issue: White Americans Are a Large Share of the Growth from 2000 to 2010 *ACA Implementation—Monitoring and Tracking*. Washington, D.C.: The Urban Institute.

Blumberg, Linda. (2012). The Affordable Care Act: What does it do for low-income families? *FastFocus*. Madison, WI: University of Wisconsin-Madison.

Boardman, Jason D., Finch, Brian Karl, Ellison, Christopher G., Williams, David R., & Jackson, James S. (2001). Neighborhood Disadvantage, Stress, and Drug Use among Adults. *Journal of Health and Social Behavior, 42*(2), 151-165.

Bollen, K. A. (2002). Latent variables in psychology and the social sciences. *Annual Review of Psychology*, 605-635.

Bollen, Kenneth A. (1989). *Structural Equations With Latent Variables*. New York: John Wiley & Sons.

Borgonovi, Francesca. (2008). Doing well by doing good. The relationship between formal volunteering and self-reported health and happiness. *Social Science & Medicine, 66*(11), 2321-2334. doi: 10.1016/j.socscimed.2008.01.011

Browning, Christopher R., & Cagney, Kathleen. (2002). Neighborhood Structural Disadvantage, Collective Efficacy, and Self-Rated Physical Health in an Urban Setting. *Journal of Health and Social Behavior, 43*(December), 383-399.

Carlisle, D. M., Leake, B. D., & Shapiro, M. F. (1997). Racial and ethnic disparities in the use of cardiovascular procedures: associations with type of health insurance. *American Journal of Public Health, 87*(2), 263-267.

Carpiano, Richard M., & Hystad, Perry W. (2011). "Sense of community belonging" in health surveys: What social capital is it measuring? *Health & Place, 17*(2), 606-617. doi: DOI: 10.1016/j.healthplace.2010.12.018

Carr, Deborah, & Springer, Kristen W. (2010). Advances in Families and Health Research in the 21st Century. *Journal of Marriage and Family, 72*(3), 743-761. doi: 10.1111/j.1741-3737.2010.00728.x

Carrier, Emily, Yee, Tracy, & Garfield, Rachel. (2011). The Uninsured and Their Health Care Needs: How Have They Changed Since the Recession? Washington, D.C.: The Kaiser Commission on Medicaid and the Uninsured.

Catalano, Ralph, Hans-Tore, Hansen, & Hartig, Terry. (1999). The Ecological Effect of Underemplyment on the Incidence of Very Low Birthweight in Norway and Sweden. *Journal of Health and Social Behavior, 40*(December), 422-428.

Cella, David, & Chang, Chih-Hung. (2000). A Discussion of Item Response Theory and Its Applications in Health Status Assessment. *Medical Care, 38*(9), II66-II72-II66-II72.

Chang, Virginia W., & Lauderdale, Diane S. (2005). Income Disparities in Body Mass Index and Obesity in the United States, 1971-2002. *Arch Intern Med, 165*(18), 2122-2128.

Chang, Virginia W., & Lauderdale, Diane S. (2009). Fundamental Causes Theory: Thechnological Innovation, and Health Disparities: The Case of Cholesterol in the Era of Statins. *Journal of Health and Social Behavior, 50*, 245-260.

Chew, L. D., Griffin, J. M., Partin, M. R., Noorbaloochi, S., Grill, J. P., Snyder, A., . . . VanRyn, M. (2008). Validation of screening questions for limited health literacy in a large VA outpatient population. *Journal of General Internal Medicine, 23*(5), 561-566.

Chew, Lisa D., Bradley, Katharine A., Flum, David R., Cornia, Paul B., & Koepsell, Thomas D. (2004). The impact of low health literacy on surgical practice. *American Journal of Surgery, 188*(3), 250-253. doi: Article

Chinn, Deborah. (2011). Critical health literacy: A review and critical analysis. *Social Science & Medicine, 73*(1), 60-67. doi: 10.1016/j.socscimed.2011.04.004

Chinn, Deborah, & McCarthy, Catherine. (2012). All Aspects of Health Literacy Scale (AAHLS): Developing a tool to measure functional, communicative and critical health literacy in primary healthcare settings. *Patient Education and Counseling*(0). doi: 10.1016/j.pec.2012.10.019

Christ, Sharon L. (2012, 8-23-2012).

Christ, Sharon L., Fleming, Lora E., Lee, David J., Muntaner, Carles, Muennig, Peter A., & Caban-Martinez, Alberto J. (2012). The effects of a psychosocial dimension of socioeconomic position on survival: occupational prestige and mortality among US working adults. *Sociology of Health & Illness, 34*(7), 1103-1117.

Coleman, Clifford, Kurtz-Rossi, Sabrina, McKinney, Julie, Pleasant, Andrew, Rootman, Irving, & Shohet, Linda. (2009). The Calgary Charter on Health Literacy: Rationale and Core Principles for the Development of Health Literacy Curricula. Calgary Institute on Health Literacy Curricula: The Centre for Literacy of Quebec.

Conrad, Kendon J., Riley, Barth B., Conrad, Karen M., Chan, Ya-Fen, & Dennis, Michael L. (2010). Validation of the Crime and Violence Scale (CVS) Against the Rasch Measurement Model Including Differences by Gender, Race, and Age. *Evaluation Review, 34*(2), 83-115.

Conrad, Kendon J., & Smith, Everett V. (2004). International Conference on Objective Measurement: Applications of Rasch Analysis in Health Care. *Medical Care, 42*(1), I1-I6.

CSDH. (2008). Closing the gap in a generation: health equity through action on the social

determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva: World Health Organization.

Cummings, J. L., & Braboy Jackson, P. (2008). Race, gender, and SES disparities in self-assessed health, 1974-2004. *Research on Aging, 30*(2), 137-137.

Cúri, Mariana, Singer, Julio M, & Andrade, Dalton F. (2010). A model for psychiatric questionnaires with embarrassing items. *Statistical Methods in Medical Research*.

Davis, TC, Crouch, MA, Long, SW, Jackson, RH, Bates, P, George, RB, & Bairnsfather, LE. (1991). Rapid assessment of literacy levels in adult primary care patients. *Family Medicine, 23*(6), 433-435.

Davis TC, Long SW, Jackson RH, Mayeaux EJ, George RB, Murphy PW, Crouch MA. (1993). Rapid estimate of adult literacy in medicine: a shortened screening instrument. *Family Medicine, 25*(6), 391-395.

Davis, TC, Wolf, MS, CL, Arnold, Byrd, RS, Long, SW, Springer, T, . . . Bocchini, JA. (2006). Development and validation of the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen): a tool to screen adolescents for below-grade reading in health care settings. *Pediatrics, 118*(6), 1707-1714.

Davis, Terry C., Michielutte, Robert, Askov, Eunice N., Williams, Mark V., & Weiss, Barry D. (1998). Practical Assessment of Adult Literacy in Health Care. *Health Education & Behavior, 25*(5), 613-624. doi: 10.1177/109019819802500508

Davis, Terry C., Williams, Mark V., Marin, Estela, Parker, Ruth M., & Glass, Jonathan. (2002). Health Literacy and Cancer Communication. *CA Cancer J Clin, 52*(3), 134-149.

De Ayala, R. J. (2008). *The theory and practice of item response theory*: The Guilford Press.

Deane, Glenn , & Shin, Hyoung-jin. (2002). Technical Report: Comparability of the 2000 and 1990 Census Occupation Codes: Lewis Mumford Center for Comparative Urban and Regional Research. University at Albany.

Dell, Cindy Ann, Harrold, Barbara, & Dell, Thomas. (2008). Test Review: Wilkinson, G. S., & Robertson, G. J. (2006). Wide Range Achievement Test—Fourth Edition. Lutz, FL: Psychological Assessment Resources. WRAT4 Introductory Kit (includes manual, 25 test/response forms [blue and green], and accompanying test materials): $243.00. *Rehabilitation Counseling Bulletin, pp. 57-60 vol. 52:*.

DeRoos, Yosikazo S., & Allen-Meares, Paula. (1993). Rasch Analysis -- Its Description and Use Analyzing the Children's Depression Inventory. *Journal of Social Service Research, 16*(3), 1-17.

DeVellis, R. F. (2003). *Scale development: Theory and applications*: Sage Publications, Inc.

DeVellis, Robert F. (2006). Classical Test Theory. *Medical Care, 44*(11), S50-S59.

DeWalt, Darren A. (2007). Low Health Literacy: Epidemiology and Interventions. *North Carolina Medical Journal, 68*(5), 327-330.

DeWalt, Darren A., Berkman, Nancy D., Sheridan, Stacey, Lohr, Kathleen N., & Pignone, Michael P. (2004). Literacy and Health Outcomes. *JGIM: Journal of General Internal Medicine, 19*(12), 1228-1239.

DeWalt, Darren A., Broucksou, Kimberly A., Hawk, Victoria, Brach, Cindy, Hink, Ashley, Rudd, Rima, & Callahan, Leigh. (2011). Developing and testing the health literacy universal precautions toolkit. *Nursing outlook, 59*(2), 85-94. doi: 10.1016/j.outlook.2010.12.002

Diamond, JJ. (2007). Development of a reliable and construct valid measure of nutritional literacy in adults. *Nutrition Journal, 6*(5).

Diez Roux, Ana V., & Mair, Christina. (2010). Neighborhoods and health. *Annals of the New York Academy of Sciences, 1186*(1), 125-145.

Do, D. Phuong, Finch, Brian Karl, Basurto-Davila, Ricardo, Bird, Chloe, Escarce, Jose, & Lurie, Nicole. (2008). Does place explain racial health disparities? Quantifying the contribution of residential context to the Black/white health gap in the United States. *Social Science & Medicine, 67*(8), 1258-1268. doi: DOI: 10.1016/j.socscimed.2008.06.018

Donovan-Kicken, Erin, Mackert, Michael, Guinn, Trey D., Tollison, Andrew C., Breckinridge, Barbara, & Pont, Stephen J. (2012). Health Literacy, Self-Efficacy, and Patients' Assessment of Medical Disclosure and Consent Documentation. *Health Communication, 27*(6), 581-590.

Douthitt, Robin A., Macdonald, Maurice, & Mullis, Randolph. (1992). The relationship between measures of subjective and economic well-being: A new look. *Social Indicators Research, 26*(4).

Duncan, Greg J., Daly, Mary C., McDonough, Peggy, & Williams, David R. (2002). Optimal Indicators of Socioeconomic Status for Health Research. *American Journal of Public Health, 92*(7), 1151-1157. doi: 10.2105/AJPH.92.7.1151

10.2105/AJPH.92.7.1151</p>

10.2105/AJPH.92.7.1151
PB - American Public Health Association

Dupre, Matthew E., & Goerge, Linda K. (2011). Exceptions to the Rule: Exceptional Health Among the Disadvantaged. *Research on Aging, 33*(2), 115-144.

Easton, Phyllis, Entwistle, Vikki A., & Williams, Brian. (2010). Health in the 'hidden population' of people with low literacy. A systematic review of the literature. *BMC public health, 10*. doi: 10.1186/1471-2458-10-459

Edelen, Maria Orlando, & Reeve, Bryce B. (2007). Applying item response theory (IRT) modeling to questionnaire development, evaluation, and refinement. *Quality of Life Research, 16*, 5-18.

Elder, Catherine, Barber, Melissa, Staples, Margaret, Osborne, Richard H., Clerehan, Rosemary, & Buchbinder, Rachelle. (2012). Assessing Health Literacy: A New Domain for Collaboration Between Language Testers and Health Professionals. *Language Assessment Quarterly, 9*(3), 205-224. doi: 10.1080/15434303.2011.627751

10.1080/15434303.2011.627751</p>

Embretson, Susan E., & Reise, Steve P. (2000). *Item Response Theory for Psychologists*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Ferraro, Kenneth F., & Farmer, Melissa M. (1999). Utility of Health Data from Social Survey: Is There a Gold Standard for Measuring Morbidity? *American Sociological Review, 64*(2), 303-315.

Fiscella, Kevin, Franks, Peter, Doescher, Mark P., & Saver, Barry G. (2002). Disparities in Health Care by Race, Ethnicity, and Language Among the Insured: Findings From a National Sample. *Medical Care, 40*(1).

Fortenberry, J, McFarlane, M, Hennessy, M, Bull, S, Grimley, D, StLawrence, J, . . . VanDevanter, N. (2001). Relation of health literacy to gonorrhoea related care. *Sex Transmitted Infections, 77*(3), 206-211.

Foulk, David, Carroli, Pamela, & Wood, Susan Nelson. (2001). ADDRESSING HEALTH LITERACY: A DESCRIPTION OF THE INTERSECTION OF FUNCTIONAL LITERACY AND HEALTH CARE. *American Journal of Health Studies, 17*(1), 7-7.

Fox, JB, & Richards, CL. (2010). Vital Signs: Health Insurance Coverage and Health Care Utilization --- United States, 2006--2009 and January--March 2010 *Morbidity and Mortality Weekly Report (MMWR)* (Vol. 59). Atlanta, GA: Centers for Disease Control and Prevention.

Franks, P., & Fiscella, K. (2008). Reducing disparities downstream: prospects and challenges. *Journal of general internal medicine, 23*(5), 672-677.

Freedman, Darcy A., Bess, Kimberly D., Tucker, Holly A., Boyd, David L., Tuchman, Arleen M., & Wallston, Kenneth A. (2009). Public Health Literacy Defined. *American Journal of Preventive Medicine, 36*(5), 446-451. doi: DOI: 10.1016/j.amepre.2009.02.001

Freese, Jeremy, & Lutfey, Karen. (2010). Fundamental Causality: Challenges of an Animating Concept for Medical Sociology. In B. A. Pescosolido, J. K. Martin, J. D. McLeod & A. Rogers (Eds.), *The Handbook of the Sociology of Health, Illness, and Healing: A Blueprint for the 21st Century*: Springer.

Frisch, Anne-Linda, Camerini, Luca, Diviani, Nicola, & Schulz, Peter J. (2012). Defining and measuring health literacy: how can we profit from other literacy domains? *Health Promotion International, 27*(1), 117-126. doi: Article

Fryback, Dennis G., Palta, Mari, Cherepanov, Dasha, Bolt, Daniel, & Kim, Jee-Seon. (2010). Comparison of 5 Health-Related Quality-of-Life Indexes Using Item Response Theory Analysis. *Medical Decision Making, 30*(1), 5-15.

Gauvin, Lise, Robitaille, Eric, Riva, Mylène, McLaren, Lindsay, Dassa, Clement, & Potvin, Louise. (2007). Conceptualizing and Operationalizing Neighborhoods. *Canadian Journal of Public Health, 98*(S1), S18-S26.

Gazmararian, Julie A., Baker, David W., Williams, Mark V., Parker, Ruth M., Scott, Tracy L., Green, Diane C., . . . Koplan, Jeffrey P. (1999). Health Literacy Among Medicare Enrollees in a Managed Care Organization. *JAMA, 281*(6), 545-551.

Gazmararian, Julie, Baker, David, Parker, Ruth, & Blazer, Dan G. (2000). A Multivariate Analysis of Factors Associated With Depression: Evaluating the Role of Health Literacy as a Potential Contributor. *Arch Intern Med, 160*(21), 3307-3314.

Giled, Sherry, & Lleras-Muney, Adriana. (2008). Technological Innovation and Ineqaulity in Health. *Demography, 45*(3), 741-761.

Gong, DA, Lee, JY, Rozier, RG, Pahel, BT, Richman, JA, & Jr., Vann WF. (2007). Development and testing of the Test of Functional Health Literacy in Dentistry (TOFHLiD). *Journal of Public Health Dentistry, 67*(2), 105-112.

Graham, H. (2000). Socio-economic change and inequalities in men and women's health.

Graham, H. (2004). Social Determinants and Their Unequal Distribution: Clarifying Policy Understandings. *Milbank Quarterly, 82*(1), 101-124.

Greenberg, Daphne. (2001). A CRITICAL LOOK AT HEALTH LITERACY. *Adult Basic Education, 11*(2).

Hackl, Franz, Halla, Martin, & Pruckner, Gerald J. (2007). Volunteering and Income – The Fallacy of the Good Samaritan? *Kyklos, 60*(1), 77-104. doi: 10.1111/j.1467-6435.2007.00360.x

Hambleton, Ronald K. (2000). Emergence of Item Response Modeling in Instrument Development and Data Analysis. *Medical Care, 38*(9), II60-II65-II60-II65.

Hambleton, Ronald K., Swaminathan, H., & Rogers, H. Jane. (1991). *Fundamentals of Item Response Theory*. Newbury Park, CA: SAGE Publications Ltd.

Hanchate, Amresh D., Ash, Arlene S., Gazmararian, Julie A., Wolf, Michael S., & Paasche-Orlow, Michael K. (2008). The Demographic Assessment for Health Literacy (DAHL): A New Tool for Estimating Associations between Health Literacy and Outcomes in National Surveys. *JGIM: Journal of General Internal Medicine, 23*(10), 1561-1566. doi: 10.1007/s11606-008-0699-5

Hanson-Divers, EC. (1997). Developing a medical achievement reading test to evaluate patient literacy skills: A preliminary study. *Journal of Health Care for the Poor and Underserved, 8*(1), 56-69.

Hargraves, J. L., & Hadley, J. (2003). The contribution of insurance coverage and community resources to reducing racial/ethnic disparities in access to care. *Health services research, 38*(3), 809-829.

Haviland, Amelia M., Elliott, Marc N., Weech-Maldonado, Robert, Hambarsoomian, Katrin, Orr, Nate, & Hays, Ron D. (2012). Racial/Ethnic Disparities in Medicare Part D Experiences. *Medical Care, 50*.

Hays, Judith C., Schoenfeld, David, Blazer, Dan G., & Gold, Deborah T. (1996). Global self-ratings of health and mortality: Hazard in the North Carolina Piedmont. *Journal of Clinical Epidemiology, 49*(9), 969-979. doi: Doi: 10.1016/0895-4356(96)00138-2

Hays, Ron D., Morales, Leo S., & Reise, Steve P. (2000). Item Response Theory and Health Outcomes Measurement in the 21st Century. *Medical Care, 38*(9), II28-II42-II28-II42.

Hayward, Mark D., Miles, Toni P., Crimmins, Eileen M., & Yang, Yu. (2000). The Significance of Socioeconomic Statu in Explaining the Racial Gap in Chronic Health Conditions. *American Sociological Review, 65*(6), 910-930.

Hayward, Peter, Cramer, Brandon, Nepaul, Ava, Osleeb, Jeffery, & Vias, Alexander. (2008). *The Spatial Context of Health Disparities: A Literature Review*.

Himmelstein, David U., Warren, Elizabeth, Thorne, Deborah, & Woolhandler, Steffie. (2005). MarketWatch: Illness And Injury As Contributors To Bankruptcy. *Health Affairs*.

House, James S. (2001). Understanding Social Factors and Inequalities in Health: 20th Century Progress and 21st Century Prospects. *Journal of Health and Social Behavior, 43*(June), 125-142.

House, James S., Kessler, Ronald C., & Herzog, A. Regula. (1990). Age, Socioeconomic Status, and Health. *The Milbank Quarterly, 68*(3), 383-411.

House, James S., Landis, Karl R., & Umberson, Debra. (1988). Social Relationships and Health. *Science, 241*(4865), 540-545.

House, James S., Leplowski, James M., Kineey, Ann M., Mero, Richard P., Kessler, Ronald C., & Herzog, A. Regula. (1994). The Social Stratification of Aging and Health. *Journal of Health and Social Behavior, 35*(3), 213-234.

Howard, David H., Sentell, Tetine, & Gazmararian, Julie A. (2006). Impact of Health Literacy on Socioeconomic and Racial Differences in Health in an Elderly Population. *JGIM: Journal of General Internal Medicine, 21*(8), 857-861.

Hummer, Robert A. (1996). BLACK-WHITE DIFFERENCES IN HEALTH AND MORTALITY. *Sociological Quarterly, 37*(1), 105-125. doi: 10.1111/j.1533-8525.1996.tb02333.x

Idler, E. L. (1992). Self-assessed health and mortality: a review of studies. *International review of health psychology, 1*, 33-54.

Idler, Ellen L., & Benyamini, Yael. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior, 38*(1), 21-37.

Idler, Ellen, Leventhal, Howard, McLaughlin, Julie, & Leventhal, Elaine. (2004). In Sickness but Not in Health: Self-ratings, Identity, and Mortality. *Journal of Health and Social Behavior, 45*(3), 336-356.

Institute of Medicine. (2012). *How Far Have We Come in Reducing Health Disparities?: Progress Since 2000: Workshop Summary*: The National Academies Press.

Ishikawa, Hirono, & Kiuchi, Takahiro. (2010). Health literacy and health communication. *BioPsychoSocial Medicine, 4*(1), 18.

Isserman, A. M. (2005). In the national interest: Defining rural and urban correctly in research and public policy. *International Regional Science Review, 28*(4), 465-465.

Isserman, A. M., Feser, E., & Warren, D. E. (2009). Why some rural places prosper and others do not. *International Regional Science Review, 32*(3), 300-300.

Isserman, A. M., Rephann, T., & Sorenson, D. J. (1989). *Highways and rural economic development: Results from quasi-experimental approaches*.

Jahan, Raquiba A. (2000). Promoting health literacy: a case study in the prevention of diarrhoeal disease from Bangladesh. *Health Promot. Int., 15*(4), 285-291.

Jeppesen, Kelly M., Coyle, James D., & Miser, William F. (2009). Screening Questions to Predict Limited Health Literacy: A Cross-Sectional Study of Patients With Diabetes Mellitus. *Annals of Family Medicine, 7*(1), 24-31.

Jin, Ying, Greenberg, Elizabeth, & Baer, Justin. (2007). 2003 National Assessment of Adult Literacy: Restricted-Use Data File User's Guide (NCES 2007-492). In N. C. f. E. S. U.S. Department of Education (Ed.). Washington, DC: National Center for Education Statistics.

Johnson, Robert J., & Wolinsky, Fredric D. (1993). The Structure of Health Status Among Older Adults: Disease, Disability, Functional Limitation, and Perceived Health. *Journal of Health and Social Behavior, 34*(2), 105-121.

Johnson, V., Currie, G., & Stanley, J. (2010). Measures of Disadvantage: is Car Ownership a Good Indicator? *Social Indicators Research, 97*(3), 439-450.

Jovic-Vranes, Aleksandra, Bjegovic-Mikanovic, Vesna, & Marinkovic, Jelena. (2009). Functional health literacy among primary health-care patients: data from the Belgrade pilot study. *J Public Health, 31*(4), 490-495.

Kalichman, SC, Benotsch, E, Suarez, T, Catz, S, Miller, J, & Rompa, D. (2000). Health literacy and health-related knowledge among persons living with HIV/AIDS. *American Journal of Preventive Medicine, 18*(4), 325-331.

Kawachi, Ichiro, & Kennedy, Bruce P. (1997). Socioeconomic determinants of health : Health and social cohesion: why care about income inequality? *British Medical Journal, 314*(7089), 1037.

Kawachi, Ichiro, Kennedy, Bruce P., & Glass, Roberta. (1999). Social Capital and Self-Rated Health: A Contextual Analysis. *American Journal of Public Health, 89*(8), 1187-1193.

Kickbusch, Ilona S. (2001). Health literacy: addressing the health and education divide. *Health Promot. Int., 16*(3), 289-297.

Kirby, James B., & Kaneda, Toshiko. (2005). Neighboirhood Socioeconomic Disadvantage and Access to Health Care. *Journal of Health and Social Behavior, 46*(March), 15-31.

Koh, Howard K., Baur, Cynthia, Brach, Cindy, Harris, Linda M., & Rowden, Jessica N. (2013). Toward a Systems Approach to Health Literacy Research. *Journal of Health Communication, 18*(1), 1-5. doi: 10.1080/10810730.2013.759029

10.1080/10810730.2013.759029</p>

10.1080/10810730.2013.759029
PB - Taylor & Francis

Koh, Howard K., Berwick, D. M., Clancy, C. M., Baur, C., Brach, C., Harris, L. M., & Zerhusen, E. G. (2012). New Federal Policy Initiatives To Boost Health Literacy Can Help The Nation Move Beyond The Cycle Of Costly 'Crisis Care'. *Health Affairs, 31*(2), 434-443.

Koh, Howard K., Brach, Cindy, Harris, Linda M., & Parchman, Michael L. (2013). A Proposed 'Health Literate Care Model' Would Constitute A Systems Approach To Improving Patients' Engagement In Care. *Health Affairs, 32*(2), 357-367.

Krieger, N. (2000). Discrimination and health. *Social epidemiology, 1*, 36-75.

Krieger, N., Williams, D. R., & Moss, N. E. (1997). Measuring Social Class in US Public Health Research: Concepts, Methodologies, and Guidelines. *Annual Review of Public Health, 18*(1), 341-378. doi: 10.1146/annurev.publhealth.18.1.341

10.1146/annurev.publhealth.18.1.341</p>

10.1146/annurev.publhealth.18.1.341
PB - Annual Reviews

Krieger, N., Williams, D. R., & Moss, N. E. (2011). Measuring Social Class in US Public Health Research: Concepts, Methodologies, and Guidelines. *Annu. Rev. Public. Health., 18*(1), 341-378. doi: 10.1146/annurev.publhealth.18.1.341

10.1146/annurev.publhealth.18.1.341</p>

Krieger, Nancy. (2003). Does Racism Harm Health? Did Child Abuse Exist Before 1962? On Explicit Questions, Critical Science, and Current Controversies: An Ecosocial Perspective. *Am J Public Health, 93*(2), 194-199.

Kripalani, Sunil, Paasche-Orlow, Michael K., Parker, Ruth M., & Saha, Somnath. (2006). Advancing the Field of Health Literacy. *JGIM: Journal of General Internal Medicine, 21*(8), 804-805.

Kurbanoglu, S. Serap. (2003). Self-efficacy: a concept closely linked to information literacy and lifelong learning. *Journal of Documentation, 59*(6), 635-646.

Kurbanoglu, S. Serap, Akkoyunlu, Buket, & Umay, Aysun. (2006). Developing the information literacy self-efficacy scale. *Journal of Documentation, 62*(6), 730-743.

Kutner, M., Greenberg, E., Jin, Y., & Paulsen, C. (2006). The Health Literacy of America's Adults: Results From the 2003 National Assessment of Adult Literacy. Washington, D.C.: National Center for Education Statistics.

Kutner, M., Greenberg, Elizabeth, Jin, Y., Boyle, B., Hsu, Y., & Paulsen, C. (2006). Literacy in Everyday Life: Results From the 2003 National Assessment of Adult Literacy (NCES 2006–477). In N. C. f. E. S. U.S. Department of Education (Ed.). Washington, DC: National Center for Educational Statistics., U.S. Department of Education National Center for Education.

Lambrew, J. M., & Fund, C. (2001). *Diagnosing disparities in health insurance for women: a prescription for change*: Commonwealth Fund.

LaVeist, ThomasA. (2005). Disentangling race and socioeconomic status: A key to understanding health inequalities. *Journal of Urban Health, 82*(3), iii26-iii34. doi: 10.1093/jurban/jti061

Lavelle, Bridget, & Smock, Pamela J. (2012). Divorce and Women's Risk of Health Insurance Loss. *Journal of Health and Social Behavior, 53*(4), 413-431.

Lee, Shoou-Yih D., Arozullah, Ahsan M., & Cho, Young Ik. (2004). Health literacy, social support, and health: a research agenda. *Social Science & Medicine, 58*(7), 1309-1321. doi: Doi: 10.1016/s0277-9536(03)00329-0

Lee, SY, Bender, D, Ruiz, R, & Cho, Y. (2006). Development of an easy-to-use Spanish health literacy test. *Health Services Research, 4*(1), 1392-1412.

Lee, Y., & Brudney, J. L. (2009). Rational volunteering: a benefit-cost approach. *International Journal of Sociology and Social Policy, 29*(9/10), 512-530.

Leung, Kwok, & Drasgow, Fritz. (1986). Relation between Self-Esteem and Delinquent Behavior in Three Ethnic Groups: An Application of Item Response Theory. *Journal of Cross-Cultural Psychology, 17*(2), 151-167.

Lillie-Blanton, Marsha, & Hoffman, Catherine. (2005). The Role Of Health Insurance Coverage In Reducing Racial/Ethnic Disparities In Health Care. *Health Affairs, 24*(2), 398-408.

Lincoln, Alisa, Paasche-Orlow, Michael K., Cheng, Debbie M., Lloyd-Travaglini, Christine, Caruso, Christine, Saitz, Richard, & Samet, Jeffrey H. (2006). Impact of Health Literacy on Depressive Symptoms and Mental Health-related Quality of Life Among Adults with Addiction. *JGIM: Journal of General Internal Medicine, 21*(8), 818-822.

Lindau, Stacy Tessler, Basu, Anirban, & Leitsch, Sara A. (2006). Health Literacy as a Predictor of Follow-Up After an Abnormal Pap Smear A Prospective Study. *JGIM: Journal of General Internal Medicine, 21*(8), 829-834.

Link, Bruce G. (2008). Epidemiological sociology and the social shaping of population health. *Journal of Health and Social Behavior, 49*(4), 367.

Link, Bruce G., Northridge, Mary E., Phelan, Jo C., & Ganz, Michael L. (1998). Social Epidemiology and the Fundamental Cause Concept: On the Structuring of Effective Cancer Screens by Socioeconomic Status. *The Milbank Quarterly, 76*(3), 375-402.

Link, Bruce G., & Phelan, Jo C. (1995). Social Conditions As Fundamental Causes of Disease. *Journal of Health and Social Behavior, 35*(Extra Issue: Forty Years of Medical Sociology: The State of the Art and Directions for the Future), 80-94.

Link, Bruce G., & Phelan, Jo C. (1996). Understanding Socioeconomic Differences in Health - The Role of Fundamental Causes. *American Journal of Public Health, 86*(4), 471-472.

