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Perceived control has convincingly been suggested to be a key concept in explaining socioeconomic differences in health.[1] Some empirical evidence exists of a higher prevalence of low control beliefs (such as powerlessness or fatalism) in lower socioeconomic groups and that this is relevant to socioeconomic inequalities in general health.[2] However, a systematic examination of the extent to which perceived control contributes to socioeconomic inequalities in mortality is lacking. This is important, as attention has recently shifted towards psychological and psychosocial explanations of socioeconomic inequalities in health.

Participants, methods, and results

Data were collected in 1991 within the framework of a general population study of the health and living conditions of the population of Eindhoven and its surroundings (the GLOBE study).[3] We invited a random subsample for interview. The response rate was 80% and not related to demographic characteristics. Interview data were available for 1220 men and 1242 women aged 25-74 (51 on average). Detailed information was obtained on socioeconomic status (educational, occupational, and income level), health status (self reports of at least one severe chronic condition (339, 14%), at least one less severe chronic condition (1062, 43%), and less than good general health (737, 30%)), and perceived control. Perceived control was measured with an 11 item Dutch version of Rotter's locus of control scale (Cronbach's $\alpha = 0.84$). This asks respondents to indicate agreement with statements using a five point scale—for example, "I often feel a victim of circumstances" (1 = strongly disagree, 5 = strongly agree).[4] The scores were summed (mean (SD) = 31 (7.1)). Municipal population registers provided information on all cause mortality during a six year follow up. There were 122 deaths, and only 30 people were lost to follow up. The analyses were done with Cox proportional hazards model.

The table shows that the socioeconomic indicators were related to mortality in the expected direction. For example, the risk of dying for people with only primary schooling was 2.64 times higher than the risk for the highest educated group. The association was not significant for income level. Perceived low control was more common among low socioeconomic groups and it was also related to mortality. People scoring 1 SD higher on the perceived control scale (indicating decreased control) had a 1.45 times higher mortality risk (95% confidence interval 1.19 to 1.75). Adjustment for perceived control substantially decreased the mortality ratios for the lower socioeconomic groups. The mortality ratio for people with only primary schooling decreased to 1.76. This implies that more than half ((2.64 – 1.76)/(2.64 – 1) = 0.54) of the raised risk in this group is accounted for by perceived low control. The average percentage of raised mortality risk in the lowest socioeconomic groups that was accounted for by perceived low control was 51% (range: 37-65%).

Comment

Our findings indicate that low socioeconomic status is related to mortality partly because people with a low socioeconomic status more often perceive low control. This supports hypotheses on the importance of perceived control for socioeconomic inequalities in health.[1] Perceptions of low control partly originate in adverse socioeconomic conditions during childhood.[2]

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Effect of perceived control on mortality ratios (95% confidence intervals) for three indicators of socioeconomic status

	No of people*	No (%) who died during follow up	Adjusted mortality ratio†	Mortality ratio additionally adjusted for perceived control	% reduction in mortality ratio between 2 models
Educational level:					
University/higher vocational	469	9 (2)	1.00	1.00	
Intermediately high	489	19 (4)	1.48 (0.65 to 3.39)	1.22 (0.53 to 2.82)	54
Intermediately low	909	36 (4)	1.67 (0.80 to 3.52)	1.29 (0.60 to 2.78)	57
Primary school only	541	58 (11)	2.64 (1.26 to 5.51)	1.76 (0.80 to 3.85)	54
Occupational level:					
Higher grade professionals	259	7 (3)	1.00	1.00	
Lower grade professionals	724	31 (4)	1.86 (0.81 to 4.27)	1.51 (0.64 to 3.53)	41
Self employed	86	5 (6)	1.56 (0.49 to 4.99)	1.31 (0.41 to 4.21)	45
Manual workers	606	49 (8)	2.43 (1.08 to 5.44)	1.72 (0.74 to 3.99)	50
Income level:					
Highest quarter	552	15 (3)	1.00	1.00	
Second highest quarter	522	19 (4)	1.46 (0.73 to 2.93)	1.29 (0.64 to 2.59)	37
Second lowest quarter	542	41 (8)	1.76 (0.94 to 3.28)	1.33 (0.70 to 2.56)	57
Lowest quarter	547	35 (6)	1.62 (0.85 to 3.11)	1.22 (0.62 to 2.40)	65

*Numbers differed between the socioeconomic indicators because the indicators had differing numbers of people with missing data. Housewives were excluded from the analyses for occupational level. Excluded people did not differ in their risk of mortality from those included.
†Adjusted for age, sex, severe chronic conditions, less severe chronic conditions, and general health in 1991.

