Socioeconomic status and maternal cigarette smoking before, during and after a pregnancy

Jake M. Najman 1, Andrew Lanyon, Margaret Andersen, Gail Williams
University of Queensland, St Lucia, Brisbane

William Bor
Children’s Health Sector, Brisbane North Regional Health Authority

Michael O’Callaghan
Mater Hospital, South Brisbane

ABSTRACT

Research suggests that cigarette use declines when women find out they are pregnant, increasing again after the birth. Pregnancy may provide many women with the impetus to stop smoking. Also, rates of smoking cessation and reduction may be class-rated, with the highest socio-economic status group manifesting higher rates of reduction. Using data from the Mater Hospital - University of Queensland Study of Pregnancy, it is reported that family income is related to rates of smoking before, during and after pregnancy. Before becoming pregnant, 45.9% of women in the sample were smokers. This declined to 34.7% of women at their 1st clinic visit. Rates of heavy smoking had returned to earlier levels by the 6th month (after birth) follow-up. Smoking cessation relapse rates were highest in the highest family-income group, but relapse rates after the birth were similar for all income groups. Arresting rates of smoking relapse by pregnant women should be seen as a major public health priority.

CIGARETTE smoking by pregnant women remains a significant public health issue. Women smokers increase the risk to their own health, and they expose their unborn children to the risk of developmental and other health problems. Given the duality of this risk and the finding that some pregnant women stop smoking once they know they are pregnant, 1 we need to extend our understanding of cigarette smoking in pregnancy and the factors associated with stopping smoking and then taking up cigarettes again.

One factor that consistently predicts levels of cigarette consumption is socioeconomic status. Those with lower levels of education 2,3 or income, 4-6 or in low status occupations (or unemployed) 7-9 have higher rates of cigarette consumption and/or lower levels of smoking cessation.

Thus, previous research leads to the expectation that pregnant women with lower socioeconomic status are likely to have higher rates of cigarette consumption. It might also be expected that smoking cessation in pregnancy will be most common in groups with higher socioeconomic status, although data have not been available. This paper examines rates of cigarette consumption, cessation in pregnancy and resuming after the birth of a baby according to one indicator of socioeconomic status, family income.

1 Correspondence to Professor Jake Najman, Department of Anthropology and Sociology, University of Queensland, St Lucia, Qld 4072.
Smoking during pregnancy

There have been no prospective longitudinal studies of the association between socioeconomic status and smoking before, during and after pregnancy. Becoming pregnant acts as a stimulus for some women to stop smoking\textsuperscript{1,2,6,10,11} or as a stimulus to reduce cigarette consumption.\textsuperscript{1,11,14} Williamson et al. reported that 21 per cent of their sample of pregnant women smoked, in comparison with 30 per cent of their sample of women who were not pregnant.\textsuperscript{1} Others have found that pregnant women have higher rates of smoking cessation than the general population (39 per cent compared with 28 per cent).\textsuperscript{10}

A low rate of smoking among women early in their pregnancy is, however, undercut by a steadily increasing rate of relapse over the months of pregnancy\textsuperscript{2} and following birth.\textsuperscript{2,10,14,15} In line with findings from research on a relationship between smoking and socioeconomic status, analysis of the smoking patterns of pregnant women indicates that women with low levels of education,\textsuperscript{1,2,4,6,10,13,16} whose income is low,\textsuperscript{4,6} and who have occupations that require low levels of skill or who are unemployed\textsuperscript{15,16} are more likely to smoke during pregnancy.

Additionally, younger women\textsuperscript{6,10,11,16,17} and single, noncohabiting women\textsuperscript{1,6,10,13,15,17} appear to be at a higher risk of smoking during pregnancy.

The amount smoked before and during pregnancy has also been associated with ability to stop. Even though rates of desiring to stop smoking are generally high (between 64 per cent\textsuperscript{14} and 75 per cent\textsuperscript{15}), lighter smokers are more likely to give up smoking than heavier smokers.\textsuperscript{6,10,13,14} These relationships are relatively constant across the United States, Canada, the United Kingdom, parts of Europe and Australia. This is true despite differences in research methods, the definition of concepts (for example, of smokers) and sample sizes.