Link, Bruce G., & Phelan, Jo C. (2002). McKeown and the Idea That Social Conditions Are Fundamental Causes of Disease. *Health Policy and Ethics, 92*(5), 730-732.

Link, Bruce G., Phelan, Jo C., Miech, Richard, & Westin, Emily L. (2008). The Resources That Matter: Fundamental Social Causes of Health Disparities and the Challenge of Intelligence. *Journal of Health and Social Behavior, 49*(March), 72-91.

Lobao, L. M., Hooks, G., & Tickamyer, A. R. (2007). *The sociology of spatial inequality*: State Univ of New York Pr.

Lobao, Linda, & Saenz, Rogelio. (2002). Spatial Inequality and Diversity as an Emerging Research Area. *Rural Sociology, 67*(4), 497-511.

Lurie, N., & Parker, R. (2007). Editorial: Moving health literacy from the individual to the community. *American Journal of Health Behavior, 31*(supp), 6-7.

Lutfey, Karen, & Freese, Jeremy. (2005). Toward Some Fundamentals of Fundamental Causality: Socioeconomic Status and Health in the Routine Clinic Visit for Diabetes. *American Journal of Sociology, 110*(5), 1326-1372.

Lynch, John, Smith, George Davey, Harper, S. A. M., Hillemeier, Marianne, Ross, Nancy, Kaplan, George A., & Wolfson, Michael. (2004). Is Income Inequality a Determinant of Population Health? Part 1. A Systematic Review. *Milbank Quarterly, 82*(1), 5-99.

Lynch, John W., & Kaplan, George A. (1997). Understanding how inequality in the distribution of income affects health. *Journal of Health Psychology, 2*(3), 297-297.

Lynch, Scott M. (2003). Cohort and Life-Course Patterns in the Relationship Between Education and Health: A Hierarchical Approach. *Demography, 40*(2), 309-331.

MacIntosh, Randall. (1998). Global Attitude Measurement: An Assessment of the World Values Survey Postmaterialism Scale. *American Sociological Review, 63*(3), 452-464.

Maddox, George L., & Douglass, Elizabeth B. (1973). Self-Assessment of Health: A Longitudinal Study of Elderly Subjects. *Journal of Health and Social Behavior, 14*(1), 87-93. doi: 10.2307/2136940

Marmot, M. G., & Smith, G. D. (1991). Health inequalities among British civil servants: The Whitehall II study. *Lancet, 337*(8754), 1387-1387.

Massey, Douglas S., & Denton, Nancy A. (1987). Trends in the Residential Segregation of Blacks, Hispanics, and Asians: 1970-1980. *American Sociological Review, 52*(6), 802-825.

Mays, V. M., Yancey, A. K., Cochran, S. D., Weber, M., & Fielding, J. E. (2002). Heterogeneity of health disparities among African American, Hispanic, and Asian American women: unrecognized influences of sexual orientation. *Journal Information, 92*(4).

McCormack, L., Bann, C., Squiers, L., Berkman, N. D., Squire, C., Schillinger, D., . . . Hibbard, J. (2010). Measuring Health Literacy: A Pilot Study of a New Skills-Based Instrument. *Journal of Health Communication, 15*, 51-71.

McDonough, Peggy, Williams, David R., House, James S., & Duncan, Greg J. (1999). Gender and the Socioeconomic Gradient in Mortality. *Journal of Health and Social Behavior, 40*(1), 17-31.

McGee, Daniel L., Liao, Youlian, Cao, Guichan, & Cooper, Richard S. (1999). Self-reported Health Status and Mortality in a Multiethnic US Cohort. *American Journal of Epidemiology, 149*(1), 41-46.

McHorney, Colleen A., & Cohen, Allan S. (2000). Equating Health Status Measures with Item Response Theory: Illustrations with Functional Status Items. *Medical Care, 38*(9), II43-II59-II43-II59.

McKinlay, John B. (1975). *A Case For Refocusing Upstream: The Political Economy of Illness.* Paper presented at the Conference on Applying Behavioral Science to Cardiovascular Risk, Seattle, WA.

McLaughlin, Diane K., Stokes, C. Shannon, Smith, P. Johnelle, & Nonoyama, Atsuko. (2007). Differential Mortality Across the United States. In L. M. Lobao, G. Hooks & A. R. Tickamyer (Eds.), *The sociology of spatial inequality*: State Univ of New York Pr.

Meade, Adam W. (2010). A taxonomy of effect size measures for the differential functioning of items and scales. *Journal of Applied Psychology, 95*(4), 728-743.

Meade, Adam W., & Lautenschlager, Gary J. (2004). A Comparison of Item Response Theory and Confirmatory Factor Analytic Methodologies for Establishing Measurement Equivalence/Invariance. *Organizational Research Methods, 7*(4), 361-388. doi: 10.1177/1094428104268027

Mechanic, D. (1994). *Inescapable decisions: The imperatives of health reform*: Transaction Pub.

Menchik, Paul L., & Weisbrod, Burton A. (1987). Volunteer labor supply. *Journal of Public Economics, 32*(2), 159-183. doi: 10.1016/0047-2727(87)90010-7

Meredith, William, & Teresi, Jeanne A. (2006). An Essay on Measurement and Factorial Invariance. *Medical Care, 44*(11).

Meyer, P. B., & Osborne, A. M. (2005). Proposed category system for 1960-2000 Census occupations.

Mirowsky, J., & Ross, C. E. (2003). *Education, social status, and health*: Aldine de Gruyter.

Moore, Spencer, Bockenholt, Ulf, Daniel, Mark, Frohlich, Katherine, Kestens, Yan, & Richard, Lucie. (2011). Social capital and core network ties: A validation study of individual-level social capital measures and their association with extra- and intra-neighborhood ties, and self-rated health. *Health & Place, 17*(2), 536-544. doi: DOI: 10.1016/j.healthplace.2010.12.010

Morgan, Stephen L., & Sørensen, Aage B. (1999). Parental Networks, Social Closure, and Mathematics Learning: A Test of Coleman's Social Capital Explanation of School Effects. *American Sociological Review, 64*(5), 661-681.

Mustard, C. A., & Frohlich, N. (1995). Socioeconomic status and the health of the population. *Medical Care, 33*(12), DS43-DS43.

Nabi, R. L., & Oliver, M. B. (2009). *The SAGE handbook of media processes and effects*: Sage Publications, Inc.

Nam, Charles. (2000). Comparison of three occupational scales. *Florida State University Center of Population, Working paper*.

Nam, Charles, & Boyd, Monica (2004). Occupational Status in 2000: Over a Century of Census-Based Measurement. *Population Research and Policy Review, 23*, 327-358.

Nath, CR, Sylvester, ST, Yasek, V, & Gunel, E. (2001). Development and validation of a literacy assessment tool for persons with diabetes. *The Diabetes Educator, 27*(6), 857-864.

. National Healthcare Disparities Report 2011. (2012). Rockville, MD: Agency for Healthcare Research and Quality.

Nielsen-Bohlman, L, Panzer, AM, & Kindig, DA. (2004). *Health literacy: A prescription to end confusion*: Natl Academy Pr.

Nielsen-Bohlman, Lynn, Panzer, Allison M., & Kindig, David A. (Eds.). (2004). *Health Literacy: A Prescription to End Confusion*. Washington, D.C.: The National Academies Press.

Norquist, Josephine M., Fitzpatrick, Ray, Dawson, Jill, & Jenkinson, Crispin. (2004). Comparing Alternative Rasch-Based Methods vs Raw Scores in Measuring Change in Health. *Medical Care, 42*(1), I25-I36-I25-I36.

Nugent, William R., & Hankins, Janette A. (1989). The Use of Item-Response Theory in Social Work Measurement and Research. *The Social Service Review, 63*(3), 447-473.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine, 67*(12), 2072-2078.

Nutbeam, Don. (1998). Health Promotion Glossary *Health Promotion International, 13*(4), 349-364.

Nutbeam, Don. (1999). Literacies across the Lifespan: Health Literacy. *Literacy & Numeracy Studies, 9*(2), 47-56.

Nutbeam, Don. (2000a). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot. Int., 15*(3), 259-267.

Nutbeam, Don. (2000b). Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International, 15*(3), 259-267.

Oakes, J. Michael, & Rossi, Peter H. (2003). The measurement of SES in health research: current practice and steps toward a new approach. *Social Science & Medicine, 56*(4), 769-784. doi: 10.1016/S0277-9536(02)00073-4

Olafsdottir, Sigrun. (2007). Fundamental Causes of Health Disparities: Stratification, the Welfare State, and Health in the United States and Iceland. *Journal of Health and Social Behavior, 48*(3), 239-253.

Osborn, Chandra Y., Paasche-Orlow, Michael K., Davis, Terry C., & Wolf, Michael S. (2007). Health literacy: an overlooked factor in understanding HIV health disparities. *American journal of preventive medicine, 33*(5).

Osgood, D. Wayne, Finken, Laura L., & McMorris, Barbara J. (2002). Analyzing Multiple-Item Measures of Crime and Deviance II: Tobit Regression Analysis of Transformed Scores. *Journal of Quantitative Criminology, 18*(4), 319-347.

Osgood, D. Wayne, McMorris, Barbara J., & Potenza, Maria T. (2002). Analyzing Multiple-Item Measures of Crime and Deviance I: Item Response Theory Scaling. *Journal of Quantitative Criminology, 18*(3), 267-296.

Ownby, Raymond L., Waldrop-Valverde, Drenna, & Taha, Jessica. (2012). Why Is Health Literacy Related to Health? An Exploration Among U.S. National Assessment of Adult Literacy Participants 40 Years of Age and Older. *Educational Gerontology, 38*(11), 776-787. doi: 10.1080/03601277.2011.645441

10.1080/03601277.2011.645441</p>

Pappas, Gregory, Queen, Susan, Hadden, Wilbur, & Fisher, Gail. (1993). The Increasing Disparity in Mortality between Socioeconomic Groups in the United States, 1960 and 1986. *N Engl J Med, 329*(2), 103-109.

Parker, R., Baker, D., Williams, M., & Nurss, J. (1995). The test of functional health literacy in adults: A new instrument for measuring patients' health literacy. *Journal of General Internal Medicine, 10*, 537-541.

Patrick, Donald L., & Chiang, Yen-pin. (2000). Measurement of Health Outcomes in Treatment Effectiveness Evaluations: Conceptual and Methodological Challenges. *Medical Care, 38*(9), II14-II25-II14-II25.

Payne, Sarah. (2004). Gender influences on men's health. *The Journal of the Royal Society for the Promotion of Health, 124*(5), 206-207.

Pease, Bob. (2009). Racialised masculinities and the health of immigrant and refugee men. *Men's Health: Body, Identity and Context. Chichester, United Kingdom: John Wiley and Sons*, 182-201.

Peerson, A., & Saunders, M. (2009). Men's health literacy: advancing evidence and priorities. *Critical public health, 19*(3-4), 441-456.

Peerson, Anita, & Saunders, Margo. (2009). Health literacy revisited: what do we mean and why does it matter? *Health Promot. Int., 24*(3), 285-296.

Phelan, Jo C., & Link, Bruce G. (2005a). Controlling Disease and Creating Disparities: A Fundamental Cause Perspective. *Journal of Gerontology, Series B, 60B*(Special Issue II), 27-33.

Phelan, Jo C., & Link, Bruce G. (2005b). Controlling Disease and Creating Disparities: A Fundamental Cause Perspective. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 60*(Special Issue 2), S27-S33-S27-S33.

Phelan, Jo C., Link, Bruce G., Diex-Roux, Ana, Kawachi, Ichiro, & Levin, Bruce. (2004). "Fundamental Causes" of Social Inequalities in Mortality: A Test of the Theory. *Journal of Health and Social Behavior, 45*(3), 265-285.

Phelan, Jo C., Link, Bruce G., & Tehranifar, Parisa. (2010). Social Conditions as Fundamental Causes of Health Inequalities. *Journal of Health and Social Behavior, 51*(1 suppl), S28-S40-S28-S40.

Piliavin, Jane Allyn, & Siegl, Erica. (2007). Health Benefits of Volunteering in the Wisconsin Longitudinal Study. *Journal of Health and Social Behavior, 48*(4), 450-464.

Pleasant, A. (2008). A Second Look at the Health Literacy of American Adults and the National Assessment of Adult Literacy. *Focus on Basics*, 46-52.

Pleasant, A. (2009a). *Health literacy measurement: A brief review and proposal.* Paper presented at the Measures of health literacy: Workshop summary, Washington, D.C.

Pleasant, A. (2009b). Measures of Health Literacy: Workshop Summary. In I. I. o. Medicine) (Ed.), *Health Literacy Measurement: A Brief Review and Proposal*. Washington, DC: The National Academies Press.

Pleasant, A., & Kuruvilla, S. (2008). A tale of two health literacies: public health and clinical approaches to health literacy. *Health Promot. Int., 23*, 152-159.

Pleasant, A., & McKinney, J. (2011). Coming to consensus on health literacy measurement: An online discussion and consensus-gauging process. *Nursing Outlook, 59*(2), 95-106.e101.

Pleasant, A., McKinney, J., & Rikard, R. V. (2011). Health literacy measurement: A proposed research agenda. *Journal of Health Communication, 16*(sup3), 11-21.

Quadagno, Jill. (2005). *One nation, uninsured: Why the US has no national health insurance*: Oxford University Press, USA.

Quesnel-Vallée, Amélie. (2004). Is it Really Worse to Have Public Health Insurance Than to Have No Insurance at All? Health Insurance and Adult Health in the United States. *Journal of Health and Social Behavior, 45*(4), 376-392.

Quesnel–Vallée, Amélie. (2007). Self-rated health: caught in the crossfire of the quest for 'true' health? *International Journal of Epidemiology, 36*(6), 1161-1164.

Raju, Nambury S., Laffitte, Larry J., & Byrne, Barbara M. (2002). Measurement equivalence: A comparison of methods based on confirmatory factor analysis and item response theory. *Journal of Applied Psychology, 87*(3), 517-529.

Ratzan, S.C., & Parker, R.M. (2000). Introduction. In C. R. Selden, Zorn, M., Ratzan, S.C., Parker, R. M. (Ed.), *Current bibliographies in medicine: health literacy.* . Bethesda, MD: National Library of Medicine.

Raudenbush, Stephen W., Johnson, Christopher, & Sampson, Robert J. (2003). A Multivariate, Multilevel Rasch Model with Application to Self-Reported Criminal Behavior. *Sociological Methodology, 33*, 169-211.

Read, Jen'nan Ghazal, & Gorman, Bridget K. (2011). Gender and Health Revisited. In B. A. Pescosolido, J. K. Martin, J. D. McLeod & A. Rogers (Eds.), *Handbook of the Sociology of Health, Illness, and Healing* (pp. 411-429): Springer New York.

Read, Jen'nanGhazal, & Gorman, BridgetK. (2011). Gender and Health Revisited. In B. A. Pescosolido, J. K. Martin, J. D. McLeod & A. Rogers (Eds.), *Handbook of the Sociology of Health, Illness, and Healing* (pp. 411-429): Springer New York.

Reder, Stephen. (1994). NALS Raises Vital Equity Issues. *NCAL Connections*(Feb 1994), 6-8.

Reiser, Mark. (1989). An Application of the Item-Response Model to Psychiatric Epidemiology. *Sociological Methods & Research, 18*(1), 66-103.

Richardson, Noel, & Carroll, Paula C. (2009). Getting men's health onto a policy agenda-charting the development of a National Men's Health Policy in Ireland. *Journal of men's health, 6*(2), 105-113.

Rikard, R. V., Thompson, Maxine S., Head, Rachel, McNeil, Carlotta, & White, Caressa. (2012). Problem Posing and Cultural Tailoring: Developing an HIV/AIDS Health Literacy Toolkit With the African American Community. *Health promotion practice, 13*(5), 626-636. doi: 10.1177/1524839911416649

Riva, Mylène, Gauvin, Lise, & Barnett, Tracie A. (2007). REVIEW: Toward the next generation of research into small area effects on health: a syntnesis of multilevel investigations published since July 1998. *Journal of Epidemiology and Community Health (1979-), 61*(10), 853-861.

Robert, Stephanie A. (1999). Socioeconomic Position and Health: The Independent Contribution of Community Socioeconomic Context. *Annual Review of Sociology, 25*, 489-516.

Robinson, Mark, & Robertson, Steve. (2013). Health information needs of men. *Health Education Journal*.

Rootman, I, & Ronson, B. (2003). Literacy and health research in Canada: Where have we been and where should we go? viewed January 2005.

Rosal, Milagros C., Goins, Karin Valentine, Carbone, Elena T., & Cortes, Dharma E. (2004). Views and Preferences of Low-Literate Hispanics Regarding Diabetes Education: Results of Formative Research. *Health Education & Behavior, 31*(3), 388-405.

Ross, Catherine E., & Mirowsky, John. (2008). Neighborhood Socioeconomic Status and Health: Context or Composition. *City & Community, 7*(2), 163-179.

Ross, Catherine E., & Mirowsky, John. (2009). Neighborhood Disorder, Subjective Alienation, and Distress. *Journal of Health and Social Behavior, 50*, 49-64.

Ross, Cathrine E., & Mirowsky, John. (2001). Neighborhood Disadvantage, Disorder, and Health. *Journal of Health and Social Behavior, 42*(3), 258-276.

Rudd, R., Kirsch, I., & Yamamoto, K. (2004). Literacy and health in America. Princeton, NJ: Educational Testing Service.

Rudd, Rima E. (2004). Adult Education and Public Health Partner to Address Health Literacy Needs. *Adult Learning, 15*(1/2), 7-9.

Ruiter, Stijn, & De Graaf, Nan Dirk. (2009). Socio-economic Payoffs of Voluntary Association Involvement: A Dutch Life Course Study. *European Sociological Review, 25*(4), 425-442.

Saha, Somnath. (2006). Improving Literacy as a Means to Reducing Health Disparities, *JGIM: Journal of General Internal Medicine,* pp. 893-895. Retrieved from http://www.lib.ncsu.edu/cgi-bin/proxy.pl?server=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=21886031&site=ehost-live&scope=site

Samejima, Fumiko. (1969). *Estimation of latent ability using a response pattern of graded scores*: Psychometric Society.

Samejima, Fumiko. (1970). Estimation of latent ability using a response pattern of graded scores. *PSYCHOMETRIKA, 35*(1), 139-139.

Samejima, Fumiko. (1997). Graded Response Model. In W. J. v. d. Linden & R. K. Hambleton (Eds.), *Handbook of Modern Item Response Thoery* (pp. 85-100). New York, NY: Springer-Verlag.

Sanders, Lee M., Thompson, Valerie T., & Wilkinson, James D. (2007). Caregiver Health Literacy and the Use of Child Health Services. *Pediatrics, 119*(1), e86-92-e86-92.

Sarkar, Urmimala, Fisher, Lawrence, & Schillinger, Dean. (2006). Is Self-Efficacy Associated With Diabetes Self-Management Across Race/Ethnicity and Health Literacy? *Diabetes Care, 29*(4), 823-829.

Schaeffer, Nora Cate. (1988). An Application of Item Response Theory to the Measurement of Depression. *Sociological Methodology, 18*, 271-307.

Schillinger, Dean, Grumbach, Kevin, Piette, John, Wang, Frances, Osmond, Dennis, Daher, Carolyn, . . . Bindman, Andrew B. (2002). Association of Health Literacy With Diabetes Outcomes. *JAMA, 288*(4), 475-482.

Schnittker, Jason. (2004). Education and the Changing Shape of the Income Gradient in Health. *Journal of Health and Social Behavior, 45*, 286-305.

Schnittker, Jason. (2005). Cognitive abilities and self-rated health: Is there a relationship? Is it growing? Does it explain disparities? *Social Science Research, 34*(4), 821-842. doi: DOI: 10.1016/j.ssresearch.2005.01.003

Schnittker, Jason, & McLeod, Jane D. (2005). The Social Psychology of Health Disparities. *Annual Review of Sociology, 31*(1), 75-103. doi: doi:10.1146/annurev.soc.30.012703.110622

Schulz, Amy, Williams, David, Israel, Barbara, Becker, Adam, Parker, Edith, James, Sherman A., & Jackson, James. (2000). Unfair Treatment, Neighborhood Effects, and Mental Health in the Detroit Metropolitan Area. *Journal of Health and Social Behavior, 41*(3), 314-332.

Sen, A. (1999). DEVELOPMENT AS FREEDOM.

Sen, Amartya K. (1993). Capability and Well-Being. In M. C. Nussbaum, A. Sen & R. Sugden (Eds.), *The quality of life*: Clarendon Press Oxford.

Sen, Amartya K. (1999a). *Development as freedom*: Oxford University Press.

Sen, Amartya K. (1999b). Poverty as capability deprivation. *Development as freedom, 1*.

Sentell, Tetine. (2012). Implications For Reform: Survey Of California Adults Suggests Low Health Literacy Predicts Likelihood Of Being Uninsured. *Health Affairs, 31*(5), 1039-1048.

Sentell, Tetine Lynn, & Halpin, Helen Ann. (2006). Importance of Adult Literacy in Understanding Health Disparities. *JGIM: Journal of General Internal Medicine, 21*(8), 862-866.

Sharif, Iman, & Blank, Arthur E. (2010). Relationship between child health literacy and body mass index in overweight children. *Patient Education and Counseling, 79*(1), 43-48. doi: DOI: 10.1016/j.pec.2009.07.035

Shi, Leiyu, Starfield, Barbara, Politzer, Robert, & Regan, Jerri. (2002). Primary Care, Self-rated Health, and Reductions in Social Disparities in Health. *Health Services Research, 37*(3), 529-550.

Shone, Laura P., Dick, Andrew W., Klein, Jonathan D., Zwanziger, Jack, & Szilagyi, Peter G. (2005). Reduction in Racial and Ethnic Disparities After Enrollment in the State Children's Health Insurance Program. *Pediatrics, 115*(6), e697-e705.

Simonds, SK. (1974). Health Education as Social Policy. *Health Education Monograph, 2*, 1-25.

Somers, Stephen A., & Mahadevan, Roopa. (2010). Health Literacy Implications of the Affordable Care Act: Center for Health Care Strategies, Inc.

StataCorp. (2011). Stata Statistical Software: Release 12. College Station, TX: StataCorp LP.

Steenland, Kyle, Hu, Sherry, & Walker, James. (2004). All-Cause and Cause-Specific Mortality by Socioeconomic Status Among Employed Persons in 27 US States, 1984-1997. *American Journal of Public Health, 94*(6), 1037-1042.

Streeter, Sonya, Licata, Rachel, Newkirk, Vann, Garfield, Rachel, Lawton, Emily, & McGrath, Megan. (2012). THE UNINSURED: A PRIMER. Washington, D.C.: The Kaiser Commission on Medicaid and the Uninsured.

Sudano, Joseph J., & Baker, David W. (2006). Explaining US racial/ethnic disparities in health declines and mortality in late middle age: The roles of socioeconomic status, health behaviors, and health insurance. *Social Science & Medicine, 62*(4), 909-922. doi: 10.1016/j.socscimed.2005.06.041

Sudore, Rebecca L., Yaffe, Kristine, Satter Field, Suzanne, Harris, Tamara B., Mehta, Kala M., Simonsick, Eleanor M., . . . Schillinger, Dean. (2006). Limited Literacy and Mortality in the Elderly The Health, Aging, and Body Composition Study. *JGIM: Journal of General Internal Medicine, 21*(8), 806-812.

Sumner, A. (2004). Economic Well-being and Non-economic Well-being. *A Review of the Meaning and Measuement of Poverty, WIDER Research Paper, 30*.

Thissen, David, & Mooney, Jo Ann. (1989). Loglinear Item Response Models, with Applications to Data from Social Surveys. *Sociological Methodology, 19*, 299-330.

Thoits, Peggy A., & Hewitt, Lyndi N. (2001). Volunteer Work and Well-Being. *Journal of Health and Social Behavior, 42*(2), 115-131. doi: 10.2307/3090173

Tones, K. (2002). Health literacy: new wine in old bottles? *Health Education Research, 17*(3), 287-290.

Tsai, T. I., Lee, S. Y., Tsai, Y. W., & Kuo, K. (2011). Methodology and validation of health literacy scale development in Taiwan. *Journal of Health Communication, 16*(1), 50-61.

U.S. Census Bureau. (2001). *Census 2000 Summary File 1 United States*.

U.S. Census Bureau. (2011, 2011

2013/01/17/21:02:50). US Census Bureau Health Insurance. *Health Insurance Historical Tables - HIB Series.* from http://www.census.gov/hhes/www/hlthins/data/historical/HIB_tables.html

U.S. Census Bureau. (2002). *Census 2000 Summary File 3 United States*.

United States Census Bureau. (2000). 2000 Standard Occupational Classification System. Retrieved 07-25-2010, from http://www.census.gov/hhes/www/ioindex/view.html

Uttl, Bob. (2002). North American Adult Reading Test Age Norms, Reliability, and Validity. *Journal of Clinical and Experimental Psychology, 24*(8), 1123-1137.

Verba, S., Schlozman, K. L., Brady, H., & Nie, N. H. (1993). Citizen activity: who participates? What do they say? *American Political Science Review*, 303-318.

Verbrugge, Lois M. (1985). Gender and Health: An Update on Hypotheses and Evidence. *Journal of Health and Social Behavior, 26*(3), 156-182.

Verbrugge, Lois M. (1989). The Twain Meet: Empirical Explanations of Sex Differences in Health and Mortality. *Journal of Health and Social Behavior, 30*(3), 282-304.

Volandes, Angelo E., Paasche-Orlow, Michael, Gillick, Muriel R., Cook, E. F., Shaykevich, Shimon, Abbo, Elmer D., & Lehmann, Lisa. (2008). Health Literacy not Race Predicts End-of-Life Care Preferences. *Journal of Palliative Medicine, 11*(5), 754-762. doi: 10.1089/jpm.2007.0224

von Wagner, Christian, Knight, Katherine, Steptoe, Andrew, & Wardle, Jane. (2007). Functional Health Literacy and Health-Promoting Behaviour in a National Sample of British Adults. *Journal of Epidemiology & Community Health, 61*, 1086-1090.

Wagle, Udaya. (2002). Rethinking poverty: definition and measurement. *International Social Science Journal, 54*(171), 155-165.

Wagle, Udaya. (2005). Multidimensional Poverty Measurement with Economic Well-being, Capability, and Social Inclusion: A Case from Kathmandu, Nepal. *Journal of Human Development, 6*(3), 301-328.

Wagle, Udaya. (2008). *Multidimensional poverty measurement: Concepts and applications* (Vol. 4): Springer Verlag.

Wagle, Udaya. (2009). Capability deprivation and income poverty in the United States, 1994 and 2004: Measurement outcomes and demographic profiles. *Social Indicators Research, 94*(3), 509-533.

Wagle, Udaya. (2012). The economic footing of the global poor, 1980–2005: The roles of economic growth, openness and political institutions. *Journal of International Development, 24*, S173-S197.

Waidmann, T. A., & Rajan, S. (2000). Race and ethnic disparities in health care access and utilization: an examination of state variation. *Medical Care Research and Review, 57*(4 suppl), 55-84.

Wainer, H. (2000). *Computerized Adaptive Testing: A primer* (2nd ed.). Mahway, NJ: Lawrence Erlbaum Assoc. .

Wallace, L. S., Rogers, E. S., Roskos, S. E., Holiday, D. B., & Weiss, B.D. (2005). Brief report: Screening items to identify patients with limited health literacy skills. *Journal of General Internal Medicine, 21*, 874-877.

Wan, T. T. H. (1989). Antecedents of health services utilization in the older population. *Aging and the use of formal care. New York: Routledge*.

Ware, John E., Bjorner, Jakob B., & Kosinski, Mark. (2000). Practical Implications of Item Response Theory and Computerized Adaptive Testing: A Brief Summary of Ongoing Studies of Widely Used Headache Impact Scales. *Medical Care, 38*(9), II73-II82-II73-II82.

Warren, John Robert, & Hernandez, Elaine M. (2007). Did Socioeconomic Inequalities in Morbidity and Mortality Change in the United States over the Course of the Twentieth Century? *Journal of Health and Social Behavior, 48*(4), 335-351.

Weinick, R. M., Zuvekas, S. H., & Cohen, J. W. (2000). Racial and ethnic differences in access to and use of health care services, 1977 to 1996. *Medical Care Research and Review, 57*(suppl 1), 36-54.

Weiss, B.D., Mays, M. Z., Martz, W., Castro, K. M., DeWalt, D. A., Pignone, M. P., . . . Hale, F. A. (2005). Quick assessment of literacy in primary care: The newest vital sign. *Annals of Family Medicine, 3*(6), 514-522.

Weiss, Barry D. (2009). *NAAL Data: To Use or Not To USe?* Paper presented at the Measures of health literacy: Workshop summary, Washington, D.C.

Weiss, Barry D., Hart, Gregory, McGee, Daniel L., & D'Estelle, Sandra. (1992). Health Status of Illiterate Adults: Relationship Between Literacy and Health Status Among Persons With Low Literacy Skills. *Journal of the American Board of Family Practice, 5*, 257-264.

White, Kellee, & Borrell, Luisa N. (2011). Racial/ethnic residential segregation: Framing the context of health risk and health disparities. *Health & Place, 17*(2), 438-448. doi: DOI: 10.1016/j.healthplace.2010.12.002

White, S., Chen, J., & Atchison, R. (2008). Relationship of preventive health practices and health literacy: a national study. *American Journal of Health Behavior, 32*(3), 227-242.

Williams, D. R., Costa, M. V., Odunlami, A. O., & Mohammed, S. A. (2008). Moving upstream: how interventions that address the social determinants of health can improve health and reduce disparities. *Journal of public health management and practice: JPHMP, 14*(Suppl).

Williams, David R. (1994). The Concept of Race in Health Services Research: 1966 to 1990. *Health Services Research, 29*(3), 261-274.

