ORIGINAL ARTICLES

Poverty status and cigarette smoking prevalence and cessation in the United States, 1983-1993: the independent risk of being poor

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Abstract

Objective—To analyse the independent relations between poverty status and cigarette smoking prevalence and cessation in the United States, 1983-1993.

Design—An analysis of eight cross-sectional national surveys.

Setting—The United States, 1983-1993.

Participants—236 311 civilian, non-institutionalised adult residents of the United States, aged 18 years and older.

Main outcome measures—Probability of current cigarette smoking and proportion of former smokers among ever-smokers (quit ratio) in surveyed subjects below the poverty threshold, compared with those at or above the poverty threshold.

Results—The odds ratio for current smoking among persons below the poverty threshold ranged from a low of 1.10 in 1985 to a high of 1.45 in 1990, and remained between 1.26 and 1.30 during 1991-1993. The odds ratio for smoking cessation (quit ratio) among persons below the poverty threshold ranged from 0.81 in 1985 to 0.64 in 1991, and remained between 0.73 and 0.66 during 1991-1993. These measures of the relations between poverty status and smoking were derived using multiple logistic regression models, which adjusted for the effects of sex, age, education, race, employment status, marital status, and geographic region.

Conclusions—Persons below the poverty threshold continue to be more likely than those at or above the threshold both to be current smokers and not to have quit. Poverty may be an indicator of underparticipation in the changing social norms regarding smoking behaviour in recent years. Individuals below the poverty threshold may need focused efforts to help achieve the Healthy People 2000 objectives for reducing adult smoking prevalence. Further understanding of the relation between poverty and smoking is essential to develop effective programmes for this vulnerable population subgroup.

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Keywords: poverty; smoking prevalence

Cigarette smoking is a major preventable cause of morbidity and mortality in the United States^{1,2} and remains a major public health priority.³ Year to year trend analyses of cigarette smoking prevalence and cessation provide a better understanding of determinants of smoking and directions for intervention. Recent reports show a steady decrease in smoking prevalence and a steady increase in smoking cessation,³ but differences have been reported in the change in smoking rates over time according to geographic region,⁴ educational attainment,⁵ race, sex,⁶ and household income.⁷ However, many analyses do not adjust for potential confounding effects of important sociodemographic factors. One multivariate analysis of 1985 National Health Interview Survey (NHIS) data suggested a small relation between poverty status (a United States Census defined household income measure which is adjusted for size, composition of household, and inflation) and smoking in that year.⁸ The US Centers for Disease Control and Prevention (CDC) recently reported that, in 1993, the prevalence of current smoking among persons below the poverty threshold was higher than for those at or above the poverty threshold.³ This study presents an analysis of the change over time of cigarette smoking prevalence and cessation by poverty status, adjusting for potential confounding effects of other sociodemographic factors, using NHIS data from 1983 to 1993.

Methods

STUDY POPULATION AND DATA

The NHIS has been conducted by the National Center for Health Statistics (NCHS) since 1957. Details of survey design and sampling methods have been reported in NCHS publications.^{9,10} The NHIS is a cross sectional sample survey of the non-institutionalised civilian population of the United States. Detailed information on smoking behaviour was collected in 1983, 1985, 1987, 1988, 1990, 1991, 1992, and 1993. In each of these years, between 21 028 and 44 233 persons were surveyed in person or by telephone. Of 274 308 total respondents, 250 184 (91.2%) provided information that permitted classification of the respondent as being at/above or below the US census poverty threshold⁹⁻¹¹ and 236 311 (86.1%) provided all

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Table 1 Distribution of subjects' sociodemographic characteristics, * by poverty status, National Health Interview surveys, 1983–1993 combined

Characteristics	At/above poverty threshold (n=217 244)	Below poverty threshold (n=32 940)
Sex, %		
Female	50.9	61.5
Male	49.1	38.5
Age (years), mean	43.8	38.9
Education, %		
High school diploma or less	56.8	78.7
Beyond high school	43.2	21.3
Race, %		
White	90.9	72.3
Black	9.1	27.7
Employment status, %		
Employed	68.3	36.8
Unemployed	3.1	9.2
Not in the work force	28.6	54.0
Marital status, %		
Married	68.9	38.4
Widowed	6.0	10.7
Divorced/separated	8.4	16.6
Never married	16.6	34.3
Geographical region, %		
Northeast	21.7	15.6
Midwest	25.4	23.9
South	31.7	41.6
West	21.2	19.0

Columns within each category may not sum to 100.0% due to rounding.

*P values for all sociodemographic characteristics by poverty status were < 0.001; P values generated from either χ^2 test or *t* test. A χ^2 test was used for categorical variables (sex, education, race, employment status, marital status, and geographical region) and a *t* test was used for the continuous variable (age).

of the sociodemographic data necessary for the final analysis. Before 1983, the NHIS did not specifically collect information that would permit determination of poverty status.⁹ In the years since 1983 that are not included in the study, the NHIS did not include information on smoking. Beginning with the 1985 survey, the NHIS oversampled blacks to obtain better estimates for this group. Postsampling stratification and weighting are designed to adjust for this oversampling effect.¹⁰

VARIABLES

Poverty status was assigned based on individual respondents' household income, size, and composition, according to the US census' threshold definition, which is adjusted annually for inflation, as measured by the consumer price index.¹¹

Current smokers for 1983–1992 were those individuals who answered "yes" to both of the following questions: (1) Have you smoked at least 100 cigarettes in your entire life? and (2) Do you smoke cigarettes now? For a second 1992 survey and the 1993 survey, the NCHS broadened the definition of current smoker to

include intermittent smokers.¹² In our study, data from the two 1992 surveys were combined using the method described by the CDC.¹² Former smokers were defined in all years as those who reported that they had smoked at least 100 cigarettes in their lifetime but did not currently smoke. Cessation was assessed by the quit ratio, a cross sectional measure of the proportion of ever-smokers who are former smokers.^{4–5} Prevalence and quit ratio outcomes were examined dichotomously, according to poverty status, using logistic regression models.

Sex, age, race (black, white), education (high school or less, beyond high school), employment status (employed, unemployed, or not in the work force), and marital status (married, widowed, divorced/separated, or never married) were self reported, and geographic region (northeast, midwest, south, or west) was recorded by the examiner, based on the respondent's place of residence. Only surveys completed by those identifying themselves as black or white (95.9%) were included in the analysis because of limited sample sizes of other racial and ethnic groups. Individual identification as Hispanic versus non-Hispanic was assessed by a separate survey item which was not considered in the race categorisation.

STATISTICAL ANALYSIS

Because of the complex sampling design of the NHIS, all data analyses included appropriate weighting and sampling adjustments.¹³ Age was analysed as a continuous variable. All other variables were analysed categorically. Comparisons of sociodemographic characteristics of those at or above or below the poverty threshold were made using a χ^2 test for categorical variables and a *t* test for continuous variables. For the unadjusted analysis, a logistic regression model containing only a poverty status term was applied. For the adjusted analysis, a consistent unconditional logistic regression model was developed using stepwise analysis, starting with a hierarchically well formulated model including both main effects and interaction terms (none of which contributed consistently).^{14–15} This model was applied separately to data for each of the eight survey years included in the analysis. The final model contained terms for poverty status, sex, age, education, race, employment status, marital status, and geographic region; all of which contributed to the model in at least two years. Data management and preliminary analyses were performed using SAS,¹⁶ and final weighting and sampling design adjusted analyses were conducted using SUDAAN.¹⁷

Results

POVERTY STATUS

Table 1 shows the sociodemographic characteristics of those at/above and below the poverty threshold for the years 1983–1993 combined. Sex, age, education, race, employment status, marital status, and geographical region were all related to poverty status.

Figure 1 Prevalence (unadjusted) of current smoking among persons below and at/above the poverty threshold, National Health Interview Survey, United States, 1983–1993.