Although there has been a number of studies of the association between smoking in pregnancy and a mother's socioeconomic status, more detailed research is required into the nature of the relationship between socioeconomic status and women's smoking patterns, and more particularly, socioeconomic status variations in patterns of cessation and subsequent uptake of smoking over the period before the pregnancy and after the birth of the baby.

Snapshots of patterns of smoking before and during pregnancy\textsuperscript{2,6,13} during pregnancy only\textsuperscript{1,11,16-18} and during and after pregnancy,\textsuperscript{14,12,13,19} have been reported. Although these have provided useful data, only two recent studies\textsuperscript{10,11} have documented changes in smoking habits among pregnant women through pregnancy to after the birth.

Finally, most studies in this area have been conducted in the United States and Europe. Wakefield and Jones appear to be the only researchers in Australia to have reported recent research into smoking among pregnant women.\textsuperscript{11} This research focused on the relationship between health beliefs, social context and smoking behaviour among pregnant women. No attention was given to the effect of socioeconomic status on smoking habits. Nor were data collected before pregnancy and after birth.

Data

Data for this analysis are taken from the Mater Hospital-University of Queensland Study of Pregnancy.\textsuperscript{20} The study was based on a sample of 8556 consecutive patients attending for their first clinic visit at a large public hospital obstetric facility. Data collection began from
1981 to 1984. Public patients, who made up about 66 per cent of all pregnant women at the study hospital, were invited to participate in the study, and only 98 declined. The cost and difficulty of data collection for such a large sample underpinned the decision to limit the study to public patients. At their first clinic visit, women were asked to describe their smoking levels before becoming pregnant and currently.

Women were reinterviewed three to five days after the birth of their child, and again when the child was six months and five years old. Details of the birth, such as length of labour, birthweight and days in the intensive care nursery were also abstracted. In all, about 200 obstetric variables were added to the data file.

Information for this analysis was taken from all questionnaires and obstetric records. Socioeconomic status was measured as an average of the family income over more than five years from the first clinic visit to the five-year follow-up. Mothers' reports of their family incomes over three phases of data collection; (at entry, at six months and five years) were added up. Mothers in the lowest income group (n = 323, 6.0 per cent of the cohort) had a mean estimated income of $4144 per year; the mothers in the highest income group (n = 538, 10.9 per cent) had a mean estimated income of $21 639). The remainder were labelled middle income families, with a mean estimated income of $11 866 per year (n = 4438, 83.1 per cent).

It was intended here to categorise families on the basis of their income over time. This seemed particularly relevant in a situation in which family incomes might change substantially because the mother was pregnant or rearing a young infant. It was hypothesised that chronic wealth or poverty was most likely to be important in determining smoking behaviour.

Smoking behaviour at each phase was determined by two questions about how often respondents smoked each week and the number of cigarettes smoked each day. These categorical responses were used to derive an estimate of the average number of cigarettes smoked per day. Respondents were categorised according to whether they did not smoke at all, smoked up to an average of 19 cigarettes per day (light to moderate), or 20 or more cigarettes per day (heavy smoker).

Findings are presented for a cohort of 5147 respondents (numbers change slightly because of missing data) for whom complete family income and smoking data were available over all phases of data collection. Sample attrition at the five-year followup, while relatively modest (of 7689 mothers who were delivered at the study hospital, 5147 remained in the study at the five-year follow-up: 66.9 per cent), is nevertheless systematic rather than random.

Results

Those lost to follow-up were more often teenagers, on a pension or unemployed, single or in de facto relationships and of lowest family income (Table 1). Loss to follow-up includes refusals and those who had moved residence and could not be located. All differences were statistically significant (2, P < 0.01). There appeared to be an approximately linear association between the quantity of cigarettes smoked and loss to follow-up. Although each income group was analysed separately, this differential level of attrition needs to be considered in the interpretation of the findings.
Of the women in the cohort, 2326 (45.2 per cent) reported they had smoked cigarettes before becoming pregnant. At the first clinic visit, 1759 women (34.2 per cent) were smokers. Of these, 681 had stopped smoking by their first clinic visit, presumably because they were pregnant. Of those who had stopped, 134 (19.7 per cent) had previously been heavy smokers (20 or more per day).

