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Socioeconomic Distribution of Health and Health Care Utilization in a New Town in Hong Kong, China[1]

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Objectives To assess the association of socioeconomic indicators with various chronic and acute illnesses and the utilization of public health care in a new town in Hong Kong, China. **Methods** Illness experience and socioeconomic and demographic data of 7570 residents from 2022 randomly selected households were collected through telephone interviews. The relationships between socioeconomic indicators and illnesses/choice of health care were explored using stepwise logistic regressions after adjusting for sex and age. **Results** Significant positive associations were noted between low household income and diabetes mellitus, any chronic illnesses among adults and flu among younger subjects; low educational level and accident-related illness among adults; being born in Chinese mainland and flu, any acute illness in adults. For the utilization of public health care, low household income was the most consistent risk factor. **Conclusion** This study did not demonstrate a unidirectional socioeconomic gradient in health but supported the hypothesis that socioeconomic deprivation was associated with the utilization of public health care.

Key words: Socioeconomic indicators; Health status; Health care need; Health care utilization

INTRODUCTION

Many studies in the west have explored the relation between socioeconomic status and health[1-5]. In Europe and North America, socially disadvantaged groups often have the greatest need for health care but paradoxically have the poorest access to treatment the so-called inverse care law[6,7]. They are less able to afford private clinics and often have to resort to the public sector health care. Many hypotheses have been used to explain why socially disadvantaged groups are vulnerable to ill-health[8,9]. Some have theorized that these groups are more likely to live in crowded conditions, to be exposed to environmental and occupational health risks, to have inadequate social and family support, to eat unbalanced diets, to have poor access to health care and to engage in health-risk behavior such as cigarette smoking and alcohol and substance abuse[10]. Bartley pointed out that stress and low self-esteem might be contributing risk factors accompanying low socioeconomic status in the pathway to disease[11].

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Mortality statistics from the Hong Kong Government's Census and Statistics Department have been used to demonstrate that standardized mortality ratios were higher in districts with lower derived socioeconomic scores[12-14]. Although these ecological studies provided useful information on possible determinants of disease, they suffered from various types of bias, such as population movements and misclassifications. Hence, individual-based evidence of the 'socioeconomic factors and health' link is needed in Hong Kong, China, especially at the local district level. Such data are vital for health management purposes[15]. This study is aimed to explore the association of social and economic factors with the health and illness experience of residents in Tai Po, a rapidly developing new town in the northeast New Territories of Hong Kong, China, with a population of over 250 000 in 1996.

METHODS

A population-based telephone health survey of residents in randomly selected households in Tai Po was conducted. Trained interviewers conducted telephone questionnaire interviews using standardized procedures. Subjects were asked about their socioeconomic and demographic background, their experience with acute and chronic illnesses and their health care utilization patterns. There were on average 1.5 telephone lines per household at the time of the study and more than 95% of households had access to a residential telephone line.

The residential telephone directory was used as the sampling frame. Each page of the directory was randomly selected. Two columns of telephone numbers were picked at random from each page. The first three telephone numbers with Tai Po prefixes (obtained from Hong Kong Telecom, Hong Kong's telecommunications company) were selected. Sampling and interview were carried out simultaneously. The following dialing procedures were adopted. As far as feasible, contact was attempted in the evening. If no one answered, each phone number was attempted three more times, each on different days, before being classified as "no answer." Another phone number was then sampled from the telephone directory.

Out of the 2441 households contacted, 2022 households responded (and 419 households refused) to the interview giving a response rate of 82.8% and consisted of 7570 subjects. The study sample was segregated into two age groups, one group for the 5198 subjects who were aged 20 years or older and the other group for the 2372 young subjects who were aged 19 years or younger. The two age groups were analyzed separately because in the younger age group, educational level is largely dependent on age and most of them had not started working.

Variables Selected for Analysis

The following groups of health and health service indicators were used as outcome measures.

Acute illnesses, which included the three most commonly reported acute ailments in the past month (flu, musculoskeletal problem and accident-related illness) and any acute illness, defined as having suffered from one or more of the acute illness items listed in the questionnaire. For the younger age group, only any acute illness and flu were analyzed because of the small numbers of subjects who suffered from the other conditions.