Williams, David R. (1996). Race/Ethnicity and Socioeconomic Status: Measurement and Methodological Issues. *International Journal of Health Services, 26*(3), 483-505.

Williams, David R. (2003). The Health of Men: Structured Inequalities and Opportunities. *American Journal of Public Health, 93*(5), 724-731. doi: 10.2105/AJPH.93.5.724

10.2105/AJPH.93.5.724</p>

10.2105/AJPH.93.5.724
PB - American Public Health Association

Williams, David R., & Collins, Chiquita. (1995). US Socioeconomic And Racial Differences in Health: Patterns and Explanations. *Annual Review of Sociology, 21*, 349-386.

Williams, David R., & Collins, Chiquita. (2001). Racial Residential Segregation: A Fundamental Cause of Racial Disparities in Health. *Public Health Reports, 116*, 404-416.

Williams, David R., Neighbors, Harold W., & Jackson, James S. (2003). Racial/Ethnic Discrimination and Health: Findings From Community Studies. *American Journal of Public Health, 93*(2), 200-208.

Williams, David R., Yan, Yu, Jackson, James S., & Anderson, Norman B. (1997). Racial Differences in Physical and Mental Health. *Journal of Health Psychology, 2*(3), 335-351.

Williams, K. (2003). Has the future of marriage arrived? A contemporary examination of gender, marriage, and psychological well-being. *Journal of health and social behavior*, 470-487.

Williams, Kristi, & Umberson, Debra. (2004). Marital Status, Marital Transitions, and Health: A Gendered Life Course Perspective. *Journal of Health and Social Behavior, 45*(1), 81-98.

Williams, Mark V., Baker, David W., Honig, Eric G., Lee, Theodore M., & Nowlan, Adam. (1998). Inadequate Literacy Is a Barrier to Asthma Knowledge and Self-Care. *Chest, 114*(4), 1008-1015.

Williams, Mark V., Baker, David W., Parker, Ruth M., & Nurss, Joanne R. (1998). Relationship of Functional Health Literacy to Patients' Knowledge of Their Chronic Disease: A Study of Patients With Hypertension and Diabetes. *Arch Intern Med, 158*(2), 166-172.

Williams, Mark V., Parker, Ruth, Baker, David W., Parikh, Nina S., Pitkin, Kathryn, Coates, Wendy C., & Nurss, Joanne R. (1995a). Inadequate Functional Health Literacy Among Patients at Two Public Hospitals. *JAMA, 274*(21), 1677-1682.

Williams, Mark V., Parker, Ruth M., Baker, David W., Parikh, Nina S., Pitkin, Kathryn, Coates, Wendy C., & Nurss, Joanne R. (1995b). Inadequate Functional Health Literacy Among Patients at Two Public Hospitals. *JAMA, 274*(21), 1677-1682.

Willson, Andrea E. (2009). `Fundamental Causes' of Health Disparities. *International Sociology, 24*(1), 93-113.

Wilson, John, & Musick, Marc. (2003). DOING WELL BY DOING GOOD. *Sociological Quarterly, 44*(3), 433-450. doi: 10.1111/j.1533-8525.2003.tb00540.x

Wilson, Mark, Allen, Diane D., & Li, Jun Corser. (2006). Improving measurement in health education and health behavior research using item response modeling: comparison with the classical test theory approach. *Health Educ. Res., 21*(suppl_1), i19-32-i19-32.

Wister, Andrew V., Malloy-Weir, Leslie J., Rootman, Irving, & Desjardins, Richard. (2010). Lifelong Educational Practices and Resources in Enabling Health Literacy Among Older Adults. *Journal of Aging and Health, 22*(6), 827-854.

Wolf, Michael S., Davis, Terry C., Osborn, Chandra Y., Skripkauskas, Silvia, Bennett, Charles L., & Makoul, Gregory. (2007). Literacy, self-efficacy, and HIV medication adherence. *Patient Education and Counseling, 65*(2), 253-260. doi: 10.1016/j.pec.2006.08.006

Wolf, Michael S., Knight, Sara J., Lyons, E. Allison, Durazo-Arvizu, Ramón, Pickard, Simon A., Arseven, Adnan, . . . Bennett, Charles L. (2006). Literacy, race, and PSA level among low-income men newly diagnosed with prostate cancer. *Urology, 68*(1), 89-93. doi: DOI: 10.1016/j.urology.2006.01.064

Wolinsky, F. D., & Johnson, R. J. (1992a). Perceived health status and mortality among older men and women. *Journal of Gerontology, 47*(6), S304-S304.

Wolinsky, F. D., & Johnson, R. J. (1992b). Widowhood, health status, and the use of health services by older adults: A cross-sectional and prospective approach. *Journal of Gerontology, 47*(1), S8-S8.

World Health Organization. (1998). Health Promotion Glossary. Geneva: World Health Organization,.

Yeracaris, C. A., & Kim, J. H. (1978). Socioeconomic differentials in selected causes of death. *Am J Public Health, 68*(4), 342-351.

Yin, H. S., Johnson, M., Mendelsohn, A. L., Abrams, M. A., Sanders, L. M., & Dreyer, B. P. (2009). The health literacy of parents in the United States: a nationally representative study. *Pediatrics, 124*(Supplement 3), S289-S298.

Young, Frank W. (2009). *The Structural Ecology of Health and Community*: Internet-First University Press.

Yusuf, S., & Deaton, A. (2009). *Development economics through the decades: a critical look at 30 years of the World Development Report*: World Bank Publications.

Zarcadoolas, Christina. (2011). The simplicity complex: exploring simplified health messages in a complex world. *Health promotion international, 26*(3), 338-350. doi: 10.1093/heapro/daq075

Zarcadoolas, Christina, Pleasant, Andrew, & Greer, David S. (2005). Understanding health literacy: an expanded model. *Health Promot. Int., 20*(2), 195-203.

Zarcadoolas, Christina, Pleasant, Andrew, & Greer, David S. (2006). *Advancing Health Literacy: A Framework for Understanding and Action*. San Francisco, CA: Josey-Bass.

Zola, Irving K. (1970). Helping: Does It Matter? The Problems and Prospects of Mutual Aid Groups *Address to the United Ostomy Association*.

Zuvekas, Samuel H., & Taliaferro, Gregg S. (2003). Pathways To Access: Health Insurance, The Health Care Delivery System, And Racial/Ethnic Disparities, 1996–1999. *Health Affairs, 22*(2), 139-153.

APPENDICES

Appendix A

NAAL Methodological Design

Data Collection

Upon selection, interviewers conducted the background questionnaire and literacy assessment using a computer–assisted personal interviewing (CAPI) system. An interviewer read the background questionnaire items to the respondent and entered the responses into the CAPI system. At the conclusion of the background questionnaire; respondents were given the literacy assessment booklet and the interviewer followed a script with instruction to complete the literacy assessment. Each assessment booklet began with the same seven questions to evaluate the respondent's literacy level. Upon completion of the seven questions, the interviewer used an algorithm to determine if the respondent should continue with the main literacy assessment or the Adult Literacy Supplemental Assessment (ALSA)[9].

The majority of respondents continued the main literacy assessment which consisted of 152 assessment questions. However, respondents were not required to answer all 152 assessment questions. Instead questions were grouped into blocks of tasks, with each block containing approximately 11 questions. Thus, a total of 12 blocks of tasks contained a balanced sample of tasks from each of the three types of literacy (i.e., prose, documents, and quantitative). The blocks of tasks were assembled into 26 different configurations of the

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[9] The ALSA is a performance based assessment of literacy to identify what forms of print a respondent could (and could not) interpret. ALSA assessment items began with simple identification tasks and sight words and then progressed to connected text from highly contextualized and authentic material found in the respondent's daily life. ALSA respondents are included in the NAAL household sample as they incorrectly responded to most or all of the first seven questions; therefore, being classified into the Below Basic level on the health literacy scale (Jin et al., 2007).

assessment booklet utilizing a Balanced Incomplete Block (BIB) spiraling approach[10]. Stated simply, in the balance portion of the Balanced Incomplete Block design, blocks are assigned to booklets so that each block appears in the same number of booklets and every pair of blocks of a certain type appears together in at least once booklet. The incomplete portion of the method means that no booklet contains all the items; therefore, each respondent provides incomplete assessment data (Johnson, 1992). The spiraling aspect involves systemically interleaving the booklets so that each booklet appears in an appropriate number of times in the sample. Booklets are bundled so that approximately equal numbers of respondents are assessed with each booklet and each booklet appears equally as often in each position in a bundle (Johnson, 1992). Each respondent in the NAAL received an assessment booklet containing only 3 blocks of questions.

It is important point out the methodological difference between the background questionnaire and the BIB spiraling approach used in the literacy assessment. Functionally, the background questionnaire serves to collect the same socio-demographic data from all sampled respondents. The literacy assessment design, however, measures the distribution of proficiencies in subpopulations to items similar to questions found in standardized achievement tests (Johnson, 1992; Sirontik and Wellington, 1977; Jin et al., 2007). Johnson (1992) notes that to estimate subpopulation distributions: 1) it is not necessary to test each

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[10] Balanced Incomplete Block (BIB) is similar to matrix sampling which is employed in large-scale testing programs. The BIB strategy provides improved information about the overall performance by giving different sets of questions to different samples of respondents during the same test administration. Assessment items are divided into blocks and blocks are assembled into booklets such that each booklet consists of an equal number of blocks and each block is paired one time with every other block. This design allows for the estimation of relations among all items through the unique linking of blocks (NCES, 2009).

person as reliable results about a population can often be obtained by testing only a small fraction of people, and 2) not even sampled respondents have to be tested with every item as accurate results for population characteristics can be obtained by presenting only a few items to each sampled respondent. As noted above, the NAAL literacy assessment contained 152 assessment questions which satisfy the objective of generating many cognitive items for an assessment (Johnson, 1992; Sirontik and Wellington, 1977; Jin et al., 2007).

For the purposes of an assessment, it is advantageous for respondents to answer only a few assessment items as participation is voluntary (Cohen and Jiang, 1999). Therefore, requiring respondents to answer all the assessment questions would decrease the participation rate (Johnson, 1992). Moreover, respondent performance on an extended assessment is likely to deteriorate due to fatigue and decreased motivation (e.g., the respondent's performance does not directly affect the respondent) (Johnson, 1992). In terms of estimating the error terms; it is more efficient to assign each respondent a subset of the items instead of presenting all the items (Lord, 1962; Sirontik and Wellington, 1977; Johnson, 1992). By spiraling assessment items so that the same items do not occur in the same pattern ensures that that the same items do not occur at the beginning (i.e., when motivation is high and fatigue is low) or at the end (i.e., when motivation is low and fatigue is high) of a booklet (Johnson, 1992). As a result, the BIB design permits the computation of the correlation between each pair of assessment items as the position of an item is held fixed within a block while balancing the block position increases control over context and position effects. Finally, administering the same items to clusters of respondents in household would result in an increase in sampling variability over an unclustered sample of the same size because of intraculster correlation (Johnson, 1992; Sirontik and Wellington, 1977). Therefore, the clustering effect is reduced leading to a sample with higher statistical efficiency. Literacy assessment data was collected directly from 17,178 respondents and imputed for 859 respondents who refused to complete the literacy assessment.

Imputation of Missing Data

Jin et al. (2007; Krenke, Van de Kerckhove, and Mohadjer; XXXX) point out that to omit respondents who refused to complete the literacy assessment, for reasons other than language barriers or mental disability, would introduce unknown bias. Thus, literacy skill estimates of the national population would be inaccurate assuming respondent refusals occurred randomly. Regression-based imputation procedures were applied to the 859 respondents who completed the background questionnaire but refused to complete the literacy assessment for reasons other than language barriers or mental disability. To impute responses, Jin et al. (2007) used the NAAL background data on age, sex, race/ethnicity, level of education, country of birth, census region, and metropolitan statistical area status. A response was imputed on the easiest task for the prose and quantitative scales; however, a response was imputed for the second easiest task on the document scale as it was part of the health literacy scale. Respondents either answered a question correctly or incorrectly on the literacy assessment. The dichotomous response outcome permitted imputation using a logistic regression model for each of the missing values. For each nonrespondent, the probability of answering the item correctly was computed and then compared with a randomly generated number between 0 and 1. If the probability of a correct answer was greater than the random number, the imputed value for the item was 1 (i.e., correct). If the probability was less than the random number, it was 0 (i.e., wrong). A wrong response on each scale was imputed for the 65 respondents who began to answer the assessment but were unable to answer at least one question on each scale because of language barriers or a mental disability. Once imputed cases were included, the weighted response rate for the household sample was 62.1 percent.

Weighting and Variance Estimation

An essential component of quantitative social science research is the ability to generalize or draw inferences about a population based on a sample (Garson, 2009). Inferential statistics are estimated by selecting a sample of cases from a population through the mathematical principles of probability sampling. Probability sampling, or random sampling, must fulfill two conditions: 1) every element, or case, has an equal chance of selection, and 2) each element has a known, or nonzero, probability of selection. Specifically, a simple random sample assumes that data collected from each element, or respondent, is independent of another case and that the values are identically distributed (Johnson, 1992). Under these assumptions it is possible to compute sample statistics, such as the mean, as well as the amount of variation, specifically the standard error, that exits from the mean.

The NAAL employed a multi-stratified cluster sampling design. As Johnson (1992; Jin et al., 2007) indicates, ignoring the effects of clustering, weighting, and stratification in variance estimation will generally lead to underestimates of the true sampling variability. Jin et al. (2007) computed the differential probabilities of selection into the household sample by calculating base weights for all respondents. Base weights were computed as the reciprocal of a respondent's final probability of selection and then adjusted for nonresponse at the screener and background questionnaire stages, respectively. In addition, trimming procedures were followed to reduce the impact of extreme weights and background questionnaire weighting were calibrated based on the 2003 Current Population Survey (CPS) population estimates. Taylor series approximation was applied to the PSU totals in the NAAL to account for intra-cluster correlation within the stratum (Cohen and Jiang, 1999; Jin et al., 2007; Johnson, 1992). Taylor series approximation provides robust variance estimators for complex survey data with stratified, cluster sampling with unequal probabilities of selection. Taylor series is used to obtain an approximation to some nonlinear function, and then the variance of the function is based on the Taylor series approximation to the function. This general computational procedure can be applied to a variety of nonlinear estimators such as regression coefficients (Cohen and Jiang, 1999; Jin et. al., 2007). Cohen and Jiang (1999) detail the computational formula for the standard error based on Taylor series approximation:

Let $\hat{h} = h(\hat{\theta})$ be any estimate function of the target statistic, where $\hat{\theta}$ is the estimated parameter vector. Therefore, the mean of a target statistic is $\bar{h} = h(\bar{\hat{\theta}})$ and the variance is calculated by $\mathrm{var}(\hat{h}) = E\left[\bar{\hat{h}}_{\hat{\theta}} \left(\hat{\theta} - \bar{\hat{\theta}}\right)\right]^2$ or letting d represent the vector of the first derivatives of $\hat{h}$ and Σ represent the variance-covariance matrix of the parameter vector, provides $\mathrm{var}(\hat{h}) = \acute{d}\Sigma d$. Replacing Σ with an estimate from the sample obtains the estimate of the variance of the function of the parameters[11] $\text{var}(\hat{h}) = \acute{d}\hat{\Sigma}\acute{d}$. Cohen and Jiang's (1999) approach removes the approximation inherent in the normality assumption within subgroups as estimation weakens the differences between groups increase. As a consequence, estimates of prose, document, quantitative and health literacy based on assessment scales are reduced where cross-group differences increase.

[11] Binder's (1983) sandwich estimator extends the utility of this result by providing a general approach to approximating the variances of the estimated parameters based on the estimating equation $\widehat{W}(\hat{\theta}) = 0$. Binder (1983; also see Cohen and Jiang, 1999) proved that the variance of parameters is var $(\hat{\theta}) = d^{\acute{-}1/}\hat{\Sigma}\acute{d}^{-1}$, where d represents the vector of the first derivatives of $\widehat{W}$.

Appendix B

IRT for Sociologists

Classical Test Theory

The construction of variables in social science research traditionally rest on the assumptions of Classical Test Theory (CTT) (R. F. DeVellis, 2003; Robert F. DeVellis, 2006). The four assumptions of CTT are considered “weak” or easily met (De Ayala, 2008). First, CTT based tests are sample dependent and rely on the characteristics of a particular sample to compute measures of central tendency (De Ayala, 2008; Hambleton et al., 1991). Second, it is not possible to compare the scores between groups of examinees. Even if examinees receive the same test or parallel versions of a test, the test scores contain different amounts of error (Hambleton et al., 1991). The amount of error is a function of the “true score model” that underpins CTT:

$$O = T + e$$

Thus, an observed score is the sum of the “true” or expected score and the error between the expected score and the observed score. It is the unknown amount of and variation in the error between examinees and administration of a test that limits comparison of scores.

The third weakness of CTT is the assumption that the standard error of measurement is equal across examinees (Embretson & Reise, 2000; Hambleton et al., 1991). In addition, CTT assumes that if an individual is tested repeatedly the "spread" of scores for the person is normally distributed. Finally, CTT or “true score theory” may also be referred to as “test response theory” since the entire test is the unit of analysis (De Ayala, 2008; Wainer, 2000). Therefore, the true score model does not consider how an examinee will respond to a question and cannot predict how an examinee or a group of examinees will perform on a given item (Embretson & Reise, 2000; Hambleton et al., 1991). In contrast to CTT, the assumptions underlying Item Response Theory (IRT) are considered “strong” (De Ayala, 2008; Embretson & Reise, 2000; Hambleton et al., 1991). Stated differently, IRT imposes a model to predict how an examinee’s responses or data will perform on a given item.

What is Item Response Theory (IRT)?

IRT is a group of models that establish a correspondence between a latent trait or characteristic and question items as predictors of observed responses (de Ayala, 2009; Bollen, 2002). There are two important differences between CTT and IRT. First, IRT ability estimates cannot be calculated directly by summing the number of correct responses and computing the percent of examinees who answered the question correctly. Second, the weight of each item differentially contributes to the estimation of individual ability, represented by theta (θ), based on the item’s level of difficulty or discrimination. Therefore, ability is not measured in an absolute sense; instead, the relative position of the examinees’ ability level can be placed on a continuum scale.

Assumptions of IRT

IRT involves two fundamental assumptions: local independence and data follow the functional form of the specified IRT model. Local independence means that an examinee's performance on any item depends only on the examinee’s ability and that item’s characteristics (Wainer, Bradlow, and Wang, 2007; Bollen, 2002). In other words, controlling for θ, responses to one item are not associated with responses to other items. The local independence assumption does not imply that items are not correlated with θ, only that items are not correlated with another separate latent ability. Moreover, the assumption of local independence implies unidimensionality or the presence of a single dimension or factor measured by the test data (Hambelton et al., 1991; Embretson and Reise, 2009; Bollen, 2002).

The functional form assumption describes how changes in a trait level relate to changes in the probability of a specified response (Embretson and Reise, 2009). Lumsden (1978) points out that the *a* provides information about individual ability and is analogous to the concept of reliability in CTT. Thus, a test item provides the most information about an examinee when the difficulty of the item is the same as the examinee's ability (Lord and Novick, 1968; Wainer et al., 2007). The function that relates the probability of a correct answer on an item to the ability measured by the test containing the item is an Item Characteristic Curve (ICC). Figure A1 presents an ICC for a hypothetical test item. If a person is much more proficient than the item is difficult, then the probability of a correct response increases. Conversely, if the item is much more difficult than the person is proficient, then this probability of a correct response decreases. Optimally, it is possible to

FIGURE A1 ABOUT HERE

gain the most information on examinee ability when the expected probability is close to one-half (p=0.5) (Wainer, 2000) as shown in Figure A1. Figure A2 presents two hypothetical ICCs, the ICC for question 1 is a solid line and the ICC for Item 4 is the dashed line. Notice that the expected probability of 0.5 is associated with a higher level of theta for Item 4. In other words, an examinee with a theta value of 1.0 has a 50% chance of answering the question correctly. Therefore, Item 4 is more difficult when compared to Item 1 and is a result of the mathematical properties of IRT.

FIGURE A2 ABOUT HERE

IRT Formulas

The Rasch or 1 Parameter Model (1PM) is the basic IRT model as one parameter is required to estimate theta:

$$P(\theta) = \frac{1}{1 + \exp -(\theta - b)}$$

In the above formula, the *b* parameter is the difficulty parameter. In essence, a high or large positive *b* parameter means that the item difficult and a large negative *b* means the item is easy. Given that the *b* parameter is measured in the same unit as the θ, there is a correspondence between the value of *b* and ability level. The scale of θ is often equivalent to that of a z-score where approximately all scores lie between -4 and +4 (C&S (p. 53)). The Rasch Model assumes that the slope of the ICC is equal to one. For example, assume that the *b* values for four items are known (Item 1 = -2.0, Item 2 = 0, Item 3 = 0.5, and Item 4 = 1.5). Figure A3 presents the ICCs for the four items: The point of inflection or the probability of

FIGURE A3 ABOUT HERE

theta is (*p*=0.5) for the four ICCs given that the *b* parameter is measured in the same unit as that of theta (θ). However, a two Parameter Logistic (2PL) Model accounts for different slope parameters:

$$P(\theta) = \frac{1}{1 + \exp -a(\theta - b)}$$

The *a* parameter is the discrimination parameter or the value for the slope of the ICC and quantifies how well a question distinguishes individuals of high and low ability. A larger *a* parameter indicates a steeper ICC slope; therefore, the question provides more information about the range of examinee abilities. Item and test information, in this sense, is the analog of reliability in CTT. Using the same *b* parameters for the four items above and assuming that the *a* parameters are known (Item 1 = 1.0, Item 2 = 1, Item 3 = 0.5, and Item 4 = 2.0) produces the ICCs in Figure A4. Notice that the functional form of the ICCs for Items 3 and

FIGURE A4 ABOUT HERE

4 in Figures A3 and A4 are different even though the *b* parameters did not change. The ICCs for Items 1 and 2 did not change as the *a* parameters are 1.0. The very gradual slope for Item 3 indicates that item will provide little information regarding individual ability. Conversely, the steep slope for Item 4 will provide a range of information about individual ability. The Rasch and 2PL IRT Models are suited for binary response outcomes, such as correct and incorrect responses. However, other IRT Models allow for polytomous or multiple response options, such as the Grade Response Model.

Samejima's (1969, 1970, 1997) Grade Response Model provides the relationship between a participant's level of theta (θ) and the likelihood of choosing a progressively increasing response category (Meade & Lautenschlager, 2004). Analogous to the ICCs for the 1PL and 2PL IRT models, a series of boundary response functions (BRFs) are estimated using the following formula:

$$P_{ix}{}^{*}(\theta) = \frac{\exp[\alpha_i(\theta - \beta_{ij})]}{1 + exp[\alpha_i(\theta - \beta_{ij})]}$$

where $P_{ix}(\theta)$ represents the probability that a respondent with an ability level of theta (θ(will respond to item *i* at or above category *x*. The *a* parameter (slope) will be the same for all BRFs for that item and are analogous to factor loadings, mathematically related to item-total correlations, and represent how sensitive the item is to changes in the latent trait. The *b* parameters are interpreted the same as dichotomous response option (p= 0.5 for response at or above a given category). The number of b parameters is equal to the number of response categories minus one ($m_i - 1$). Stated simply, the BRFs depict how much theta or ability is required for a respondent to choose the next highest response option. For example, a hypothetical item has a known *a* parameter of 1.21 and four *b* parameters (b_1 = -2.5, b_2 = -1.0, b_3 = 1.5, b_4 = 2.5). Figure A5 displays the calculated BRFs for the hypothetical item with five response categories.

FIGURE A5 ABOUT HERE

Why Use Item Response Theory?

An invariant or equivalent measure provides a consistent estimate of a latent attribute regardless of different situations (Meade & Lautenschlager, 2004; Meredith & Teresi, 2006; Raju, Laffitte, & Byrne, 2002). In this sense, situations refer to measurement over time, across diverse samples (e.g., racial/ethnic groups, levels of education) selected from a population, and/or different means of data collection (e.g., mail surveys versus Computer Assisted Self Interview or CASI versus web surveys) (Meade & Lautenschlager, 2004). Establishing measurement equivalence typically employs confirmatory factor analysis (CFA) (Kenneth A. Bollen, 1989) and/or item response theory (Meade & Lautenschlager, 2004; Raju et al., 2002).

Raju and colleagues (2002) and Meade & Lautenschlager (2004) point out that CFA and IRT rely on different assumptions of data to model fit. CFA assumes a linear fit of true score data to the latent construct while IRT assumes a nonlinear fit. Moreover, CFA and IRT identify the extent and source of measurement nonequivalence and are not mutually exclusive methods of latent construct analysis. IRT assesses each item for Differential Functioning (DF). CFA only tests the extent that the proposed model is a good fit to the data for each sample before examining the source(s) of nonequivalence. However, IRT is an advantageous method to determine equivalence of a set of scale items for a latent construct given the estimation of *b* parameters. Stated simply, IRT provides more information of individual ability (θ) at the item level given the probability of choosing a response category for an item. CFA item intercepts do not provide known probabilities for a respondent with a given level of ability (θ).

IRT in the Sociological Literature

Item Response Theory, as a methodological approach, is not foreign in the Sociological literature. Bollen (2002) suggests that IRT's measurement properties have broad application beyond psychological measurement. Thissen & Mooney (1989) demonstrate the general applicability of IRT models to CTT social survey data. While Thissen & Mooney's (1989) research supports the applicability of IRT to social survey data; other research concludes that IRT models are too strict for survey data (MacIntosh, 1998; Morgan & Sørensen, 1999). In companion articles, Osgood and colleagues (2002; 2002) demonstrate the quantitative properties of IRT to develop scale measures for multivariate analysis. Specifically, Osgood and colleagues (2002) employ the Graded Response Model

(GRM) to a multiple item scale of self-reported offending. Beyond the quantitative application of IRT; the sub-disciplines of Criminology and Medical Sociology employ IRT to address substantive research topics.

As noted above, the Rasch or one parameter logistic IRT model estimates only the *b* parameter. Conrad and colleagues (2010) assess the measurement invariance and Differential Functioning of the Crime and Violence Scale (CVS). The results of their analysis suggest that dropping two items will improve the overall CVS. Likewise, an extension of the Rasch model (Raudenbush, Johnson, & Sampson, 2003) reveals the applicability of IRT to assess multi-level reports of criminal behavior. In addition, in one study (Leung & Drasgow, 1986) the two parameter logistic (2PL) model exposed the fallacy of racial/ethnic differential prediction to explain the relationship between self-esteem and self-reported delinquent acts. The use of IRT extends beyond the study of crime and deviance into the study of health.

Bjorner and Ware (1998) highlight that IRT provides the greatest potential to achieve valid, precise and efficient heath status measures. Indeed, operationalizing and standardizing health outcomes possess particular challenges. Two symposiums convened by the Medical Section of the American Public Health Association indicate growing support for IRT based models to assess a range of health outcomes (see Cella & Chang, 2000; Hambleton, 2000; R. D. Hays, Morales, & Reise, 2000; McHorney & Cohen, 2000; Patrick & Chiang, 2000; Ware, Bjorner, & Kosinski, 2000) specifically the application of Rasch models in health assessments (see Andrich, 2004; Conrad & Smith, 2004; Norquist, Fitzpatrick, Dawson, & Jenkinson, 2004). There is a logical fit between IRT models and health outcome measures as

Medical Sociology, Social Epidemiology, and Public Health focus on both physical and mental health outcomes. For example, IRT models of mental health outcomes include: adolescent depression (Cúri, Singer, & Andrade, 2010; Edelen & Reeve, 2007; Nugent & Hankins, 1989), depression among children (DeRoos & Allen-Meares, 1993), adult depression (Schaeffer, 1988), anxiety and depression (Reiser, 1989), self-efficacy (M. Wilson, Allen, & Li, 2006), and quality of life (Fryback, Palta, Cherepanov, Bolt, & Kim, 2010). In sum, while not employed broadly in the Sociological literature; there is growing interest substantively and methodologically for IRT based measures in Sociological research.

Scoring & Scaling of the NAAL Health Literacy Items

Baldi and colleagues (2009) established a set of scoring criteria for the assessment items in the NAAL. Responses to 5 items (e.g., C020901, C030101, C04050, C071101, and C080101) are scored correct, partially correct, incorrect, omitted, or not reached (1 = correct, 2 = partially correct, 0 = incorrect, 8 = omitted, and 9 = not reached). Responses to the other 23 items are scored dichotomously and include: incorrect, correct, omitted, and not reached (0 = incorrect, 1 = correct, 8 = omitted, 9 = not reached). Nonresponses that were followed by valid responses to other items in the same block were considered Omitted. Items scored as Omitted were treated as though they were incorrect. Nonresponses that occurred after the last item in a block with a valid response were considered Not Reached. Items scored as Not Reached were treated as though they had never been presented to the respondent. This is done so as not to underestimate the literacy ability of respondents who did not complete an entire block. Moreover, multiple responses to an item are considered incorrect, “I Don’t

Know" responses were considered incorrect, and all other responses were considered incorrect.

Appendix C

Differential Functioning Analysis of the NAAL Health Literacy Items

Tests of Differential Functioning (DF), or measurement invariance, serve to determine if the psychometric properties of a measure (e.g., an item or an assessment) are constant across samples (Meade, 2010; Raju et al., 2002). The presence of measurement invariance determines if a measure is appropriate and permits comparisons of observed data (Meade, 2010). Thus, by examining measurement invariance it is possible to determine whether or not the item(s) and assessment function significantly differently for different samples or if differences in item parameters are attributable to sampling error (Meade, 2010). Significant DF is evidence that the measure does not function comparatively in different samples.

