SHORT REPORT

Educational level and mortality from infectious diseases

E Regidor, S de Mateo, M E Calle, V Domínguez

J Epidemiol Community Health 2002;**56**:682–683

The explanation for the observed social gradient in morbidity and mortality is a subject of controversy. Whereas some authors emphasise the importance of psychosocial factors related with health,[1] because they show a linear relation with individual socioeconomic status, others postulate that health inequalities are produced as a result of a differential accumulation of exposures and experiences that have their origin in objective material conditions.[2]

This debate is focused principally on chronic diseases, thus infectious diseases are implicitly excluded. Furthermore, the mechanisms by which these diseases produce inequalities are assumed to be well understood because of their strong association with absolute poverty[3]: material conditions related to absolute poverty would increase exposure to comunicable diseases and would reduce resistence to infection. Because these assumptions have not been evaluated, even though their confirmation would be important in supporting one or the other of the theories mentioned, in this study we analyse the relation between educational level and mortality from infectious diseases.

METHODS

This study is based on information from the 1996 population census and on mortality data for 1996 and 1997 taken from the mortality registry of the Region of Madrid (Spain). The two datasets were linked using personal characteristics that were common to both sets: name, date of birth, sex, and residential area. Linkage was achieved for 70% of all deceased persons and no significant variations in this percentage were found by sex or age group. We selected all deaths assigned to International Classification of Diseases, 9th revision (ICD-9) codes for infectious diseases or the result of infectious diseases.[4] The analysis was restricted to men and women 35–64 years of age. Educational level in the 1996 census refers to the highest academic degree achieved. Individuals were classified into four educational categories: elementary or less, lower secondary, upper secondary, and third level. To adjust for the potential confounding effects of other variables, Poisson regression analyses were carried out including age, employment status, marital status, household size, and area of residence based on deprivation category. Because of the effect the AIDS epidemic could have on the results, a separate analysis was made after excluding deaths from this disease.

RESULTS

Of the total 8246 deaths produced, 721 were attributable to infectious diseases. Table 1 shows an important association between education and mortality from infectious diseases. After adjusting for all variables, mortality for men and women with elementary or less education was 2.82 and 2.73 times higher than that of men and women with third level education, respectively. The magnitude of the association was somewhat smaller when AIDS deaths were excluded from the analysis. In all the analyses the magnitude of the association showed a clear gradient with educational level.

COMMENT

Most authors assume implicitly the lack of a linear relation between socioeconomic status and infectious diseases when they point out that social gradient in health by the late 20th century in Western societies can be observed only for injuries

Table 1 Association between education and mortality from infectious diseases. Mortality rate ratios (95% confidence intervals)

		All infectious diseases*			All infectious diseases without aids		
	Number of people	Number of deaths	Adjusted for age	Adjusted for age and other factors†	Number of deaths	Adjusted for age	Adjusted for age and other factors†
Men							
Third level	166745	55	1.00	1.00	31	1.00	1.00
Upper secondary	161066	70	1.27 (0.89 to 1.81)	1.32 (0.92 to 1.89)	38	1.36 (0.84 to 2.19)	1.31 (0.80 to 2.13)
Lower secondary	163675	122	2.23 (1.62 to 3.08)	2.46 (1.76 to 3.45)	58	1.92 (1.23 to 2.99)	1.86 (1.17 to 2.96)
Elementary or less	335693	297	2.92 (2.18 to 3.92)	2.82 (2.06 to 3.86)	172	2.27 (1.53 to 3.36)	2.00 (1.31 to 3.06)
p value for trend			<0.001	<0.001		<0.001	<0.001
Women							
Third level	127060	9	1.00	1.00	6	1.00	1.00
Upper secondary	131934	19	2.00 (0.90 to 4.41)	1.91 (0.86 to 4.23)	8	1.25 (0.43 to 3.59)	1.19 (0.41 to 3.45)
Lower secondary	205485	40	2.53 (1.22 to 5.23)	2.41 (1.14 to 5.10)	26	2.10 (0.86 to 5.14)	1.93 (0.77 to 4.84)
Elementary or less	440340	109	2.91 (1.45 to 5.81)	2.73 (1.31 to 5.68)	90	2.51 (1.09 to 5.81)	2.29 (0.95 to 5.57)
p value for trend			0.002	0.007		0.007	0.020