Chronic illnesses, which included the four most commonly reported chronic illnesses-hypertension, diabetes mellitus, heart disease and chronic obstructive airways disease (COAD) and any chronic illness, defined as having any one of the 11 chronic illnesses listed in the questionnaire. Only the composite variable any chronic illness was included in the

analysis for the younger subjects due to the small numbers of individual illnesses.

Public health care utilization refers to the use of public health care facilities (Government outpatient clinics, specialist clinics and accident and emergency services in public hospitals which provide either free services or had a very minimal fee for service) as the primary treatment source. For acute illnesses, analyses were carried out only for sufferers of any acute illness and flu in both age groups. The other conditions were not separately analyzed because of small numbers. For chronic illnesses, the analysis was conducted for sufferers of hypertension and any chronic illness in adults only.

The following socioeconomic indicators were included as explanatory variables:

Place of birth (Mainland of China compared with Hong Kong, China). In Hong Kong, mainland Chinese immigrants are often at a socioeconomic disadvantage compared with Hong Kong-born Chinese.

Education (those with primary education or less compared with the rest) for the adult group. Educational level was highly related to age among the younger subjects and hence was not included in the analysis.

Occupation (occupations were classified into four groups: administrative and professional, clerical and service, skilled and elementary workers, unemployed or retired with the first group being used as the baseline for comparison) for the adult subjects only.

Housing type classified into three types: private housing, public housing, village house and others with the first group as the baseline.

Household income (households earning less than HK$10 000 per month compared with the rest). The cut off point being roughly the median household income in Hong Kong, China.

Factors that might also be associated with the health outcomes were included as adjustment variables: age (as a continuous variable) and sex (females compared with males).

Statistical Methods

Associations between socioeconomic risk factors and health and health service utilization indicators were studied by multiple logistic regressions. Age and sex were entered and the other independent variables were then selected into the model using a forward stepwise procedure. All available subjects were used in the analyses for the two major outcomes: any acute illness and any chronic illness. For the analysis of specific acute illnesses, only cases with the index illness and subjects without any other acute illness were included. As subjects with chronic illnesses might predispose them to acute illnesses, the analysis was repeated after excluding subjects with chronic illnesses. For specific chronic diseases, only cases with the index disease and those subjects without any other chronic illness were included in the analysis. For health services utilization, logistic regression was performed using all available subjects who suffered from the various illnesses listed above. Those who chose to use public health care facilities were treated as cases.

As information on household income was missing in more than 40% (3263) of the subjects, all analyses were repeated after excluding household income from the list of independent variables.

All analyses were carried out using SPSS for Windows version 7.5.

RESULTS

Acute Illness Experience in Adults

Any acute illness was positively associated with older age, female sex and place of

birth in the Mainland of China. In contrast, unemployed subjects and those employed in mainly manual occupations were less likely to report any acute illness (Table 1). Repeated analysis without household income did not alter the results very much.

Place of birth in the Mainland of China was a significant risk factor for flu, but became non-significant on repeated analysis without household income. Instead, older age and the female sex became positively associated.

Older age was the only significant risk factor for musculoskeletal problems when household income was included; female sex was added as a risk factor on repeated analysis without household income. Lower educational level was associated with a high risk for accident-related illness in addition to aging. On repeated analysis without household income, none of the factors remained significant. Low household income itself was not found to be associated with any group of acute illness.

Analyses of the data after excluding subjects with chronic illnesses did not appreciably alter the results.

History of Chronic Illness in Adults

Older age and low household income were risk factors for any chronic illness (Table 2). On the other hand, skilled and elementary occupations were protective. For the analysis without household income, clerical and service occupations became protective while older age remained as a risk factor.

Older age was the only significant risk factor for hypertension. Living in village houses was found to be protective on repeated analysis without household income. For diabetes mellitus, the only significant risk factors were older age and low household income. Repeated analysis without household income yielded no added information. Heart disease was related to older age, and repeated analysis without household income added female sex as a significant risk factor and housing types other than private housing as protective factors. COAD was only related to older age.