The principle components of DF analysis are the comparison of the expected "true" scale scores for members of the majority or reference group and the minority or focal group. The expected "true" score is the probability that a theta value, for a given item, is associated with the response option that the person actually chose. The sum of the probability values across items provides the expected "true" score for the individual. Item level DF analysis examines if an individual's expected or "true" scale score differs had that person been a member of the reference group.

NAAL project staff examined items for unidimensionality and estimated item parameters for the health literacy items and scale during field testing and after conducting the

NAAL (Jin, Greenberg, and Baer, 2007). The project staff analyses indicate that the blocks of health literacy items are unidimensional[12] (Baldi et al., 2009).

The DF analyses presented here employ different reference and focal groups. Whites serve as the reference group and all racial/ethnic minorities are the focal group in the race/ethnicity analysis. Likewise, women are the reference group and men are the focal group. Respondents were asked if they had worked in the past three years and, if they had, what was their job title. The NAAL staff developed a coarsened Census Occupational Code based on employment status and the 2000 Standard Occupational Classification System (United States Census Bureau, 2000). Occupations requiring at least a four year college degree serve as the reference group, while all other occupations and those who had not worked in past three years are the focal group.

Tests of Item Level Differential Functioning and Bias

The four item level indices of DF in Table A2 follow from Meade (2010) and require explanation. The SIDS or Signed Item Difference in the Sample and can be interrupted as the average difference in the expected score across the sample of focal group respondents. SIDS index values are reported in the metric of the expected scores for an item. Therefore, a SIDS value of -2 for an item with four response options indicates that, on average, members of the focal group are expected to score 2 points lower on an item than reference group members with equivalent estimated trait scores. The Unsigned Item Difference in the

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[12] DF analyses were conducted by the NAAL staff for the following target groups: females versus males, Hispanics versus others (others included all adults who were not classified as Hispanic or Black), Blacks versus others (others included all adults who were not classified as Hispanic or Black), and adults age 60 or over versus under age 60 (Baldi et al., 2009). The analyses did not reveal DF between the reference and focal groups.

Sample (UIDS) provides the absolute value of the average difference in the expected score. UIDS expresses the hypothetical amount of item DF had DF been uniformly against either the reference or focal group. If the SIDS and UIDS values are equal then the presence of DF is uniform in nature. However, if the UIDS value is larger than SIDS then further examination of the expected score plots are required. D-Max indicates the maximum level (either positive or negative) that item DF affects a member of the focal group. D-Max provides an indication of DF present in the specific characteristics of the sample. ESSD or Estimated Score Standardized Difference is the mean and pooled standard deviations in the expected scores for the focal group. ESSD values are expressed in standard deviation units and indicate the magnitude of item DF.

TABLE A2 ABOUT HERE

Table A2 presents the SIDS, UIDS, Max-D, and ESSD indices by race/ethnicity, sex, and occupation. Of the 28 health literacy measures, index values for C0002, C0007, C040601, C040801, and C051101 suggest DF between whites and racial/ethnic minority groups. The SIDS values for items C0002, C0007, C040601, C040801, and C051101 are 0.126, -0.123, -0.051, -0.035, and -0.091, respectively. On average racial/ethnic minorities in the NAAL would be expected to score 0.126 points higher, 0.123 points lower, 0.051 points lower, 0.035 points lower, and 0.091 points lower than whites with equal estimated trait scores on the respective items. The D-Max values for items C0002, C0007, C040601, C040801, and C051101 are 0.211, -0.361, -0.132, -0.040, and -0.148, respectively. The D-Max values indicate the largest difference in expected responses for any individual in the sample and provide further support of DF given the racial/ethnic composition of the NAAL sample. The ESSD values for items C0002, C0007, C040601, C040801, and C051101 are 0.793, -1.116, -1.380, -1.696, and -2.111, respectively. Given that the ESSD values represent standard deviations from the mean; racial/ethnic minorities would be expected to score 0.793 standard deviations above and 1.116, 1.380, 1.696, and 2.111 standard deviations below the mean compared to whites for the respective items.

Examining the item level DF indices for women and men suggests the absence of DF by sex. The occupation analysis reveals possible DF for item C040801. The ESSD value of -1.295 indicates that respondents from low prestige occupations would be expected to score 1.295 standard deviations below the mean on item C040801 compared to respondents from high prestige occupations. The item level DF effect indices reported above are employed to compute scale or assessment level indices of DF effect size.

Tests of Scale Level Differential Functioning and Bias

Table A3 contains scale or assessment level indices of DF by race/ethnicity, sex, and occupation. Again, following from (Meade, 2010), the Singed and Unsigned Test Difference in the Sample (STDS and UTDS) are similar to the SIDS and UIDS, respectively. The differences in the expected scores for each respondent and item are summed across the items and averaged by the number of respondents (i.e., the STDS). The UTDS sums the absolute value of the differences. STDS and UTDS values are interpreted the same as SIDS and UTDS but the unit of analysis is the scale or assessment. The Unsigned ETS Difference in Sample (UETSDS) sums the item expected scores, thereby allowing cancelation between item level expected scores, and then the absolute value of the difference in the expected test scores between the focal and reference groups. Thus, a UETSDS value is the hypothetical difference in expected scores potentially present if scale or assessment level DF was uniform across participants. Expected Test Score Standardized Difference (ETSSD) is the difference in the mean expected test scores between the focal and reference group divided by the pooled standard deviations of the expected test scores. Similar to its item level counterpart, ETSSD values are presented in standard deviation units. Test D-Max indicates the maximum level (either positive or negative) that scale or assessment DF affects the focal group. The Theta Region of Disadvantage is established by the range of sample estimated theta scores that estimated test scores are lower when employing the focal group parameters rather than reference group parameters.

TABLE A3 ABOUT HERE

The STDS values in Table A3 suggest that, on average, racial/ethnic minorities would be expected to score 0.377 points lower on the HL assessment than whites with equal vales of theta. However, the large difference in the STDS value (-0.377) and the UTDS (0.945) indicates a large amount of cancellation of DF across items and racial/ethnic groups. However, the UETSDS value (0.547) is positive and suggests DF favoring racial/ethnic minorities. The ETSSD value of -0.126 indicates that racial/ethnic minorities would score 0.126 standard deviations below the mean on the HL assessment than whites. The scale level indices of DF do not suggest DF between women and men. In terms of occupation, respondents from low prestige occupations would be expected to score 0.417 points lower on the HL assessment than high prestige respondents with equal vales of theta. However, the large difference between the STDS and UTDS value (0.938) suggest a large amount of cancellation of DF between occupational groups. Moreover, the ETSSD value of -0.135

indicates that low occupational prestige participants would score 0.135 standard deviations below the mean on the HL assessment than high occupational prestige respondents.

The analysis presented above indicates a lack of DF and bias between women and men who participated in the NAAL. Moreover, it is likely that there is a lack of DF and bias between low and high occupational prestige groups as a measure of SES. . However, the analyses comparing whites and racial/ethnic minorities suggest the presence of item level DF.

Items C040601 and C040801 ask respondents to preform quantitative computations related to find least expensive way to join a fitness center and calculating insurance costs. In addition, item C051101 ask respondents to make decisions based on end of life information regarding rewriting a living will. As noted above, Volandes and colleagues (2008) found in their research that African Americans were more likely to misunderstand end-of-life preferences. Thus, the presence of DF in C051101 may not likely suggest item level bias but cultural differences related to the meanings attached to death. However, the presence of DF for items C040601 and C040801 it not as easily explained by cultural differences. Examination of the expected score plots (available upon request) indicate that racial/ethnic minorities are disadvantage at higher levels of theta compared to whites. Given the analysis and the substantive content of items C040601 and C040801 it is possible to conclude the presence of bias for items C040601 and C040801.

Appendix D

Items in the Test of Functional Health Literacy of Adults (TOFHLA)

Test of Functional Literacy in Adults TOFHLA
NUMERACY

HAND PATIENT PROMPT FOR EACH QUESTION. THEN READ EACH QUESTION, AND RECORD RESPONSES. STOP AT THE END OF 10 MINUTES.

PREFACE FIRST QUESTION WITH:
"These are directions you or someone else might be given at the hospital. Please read each direction to yourself. I will ask you some questions about what it means."

PREFACE SUCCEEDING QUESTIONS WITH:
"Have a look at this one" OR "Here is another direction you might be given."

		Correct	Incorrect
PROMPT 1:			
If you take your first tablet at 7:00 am, when should you take the next one?	N-1	1	0
And the next one after that?	N-2	1	0
What about the last one for the day, when should you take that one?	N-3	1	0
PROMPT 2			
Could you take that medicine on July 10, 1993?	N-4	1	0
PROMPT 3:			
If you began taking your medicine Tuesday, when should you take it next?	N-5	1	0
What day would you take it after that?	N-6	1	0
PROMPT 4			
If this were your score, would your blood sugar be normal today?	N-7	1	0
PROMPT 5:			
When is your next appointment?	N-8	1	0
Where should you go?	N-9	1	0

How many of those pills should you take?	N-10		
PROMPT 7:			
How many times can you get that prescription refilled?	N-11	1	0
When is the date of issue?	N-12	1	0
When is six months from the date of issue?	N-13	1	0
PROMPT 8:			
If you eat lunch at 12:00 noon, and you want to take this medicine before lunch, what time should you take it?	N-14	1	0
If you forgot to take it before lunch, what time should you take it?	N-15	1	0
PROMPT 9:			
Let's just say the last time you came to the clinic was on Jul 12, 1992.			
When would you have to reapply for financial aid?	N-16	1	0
PROMPT 10:			
Let's say that after deductions, your monthealth literacyy income and other resources are $1,129. And, let's say you have 3 children. Would you have to pay for your care at that clinic?	N-17	1	0
	Total Raw		

COMMENTS

Test of Functional Literacy in Adults TOFHLA
READING COMPREHENSION

HAND PATIENT THE READING COMPREHENSION PASSAGES TO BE COMPLETED. FOLD BACK THE PAGE OPPOSITE THE TEXT SO THAT THE PATIENT SEES ONLY THE TEXT.

PREFACE THE READING COMPREHENSION EXERCISE WITH:

"Here are some other medical instructions that you or anybody might see around the hospital. These instructions are in sentences that have some of the words missing. Where a word is missing, a blank line is drawn, and 4 possible words that could go in the blank appear just below it .. I want you to figure out which of those 4 words should go in the blank, which word makes the sentence make sense. When you think you know which one it is, circle the letter in front of that word, and go on to the next one. When you finish the page, turn the page and keep going until you finish all the pages."

STOP AT THE END OF 12 MINUTES

PASSAGE A: X-RAY PREPARATION
PASSAGE B: MEDICAID RIGHTS AND RESPONSIBILITIES
PASSAGE C: HOSPITAL CONSENT FORM

PASSAGE A

Your doctor has sent you to have a ________ X-ray.

a. stomach
b. diabetes
c. stitches
d. germs

You must have an _________ stomach when you come for ______ .

a. asthma	a. is
b. empty	b. am.
c. incest	c. if.
d. anemia	d. it.

The X-ray will ________ from 1 to 3 _________.

a. take	a. beds
b. view	b. brains
c. talk	c. hours
d. look	d. diets

THE DAY BEFORE THE X-RAY.

For supper have only a __________ snack of fruit, ________ and jelly, with coffee or tea

a. little	a. toes
b. broth	b. throat
c. attack	c. toast
d. nausea	d. thigh

After _____________, you must not ___________or drink anything at _____ until after you have _____ the X-ray.

a. minute,	a. easy	a. ill	a. are
b. midnight,	b. ate	b. all	b. has
c. during,	c. drank	c. each	c. had
d. before,	d. eat	d. any	d. was

THE DAY OF THE X-RAY.

Do not eat _____________

a. appointment.
b. walk-in.
c. breakfast.
d. clinic.

Do not _______, even _______

a. drive,	a. heart.
b. drink,	b. breath.
c. dress,	c. water.
d. dose,	d. cancer.

If you have any _________ , call the X-ray _____________ at 616-4500.

a. Department	a. answers,
b. Sprain	b. exercises,
c. Pharmacy	c. tracts,
d. Toothache	d. questions,

PASSAGE B

I agree to give correct information to ______ if I can receive Medicaid.

a. hair

b. salt
c. see
d. ache

I _________ to provide the county information to ________ any statements given in this __________ and hereby give permission to the to get such proof I _______ that for Medicaid I must report any _________ in my circumstances within ______ (10) days of becoming ______ of the change.

a. agree	a. hide	a. emphysema	a. inflammation	a. investigate	a. changes	a. three	a. award
b. probe	b. risk	b. application	b. religion	b. entertain	b. hormones	b. one	b. aware
c. send	c. discharge	c. gallbladder	c. Iron	c. understand	c. antacids	c. five	c. away
d. gain	d. prove	d. relationship	d. county	d. establish	d. charges	d. ten	d. await

I understand _______ if I DO NOT like the __________ made on my case, I have the ________ to a fair hearing. I can ________ a hearing by writing or ________ the county where I applied.

a. thus	a. marital	a. bright	a. request	a. counting
b. this	b. occupation	b. left	b. refuse	b. reading
c. that	c. adult	c. wrong	c. fail	c. calling
d. than	d. decision	d. right	d. mend	d. smelling

If you ________ TANF for any family _________, you will have to _______ a different application form. _______ , we will use the ______ on this form to determine your __________.

a. wash	a. member,	a. relax	a. Since,	a. lung	a. hypoglycemia.
b. want	b. history,	b. break	b. Whether,	b. date	b. eligibility.
c. cover	c. weight,	c. inhale	c. However,	c. meal	c. osteoporosis.
d. tape	d. seatbelt,	d. sign	d. Because,	d. pelvic	d. schizophrenia.

Appendix E

Items in the Rapid Estimation of Adult Literacy in Medicine (REALM)

RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE (REALM) Examiner's Instruction Sheet

Terry Davis, PhD, Michael Crouch, MN, Sandy Long, PhD

The Rapid Estimate of Adult Literacy in Medicine (REALM) is a screening instrument to assess an adult patient's ability to read common medical words and lay terms for body parts and illnesses. It is designed to assess medical professionals in estimating a patient's literacy level so that the appropriate level of patient education materials or oral instructions may b3 used. The test takes two to three minutes to administer and score. The REALM has been correlated with other standardized tests (Family Medicine, 1993: 25:391-5).

Directions to the Examiner:

1. Examiner should say to the patient:
   "This survey is to help us figure out the best type of patient education materials to give you. The survey only takes 2 to 3 minutes to do"
2. Give the patient a laminated copy of the "REALM" Patient Word List.
3. Examiner should hold an unlaminated "REALM" Score Sheet on a clipboard at an angle so that the patient is not distracted by your scoring procedure.
4. Examiner should say:
   "I want to hear you read as many words as you can from this list. Begin with the first word on List 1 and read aloud. When you come to a word you cannot read, do the best you can or say "blank" and go on to the next word."
5. If the patient takes more than five seconds on a word say "blank" and point to the next word, if necessary, to move the patient along. If the patient begins to miss every word; have him/her pronounce only known words.
6. Count as an error any word not attempted or mispronounced. Score by:
   - (/) after each mispronounced word.
   - (-) after each word not attempted.
   - (+) after each word pronounced correctly.
7. Count the number of correct words for each list and record the numbers in the "SCORE box. Total the numbers and match the total score with its grade equivalent in the table below.
8. Record the "Realm" generated reading level on the Examiner's Score Sheet and in the Education/Learning History section of the Social and Patient Education History assessment form in the Medical Record.

GRADE EQUIVALENT

Raw Score	Grade Range	
0-18	3rd Grade and Below	Will not be able to read most low literacy materials; will need repeated oral instructions, materials composed primarily of illustrations, or audio or video tapes.
19-44	4th to 6th Grade	Will need low literacy materials; may not be able to read prescription labels.
45-60	7th to 8th Grade	Will struggle with most patient education materials.
61-66	High School	Will be able to read most patient education materials.

Red Lake Hospital
Red Lake, MN 56671
4/98/JMcD

RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE (REALM)

Terry Davis, PhD, Michael Crouch, MD, Sandy Long, PhD

Chart # | **Examine date:**

Name: | **Birth date:**

REALM generated reading level: | **Grade completed:**

List 1		List 2		List 3	
Fat	________	Fatigue	________	Allergic	________
Flu	________	Pelvic	________	Menstrual	________
Pill	________	Jaundice	________	Testicle	________
Dose	________	Infection	________	Colitis	________
Eye	________	Exercise	________	Emergency	________
Stress	________	Behavior	________	Medication	________
Smear	________	Prescription	________	Occupation	________
Nerves	________	Notify	________	Sexually	________
Germs	________	Gallbladder	________	Alcoholism	________
Meals	________	Calories	________	Irritation	________
Disease	________	Depression	________	Constipation	________
Cancer	________	Miscarriage	________	Gonorrhea	________
Caffeine	________	Pregnancy	________	Inflammatory	________
Attack	________	Arthritis	________	Diabetes	________
Kidney	________	Nutrition	________	Hepatitis	________
Hormones	________	Menopause	________	Antibiotics	________
Herpes	________	Appendix	________	Diagnosis	________
Seizure	________	Abnormal	________	Potassium	________
Bowel	________	Syphilis	________	Anemia	________
Asthma	________	Hemorrhoids	________	Obesity	________
Rectal	________	Nausea	________	Osteoporosis	________
Incest	________	Directed	________	Impetigo	________
# of (+) Responses in List 1: ________		# of (+) Responses in List 2: ________		# of (+) Responses in List 3: ________	

LEGEND: (+)=Correct (-)=Word not attempted (/)=Mispronounced word

Raw Score:

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4/98/JMcD

Appendix E

Sample of NAAL Health Literacy Items

Item Number: C080101

Answer a question using a medicine label

Year(s)	Scale(s)	Task Demand(s)	Printed Material(s)	Percent who answered correctly
2003	Quantitative Literacy	Computation, Text Search	Procedures	60%

Question:
Refer to the medicine label to answer the following question.

The patient forgot to take this medicine before lunch at 12: 00 noon. What is the earliest time he can take it in the afternoon?

GARFIELD, Robert M. 16 Apr 01

Dr. LUBIN, Michael

DOXYCYCLINE
100 MG

Take one tablet on an empty stomach one hour before a meal or two to three hours after a meal unless otherwise directed by your doctor.

Notes:
Answer:
Correct Answer: 1) 2 p.m. or 2 to 3 p.m.; 2) 2 hours after

Performance Data: In 1992, **60%** of adults answered the question or completed the task correctly.

Item Number: C080201

Underline three substances that may increase the drowsiness a ssociated with taking Alladryl, using an Alladryl label.

Year(s)	Scale(s)	Task Demand(s)	Printed Material(s)	Percent who answered correctly
2003	Document Literacy	Text Search	Other Documents	64%

Question:
Refer to the Alladryl label to answer the following question.

Underline three substances that may increase the drowsiness associated with taking Alladryl.

Alladryl Allergy

Drug Facts

Active ingredients (in each capsule) ***Purposes***

Acetaminophen 400 mg .... Pain reliever/fever reducer
Diphenhydramine HCl 12.5 mg .... Antihistamine
Pseudoephedrine HCl 25 mg .... Nasal decongestant

Uses
- temporarily relieves these symptoms of hay fever and the common cold:
  - sneezing
  - runny nose
  - headache
  - minor aches and pains
  - fever
  - sore throat
  - muscular aches
  - nasal congestion
- temporarily relieves these additional symptoms of hay fever:
  - itching of the nose or throat
  - itchy, watery eyes

Warnings

Alcohol warning: If you consume 3 or more alcoholic drinks every day, ask your doctor whether you should take acetaminophen or other pain relievers/fever reducers. Acetaminophen may cause liver damage.

Do not use
- if you are now taking a prescription monoamine oxidase inhibitor (MAOI) (certain drugs for depression, psychiatric, or emotional conditions, or Parkinson's disease), or for 2 weeks after stopping the MAOI drug. If you do not know if your prescription drug contains an MAOI, ask a doctor or pharmacist before taking this product.
- with any other product containing diphenhydramine, including one applied topically.

Ask a doctor before use if you have
- heart disease
- high blood pressure
- thyroid disease
- trouble urinating due to an enlarged prostate gland
- glaucoma
- diabetes
- a breathing problem such as emphysema or chronic bronchitis

Ask a doctor or pharmacist before use if you are taking sedatives or tranquilizers

When using this product
- **do not use more than directed**
- marked drowsiness may occur
- avoid alcoholic drinks
- alcohol, sedatives, and tranquilizers may increase drowsiness
- be careful when driving a motor vehicle or operating machinery
- excitability may occur, especially in children

Stop use and ask a doctor if
- you get nervous, dizzy, or sleepless
- new symptoms occur
- symptoms get better
- you need to use more than 10 days
- fever occurs and lasts more than 3 days
- sore throat is severe
- redness or swelling is present
- sore throat lasts for more than 2 days, is accompanied or followed by fever, headache, rash, swelling, nausea, or vomiting

If pregnant or breast-feeding, ask a health professional before use.
Keep out of reach of children. In case of overdose, get medical help or contact a Poison Control Center right away. Quick medical attention is critical for adults as well as for children even if you do not notice any signs or symptoms.

Directions
- adults and children 12 years of age and over: 2 capsules
- children under 12 years of age: ask a doctor
- do not take more than 8 capsules in 24 or as directed by a doctor
- take every 6 hours while symptoms persist

Other information
- store at 59° to 77°F in a dry place

Inactive ingredients corn starch, croscarmellose sodium, hydroxypropyl cellulose, hydroxypropyl methylcellulose, microcrystalline cellulose, polyethylene glycol, pregelatinized starch, sodium starch glycolate, stearic acid, titanium dioxide, and zinc stearate

Notes:
Answer:
Correct Answer: Underlines or circles "alcohol, sedatives, and tranquilizers (may increase drowsiness)".

Performance Data: In 1992, **64%** of adults answered the question or completed the task correctly.

Item Number: N110101

Answer a question based on reading the article

Year(s)	Scale(s)	Task Demand(s)	Printed Material(s)	Percent who answered correctly
1992, 2003, 1992 & 2003	Prose Literacy	Text Search	Persuasion	74%

Question:
Refer to the article on the next page to answer the following question.

According to the brochure, why is it difficult for people to know if they have high blood pressure?

TOO MANY BLACK ADULTS DIE FROM THE EFFECTS OF HIGH BLOOD PRESSURE

DID YOU KNOW?

More than one out of every four Black adults has high blood pressure, according to a two-year survey by Public Health Service in the 1960's. Other studies show as many as one out of three Black adults has high blood pressure.

High blood pressure is the most common chronic disease treated by practitioners in the Black community.

More Black people die as a result of high blood pressure than any other disease.

For every Black person who dies of sickle-cell anemia, at least 100 others die from the effects of high blood pressure.

The rate of death from the effects of high blood pressure for Black people is nearly one and one-half times the rate for White people.

High blood pressure, along with cigarette smoking, contributes greatly to the apparent increased number of heart attacks among Black adults.

If high blood pressure is controlled, strokes, heart attacks and kidney disease can be substantially reduced.

YES, HIGH BLOOD PRESSURE CAN BE TREATED... AND CONTROLLED.

WHAT YOU CAN DO

Have your blood pressure checked regularly
Unfortunately, high blood pressure is a silent killer and crippler. At least half of the people who have high blood pressure don't know it because symptoms usually are not present. The only way you can be sure is to have the doctor check your blood pressure. You should have your blood pressure checked at least once a year, especially if: (1) you are Black, (2) if you are over 40, (3) if members of your family or close relatives have had high blood pressure or the complications of high blood pressure (stroke, heart attack, or kidney disease), or (4) if you have frequent headaches, dizziness, or other symptoms that may occasionally be related to high blood pressure.

Follow your doctor's instructions
High blood pressure can't be cured, but it can be kept under control. Control means keeping your blood pressure as close to normal as possible. That's very important to you — it can prevent a crippling stroke or other serious illness in the future.

The doctor will find a way to control your blood pressure that's most comfortable for you. Then it will be up to you — to take the medicine and follow the prescribed diet, to follow the instructions carefully and to come back regularly for checkups.

Yes, high blood pressure can be controlled, but only if *you* cooperate fully with your doctor.

Notes:
This question (or item) uses the same printed material as other questions.

Answer:
Correct Answer: Any statement such as the following: symptoms are not usually present; high blood pressure is silent

Performance Data: In 1992, **74%** of adults answered the question or completed the task correctly.

Item Number: N110201

Answer a question based on reading the article

Year(s)	Scale(s)	Task Demand(s)	Printed Material(s)	Percent who answered correctly
1992, 2003, 1992 & 2003	Quantitative Literacy	Computation, Text Search	Persuasion	40%

Question:

The rate of death from the effects of high blood pressure for White people is 94.5 per hundred thousand. Using the figure given in the brochure, calculate the rate of death from the effects of high blood pressure for Black people.

TOO MANY BLACK ADULTS DIE FROM THE EFFECTS OF HIGH BLOOD PRESSURE

DID YOU KNOW?

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High blood pressure is the most common chronic disease treated by practitioners in the Black community.

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High blood pressure can't be cured, but it can be kept under control. Control means keeping your blood pressure as close to normal as possible. That's very important to you — it can prevent a crippling stroke or other serious illness in the future.

The doctor will find a way to control your blood pressure that's most comfortable for you. Then it will be up to you — to take the medicine and follow the prescribed diet, to follow the instructions carefully and to come back regularly for checkups.

Yes, high blood pressure can be controlled, but only if *you* cooperate fully with your doctor.

Notes:
This question (or item) uses the same printed material as other questions.

Answer:
Correct Answer: The correct answer is 141 3/4 or 141.75. Also accept 141 and 142.

Performance Data: In 1992, **40%** of adults answered the question or completed the task correctly.

Appendix F

Classical Test Theory, Item Response Theory Item Statistics, & Correlation Matrices

Table F1: Classical Test Theory and Item Response Theory Item Statistics*

Item	Booklet Number	Classical Test Theory				Item Response Theory					
		N	Mean	Std Dev	Pct. Correct	*a*	Std Error	*b1*	Std Error	*b2*	Std Error
C000002	1 -- 26	18,102	1.26	1.60	88.71	0.56	0.049	-3.55	0.236	--	--
C000007	1 -- 26	18,102	1.00	0.78	92.71	0.34	0.06	-7.11	1.139	--	--
C020901	1, 2, 11, 15, 21, 26	4,242	3.43	2.96	17.51	1.21	0.122	-2.07	0.129	-1.52	0.081
C021001	1, 2, 11, 15, 21, 26	4,242	2.61	3.41	14.42	0.93	0.08	-1.29	0.082	--	--
C021101	1, 2, 11, 15, 21, 26	4,242	2.27	3.61	6.66	0.94	0.085	0.38	0.045	--	--
C030101	2, 3, 12, 14, 16, 22	4,164	2.93	2.62	18.35	1.56	0.153	-1.76	0.1	-1.13	0.06
C030201	2, 3, 12, 14, 16, 22	4,164	2.20	2.88	18.41	1.65	0.203	-1.76	0.102	--	--
C030301	2, 3, 12, 14, 16, 22	4,164	2.20	3.00	15.97	0.84	0.074	-1.36	0.094	--	--
C040501	3, 4, 13, 15, 17, 23	4,190	2.88	3.12	17.05	1.48	0.1	-1.36	0.069	0.66	0.041
C040502	3, 4, 13, 15, 17, 23	4,190	2.51	3.46	10.57	1.12	0.084	-0.16	0.044	--	--
C040503	3, 4, 13, 15, 17, 23	4,190	2.45	3.40	11.30	1.14	0.093	-0.31	0.043	--	--
C040504	3, 4, 13, 15, 17, 23	4,190	2.84	3.33	16.29	2.57	0.333	-1.05	0.045	--	--
C040601	3, 4, 13, 15, 17, 23	4,190	2.19	3.40	8.58	0.56	0.043	0.09	0.063	--	--
C040801	3, 4, 13, 15, 17, 23	4,190	2.01	3.50	5.25	0.39	0.039	1.52	0.144	--	--
C050801	9, 12, 13, 19, 24, 26	4,187	2.57	3.31	16.01	0.84	0.089	-1.82	0.131	--	--
C050901	9, 12, 13, 19, 24, 26	4,187	2.74	3.73	8.73	0.78	0.076	0.04	0.054	--	--
C051001	9, 12, 13, 19, 24, 26	4,187	2.73	3.86	5.87	0.59	0.057	0.78	0.087	--	--
C051101	9, 12, 13, 19, 24, 26	4,187	3.24	3.94	9.08	0.34	0.05	-0.67	0.137	--	--
C060501	5, 8, 9, 15, 20, 22	4,234	2.12	3.16	12.71	0.84	0.078	-0.66	0.065	--	--
C060601	5, 8, 9, 15, 20, 22	4,234	2.00	3.20	10.29	0.82	0.079	-0.15	0.052	--	--

C070101	3, 6, 7, 18, 20, 26	4,196	2.05	2.76	18.99	1.01	0.1	-2.38	0.147	--	--
C070901	6, 7, 18, 20, 26	4,196	2.38	3.10	17.34	1.15	0.126	-1.71	0.113	--	--
C071001	6, 7, 18, 20, 26	4,196	2.39	3.05	18.54	1.61	0.251	-2.04	0.13	--	--
C071101	6, 7, 18, 20, 26	4,196	2.96	3.56	12.69	0.64	0.063	-1.09	0.109	1.64	0.153
C080101	4, 7, 8, 14, 19, 21	4,143	2.45	2.81	14.03	0.77	0.059	-0.97	0.066	-0.43	0.049
C080201	4, 7, 8, 14, 19, 21	4,143	2.36	3.21	13.74	0.71	0.061	-0.97	0.071	--	--
N110101	7, 10, 11, 17, 22, 24	4,248	2.57	3.23	16.25	1.01	0.092	-1.31	0.079	--	--
N110201	7, 10, 11, 17, 22, 24	4,248	3.23	3.79	8.25	0.95	0.091	0.21	0.05	--	--

* *Source:* 2003 National Assessment of Adult Literacy, Restricted Data File.

