Should Health Studies Measure Wealth?

A Systematic Review

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Background: Health researchers rarely measure accumulated wealth to reflect socioeconomic status/position (SES). In order to determine whether health research should more frequently include measures of wealth, this study assessed the relationship between wealth and health.

Methods: Studies published between 1990 to 2006 were systematically reviewed. Included studies used wealth and at least one other SES measure as independent variables, and a health-related dependent variable.

Results: Twenty-nine studies met inclusion criteria. Measures of wealth varied greatly. In most studies, greater wealth was associated with better health, even after adjusting for other SES measures. The findings appeared most consistent when using detailed wealth measures on specific assets and debts, rather than a single question. Adjusting for wealth generally decreased observed racial/ethnic disparities in health.

Conclusions: Health studies should include wealth as an important SES indicator. Failure to measure wealth may result in under-estimating the contribution of SES to health, such as when studying the etiology of racial/ethnic disparities. Validation is needed for simpler approaches to measuring wealth that would be feasible in health studies.

(Am J Prev Med 2007;33(3):250–264) © 2007 American Journal of Preventive Medicine

Introduction

Whether measured by education, income, wealth, occupation, or other indicators, socioeconomic status/position (SES) has been related to a wide range of health and health-related outcomes across diverse populations and settings.[1–8] Recent studies have demonstrated that measures of SES may not be interchangeable, reflecting the fact that different socioeconomic factors may influence health through various mechanisms at different points in the lifespan.[4,9]

In the field of economics, "wealth" generally refers to an individual's or a household's total financial resources amassed over his or her lifetime. Measures of wealth include assets and net worth. Assets are the accumulated cash value of all sources that can be quickly converted into cash (e.g., disposable income and savings), as well as those that are less readily converted (e.g., stocks, bonds, inheritance, and real estate). Net worth is defined as one's assets minus outstanding debts. In comparison, income, or the capital obtained during a specified period of time, depicts a cross-sectional account of an individual's or household's financial resources during a relatively brief portion of a lifetime. Since wealth can buffer the effects of lost or temporarily low income, it could be more important than income in relation to health. Wealth may be particularly important for the elderly and retired persons because of their relatively low or absent incomes.[10–13] In addition, wealth has been shown to vary dramatically among people of different racial/ethnic groups, even among those with similar income levels.[4]

Wealth, however, has not been widely used as an economic indicator in health research. Wealth is generally more difficult to measure than income. For example, the market values of items such as stocks, retirement accounts (e.g., IRAs), pensions, and real estate vary depending on the time of assessment, taxes,

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The full text of this article is available via AJPM Online at www.ajpm-online.net; 1 unit of Category-1 CME credit is also available.

0749-3797/07/$–see front matter
doi:10.1016/j.amepre.2007.04.033

and locale, or are difficult to value at all without professional appraisal.[14] Accuracy of respondent recall can be problematic.[15,16] Furthermore, standard approaches to measuring wealth have been considered too lengthy, intrusive, and/or burdensome on respondents for inclusion in most health studies.[15,17]

A review of U.S.-based health literature was conducted to describe how wealth has been measured and to determine whether empiric evidence supports including measures of wealth in health research.

Methods

Online databases PubMed, Web of Science, and EconLit were systematically searched for English-language articles published between January 1990 and May 2006 and a manual search of the reference lists from relevant retrieved articles was completed. In each database, the term "United States" was used in combination with both a wealth term ("wealth," "assets," "debt," "home ownership," "housing tenure," and "car ownership") and a health indicator ("health," "disease," "mortality," "self-rated health," "functional status," "chronic conditions," "medical conditions," "health-related behaviors," "smoking," "BMI" (body mass index), "alcohol," "mental health," and "healthcare utilization"). Studies using residential crowding as the sole indicator of wealth were excluded, because of concerns that it is too insensitive as a wealth measure in the United States. After excluding duplicates, this search yielded 1760 articles. The titles and abstracts (or full articles if the titles and abstracts provided insufficient information) were then reviewed for possible inclusion. Non–peer-reviewed literature was considered if it seemed particularly relevant and the full text was available.

Studies were selected if they met all of the following criteria: English language; based in the United States; examining health status or a health-related dependent variable; including as an independent variable a measure of personal/household-level (as distinguished from aggregate-level, such as neighborhood- or community-level) wealth; and controlling for at least one other measure of personal/household-level socioeconomic status/position, such as income, education, or relative occupational ranking (e.g., professional, white-collar nonprofessional, skilled manual, manual), but not whether an individual was employed.

Results

Twenty-nine articles, published between 1990 and 2006, met the inclusion criteria (Figure 1). Twenty-four articles reported results from national samples, four reported city, state, or regional samples, and one reported on both a national and a city-based sample. A total of 12 different national samples were analyzed.

Measurement

The terminology for wealth varied among studies, with various authors using the same term to apply to different economic concepts. For consistency, this paper uses the term "assets" to refer to the estimated cash value of a respondent's home(s), business, property, accounts, and/or other investments. "Net worth" refers to total assets minus outstanding debts. While the terms wealth, assets, and/or net worth are sometimes used interchangeably in the literature, here wealth is used to denote the broader concept and field of study.

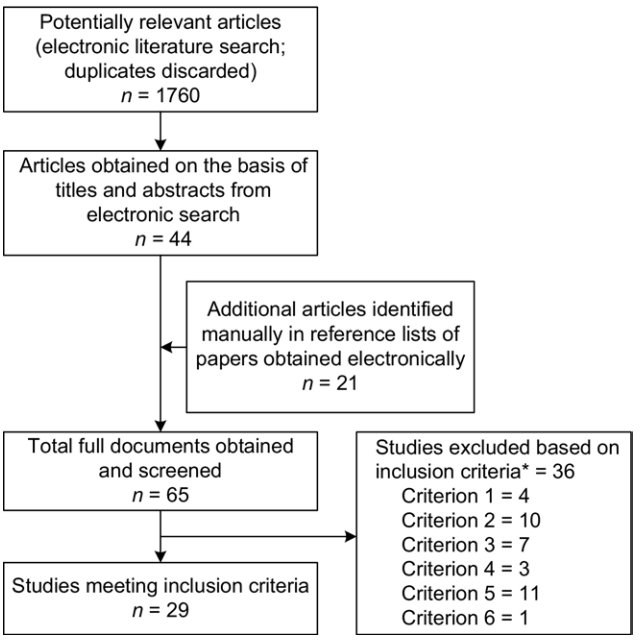

Figure 1. Flow chart of literature search and selection of papers. *Criterion 1: editorial/not an empirical study/review article. Criterion 2: no individual-level (vs aggregate-level) wealth variable. Criterion 3: no multivariate analysis/did not control for at least one additional individual- or household-level socioeconomic status/position measure. Criterion 4: no health measure. Criterion 5: used wealth as a dependent variable. Criterion 6: residential crowding was the only wealth measure.

