

Association between Census Tract Level Poverty and Leading Causes of Death, New Mexico, 2009-2013

The social determinants of health are social, economic and cultural factors that can influence the ability of a person or a population to live a healthy and fulfilled life. The importance of examining socioeconomic disparities and their relationship with health outcomes, is well established.¹

Linking health data to area based socioeconomic measures from the United States Census data is an established method of monitoring the effect of inequalities on health.² This type of analysis highlights the importance of place in relationship to health and the potential for implementation of population-level interventions. Neighborhood level social conditions and physical structures, such as segregation by SES and poor housing quality, may contribute to the concentration of poor health outcomes in particular areas through an uneven distribution of resources.³

To explore the influence of social determinants on health in New Mexico, the association between poverty level and health outcomes at the census tract level was examined.

Methods

The United States Census, American Community Survey five-year estimates provides information on poverty and other indicators of the social determinants of health by census tract for 2009-2013. Mortality data for 2009-2013 from the New Mexico Department of Health (NMDOH), Bureau of Vital Records and Health Statistics, New Mexico Death Certificate Database had previously been geocoded and aggregated to census tract. Population estimate data, by census tract, from 2009-2013 were obtained from the University of New Mexico, Geospatial and Population Studies (GPS) Program.

To measure place-based disparities, the Public Health Disparities Geocoding Project (PHDGP) recommends the use of a standard area-based socioeconomic status

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measure such as the US Census or American Community Survey 5 Year estimate census tract level percentage of population living below the federal poverty level using 4 categories (<5%, 5-9.9%, 10-19.9%, 20% and above). That research suggests that the guidelines can be applied to any health outcome, however mortality outcomes are good candidates due to a probable large sample size and high level of completeness.⁴ In populations with a high proportion of census tracts in the 20% poverty and above category, additional poverty categories may be more appropriate (<5%, 5-9.9%, 10-19.9%, 20-29.9%, 30-39.9%, and ≥40%).⁵ Neither the PHDGP nor the CSTE Health Disparities Workgroup has specific recommendations regarding the use of other American Community Survey SES measures or cut-points. Family income has been associated with increased mortality.⁶

Six poverty categories were: <5%, 5-9.9%, 10-19.9%, 20-29.9%, 30-39.9%, and ≥40% of persons living below the federal poverty level. These poverty categories were assigned to each outcome (cause of mortality) by census tract in the vital records datasets, and the population denominator data. Age adjusted deaths per 100,000 population, were calculated within each poverty group for the 10 leading causes of death within New Mexico from 2009 to 2013. The ten leading causes of death were defined using the National Center for Health Statistics 50 leading causes of death classification of ICD 10 codes. Those causes of death were: Circulatory, Heart disease (ICD10: I00-I09, I11, I13, I20-I51); Neoplasm, malignant (ICD10: C00-C97); Unintentional injuries (ICD10: V01-X59, Y85-Y86); Respiratory, Chronic lower respiratory diseases (ICD10: J40-J47); Circulatory, Cerebrovascular diseases (ICD10: I60-I69); Diabetes mellitus (ICD10: E10-E14); Chronic liver disease and cirrhosis (ICD10: K70,

K73-K74); Injury, Injury, Intentional self-harm (suicide) (ICD10: X60-X84, Y87.0, U03); Alzheimer's disease (ICD10: G30); Respiratory, Influenza and pneumonia (ICD10: J09-J18).

In order to perform this analysis, categorized census tract level data from the American Community Survey were linked to record-level mortality and census tract-level population data. Using the resulting datasets, the association between census tract level poverty and mortality outcomes was assessed. Analysis of Variance (ANOVA) was used to analyze an association between the six poverty categories and leading cause of death rate by census tract for the 498 populated census tracts within New Mexico. A cutoff value of $\alpha < 0.05$ to determine if poverty category was significantly associated with a leading cause of mortality.