Table F2: Correlations Between Demographic Characteristics, Flexible Resources, & Health Literacy Score*

		X1	X2	X3	X4	X5	X6	X7
Age	**X1**							
Female	**X2**	0.0235**						
		(0.004)						
African-American	**X3**	-0.0689***	0.0194*					
		(0.000)	(0.016)					
Foreign Born Hispanic/Latino	**X4**	-0.103***	-0.00822	-0.101***				
		(0.000)	(0.309)	(0.000)				
Native Born Hispanic/Latino	**X5**	-0.103***	0.0184*	-0.0777***	-0.0626***			
		(0.000)	(0.023)	(0.000)	(0.000)			
Asian/Pacific Islander	**X6**	-0.0517***	-0.0141	-0.0654***	-0.0527***	-0.0405***		
		(0.000)	(0.082)	(0.000)	(0.000)	(0.000)		
American Indian/Alaskan Native	**X7**	-0.0183*	-0.00945	-0.0302***	-0.0243**	-0.0187*	-0.0157	
		(0.023)	(0.242)	(0.000)	(0.003)	(0.021)	(0.052)	
Multiracial	**X8**	-0.0212**	-0.00931	-0.0427***	-0.0345***	-0.0265**	-0.0223**	-0.0103
		(0.009)	(0.249)	(0.000)	(0.000)	(0.001)	(0.006)	(0.203)
Household Income	**X9**	-0.0679***	-0.0778***	-0.158***	-0.156***	-0.0703***	0.0355***	-0.0486***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Income From	**X10**	0.242***	-0.0541***	-0.172***	-0.193***	-0.0982***	0.0139	-0.0417***
Savings/Investments		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.085)	(0.000)
Educational Attainment	**X11**	-0.0290***	-0.0113	-0.0961***	-0.214***	-0.0592***	0.0951***	-0.0305***
		(0.000)	(0.161)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nam Powers Boyd	**X12**	-0.400***	-0.0333***	-0.000399	-0.0384***	0.0268***	0.0387***	-0.00741
Occupational Score		(0.000)	(0.000)	(0.961)	(0.000)	(0.001)	(0.000)	(0.359)
Employed Part Time	**X13**	-0.0921***	0.0939***	-0.0206*	-0.0102	0.0135	-0.00145	-0.00637

		(0.000)	(0.000)	(0.011)	(0.206)	(0.094)	(0.858)	(0.431)
Employed Not at Work	**X14**	-0.0443***	0.0200*	0.0154	-0.0187*	-0.0108	-0.0162*	-0.00742
		(0.000)	(0.013)	(0.057)	(0.020)	(0.180)	(0.045)	(0.358)
Unemployed	**X15**	-0.114***	-0.00236	0.0741***	-0.0191*	0.0305***	0.0105	0.0171*
		(0.000)	(0.771)	(0.000)	(0.018)	(0.000)	(0.195)	(0.034)
Out of Labor Force	**X16**	0.456***	0.153***	-0.0323***	-0.0133	-0.0339***	-0.0252**	-0.000892
		(0.000)	(0.000)	(0.000)	(0.101)	(0.000)	(0.002)	(0.912)
Not a Citizen	**X17**	-0.153***	-0.0191*	-0.0345***	0.605***	-0.0648***	0.179***	-0.0242**
		(0.000)	(0.018)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
Did Not Vote	**X18**	-0.285***	-0.0381***	0.0565***	-0.0852***	0.0901***	-0.00803	0.0332***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.321)	(0.000)
Do Not Remember	**X19**	-0.0386***	0.00270	0.0334***	-0.0321***	0.0334***	0.0376***	0.00335
		(0.000)	(0.738)	(0.000)	(0.000)	(0.000)	(0.000)	(0.679)
Current Affairs/Political/Govt.	**X20**	-0.00630	0.0459***	0.0485***	-0.197***	-0.00974	0.0188*	-0.000573
Information Source		(0.436)	(0.000)	(0.000)	(0.000)	(0.228)	(0.020)	(0.943)
Weekly Library Use	**X21**	-0.0714***	0.0940***	-0.00466	-0.0277***	-0.00314	0.0508***	0.0142
		(0.000)	(0.000)	(0.564)	(0.001)	(0.698)	(0.000)	(0.079)
Monthly Library Use	**X22**	-0.0604***	0.0842***	0.0153	-0.0270***	0.00735	-0.00198	-0.00908
		(0.000)	(0.000)	(0.058)	(0.001)	(0.363)	(0.806)	(0.261)
Library Use 1 or 2 Times a Year	**X23**	-0.0391***	-0.0277***	-0.0145	-0.0961***	0.00786	-0.0141	-0.00895
		(0.000)	(0.001)	(0.073)	(0.000)	(0.331)	(0.080)	(0.268)
Never Use Library	**X24**	0.160***	-0.105***	0.00495	0.140***	-0.0116	-0.0375***	0.0102
		(0.000)	(0.000)	(0.540)	(0.000)	(0.150)	(0.000)	(0.206)
Freq Volunteer Activity	**X25**	0.0578***	0.0442***	-0.00848	-0.107***	-0.0131	-0.0270***	0.00247
		(0.000)	(0.000)	(0.294)	(0.000)	(0.106)	(0.001)	(0.760)
Spanish/ESL	**X26**	-0.0774***	-0.0192*	-0.0673***	0.300***	0.376***	-0.0261**	-0.0000721
		(0.000)	(0.018)	(0.000)	(0.000)	(0.000)	(0.001)	(0.993)
Speaks Only Spanish	**X27**	0.0421***	-0.0427***	-0.0356***	-0.0639***	-0.0450***	0.362***	0.00697

		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.388)
Other Language Spoken ESL	**X28**	-0.0830***	0.00344	-0.0829***	0.727***	0.0342***	0.0749***	-0.00901
		(0.000)	(0.671)	(0.000)	(0.000)	(0.000)	(0.000)	(0.265)
Never Married	**X29**	-0.436***	-0.0411***	0.130***	-0.000645	0.0652***	0.0250**	0.00879
		(0.000)	(0.000)	(0.000)	(0.936)	(0.000)	(0.002)	(0.277)
Separated/Divorced/Widowed	**X30**	0.280***	0.131***	0.0411***	-0.0393***	-0.0175*	-0.0514***	0.0276***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.031)	(0.000)	(0.001)
Health Information Source	**X31**	0.138***	0.167***	0.0311***	-0.144***	-0.00686	0.0227**	-0.00840
		(0.000)	(0.000)	(0.000)	(0.000)	(0.396)	(0.005)	(0.299)
Health Literacy Score	**X32**	-0.169***	0.0478***	-0.136***	-0.223***	-0.0303***	0.00715	-0.0255**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.376)	(0.002)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

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		X8	X9	X10	X11	X12	X13	X14
Age	**X1**							
Female	**X2**							
African-American	**X3**							
Foreign Born Hispanic/Latino	**X4**							
Native Born Hispanic/Latino	**X5**							
Asian/Pacific Islander	**X6**							
American Indian/Alaskan Native	**X7**							
Multiracial	**X8**							
Household Income	**X9**	-0.0175*						
		(0.030)						
Income From	**X10**	-0.0235**	0.419***					
Savings/Investments		(0.004)	(0.000)					
Educational Attainment	**X11**	-0.0133	0.465***	0.368***				
		(0.101)	(0.000)	(0.000)				
Nam Powers Boyd	**X12**	0.00205	0.264***	0.0275***	0.281***			
Occupational Score		(0.800)	(0.000)	(0.001)	(0.000)			
Employed Part Time	**X13**	0.00823	-0.0186*	-0.0148	0.00517	0.142***		

		(0.309)	(0.021)	(0.066)	(0.522)	(0.000)		
Employed Not at Work	**X14**	-0.000800	0.0209**	-0.000701	0.0399***	0.0835***	-0.0716***	
		(0.921)	(0.010)	(0.931)	(0.000)	(0.000)	(0.000)	
Unemployed	**X15**	0.0277***	-0.120***	-0.0950***	-0.0655***	0.0176*	-0.0919***	-0.0499***
		(0.001)	(0.000)	(0.000)	(0.000)	(0.029)	(0.000)	(0.000)
Out of Labor Force	**X16**	-0.00597	-0.214***	0.0402***	-0.172***	-0.595***	-0.225***	-0.122***
		(0.460)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Not a Citizen	**X17**	-0.0216**	-0.121***	-0.164***	-0.132***	-0.00295	0.0106	-0.0303***
		(0.008)	(0.000)	(0.000)	(0.000)	(0.715)	(0.188)	(0.000)
Did Not Vote	**X18**	0.0376***	-0.178***	-0.214***	-0.236***	0.0191*	0.0362***	0.00591
		(0.000)	(0.000)	(0.000)	(0.000)	(0.018)	(0.000)	(0.465)
Do Not Remember	**X19**	-0.00119	-0.0457***	-0.0644***	-0.0533***	0.00237	0.00703	0.00478
		(0.883)	(0.000)	(0.000)	(0.000)	(0.769)	(0.384)	(0.554)
Current Affairs/Political/Govt.	**X20**	0.00493	0.220***	0.188***	0.312***	0.135***	0.0271***	0.0216**
Information Source		(0.542)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.008)
Weekly Library Use	**X21**	0.00278	0.0310***	0.0310***	0.163***	0.0515***	0.0536***	0.0199*
		(0.731)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.014)
Monthly Library Use	**X22**	-0.00586	0.0445***	0.0368***	0.152***	0.0599***	0.0433***	0.0188*
		(0.468)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.020)
Library Use 1 or 2 Times a Year	**X23**	0.0223**	0.0950***	0.0486***	0.0628***	0.0728***	-0.000718	0.00526
		(0.006)	(0.000)	(0.000)	(0.000)	(0.000)	(0.929)	(0.515)
Never Use Library	**X24**	-0.0188*	-0.163***	-0.105***	-0.330***	-0.171***	-0.0815***	-0.0334***
		(0.020)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Freq Volunteer Activity	**X25**	-0.0111	0.140***	0.171***	0.219***	0.0655***	0.0448***	0.0171*
		(0.169)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.034)
Spanish/ESL	**X26**	-0.0188*	-0.0457***	-0.0834***	-0.0381***	0.0252**	-0.00371	-0.00523
		(0.020)	(0.000)	(0.000)	(0.000)	(0.002)	(0.646)	(0.518)
Speaks Only Spanish	**X27**	0.00325	0.0300***	0.0372***	0.0610***	-0.00329	0.00601	-0.0214**

		(0.687)	(0.000)	(0.000)	(0.000)	(0.684)	(0.457)	(0.008)
Other Language Spoken ESL	**X28**	-0.0348***	-0.175***	-0.193***	-0.229***	-0.0640***	-0.00479	-0.0250**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.554)	(0.002)
Never Married	**X29**	0.0434***	-0.114***	-0.116***	-0.0217**	0.112***	0.0876***	-0.00526
		(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)	(0.515)
Separated/Divorced/Widowed	**X30**	-0.00957	-0.241***	-0.0755***	-0.0910***	-0.118***	-0.0310***	-0.0126
		(0.236)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.120)
Health Information Source	**X31**	-0.00582	0.154***	0.179***	0.232***	0.0459***	0.0362***	0.0277***
		(0.471)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Health Literacy Score	**X32**	-0.0114	0.333***	0.223***	0.404***	0.233***	0.0370***	0.0389***
		(0.157)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table F2: Correlations Between Demographic Characteristics, Flexible Resources, & Health Literacy Score*

		X15	X16	X17	X18	X19	X20	X21
Age	**X1**							
Female	**X2**							
African-American	**X3**							
Foreign Born Hispanic/Latino	**X4**							
Native Born Hispanic/Latino	**X5**							
Asian/Pacific Islander	**X6**							
American Indian/Alaskan Native	**X7**							
Multiracial	**X8**							
Household Income	**X9**							
Income From Savings/Investments	**X10**							
Educational Attainment	**X11**							
Nam Powers Boyd Occupational Score	**X12**							
Employed Part Time	**X13**							

Employed Not at Work	**X14**							
Unemployed	**X15**							
Out of Labor Force	**X16**	-0.157***						
		(0.000)						
Not a Citizen	**X17**	-0.00206	-0.0388***					
		(0.799)	(0.000)					
Did Not Vote	**X18**	0.111***	-0.0504***	-0.192***				
		(0.000)	(0.000)	(0.000)				
Do Not Remember	**X19**	0.0314***	-0.00788	-0.0568***	-0.125***			
		(0.000)	(0.329)	(0.000)	(0.000)			
Current Affairs/Political/Govt. Information Source	**X20**	-0.0332***	-0.0729***	-0.156***	-0.125***	-0.0288***		
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Weekly Library Use	**X21**	0.0198*	0.0102	0.0158	-0.0396***	-0.00754	0.127***	
		(0.014)	(0.205)	(0.051)	(0.000)	(0.351)	(0.000)	
Monthly Library Use	**X22**	0.00990	-0.0243**	-0.0360***	-0.0344***	-0.00839	0.142***	-0.177***
		(0.221)	(0.003)	(0.000)	(0.000)	(0.299)	(0.000)	(0.000)
Library Use 1 or 2 Times a Year	**X23**	0.0107	-0.0919***	-0.0896***	-0.00280	-0.00422	0.0705***	-0.256***
		(0.185)	(0.000)	(0.000)	(0.729)	(0.601)	(0.000)	(0.000)
Never Use Library	**X24**	-0.0313***	0.102***	0.0981***	0.0600***	0.00856	-0.296***	-0.262***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.289)	(0.000)	(0.000)
Freq Volunteer Activity	**X25**	-0.0339***	-0.00368	-0.107***	-0.139***	-0.0450***	0.167***	0.116***
		(0.000)	(0.649)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Spanish/ESL	**X26**	0.0156	-0.0402***	0.0917***	0.0354***	-0.00793	0.00529	-0.00124
		(0.054)	(0.000)	(0.000)	(0.000)	(0.327)	(0.513)	(0.878)
Speaks Only Spanish	**X27**	-0.00470	0.0170*	0.177***	-0.0353***	0.0313***	0.0197*	0.0243**

		(0.561)	(0.035)	(0.000)	(0.000)	(0.000)	(0.015)	(0.003)
Other Language Spoken ESL	**X28**	-0.00728	0.0191*	0.618***	-0.0881***	-0.0191*	-0.217***	-0.0176*
		(0.368)	(0.018)	(0.000)	(0.000)	(0.018)	(0.000)	(0.030)
Never Married	**X29**	0.101***	-0.123***	0.0225**	0.212***	0.0237**	0.0188*	0.0558***
		(0.000)	(0.000)	(0.005)	(0.000)	(0.003)	(0.020)	(0.000)
Separated/Divorced/Widowed	**X30**	0.00954	0.114***	-0.0658***	-0.00725	0.0192*	-0.0547***	-0.0148
		(0.238)	(0.000)	(0.000)	(0.369)	(0.018)	(0.000)	(0.067)
Health Information Source	**X31**	-0.0392***	0.0236**	-0.128***	-0.172***	-0.0160*	0.542***	0.118***
		(0.000)	(0.004)	(0.000)	(0.000)	(0.048)	(0.000)	(0.000)
Health Literacy Score	**X32**	-0.0354***	-0.169***	-0.168***	-0.0713***	-0.0173*	0.187***	0.0677***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.033)	(0.000)	(0.000)

*Source: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table F2: Correlations Between Demographic Characteristics, Flexible Resources, & Health Literacy Score*

		X22	X23	X24	X25	X26	X27	X28
Age	**X1**							
Female	**X2**							
African-American	**X3**							
Foreign Born Hispanic/Latino	**X4**							
Native Born Hispanic/Latino	**X5**							
Asian/Pacific Islander	**X6**							
American Indian/Alaskan Native	**X7**							
Multiracial	**X8**							
Household Income	**X9**							
Income From Savings/Investments	**X10**							
Educational Attainment	**X11**							
Nam Powers Boyd Occupational Score	**X12**							
Employed Part Time	**X13**							

Employed Not at Work	**X14**				
Unemployed	**X15**				
Out of Labor Force	**X16**				
Not a Citizen	**X17**				
Did Not Vote	**X18**				
Do Not Remember	**X19**				
Current Affairs/Political/Govt. Information Source	**X20**				
Weekly Library Use	**X21**				
Monthly Library Use	**X22**				
Library Use 1 or 2 Times a Year	**X23**	-0.337*** (0.000)			
Never Use Library	**X24**	-0.346*** (0.000)	-0.500*** (0.000)		
Freq Volunteer Activity	**X25**	0.0684*** (0.000)	0.0215** (0.008)	-0.171*** (0.000)	
Spanish/ESL	**X26**	0.00985 (0.223)	-0.00480 (0.552)	-0.0108 (0.181)	-0.0303*** (0.000)

Speaks Only Spanish	**X27**	0.00238	-0.0162*	-0.0193*	-0.0422***	-0.0437***		
		(0.769)	(0.046)	(0.017)	(0.000)	(0.000)		
Other Language Spoken ESL	**X28**	-0.0358***	-0.109***	0.156***	-0.109***	-0.0549***	-0.0662***	
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Never Married	**X29**	0.0223**	-0.00570	-0.0742***	-0.0450***	0.0416***	-0.00920	-0.0111
		(0.006)	(0.481)	(0.000)	(0.000)	(0.000)	(0.255)	(0.171)
Separated/Divorced/Widowed	**X30**	-0.0184*	-0.00218	0.0333***	-0.0198*	-0.00921	-0.00302	-0.0509***
		(0.023)	(0.787)	(0.000)	(0.014)	(0.255)	(0.709)	(0.000)
Health Information Source	**X31**	0.121***	0.0688***	-0.260***	0.135***	0.0128	0.0366***	-0.175***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.114)	(0.000)	(0.000)
Health Literacy Score	**X32**	0.0958***	0.103***	-0.237***	0.139***	-0.0455***	-0.0321***	-0.246***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table F2: Correlations Between Demographic Characteristics, Flexible Resources, & Health Literacy Score*

		X29	X30	X31
Age	**X1**			
Female	**X2**			
African-American	**X3**			
Foreign Born Hispanic/Latino	**X4**			
Native Born Hispanic/Latino	**X5**			
Asian/Pacific Islander	**X6**			
American Indian/Alaskan Native	**X7**			
Multiracial	**X8**			
Household Income	**X9**			
Income From Savings/Investments	**X10**			
Educational Attainment	**X11**			
Nam Powers Boyd Occupational Score	**X12**			
Employed Part Time	**X13**			

Employed Not at Work	**X14**
Unemployed	**X15**
Out of Labor Force	**X16**
Not a Citizen	**X17**
Did Not Vote	**X18**
Do Not Remember	**X19**
Current Affairs/Political/Govt. Information Source	**X20**
Weekly Library Use	**X21**
Monthly Library Use	**X22**
Library Use 1 or 2 Times a Year	**X23**
Never Use Library	**X24**
Freq Volunteer Activity	**X25**
Spanish/ESL	**X26**
Speaks Only Spanish	**X27**

Other Language Spoken ESL	**X28**			
Never Married	**X29**			
Separated/Divorced/Widowed	**X30**	-0.241*** (0.000)		
Health Information Source	**X31**	-0.0742*** (0.000)	-0.0102 (0.206)	
Health Literacy Score	**X32**	0.0113 (0.161)	-0.0991*** (0.000)	0.132*** (0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table F3: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy & Health Insurance Status*

		X1	X2	X3	X4	X5	X6	X7
Age[a]	X1							
Female	X2	0.0147						
		(0.092)						
African-American	X3	-0.0411***	0.0205*					
		(0.000)	(0.019)					
Foreign Born Hispanic/Latino	X4	-0.0846***	-0.0115	-0.110***				
		(0.000)	(0.189)	(0.000)				
Native Born Hispanic/Latino	X5	-0.109***	0.0228**	-0.0842***	-0.0687***			
		(0.000)	(0.009)	(0.000)	(0.000)			
Asian/Pacific Islander	X6	-0.0320***	-0.0172*	-0.0712***	-0.0581***	-0.0444***		
		(0.000)	(0.049)	(0.000)	(0.000)	(0.000)		
American Indian/Alaskan Native	X7	0.000591	-0.0101	-0.0332***	-0.0271**	-0.0207*	-0.0175*	
		(0.946)	(0.247)	(0.000)	(0.002)	(0.018)	(0.045)	
Multiracial	X8	-0.00996	-0.0157	-0.0460***	-0.0376***	-0.0287**	-0.0243**	-0.0113
		(0.255)	(0.072)	(0.000)	(0.000)	(0.001)	(0.005)	(0.196)
Median Household Income[a]	X9	0.112***	-0.0610***	-0.177***	-0.178***	-0.0800***	0.0291***	-0.0557***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Extra Income From	X10	0.171***	-0.0461***	-0.157***	-0.191***	-0.0907***	0.0419***	-0.0386***
Savings/Investments		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Educational Attainment[a]	X11	0.0928***	0.00949	-0.101***	-0.240***	-0.0636***	0.0934***	-0.0347***
		(0.000)	(0.278)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nam Powers Boyd	X12	-0.118***	-0.0245**	-0.0360***	-0.0829***	0.00979	0.0213*	-0.0260**
Occupational Score[a]		(0.000)	(0.005)	(0.000)	(0.000)	(0.263)	(0.015)	(0.003)

Employment Status	**X13**	-0.000212	-0.229***	-0.0241**	0.0107	-0.00552	0.0111	-0.0107
		(0.981)	(0.000)	(0.006)	(0.222)	(0.528)	(0.204)	(0.220)
Vote in 2000 Election	**X14**	0.351***	0.0464***	-0.0313***	-0.244***	-0.0598***	-0.0985***	-0.0102
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.242)
Current Affairs/Political/Govt. Information Source[a]	**X15**	0.0332***	0.0470***	0.0613***	-0.210***	-0.0122	0.0161	0.000807
		(0.000)	(0.000)	(0.000)	(0.000)	(0.161)	(0.066)	(0.926)
Library	**X16**	-0.103***	0.127***	-0.00293	-0.153***	0.0161	0.0360***	-0.0139
		(0.000)	(0.000)	(0.738)	(0.000)	(0.065)	(0.000)	(0.113)
Volunteer	**X17**	0.0656***	0.0602***	-0.0408***	-0.146***	-0.0169	-0.0336***	0.00519
		(0.000)	(0.000)	(0.000)	(0.000)	(0.053)	(0.000)	(0.553)
Non-English Speaker	**X18**	-0.0861***	-0.0314***	-0.119***	0.658***	0.176***	0.264***	-0.00528
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.546)
Marital Status	**X19**	0.251***	-0.0314***	-0.146***	0.0355***	-0.0419***	0.0227**	-0.0314***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.009)	(0.000)
Health Info. Source[a]	**X20**	0.176***	0.177***	0.0507***	-0.146***	-0.00842	0.0264**	-0.00367
		(0.000)	(0.000)	(0.000)	(0.000)	(0.335)	(0.003)	(0.675)
Health Literacy Score[a]	**X21**	-0.0494***	0.0576***	-0.157***	-0.254***	-0.0349***	-0.00264	-0.0324***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.763)	(0.000)
Need Based Literacy Support[a]	**X22**	-0.0466***	-0.0606***	0.0227**	0.261***	0.00392	0.0438***	0.0194*
		(0.000)	(0.000)	(0.009)	(0.000)	(0.654)	(0.000)	(0.027)
Literacy Self-Efficacy[a]	**X23**	0.0306***	0.0153	-0.0731***	-0.348***	-0.0327***	-0.0329***	-0.0170
		(0.000)	(0.081)	(0.000)	(0.000)	(0.000)	(0.000)	(0.052)
Health Insurance Status	**X24**	0.172***	0.0380***	-0.0480***	-0.244***	-0.0463***	0.00893	-0.0317***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.307)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 13,080 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001
[a] Variable rescaled by Interquartile Range (IQR)

Table F3: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy & Health Insurance Status*

		X8	X9	X10	X11	X12	X13	X14	X15
Age[a]	**X1**								
Female	**X2**								
African-American	**X3**								
Foreign Born Hispanic/Latino	**X4**								
Native Born Hispanic/Latino	**X5**								
Asian/Pacific Islander	**X6**								
American Indian/Alaskan Native	**X7**								
Multiracial	**X8**								
Median Household Income[a]	**X9**	-0.0213*							
		(0.015)							
Extra Income From Savings/Investments	**X10**	-0.0152	0.427***						
		(0.082)	(0.000)						
Educational Attainment[a]	**X11**	-0.0248**	0.456***	0.375***					
		(0.005)	(0.000)	(0.000)					
Nam Powers Boyd	**X12**	-0.0133	0.203***	0.123***	0.274***				

Occupational Score[a]		(0.128)	(0.000)	(0.000)	(0.000)				
Employment Status	**X13**	-0.0256**	0.201***	0.0916***	0.142***	0.276***			
		(0.003)	(0.000)	(0.000)	(0.000)	(0.000)			
Vote in 2000 Election	**X14**	-0.0185*	0.307***	0.276***	0.357***	0.0881***	0.104***		
		(0.034)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Current Affairs/Political/Govt.	**X15**	-0.00370	0.207***	0.178***	0.305***	0.137***	0.0446***	0.222***	
Information Source[a]		(0.672)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Library	**X16**	0.0163	0.129***	0.122***	0.310***	0.128***	-0.0511***	0.142***	0.285***
		(0.063)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Volunteer	**X17**	-0.00786	0.223***	0.202***	0.281***	0.127***	0.0252**	0.258***	0.190***
		(0.369)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Non-English Speaker	**X18**	-0.0353***	-0.148***	-0.156***	-0.163***	-0.0590***	0.000359	-0.281***	-0.158***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.967)	(0.000)	(0.000)
Marital Status	**X19**	-0.0296***	0.288***	0.141***	0.0861***	-0.0136	0.0630***	0.166***	0.0132
		(0.001)	(0.000)	(0.000)	(0.000)	(0.119)	(0.000)	(0.000)	(0.131)
Health Info. Source[a]	**X20**	-0.00986	0.159***	0.153***	0.235***	0.0746***	-0.0249**	0.229***	0.529***
		(0.260)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.000)	(0.000)
Health Literacy Score[a]	**X21**	-0.0181*	0.321***	0.262***	0.406***	0.188***	0.0703***	0.220***	0.178***
		(0.039)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Need Based Literacy Support[a]	**X22**	-0.0123	-0.196***	-0.167***	-0.305***	-0.127***	-0.0759***	-0.214***	-0.130***
		(0.160)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Literacy Self-Efficacy[a]	**X23**	0.00983	0.322***	0.256***	0.420***	0.186***	0.125***	0.267***	0.247***
		(0.261)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Health Insurance Status	**X24**	-0.00496	0.318***	0.281***	0.268***	0.0284**	0.104***	0.258***	0.137***
		(0.571)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 13,080 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

[a] Variable rescaled by Interquartile Range (IQR)

Table F3: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy & Health Insurance Status*

		X16	X17	X18	X19	X20	X21	X22	X23
Age[a]	**X1**								
Female	**X2**								
African-American	**X3**								
Foreign Born Hispanic/Latino	**X4**								
Native Born Hispanic/Latino	**X5**								
Asian/Pacific Islander	**X6**								
American Indian/Alaskan Native	**X7**								
Multiracial	**X8**								
Median Household Income[a]	**X9**								
Extra Income From Savings/Investments	**X10**								
Educational Attainment[a]	**X11**								
Nam Powers Boyd Occupational Score[a]	**X12**								

Employment Status	**X13**								
Vote in 2000 Election	**X14**								
Current Affairs/Political/Govt. Information Source[a]	**X15**								
Library	**X16**								
Volunteer	**X17**	0.201***							
		(0.000)							
Non-English Speaker	**X18**	-0.103***	-0.162***						
		(0.000)	(0.000)						
Marital Status	**X19**	-0.0464***	0.0692***	0.0341***					
		(0.000)	(0.000)	(0.000)					
Health Info. Source[a]	**X20**	0.261***	0.152***	-0.106***	0.0709***				
		(0.000)	(0.000)	(0.000)	(0.000)				
Health Literacy Score[a]	**X21**	0.214***	0.189***	-0.241***	0.0719***	0.124***			
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Need Based Literacy Support[a]	**X22**	-0.161***	-0.128***	0.244***	-0.00350	-0.111***	-0.309***		
		(0.000)	(0.000)	(0.000)	(0.689)	(0.000)	(0.000)		
Literacy Self-Efficacy[a]	**X23**	0.182***	0.179***	-0.307***	0.0542***	0.150***	0.373***	-0.468***	
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Health Insurance Status	**X24**	0.103***	0.153***	-0.211***	0.167***	0.145***	0.205***	-0.151***	0.244***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 13,080 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001
[a] Variable rescaled by Interquartile Range (IQR)

Table F4: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy, Type of Health Insurance, & Self-Rated Health Status*

		X1	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**
Age[a]	**X1**							
Female	**X2**	0.0235**						
		(0.004)						
African-Americans	**X3**	-0.0689***	0.0194*					
		(0.000)	(0.016)					
Foreign Born Hispanic/Latino	**X4**	-0.103***	-0.00822	-0.101***				
		(0.000)	(0.309)	(0.000)				
Native Born Hispanic/Latino	**X5**	-0.103***	0.0184*	-0.0777***	-0.0626***			
		(0.000)	(0.023)	(0.000)	(0.000)			
Asian/Pacific Islander	**X6**	-0.0517***	-0.0141	-0.0654***	-0.0527***	-0.0405***		
		(0.000)	(0.082)	(0.000)	(0.000)	(0.000)		
American Indian/Alaskan Native	**X7**	-0.0183*	-0.00945	-0.0302***	-0.0243**	-0.0187*	-0.0157	
		(0.023)	(0.242)	(0.000)	(0.003)	(0.021)	(0.052)	
Multiracial	**X8**	-0.0212**	-0.00931	-0.0427***	-0.0345***	-0.0265**	-0.0223**	-0.0103
		(0.009)	(0.249)	(0.000)	(0.000)	(0.001)	(0.006)	(0.203)
Median Household Income[a]	**X9**	-0.0679***	-0.0778***	-0.158***	-0.156***	-0.0703***	0.0355***	-0.0486***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Extra Income From Savings/Investments	**X10**	0.219***	-0.0432***	-0.174***	-0.199***	-0.0949***	0.0277***	-0.0428***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Educational Attainment[a]	**X11**	-0.0290***	-0.0113	-0.0961***	-0.214***	-0.0592***	0.0951***	-0.0305***
		(0.000)	(0.161)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Nam Powers Boyd Occupational Score[a]	**X12**	-0.400***	-0.0333***	-0.000399	-0.0384***	0.0268***	0.0387***	-0.00741
		(0.000)	(0.000)	(0.961)	(0.000)	(0.001)	(0.000)	(0.359)