Studies varied considerably in the level of detail devoted to estimating wealth. Some surveys employed a single question to estimate net worth (American Changing Lives [ACL], HIV Costs and Utilization Study, National Comorbidity Study [NCS]). For example, the ACL survey asked respondents to ascertain their assets with the question, "If you needed money quickly and cashed in all bank accounts, investments, and real estate, how much would this amount to?"[18] Other researchers summed responses from more detailed questions concerning multiple specific sources of assets and debts (Health and Retirement Survey [HRS], Asset and Health Dynamic Survey Among the Oldest Old [AHEAD], Panel Study of Income Dynamics [PSID], National Longitudinal Survey of Mature Men [NLSMM], National Survey of Families and Households [NSFH], Survey of Consumer Finances [SCF], Survey of Income and Program Participation [SIPP]). Authors varied as to which specific assets or debts were included in their calculations; for example, some excluded the principal home.[12,19] Studies have indicated

that surveys using relatively few items on specific assets and debts may significantly under-estimate wealth, especially among the wealthiest individuals.[14,20,21]

In addition to the particular construct(s) used to reflect wealth, researchers chose different methods to categorize it. Eleven studies used wealth as a continuous variable; of these, six used a log, natural log, or other nonlinear transformation of the variable, and one excluded the top and/or bottom 1% of observations.[22] Most studies categorized wealth. Some authors selected an absolute cut-off—for example, above or below $10,000[12,19,23]—while others used tertiles or quartiles based on the sample's distribution.[24] Only one study was identified that adjusted wealth measures for household size or apportioned the wealth among household members.[13]

Some researchers used "nonmonetary" wealth measures, either alone or in combination with monetary estimations. Nonmonetary indicators included home ownership (yes/no), car ownership (yes/no), credit card debt (yes/no), estimations of how long one's current lifestyle could be sustained without receiving further income, and numbers and types of specified assets without specific value estimations. Home ownership is often the single largest component of an individual's wealth.[25,26]

Associations Between Wealth and Health or Health-Related Indicators

The following section focuses on the associations between measures of wealth and measures of health or health-related indicators, after controlling for other socioeconomic measures (Table 1). The majority (15 of 29) of studies found a significant and direct relationship between wealth and health, another 10 found mixed results, and a few (4 of 29) showed no association.

Mortality. Five studies examined the relationship between wealth and mortality. Each used a nationally representative data set, and found that wealth was associated with lower mortality after controlling for education and income,[27,29,30] or for education and occupation.[24,28] In a cohort of HIV-infected individuals, having assets of ≤$1000 was associated with increased HIV-related and all-cause mortality after adjusting for other SES and treatment variables.[30] Controlling for wealth and other measures of SES substantially reduced or eliminated observed black/white differences in mortality.[27,29]

Self-rated health status. Fourteen studies investigating the association between wealth and self-rated health generally found either mixed or positive results. Some studies found that after controlling for income and education, net worth,[39] assets,[18,19,37] debts,[33] and home ownership[12] were not significantly related to improved self-rated health. Others found that after controlling for income and education, assets,[12,35] absence of credit card debt,[34] a low debt-stress index,[34] home ownership,[37] and net worth[13,18,22] were significantly associated with better self-rated health. Meer et al.[36] found that net worth was significantly associated with self-rated health after controlling for education. A study by Wenzlow et al.[13] found that the association between wealth and health was strongest in the lowest wealth group and among older people. Mutchler and Burr[31] found that net worth was significantly associated with better self-rated health in white respondents only, and Rodriguez et al.[33] found that assets were associated with better health in white men only. Controlling for assets[32] and net worth[22,31,38] reduced observed racial/ethnic differences in self-rated health among men and women.

Chronic conditions. Six studies examined whether wealth is associated with the prevalence and/or incidence of various chronic medical conditions. Robert and House[12] found that having assets valued at >$10,000 was significantly associated with fewer chronic conditions, but home ownership was not. An individual's assets remained significantly associated with chronic conditions after controlling for both individual-level and community-level SES.[19] Two studies showed that controlling for assets tended to reduce observed black/white differences in chronic disease states.[11,32] In smaller, nonnational studies, wealth was not associated with lupus after controlling for education[40]; and net worth was not significantly associated with the number of chronic conditions or with general health symptoms after controlling for income, education, occupational status, and financial strain.[39]

Functional status. Eight studies addressed the association between wealth and functional status, of which all but one found an association between wealth and functional status, at least among some subgroups, after controlling for income and education.[11,12,19,31,32,34,37] Kington and Smith[11] found the association between net worth and functional status was nonlinear, with the strongest effect among the least wealthy. Three studies[11,31,32] found that assets helped explain observed black/white differences in functional status after adjustment for income and education. In a smaller study, von dem Knesebeck et al.[37] found no significant relationship between assets and functional limitations overall, but not owning a home was independently associated with worse functional status among people aged 60 to 65 after adjusting for income, education, occupational status, and assets. Two studies did not find a significant relationship between functional status and either net worth[39] or home ownership.[12]

Mental health. Six studies examined the relationship between wealth and mental health, with five finding

Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Mortality								
Mare (1990)[24]	NLSMM, 1966 wave	Nationally representative; aged 45–59; male; black, non-black; *n*=5020	Mortality	Net worth	Quartiles	Education; occupational status	Yes	Models reduced (but did not eliminate) the effects of education and occupation on mortality.
Menchik (1993)[27]	NLSMM, 1966	Nationally representative; aged 45–59; male; black, non-black; *n*=5020	Mortality	Net worth	Continuous	Income; education; poverty status	Yes	Models reduced (but did not eliminate) observed racial/ethnic disparities in mortality.
Daly (2002)[28]	PSID, 1984	Nationally representative; aged ≥45; male, female; black, non-black; *n*=3734	Mortality	Net worth	Continuous	Education; occupational status	Yes	Lower net worth was more strongly associated with increased risk of mortality than education or occupation.
Bond Huie (2003)[29]	HRS, 1992	Nationally representative; aged 51–61; male, female; black, white; *n*=8633	Mortality	Assets	Log transformation	Income; education	Yes	Models reduced (but did not eliminate) the observed black/white disparity in mortality.
Cunningham (2005)[30]	HIV Costs and Service Utilization Study, 1996	Nationally representative; aged ≥18; male, female; black, Hispanic, white, other; *n*=2864	Mortality	Assets	$0, $1–$1,000; $1,001–$5000; $5001–$50,000; >$50,000	Income; education	Yes	Low assets (≤$1000) were associated with increased risk of mortality among HIV-infected individuals.
Self-rated health status								
Mutchler (1991)[31]	SIPP, 1984	Nationally representative; aged ≥55; male, female; black, white; *n*=9803	Self-rated health status	Net worth	Log transformation	Income; education	Mixed	Net worth was associated with better health status among white but not black respondents. Models reduced (but did not eliminate) the observed black/white disparity in health status.
Robert (1996)[12]	ACL, 1986	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Self-rated health status	Assets; home ownership	<$10,000, >$10,000; home owner or not	Income; education	Mixed	In the overall sample, assets were associated with better health status while home ownership was not. Assets and home ownership were both associated with better health status in the 35–44 and 65–74 age groups.
Schoenbaum (1997)[32]	AHEAD, 1993	Nationally representative; aged ≥70; male, female; black, white; *n*=6962	Self-rated health status	Assets; home ownership	Continuous; home owner or not	Income; education	Yes	Models reduced (but did not eliminate) the observed black/white disparity in health status. Assets had a larger positive effect on health status for black respondents than for black and white respondents overall.

