Journal of Public Health Medicine

Vol. 24, No. 4, pp. 252–254
Printed in Great Britain

Availability of primary care doctors and population health in England: is there an association?

Martin C. Gulliford

Abstract

Background In the United States, an association has been proposed between better access to primary care and lower mortality. This paper reports an ecological analysis that evaluated whether population health was associated with general practitioner (GP) supply in England.

Methods Data were analysed for 99 health authorities in England in 1999. Health outcomes included standardized mortality ratios, infant mortality rate (per 1000), hospital admissions with acute and chronic conditions (per 100 000), and teenage conception rates (per 1000). The number of GPs per 10 000 population was included as explanatory variable. Confounders included the Townsend deprivation score, proportion of ethnic minorities, proportion in social classes IV and V, and proportion with limiting long-term illness. Analyses were by linear regression weighted for population size.

Results Higher GP supply was associated with lower mortality in univariate analyses. After adjusting for deprivation score, ethnic group and social class, the standardized mortality ratio for all-cause mortality at 15–64 years decreased by –5.2 (95 per cent confidence interval –8.3 to –2.0, $p = 0.002$) per unit increase in GP supply. After additional adjustment for limiting long-term illness, the decrease was –3.3 (–6.7 to 0.1, $p = 0.060$). In the fully adjusted model, each unit increase in GP supply was associated with a decrease in hospital admission rates for acute conditions (–14.4, –21.4 to –7.4 per 100 000, $p < 0.001$) and chronic conditions (–10.6, –17.2 to –4.0, $p = 0.002$).

Conclusions In England, lower supply of GPs was associated with increased hospital utilization, but a strong univariate association with mortality might be explained by confounding.

Keywords: primary health care, social inequalities, access to medical care, hospital utilization

Introduction

Shi and coworkers[1,2] recently reported an ecological association between low access to primary care doctors and higher population mortality in the United States. This association was independent of income inequality. Those workers argued that lack of access to primary care may contribute to social inequalities in health. These relationships may differ in Britain where the political environment, and the health care system, have a more egalitarian inclination. In England, reducing inequalities in health is a discernible objective of public policy, a population-based system of primary health care is well established, and financial barriers to access in health care are less important. However, it is well known that there are large variations in the availability of general practitioners (GPs) in different geographical areas in England.[3] More deprived areas generally have fewer primary care doctors, in keeping with the 'inverse care law'.[3] The analyses by Shi and coworkers[1,2] raise the possibility that lower availability of GPs may have a negative impact on the health of more deprived areas. This report aimed to determine whether there was an association between GP supply and population health in England after allowing for deprivation. The study was based on an ecological analysis of data for the 99 health authority populations in England in 1999.

Methods and results

Data were obtained from the English Department of Health's statistical publications.[4,5] The data included the estimated resident population size, the number of whole-time equivalent GPs per 10 000 weighted population, and the proportion of residents in households headed by persons born in the New Commonwealth as a measure of the proportion of ethnic minorities. The Townsend score was included as a measure of deprivation. The score is based on the proportion of people in an area who are unemployed, living in overcrowded accommodation, not in owner occupation and not owning a car. Higher scores indicate greater deprivation. The proportion of people in households headed by people in social class IV (semi-skilled manual occupation) and V (unskilled manual) was also included. Health indicators included the proportion of the population with limiting

Department of Public Health Sciences, Kings College London, Capital House, 42 Weston Street, London SE1 3QD.

Martin C. Gulliford, Senior Lecturer

Address correspondence to Dr M. C. Gulliford.
E-mail: martin.gulliford@kcl.ac.uk

long-standing illness, the infant mortality rate and the standardized mortality ratios for all-cause mortality at ages 15–64 years, for 'avoidable' mortality from conditions amenable to medical intervention, and for acute myocardial infarction. Indirectly standardized hospital admission rates per 100 000 for acute conditions (infections of the ears, nose and throat, or kidneys and urinary tract, and heart failure) and chronic conditions (diabetes and asthma), and the conception rate per 1000 females <18 years were also included. Analyses were by linear regression, with observations weighted for health authority population size.

The number of GPs ranged from 4.3 to 7.1 per 10 000 population. There were strong univariate associations between higher supply of GPs and lower levels of deprivation, lower proportion in social class IV and V, and lower levels of limiting long-standing illness. Infant mortality, all-cause mortality, avoidable mortality, and mortality from myocardial infarction were all lower in areas with more GPs (Table). Higher supply of GPs was also associated with lower hospital admission rates for acute and chronic conditions and lower teenage conception rates. After adjusting for deprivation score, social class and the proportion of ethnic minorities, there was only weak evidence for an association between GP supply and mortality indicators. When limiting long-standing illness was included as an additional confounder, then the mortality indicators were not associated with GP supply. In the fully adjusted model, there was still strong evidence for lower hospital utilization from acute or chronic conditions, and lower teenage conception rates in areas with higher GP supply.