Employment Status	**X13**	-0.278***	-0.204***	0.00105	0.0346***	0.0113	0.0247**	-0.000436
		(0.000)	(0.000)	(0.897)	(0.000)	(0.164)	(0.002)	(0.957)
Vote in 2000 Election	**X14**	0.364***	0.0449***	-0.0460***	-0.243***	-0.0605***	-0.106***	-0.0188*
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.020)
Current Affairs/Political/Govt. Information Source[a]	**X15**	-0.00630	0.0459***	0.0485***	-0.197***	-0.00974	0.0188*	-0.000573
		(0.436)	(0.000)	(0.000)	(0.000)	(0.228)	(0.020)	(0.943)
Library	**X16**	-0.160***	0.105***	-0.00495	-0.140***	0.0116	0.0375***	-0.0102
		(0.000)	(0.000)	(0.540)	(0.000)	(0.150)	(0.000)	(0.206)
Volunteer	**X17**	0.0223**	0.0508***	-0.0414***	-0.139***	-0.0205*	-0.0298***	0.00274
		(0.006)	(0.000)	(0.000)	(0.000)	(0.011)	(0.000)	(0.735)
Non-English Speaker	**X18**	-0.0736***	-0.0323***	-0.115***	0.637***	0.185***	0.255***	-0.00243
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.764)
Marital Status	**X19**	0.138***	-0.0704***	-0.140***	0.0318***	-0.0400***	0.0202*	-0.0292***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.012)	(0.000)
Health Info. Source[a]	**X20**	0.138***	0.167***	0.0311***	-0.144***	-0.00686	0.0227**	-0.00840
		(0.000)	(0.000)	(0.000)	(0.000)	(0.396)	(0.005)	(0.299)
Health Literacy Score[a]	**X21**	-0.169***	0.0478***	-0.136***	-0.223***	-0.0303***	0.00715	-0.0255**
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.376)	(0.002)
No Health Insurance	**X22**	-0.227***	-0.0368***	0.0579***	0.242***	0.0508***	0.00179	0.0338***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.825)	(0.000)
Medicare Medicaid or State Service	**X23**	0.301***	0.0572***	0.0564***	0.00555	0.00944	-0.0364***	0.0119
		(0.000)	(0.000)	(0.000)	(0.493)	(0.243)	(0.000)	(0.142)
Private Company	**X24**	0.230***	0.0224**	-0.0510***	-0.0673***	-0.0366***	-0.0273***	-0.0111
		(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.001)	(0.171)
Military & Other Not Specified	**X25**	0.155***	-0.0449***	-0.0168*	-0.0390***	-0.00535	0.00725	0.0241**
		(0.000)	(0.000)	(0.038)	(0.000)	(0.508)	(0.370)	(0.003)
Need Based Literacy Support[a]	**X26**	0.0186*	-0.0659***	0.0348***	0.245***	0.0112	0.0373***	0.0182*

		(0.021)	(0.000)	(0.000)	(0.000)	(0.164)	(0.000)	(0.025)
Literacy Self-Efficacy[a]	**X27**	-0.476***	0.00485	-0.00328	-0.159***	0.00737	0.0146	0.00541
		(0.000)	(0.549)	(0.685)	(0.000)	(0.362)	(0.071)	(0.504)
Poor/Fair Self-Rated Health	**X28**	0.232***	0.00393	0.0483***	0.0297***	-0.00111	-0.0243**	0.0233**
		(0.000)	(0.627)	(0.000)	(0.000)	(0.891)	(0.003)	(0.004)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

[a] Variable rescaled by Interquartile Range (IQR)

Table F4: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy, Type of Health Insurance, & Self-Rated Health Status*

		X8	X9	X10	X11	X12	X13	X14
Age[a]	**X1**							
Female	**X2**							
African-Americans	**X3**							
Foreign Born Hispanic/Latino	**X4**							
Native Born Hispanic/Latino	**X5**							
Asian/Pacific Islander	**X6**							
American Indian/Alaskan Native	**X7**							
Multiracial	**X8**							
Median Household Income[a]	**X9**	-0.0175* (0.030)						
Extra Income From Savings/Investments	**X10**	-0.0200* (0.013)	0.376*** (0.000)					
Educational Attainment[a]	**X11**	-0.0133 (0.101)	0.465*** (0.000)	0.337*** (0.000)				
Nam Powers Boyd Occupational Score[a]	**X12**	0.00205 (0.800)	0.264*** (0.000)	0.0271*** (0.001)	0.281*** (0.000)			

Employment Status	**X13**	-0.0128	0.253***	0.0194*	0.167***	0.402***		
		(0.113)	(0.000)	(0.017)	(0.000)	(0.000)		
Vote in 2000 Election	**X14**	-0.0225**	0.249***	0.295***	0.313***	-0.0170*	0.0139	
		(0.005)	(0.000)	(0.000)	(0.000)	(0.035)	(0.084)	
Current Affairs/Political/Govt. Information Source[a]	**X15**	0.00493	0.220***	0.177***	0.312***	0.135***	0.0555***	0.213***
		(0.542)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Library	**X16**	0.0188*	0.163***	0.106***	0.330***	0.171***	0.0113	0.113***
		(0.020)	(0.000)	(0.000)	(0.000)	(0.000)	(0.162)	(0.000)
Volunteer	**X17**	-0.00727	0.216***	0.199***	0.279***	0.123***	0.0343***	0.243***
		(0.368)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-English Speaker	**X18**	-0.0327***	-0.132***	-0.154***	-0.148***	-0.0357***	0.0105	-0.268***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.193)	(0.000)
Marital Status	**X19**	-0.0283***	0.286***	0.145***	0.0903***	0.00109	0.0583***	0.152***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.893)	(0.000)	(0.000)
Health Info. Source[a]	**X20**	-0.00582	0.154***	0.168***	0.232***	0.0459***	-0.0362***	0.236***
		(0.471)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Health Literacy Score[a]	**X21**	-0.0114	0.333***	0.214***	0.404***	0.233***	0.130***	0.165***
		(0.157)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
No Health Insurance	**X22**	0.00697	-0.264***	-0.285***	-0.225***	0.0486***	-0.0292***	-0.269***
		(0.388)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Medicaid or State Service	**X23**	-0.00771	-0.260***	-0.0705***	-0.182***	-0.315***	-0.323***	0.0108
		(0.340)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.183)
Private Company	**X24**	0.0145	-0.00274	0.149***	0.0296***	-0.136***	-0.118***	0.111***
		(0.073)	(0.735)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Military & Other Not	**X25**	0.00564	-0.0348***	0.0419***	0.000180	-0.0920***	-0.102***	0.0687***

Specified								
		(0.485)	(0.000)	(0.000)	(0.982)	(0.000)	(0.000)	(0.000)
Need Based Literacy Support[a]	**X26**	-0.00737	-0.197***	-0.163***	-0.303***	-0.126***	-0.0867***	-0.191***
		(0.362)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Literacy Self-Efficacy[a]	**X27**	0.0186*	0.318***	0.0440***	0.317***	0.446***	0.351***	0.0170*
		(0.021)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.036)
Poor/Fair Self-Rated Health	**X28**	0.0319***	-0.229***	-0.106***	-0.229***	-0.241***	-0.214***	-0.0426***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001
[a] Variable rescaled by Interquartile Range (IQR)

Table F4: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy, Type of Health Insurance, & Self-Rated Health Status*

		X15	X16	X17	X18	X19	X20	X21
Age[a]	X1							
Female	X2							
African-Americans	X3							
Foreign Born Hispanic/Latino	X4							
Native Born Hispanic/Latino	X5							
Asian/Pacific Islander	X6							
American Indian/Alaskan Native	X7							
Multiracial	X8							
Median Household Income[a]	X9							
Extra Income From Savings/Investments	X10							
Educational Attainment[a]	X11							
Nam Powers Boyd	X12							

Occupational Score[a]								
Employment Status	**X13**							
Vote in 2000 Election	**X14**							
Current Affairs/Political/Govt. Information Source[a]	**X15**							
Library	**X16**	0.296***						
		(0.000)						
Volunteer	**X17**	0.191***	0.205***					
		(0.000)	(0.000)					
Non-English Speaker	**X18**	-0.143***	-0.0964***	-0.159***				
		(0.000)	(0.000)	(0.000)				
Marital Status	**X19**	0.0279***	-0.0349***	0.0710***	0.0283***			
		(0.001)	(0.000)	(0.000)	(0.000)			
Health Info. Source[a]	**X20**	0.542***	0.260***	0.155***	-0.0987***	0.0695***		
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Health Literacy Score[a]	**X21**	0.187***	0.237***	0.189***	-0.220***	0.0695***	0.132***	
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
No Health Insurance	**X22**	-0.125***	-0.0731***	-0.139***	0.200***	-0.152***	-0.142***	-0.158***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Medicare Medicaid or State Service	**X23**	-0.0878***	-0.100***	-0.0895***	0.0127	-0.0792***	-0.0288***	-0.174***
		(0.000)	(0.000)	(0.000)	(0.116)	(0.000)	(0.000)	(0.000)
Private Company	**X24**	0.0289***	-0.0255**	0.0574***	-0.0521***	0.00451	0.0482***	0.00113
		(0.000)	(0.002)	(0.000)	(0.000)	(0.577)	(0.000)	(0.889)
Military & Other Not	**X25**	0.0211**	0.0136	0.0252**	-0.0331***	0.0356***	0.0370***	-0.0144

Specified								
		(0.009)	(0.093)	(0.002)	(0.000)	(0.000)	(0.000)	(0.074)
Need Based Literacy Support[a]	**X26**	-0.142***	-0.174***	-0.127***	0.226***	-0.00243	-0.131***	-0.303***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.763)	(0.000)	(0.000)
Literacy Self-Efficacy[a]	**X27**	0.168***	0.194***	0.133***	-0.157***	0.0424***	0.0587***	0.330***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Poor/Fair Self-Rated Health	**X28**	-0.134***	-0.144***	-0.111***	0.0274***	-0.0540***	-0.0826***	-0.220***
		(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001
[a] Variable rescaled by Interquartile Range (IQR)

Table F4: Correlations Between Demographic Characteristics, Flexible Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy, Type of Health Insurance, & Self-Rated Health Status*

		X22	X23	X24	X25	X26	X27
Age[a]	X1						
Female	X2						
African-Americans	X3						
Foreign Born Hispanic/Latino	X4						
Native Born Hispanic/Latino	X5						
Asian/Pacific Islander	X6						
American Indian/Alaskan Native	X7						
Multiracial	X8						
Median Household Income[a]	X9						
Extra Income From Savings/Investments	X10						
Educational Attainment[a]	X11						

Nam Powers Boyd Occupational Score[a]	**X12**		
Employment Status	**X13**		
Vote in 2000 Election	**X14**		
Current Affairs/Political/Govt. Information Source[a]	**X15**		
Library	**X16**		
Volunteer	**X17**		
Non-English Speaker	**X18**		
Marital Status	**X19**		
Health Info. Source[a]	**X20**		
Health Literacy Score[a]	**X21**		
No Health Insurance	**X22**		
Medicare Medicaid or State Service	**X23**	-0.196*** (0.000)	
Private Company	**X24**	-0.160*** (0.000)	-0.135*** (0.000)

Military & Other Not Specified	**X25**	-0.135***	-0.114***	-0.0927***			
		(0.000)	(0.000)	(0.000)			
Need Based Literacy Support[a]	**X26**	0.131***	0.104***	-0.0163*	0.00742		
		(0.000)	(0.000)	(0.043)	(0.359)		
Literacy Self-Efficacy[a]	**X27**	-0.0343***	-0.352***	-0.155***	-0.0937***	-0.305***	
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Poor/Fair Self-Rated Health	**X28**	0.0309***	0.267***	0.0138	0.0308***	0.151***	-0.236***
		(0.000)	(0.000)	(0.088)	(0.000)	(0.000)	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. N = 15,308 p-values in parentheses. * p<0.05, ** p<0.01, *** p<0.001

[a] Variable rescaled by Interquartile Range (IQR)

Appendix G

Future Research: The Context of Health Literacy & Health Disparities

The purpose of the future research project is to examine health literacy within the community or social context. The review of literature synthesizes the community context and health research (also referred to as social ecology of health), health literacy literature, and the fundamental social cause framework. Community context, independently of individual level characteristics, is a consistent and significant predictor of individual health outcomes (Riva, Gauvin, & Barnett, 2007). The analyses will build upon the overall project above by including measures of socioeconomic and demographic characteristics at the community level. The future research will examine individual levels of health literacy as mediating mechanism between community context and self-reported health status. Therefore, the future research will examine the principle questions: 1) above and beyond individual socio-demographic and socioeconomic characteristics, is there a relationship between community level social context and aggregate or group levels of health literacy? 2) If a relationship exists, does health literacy mediating the relationship between community level social context and differences in self-reported health?

Literature Review

An essential component of the fundamental social cause framework is the importance of flexible resources. Link and Phelan (2002) point out that resources are important for, at least, two reasons: 1) resources directly shape health behaviors by influencing whether people know about, have access to, can afford, and locate support to engage in health-enhancing behaviors, and 2) resources shape access to broad contexts such as neighborhoods, occupations, and social networks that vary in associated profiles of risk and protective factors. The future research project will focus on the importance of the latter, to examine the impact of community context on individual levels of health literacy and self-rated health. Individuals live within social contexts that promote or prohibit health-enhancing behavior. To date, there is a vacuum to research examining the impact of community context on individual health literacy level.

Previous community context and health research examine the impact of disadvantaged and/or disorganized communities on individual level health outcomes and/or disparities in health outcomes (N. Krieger, Williams, & Moss, 2011; Robert, 1999). The bulk of the research focuses on the independent contribution of low socioeconomic context on health outcomes. For instance, low socioeconomic neighborhoods have a high percentage of residents in: 1) poverty, 2) unemployed, 3) without a high school diploma/GED or college degree (Catalano, Hans-Tore, & Hartig, 1999; Kirby & Kaneda, 2005; J. Lynch et al., 2004; Robert, 1999), 4) female headed households (Boardman, Finch, Ellison, Williams, & Jackson, 2001; Catherine E. Ross & Mirowsky, 2008, 2009; Cathrine E. Ross & Mirowsky, 2001). Conversely, a portion of previous research examine the protective effects of neighborhood residents to mobilize resources for their community (i.e., collective efficacy and social capital), level of affluence, and residential stability (Browning & Cagney, 2002; Carpiano & Hystad, 2011; Moore et al., 2011; Robert, 1999). Both lines of research suggest that socially disadvantaged communities (i.e., low socioeconomic) or communities who lack affluence and residential stability are negatively impact on a range of individual level physical and mental health outcomes. Moreover, neighborhoods with a high level of racial segregation account for a moderate to substantial portion of the gap in health differences between African-American and whites (Do et al., 2008; Schulz et al., 2000; K. White & Borrell, 2011).

The findings from the community context and health literature highlight that community characteristics independently contribute to poor health outcomes as well as disparities in health outcomes. However, with a few exceptions (Do et al., 2008; Kawachi, Kennedy, & Glass, 1999; Kirby & Kaneda, 2005), the majority of community context and health research employ samples from urban areas. Thus, the findings from the research above are not generalizability to rural and/or suburban areas. In general, the studies reviewed above rely on survey responses from residents to infer a community characteristic and commit a fallacy of composition (Nabi & Oliver, 2009). Spatial inequality research provides insight to conceptualize and measure the impact of social context (L. Lobao & Saenz, 2002).

Lobao and colleagues (2007) note that the study of spatial inequality encompasses and examines stratification across places at different levels of scale. Therefore, the focus of spatial inequality research meshes well with Link and Phelan’s (2002) second point above. Spatial inequality research (Diez Roux & Mair, 2010; P. Hayward, Cramer, Nepaul, Osleeb, & Vias, 2008; L. M. Lobao et al., 2007; L. Lobao & Saenz, 2002; McLaughlin, Stokes, Smith, & Nonoyama, 2007) suggests that single measures of economic inequality are limited. McLaughlin and colleagues (2007) demonstrate that multiple measures for Census data provide a single socioeconomic status factor. Access to health care services is equally important. Likewise, racial/ethnic segregation is a social structural process that leads to health outcome disparities (David R. Williams & Collins, 1995, 2001). Yet, a single measure of residential segregation, such as the percent of African-American residents, provides little information on the distribution of racial/ethnic minorities in a given area. However, an index of dissimilarity (Massey & Denton, 1987) measures the spatial distribution of racial/ethnic evenness and exposure.

As noted above, Kirby and Kaneda (2005) point out that data from the Area Resource File from the Bureau of Health Professionals and the Primary Care Service Area data provide measures of medical service supply. Supply of medical services suggests access (or thereof) to medical care services. Access to resources is a salient concern in rural areas (Isserman, 2005; Isserman, Feser, & Warren, 2009; Isserman, Rephann, & Sorenson, 1989). A spatial inequality analysis must account for the characteristics of an area such as population density, commuting patterns, and distance from resources (L. M. Lobao et al., 2007; L. Lobao & Saenz, 2002). Isserman (2005) provides a comprehensive review of the predominant rural-urban typologies. Moreover, Isserman (2005) offers a rural-urban typology that focuses on importance of rural areas. Health literacy researchers are in the early stages of recognizing the importance of spatial analysis and community context.

Lurie & Parker (2007) argue that health literacy researchers need to think beyond addressing health literacy as an individual problem that is only addressed in the clinical setting. The strong relationship between health literacy to both income and education warrants viewing health literacy as a neighborhood or community issue. Ideally, a conceptual and operational definition of community or public health literacy would guide an analysis of the effect that community or public health literacy may (or may not) have on individual level health literacy. Freedman & colleagues (2009) propose a conceptual definition of public health literacy. Paralleling the IOM definition of health literacy, Freedman & colleagues (2009) define public health literacy as the degree to which individuals and groups can obtain, process, understand, evaluate and act upon information needed to make public health decisions that benefit the community. Unfortunately, there is not an operational definition to measure the concept of public health literacy.

Research Aim

Importantly, Lurie & Parker (2007, p. S6) propose "building predictive models of health literacy by linking socio-demographic characteristics to health literacy scores in the NAAL…census data will not only support such estimates on a census tract basis, but will also provide a profile of the racial/ethnic and economic characteristics of residents." Lurie & Parker (2007, p. S6) further note, "imagine the power that such a map detailing the health literacy status of a community could have." The analyses in the future research will move from imagination to reality. The future research project will examine health literacy as a mediator in the potential relationship between social context at the community level and self-rated health status.

Data & Measurement

The data for the future project come from two separate federal agencies. To examine health literacy as a theoretically abstract concept requires measuring health literacy as an abstract or latent trait (Pleasant, 2009b). To date, the 2003 National Assessment of Adult Literacy (NAAL) from the National Center for Education Statistics (NCES) is the only data set that contains a latent measure of health literacy (Baldi et al., 2009; Jin et al., 2007). The NAAL data are managed by the NCES under restricted access. In addition to the NAAL data, the NCES provides a data file to link individual respondents to their 2000 Decennial Census tract. Thus, the second source of data is Summary File 1 and 3 from the 2000 Decennial Census (U.S. Census Bureau, 2001, 2002). The analyses will employ the NAAL data, the NCES data file to link respondents to their Census tract, and 2000 Census Summary File 1 and 3. The NCES data and linked files and data from the 2000 Decennial Census are described in detail below.

In addition to the NAAL, the NCES provides a data file to link individual respondents to their 2000 Decennial Census tract. Each respondent has a unique eleven digit case identification number in the NAAL data set. The first six digits contain the respondent's three digit Primary Sampling Unit (PSU) number and three digit segment numbers. The NCES link file contains the corresponding PSU and segment numbers as well as the state and county Federal Information Processing Standards (FIPS) code and 2000 Decennial Census tract number. Respondents represent 39 states, 343 counties, and 1,753 Census tracts. Thus, tract level data from the 2000 Census will be matched to each NAAL respondent.

2000 Decennial Census

The second source of data will come from Summary Files 1 and 3 of the 2000 Decennial Census (U.S. Census Bureau, 2001, 2002). The Census provides demographic and socioeconomic data from the largest (i.e., national) to smallest (i.e., Census block) geographic levels. Previous research utilizes community level (i.e., contextual and/or community environment) socio-demographic and/or socioeconomic characteristics to examine the relationship with individual level health outcomes and health disparities (Diez Roux & Mair, 2010; Gauvin et al., 2007; Riva et al., 2007).

While not the smallest geographical unit of analysis, Census tracts are small relatively permanent statistical subdivisions nested within a county (U.S. Census Bureau, 2002). Tracts are delineated by a local committee of census data users for the purpose of presenting data. Census tract boundaries generally follow visible geographic features; however, boundaries may follow governmental unit boundaries and/or other non-visible features in some instances. Census tracts are relatively homogeneous units with respect to population characteristics (e.g., socioeconomic status, racial/ethnic composition, etc.) and contain an average of 4,000 individuals (U.S. Census Bureau, 2002).

Community context, independently of individual level characteristics, is a consistent and significant predictor of individual health outcomes (Riva et al., 2007). The analyses will attempt to examine the mediating effect of community context on health literacy above and beyond group or individual level characteristics. Therefore, above and beyond individual level socio-demographic and/or socioeconomic characteristics, is there a mediating effect between the social context at the community level and aggregate levels of health literacy?

Measures

Dependent Variable

Self-rated health is the dependent variable of interest.

Individual Level Independent Variables

The individual level or Level 1 predictors are described in Chapter 2.

Community Level Independent Variables

Economic inequality will be measured with a factor analysis of: 1) per capita income, 2) per capita income squared, 3) percent of persons aged 25 and over with more than a high school education, 4) percent of persons aged 25 and over with a college degree or more, 5) percent of employees in executive, administrative, and managerial positions, and 6) percent of employees in professional positions (McLaughlin et al., 2007).

Following Kirby & Kaneda (2005), data may also be employed from the Area Resource File from the Bureau of Health Professionals and the Primary Care Service Area data to measure *access to medical care services*. Classification of *rural-urban areas* will come from Isserman's (2005) rural-urban typology:

Rural County: (1) the county's population density is less than 500 people per square mile, and (2) 90 percent of the county population is in rural areas or the county has no urban area with a population of 10,000 or more. The density requirement is the same used to distinguish urban and rural census blocks, and the urban area threshold mimics the urban cluster requirement that defines micropolitan core areas. The 90 percent requirement screens out low-density counties with substantial urban populations, but it has no official precedent or standing.

Urban County: (1) the county's population density is at least 500 people per square mile, (2) 90 percent of the county population lives in urban areas, and (3) the county's population in urbanized areas is at least 50,000 or 90 percent of the county population. The density and the 90 percent requirement serve as above, and 50,000 is the urbanized area threshold for the nucleus of a metropolitan county. The second part of the third criterion is only necessary because independent Virginia cities are treated as counties statistically; it designates as urban counties some independent cities that have fewer than 50,000 residents but are entirely or almost entirely within larger urbanized areas that spill over their borders.

Mixed rural county: (1) the county meets neither the urban nor the rural county criteria, and (2) its population density is less than 320 people per square mile. That density is two acres per person; it has no official standing but seems reasonable.

Mixed urban county: (1) the county meets neither the urban nor the rural county criteria, and (2) its population density is at least 320 people per square mile. Thus, mixed urban counties are almost two-thirds of the way from no population to the urban density threshold of 500 people per square mile.

The index of dissimilarity values will be computed to estimate *racial/ethnic segregation*. Residential evenness is computed using the following formula:

$$D_{xy} = .5 * \Sigma| (x_i/X) - (y_i/Y)|$$

where x_i and y_i are the numbers of X and Y members in tract i, and X and Y are their totals.

Mediating Variable

The measure for level of health literacy is described in Chapter 2.

Analytical Techniques

Once data from the NAAL data file, the 2000 Census Summary File 1 and 3, and a linking file from the NCES are linked additional data containing community structural measures will be considered. For instance, Kirby & Kaneda (2005) employ data from the Area Resource File from the Bureau of Health Professionals and the Primary Care Service Area Files from the Health Resources and Services Administration to create measure of health care supply at the community level.

The initial analyses will present thematic GIS maps displaying the distribution of individuals by demographic and socioeconomic characteristic and level of health literacy.

Based on Lynch & colleagues (2004) and Krieger & colleagues (2011) the analyses in the future research project must take into consideration sampling weights from the NAAL and estimate effects at two units of analysis (i.e., individual and community). Thus, a multilevel analytic technique, such as HLM or Mixed Level Models in either SAS or Stata, will be appropriate at that time.

Appendix H

Weighted Multinominal Logistic Regression Analysis

Table H1: Multinominal Logistic Regression Self-Reported Health Status: Relative Risk Ratios for Demographic, Flexible Resources, Social Resources, & Health Literacy Score (Weighted)*

	Model 1		Model 2		Model 3		Model 4	
Demographic	**Poor/Fair**	**Very Good/ Excellent**	**Poor/Fair**	**Very Good/ Excellent**	**Poor/Fair**	**Very Good/ Excellent**	**Poor/Fair**	**Very Good/ Excellent**
Age[a]	1.887***	0.551***	1.434***	0.541***	1.384***	0.551***	1.370**	0.559***
Female	0.899	0.912	0.787*	0.947	0.799+	0.923	0.817+	0.902
Black	1.678***	0.747**	1.266+	0.982	1.188	1.017	1.145	1.031
Foreign Born Hispanic	1.551**	0.603***	0.901	1.055	0.785	0.870	0.764	0.957
Native Born Hispanic	1.338	0.676**	0.994	0.882	0.938	0.792+	0.910	0.798
Asian/Pacific Islander	0.953	0.932	1.064	0.905	0.977	0.780	1.000	0.806
Amer Indian/AK Native	3.321*	1.106	2.309+	1.524	2.184+	1.507	2.024	1.540
Multiracial	2.143**	0.708	1.966**	0.822	1.916*	0.832	1.922*	0.809
Flexible Resources								
Economic								
Median Household Income[a]			0.775*	1.358***	0.830	1.360***	0.903	1.322***
Extra Income From Savings/Investments			0.727*	1.157+	0.740*	1.140+	0.768+	1.110

Capability						
Educational Attainment[a]	0.681**	1.451***	0.717*	1.379***	0.731*	1.322***
Nam Powers Boyd Occupational Score[a]	0.804*	1.108	0.813+	1.099	0.836+	1.088
Inclusion						
Economic						
Employed Full-Time	0.525***	1.056	0.526***	1.057	0.608***	1.011
Political						
Voted in 2000 Election	0.928	1.156+	0.949	1.163+	0.954	1.140
Current Affairs/Political/Govt. Info. Source[a]	0.898+	1.056	0.909	1.029	0.897	1.030
Civic/Cultural						
Ever Use Library	0.892	1.025	0.903	0.996	0.904	0.990
Unpaid Volunteer	0.908	1.196*	0.919	1.201*	0.920	1.191*
Social Resources						
Non-Native English Speaker			1.086	1.357*	1.086	1.400*
Married/Living as Married			0.870	0.913	0.893	0.907
Health Information Source[a]			0.994	1.057	1.011	1.054
Health Literacy Score[a]			0.838*	1.152***	0.845*	1.117*
Health						

Insurance Type					
No Health Insurance				1.340+	0.868+
Medicare Medicaid or State Service				2.195***	0.819+
Private Company				1.316+	1.180
Military & Other Not Specified				1.373	0.998
Need Based Social Support [a]				1.064	0.887**
Literacy Self Efficacy [a]				1.183+	1.069
McFadden's Adj R^2	0.0538	0.122	0.123	0.129	
Log likelihood	-13843.7	-12829.4	-12806.5	-12708.0	

*Source: The National Assessment of Adult Literacy (NAAL) 2003. Respondent N = 15,308. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001. [a] Continuous measures are scaled by their respective Interquartile Range (IQR). Significant Odds Ratios are interpreted as the average amount of change in the predictor variable.