Table 2 Odds ratios for current smoking among persons below the poverty threshold* (v at/above the poverty threshold), National Health Interview surveys, United States, 1983–1993

Survey year	Unadjusted odds ratio (95% CI)†	Adjusted odds ratio (95% CI)‡
1983	1.46 (1.30–1.64)	1.23 (1.08–1.41)
1985	1.23 (1.13–1.35)	1.10§ (1.00–1.21)
1987	1.38 (1.26–1.52)	1.21 (1.11–1.32)
1988	1.52 (1.38–1.68)	1.32 (1.20–1.44)
1990	1.63 (1.49–1.78)	1.45 (1.33–1.59)
1991	1.51 (1.38–1.64)	1.29 (1.17–1.42)
1992	1.57 (1.39–1.77)	1.30 (1.16–1.47)
1993	1.51 (1.33–1.70)	1.26 (1.11–1.43)

*Defined by United States Census using household size, income, and composition.

†CI, confidence interval.

‡Adjusted for effects of sex, age, education, race, employment status, marital status, and geographical region.

§Odds ratio is not significantly different from 1.00, at $P < 0.05$.

Figure 2 Adjusted log odds (with 95% confidence intervals) for current smoking among persons below the poverty threshold, National Health Interview Survey, United States, 1983–1993.

Table 3 Odds ratios for smoking cessation (quit ratio) among persons below the poverty threshold* (v at/above the poverty threshold), National Health Interview surveys, United States, 1983–1993

Survey year	Unadjusted odds ratio (95% CI)†	Adjusted odds ratio (95% CI)‡
1983	0.42 (0.35–0.49)	0.70 (0.57–0.85)
1985	0.54 (0.48–0.60)	0.81 (0.72–0.92)
1987	0.45 (0.40–0.50)	0.72 (0.64–0.81)
1988	0.44 (0.39–0.49)	0.69 (0.61–0.78)
1990	0.39 (0.35–0.44)	0.64 (0.56–0.72)
1991	0.41 (0.36–0.46)	0.68 (0.59–0.77)
1992	0.44 (0.37–0.51)	0.73 (0.61–0.87)
1993	0.40 (0.34–0.46)	0.66 (0.56–0.78)

*Defined by United States Census using household size, income, and composition.

†CI indicates confidence interval.

‡Adjusted for effects of sex, age, education, race, employment status, marital status, and geographical region.

Figure 3 Adjusted log odds (with 95% confidence intervals) for smoking cessation (quit ratio) among persons below the poverty threshold, National Health Interview Survey, United States, 1983–1993.

SMOKING PREVALENCE

Figure 1 shows the overall unadjusted prevalence of current smoking by poverty status from 1983 to 1993. Those below the

poverty threshold declined in prevalence of current smoking from 40.2% in 1983 to 32.0% in 1993. Those at or above the poverty threshold declined from 31.5% in 1983 to 23.8% in 1993.

The left side of table 2 shows the unadjusted odds ratios and 95% confidence intervals of current smoking given poverty status below the poverty threshold for each of the survey year from 1983 through 1993, which ranged from 1.23 to 1.63. The right side of table 2 shows adjusted odds ratios and 95% confidence intervals by year, derived from the multiple logistic regression model, controlling for sex, age, education, race, employment status, marital status, and geographical region. The adjusted odds ratios for current smoking ranged from 1.10 (95% confidence interval included 1.00) in 1985 to 1.45 in 1990. In the most recent three years of analysis, 1991–1993, the adjusted odds ratios ranged from 1.26 to 1.30.

Figure 2 shows the adjusted log odds and 95% confidence intervals of current smoking among those persons below the poverty threshold, illustrating changes over time.

SMOKING CESSATION

The left side of table 3 shows the unadjusted odds ratios and 95% confidence intervals of smoking cessation given poverty status below the poverty threshold from 1983 to 1993 (range 0.54 to 0.39). The right side of table 3 shows the adjusted odds ratios and 95% confidence intervals, derived from the multiple logistic regression model, controlling for sex, age, education, race, employment status, marital status, and geographical region, all of which were significantly less than 1.0 (range 0.81 in 1985 to 0.64 in 1990). The odds ratios significantly less than 1.0 indicate that those below the poverty threshold were significantly less likely to be quitters than those at or above the poverty threshold. In the most recent three years, 1991–1993, the adjusted odds ratios ranged from 0.66 to 0.73. Figure 3 shows the adjusted log odds for smoking cessation among those below the poverty threshold over time.