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Smith (1997)[22]	HRS, 1993 AHEAD, 1994	Nationally representative; aged 51–61; male, female; black, Latinos, white; sample size not reported Nationally representative; aged ≥70; male, female; black, Latino, white; sample size not reported	Self-rated health status	Net worth	Excluded highest/lowest 1%; terciles; linearly splined terciles	Income; education	Yes	In HRS, net worth reduced (but did not eliminate) the observed racial/ethnic disparities in health status. In AHEAD, net worth eliminated racial/ethnic disparities in health status.
Robert (1998)[19]	ACL, 1986; 1980 Census	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Self-rated health status	Assets	<$10,000, >$10,000	Income; education; community-level SES	No	
Ostrove (1999)[18]	ACL, 1989 HRS, 1992	ACL: Nationally representative; aged 27-98; male, female; black, white; *n*=2568 HRS: nationally representative; aged 51-61; male, female; black, white; *n*=6032	Self-rated health status	ACL: assets HRS: net worth	ACL: <$10,000; $10,000–$20,000; $20,000–$50,000; >$50,000 HRS: <$0, $1–$10,000, $10,001–$20,000; $20,001–$50,000; $50,001–$100,000; $100,001–$200,000; $200,001–$500,000; >$500,000	Income; education	Mixed	Wealth was associated with better health status in HRS only. Interaction terms between wealth and race/ethnicity were not significant.
Rodriguez (1999)[33]	NSFH, 1987–1992	Nationally representative; aged 17–65; male, female; black, white; *n*=8029	Self-rated health status	Assets; debts	Nonlinear transformation	Income; education	Mixed	Assets were associated with health status in white men only. Debts were not associated with health status among men or women.
Drentea (2000)[34]	Two random-digit-dial telephone surveys in Ohio, 1997	Mean age 45 (SD=17 years); male, female; black, white; *n*=970	Self-rated health status	Debt/income ratio; debt stress; carrying unpaid credit card balance; amount of credit line used; defaulting on credit card; charging on two or more credit cards	Various, according to item	Income; education	Mixed	Carrying unpaid credit card balance and debt stress were significantly associated with worse self-reported health. Interaction terms with wealth by race/ethnicity were not significant.
Hurd (2003)[35]	HRS, 1992–2000	Nationally representative; aged 51–65, male, female; racial/ethnic groups not reported; *n*=12,652	Self-rated health status	Assets	Nine income–wealth categories	Income; education	Yes	Increases in assets increase the odds of remaining in the best health status category (at all income levels).
Meer (2003)[36]	PSID, 1984–1999	Nationally representative; mean age 49; male, female; black, white; *n*=3302	Self-rated health status	Net worth	Continuous	Education; total and expected inheritance	Yes	Increases in wealth result in increases in health status.

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Von dem Knesebeck (2003)[37]	National telephone survey, 2000–2001	Aged ≥60; male, female; black, white; *n*=608	Self-rated health status	Assets; home ownership	Owned assets or not; home owner or not	Income; education; occupational status	Mixed	Home ownership, but not assets, was significantly associated with better self-rated health but only among those aged 66–74.
Wenzlow (2004)[13]	SCF, 1989, 1992, 1995, 1998	Nationally representative; aged 25–54; male, female; white, non-white; *n*=9164	Self-rated health status	Net worth	Nonlinear transformation; log transformation; quantiles; spline tertiles	Income; education; expected inheritance	Yes	The inverse association between wealth and health status was nonlinear, with the strongest effect at very low levels of wealth.
Wenzlow (2004)[38]	SCF, 1989, 1992, 1995, 1998	Nationally representative; aged 25–54; male, female; white, non-white; *n*=9164	Self-rated health status	Net worth	Nonlinear association	Income; education	Yes	Models reduced the observed white/non-white disparity in health status, particularly among those with the lowest net worth.
Kahn (2005)[39]	Aging, Stress, and Health Study, 2001–2002	Washington DC and Maryland, Medicare beneficiary; aged ≥65; male, female; black, white; *n*=1167	Self-rated health status	Net worth	Log transformation	Income; education; occupational status; financial hardship	No	
Chronic condition								
Robert (1996)[12]	ACL, 1986	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Number of chronic conditions	Assets; home ownership	<$10,000, ≥$10,000; home owner or not	Income; education	Mixed	Assets were associated with chronic conditions while home ownership was not. Assets comprised the only SES variable associated with chronic conditions in the 75–84 age group.
Kington (1997)[11]	HRS, 1992	Nationally representative; aged 51–61; male, female; black, Hispanic, white/other; *n*=9744	Hypertension, diabetes, heart condition, arthritis	Net worth	$0–$50,000; $50,001–$164,100; >$164,100	Income; education	Yes	Effect of wealth is nonlinear with the strongest effect among the lowest tercile. Models reduced (but did not eliminate) the observed black/white disparities in hypertension and diabetes and the Hispanic/white disparity in diabetes. Models eliminated the observed black/white disparity in arthritis and resulted in lower odds of arthritis among Hispanics compared to whites.