Table 1.1: Descriptive Statistics for Demographic, Flexible Resources, Social Resources, Social Support, Literacy Self-Efficacy, Health Insurance Type, Health Literacy Score, Health Insurance Status, and Self-Reported Health Status (Weighted)*

Demographic	**Mean**	**Lin. Std. Err.**	**[95% Conf. Interval]**		**Std. Dev.**	**Min**	**Max**	**25th Prcntl**	**75th Prcntl**
Age	44.9	0.28	44.34	45.45	17.09	18.00	100.00	31.00	56.00
Male	0.48	0.01	0.47	0.49	0.50	0.00	1.00		
Female	0.52	0.01	0.51	0.53	0.50	0.00	1.00		
White	0.71	0.02	0.68	0.75	0.49	0.00	1.00		
Black	0.11	0.01	0.09	0.13	0.39	0.00	1.00		
Foreign Born Hispanic/Latino	0.07	0.01	0.06	0.09	0.31	0.00	1.00		
Native Born Hispanic/Latino	0.05	0.01	0.03	0.06	0.24	0.00	1.00		
Asian/Pacific Islander	0.03	0.01	0.02	0.04	0.14	0.00	1.00		
American Indian/Alaskan Native	0.01	0.00	0.00	0.01	0.09	0.00	1.00		
Multiracial	0.01	0.00	0.01	0.02	0.14	0.00	1.00		
Flexible Resources									
Economic									
Median Household Income (in $1,000)	51.97	1.13	49.74	54.19	35.07	0.00	12.49	17.49	67.49
Num. Inc. Sources From Savings/Investments	0.72	0.02	0.68	0.77	0.79	0.00	2.00		
Income From Savings/Investments	0.51	0.01	0.49	0.54	0.49	0.00	1.00		
No Income From Savings/Investments	0.49	0.01	0.46	0.51	0.51	0.00	1.00		
Capability									
Educational Attainment	5.70	0.08	5.55	5.86	2.99	1.00	11.00	3.00	8.00

Nam Powers Boyd Occupational Score	53.85	0.58	52.72	55.00	34.94	0.00	100.00	21.50	83.00
Inclusion									
Economic									
Employment Status									
Employed Full Time	0.51	0.01	0.49	0.52	0.50	0.00	1.00		
Employed Less Than Full Time	0.49	0.01	0.48	0.51	0.50	0.00	1.00		
Employed Part Time	0.12	0.00	0.11	0.13	0.32	0.00	1.00		
Employed Not at Work	0.04	0.00	0.03	0.04	0.19	0.00	1.00		
Unemployed	0.06	0.00	0.05	0.07	0.25	0.00	1.00		
Out of Labor Force	0.28	0.01	0.26	0.29	0.45	0.00	1.00		
Political									
Voted in 2000									
Yes	0.59	0.01	0.57	0.61	0.50	0.00	1.00		
No	0.41	0.01	0.39	0.43	0.50	0.00	1.00		
Did Not Vote	0.30	0.01	0.28	0.31	0.30	0.00	1.00		
Not a Citizen	0.08	0.01	0.06	0.1	0.46	0.00	1.00		
Do Not Remember	0.04	0.00	0.03	0.04	0.19	0.00	1.00		
Current Affairs/Political/Govt. Info. Source	2.65	0.01	2.63	2.67	0.56	1.00	4.00	2.33	3.00
Civic/Cultural									
Library Use									
Use Library	0.66	0.01	0.64	0.68	0.48	0.00	1.00		
Daily Library Use	0.03	0.00	0.02	0.03	0.17	0.00	1.00		
Weekly Library Use	0.12	0.00	0.11	0.13	0.33	0.00	1.00		
Monthly Library Use	0.19	0.01	0.18	0.20	0.39	0.00	1.00		

Library Use 1 or 2 Times a Year	0.33	0.01	0.32	0.34	0.46	0.00	1.00		
Never Use Library	0.34	0.01	0.32	0.36	0.48	0.00	1.00		
Volunteer Activity									
Never Volunteer	0.61	0.01	0.59	0.63	0.48	0.00	1.00		
Unpaid Volunteer	0.39	0.01	0.37	0.41	0.48	0.00	1.00		
Frequency of Volunteer Activity	0.67	0.02	0.64	0.70	1.02	0.00	4.00		
Social Resources									
Language Spoken									
Native English Speaker	0.84	0.01	0.81	0.87	0.39	0.00	1.00		
Non-native English Speaker	0.16	0.01	0.13	0.19	0.39	0.00	1.00		
Spanish/ESL	0.03	0.00	0.03	0.04	0.20	0.00	1.00		
Speaks Only Spanish	0.05	0.00	0.04	0.06	0.19	0.00	1.00		
Other Language Spoken ESL	0.08	0.01	0.06	0.09	0.30	0.00	1.00		
Marital Status									
Married/Living as Married	0.61	0.01	0.59	0.63	0.50	0.00	1.00		
Not Married/Living as Married	0.39	0.01	0.37	0.41	0.50	0.00	1.00		
Never Married	0.21	0.01	0.19	0.22	0.43	0.00	1.00		
Separated/Divorced/widowed	0.18	0.01	0.17	0.20	0.44	0.00	1.00		
Health Information Source	2.5	0.01	2.47	2.52	0.79	1.00	4.00	2.00	3.00
Need Based Social Support	1.92	0.02	1.88	1.95	0.71	1.00	4.00	1.00	1.75
Literacy Self-Efficacy	1.48	0.01	1.46	1.51	1.33	1.00	4.00	2.00	4.00
Health Insurance Type									
No Health Insurance	0.19	0.01	0.17	0.21	0.42	0.00	1.00		
Employer Provided	0.5	0.01	0.48	0.52	0.50	0.00	1.00		

Medicare/Medicaid/State Service	0.14	0.01	0.13	0.15	0.38	0.00	1.00		
Private Company	0.10	0.00	0.09	0.11	0.29	0.00	1.00		
Military/Other Not Specified	0.07	0.01	0.06	0.08	0.25	0.00	1.00		
Health Literacy Score	243.88	0.86	242.18	245.57	42.09	89.74	336.38	216.51	267.52
Health Insurance Status	0.81	0.01	0.79	0.83	0.42	0.00	1.00		
Self-Rated Health Status									
Excellent/Very Good/Good	0.86	0.01	0.85	0.87	0.37	0.00	1.00		
Poor/Fair	0.14	0.01	0.13	0.15	0.37	0.00	1.00		

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. Respondents 18+ years of age N = 15,309. Respondents 18-64 years of age N = 13,080.

Table 2.1: Bivariate Correlations Between Health Literacy Score, Flexible Resources, & Social Resources (Weighted)*

	Health Literacy		Health Literacy
Household Income (in $1000)	0.333*** (0.000)	Daily Library Use	0.0285*** (0.000)
Income From Savings/Investments	0.223*** (0.000)	Weekly Library Use	0.0677*** (0.000)
Educational Attainment	0.404*** (0.000)	Monthly Library Use	0.0958*** (0.000)
Nam Powers Boyd Occ. Score	0.233*** (0.000)	Library Use 1 or 2 Times a Year	0.103*** (0.000)
Employed Full Time	0.130*** (0.000)	Never Use Library	-0.237*** (0.000)
Employed Part Time	0.0370*** (0.000)	Volunteer Time	0.139*** (0.000)
Employed Not at Work	0.0389*** (0.000)	Native English Speaker	0.220*** (0.000)
Unemployed	-0.0354*** (0.000)	Spanish/ESL	-0.0455*** (0.000)
Out of Labor Force	-0.169*** (0.000)	Speaks Only Spanish	-0.0321*** (0.000)
Not a Citizen	-0.168*** (0.000)	Other Language Spoken ESL	-0.246*** (0.000)
Did Not Vote	-0.0714*** (0.000)	Never Married	0.0112 (0.165)
Voted	0.165*** (0.000)	Married/Living as Married	0.0696*** (0.000)
Do Not Remember	-0.0173* (0.033)	Separated/Divorced/Widowed	-0.0991*** (0.000)
Cur Aff/Pol./Govt. Info. Source	0.187*** (0.000)	Health Information Source	0.133*** (0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. p-values in parentheses. * p <0.05, ** p <0.01, *** p <0.001.

Table 2.2: Ordinary Least Squares Regression of Health Literacy Score on Demographic, Flexible Resources, & Social Resources (Weighted)*

	Model 1	Model 2	Model 3	Model 4	Model 5
Demographic					
Age	-0.567***	-0.569***	-0.472***	-0.501***	-0.525***
	(-0.230)	(-0.231)	(-0.191)	(-0.203)	(-0.213)
Female	4.708***	6.580***	5.966***	5.258***	4.857***
	(0.056)	(0.078)	(0.071)	(0.063)	(0.058)
Black	-25.96***	-17.06***	-16.35***	-16.63***	-16.56***
	(-0.195)	(-0.128)	(-0.123)	(-0.125)	(-0.125)
Foreign Born Hispanic/Latino	-44.48***	-33.59***	-27.96***	-22.44***	-11.61***
	(-0.279)	(-0.211)	(-0.176)	(-0.141)	(-0.073)
Native Born Hispanic/Latino	-18.38***	-10.88***	-9.298***	-9.588***	-5.690*
	(-0.092)	(-0.054)	(-0.046)	(-0.048)	(-0.028)
Asian/Pacific Islander	-8.801*	-8.499*	-12.81***	-9.152**	-3.472
	(-0.037)	(-0.036)	(-0.054)	(-0.039)	(-0.015)
American Indian/Alaskan Native	-22.59**	-12.00	-11.37	-11.59	-10.26
	(-0.045)	(-0.024)	(-0.023)	(-0.023)	(-0.021)
Multiracial	-13.05**	-8.317*	-7.479*	-7.495*	-7.202+
	(-0.037)	(-0.024)	(-0.021)	(-0.022)	(-0.021)
Flexible Resources					
Economic					
Household Income (in $1000)		0.248***	0.131***	0.117***	0.109***
		(0.219)	(0.116)	(0.104)	(0.096)
Income From Savings/Investments		6.389***	3.520***	3.053***	3.081***
		(0.125)	(0.069)	(0.060)	(0.060)
Capability					
Educational Attainment			3.806***	3.342***	3.304***
			(0.264)	(0.231)	(0.229)
Nam Powers Boyd Occ. Score			0.0665***	0.0512**	0.0497**
			(0.055)	(0.043)	(0.041)
Inclusion					
Economic					
Employment Status					

Employed Part Time	-0.140	0.237
	(-0.001)	(0.002)
Employed Not at Work	1.257	1.049
	(0.006)	(0.005)
Unemployed	-2.392	-2.106
	(-0.014)	(-0.012)
Out of Labor Force	-1.305	-0.859
	(-0.014)	(-0.009)
Political		
Voted in 2000		
Not a Citizen	-8.949***	-2.598
	(-0.058)	(-0.017)
Did Not Vote	-3.994**	-3.635**
	(-0.044)	(-0.040)
Do Not Remember	-1.745	-1.231
	(-0.008)	(-0.005)
Cur Aff/Pol/Govt. Info	1.552+	0.707
	(0.020)	(0.009)
Civic/Cultural		
Library Use		
Weekly	2.545	2.434
	(0.020)	(0.019)
Monthly	5.435+	5.251
	(0.051)	(0.049)
1 or 2 Times a Year	5.844+	5.412+
	(0.066)	(0.061)
Never	-0.152	-0.225
	(-0.002)	(-0.003)
Volunteer Time	1.217+	1.120+
	(0.030)	(0.027)
Social Resources		
Language Spoken		
Spanish/ESL		-5.710+
		(-0.025)
Speaks Only Spanish		-9.910**
		(-0.051)
Other Language Spoken ESL		-19.19***
		(-0.122)

Marital Status					
Never Married					-3.456*
					(-0.033)
Separated/Divorced/widowed					-0.686
					(-0.006)
Health Information Source					0.949
					(0.017)
Constant	274.6***	253.9***	232.2***	232.3***	235.4***
R-squared	0.136	0.213	0.270	0.280	0.286
F	101.0***	231.5***	251.4***	137.0***	110.0***

*Source: The National Assessment of Adult Literacy (NALL) 2003. Unstandardized coefficients above standardized coefficients in parentheses. Respondent N = 15,309. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001

Table 2.3: Ordinary Least Squares Regression of Health Literacy Score on Demographic, Flexible Resources, & Social Resources by Race/Ethnicity (Weighted)*

	White	**African-American**	**Foreign Born Hispanic**	**Native Born Hispanic**
Demographic				
Age	-0.551***	-0.390***	-0.360*	-0.506***
	(-0.238)	(-0.149)	(-0.120)	(-0.214)
Female	5.385***	2.610	1.181	2.633
	(0.068)	(0.032)	(0.014)	(0.035)
Flexible Resources				
Economic				
Household Income (in $1000)	0.0989***	0.127*	0.180*	0.0961
	(0.094)	(0.094)	(0.109)	(0.078)
Income From Savings/Investments	3.592***	0.453	2.072	2.081
	(0.076)	(0.007)	(0.022)	(0.035)
Capability				
Educational Attainment	3.286***	3.577***	3.610***	3.640***
	(0.235)	(0.229)	(0.233)	(0.253)
Nam Powers Boyd Occ. Score	0.0660**	0.0180	0.00172	0.00453
	(0.059)	(0.015)	(0.001)	(0.004)
Inclusion				
Economic				
Employed Part Time	-0.592	2.231	-4.845	2.414
	(-0.005)	(0.016)	(-0.035)	(0.022)
Employed Not at Work	1.480	-1.228	0.760	-12.34+
	(0.007)	(-0.006)	(0.003)	(-0.054)
Unemployed	-0.222	-1.009	-7.652	-2.189
	(-0.001)	(-0.008)	(-0.036)	(-0.017)
Out of Labor Force	-0.337	-2.568	-4.084	-6.713
	(-0.004)	(-0.027)	(-0.042)	(-0.073)
Political				
Did Not Vote	-3.804*	-2.814	-0.543	-1.990
	(-0.045)	(-0.035)	(-0.005)	(-0.026)
Curr Aff./Pol/Govt. Info Source	0.486	2.024	3.556	2.730
	(0.006)	(0.028)	(0.054)	(0.040)
Civic/Cultural				
Weekly Library Use	0.648	8.332	-2.287	11.61
	(0.005)	(0.065)	(-0.015)	(0.099)
Monthly Library Use	4.006	11.73+	-1.447	8.253

	(0.040)	(0.117)	(-0.012)	(0.088)
Library Use 1 or 2 Times a Year	3.913	10.79	-1.603	11.01
	(0.047)	(0.122)	(-0.014)	(0.139)
Never Use Library	-1.346	4.867	-6.817	6.520
	(-0.016)	(0.057)	(-0.079)	(0.080)
Volunteer Time	1.235+	-0.511	3.073	2.138
	(0.032)	(-0.014)	(0.056)	(0.057)
Social Resources				
Non-Native English Speaker	-13.28***	-10.29	-13.69	-5.330
	(-0.073)	(-0.052)	(-0.037)	(-0.071)
Never Married	-4.724*	-1.749	0.789	-6.260+
	(-0.044)	(-0.021)	(0.007)	(-0.078)
Separated/Divorced/Widowed	-1.769	0.380	3.972	-0.333
	(-0.017)	(0.004)	(0.032)	(-0.003)
Health Information Source	1.288	-0.279	0.00864	1.990
	(0.024)	(-0.006)	(0.000)	(0.041)
Constant	237.2***	209.2***	215.7***	217.6***
R-squared	0.242	0.156	0.164	0.242
F	66.03***	19.31***	25.13***	12.78***

**Source*: The National Assessment of Adult Literacy (NALL) 2003. Unstandardized coefficients above standardized coefficients in parentheses. Respondent N = 15,309. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001.

Table 2.4: Ordinary Least Squares Regression Models of Health Literacy Score on Demographic, Flexible Resources, & Social Resources by Sex (Weighted)*

	Females	**Males**
Demographic		
Age	-0.544***	-0.509***
	(-0.225)	(-0.202)
African-American	-17.89***	-14.82***
	(-0.140)	(-0.107)
Foreign Born Hispanic/Latino	-12.76**	-9.792+
	(-0.080)	(-0.062)
Native Born Hispanic/Latino	-7.606*	-3.234
	(-0.040)	(-0.015)
Asian/Pacific Islander	0.488	-7.449
	(0.002)	(-0.032)
American Indian/Alaskan Native	-8.645	-11.39
	(-0.017)	(-0.024)
Multiracial	-4.795	-9.148+
	(-0.013)	(-0.027)
Flexible Resources		
Economic		
Household Income (in $1000)	0.128***	0.0899**
	(0.114)	(0.079)
Income From Savings/Investments	3.395***	2.883*
	(0.066)	(0.057)
Capability		
Educational Attainment	3.018***	3.601***
	(0.207)	(0.252)
Nam Powers Boyd Occupational Score	0.0365	0.0667*
	(0.032)	(0.053)
Inclusion		
Economic		
Employed Part Time	1.357	-0.959
	(0.012)	(-0.006)
Employed Not at Work	0.621	2.934
	(0.003)	(0.013)
Unemployed	-1.456	-2.525
	(-0.008)	(-0.014)
Out of Labor Force	0.523	-2.402
	(0.006)	(-0.023)
Political		

Not a Citizen	-4.367	-1.662
	(-0.028)	(-0.011)
Did Not Vote	-4.051*	-3.027+
	(-0.044)	(-0.033)
Do Not Remember	-3.781	1.520
	(-0.017)	(0.007)
Current Affairs./Pol/Govt. Info Source	0.0170	1.472
	(0.000)	(0.018)
Civic/Cultural		
Weekly Library Use	3.747	0.269
	(0.032)	(0.002)
Monthly Library Use	6.753+	2.778
	(0.068)	(0.024)
Library Use 1 or 2 Times a Year	7.003+	2.898
	(0.079)	(0.032)
Never Use Library	1.528	-2.998
	(0.017)	(-0.034)
Volunteer Time	1.265+	0.835
	(0.032)	(0.020)
Social Resources		
Spanish/ESL	-5.321	-6.772
	(-0.022)	(-0.031)
Speaks Only Spanish	-11.86**	-7.841
	(-0.056)	(-0.044)
Other Language Spoken ESL	-18.89***	-19.51***
	(-0.122)	(-0.121)
Never Married	-1.339	-4.920**
	(-0.013)	(-0.048)
Separated/Divorced/widowed	1.232	-2.765
	(0.013)	(-0.022)
Health Information Source	2.025+	-0.193
	(0.037)	(-0.003)
Constant	238.7***	236.9***
R-squared	0.294	0.280
F	62.36***	72.31***

**Source*: The National Assessment of Adult Literacy (NALL) 2003. Unstandardized coefficients above standardized coefficients in parentheses. Respondent N = 15,309. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001

Table 3.1: Bivariate Correlations Between Health Insurance Status, Flexible Resources, Social Resources, Health Literacy Score, Need Based Social Support & Literacy Self-Efficacy (Weighted)*

	Health Insurance Status		Health Insurance Status
Median Household Income	0.264***	Never Use Library	-0.0731***
	(0.000)		(0.000)
Extra Income	0.285***	Unpaid Volunteer	0.139***
	(0.000)		(0.000)
No Extra Income	-0.285***	Never Volunteer	-0.139***
	(0.000)		(0.000)
Educational Attainment	0.225***	Health Literacy Score	0.158***
	(0.000)		(0.000)
Nam Powers Boyd	-0.0486***	Need Based Social	-0.131***
Occupational Score	(0.000)	Support	(0.000)
Employed Full Time	0.0292***	Literacy Self-Efficacy	0.0341***
	(0.000)		(0.000)
Employed Less	-0.0292***	Non-English Speaker	-0.200***
Than Full Time	(0.000)		(0.000)
Voted	0.269***	English Speaker	0.200***
	(0.000)		(0.000)
Did Not Vote	-0.269***	Married/Living	0.152***
	(0.000)	as Married	(0.000)
Current Affairs/Political/	0.124***	Not Married	-0.152***
Govt. Information Source	(0.000)		(0.000)
Ever Use Library	0.0731***	Health Information	0.142***
	(0.000)	Source	(0.000)

**Source*: The National Assessment of Adult Literacy (NAAL) 2003, p-values in parentheses, * p<0.05, ** p<0.01, *** p<0.001, N = 13,080

Table 3.2: Odds Ratios of Demographic, Flexible Resources, Social Resources, & Health Literacy Score Predicting Health Insurance Status for Adults 18 to 64 Years Old (Weighted)*

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Demographic							
Age[a]	2.127***	1.873***	1.784***	1.610***	1.482***	1.527***	1.546***
Female	1.214*	1.409***	1.378***	1.451***	1.422***	1.409***	1.411***
African-American	0.543***	0.985	1.002	0.975	1.019	1.058	1.080
Foreign Born Hispanic/Latino	0.167***	0.310***	0.347***	0.366***	0.500***	0.516***	0.543***
Native Born Hispanic/Latino	0.526***	0.823	0.863	0.855	1.010	1.017	1.027
Asian/Pacific Islander	0.845	0.790	0.708	0.804	1.011	1.021	1.051
American Indian/Alaskan Native	0.325**	0.653	0.656	0.633	0.694	0.704	0.695
Multiracial	0.678	0.900	0.906	0.940	0.967	0.982	0.982
Flexible Resources							
Economic							
Median Household Income[a]		2.996***	2.749***	2.482***	2.295***	2.253***	2.217***
Extra Income From Savings/Investments		2.342***	2.119***	2.072***	2.088***	2.068***	2.050***
Capability							
Educational Attainment[a]			1.701***	1.481***	1.521***	1.454***	1.394**
Nam Powers Boyd Occupational Score[a]			0.734***	0.657***	0.659***	0.653***	0.650***
Inclusion							
Economic							
Employed Full-Time				1.491***	1.484***	1.481***	1.466***
Political							

Voted 2000 Election				1.430***	1.374**	1.362**	1.352**
Current Affairs/Political/Govt. Info. Source[a]				1.003	0.963	0.962	0.948
Civic/Cultural							
Ever Use Library				1.107	1.107	1.093	1.094
Unpaid Volunteer				1.179+	1.159+	1.154	1.152
Social Resources							
Non-Native English Speaker					0.658**	0.677**	0.691*
Married/Living as Married					1.486***	1.479***	1.476***
Health Information Source[a]					1.101	1.100	1.103
Health Literacy Score[a]						1.131*	1.115+
Need Based Social Support[a]							1.057
Literacy Self Efficacy[a]							1.343**
McFadden's Adj R2	0.0768	0.167	0.177	0.183	0.185	0.185	0.186
Log likelihood	-6772.3	-6104.3	-6034.3	-5979.8	-5968.1	-5963.3	-5954.1

*Source: The National Assessment of Adult Literacy (NAAL) 2003. Respondent N = 13,080. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001.
[a] Continuous measures are scaled by their respective Interquartile Range (IQR). Significant odds ratios are interpreted as the likelihood of health insurance given a change (i.e., increase or decrease) in the average amount of change in a predictor variable (i.e., the change from the 25th percentile to the 75th percentile observation).

Table 3.3: Odds Ratios for Demographic, Flexible Resources, Social Resources, & Health Literacy Score Predicting Health Insurance Status by Sex for Adults 18 to 64 Years Old (Weighted)*

	Female	**Male**
Demographic		
Age [a]	1.317*	1.832***
African-American	1.382*	0.821
Foreign Born Hispanic/Latino	0.566*	0.528*
Native Born Hispanic/Latino	0.983	1.076
Asian/Pacific Islander	0.857	1.270
American Indian/Alaskan Native	0.949	0.517+
Multiracial	0.890	1.041
Flexible Resources		
Economic		
Median Household Income [a]	2.041***	2.462***
Extra Income From Savings/Investments	2.285***	1.867***
Capability		
Educational Attainment [a]	1.294*	1.507*
Nam Powers Boyd Occupational Score [a]	0.689***	0.609***
Inclusion		
Economic		
Employed Full-Time	1.343**	1.587**
Political		
Voted in 2000 Election	1.405*	1.301+
Current Affairs/Political/Govt. Info. Source [a]	0.942	0.953
Civic/Cultural		
Ever Use Library	1.034	1.147
Unpaid Volunteer	1.134	1.177
Social Resources		
Non-Native English Speaker	0.731+	0.652+
Married/Living as Married	1.402*	1.526***
Health Information Source [a]	1.117	1.096
Health Literacy Score [a]	1.173*	1.065

Need Based Social Support [a]	1.048	1.065
Literacy Self Efficacy [a]	1.382*	1.306+
McFadden's Adj R2	0.225	0.152
Log likelihood	-2586.9	-3336.6

**Source*: The National Assessment of Adult Literacy (NAAL) 2003. Respondent N = 13,080 (Female n = 5,710 & Male n = 7,370). + $p< 0.05$ * $p< 0.01$ ** $p< 0.001$ *** $p< 0.0001$.

[a] Continuous measures are scaled by their respective Interquartile Range (IQR). Significant odds ratios are interpreted as the likelihood of health insurance given a change (i.e., increase or decrease) in the average amount of change in a predictor variable (i.e., the change from the 25th percentile to the 75th percentile observation).

Table 4.1: Bivariate Correlations Between Self-Rated Health Status, Flexible Resources, Social Resources, Health Literacy Score, Need Based Social Support, Literacy Self-Efficacy, & Health Insurance Type (Weighted)*

	Self-Rated Health		Self-Rated Health
Household Income	-0.229***	Non-English Speaker	0.0274***
	(0.000)		(0.001)
Extra Income	-0.106***	English Speaker	-0.0274***
	(0.000)		(0.001)
No Extra Income	0.106***	Married Living as	-0.0540***
	(0.000)	Married	(0.000)
Educational Attainment	-0.229***	Not Married	0.0540***
	(0.000)		(0.000)
Nam Powers Boyd	-0.241***	Health Info. Source	-0.0826***
Occupational Score	(0.000)		(0.000)
Employed Full Time	-0.214***	Health Literacy Score	-0.220***
	(0.000)		(0.000)
Employed Less	0.214***	No Health Insurance	0.0309***
Than Full Time	(0.000)		(0.000)
Voted	-0.0426***	Employer Provided	-0.235***
	(0.000)	Health Insurance	(0.000)
Did Not Vote	0.0426***	Medicare Medicaid	0.267***
	(0.000)	or State Service	(0.000)
Current Affairs/Political/	-0.134***	Private Company	0.0138
Govt. Information Source	(0.000)		(0.088)
Ever Use Library	-0.144***	Military & Other	0.0308***
	(0.000)	Not Specified	(0.000)
Never Use Library	0.144***	Need Based Literacy	0.151***
	(0.000)	Support	(0.000)
Unpaid Volunteer	-0.111***	Literacy Self-Efficacy	-0.236***
	(0.000)		(0.000)
Never Volunteer	0.111***		
	(0.000)		

**Source*: The National Assessment of Adult Literacy (NAAL) 2003, p-values in parentheses, * $p<0.05$, ** $p<0.01$, *** $p<0.001$, N = 15,308.

Table 4.2: Odds Ratios for Demographic, Flexible Resources, Social Resources, & Health Literacy Score Predicting Poor/Fair Self-Reported Health Status for Adults 18 to 64 Years Old (Weighted)*

	Model 1	Model 2	Model 3	Model 4
Demographic				
Age[a]	3.154***	3.070***	3.014***	3.162***
Female	1.014	0.836+	0.861	0.867
Black	1.910***	1.144	1.019	0.916
Foreign Born Hispanic/Latino	2.215***	0.872	0.851	0.699
Native Born Hispanic/Latino	1.798*	1.155	1.153	1.049
Asian/Pacific Islander	1.027	1.209	1.198	1.107
American Indian/Alaskan Native	3.087**	1.631	1.515	1.395
Multiracial	2.705***	2.011***	1.921***	1.941**
Flexible Resources				
Economic				
Median Household Income[a]		0.538***	0.600***	0.741*
Extra Income From Savings/Investments		0.790+	0.816	0.921
Capability				
Educational Attainment[a]		0.459***	0.497***	0.555***
Nam Powers Boyd Occupational Score[a]		0.717***	0.725***	0.801*
Inclusion				
Economic				
Employment Status		0.455***	0.455***	0.579***
Political				
Vote in 2000 Election		0.952	0.971	0.992
Current Affairs/Political/Govt. Info. Source[a]		0.869*	0.868+	0.869+
Civic/Cultural				
Library		0.877	0.889	0.899
Volunteering		0.945	0.954	0.967
Social Resources				
Non-Native English Speaker			0.926	0.928
Married/Living as Married			0.785*	0.860
Health Information Source[a]			1.010	1.036
Health Literacy Score[a]			0.763***	0.795***

Health Insurance Type				
No Health Insurance				1.692***
Medicare Medicaid or State Service				4.130***
Private Company				1.233
Military & Other Not Specified				1.660*
Need Based Social Support[a]				0.986
Literacy Self Efficacy[a]				0.672**
McFadden's Adj R^2	0.0666	0.2024	0.2056	0.228
Log likelihood	-4913.1	-4198.3	-4181.7	-4063.4

*Source: The National Assessment of Adult Literacy (NAAL) 2003. Respondent N = 15,308. + p< 0.05 * p< 0.01 ** p< 0.001 *** p< 0.0001.

[a] Continuous measures are scaled by their respective Interquartile Range (IQR). Significant odds ratios are interpreted as the likelihood of poor/fair self-reported health status given a change (i.e., increase or decrease) in the average amount of change in a predictor variable (i.e., the change from the 25th percentile to the 75th percentile observation).

