Cervical screening by socio-economic status in Australia

Abstract

Objectives: To examine differentials and time trends in self-reported Pap test rates by socio-economic status (SES) from the 1989/90 and 1995 Australian National Health Surveys (NHS).

Methods: The unit record data for females were extracted from the two NHSs and combined. The outcome variable of interest was 'having a Pap test in the past three years'. The principal study factor was SES measured as individual characteristics and SES of area of residence. Migrant status, rurality, year of survey and age were controlled for in logistic regression models.

Results: Self-reported rates of having a Pap test in the past three years were higher in women from higher compared with lower SES groups. Compared with women with a bachelor or higher degree, the odds of reporting having a Pap test in the past three years in women with no post- school qualification was 0.86 (p<0.0005). Women with a gross annual income of less than $20,000 had significantly lower odds (OR=0.79) compared with women earning $40,000 or more. Blue collar (OR=0.84) and not employed (OR=0.73) women also had significantly lower odds compared to the referent white collar group.

Conclusion: This study reveals differentials in Pap screening behaviour by individual measures of SES in Australia. Area-based SES measures under-estimated the SES differentials in Pap test rates compared with individual measures. Derived population attributable fractions reveal that about a quarter of self-reported under-screening is accounted for by low SES when measured individually, compared to 8% when SES is measured ecologically.

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Participation in cervical screening by socio-economic status in Australia is of interest because higher cervical cancer incidence and mortality occurs in lower SES groups as defined ecologically by area of residence.[1-5] Higher rates of cervical cancer in lower SES groups may be due to greater exposure to causative risk factors, lower rates of cervical screening and therefore later intervention, or both.

From a program perspective, it is important to know which population groups have lower than average Pap test rates so that they can be appropriately targeted; and that changes in Pap test rates in these groups over time are documented so that the implementation of interventions can be evaluated at a population level.

Data from the Pap Test Register (PTR) show lower Pap test rates in lower SES using area of residence.[6] However, the NSW PTR does not record individual markers of socio-economic status or ethnicity, partly because of the impracticality of obtaining this information through smear takers via laboratories, and because this is not provided for in the PTR legislation. The only source of population-based representative data on Pap tests by socio-economic status and ethnicity in Australia is the quinquennial National Health Survey (NHS), which included questions on Pap test behaviour in the 1989/90 and 1995 surveys.[7,8] This questionnaire survey provides self-reported information on 'ever had a Pap test' and 'Pap test within three years' (for those who have ever had a Pap test), with individual and ecological (area-based) markers of SES, and by ethnicity as measured by country-of-birth. Although surveys of Pap test behaviour are affected by recall bias, which inflates reported rates,[9-11] it is anticipated that this would be fairly equally distributed across different groups under analysis.

Previous area-based SES analyses of population cervical screening rates in Australia have shown trends of lower screening rates with decreasing SES of area of residence.[6,12,13] Similar findings from survey data have also been noted.[14] Internationally,

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lower cervical screening in lower SES groups has been found in North America,[15,16] Taiwan,[17] and a number of other countries.[5,18]

Availability of different individual SES markers in the NHS data allowed the opportunity to investigate the effect of each individual SES marker on cervical screening after controlling for others. Previous studies of cervical screening have examined either the effect of area-based SES markers or other individual markers separately.[6,13,19] This paper examines SES differentials in self-reported cervical screening behaviours from the 1989/90 and 1995 NHSs by individual-based and area-based measures of socio-economic status. The effects of confounders such as age, country-of-birth and urban/rural residences are controlled for statistically and population attributable fractions for area-based and individual SES differentials are also estimated.

Methods

Survey

The Australian NHS is a representative population-based household questionnaire survey of health and illness, health-related behaviour and health service utilisation, which includes information on social, economic and demographic characteristics of respondents.[7,8] Data used for this study was extracted in the same way as for a similar study on migrant cervical screening by the authors.[20]

The outcome factor of interest was whether the respondent reported having a Pap test within three years. This was derived from the question 'Have you had a Pap test within the last three years', and was asked of those who reported ever having a Pap test which served as the denominator population.

The area-based SES classification used for this analysis is derived from the information on Socio-economic Indexes for Areas (SEIFA) developed by Australian Bureau of Statistics.[21] For the purpose of this paper, the 'index of relative socio-economic disadvantage' was used since both the 1989/90 and 1995 NHS contain this variable. Variables used to create the index of relative socio-economic disadvantage focus on area-level attributes such as prevalence of low income earners, lower educational attainment and unemployment levels, among others.