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Schoenbaum (1997)[32]	AHEAD, 1993	Nationally representative; aged ≥70; male, female; black, white; *n*=6962	Hypertension, diabetes, heart problems, stroke, arthritis, lung disease	Assets; home ownership	Continuous; home owner or not	Income; education	Yes	Models reduced the observed black/white disparities in hypertension, diabetes, and stroke among women and stroke, arthritis, and lung disease among men. At higher asset levels, observed black/white disparities in heart problems and lung disease are greater among women and observed black/white disparities in hypertension, diabetes, and heart problems are greater among men.
Robert (1998)[19]	ACL, 1986; 1980 Census	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Number of chronic conditions	Assets	<$10,000, ≥$10,000	Income; education; community-level SES	Yes	Higher assets were associated with fewer chronic conditions.
Alarcon (2004)[40]	Lupus in Minorities, Nature versus Nurture cohort, 1994–2001	Alabama or Texas resident; mean age 40 (SD=14 years); male, female; black, Hispanic, white; *n*=202	Systemic lupus erythematous disease activity	Time able to sustain current standard of living if income ceased; assets; debts; home ownership	<2 months or >2 months; limited or significant assets; significant or negligible debt; homeowner or not	Education; poverty status	No	
Kahn (2005)[39]	Aging, Stress, and Health Study, 2001–2002	Washington DC and Maryland, Medicare beneficiary; aged ≥65; male, female; black, white, *n*=1167	Number of chronic conditions; health symptoms scale of 9 items (e.g., headaches, back pain)	Net worth	Log transformation	Income; education; occupational status; financial hardship	No	
Functional status								
Mutchler (1991)[31]	SIPP, 1984	Nationally representative; aged ≥55; male, female; black, white; *n*=9803	Functional health status	Net worth	Log transformation	Income; education	Mixed	Models eliminated the observed racial disparity in the indices. However, subgroup analyses found wealth association for whites only.

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Robert (1996)[12]	ACL, 1986	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Functional health status	Assets; home ownership	<$10,000, ≥$10,000; home owner or not	Income; education	Mixed	Overall, assets were associated with improved functional health. Subgroup analyses found assets associated with functional health among those aged 45–84 only, with the greater effects among those aged 75–84. Home ownership was associated with functional health among those aged 35–44 and 65–84 only.
Kington (1997)[11]	HRS, 1992	Nationally representative; aged 51–61; male, female; black, Hispanic, white/other; *n*=9744	Functional health status	Net worth	$0–$50,000; $50,001–$164,100; >$164,100	Income; education	Yes	Effect of wealth is nonlinear with the strongest effect among the lowest tercile. Models eliminated the observed racial/ethnic disparities in functional status.
Schoenbaum (1997)[32]	AHEAD, 1993	Nationally representative; aged ≥70; male, female; black, white; *n*=6962	Functional health status	Assets; home ownership	Continuous; home owner or not	Income; education	Yes	Assets reduced the observed black/white disparity in functional status, with a greater positive association among blacks compared to whites.
Robert (1998)[19]	ACL, 1986; 1980 Census	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Functional health status	Assets	<$10,000, ≥$10,000	Income; education; community-level SES	Yes	Higher assets were associated with fewer functional limitations.
Drentea (2000)[34]	Two random-digit-dial telephone surveys in Ohio, 1997	Mean age 45 (SD=14 years); male, female; black, white; *n*=970	Functional health status	Debt/income ratio; debt stress; carrying unpaid credit card balance; amount of credit line used; defaulting on credit card; charging on 2 or more credit cards	Various, according to item	Income; education	Mixed	Debt/income ratio and debt-stress index were significantly associated with higher physical impairment. Interaction terms found that the debt/income ratio had a greater impact among blacks compared with whites and using more of credit line and having 3 or more credit cards had less of an impact for blacks compared with whites.
Von dem Knesebeck (2003)[37]	National telephone surveys in U.S. and Germany, 2000-2001	Aged ≥60; male, female; black, white; *n*=608	Functional health status	Assets; home ownership	Owned assets or not; home owner or not	Income; education; occupational status	Mixed	Home ownership was associated with lower functional limitations among those aged 60–65 only.

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Kahn (2005)[39]	Aging, Stress, and Health Study, 2001–2002	Washington DC and Maryland, Medicare beneficiary, aged ≥65; male, female; black, white, *n*=1167	Functional health status	Net worth	Log transformation	Income; education; occupational status; financial hardship	No	
Mental health–related indicators								
Muntaner (1998)[41]	NCS, 1990–1992 ECA, 1993	NCS: Nationally representative; aged 15–54; male, female; race/ethnicity classification not reported; *n*=8098 ECA: Baltimore; age distribution not reported; male, female; race/ethnicity classification not reported; *n*=2980	NCS: mood disorders; anxiety disorders ECA: depression; anxiety disorders	NCS: net worth ECA: car ownership; home ownership; dividend income; savings account owner; receiving property income	NCS: $0–$9000, $10,000–$49,000; $50,000–$199,000; ≥$200,000 ECA: owner or not of each commodity	Income; education; occupational status	NCS: mixed ECA: mixed	NCS: Wealth associated with lower levels of mood disorders. ECA: Receiving property income was associated with lower levels of anxiety disorders.
Ostrove (1999)[18]	ACL, 1989 HRS, 1992	ACL: Nationally representative; aged 27–98; male, female; black, white; *n*=2568 HRS: Nationally representative; aged 51–61; male, female; black, white; *n*=6032	Depression	ACL: assets HRS: net worth	ACL: <$10,000; $10,001–$20,000; $20,001–$50,000; ≥$50,001 HRS: <$0; $1–$10,000; $10,001–$20,000; $20,001–$50,000; $50,001–$100,000; $100,001–$200,000; $200,001–500,000; ≥$501,000	Income; education	Yes	Lower levels of wealth were associated with higher rates of depression. Interaction terms for wealth and race/ethnicity were not significant.
Rodriguez (1999)[33]	NSFH, 1987–1993	Nationally representative; aged 17–65; male, female; black, white; *n*=8029	Depression	Assets; debts	Nonlinear transformation	Income; education	Mixed	Assets were associated with decreased depression in white men and women only. Increased debts were significantly associated with decreased depression among white women only.
Cagney (2002)[42]	AHEAD, 1993	Nationally representative; aged ≥70; male, female; black, Latino, white; *n*=6577	Cognitive ability	Net worth	≤$0; $0–$25,000; $25,001–$75,000; $75,001–$200,000; ≥$200,001	Income; education	Mixed	Net worth was associated with greater cognitive ability among white respondents only.
Von dem Knesebeck (2003)[37]	National telephone survey, 2000-2001	Aged ≥60; male, female; black, white; *n*=608	Depression	Assets; home ownership	Owned assets or not; home owner or not	Income; education; occupational status	Mixed	Lack of assets was associated with increased depression among those aged ≥75 only.
Kahn (2005)[39]	Aging, Stress, and Health Study, 2001–2002	Washington DC and Maryland, Medicare beneficiary; aged ≥65; male, female; black, white; *n*=1167	Depressive symptoms	Net worth	Log transformation	Income; education; occupational status; financial hardship	No	