Table A2: Item Level Indices of Differential Functioning by Race, Sex, and Occupation*

Item	Race				Sex				Occupation			
	SIDS**	UIDS**	D-Max**	ESSD**	SIDS	UIDS	D-Max	ESSD	SIDS	UIDS	D-Max	ESSD
C000002	0.126	0.126	0.211	0.793	0.006	0.006	0.010	0.038	0.016	0.016	0.036	0.103
C000007	-0.123	0.123	-0.361	-1.116	-0.012	0.012	-0.015	-0.107	-0.039	0.039	-0.135	-0.419
C020901	0.024	0.024	0.058	0.086	-0.021	0.023	-0.103	-0.071	-0.014	0.014	-0.023	-0.046
C021001	-0.020	0.020	-0.043	-0.251	0.027	0.027	0.059	0.306	0.029	0.029	0.057	0.343
C021101	-0.009	0.009	-0.066	-0.613	0.009	0.009	0.050	0.548	0.008	0.008	0.017	0.535
C030101	-0.014	0.017	0.049	-0.045	0.015	0.015	0.027	0.045	-0.097	0.097	-0.138	-0.289
C030201	-0.010	0.010	-0.018	-0.045	0.041	0.041	0.067	0.177	0.072	0.072	0.151	0.321
C030301	-0.028	0.036	0.123	-0.216	-0.016	0.016	-0.032	-0.123	-0.078	0.078	-0.096	-0.587
C040501	0.032	0.033	0.119	0.198	0.025	0.025	0.041	0.152	-0.023	0.024	-0.035	-0.144
C040502	-0.006	0.006	-0.009	-0.165	-0.013	0.013	-0.035	-0.320	-0.018	0.018	-0.027	-0.433
C040503	-0.001	0.001	0.008	-0.023	-0.009	0.009	-0.014	-0.199	-0.032	0.032	-0.060	-0.679
C040504	0.063	0.063	0.241	0.571	0.017	0.017	0.045	0.141	0.016	0.016	0.115	0.135
C040601	-0.051	0.051	-0.132	-1.380	-0.009	0.009	-0.010	-0.224	-0.036	0.036	-0.067	-0.892
C040801	-0.035	0.035	-0.040	-1.696	-0.005	0.005	-0.010	-0.210	-0.029	0.029	-0.042	-1.295
C050801	-0.001	0.012	0.065	-0.010	0.007	0.007	0.009	0.048	0.008	0.012	0.055	0.059
C050901	-0.008	0.008	0.024	-0.305	-0.009	0.009	-0.028	-0.317	-0.031	0.031	-0.080	-0.984
C051001	-0.006	0.006	-0.017	-0.304	-0.003	0.003	-0.020	-0.155	-0.003	0.003	-0.011	-0.156
C051101	-0.091	0.091	-0.148	-2.111	0.022	0.022	0.052	0.477	-0.022	0.022	-0.026	-0.503
C060501	-0.005	0.005	-0.030	-0.072	-0.038	0.038	-0.053	-0.499	-0.022	0.022	-0.057	-0.283
C060601	-0.006	0.006	-0.037	-0.119	-0.013	0.013	-0.019	-0.252	0.004	0.005	-0.021	0.083
C070101	-0.009	0.010	-0.022	-0.037	0.026	0.026	0.038	0.108	0.017	0.017	0.028	0.072
C070901	-0.009	0.020	0.125	-0.065	-0.011	0.011	-0.038	-0.070	0.005	0.005	0.012	0.034
C071001	0.031	0.031	0.115	0.148	-0.025	0.026	-0.057	-0.111	0.077	0.077	0.219	0.363

C071101	-0.062	0.062	-0.099	-0.796	-0.007	0.007	-0.024	-0.089	0.006	0.007	-0.013	0.081
C080101	-0.089	0.089	-0.245	-0.558	-0.067	0.068	-0.079	-0.406	-0.099	0.099	-0.116	-0.601
C080201	-0.015	0.015	-0.018	-0.160	0.010	0.010	0.028	0.105	-0.060	0.060	-0.070	-0.620
N110101	-0.034	0.034	-0.043	-0.253	-0.012	0.013	-0.043	-0.083	-0.052	0.052	-0.064	-0.376
N110201	-0.021	0.021	-0.108	-0.738	0.010	0.010	0.071	0.335	-0.019	0.019	-0.029	-0.613

* *Source:* 2003 National Assessment of Adult Literacy, Restricted Data File.

** SIDS is the Signed Item Difference in Sample, UIDS is the Unsigned Item Difference in Sample, Max-D is the Maximum Difference in Sample, and ESSD is the Expected Score Standardized Difference

Table A3: Scale Level Indices of Differential Functioning by Race, Sex, and Occupation*

	Race	**Sex**	**Occupation**
Signed Test Difference in the Sample (STDS)	-0.377	-0.054	-0.417
Unsigned Test Difference in the Sample (UTDS)	0.964	0.491	0.938
Unsigned ETS Difference in Sample (UETSDS)	0.547	0.275	0.533
Expected Test Score Stand. Difference (ETSSD)	-0.126	-0.017	-0.135
Expected Test Score D-Max (Test D-Max)	-7.788	-7.404	-7.231
Theta Region of Disadvantage	(-2.55 - -2.00)	(-2.3 - -1.72)	(-2.57 - -2.04)

* *Source*: 2003 National Assessment of Adult Literacy, Restricted Data File.

Figure 1.1: Heuristic Model of the Fundamental Social Cause Framework

Figure 1.2: Complete Sample from the 2003 National Assessment of Adult Literacy

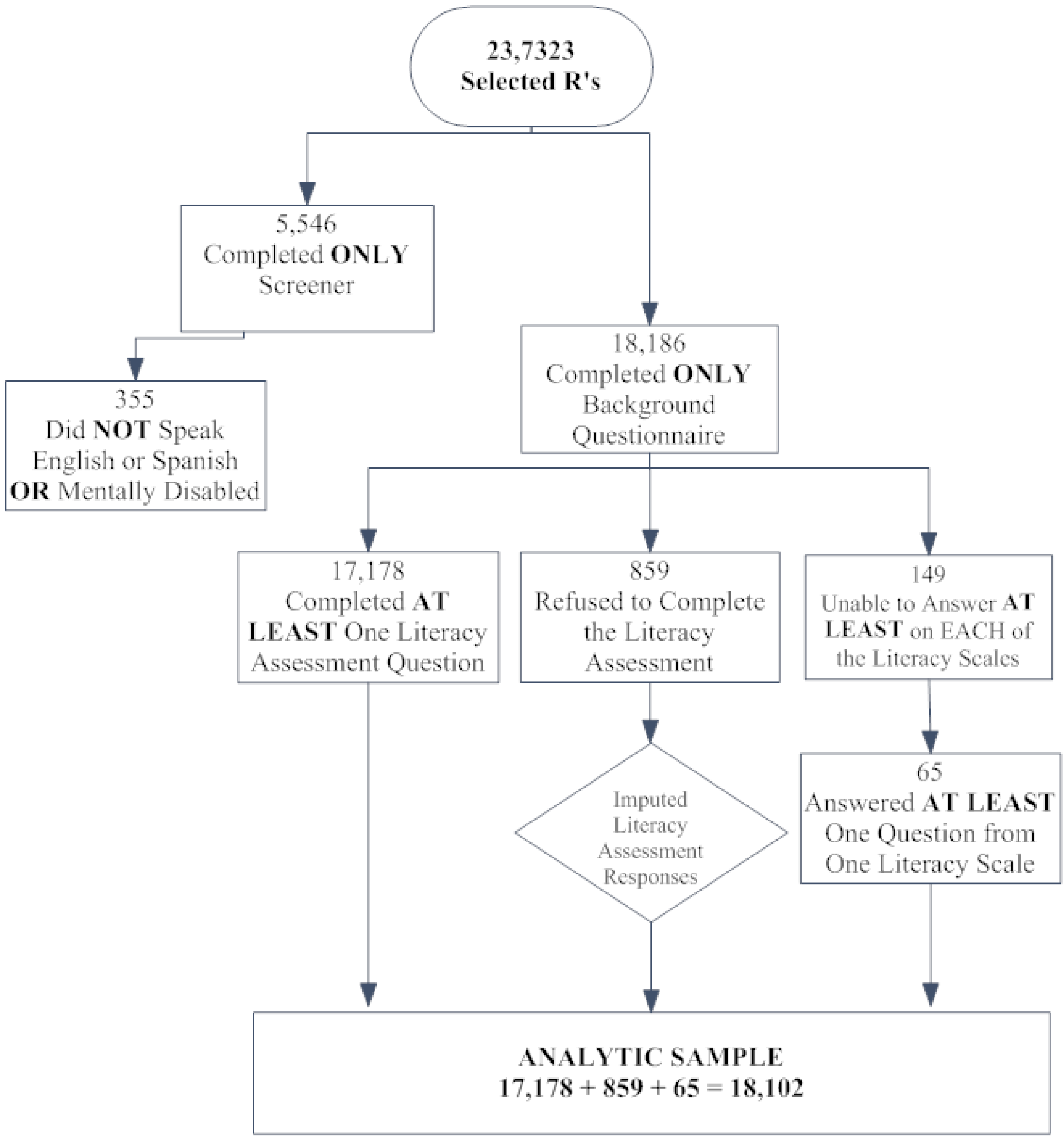

Figure 2.1: Conceptual Model of the Relationship between Level of Health Literacy and Demographic, Flexible Resources, & Social Resources

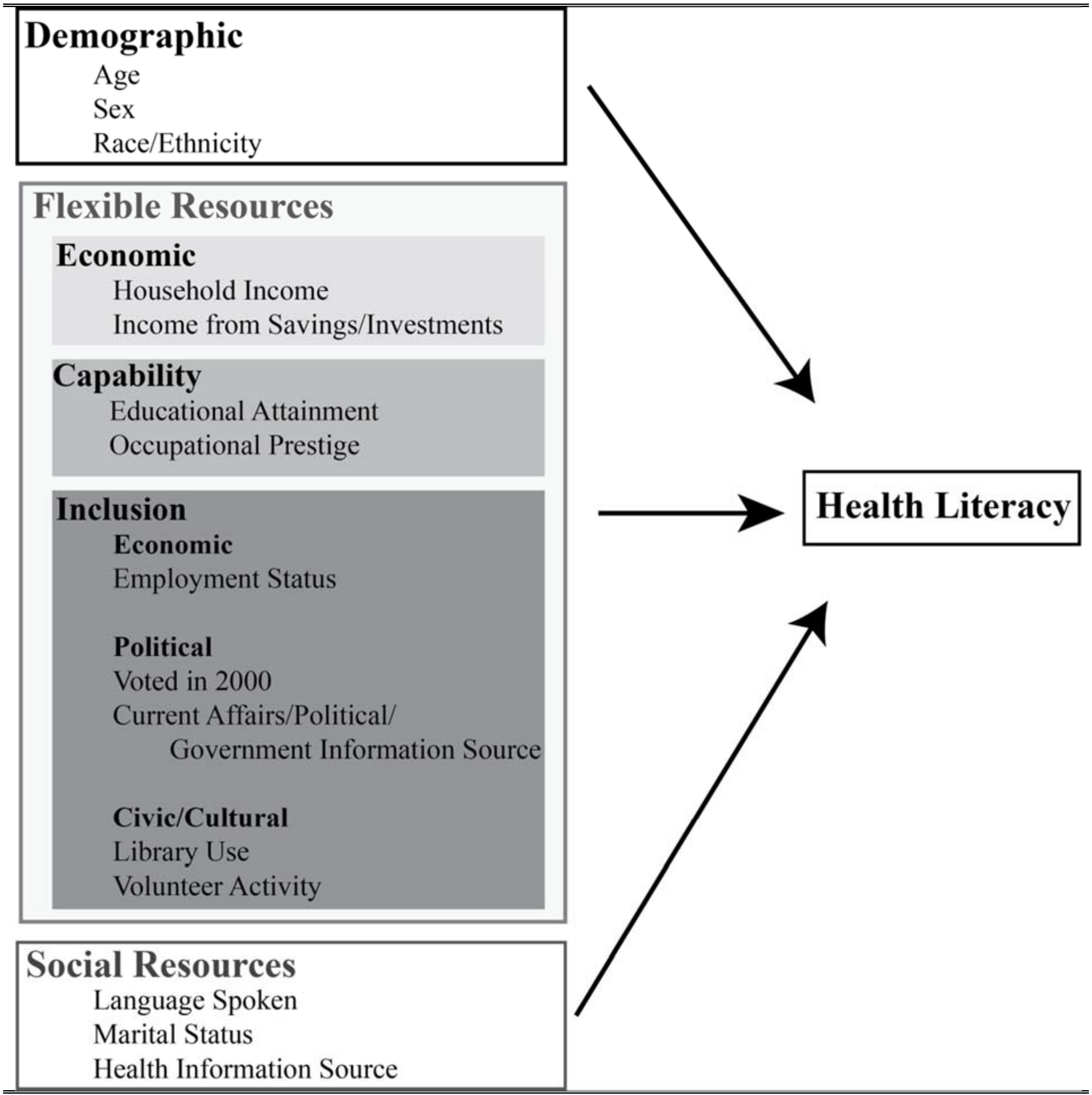

Figure 3.1: Conceptual Model of Health Literacy as a Metamechansim for Health Insurance Type

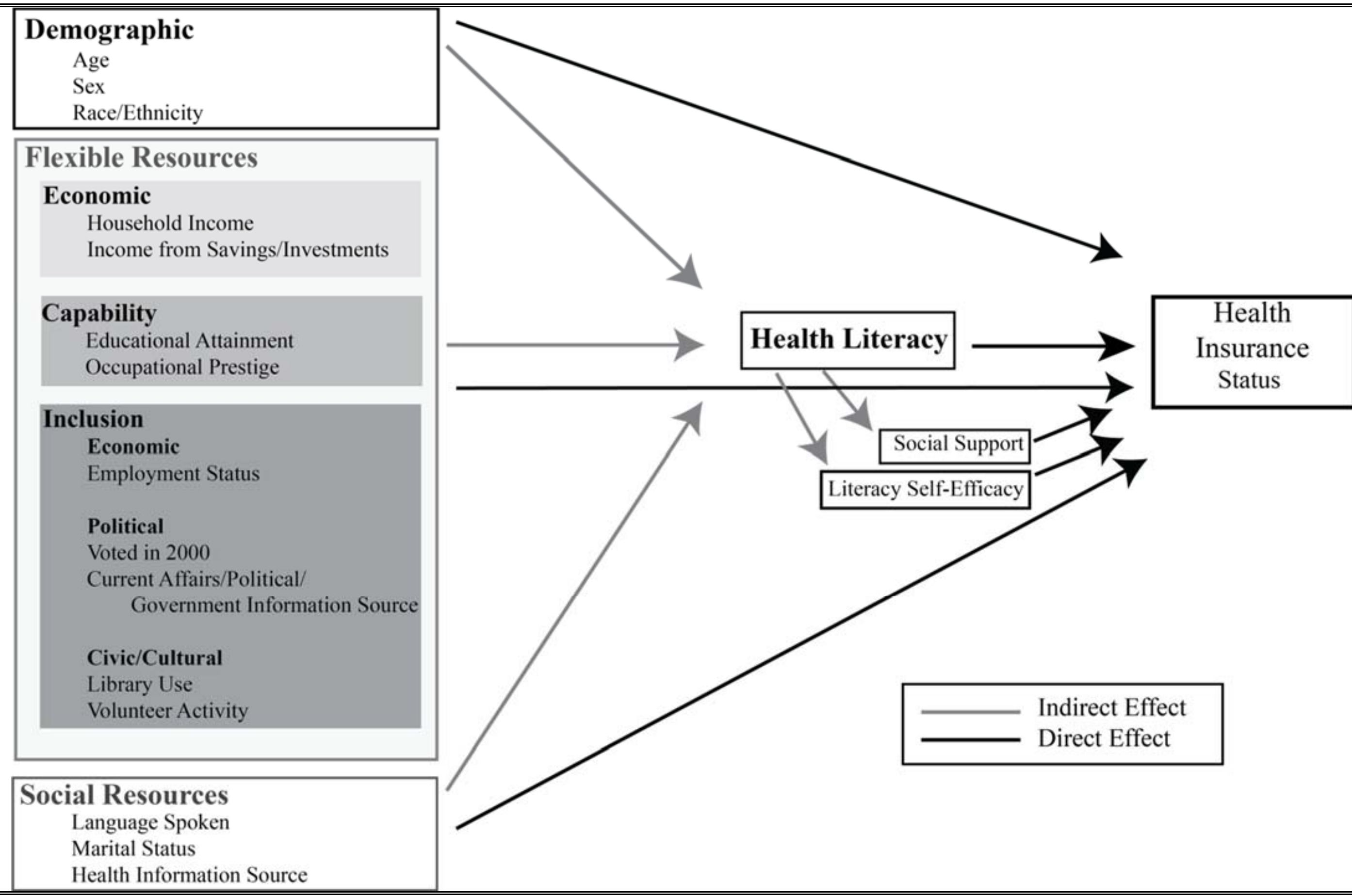

Figure 4.1: Conceptual Model of Health Literacy as a Metamechansim for Self-Reported Health Status

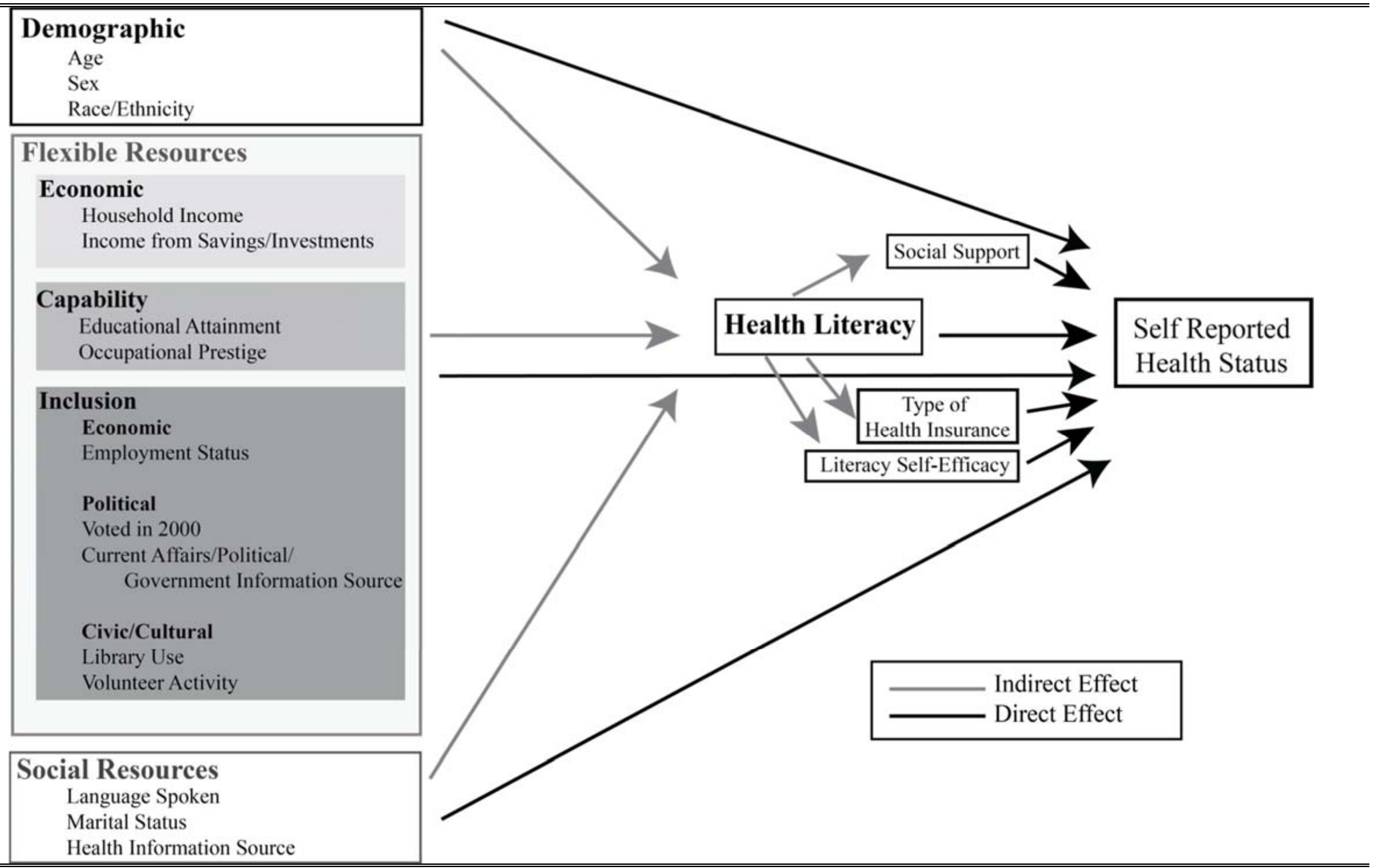

Figure A1: Hypothetical Item Characteristic Curve

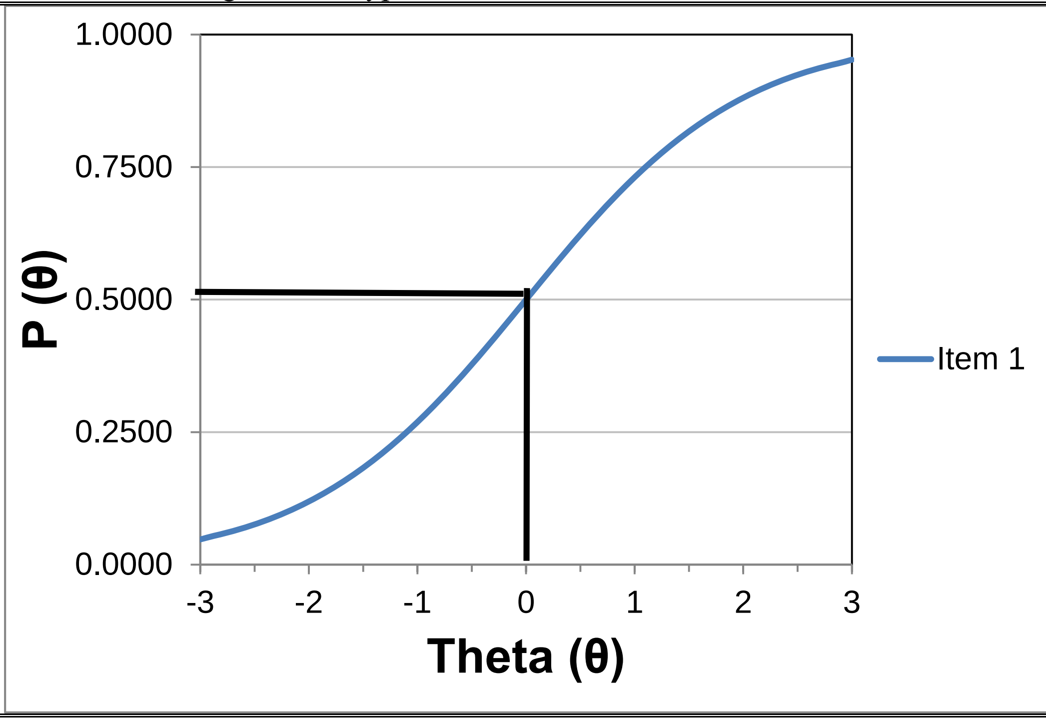

Figure A2: Two Hypothetical Item Characteristic Curves

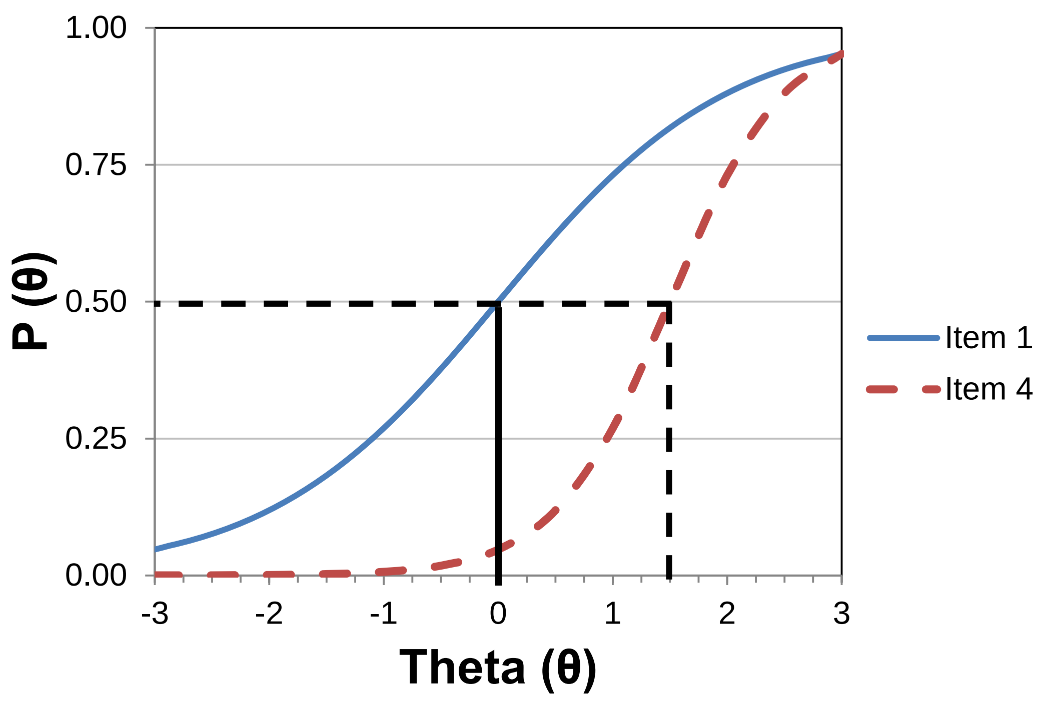

Figure A3: Item Characteristic Curves using the Rasch Model

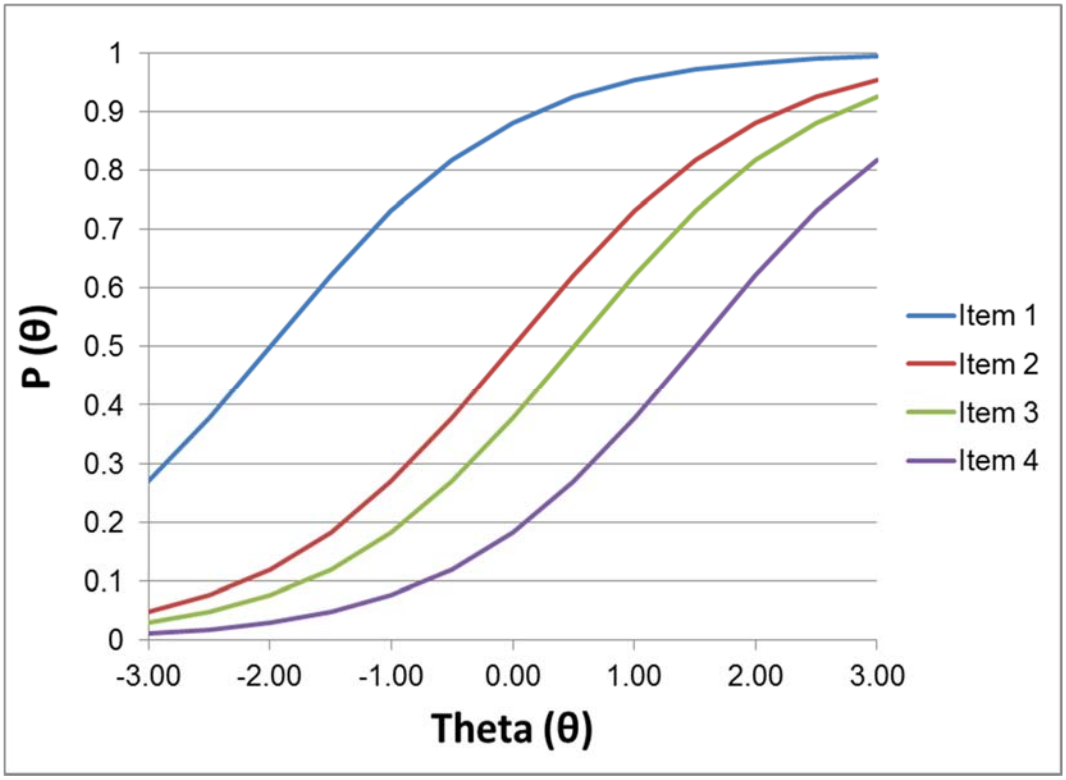

Figure A4: Item Characteristic Curves using the 2PL Model

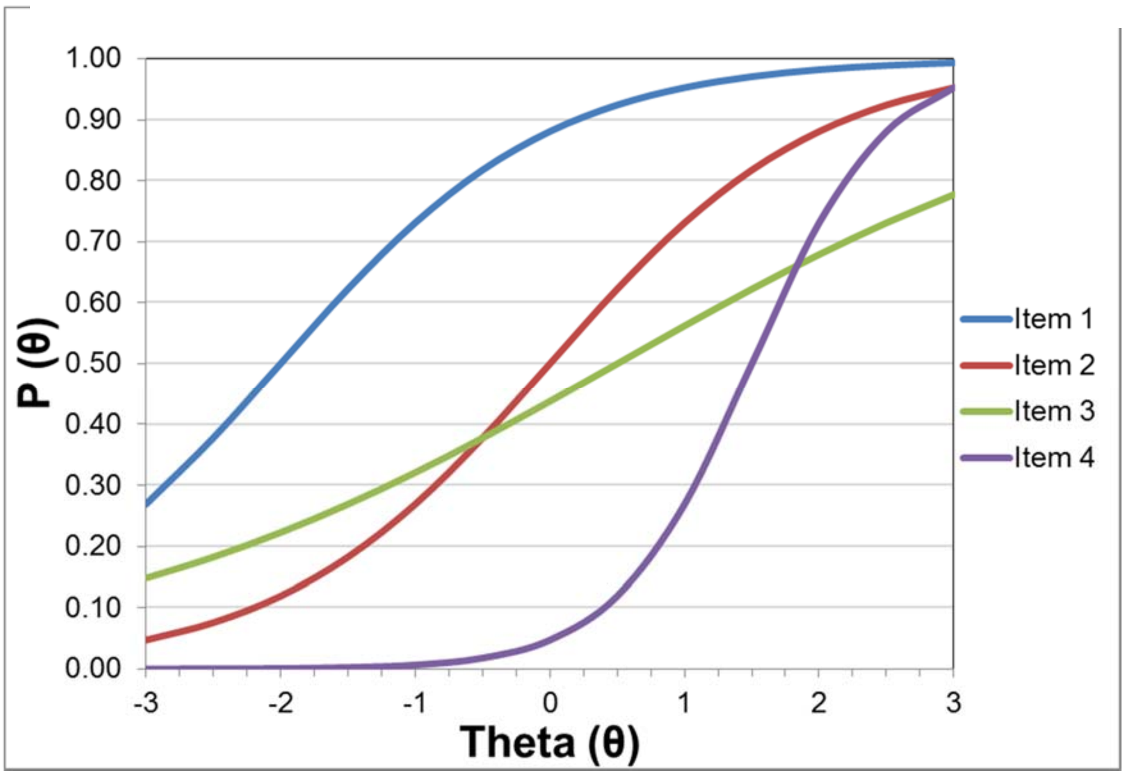

Figure A5: Boundary Response Functions for a Five Category Item Using the Graded Response Model