*Tuberculosis ((ICD-9) codes 010–018.9; 137.0–137.4); bacterial meningitis (027.0, 036.9, 320–321.3, 321.8); septicaemia (038.0–038.9); AIDS (279.5–279.6); hepatobiliary disease (070.0–070.9, 576.1); mycoses (110.0–118.0); infections of the heart (391.0–391.9, 393, 394.1, 395.0–395.2, 397.1, 397.9, 398–398.0, 421, 422.0, 424.9); selected respiratory tract infections (460.0–466.1, 475, 480.0–487.8, 510.0–510.9, 513.0–513.1); selected gastrointestinal tract infections (540–542, 566, 567.0–567.2, 569.5); infections of kidney and urinary tract (590.0–590.9, 599.0) and other infectious diseases (rest of codes 001–139).
†Employment status, marital status, household size, and area residence based deprivation category.

and chronic and degenerative diseases.[3 5 6] The observed gradient in this study does not confirm the belief that infectious diseases are basically associated with absolute poverty. For some authors, education is important for health because of the opportunities it creates to obtain better material living conditions: well educated people are less likely to be unemployed, and more likely to have full time jobs, fulfilling work, and high income. However, after adjusting for several factors associated with educational level and related to material conditions, results were not much modified. Some of those factors are probably intermediate variables and they can have attenuated the effect, nevertheless the relative risks of death show a similar pattern in both sexes despite the fact that the employment rate was 90% in men and 40% in women. Even though the material conditions do not have an effect on the gradient in the association between education and mortality from infectious diseases, one should not rule out the importance of a series of psychological and social resources closely related with education that permit people to confront stressful life events, such as sense of control and social support.[7] As has already been done with ishaemic heart disease, future studies should determine the importance of low control and/or psychological stress in explaining the social gradient of infectious diseases, as stress has been seen to play an important part in producing some infections and reducing immunocompetence.[8]

Authors' affiliations

E Regidor, M E Calle, V Domínguez, Department of Preventive Medicine and Public Health, Faculty of Medicine, Universidad Complutense de Madrid, Spain

S de Mateo , National Centre for Epidemiology, Instituto de Salud Carlos III, Spain

Funding: this study was supported by a grant from the Consejería de Educación de la Comunidad de Madrid (no 06/0092/1999) and by a grant from the Fondo de Investigaciones Sanitarias (no 00/0514/1999).

Conflicts of interest: none.

Correspondence to: Dr E Regidor, Department of Preventive Medicine and Public Health, Faculty of Medicine, Universidad Complutense de Madrid, Ciudad Universitaria s/n 28040 Madrid, Spain; enriqueregidor@hotmail.com

Accepted for publication 26 March 2002

REFERENCES

1 **Marmot M**, Bosma H, Hemingway H, *et al*. Contribution of job control and other risk factors to social variations in coronary heart disease incidence. *Lancet* 1997;**350**:235–9.
2 **Davey Smith G**, Harding S. Is control at work the key to socioeconomic gradients in mortality? *Lancet* 1997;**350**:1369–70.
3 **Leon DA**, Walt G, Gilson L. International perspectives on health inequalities and policy. *BMJ* 2001;**322**:591–4.
4 **Pinner RW**, Teutsch SM, Simonsen L, *et al*. Trends in infectious diseases mortality in the United States. *JAMA* 1996;**275**:189–93.
5 **Hertzman C**. Population health and human development. In: Keating DP, Hertzman C, eds. *Developmental health and the wealth of nations*. New York: The Guilford Press, 1999:21–40.
6 **Marmot M**. Introduction. In: Marmot M, Wilkinson RG. *Social determinants of health*. Oxford: Oxford University Press, 1999:1–14.
7 **Ross CE**, Wu Ch. The links between education and health. *Am J Sociol* 1995;**60**:719–45.
8 **McEwen BS**. Protective and damaging effects of stress mediators. *N Engl J Med* 1998;**338**:171–9.