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Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Healthcare-related indicators								
Mutchler (1991)[31]	SIPP, 1984	Nationally representative; aged ≥55; male, female; black, white; *n*=9803	Number of visits to healthcare provider; number of nights spent in hospital	Net worth	Log transformation	Income; education	No	
Alegria (2002)[43]	NCS, 1990–1992	Nationally representative; aged 15–54; male, female; black, white; *n*=8098	Use of outpatient mental health services	Assets	<$10,000; $10,000–$99,000; ≥$99,001	Income; education	No	
Dunlop (2003)[44]	AHEAD, 1993, 1995	Nationally representative; aged ≥70; male, female; black, Latino, white, other; *n*=6230	Physician visits, hospital stays, outpatient surgery, home health care, nursing home stays, out-of-pocket expenses	Assets	<$1000; $1,000–$14,999; ≥$15,000	Income; education	Mixed	Assets were associated with fewer nursing home stays only.
Saver (2004)[45]	Survey of HMO members enrolled in "Medicare+ Choice," 2000	Washington state; aged >66; male, female; black, Asian/ Pacific Islander, white, other; *n*=4498	Ability to afford medications; stretching out medications to make them last longer	Assets; home ownership	<$10,000, ≥$10,000; home ownership with mortgage, home ownership without mortgage, rent	Income; education	Yes	Lower assets and owning a home with a mortgage (as compared to owning without a mortgage) were associated with greater difficulty in affording prescription medications and increased likelihood of stretching out medications.
Other health-related indicators								
McClellan (1998)[46]	HRS, 1992, 1994	Nationally representative; aged 51–61; male, female; black, Latino, white; *n*=10,027	Health event; major health event (death, heart attack, stroke, cancer, chronic illness, accident, or injury)	Net worth	$0–$200,000; $200,001–$1,000,000; ≥$1,000,001	Income; education	Yes	Net worth associated with decreased risk of health events.

(Continued on next page)

Table 1. U.S. studies of relationships between wealth (as independent variables) and health indicators (as dependent variables) (*continued*)

Study	Data set	Population	Health measure	Wealth measure	Operationalization of wealth measure	Other measures of SES/position	Wealth significantly associated with health?[a]	Main findings
Muntaner (1998)[41]	NCS, 1990–1992 ECA, 1993	NCS: Nationally representative; aged 15–54; male, female; race/ethnicity classification not reported; *n*=8098 ECA: Baltimore; age distribution not reported; male, female; race/ethnicity classification not reported; *n*=2980	NCS/ECA: alcohol abuse/ dependence; drug abuse/ dependence	NCS: net worth ECA: car ownership; home ownership; dividend income; savings account owner; receiving property income	NCS: $0–$9000; $10,000–$49,000; $50,000–$199,000; ≥$200,000 ECA: owner of each commodity or not	Income; education; occupational status	NCS: yes ECA: mixed	NCS: Net worth in $50,000–$199,000 range was inversely associated with alcohol and drug abuse compared to wealth in $0–$9000 range. ECA: Home ownership and savings account ownership were associated with lower levels of alcohol abuse/ dependence, while car ownership was associated with higher levels of alcohol abuse/dependence.
Robert (2004)[23]	ACL, 1986; 1980 census	Nationally representative; aged ≥25; male, female; black, non-black; *n*=3617	Body mass index	Assets	<$10,000, ≥$10,000	Income; education; financial stress; community-level SES	No	
Ahmed (2005)[47]	NHIS, 1999–2000	Nationally representative; aged ≥18; male, female; Hispanic, white, black, other; *n*=23,459	Leisure-time physical activity	Home ownership	Home owner or not	Income; education	Yes	Home owners were more likely to engage in regular leisure time physical activity than non-home owners.

[a]Results from models controlling for other SES variables.

ACL, American Changing Lives; AHEAD, Asset and Health Dynamic Survey Among the Oldest Old; ECA, Epidemiologic Catchment Area Follow-up; HRS, Health and Retirement Survey; NCS, National Comorbidity Study; NHIS, National Health Interview Survey; NLSMM, National Longitudinal Survey of Mature Men; NSFH, National Survey of Families and Households; PSID, Panel Study of Income Dynamics; SCF, Survey of Consumer Finances; SD, standard deviation; SES, socioeconomic status/position; SIPP, Survey of Income and Program Participation.

significant relationships between wealth and mental health within the entire sample or subgroups of the population after controlling for income and education. Rodriguez et al.[33] found that greater assets were significantly associated with less depression among white men and women but not among black men and women. However, increased debts were associated with decreased depression among white women. In a small study, von dem Knesebeck et al.[37] found that neither home ownership nor assets were significantly associated with depression among people in the sample overall; however, in subgroup analyses, having no assets was associated with an increased risk of depression among respondents aged ≥75 years. Cagney and Lauderdale[42] found that increased net worth was significantly associated with higher cognitive ability among elderly white, but not black or Latino respondents. Muntaner et al.[41] found that in the National Comorbidity Survey (NCS), wealth was inversely associated with the prevalence of mood disorders, and, in the Epidemiologic Catchment Area (ECA) study, receiving income from property was inversely associated with anxiety disorders. In a regional study, Kahn and Fazio[39] did not find significant associations between net worth and depressive symptoms after adjusting for income, education, occupational status, and financial hardship.

Healthcare-related indicators. Four studies examined healthcare utilization, with mixed results. Wealth measures were not associated with visits to a healthcare provider or nights spent in the hospital,[31] nor with use of specialty mental health services.[43] Dunlop et al.[44] found that higher assets were associated with fewer nursing home stays after controlling for income and education, but not with physician visits, hospital stays, outpatient surgeries, home health care, or large out of pocket expenses. Saver et al.,[45] however, found that having lower assets and owning a home with a mortgage (compared to owning a home without a mortgage) were both associated with inability to afford medications after controlling for income and education.

Other health-related indicators. McClellan[46] found that higher net worth was associated with decreased risk of adverse health events. Robert and Reither[23] did not find any significant relationships between asset level and BMI, after controlling for education and income. Owning a home was significantly associated with more leisure-time physical activity after controlling for income.[47] Finally, Muntaner et al.[41] found that moderately high levels of net worth ($50,000 to $199,000) were associated with decreased alcohol and drug abuse/dependence after controlling for education, income, and occupation in one data set. In a different data set, Muntaner et al.[41] found that owning a home or a savings account was associated with decreased alcohol and drug abuse/dependence, while owning a car was associated with increased alcohol abuse/dependence.