The area-based SEIFA was initially classified into five equal population quintiles. As there were negligible differences in odds ratios for quintiles 3, 4 and 5, they were grouped together.

Individual SES measures were:

- **Educational qualification –** bachelor degree (referent), trade certificate or diploma, no post school qualification;
- **Occupational status –** white collar (referent), blue collar and not employed; and
- **Gross personal annual income –** $40,000 or more (referent), $20,000-$39,999 and <$20,000.

Migrant status, rurality, age and year of survey were included in the analysis as confounders, since Pap test behaviour is known to vary by country-of-birth.[20] From the data in the NHS it was only possible to use metropolitan and non-metropolitan areas to classify geographic area of residence.[22]

Analysis

Data was analysed using the SAS system for Windows Version 6.12 (SAS, 1996).[23]

Logistic regression was used to determine the statistical significance of SES differentials within each survey and inter-survey time trends for 1989/90-1995. To measure time trend, year of survey was entered into the logistic model and chi-square statistics used to estimate the magnitude and significance of difference between surveys within each category of area-based and individual-based SES measure.

Self-reported Pap test behaviour by quintiles of area-based SES (as measured by SEIFA) and by individual measures of education, income, occupational status and employment status were compared. Five-year age groups (i.e. 20-24, 25-29, ... 65-69 years) were used in the logistic models to control for age differences. Other potential confounders were country-of-birth and geographic area of residence (metropolitan/non-metropolitan), since these factors have been shown to affect cervical screening behaviour in Australia.[6,12,13,20,24,25]

The contribution of each variable to the model was assessed by changes in model deviance as an approximate chi-square distribution, after accounting for changes in model degrees of freedom with the addition of each variable.

Reported Pap testing in the past three years was modelled against individual SES measures and against these in combination to assess which individual SES measures significantly predicted reported screening after controlling for the others.

Population attributable fractions (PAF) were calculated for area-based and individual SES measures.[26]

Results

Blue collar women (OR=0.84, $p<0.0002$) and women not employed (OR=0.73, $p<0.0001$) had significantly lower odds of reporting having had a Pap test within the past three years, compared with the referent white collar group. A statistically significant rising trend in having a Pap test within the past three years was evident with rising occupational status ($\chi^2_{(1)}=258.07$, $p<0.0001$) (see Table 1).

Compared with women with a bachelor or higher degree, the odds of reporting having a Pap test within the past three years in women with a trade or diploma was lower, but not significantly (OR=0.92, $p<0.06$), while women with no post-school qualification had significantly lower odds (OR=0.86, $p<0.0005$). A statistically significant rising trend in reporting a Pap test within the past three years was evident with increasing level of education ($\chi^2_{(1)}=108.31$, $p<0.0001$) (see Table 1).

Women with a gross annual income of less than $20,000 had significantly lower odds of reporting having a Pap test within the past three years (OR=0.79, $p<0.03$), compared with women whose annual income was $40,000 or more. A statistically significant rising trend in having a Pap test within the past three years was evident with increased gross annual personal income ($\chi^2_{(1)}=75.14$, $p<0.0001$) (see Table 1).

Derived PAFs indicate that about a quarter of unscreened women

is attributable to low individually measured SES (see Table 1).

When the effect of each individual measure of SES was estimated in the presence of the others, it emerged that 'gross annual personal income' was no longer a significant predictor of having a Pap test in the past three years. No post-school qualification (OR=0.79, $p<0.003$), blue collar workers (OR=0.77, $p<0.0001$) and being unemployed or not in the labour force (OR=0.90, $p<0.04$) were significant predictors of lower odds of having a Pap test in the past three years, when income, educational level and occupational status were in the logistic regression model along with age, rurality of residence and country-of-birth as confounders (see Table 2).

Compared with the highest area-based SES quintile, rates of reporting having a Pap test within the past three years were lower in quintile 2 (OR=0.93, $p<0.6$) and quintile 3 (OR=0.91, $p<0.07$). The linear trend for the area-based SES gradient of Pap testing within the past three years was not significant ($\chi^2_{(1)}=1.35$, $p<0.2$) (see Table 1).

There was a statistically significant overall increase in reporting having a Pap test in the past three years from the 1989/90 NHS to the 1995 NHS (1.5 percentage points increase in 1995 NHS, $p<0.001$). This occurred across all categories except for quintile 2 of the SEIFA index, women with a bachelor or higher degree, and women with an annual income of less than $20,000.

