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Chronic disease and county economic status: Does it matter where you live?

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Abstract

Chronic disease is a major health burden in the United States, affecting about half of adults, and leading to poor health, disability, and death. However, the burden of chronic disease is not shared equally among Americans, with some groups (created by determinants such as race/ethnicity and socioeconomic resources) experiencing higher rates of morbidity and mortality. When measures of health and socioeconomic resources are examined together, a stepwise gradient pattern emerges. This social gradient has been established for individual measures, such as household income and social class, and several measures of morbidity and mortality. However, nationally, little research has been conducted using area-level measures, such as county economics, to examine its relationship with chronic disease.

Three studies were completed using data from the Behavioral Risk Factor Surveillance System (BRFSS). County economic status was determined using unemployment, per capita market income, and poverty. The first study examined the relationship between county economic status and chronic disease and risk factors, both nationally and by metropolitan classification, using data from BRFSS 2013. Further, the social gradient was explored. The second study also used data from BRFSS 2013 to examine county economic status and prevalence of hypertension, arthritis, and poor health, after controlling for known risk factors. This study also examined results by US region. Finally, the third study assessed changes in disparities between persistently poor and persistently affluent counties for heart disease, hypertension, arthritis, and diabetes using data from BRFSS 2001-2010.

Introduction

Chronic Disease

Chronic disease is a major health burden in the United States, leading to poor health, disability, and death¹ and accounts for about 84% of health care spending.² Chronic diseases affect approximately 117 million American adults, about half of the population, with almost 60 million having more than one chronic condition.³ Heart disease, hypertension, arthritis, and diabetes are among the most common chronic diseases affecting 11.3%, 25.5%, 22.1%, and 9.2% of adults, respectively.⁴ Further, several chronic diseases were among the 15 top leading causes of death in 2012, including cardiovascular disease, cancer, chronic lower respiratory disease, stroke, diabetes, and hypertension.⁵

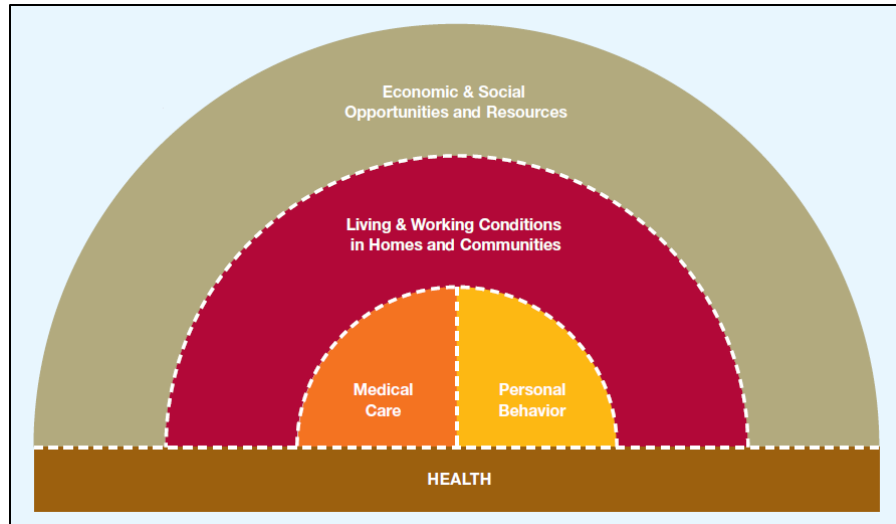
Nationally, the burden of chronic disease is large, but it is not shared equally among Americans. Disparities exist with some groups (such as groups created by race/ethnicity, household income, or education) experiencing higher prevalence than national estimates.⁶ Health disparities can occur because of biological differences or social disparities, but the latter is avoidable and inherently unjust.⁷

Health Disparities

Health disparities are defined as systematic and potentially avoidable health differences due to rankings in social hierarchies, created by determinants such as race/ethnicity, religion, geography, or measures of socioeconomic resources, that can occur because of intentional or unintentional discrimination or marginalization.⁸ Regardless of their origin, health disparities

cause groups that are already disadvantaged socially to be further disadvantaged with respect to health, which in turn makes it harder to overcome social challenges.

The term most often used in public health to describe social challenges is social determinants. Marmot simply defined social determinants as "...the circumstances in which people live and work."⁹ Social determinants can be further classified into downstream social determinants, factors that are spatially and temporally near the health effects such as health behaviors and beliefs, and upstream social determinants, the fundamental causes of health effects such as economics and social opportunities.¹⁰ The conceptual framework of downstream and upstream social determinants can be described using the figure below from the Robert Wood Johnson Foundation.¹¹ Behaviors and access to medical care (downstream social determinants) directly affect a person's health. But, behaviors and medical care access are affected by a person's living and working conditions (upstream social determinants). Further, living and working conditions can be affected by even more upstream social determinants, economic and social opportunities and resources. Children in affluent families (economic and social opportunity) tend to get higher paying jobs as adults with insurance and sick leave (better living and working conditions), which leads to increased access to medical care, positive health behaviors, and improved health overall.



Social Gradient

Measures of health and socioeconomic resources together generally follow a dose-response or stepwise gradient pattern.^{10, 12} This was first observed in the Whitehall studies of civil servants in the United Kingdom.^{13, 14} At all levels of occupational hierarchy below the top most level, participants experienced worse health and higher mortality at each step down the hierarchy. It has been demonstrated in the United States^{10, 15} and in other countries and at all levels of development and income, that a social gradient exists through which poor health outcomes increase as socioeconomic status decreases.¹⁶ However, to date, little research has been conducted on the social gradient created by area-level measures, such as county economics, and its relationship to chronic disease in the United States.

Economic Distressed Programs

Several federal agencies use economic indicators, commonly measures of unemployment and income, to classify areas as distressed or disadvantaged. For example, the Economic Development Administration (EDA), located within the US Department of Economics, supports

economic development programs and strategy implementation.¹⁷ EDA uses unemployment and per capita income to classify regions as economically distressed.¹⁸ A second example, the Delta Regional Authority, established in 2000, also uses unemployment and per capita income to determine economically distressed counties in the Delta region.¹⁹ The measures of economic distress are similar, but the specific measures and the methodology used to create indices vary across federal agencies.

Perhaps the oldest use of a distress measure by a federal agency is the one used by the Appalachian Regional Commission (ARC), which uses an economic indicator to classify counties as distressed. The ARC created its Distressed Counties Program in 1981, whose main goal was to bring water and sewer services to the least advantaged counties in the Appalachian.²⁰ Initially, the ARC used 4 measures to determine economic distress: unemployment, poverty, per capita market income, and infant mortality.²¹ Later, infant mortality was dropped since the region's average had improved and was aligned with the national average. Unemployment (3-year average), per capita market income, and poverty rate (5-year average) are used to create a composite index value.²² The current distressed county methodology classifies counties into 5 groups based on the index value: distressed, at-risk, transitional, competitive, and attainment. This proposed research will use methodology and measures similar to that used by the ARC, since the ARC has the longest history of using such an economic distress indicator.

Proposed Studies

Study 1

Using 2013 data from the Behavioral Risk Factor Surveillance System (BRFSS), the first study will examine chronic disease and risk factors by county economic status and metropolitan classification in the contiguous United States. Further, the social gradient created by economic status will be studied. The following chronic diseases and risk factors will be examined: leisure time physical activity, poor health, body mass index classified as overweight or obese, hypertension, high cholesterol, heart disease, arthritis, diabetes, current cigarette smoking, depressive disorder, asthma, and chronic obstructive pulmonary disease. Unemployment and per capita market income data from 2012 and 5-year poverty rates for 2008-2012, which is the most recent data, will be used to create an economic index. Quintiles will be used to create five economic groups: poorest, poor, median, affluent, most affluent.

Study 2

The second study will examine the association between county economic status and hypertension, arthritis, and poor health, after controlling for known risk factors. The social gradient created by economic status will also be examined by region. BRFSS 2013 data, unemployment and per capita market income data from 2012, and 5-year poverty rates for 2008-2012, will be used for this study to create an economic index. Quintiles will be used to create five economic groups: poorest, poor, median, affluent, most affluent. Multivariable logistic regression will be used to control for risk factors; these risk factors will include metropolitan classification, age, sex, race/ethnicity, education, household income, health insurance, body mass

index classified as overweight or obese, current cigarette smoking, and leisure time physical activity.

Study 3

Data from 2001-2010 BRFSS will be used in the third study to examine health disparities in prevalence of heart disease, hypertension, arthritis, and diabetes between persistently poor and persistently affluent counties in the contiguous United States. Unemployment, per capita market income, and poverty for 2001-2010 will be used to create an economic index. Counties that are in the lowest quintile every year for 2001-2010 will be classified as persistently poor counties; counties in the highest quintile will be classified as persistently affluent counties. Change in disparities will be assessed using methodology from Healthy People 2010.²³

Data Sources

BRFSS

Health data will be obtained from the BRFSS. The BRFSS is a random-digit-dialed survey which has been used to assess chronic disease, risk behaviors, and utilization of health services since 1984.²⁴ The BRFSS surveys noninstitutionalized civilian adults aged 18 years and older in all states and territories in the United States. Recent surveys have a sample size of about 400,000. A complex sample survey design and weighting are used to account for probability of selection and the population distribution by age, sex, and race/ethnicity. The questionnaire consists of core questions asked of all respondents, optional modules used in select states/territories, and state/territory added questions. Some core questions and optional modules are not offered every year.

Economic Measures

Economic data will be obtained from several sources. Unemployment is reported by the US Bureau of Labor Statistics.²⁵ Per capita market income is calculated using personal income, transfer payments, and population data from the US Bureau of Economic Analysis.²⁶ County level data is available beginning with 1969. Finally, poverty rates are five-year estimates provided by the US Census Bureau's American Community Survey (ACS).²⁷ Five-year poverty estimates are only available beginning in 2005. For poverty prior to 2005, estimates can be obtained from the US Census Bureau's Small Area Income and Poverty Estimates program.²⁸

Metropolitan Classification

About 84% of the US population lives in metropolitan areas²⁹ and county economics differ for metropolitan and non-metropolitan areas.³⁰ To minimize the effect of urban areas on economic classification of counties, the counties can be first stratified by urban/rural status. Metropolitan classification will be determined using the US Office of Management and Budget's metropolitan classification, which are areas that have at least one urbanized area with $\geq 50,000$ population and includes adjacent areas in which they are socially and economically integrated.³¹

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Chronic disease disparities by county economic status and metropolitan classification, Behavioral Risk Factor Surveillance System, 2013.

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Hypertension, arthritis, and poor health: A closer look at county economics and region using the Behavioral Risk Factor Surveillance System, 2013.

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Cardiovascular disease, arthritis, and diabetes: An examination of health disparities between residents of persistently poor and affluent counties, 2001-2010.

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Conclusion

Summary of Results

Study 1

Poor counties have poorer health outcomes than affluent counties and differences exist between metropolitan and non-metropolitan counties in the contiguous United States. For 2013, statistically significant differences between the most affluent counties and poorest counties were found for: poor health (−11.5); hypertension (−7.6) arthritis (−6.0); and several risk factors including body mass index classified as overweight or obese (−9.2), leisure time physical activity (8.7), and current smoking (−6.4). Further, respondents in non-metropolitan counties were more likely to report chronic diseases, excluding asthma for which there was no significant difference, and risk factors than those in metropolitan counties. The largest differences between metropolitan and non-metropolitan counties were found for hypertension (metropolitan: −5.8; non-metropolitan: −10.2), poor health (metropolitan: −9.0; non-metropolitan: −12.2), and arthritis (metropolitan: −4.8; non-metropolitan: −6.9).

Study 2

Residents in poor counties experience greater prevalence of hypertension, arthritis, and poor health in 2013, compared to residents in affluent counties in the contiguous United States. This association remained after adjusting for known risk factors (age, sex, race/ethnicity, education, household income, health insurance, overweight or obese, current cigarette smoking, physical activity, and metropolitan county classification). Prevalence of hypertension, arthritis, and poor self-rated health in the poorest counties was 7%, 11%, and 15% higher, respectively, compared

with the prevalence in the most affluent counties. Further, this association was examined by region. For all regions, the prevalence of the studied health outcomes decreased as county economic status increased from poorest to most affluent; however the range and rate of decrease for prevalence estimates differed. After adjusting for known risk factors, hypertension was no longer significantly associated with county economic status in the Northeast, but poor counties had higher prevalence in other regions. For arthritis, poor counties in all regions had higher prevalence than affluent counties. Only the poorest counties in the West and poorest and poor counties in the Midwest had a higher prevalence of poor health compared to the most affluent counties in their region.

Study 3

Compared to persistently affluent counties, persistently poor counties have increased burden of heart disease, hypertension, arthritis, and diabetes for 2001 to 2010 in the contiguous United States. Statistically significant differences between poor and affluent counties for all conditions were found overall and for non-metropolitan counties; only differences for heart disease, hypertension, and diabetes were statistically significant for metropolitan counties. A significant change in disparities between persistently poor and affluent counties was found for heart disease, both overall and for non-metropolitan counties; there were no other significant changes in disparities. Thus, the disparity in the prevalence between persistently poor and affluent counties did not improve for hypertension, arthritis, and diabetes, and worsened for heart disease.

Policy and Program Recommendations

This research shows that poor counties have a higher burden of chronic disease and risk factors. Several characteristics associated with poor counties are potentially modifiable through policies and programs. Higher education achievement; improved housing, food, and built environments; and economic development, have the potential to improve the health of residents in disadvantaged communities.

Education

One of the strongest predictors of health is education, with health improving as education increases.¹ Nationally, about 80% of students graduate high school,² but only about one-third of those students have the minimum qualifications to attend college.³ Compared to those with at least some college education, adults without a high school diploma have higher prevalence of chronic diseases and risk factors, such as heart disease, stroke, and current cigarette smoking.⁴ Estimates for education attainment using data from the Behavioral Risk Factor Surveillance System (BRFSS) 2013 data by county economic status as defined in studies 1 and 2 are provided below (Table 1). In the poorest counties, 1 in 4 respondents have less than a high school education compared to 1 in 10 for the most affluent counties. Conversely, almost 40% of respondents in the most affluent counties have at least a college education compared to 16% in the poorest counties.

Table 1. Education by county economic status¹, adults (≥ 25 years), Behavioral Risk Factor Surveillance System, 2013.²

	Poorest	Poor	Median	Affluent	Most Affluent
Education	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
< High School	25.0 (24.0, 26.0)	19.0 (18.2, 19.7)	14.5 (13.9, 15.1)	13.7 (13.1, 14.3)	10.1 (9.7, 10.6)
High School	31.3 (30.4, 32.1)	29.4 (28.7, 30.1)	30.7 (30.2, 31.3)	27.2 (26.6, 27.8)	23.6 (23.1, 24.1)
> High School	28.2 (27.3, 29.0)	30.6 (29.8, 31.3)	30.4 (29.8, 31.0)	30.4 (29.8, 31.0)	28.4 (27.9, 29.0)
College Graduate	15.6 (15.0, 16.1)	21.1 (20.5, 21.7)	24.4 (23.9, 24.9)	28.7 (28.2, 29.3)	37.9 (37.3, 38.4)

CI=Confidence Interval

1. County economic status was created using 2012 unemployment rate, per capita market income, and poverty rate for each county. An index was used to order counties into 5 quintiles (poorest, poor, median, affluent, and most affluent).
2. Analyses excluded data from respondents in Alaska and Hawaii.