Potential Sources of Variability in Results

While most results showed a positive relationship between wealth and health, not all did, and a few showed an inverse relationship. This variation may reflect the underlying relationships between wealth and different health and health-related outcomes; it seems likely that wealth would not be uniformly related to all health outcomes across the life span.[4] Additional explanations for mixed results were considered. These include variability in (1) sample size and statistical power, (2) sample settings, (3) covariates used as independent variables along with wealth, and (4) how wealth was measured. The following section discusses wealth with regard to sample characteristics (e.g., race/ethnicity, gender, and age).

Sample size and power. Four of the studies report on generally small sample sizes (n=202 to 1167)[34,37,39,40]; two found negative and two found mixed results. These samples may have had insufficient power to detect associations. All other studies reported on samples of >2000 individuals.

Variations in sample settings. Geographic regions may vary greatly in terms of relative buying power, tax codes, and other factors. Of the two large studies that reported on state or local samples, one found a positive association between medication affordability and monetary and nonmonetary wealth measures,[45] whereas the other showed mixed results with mental health and health-related behaviors using nonmonetary wealth measures.[41] The different health indicators, geographic regions, and/or age groups could have accounted for the variation in associations.

Covariates used as independent variables. While most studies included income, education, age, gender, and race/ethnicity, others included, for example, marital status, health-related behaviors, employment status, and still other variables. In most cases, there was not a clear pattern as to whether and how the additional covariates may have affected the relationship between wealth and health outcomes. As an exception, the differing results found by the studies that used the ACL survey with regard to self-rated health may have stemmed from the inclusion of different covariates (i.e., employment status[18] and home ownership[12]) and the categorization of these covariates (such as income and education[12,19]).

Varying ways wealth was measured and coded. Whether studies used home ownership as a wealth measure, relied on a single question of wealth, or used a composite of multiple wealth questions, may have affected the apparent relationship between wealth and health

outcomes. Of the five large studies that used home ownership, three found positive results,[32,45,47] one showed mixed results[12] and one showed negative results.[41] Both Schoenbaum and Waidmann[32] and Robert and House[12] examined similar outcomes (self-rated health, chronic conditions, and functional status) and found associations in older individuals (with the exception of chronic conditions[12]). Thus, given the variability in associations between home ownership and health outcomes, limited evidence supports the use of home ownership as a single wealth measure, especially in older populations.

Seven of the large studies used three different national data sets in which a single question measured monetary wealth. In all data sets, wealth was categorized as opposed to being used as a continuous variable. Only one data set showed a positive association between wealth and a health outcome found.[30] The two studies that used NCS[41,43] and the four that used ACL[12,18,19,23] showed mixed findings. Evidence does not currently support the use of a single question to measure monetary wealth.

Results from studies using other large national samples and employing monetary wealth measures constructed from multiple questions about specific resources tended to be more consistent in finding positive and significant associations between wealth and health or health-related indicators (AHEAD,[22,32,42,44] PSID,[28,36] HRS,[11,18,22,29,35,46] SCF,[13,38] NLSMM,[24,27] SIPP,[31] and NSFH[33]). Each of the studies employing PSID, HRS, SCF, and NLSMM were unanimous in finding positive associations between wealth and health indicators (i.e., mortality,[28,29] self-reported health,[18,22,35,36] depression,[18] chronic conditions,[11] functional status,[11] and health events[46]). Studies that used SIPP[31] and NSFH[33] found mixed results. Two studies using AHEAD found positive associations[22,32] and two found mixed results.[42,44] This variation using AHEAD may be due to the different health outcomes used in each study. The evidence suggests that wealth is likely to be best measured from multiple, detailed questions.

Wealth and Health Across Various Population Groups

Observed racial/ethnic differences in associations between wealth and health. Many studies have found that wealth varies by racial/ethnic group, with blacks and Latinos tending to have lower levels of wealth compared with whites, and that these differences persist after accounting for differences in income.[4,11,18,23,29,42,43,48] Controlling for wealth may reduce or eliminate observed black/white differences in health, as noted earlier.

One study concluded that net worth did not provide the same level of improvement in self-rated health, functional status, and bed-bound days for blacks as it did for whites.[31] Similarly, some studies found that the relationship between assets and health outcomes was significant only for white respondents (Rodriguez et al.[33] for depression, Cagney and Lauderdale[42] for cognitive ability). However, Schoenbaum and Waidmann[32] suggested that assets have a larger positive effect on the general health and functional status of black respondents than white respondents, and that assets tend to have a similar effect for black and white respondents on the prevalence of specific disease states. Similarly, Drentea and Lavrakas[34] found no significant differences among racial/ethnic groups in the association between wealth measures and self-rated health, but they had a small sample size. One study noted that wealth was most important in explaining differences in self-rated health between whites and nonwhites within the lowest income–wealth strata.[38] While controlling for wealth tends to decrease racial/ethnic disparities, there is currently insufficient evidence to conclude that wealth has a different relationship to health indicators among racial/ethnic groups.

Gender differences in associations between wealth and health. While gender is often used as a covariate in studies of wealth, few U.S. studies have focused on gender differences in the relationship between wealth and health. One problem in focusing on gender may be that wealth is often measured from a household perspective. How to correctly apportion wealth within a given household, especially among people of different genders, has not been established.[49] Two studies showed that men tend to have more net worth than women.[32,42] The association between wealth and mortality was stronger for women than for men in a model that did not control for other SES indicators.[28] Gender-stratified analyses revealed varying patterns of association between wealth and health outcomes.[32,33] Therefore, no conclusion was reached about wealth and health in relation to gender.

Age differences in associations between wealth and health. Many of the data sets used focused on populations aged ≥50 years (e.g., SIPP, NLSMM, HRS, AHEAD). For older and elderly persons, the correlation between wealth and health appears particularly strong, especially as it relates to mortality, self-reported health, functional status, and cognitive ability.[22,27,35,42,50]

Wenzlow et al.[13] found that among people aged 25 to 54, the effects of wealth are greater among older individuals. Robert and House[12] found significant interactions between age and assets overall and between age and home ownership in relation to functional status, with the positive association between assets and better functional status increasing over the life span. However, there was not a consistent age-related pattern between assets and chronic conditions, and assets and home ownership were each significantly associated with

better self-rated health in both younger (age 35 to 44) and older (65 to 74) adults. Age-stratified analyses by von dem Knesebeck et al.[37] did not reveal a clear pattern by age. Daly et al.[28] found a stronger relationship between wealth and survival in people aged 45 to 64 compared to people aged ≥65. Wealth may be particularly important in relation to the health of older adults.