We found that low socioeconomic status in adulthood was related to adverse changes in control beliefs during the six year follow up (results not shown), suggesting that adult socioeconomic conditions further contribute to beliefs of low control. More information is needed on the specific socioeconomic correlates that induce beliefs of low control as these may be easier to modify than the beliefs themselves. Low job control may be one of these conditions.[5] Other studies with larger numbers are needed to examine the behavioural or psychophysiological pathways through which perceived control affects mortality. Our findings emphasise that only by examining psychological mechanisms more thoroughly can we determine the complex pathways through which social structure affects individual disease and mortality.

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Contributors: HB was the main author, formulated the hypothesis, carried out the analyses, interpreted data, and was partly responsible for data collection. CS helped with writing and interpreting data and was partly responsible for data collection. JPM was principal investigator, helped with writing and interpreting data, was responsible for data collection, and is guarantor for the study.

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Cost effectiveness analysis of inhaled anticholinergics for acute childhood and adolescent asthma

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website
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A table with baseline data is on the BMJ's website

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A recent systematic review by the Cochrane Airways Group showed that adding multiple doses of anticholinergics to β_2 agonists is safe and effective in improving lung function and avoiding hospital admission for school aged children and adolescents attending casualty departments with severe acute asthma.[1] The estimated reduction in the risk of admission was 9.4% (0.4% to 18.4%). This intervention presumably improves bronchodilatation until systemic corticosteroids take effect. Evidence of cost effectiveness, however, is lacking. To clarify whether scarce health resources should be spent on this intervention we conducted an economic evaluation.

Methods and results

We used various assumptions to estimate the financial implications of treatment (see table on the *BMJ*'s website). The costs of drug administration were not included, as anticholinergics are always given with β_2 agonists and involve little additional manipulation. The cost of nebulisers, other drugs, and the casualty attendance were also excluded. No consideration was given to possible changes in length of stay in casualty. The effect of changing the various assumptions was tested by simple, one way, sensitivity analysis, and by multivariate probabilistic sensitivity analysis.[2] The latter is a simulation approach that enables estimation of uncertainty ranges containing 95% of replicated results.[3]

We estimated that treatment would cost about £8 (uncertainty range £1 to £47) per admission avoided (table). This implies a net saving of £80 (£0 to £157) per severe case treated. Varying the risk reduction within 95% confidence limits varied the mean net saving from £3 to £157 per severe case treated. More precision is expected when the Cochrane review is updated. Varying the cost of hospital admissions within the interquartile range for English providers (£620 to £907) varied the mean savings from £58 to £85 per severe case treated. Changes to the dose and unit cost of ipratropium had very little effect on the results.

Further assumptions were used to extrapolate the findings to a national level. About 7200 children aged 5-15 years are admitted from casualty with a diagnosis of asthma each year (hospital episode statistics 1988 to 1996). About 40% of children in this age group attending casualty with asthma are admitted.[4] We assumed that 50% of people with asthma attending casualty have severe asthma.[5] The rate of uptake of the review recommendations was assumed to be 5% a

Results of baseline analysis, with uncertainty ranges estimated by probabilistic sensitivity analysis

	Per severe case treated	
	Best estimate	Uncertainty range*
Admissions avoided†	0.09	0-0.18
Cost of treatment‡	£0.75	£0.28-£1.40
Savings due to avoided admissions§	£81	£0-£158
Cost of treatment per admission avoided¶	£8	£1-£47
Net monetary saving to the health service**	£80	£0-£157

*Interval containing 95% of 5000 simulation replications. †Risk difference estimated by meta-analysis.[1]
‡Cost of ipratropium bromide 25p per 0.25 mg (from *British National Formulary* March 1999), and total dose per patient 0.625 mg (median for multiple dose protocols included in the meta-analysis[1]). Authors assumed that one mild to moderate case is treated for every five severe cases treated.
§Mean cost of non-elective inpatient admissions £860 (NHS Executive's reference costs 1998 (HRG D21 and D22)). ¶Cost of treatment divided by the number of admissions avoided.
**Savings due to avoided admissions minus the cost of treatment.