Discussion

At the population level, there were univariate associations between higher supply of primary care doctors and lower all-cause mortality, as noted previously by Gravelle and Sutton.[3] The finding of higher mortality from all causes in areas less well supplied with primary care doctors is non-specific, and might perhaps result from confounding with wider influences on health. The present analyses showed that the association between GP supply and mortality was not robust to adjustment for deprivation, social class, the proportion of ethnic minorities and limiting long-term illness. Interpretation must be qualified, because it might be argued that limiting long-term illness may be part of the causal path between GP supply and mortality. Residual confounding is a more serious concern because GPs' choice of location may be very sensitive to the quality of environment and amenities in an area[3] and the confounders included in the analyses are unlikely to fully account for the impact of deprivation on health. Even after adjusting for several confounders, which may capture some of the wider influences, higher supply of GPs was associated with lower hospital utilization from acute or chronic conditions and lower teenage conception rates. Residual confounding must again be considered as an explanation because deprived areas are known to make higher demands

Table Association of primary care doctor (GP) supply and population health indicators for 99 health authorities in England in 1999

Indicator	Median (range)	Correlation with GP supply	Mean change (95% CI) per unit increase in GP supply (per 10 000)			
			Model 1*	*p* value	Model 2†	*p* value
Resident population (thousands)	492 (128, 1013)	—	—		—	
GP supply (number per 10 000)	5.8 (4.3, 7.1)	—	—		—	
Townsend score (z score)	−0.8 (−5.5, 12.2)	−0.47	—		—	
New Commonwealth head of household (%)	2.5 (0.5, 30.9)	0.06	—		—	
Household head social class IV or V (%)	18.4 (9.0, 26.1)	−0.65	—		—	
Limiting long-term illness (%)	13.0 (8.9, 18.5)	−0.76	−1.2 (−1.7, −0.7)	<0.001	—	
All-cause mortality 15–64 years (SMR)‡	89 (70, 154)	−0.68	−5.2 (−8.3, −2.0)	0.002	−3.3 (−6.7, 0.1)	0.060
Infant mortality rate (per 1000)	5.5 (2.7, 9.5)	−0.34	−0.4 (−0.9, 0.2)	0.154	−0.2 (−0.8, 0.4)	0.493
Avoidable mortality (SMR)	98 (71, 148)	−0.55	−5.3 (−9.7, −0.8)	0.022	−4.2 (−9.2, 0.8)	0.095
Acute myocardial infarction (SMR)	97 (39, 206)	−0.64	−10.3 (−19.3, −1.3)	0.026	−5.5 (−15.3, 4.3)	0.269
Hospital admissions with acute conditions (per 100 000)	99 (65, 158)	−0.72	−15.3 (−21.6, −9.0)	<0.001	−14.4 (−21.4, −7.4)	<0.001
Hospital admissions with chronic conditions (per 100 000)	96 (64, 175)	−0.68	−12.0 (−18.0, −6.1)	0.001	−10.6 (−17.2, −4.0)	0.002
Conceptions <18 years (per 1000)	44.1 (22.5, 82.7)	−0.73	−6.2 (−8.5, −4.0)	<0.001	−6.4 (−8.9, −3.8)	<0.001

SMR, standardized mortality ratio; CI, confidence interval.
*Adjusted for deprivation (Townsend score), proportion of ethnic minorities and proportion of social class IV or V.
†Adjusted for deprivation, ethnic minorities, social class and limiting long-term illness.
‡1993 used as reference to calculate SMR.

on both primary and secondary services, rather than one compensating for the other.[6]

As well as having more GPs, more affluent areas have general practices with better facilities, providing more services[7] and offering longer consultations with higher quality of care.[8] Bunker *et al*. suggested that more comprehensive implementation of effective medical interventions could yield additional gains in life expectancy.[9] However, some studies suggest that even the best performing general practices conform to recommended standards of care on less than 50 per cent of occasions.[10]

These analyses provide some evidence that the associations proposed by Shi *et al*.[2] also hold in the United Kingdom. However, in England the association between supply of primary care doctors and mortality might be largely explained by confounding. Ultimately, need and outcome cannot be distinguished in cross-sectional data; future studies therefore require longitudinal data collected at the individual, as well as area, level. The present analyses confirm the need to reduce inequity in the supply of GPs, to increase the effectiveness of primary care services in more deprived areas, and to link the geographical allocation of resources for hospital and primary care services.[3,11] These issues are being addressed by current policy developments.

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Accepted on 21 May 2002