Acute and Chronic Illness Experience in Children

Older age was the only significant factor negatively associated with any acute illnesses in the analysis with or without household income (Table 3). Low household income was the only significant socioeconomic risk factor identified for flu while older age was protective. Repeated analysis without household income yielded no added information. For any chronic illness, female sex was protective in both analyses, being significant when household income was included. Furthermore, public housing was found to be protective and village house was found to be a risk factor in both analyses, but none of the associations achieved statistical significance.

Utilization of Public Health Care

The utilization of public health care for any acute illness among adults was positively associated with low household income and place of birth in the Mainland of China (Table 4). For the analysis without household income, only unemployed or retired persons had significantly higher risk. The situation for flu was similar except that low household incomewas not a significant factor. For any chronic illness and hypertension, low household income was the only significant factor positively associated with the utilization of public health care. On repeated analysis without household income, only older age was significant for any chronic illness and none of the factors was significant for hypertension.

TABLE 1

Adjusted Odds Ratios and 95 % Confidence Intervals (in parenthesis) of Socioeconomic Indicators for Acute Illnesses Among Adult Subjects

	Any Acute Illness		Flu		Musculo-skeletal		Accident-related	
	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'
Overall Prevalence (%)	17.0		12.5		0.7		0.7	
No. of Subjects Included in Regression[a]	2834	5129	2475	4568	2359	4365	2368	4349
Age-years	1.01 (1.00, 1.02)**	1.01 (1.01, 1.02)**	0.99 (0.98, 1.01)	1.01 (1.00, 1.02)*	1.09 (1.05, 1.14)**	1.08 (1.06, 1.10)**	1.03 (1.00, 1.06)*	1.02 (1.00, 1.04)
Sex-female	1.32 (1.05, 1.66)*	1.32 (1.11, 1.56)**	1.23 (0.86, 1.76)	1.37 (1.06, 1.78)*	0.53 (0.14, 1.94)	3.28 (1.61, 6.69)**	1.04 (0.42, 2.57)	0.64 (0.30, 1.35)
Household Income-low	NE	—	NE	—	NE	—	NE	—
Education Primary	NE	NE	NE	NE	NE	NE	2.79 (1.10, 7.09)*	NE
House Type:	NE	NE	NE	NE	NE	NE	NE	NE
Occupation:								
-clerical/service	0.74 (0.53, 1.03)	0.77 (0.59, 1.01)	NE	NE	NE	NE	NE	NE
-skilled/elementary	0.65 (0.48, 0.88)**	0.59 (0.46, 0.76)**						
-unemployed/retired	0.58 (0.42, 0.81)**	0.69 (0.53, 0.89)**						
Place of Birth-Mainland China	1.33 (1.06, 1.67)*	1.24 (1.04, 1.48)*	1.66 (1.11, 2.49)*	NE	NE	NE	NE	NE

Note. [a] The numbers of subjects included in the regressions for the different illnesses were different due to some missing data for individual items. * $P<0.05$, ** $P<0.01$, NE = not entered. The analysis was done first using all socioeconomic variables (with 'income') and then repeated after excluding the variable 'household income' (without 'income').

TABLE 2

Adjusted Odds Ratios and 95 % Confidence Intervals (in parenthesis) of Socioeconomic Indicators for Chronic Illnesses Among Adult Subjects

	Any Chronic Illness		Hypertension		Diabetes Mellitus		Heart Disease		COAD	
	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'
Overall Prevalence (%)	7.2		2.5		1.5		0.8		0.4	
No. of Subjects Included in Regression [a]	2834	5129	2698	4894	2670	4840	2651	4813	2640	4787
Age-years	1.07 (1.05, 1.08)**	1.06 (1.05, 1.07)**	1.09 (1.08,1.11)**	1.09 (1.08, 1.11)**	1.07 (1.05, .09)**	1.07 (1.06, 1.09)**	1.07 (1.04, .09)**	1.08 (1.06, 1.10)**	1.09 (1.05, .13)**	1.07 (1.04, .09)**
Sex-female	0.94 (0.66, 1.34)	1.00 (0.77, 1.29)	1.26 (0.76, 2.09)	1.36 (0.93, 1.98)	1.10 (0.58, 2.08)	1.23 (0.76, 1.99)	2.49 (0.96, 6.45)	1.89 (1.00, 3.56)*	0.50 (0.14, 1.74)	0.69 (0.27, 1.73)
Household Income-low	1.43 (1.04, 1.96)*	—	NE	—	2.01 (1.04, 3.88)*	—	NE	—	NE	—
Education-primary	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
House Type:										
-public	NE	NE	NE	0.73 (0.48, 1.10)	NE	NE	NE	0.34 (0.16, .70)**	NE	NE
-village/others				0.49 (0.29, 0.84)**				0.40 (0.17, 0.91)*		
-occupation:										
-clerical/service-	0.50 (0.23, 1.08)	0.53 (0.28, 0.99)*								
-skilled/elementary-	0.46 (0.25, 0.86)*	0.63 (0.39, 1.02)	NE	NE	NE	NE	NE	NE	NE	NE
-unemployed/retired	0.95 (0.52, 1.75)	1.24 (0.78, 1.97)								
Place of Birth-Mainland China	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

Note. [a]: The numbers of subjects included in the regressions for the different illnesses were different due to some missing data for individual items. *P< 0.05; **P< 0.01; NE = not entered. The analysis was done first using all socioeconomic variables (with 'income') and then repeated after excluding the variable 'household income' (without 'income').

TABLE 3

Adjusted Odds Ratios and 95 % Confidence Intervals (in parenthesis) of Socio-economic Indicators for Acute and Chronic Illnesses Among Young Subjects

	Any Acute Illness		Flu		Any Chronic Illness	
	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'
Prevalence (%)	23.8		21.5		1.3	
No. of Subjects Included in Regression [a]	1419	2353	1226	2094	1419	2353
Age-years	0.92 (0.90, 0.94)**	0.91 (0.89, 0.93)**	0.91 (0.87, 0.94)**	0.89 (0.87, 0.92)**	1.02 (0.93, 1.11)	0.98 (0.90, 1.05)
Sex-female	1.00 (0.78, 1.28)	1.10 (0.89, 1.36)	0.78 (0.54, 1.12)	0.85 (0.63, 1.14)	0.29 (0.10, 0.89)*	0.56 (0.24, 1.32)
Household Income-low	NE	—	2.36 (1.62, 3.45)**	—	NE	—
House Type: -public -village/others	NE	NE	NE	NE	0.57 (0.19, 1.74) 2.69 (0.83, 8.69)	0.47 (0.18, 1.23) 2.00 (0.73, 5.48)
Place of Birth - Mainland China	NE	NE	NE	NE	NE	NE

Note. [a]: The numbers of subjects included in the regressions for the different illnesses were different due to some missing data for individual items. *P<0.05; **P<0.01; NE = not entered. The analysis was done first using all socioeconomic variables (with 'income') and then repeated after excluding the variable 'household income' (without 'income').

TABLE 4

Adjusted Odds Ratios and 95 % Confidence Intervals (in parenthesis) of Factors Associated With the Use of Public Health Care by Adult Illness Sufferers

	Any Acute Illness		Flu		Any Chronic Illness		Hypertension	
	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'
No. of Subjects Included In Regression[a]	485	809	126	248	205	361	70	127
Age-years	1.01 (1.00, 1.03)	1.01 (1.00, 1.02)	1.00 (0.96, 1.04)	0.99 (0.97, 1.02)	1.01 (0.99, 1.03)	1.02 (1.00, 1.03)*	0.99 (0.94, 1.04)	1.03 (1.00, 1.07)
Sex-female	1.12 (0.63, 1.99)	0.87 (0.57, 1.32)	1.69 (0.65, 4.37)	0.77 (0.35, 1.70)	1.37 (0.77, 2.45)	1.38 (0.90, 2.11)	1.10 (0.37, 3.24)	0.83 (0.39, 1.73)
Household Income-low	1.98 (1.20, 3.27)**	—	NE	—	1.87 (1.05, 3.35)*	—	4.58 (1.54, 13.67)**	—
Education-primary	NE	NE	NE	NE	NE	NE	NE	NE
House type:	NE	NE	NE	NE	NE	NE	NE	NE
Occupation:								
-clerical/service	1.95 (0.82, 4.63)	1.69 (0.82, 3.51)	NE	2.56 (0.47, 14.00)	NE	NE	NE	NE
-skilled/elementary	0.58 (0.23, 1.44)	1.21 (0.60, 2.44)		3.85 (0.79, 18.73)				
-unemployed/retired	1.25 (0.50, 3.14)	2.47 (1.22, 4.99)*		9.69 (1.95, 48.13)**				
Place of Birth-Mainland China	2.01 (1.14, 3.53)*	NE	4.64 (1.47, 14.67)**	NE	NE	NE	NE	NE

Note. [a]: The numbers of subjects included in the regressions for the different illnesses were different due to their different prevalence and some missing data for individual items. *$P<0.05$; **$P<0.01$; NE = not entered. The analysis was done first using all socioeconomic variables (with 'income') and then repeated after excluding the variable 'household income' (without 'income').

For young subjects, the utilization of public health care for any acute illness was associated only with low household income, whereas for flu, in addition to low household income, housing types other than private housinghad odds ratios greater than one with pubic housing achieving statistical significance (Table 5). On repeated analysis without using household income, public housing remained the only significant risk factor for both flu and any acute illness.

TABLE 5

Adjusted Odds Ratios and 95% Confidence Intervals (in parenthesis) of Factors Associated With the Use of Public Health Care by Young Illness Sufferers

	Any Acute Illness		Flu	
	With 'Income'	Without 'Income'	With 'Income'	Without 'Income'
No. of Subjects Included in Regression [a]	335	458	142	199
Age-years	1.00 (0.94, 1.06)	0.97 (0.92, 1.02)	0.95 (0.85, 1.05)	0.95 (0.87, 1.03)
Sex-female	1.10 (0.59, 2.03)	1.03 (0.61, 1.73)	1.54 (0.61, 3.93)	2.04 (0.92, 4.49)
Household Income−low	5.49 (2.57, 11.73)**	—	9.91 (1.24, 79.21)*	—
House Type:				
-public	NE	2.34 (1.28, 4.28)**	6.85 (1.44, 32.64)*	5.79 (2.03, 16.55)**
-village/others		2.24 (0.90, 5.56)	6.99 (0.95, 51.38)	4.46 (0.92, 21.66)
Place of Birth-Mainland China	NE	NE	NE	NE

Note. [a]: The numbers of subjects included in the regressions for the different illnesses were different due to their different prevalence and some missing data for individual items. * $P < 0.05$; ** $P < 0.01$; NE = not entered. The analysis was done first using all socioeconomic variables (with 'income') and then repeated after excluding the variable 'household income' (without 'income').

DISCUSSION

Analysis of health outcomes showed inconsistent and conflicting relationships between indicators of socioeconomic deprivation and ill-health. A significant negative impact on health was noted for low household income (diabetes mellitus and any chronic illness among adults, flu among younger subjects), low educational level (accident-related illness among adults) and place of birth in the Mainland of China (flu and any acute illness in adults). In contrast, lower levels of occupational categories, especially for those involving skilled and elementary manual work, were negatively associated with illnesses for adult subjects (any acute illness and any chronic illness). Furthermore, living in public housing was consistently found to be a "protective" factor—for hypertension and heart disease among adults and for any chronic illness among young subjects (though not significant), whereas the effect of living in village houses was less uniform—being "protective" against hypertension and heart disease among adults, but was associated with a non-significant increased risk for any chronic illness among young subjects.

The influence of socioeconomic deprivation on the choice of public health care facilities was more consistent. Low household income was a significant factor for the utilization of

public health care for all illness groups included in the analyses for both adults and young subjects with the exception of flu for adults. Adults born in the Mainland of China tended to utilize more public health care services for flu and any acute illness. When household income was not used in the analysis, adults who were unemployed or retired were more likely to depend on public health care for flu and any acute illness. Younger subjects living in public housing had significantly higher odds ratios for using public health care services. Education had no independent significant impact in this aspect.

The socioeconomic factors included in the present study have often been used as indicators of socioeconomic deprivation in many studies on health status and health outcomes[2-4,16-19], and some studies have used surrogates such as socioeconomic class/status[16,20] or inequality index[4]. It is noteworthy that these factors might exert their effects independently on specific health problems as illustrated in this study. An examination of the correlation matrix between the socioeconomic indicators showed only moderate correlation between them, 3 out of 10 correlation coefficients being greater than 0.2 (0.258 between income and type of housing, 0.238 between income and occupation and 0.209 between occupation and education), and 5 being less than 0.1. This suggested that the individual socioeconomic variables might have measured different aspects of social and/or economic status, and that these different aspects might have different influence on health and specific illnesses.

The possibility of differential over- or under-reporting or detection of illnesses by the socioeconomic subgroups should be considered. Those at the lower end of the socioeconomic ladder might have under-reported their illnesses (or illnesses under-detected), giving rise to an underestimation of the socioeconomic inequalities in health[21]. This might partly explain why adults in less advantageous occupational groups and younger subjects in less privileged housing had less complaints. The effects of under-reporting should not be substantial in this study, as low income was still frequently found to be significantly associated with various illnesses.

On the other hand, the inconsistent relations between indicators of socioeconomic deprivation and health might reflect truly the different effects on health of the specific social or economic indicators. If this was the case, further exploration of the mechanism or pathway from socioeconomic deprivation to poor health might shed new light on the causation of ill health. A possible example from this study was the higher odds ratio of accident-related illness for those adults with less education (used more as a social indicator). A proportion of this subgroup might enjoy a relatively high income by engaging in high-risk jobs (e.g. working in the construction industry), and hence had a higher chance of occupational accidents. In this situation, low income in itself (as an economic indicator) would not be important.

Subjects born in the Mainland of China (35% of adult subjects and 4% of young subjects in this study) might have different early life experience and exposures in addition to the possibility of their different sub-cultural health beliefs and practices. While their higher prevalence of reported illnesses might be real[19], we could not rule out over-reporting due to different perceptions of illness, especially when the associations were noted only for less well defined acute illnesses in adults.

Subjects living in village houses (representing 17% of adult subjects and 11% of young subjects) were a special group in this rapidly developing new town. They were descendants of indigenous residents in the more rural parts of the district and maintained a more conservative life style than those living in private and public housing estates. The latter were mostly migrants from other parts of Hong Kong, China.

Even after taking into consideration the possibility of under-reporting of illness by

certain vulnerable subgroups, the socioeconomic gradient for health of this study population in Hong Kong, China seemed to be less than those observed in other places[4,5,18]. This phenomenon has also been noted for infant mortality in Hong Kong, China in the more recent years. These results suggested that urbanization and high-density settlement[22], in association with the general affluence in Hong Kong, China, might have diluted the socioeconomic influence on physical health despite having undesirable psychological impacts. Plausible explanations include easy accessibility and affordability of basic public health preventive measures (e. g. sewerage and immunization) to the socio-economically disadvantaged group, physical proximity (and possibly more interactions) among the various socioeconomic subgroups, and a common source of food and water supply for all residents throughout Hong Kong, China.

Although being different in their effects on health outcomes, all socioeconomic indicators studied had a unidirectional effect on the utilization of public health care services. The public health care services are provided as a form of social welfare and are therefore affordable to most of local people, but are rationed by waiting time and queuing. This rationing process might explain why only 17.8% of all subjects reporting any acute illness in the present survey visited General Outpatient Clinics or attended Accident & Emergency Departments[23]. On the other hand, as chronic illnesses require long-term treatment and a higher level of care, seeking health services from the private sector can be quite expensive. We found that 58.5% of chronic illness sufferers sought services from the public health care providers[23]. This differential use of public and private health care for chronic and acute illnesses demonstrated that socioeconomic considerations was associated with the choice of public health care services. Economic deprivation (having low household income or being unemployed) might still be the most important determinant for the utilization of public health care services in Hong Kong, China as demonstrated in the results.

This study did not demonstrate the unidirectional inequalities in health among socioeconomic subgroups in the study population but supported the hypothesis that socioeconomic deprivation is associated with the utilization of public health care. An exploration of the associations between individual social and economic indicators and specific illnesses, instead of using surrogate summary socioeconomic indices, would elucidate the underlying mechanisms for the “socioeconomic deprivation and health” link.

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