There are several policies and program recommendations aimed at increasing education by addressing early education. The Community Preventive Services Task Force recommends comprehensive, center-based early childhood development programs.⁵ For low income children aged 3-5 years, there is strong evidence that these programs prevent delay of cognitive development and increase readiness to learn. One example of such a program is Head Start, a federal program whose funding is administered by the Office of the Administration for Children and Families,⁶ which has been shown to have a positive impact on health outcomes.⁷ The Task Force also recommends full-day kindergarten (5-6 hours/day, 5 days/week) for 4-6 year old children during the year prior to the first grade.⁸ Evidence shows that full-day kindergarten results in improved reading and mathematics achievement.

Increasing high school completion is another objective of education policies and programming. The Task Force recommends several different programs to increase high school completion.⁹ These include vocational training, alternative schooling, college-oriented programs, and supplement academic services, such as tutoring and homework assistance. Also, states can

increase the age at which students can drop out, keeping students in schools longer.⁷ Health interventions, such as mental health programs, substance abuse prevention and treatment programs, and sex education and HIV/pregnancy prevention programs, might also have a positive impact on high school dropout rates.¹

Housing

Housing is a basic necessity providing shelter and a place to store food, water, and other essentials.¹⁰ In 2012, almost 41 million households paid more than 30% of their income for housing and more than one-fourth of renter households paid more than half of their income for housing.¹¹ In 2011, there were only 3.2 million affordable and available housing units for the 11.5 million low-income renters.¹¹ Estimates for the median and interquartile ranges for county percent of households with cost burden housing by county economic status are presented in Table 2. The median county percentage was highest for poorest counties and lowest for most affluent counties.

Table 2. Medians and interquartile ranges for percent of households in county with cost burden housing¹ by county economic status², 2007-2011.³

County Economic Status	Median (%)	Interquartile Range (25 th -75 th percentiles)
Poorest	12.9	(11.0-15.4)
Poor	11.6	(9.9-14.0)
Median	11.2	(9.3-13.5)
Affluent	10.3	(8.3-12.9)
Most Affluent	8.8	(6.8-11.4)

1. Cost burden housing is defined as > 50% of household income paid for housing
2. County economic status was created using 2012 unemployment rate, per capita market income, and poverty rate for each county. An index was used to order counties into 5 quintiles (poorest, poor, median, affluent, and most affluent); analyses excluded data from respondents in Alaska and Hawaii.
2. 5-year estimates from the American Community Survey as calculated for the Comprehensive Housing Affordability Strategy (CHAS) program: http://www.huduser.org/portal/datasets/cp/CHAS/bg_chas.html

Rental assistance and revitalization programs can assist with housing issues. The Community Preventive Services Task Force recommends tenant-based rental assistance programs because it allows families to find affordable housing in safer neighborhoods.¹⁰ The Housing Choice Voucher Program or Section 8, funded by the US Department of Housing and Urban Development (HUD), is administered locally by public housing agencies and provides vouchers for very low income families and elderly and disabled citizens to secure housing that is not limited to units located in subsidized housing projects.¹² HOPE VI, also administered by HUD, funds the demolition and reconstruction of distressed public housing units.¹³

Built Environment

Shelter alone does not improve health outcomes. Research has also shown that the environment in which people live and work can adversely affect health. Improved neighborhood environments have been associated with increased physical activity and decreased prevalence of obesity, depression, and chronic disease.¹⁴ Estimates for the median and interquartile ranges for the number of recreation and fitness facilities in a county per 1000 population and percentage of county residents who live within a half mile of a park by county economic status are presented in Table 3. The median number of recreation and fitness facilities in a county per 1000 population and the median county percentage of residents living within a half mile of a park were lowest for poorest counties and highest for most affluent counties.