Discussion

This study assessed differentials in reported Pap test behaviour by individual and aggregate measures of SES, using combined data from the two most recent Australian National Health Surveys (1989/90 and 1995).[7,8] Survey information on Pap test behaviour using questionnaires is based on self-report, and several studies have shown that participation in cervical screening is over-estimated from this source when compared with screening data as recorded on population-based Pap test registries.[9-11] However, this may not necessarily affect relative differences between SES groups, nor trends over time, if the over-reporting is non-differential.

The response rates for the women's health section of the surveys were high in 1989/90 (97%) and 1995 (92%). Women who

Table 1: Odds of a Pap test within the past three years for Australia by various measures of SES based on the 1989/90 and 1995 National Health Surveys.

Area-based and individual measures of SES	No. of women	Pap test within 3 years Odds ratio (95% CIs)[a]	Population Attributable Fraction for not screening
Area-based socio-economic status			
SEIFA Index for Australia (disadvantage)			
Quintile 1 (High) (referent)	4,001	1.00	8%
Quintile 2	3,914	0.93 (0.83-1.05)[ns]	
Quintile 3–5 (Low)	12,920	0.91 (0.83-1.01)[b]	
Effect of area-based SES: $\chi^2_{(2)}$ =16.1, *p*-value: <0.0003;			
Linear trend for area-based SES: $\chi^2_{(1)}$ =1.35, *p*-value: ns;			
Individual measures of socio-economic status			
Educational qualification			
Bachelor degree or higher (referent)	2,184	1.00	24%
Trade or diploma	6,822	0.92 (0.69-1.23)[ns]	
No qualification	11,829	0.86 (0.79-0.93)[c]	
Effect of educational qualification: $\chi^2_{(2)}$ = 23.89, *p*-value: <0.0001;			
Linear trend for educational qualification: $\chi^2_{(1)}$ =108.31, *p*-value: <0.0001;			
Gross annual personal income			
$40,000 or more (referent)	810	1.00	20%
$20,000-$39,999	5,446	0.86 (0.69-1.08)[ns]	
<$20,000	14,579	0.79 (0.64-0.98)[c]	
Effect of gross annual personal income: $\chi^2_{(2)}$ = 5.36, *p*-value: ns;			
Linear trend for gross annual personal income: $\chi^2_{(1)}$ = 75.14, *p*-value: <0.0001;			
Occupation			
White collar (referent)	10,435	1.00	26%
Blue collar	2,307	0.84 (0.77-0.92)[c]	
Not employed (unemployed or not in labour force)	8,093	0.73 (0.64-0.82)[c]	
Effect of occupation: $\chi^2_{(2)}$ = 24.78, *p*-value: <0.0001;			
Linear trend for occupation: $\chi^2_{(1)}$ = 258.07, *p*-value: <0.0001;			

Notes:
(a) Adjusted for age, country-of-birth, rurality and survey. Women aged 20-69 years.
(b) Statistically significant at p<0.05.
(c) p-*values between 0.05 and 0.10.*
ns = non-significant.

volunteered information may have different Pap test behaviour than those who did not complete the women's health questions, but their socio-economic, employment status and income sources were similar. However, there were significant differences between responders and non-responders in age, migrant status and marital status which may represent a propensity to develop cervical cancer. Nevertheless, the non-respondents were a small proportion and thus are unlikely to have a significant effect on the results of this study. Despite differences between the 1989/90 and 1995 NHSs in how the women were selected for the women's health section of the NHS (all female NHS participants in the 1989/90 NHS, optional in the 1995 NHS), the samples were not significantly different in age, income or educational levels.

Using an area-based measure of SES, this study has shown that self-reported rates of having a Pap test within three years were higher in women from the highest SES group compared with women from lower SES categories. Women with a bachelor or higher degree, high income, and white collar workers had significantly higher odds of having a Pap test compared to women with no post school qualification, low income earners, blue collar women and women not employed respectively. After adjusting for confounders, only educational attainment and occupational status remained significant predictors of reporting a Pap test in the past three years. Estimates of population attributable fractions for 1997-99 showed that about a quarter of all unscreened women was attributable to being in lower SES groups characterised by lower occupational status or lower educational qualification. The attributable fraction applies to each measure individually after controlling for the others.

The findings of this study are congruent with an international review of SES and cervical screening which has shown low SES women to have lower screening participation rates than high SES women.[18] Results related to individual-based markers of SES, including educational qualification, gross personal annual income and occupation, were also consistent with previously published papers.[15-17] