



Community Health Assessment Quarterly

Volume 2, Issue 1

Winter 2007

Education and Health in Multnomah County: An Area-Based Analysis of Mortality Data

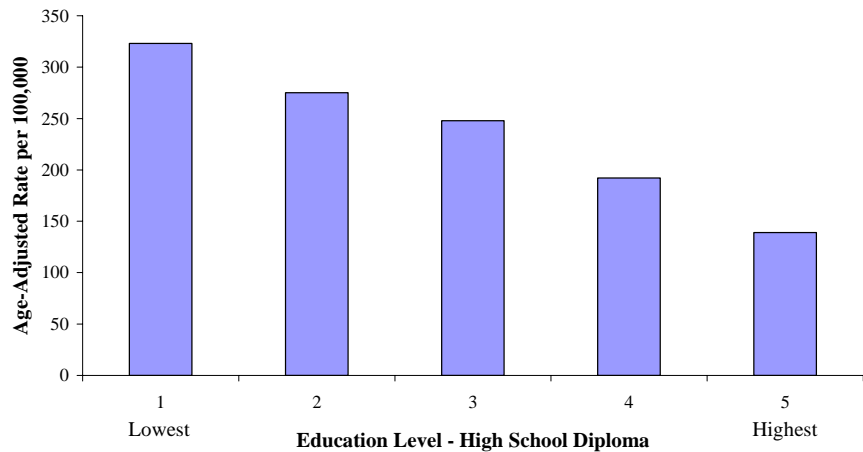
Education is considered the most basic component of socioeconomic status, and significantly shapes one's future occupation and income (two other important socioeconomic factors). But education is more than simply a way to a better job; researchers are finding that education has direct benefits to health (1). A review of education and health featured recently in the New York Times summarized education's impact this way: "[It is] the one social factor that researchers agree is consistently linked to longer lives in every country where it has been studied (2)." More specifically, studies have shown that educated individuals are less likely than those with low levels of education to have diabetes and heart ailments, they are less likely to be overweight and to smoke cigarettes, and they are more likely to abstain from illegal drugs and excess alcohol (1, 3-4).

Until recently, it has been difficult to determine the health effects of education at the local level. Fortunately, researchers at the Harvard School of Public Health have outlined new methods for analyzing health data using education information from the 2000 US Census* (5-6). Given these advances, we thought it would be useful to explore the relationship between education and health in Multnomah County.

What we did (Methodology†)

We followed the lead of Harvard's Disparities Geocoding Project (5)

Premature Mortality (< 65 Years Old)
by Education: 1999-2002
Multnomah County, Census Tract Level



Graph 1. Premature Mortality by Education.

and analyzed Multnomah County mortality data - our measure of health - for years surrounding the 2000 US Census (1999-2002 to be exact. Although more recent mortality data are available, these years provide the closest match to the population at the time of the 2000 Census). We combined the location (i.e., the census tract) and the age of individuals at death with population and education information from the 2000 Census to calculate mortality rates (recall that the mortality rate is the number of deaths divided by the total population) by education level.

Education level was measured as the percentage of adults in each census tract (there are more than 150 in Multnomah County) with less than a high school education at the time of the 2000 Census. We then categorized these percentages into five categories; we designated the lowest education level as all census tracts where 20% or more of adults have less than a high school education. The highest education level includes all census tracts where 95% or more of adults have a high school education (or, less than 5% of adults have no high school education). A census tract in the West Hills of Portland, for example, has the highest education level because by our definition it has the fewest adults with less than a high school education (1.1%). A census tract in East County has the lowest education

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level because it has the most adults with less than a high school education (36%).

We then calculated mortality rates by adding up the number of deaths in each education level, and divided this number by the population in that education category. (It’s a little more complicated than this, but that’s the general idea.) We then estimated a rate ratio, which is the mortality rate in the lowest education category divided by the mortality rate in the higher education categories. Finally, we calculated what we call a “ratio of inequality”, which is the mortality rate for the lowest education category (20% or more of adults having less than a high school education) divided by the mortality rate for the highest education category (95% or more with a high school education). We calculated rates and ratios for overall mortality, along with seven other selected causes of death that have been shown to be related to education level (3, 5-6): premature mortality (i.e., deaths to those less than 65 years of age), drug-related deaths, alcohol-related deaths, coronary heart disease, homicide, diabetes, and smoking-related deaths.