Table 3. Medians and interquartile ranges for number of recreation and fitness facilities in a county per 1000 population¹ and percentage of county residents who live within a half mile of park² by county economic status.³

County Economic Status	Recreation and Fitness Facilities in county per 1000 population (2011)		Population in county within half mile of a park (2010)	
	Median	Interquartile Range (25 th –75 th percentiles)	Median (%)	Interquartile Range (25 th –75 th percentiles)
Poorest	0.03	(0–0.07)	4	(1–12)
Poor	0.06	(0.01–0.09)	9	(2–20)
Median	0.07	(0.04–0.11)	16	(7–29)
Affluent	0.08	(0.02–0.12)	23	(9–24)
Most Affluent	0.09	(0–0.14)	26	(12–43)

1. US Department of Agriculture, Economic Research Service, Food Atlas: <http://www.ers.usda.gov/foodatlas/>

2. Centers for Disease Control and Prevention. Healthy Community Design Initiative and Geospatial Research Analysis and Services Program. Environmental Public Health Tracking Network: <http://www.cdc.gov/ephtracking>

3. County economic status was created using 2012 unemployment rate, per capita market income, and poverty rate for each county. An index was used to order counties into 5 quintiles (poorest, poor, median, affluent, and most affluent); analyses excluded data from respondents in Alaska and Hawaii.

The Community Preventive Services Task Force recommends a number of environmental and policy approaches. Community-scale urban design and land use policies are recommended that support physical activity, such as proximity of residential areas to stores, schools, and recreational areas and providing continuity and connectivity of sidewalks.¹⁵ The Task Force also recommends street-scale urban design and land use policies, such as improving street lighting, increasing safety of street crossing, using traffic calming designs, and improving street landscaping.¹⁶ Finally, creating or enhancing access to places for physical activity is recommended by the Task Force.¹⁷ Examples of this recommendation include creating walking or biking trails and building new, or providing access to existing, exercise facilities.

Food Environment

To lead a healthy life, people must also have access to nutritious foods. Less availability of healthy foods is associated with a low quality diet.¹⁸ Poorer neighborhoods have a greater density

of fast-food restaurants and convenience stores,¹⁹ which has been shown to be associated with mortality and diabetes.²⁰

Currently, the Community Preventive Services Task Force does not have recommendations on improving the food environment. However, others have suggested programs and policies. One recommendation is to increase public transportation to food retailers by creating routes that connect low-income neighborhoods with supermarkets.²¹ Also, incentives for businesses could be used to increase access to healthy foods.^{19, 21} Zoning changes could be used to restrict the density of fast food restaurants.²²

Economic Development

Finally, policies and programs could be used to improve the economy in distressed areas. The Joint Center for Political and Economic Studies provides suggestions to promote economic development.²¹ First, incentives providing customized job training for new businesses could bring jobs to the area. Second, training in developing business could create new small businesses. Third, tax and regulatory relief could be provided as incentives for investors to bring businesses to the areas.

Future Research

This current research can be extended to gain further knowledge on county economics and its association with health. First, this research was limited to select chronic conditions and risk factors. This methodology could be extended to other health conditions, behaviors, and risk factors. Second, health disparities between persistently poor and persistently affluent counties

were examined using 10 years of data. Additional historical data could be added to analyses and other time periods could be used to develop a more comprehensive look at these disparities.

Third, this research could be used to monitor health disparities by area level poverty in the future. As county economies change, it is important to assess how these disparities change.

Fourth, county economic status could be evaluated over time to identify counties which have had significant improvements or declines in their economies. Studying how health outcomes change with the change in economic status could provide additional information on the association between county economics and health. Finally, using longitudinal data, such as the Panel Study of Income Dynamics²³ or the National Longitudinal Survey of Youth,²⁴ if sample sizes are adequate, one could look at respondents who have moved out of economically disadvantaged areas (or moved to one from non-economically disadvantaged areas) and examine the change in health outcomes. Regardless of the direction, more research needs to be conducted to assess area-level poverty and its association with health outcomes.

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