Smoking categories in the five phases of data collection are detailed in Table 2. The highest proportion of heavy and light or moderate smokers was before pregnancy, while the lowest proportion was recorded at the first clinic visit. The first trimester of pregnancy was a time when a substantial minority of women reduced their cigarette consumption or ceased smoking altogether. Rates of maternal heavy smoking before pregnancy and six months and five years after the birth were similar.

Most of those in the highest income group were abstainers, and very few of this group were categorised as heavy smokers (Table 3). By contrast, a little over a third of women in the lowest family income group were abstainers, with one in four being a heavy smoker. Table 3 also includes directly standardised percentages adjusted for the mothers' age and marital status. Adjustment for age and marital status did not alter the findings.
Taking the middle income group as the reference category, at each phase, women in the lowest income group were substantially more likely to smoke than women in the highest income group (Table 4). The analyses, with adjustment for mothers' age and marital status, indicated that at least a part of the association between family income and smoking could be attributed to the younger age and single marital status of the most economically disadvantaged group. However, even the adjusted analyses remained statistically significant in two instances, pointing to other factors that associate economic disadvantage with smoking in pregnancy at those times.

To create the smoking categories for Table 5 maternal smoking at three points was used. Abstainers were so classified if they did not smoke before pregnancy, at the first clinic visit and at the six-month follow-up. Quitters were women who smoked before pregnancy but who had stopped smoking at the first clinic visit. Some quitters had relapsed by the six-month follow-up, and they were distinguished from permanent quitters. Heavy smokers were women who smoked 20 or more cigarettes per day as a weekly average on each of the three occasions data were collected. The residual category primarily consisted of women who were light or moderate smokers or who had reduced their cigarette consumption by the first clinic visit and then generally increased this consumption subsequently.

Abstainers constituted a little over a third of the lowest income group and well over half the highest income group. Quitters came almost equally from all income groups. When permanent quitters were considered as a proportion of all smokers in a particular income group, they appeared more likely to come from the highest income group. Between 50 and 55 per cent of all quitters had relapsed by the six-month follow-up, regardless of their income category. Heavy smokers were disproportionately likely to be in the lowest income group, whether looked at absolutely or as a proportion of all smokers. The other group (mainly heavy
or light smokers who temporarily reduced their consumption) were most often found in the lowest income group.

We dichotomised the women into smokers and nonsmokers in order to examine changes in smoking and nonsmoking rates over the three phases of data collection (Figure 1). In the lowest income group of smokers, 21.6 per cent had stopped smoking by the first clinic visit, compared with 24.4 per cent for the middle income group and 33.9 per cent for the highest income group ($P< 0.01$). Thus, there appeared to be an association between family income and the rate at which smoking pregnant women stopped smoking before the first clinic visit. The higher the family income, the greater the apparent likelihood of a mother stopping smoking by her first clinic visit. These differences remained statistically significant even after adjustment for the mother's age and marital status.

At the six-month follow-up there were no socioeconomic status differences in the rate of relapse to smoking.

**Discussion**

The rate of cigarette smoking by pregnant women in our public hospital sample was very high. While our data were collected in the 1980s when smoking rates may have been higher than now, it must be of great public health concern that over one-third of public obstetric patients were smokers at their first clinic visit. Hill, White and Gray, in their 1989 national survey, found that 37.7 per cent of women aged 20 to 24 years and 36.7 per cent of women aged 25 to 29 years were current smokers.21

Second, maternal cigarette consumption in pregnancy is associated with at least one indicator of socioeconomic status: specifically, sustained lower family income is associated with higher rates of cigarette consumption.

Third, a substantial minority of mothers reported a reduction in their cigarette consumption early in their pregnancy. The smoking cessation rates appeared to be highest for mothers with the highest family income. Women in the highest income group were more likely to stop smoking (and maintain their nonsmoking status), when we consider them as a proportion of the smokers in their income group.

Fourth, there is the issue of relapse. By six months after the birth, rates of heavy smoking returned to prepregnancy levels. About 50 per cent of women who had stopped smoking subsequently relapsed. The rate was similar for all income groups.

