



# Primary care, social inequalities and all-cause, heart disease and cancer mortality in US counties: a comparison between urban and non-urban areas

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Received 26 November 2003; received in revised form 4 November 2004; accepted 20 December 2004  
Available online 11 May 2005

## KEYWORDS

Primary care;  
Social epidemiology;  
Health inequalities;  
Urban health

**Summary Objective:** The objective of this study was to test whether the association between primary care and income inequality on all-cause, heart disease and cancer mortality at county level differs in urban (Metropolitan Statistical Area-MSA) compared with non-urban (non-MSA) areas.

**Study design:** The study consisted of a cross-sectional analysis of county-level data stratified by MSA and non-MSA areas in 1990. Dependent variables included age and sex-standardized (per 100,000) all-cause, heart disease and cancer mortality. Independent variables included primary care resources, income inequality, education levels, unemployment, racial/ethnic composition and income levels.

**Methods:** One-way analysis of variance and multivariate ordinary least squares regression were employed for each health outcome.

**Results:** Among non-MSA counties, those in the highest income inequality category experienced 11% higher all-cause mortality, 9% higher heart disease mortality, and 9% higher cancer mortality than counties in the lowest income inequality quartile, while controlling for other health determinants. Non-MSA counties with higher primary care experienced 2% lower all-cause mortality, 4% lower heart disease mortality, and 3% lower cancer mortality than non-MSA counties with lower primary care. MSA counties with median levels of income inequality experienced approximately 6% higher all-cause mortality, 7% higher heart disease mortality, and 7% higher cancer mortality than counties in the lowest income inequality quartile. MSA counties with low primary care (less than 75th percentile) had significantly lower levels of all-cause, heart disease and cancer mortality than those counties with high primary care.

**Conclusions:** In non-MSA counties, increasing primary physician supply could be one way to address the health needs of rural populations. In MSA counties, the association

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between primary care and health outcomes appears to be more complex and is likely to require intervention that focuses on multiple fronts.

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## Introduction

There is considerable evidence of an association between social inequalities and health outcomes in USA.<sup>1-4</sup> Although there is still debate regarding the extent and significance of this relationship,<sup>5,6</sup> these studies have generally found that, at least within USA, a greater gap in income distribution between the rich and poor is associated with poorer population health.

As well as exploration of contextual-level risk factors, there has also been progress in identifying features of the environment that are health enhancing. We have previously suggested that primary care may partially mitigate some of the adverse effects of social inequalities on adult health in USA.<sup>7,8</sup>

One question posed by these studies is at which level of aggregation do contextual factors have the largest effect on population health? Several studies have shown that at state level, income inequality is associated with mortality, greater odds of morbidity, increased risk factors for poor health, and some sexually transmitted diseases.<sup>2,9-11</sup> Similar results have been found for county-level,<sup>12</sup> urban (metropolitan statistical area, MSA)-level<sup>13</sup> and mixed-level analyses.<sup>14-16</sup> However, this effect does not appear to manifest at the census-tract level.<sup>17</sup> Primary care has also been found to be associated with better health outcomes in state,<sup>18</sup> US metropolitan area<sup>19</sup> and mixed-level analyses.<sup>8,20</sup>

One of the difficulties associated with assessing the contextual determinants of health at aggregation smaller than state level is that some smaller units (e.g. census tract and MSA) may not represent politically viable units of analysis, annulling the possibility that research results could be meaningfully linked to policy action. This study examines the extent to which county-level determinants of health (income inequality and primary care) affect population health while stratifying for MSA compared with non-MSA counties. Counties were chosen because they represent an important unit of decision-making regarding the local character of public health and other social programmes. We analysed all counties in USA because several prior studies performed at MSA level excluded non-MSA

areas from their study.<sup>21,22</sup> This study further stratifies counties by MSA and non-MSA status because of the great differences in demographics, income dynamics and health infrastructure between MSA and non-MSA areas in USA.

## Methods

We tested the effects of local-level primary care and social inequalities on a variety of health outcomes. The first dependent variable was all-cause mortality. This is among the most commonly used health status indicators, especially in studies on income inequality and health.<sup>23,24</sup> The second dependent variable was heart disease mortality. Heart disease is one of the principal causes of death in USA and is amenable to prevention and control by primary care.<sup>25,26</sup> At state level and in mixed-level analyses, heart disease and several of its risk factors have been found to be associated with social inequalities.<sup>10,27</sup> The third dependent variable was cancer mortality, the second leading cause of death after heart disease. Primary care is negatively associated with some forms of cancer,<sup>28</sup> while social inequalities have been found to be associated with some cancers.<sup>29</sup>

All mortality data were taken from the Centers for Disease Control and Prevention (CDC) compressed mortality files. Data were drawn from 1990; the most recent period for which a complete set of other county-level variables are available. CDC WONDER/PC software<sup>30</sup> was used to directly standardize data for age and sex to the 1980 US population. Standardized mortality rates for each county are expressed as the number of deaths per 100,000 population.

Primary care was measured by primary care physicians per 10,000 civilian population who were in active office-based patient care in either family medicine, internal medicine or paediatrics.<sup>31</sup> Exploratory data analyses suggested a threshold effect for primary care. Thus, all counties were classified regarding whether they fell below or above the national 75th percentile in terms of primary care physicians per 10,000 population. Physician data were obtained from the American Medical Association annual

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