Results

Significant associations between census tract level poverty category and mortality were found for five of the ten leading cause of death in New Mexico (Table). Those causes were Alzheimer's disease, diabetes mellitus, chronic liver disease and cirrhosis, unintentional injuries, and influenza and pneumonia. The association was the strongest between chronic liver disease ($F=16.36$) and diabetes mellitus ($F=16.05$). A weaker but still statistically significant association was found between poverty category and influenza and pneumonia ($F=3.66$) and unintentional injuries ($F=2.51$). Finally, an inverse relationship was found between Alzhei-

mer's disease mortality and census tract level poverty ($F=3.62$). The mortality rates for each of these five causes of mortality were stratified by percent of persons living in poverty within a census tract (Figure).

Census tract level poverty was not found to be significantly associated with deaths due to heart disease, cancer, chronic lower respiratory disease, cerebrovascular disease or suicide.

Discussion

This analysis has highlighted a clear relationship between poverty and five of the 10 leading causes of death within New Mexico. However, the analysis presented here provides only a simple description of one of the many social determinants of health. A more complex understanding of the relationship between the social determinants of health and health outcomes requires further analysis. Additionally, more analysis is needed on why census tract poverty level was associated with some leading causes of death and not others, and how poverty interacts with demographic characteristics such as race, age and sex.

There are several possible explanations for why poverty may not be associated with a given health outcome within a certain population or geographic area. A New York City based study of cardiovascular disease (CVD) patients followed one year after a CVD hospitalization found an increased prevalence in CVD risk factors but not an increase in CVD-related mortality in

Table. ANOVA of 6 category Poverty Definition vs Leading Cause of Death, New Mexico, 2009 to 2013

Rank	Cause of Death	F Statistic	Probability	F Statistic significant at $\alpha < 0.05$
1	Heart disease	0.6754	0.64229	-
2	Neoplasm, malignant	0.9463	0.45287	-
3	Unintentional injuries	2.5114	0.02926	+
4	Chronic lower respiratory diseases	1.7673	0.11797	-
5	Cerebrovascular diseases	1.9122	0.09078	-
6	Diabetes mellitus	16.0521	0	+
7	Chronic liver disease and cirrhosis	16.3606	0	+
8	Intentional self-harm (suicide)	1.9488	0.08489	-
9	Alzheimer's disease	3.6297	0.00311	+
10	Influenza and pneumonia	3.6656	0.00288	+

the highest poverty neighborhoods (40% or higher). This result was potentially related to a younger population in the highest poverty areas, translating to lower mortality rates.⁷ Another possible explanation includes in-migration of healthier populations into the low-income areas (gentrification) including in-migration of foreign born immigrants. The “healthy immigrant effect”, where newly immigrated populations are healthier than their native born counterparts, has been established in the literature.⁸ Areas experiencing higher immigration may display better health outcomes compared to areas with lower immigration.

The linked birth and death datasets have been made available on New Mexico’s Indicator-Based Information system (NM-IBIS) website in query able format by selected birth and death outcome measures displayed by social determinant of health category (poverty category). Additional social determinant variables included in these datasets are percentage of children under 5 in poverty, median income, percentage of persons without health insurance, percentage of persons 25 and older with a bachelor’s degree or higher, unemployment, percentage of persons aged 18-64 with a disability, percentage speaking a language other than English at home, percentage of single female-headed households, and percentage of households without vehicles.

Recommendations

Linking data from the United States Census American Community Survey with census geocoded birth and death data highlights how these conditions may influence the health of New Mexicans. The availability of these data in an online query tool, the New Mexico Indicator Based Information System (NM-IBIS) website, will make this type of analysis available to the public, promoting its use by advocates for public health in New Mexico. These data may increase the likelihood that limited health care and public health resources will be used to focus interventions toward those populations with the greatest risk of death.

Based on the current findings, we recommend that public health professionals interested in preventing excess mortality due to chronic liver disease, diabetes and unintentional injuries be aware of the relationship between these outcomes and poverty. Resources and interventions should be targeted to subpopulations in NM with the least favorable health outcomes. Addi-

tionally, we recommend more emphasis on the understanding of the social determinants of health within New Mexico. In the past in New Mexico recognition of differing area level social determinants of health has allowed for policy changes and population specific interventions to address health disparities, including hepatitis A vaccination campaigns, and improving medication access.⁹

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Figure. Leading Causes of Death Associated with Census Tract Level Poverty by Poverty Category, New Mexico, 2009 to 2013 (N= 498 New Mexico Census Tracts)