Mortality rates decline as education level increases

Here’s what we found when we analyzed the data : as education level increases, the mortality rate declines. Table 1 shows more specifically what that means: among those people living in areas with the lowest education levels, the mortality rate was 1,051 per 100,000 (all rates are age-adjusted to the 2000 US Standard Population). Rates show a gradient—or stepwise—decline as the education level increases, until it reaches 745 per 100,000 in areas with the highest education levels. The ratio of inequality of 1.44 can be interpreted to

**Table 1. All-Cause Mortality Rates by Education: 1999-2001
Multnomah County, Census Tract Level**

Education Level-	Deaths	Population	Age-Adjusted Mortality Rate, per 100,000	Rate Ratio (95% CI)	Ratio of Inequality (95% CI)
High School Diploma					1.44 (1.36, 1.51)
1 (Lowest)	4,909	549,174	1,051	1.41 (1.34, 1.49)	
2	4,250	434,556	1,020	1.37 (1.30, 1.45)	
3	2,964	303,894	933	1.25 (1.18, 1.33)	
4	3,123	426,186	894	1.19 (1.13, 1.27)	
5 (Highest)	1,880	267,648	745	1.00	

Note. CI=confidence interval. Population and high school education percentages from 2000 US Census. Education levels are percentages of adults at the census-tract level with less than a high school education. Categories are as follows: 1 = 0-4.9%; 2= 5-9.9%; 3 = 10-14.9%; 4 = 15-19.9%; 5 = 20-100%. The ratio of inequality was calculated using the Relative Index of Inequality (RII) (5-6). The RII can be considered as the ratio of the mortality rate at the lowest education level (level 1) to the mortality rate at the highest education level (level 5).

mean that those living in areas with low education levels have a mortality rate that is 1.44 times (or 44%) greater than the rate for those living in areas with high education levels.

We found even stronger evidence for the relationship between education level and mortality when we looked at selected causes of death. Ratios of inequality were calculated for each selected cause of death, and as Table 2 shows, they all indicate significant disparities by education level. Six ratios of inequality were greater than 2. The table shows, for example, that the premature mortality rate (or deaths to those less than 65 years old) is 2 1/2 times higher in areas with low education levels, when compared to the mortality rate in areas with high education levels (see Graph 1 for a dramatic illustration of premature mortality by education). The largest ratios of inequality were for homicide and alcohol-related deaths, which show that mortality rates are 3 1/2 times greater in areas with low education levels when compared to mortality rates in high education areas.

The premature mortality rate (deaths to those less than 65 years old) is 2 1/2 times higher in areas with low education levels, compared to the mortality rate in areas with high education levels.

Education and health: a causal relationship?

We have found clear evidence of a relationship between education and health among Multnomah County residents. But unfortunately, we don’t know how much of our relationship is causal (i.e., education directly affecting health). It could be, for example, that poor health leads to lower levels of education (though researchers have mostly ruled this out based on the simple fact that very few children have such poor health that they stay out of school). Or it could be that education and health are related to a third factor, such as income. But research tells us that at least some of the relationship involves education directly causing better health. The most compelling evidence for this proposal comes from a recent study looking at increases in compulsory education in the US during the first half of the 20th century. That study showed that individuals born in states that forced them to go to school “obtained more education... [and] had substantially lower mortality rates much later in life (1).”

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Assuming that higher education confers health benefits, we are still left wondering why this is the case. The reasons are still being worked out, but there are some interesting theories. One plausible theory is that education provides access to information and allows one to learn cognitive skills that change behavior to avoid poor health outcomes. Others suggest that higher levels of education may teach people to think ahead and plan more clearly, to delay gratification, and to avoid health behaviors (e.g., cigarette smoking) that adversely affect health (1-3).

Conclusion

This study shows that Census data can be used to monitor educational and other socioeconomic health inequalities among Multnomah County residents. We found that those living in areas with low education levels die at significantly higher rates than those living in high education areas. This relationship is strongest for selected causes of death such as premature mortality (<65 years old), diabetes, and alcohol-related deaths, which showed mortality rates over twice as high in areas with low levels of education when compared to areas with high education levels.

**Table 2. Selected Causes of Death by Education: 1999-2002
Multnomah County, Census Tract Level**

	Deaths	Population	Ratio of Inequality (95% CI)
Premature Mortality (ages <65)	6,466	2,347,516	2.50 (2.28, 2.75)
Tobacco-Related	3,577	2,641,944	2.19 (1.96, 2.46)
Alcohol-Related	383	2,641,944	3.41 (2.36, 4.92)
Drug-Related	533	2,641,944	2.19 (1.60, 3.01)
Homicide	126	2,641,944	3.66 (1.89, 7.13)
Diabetes	755	2,641,944	2.48 (1.93, 3.17)
Coronary Heart Disease	3,460	2,641,944	1.44 (1.29, 1.61)

Note. CI=confidence interval. The ratios of inequality were calculated using the Relative Index of Inequality (RII). The RII can be considered as the ratio of the mortality rate at the lowest education level (level 1) to the mortality rate at the highest education level (level 5) (see Table 1).

Notes

* The 2000 Census is the most recent available. The next Census will be taken in 2010.

† For a more technical version of this report, please go to: <http://tinyurl.com/28suskg>

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Community Health Assessment Quarterly is published four times per year by:

Multnomah County Health Department
Health Assessment and Evaluation Office
426 SW Stark St 9th Floor, Portland OR 97204.

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