Some issues associated with the quality of the data may threaten the validity of the observations. These concern the differential attrition rate and the likely accuracy of self-reports of smoking behaviour.

Those lost to follow up were differentially more likely to be both in a lower income category and to be heavy smokers at entry to the study. The consequence of this pattern of attrition is likely to be a reduction in the magnitude of difference between the socioeconomic status groups at the five-year follow-up. Our results should be interpreted as minimal estimates of the differences in smoking levels and smoking cessation rates that prevail among pregnant women.
While self-reports of behaviour may have limited validity, this does not appear to be the case with self-reports of smoking. Numerous studies have used biochemical markers on samples of exhaled air, blood or saliva to validate self-reports of smoking. These self-reports have been accurate in studies that do not involve interventions or student populations. Another report noted that correlates of smoking are effectively identical, regardless of whether self-report or biochemical markers are used in the analysis. A recent study using urinary cotinine has further confirmed these observations.

Young, single mothers constituted a substantial proportion of the economically disadvantaged. Young, single mothers are more likely to be heavy smokers and are more likely to be poor. The socioeconomic differences in smoking rates remain even after controlling for a mother's age and marital status.

Self-reports of smoking rarely document relevant risk factors such as the degree of inhalation and whether passive cigarette inhalation occurs in addition to smoking (smokers more often have family and friends who smoke). Therefore, self-reports of smoking, while
relatively reliable and valid, may provide incomplete information on the amount of tobacco smoke inhaled.\textsuperscript{26}

The four key findings of this study demand a public health policy response. First, not only is cigarette smoking relatively common in pregnancy, but it is strongly related to the socioeconomic circumstances of the mother. Other evidence reinforces the finding that pregnant women smoke at rates that are higher than those reported for their non-pregnant comparably aged counterparts.\textsuperscript{27} Policies intended to reduce socioeconomic inequalities in health should, at the very least, deal with health-related behaviour that shows the greatest contribution to these inequalities. Public health measures that include increasing the price of cigarettes are likely to be among those most effective in reducing differences in rates of cigarette consumption related to socioeconomic status.\textsuperscript{28} It has been observed that programs developed for and aimed specifically at socioeconomically disadvantaged pregnant women can achieve quit rates substantially above those that would otherwise be observed.\textsuperscript{29}

Second, cigarette smoking is perhaps most appropriately interpreted as part of a broader pattern of behaviour and lifestyle.\textsuperscript{30} Those who smoke are more likely to drink alcohol and eat less healthy food.\textsuperscript{31} Attention needs to be paid to a mother's total lifestyle, rather than to a single behaviour. Third, many women are sufficiently concerned about the effect of their smoking on the fetus that they stop smoking or reduce their cigarette intake. There is an opportunity to build upon these concerns and persuade even more women that the health of their unborn child demands that they stop smoking. The evidence indicates that most pregnant women smokers want to stop.\textsuperscript{11} Interventions that facilitate cessation in pregnancy are cost-effective compared with other interventions or with the cost of providing additional medical care to those who continue smoking.\textsuperscript{32} In these circumstances, it could be argued that a failure to mount stop-smoking programs for pregnant women constitutes evidence of inadequate medical care.

Fourth, many women who have managed to give up smoking and who have managed to overcome the physical addiction involved subsequently relapse. We have found that about 50 per cent of people who stop smoking relapse, a proportion comparable with that observed in other studies.\textsuperscript{33,34} There is a major opportunity being missed here-to mount maintenance programs that persuade women that they should remain free of the cigarette-smoking habit. Here it is helpful if we reflect on the factors that predict why they relapse when their child is born.

Relapse rates appear to be related to three major factors: having a smoker in the immediate environment (usually the mother's partner\textsuperscript{11}); being a previously heavy smoker;\textsuperscript{34} and reporting stressful experiences in the postnatal period.\textsuperscript{35} Depression and boredom have been found to precipitate a relapse.\textsuperscript{34} Advertising and the manipulation of idealised physical images women have also contributed to decisions to relapse. Economically disadvantaged mothers may disproportionately experience each of these. Targeted programs will need to consider the breadth of factors precipitating a smoking relapse in the economically disadvantaged.
References