Discussion

This review revealed that wealth was, more often than not, significantly associated with a range of health and health-related indicators. Higher levels of wealth were consistently associated with decreased mortality, and the findings also generally—albeit not invariably—supported an association between increased wealth and better self-rated health, better functional status, and fewer chronic diseases. Associations between wealth and mental health indicators tended to be mixed, and associations between wealth and healthcare utilization were generally not significant. Each study reviewed controlled for at least one measure of SES (and some for two or more SES measures) in addition to wealth, suggesting the importance of measuring wealth itself in many if not all health studies, and that other SES measures cannot be assumed to serve as proxies. It is plausible that wealth could affect health independently of income and other socioeconomic factors—for example. by providing economic security in the face of income fluctuations—and because wealth more accurately reflects the economic resources of persons who are retired or not in the paid labor force.

It may be particularly important to measure wealth to capture socioeconomic circumstances for specific subgroups of the U.S. population, such as the elderly and retired persons, and when studying ethnically diverse populations, particularly given the fact that other studies have shown dramatic racial/ethnic differences in accumulated wealth within comparable income groups.[51] A 2005 study found that among those in the bottom income quintile in the United States, whites had approximately 400 times the net worth of blacks; the ratio diminished as income increased, but even among the top quintile, whites had over three times the net worth of blacks.[4] Considering the body of evidence that wealth is associated with health, it is not surprising that controlling for wealth significantly reduced observed black/white differences in health in several studies.[27,29,31,32,38] This also suggests that studies concluding that an observed racial/ethnic difference in health must have a genetic etiology because differences persist after controlling for education, income, and/or occupation, but that did not measure wealth (or other potentially relevant social factors), should be suspect. Longitudinal studies incorporating information on wealth are needed to help better understand potential mechanisms through which wealth may mitigate racial/ethnic disparities in health and health-related outcomes.

It is important to underscore that it was not within the scope of this study to examine how health may influence wealth. This has been investigated in other studies.[48,49,52–60] Since most of the studies identified were cross-sectional, causal inferences cannot be made. The observed associations between wealth and health may have been confounded by unmeasured factors, such as if wealth reflected family/intergenerational factors unmeasured by the other SES indicators. It is possible that unidentified literature could support alternative conclusions; to reduce that possibility, multiple databases were searched using multiple key terms and techniques.

This review found a significant association between wealth and health in most studies. The findings were most consistent when monetary wealth measures relying on detailed questions about specific assets and debts were employed. This type of measure may not be practical in most surveys and could lead to higher rates of refusal and/or significant recall and/or response bias. Shorter monetary measures of wealth, especially those relying on a single question to measure wealth, were less consistent in their relationship to health and health-related outcomes. These may under-estimate relationships between wealth and health. Nonmonetary wealth measures, such as home ownership, are appealing for their relative simplicity and relative lack of disclosure sensitivity. However, no studies were found validating nonmonetary measures of wealth against accepted standards in the health literature. To achieve an improved understanding of how SES affects health throughout the life span, the creation of an accurate, valid, and simple measure of accumulated wealth should be a priority for health research.

No financial disclosures were reported by the authors of this paper.

The research for this paper was supported by Cooperative Agreement TS-0842 from the Centers for Disease Control and Prevention, Coordinating Center on Health Promotion, to the Center on Social Disparities in Health at the University of California-San Francisco.

No financial disclosures were reported by the authors of this paper.

References

1. Adler NE, Boyce T, Chesney MA, et al. Socioeconomic status and health. The challenge of the gradient. Am Psychol 1994;49:15–24.
2. Adler NE, Newman K. Socioeconomic disparities in health: pathways and policies. Health Aff (Millwood) 2002;21:60–76.
3. Avendano M, Kunst AE, van Lenthe F, et al. Trends in socioeconomic disparities in stroke mortality in six european countries between 1981–1985 and 1991–1995. Am J Epidemiol 2005;161:52–61.
4. Braveman PA, Cubbin C, Egerter S, et al. Socioeconomic status in health research: one size does not fit all. JAMA 2005;294:2879–88.