Discussion

While overall trends in recent years show a slow decline in current smoking and a slight decline in quit ratio in the United States, the results suggest that persons below the poverty threshold have been and continue to be at a significantly higher risk both to be current smokers and not to have quit smoking. From 1983 on, those below the poverty threshold were consistently found to be more likely to be current smokers than those at or above the poverty threshold, even after adjusting for sex, age, education, race, employment status, marital status, and geographical region. Similarly, persons below the poverty threshold were less likely to be quitters throughout the study period. Although blacks, women, and individuals with lower educational attainment seem to be overrepresented below the poverty threshold, adjusting for these factors did

explain the relation between poverty status and smoking. In reviewing the findings from the most recent years in figs 1 and 2, there seems to have been no recent improvement in the risk of smoking among the poor.

Cigarette smoking is a complex behaviour with several identifiable socioeconomic, demographic, and psychosocial determinants. Poverty status probably represents determinants that extend beyond issues of individual or household income. Indeed, individuals residing in federally designated poverty areas have been found to be at increased risk of all cause mortality, even after adjusting for race, income, and employment status.¹⁸ Further research may be needed to understand why poverty is a persistent independent marker of cigarette smoking among adults. It may be that those below the poverty threshold differ in other ways. Understanding these differences by further study of NHIS data and other data sources may provide better understanding of our findings.

Excluding individuals with missing data is a possible limitation of our study. Of all those surveyed, 98.5% provided the necessary information on smoking status; it is unlikely that excluding the 1.5% with unknown smoking status would have substantially affected our findings. Information on poverty status, however, was lacking in 8.8% of survey respondents who declined to answer questions relating to their household's income, size, or composition. However, current smoking prevalence in the group with missing information on poverty status was very similar to that in the at/above poverty threshold group in all years. In an effort to evaluate the potential bias introduced by necessarily excluding those for whom poverty status information was lacking, we performed trend analyses for ever-smoking (the most fundamental of smoking status assessments), comparing those excluded (for lack of information on poverty status) to those who did provide information on poverty status. While the prevalence of ever-smoking was consistently lower for those lacking information on poverty status than for those with information on poverty status (ranging from 1.1 to 3.9 percentage points in each year), the modelled slopes (change in ever-smoking by year) for these two groups did not differ ($z = 0.34$, $P > 0.35$). Although we cannot rule out selection bias in excluding the 8.8% of survey subjects who did not report sufficient information on household income, size, and composition, we have no reason to expect that those excluded would systematically differ from those included with regard to changing smoking status over time.

Although the National Health Interview Survey is a nationally representative sample survey, all sociodemographic groups may not be sampled equally. While differences were observed between those at/above and those below the poverty threshold, those below the threshold may be underrepresented in household based surveys.

Our findings have relevance for both health professionals and public health policy makers.

Broad public health efforts to educate the public about the ill health effects of smoking, to oppose tobacco advertising and promotion, and to support legislation restricting smoking in public places have coincided with the overall trends of decreasing prevalence and increasing cessation.¹ However, these efforts may not be reaching all socioeconomic groups equally. Poverty may be an indicator of underparticipation in the changing social norms regarding smoking behaviour in recent years. The relation of social class to mental illness and other comorbid conditions may also play a role.¹⁹ Given that poverty is also an independent predictor of poor health outcomes,¹⁸ such possibilities are particularly disturbing.

The nation's progress toward the Healthy People 2000 objectives must be continually reassessed. Although there are "special population" targets for current smoking prevalence for those with a high school education or less, blue collar workers, blacks, Hispanics, American Indians, those of Southeast Asian descent, women of reproductive age, pregnant women, and women using oral contraceptives, there is no specific target for low income populations.² Our findings suggest that individuals below the poverty threshold may need strengthened efforts (beyond those focused on blacks and women) to prevent recruitment of new smokers and to help those who already smoke to quit. If the Healthy People 2000 objectives are to be applied evenly to all income groups, the differentials reported here must also be better understood.

Ultimately, increased efforts to reduce smoking among the poor may lead to decreased rates of smoking related morbidity and mortality in years to come.

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