5. Isaacs SL, Schroeder SA. Class—the ignored determinant of the nation's health. N Engl J Med 2004;351:1137–42.
6. Kaplan GA. People and places: contrasting perspectives on the association between social class and health. Int J Health Serv 1996;26:507–19.
7. Mackenbach JP, Kunst AE, Groenhof F, et al. Socioeconomic inequalities in mortality among women and among men: an international study. Am J Public Health 1999;89:1800–6.
8. Marmot M. Inequalities in health. N Engl J Med 2001;345:134–6.
9. Braveman P, Cubbin C, Marchi K, Egerter S, Chavez G. Measuring socioeconomic status/position in studies of racial/ethnic disparities: maternal and infant health. Public Health Rep 2001;116:449–63.
10. Hurd MD. The economic status of the elderly. Science 1989;244:659–64.
11. Kington RS, Smith JP. Socioeconomic status and racial and ethnic differences in functional status associated with chronic diseases. Am J Public Health 1997;87:805–10.
12. Robert S, House JS. SES differentials in health by age and alternative indicators of SES. J Aging Health 1996;8:359–88.
13. Wenzlow A, Mullahy J, Robert SA, Wolfe BL. An empirical investigation of the relationship between wealth and health using the Survey of Consumer Finances. Madison: Institute for Research on Poverty, University of Wisconsin-Madison, 2004.
14. Juster FT, P. SJ, Stafford F. The measurement and structure of household wealth. Labour Econ 1999;6:253–75.
15. Fries G, Starr-McCluer M, Sunden AE. The measurement of household wealth using survey data: an overview of the Survey of Consumer Finances. Washington DC: Employee Benefit Research Institute, March 1998.
16. Kennickell AB, Starr-MCluer M. Retrospective reporting of household wealth: evidences from the 1983–1989 Survey of Consumer Finances. J Bus Econ Stat 1997;15:452–63.
17. Duncan GJ, Petersen E. The long and short of asking questions about income, wealth, and labor supply. Soc Sci Res 2001;30:248–63.
18. Ostrove JM, Feldman P, Adler NE. Relations among socioeconomic status indicators and health for African-Americans and whites. J Health Psychol 1999;4:451–63.
19. Robert SA. Community-level socioeconomic status effects on adult health. J Health Soc Behav 1998;39:18–37.
20. Curtin RT, Juster FT, Morgan JN. Survey estimates of wealth: an assessment of quality. In: Lipsey RE, Tice HS, eds. The measurement of saving, investment, and wealth. Chicago: University of Chicago Press, 1989:473–551.
21. Juster FT, Kuester KA. Differences in the measurement of wealth, wealth inequality and wealth composition obtained from alternative U.S. wealth surveys. Rev Income Wealth 1991;37:33–62.
22. Smith JP, Kington R. Race, socioeconomic status and health in late life. In: Martin L, Soldo B, eds. Racial and ethnic differences in the health of older Americans. Washington DC: National Academy Press;1997:106–62.
23. Robert SA, Reither EN. A multilevel analysis of race, community disadvantage, and body mass index among adults in the US. Soc Sci Med 2004;59:2421–34.
24. Mare RD. Socio-economic careers and differential mortality among older men in the United States. In: Vallin J, D'Souza S, Palloni A, eds. Measurement and analysis of mortality: new approaches. New York: Oxford University Press, 1990:362–87.
25. Attanasio OP, Hoynes HW. Differential mortality and wealth accumulation. J Hum Resources 2000;35:1–29.
26. Rooks RN, Simonsick EM, Miles T, et al. The association of race and socioeconomic status with cardiovascular disease indicators among older adults in the health, aging, and body composition study. J Gerontol B Psychol Sci Soc Sci 2002;57:S247–56.
27. Menchik PL. Economic status as a determinant of mortality among black and white older men: does poverty kill? Pop Stud 1993;47:427–36.
28. Daly MC, Duncan GJ, McDonough P, Williams DR. Optimal indicators of socioeconomic status for health research. Am J Public Health 2002;92:1151–7.
29. Bond Huie SA, Krueger PM, Rogers RG, Hummer RA. Wealth, race, and mortality. Soc Sci Q 2003;84:667–84.
30. Cunningham WE, Hays RD, Duan N, et al. The effect of socioeconomic status on the survival of people receiving care for HIV infection in the United States. J Health Care Poor Underserved 2005;16:655–76.
31. Mutchler JE, Burr JA. Racial differences in health and health care service utilization in later life: the effect of socioeconomic status. J Health Soc Behav 1991;32:342–56.
32. Schoenbaum M, Waidmann T. Race, socioeconomic status, and health: accounting for race differences in health. J Gerontol B Psychol Sci Soc Sci 1997;52:61–73.
33. Rodriguez E, Allen JA, Frongillo EA Jr, Chandra P. Unemployment, depression, and health: a look at the African-American community. J Epidemiol Community Health 1999;53:335–42.
34. Drentea P, Lavrakas PJ. Over the limit: the association among health, race and debt. Soc Sci Med 2000;50:517–29.
35. Hurd M, Kapteyn A. Health, wealth and the role of institutions. J Hum Resources 2003;38:386–415.
36. Meer J, Miller DL, Rosen HS. Exploring the health-wealth nexus. J Health Econ 2003;22:713–30.
37. von dem Knesebeck O, Luschen G, Cockerham WC, Siegrist J. Socioeconomic status and health among the aged in the United States and Germany: a comparative cross-sectional study. Soc Sci Med 2003;57:1643–52.
38. Wenzlow AT, Mullahy J, Wolfe BL. Understanding racial disparities in health: The income-wealth paradox. Madison: Institute for Research on Poverty, University of Wisconsin-Madison, 2004.
39. Kahn JR, Fazio EM. Economic status over the life course and racial disparities in health. J Gerontol B Psychol Sci Soc Sci 2005;60:76–84.
40. Alarcon GS, McGwin G, Jr, Sanchez ML, et al. Systemic lupus erythematosus in three ethnic groups. XIV. Poverty, wealth, and their influence on disease activity. Arthritis Rheum 2004;51:73–7.
41. Muntaner C, Eaton WW, Diala C, Kessler RC, Sorlie PD. Social class, assets, organizational control and the prevalence of common groups of psychiatric disorders. Soc Sci Med 1998;47:2043–53.
42. Cagney KA, Lauderdale DS. Education, wealth, and cognitive function in later life. J Gerontol B Psychol Sci Soc Sci 2002;57:P163–72.
43. Alegria M, Canino G, Rios R, et al. Inequalities in use of specialty mental health services among Latinos, African Americans, and non-Latino whites. Psychiatr Serv 2002;53:1547–55.
44. Dunlop DD, Manheim LM, Song J, Chang RW. Health care utilization among older adults with arthritis. Arthritis Rheum 2003;49:164–71.
45. Saver BG, Doescher MP, Jackson JE, Fishman P. Seniors with chronic health conditions and prescription drugs: benefits, wealth, and health. Value Health 2004;7:133–43.
46. McClellan M. Health events, health insurance, and labor supply: evidence from the Health and Retirement Survey. In: Wise DA, ed. Frontiers in economics of aging. Chicago: University of Chicago Press, 1998:301–46.
47. Ahmed NU, Smith GL, Flores AM, et al. Racial/ethnic disparity and predictors of leisure-time physical activity among U.S. men. Ethn Dis 2005;15:40–52.
48. Shea DG, Miles T, Hayward M. The health-wealth connection: racial differences. Gerontologist 1996;36:342–9.
49. Fonda SJ, Fultz NH, Jenkins KR, Wheeler LM, Wray LA. Relationship of body mass and net worth for retirement-aged men and women. Res Aging 2004;26:153–76.
50. Adams P, Hurd MD, McFadden D, Merrill A, Ribeiro T. Healthy, wealthy and wise? Tests for the direct causal paths between health and socioeconomic status. J Econometrics 2003;112:3–56.
51. Oliver ML, Shapiro TM. Black wealth/white wealth: a new perspective on racial inequality. New York: Routledge, 1995.
52. Lee J, Kim H. An examination of the impact of health on wealth depletion in elderly individuals. J Gerontol B Psychol Sci Soc Sci 2003;58:S120–6.
53. Smith JP. Racial and ethnic differences in wealth in the Health and Retirement Study. J Hum Resources 1995;30:pS158–83.
54. Smith JP. Healthy bodies and thick wallets: the dual relation between health and economic status. J Econ Perspect 1999;13:144–66.
55. Wu S. The effects of health events on the economic status of marries couples. J Hum Resources 2003;38:219–30.
56. Zagorsky JL. The wealth effects of smoking. Tob Control 2004;13:370–4.
57. Zagorsky JL. Is obesity as dangerous to your wealth as it is to your health? Res Aging 2004;26:130–52.
58. Smith JP. Wealth inequality among older Americans. J Gerontol B Psychol Sci Soc Sci 1997;52:74–81.
59. Zagorsky JL. Health and wealth. The late-20th century obesity epidemic in the U.S. Econ Hum Biol 2005;3:296–313.
60. Smith JP, Kington R. Demographic and economic correlates of health in old age. Demography 1997;34:159–70.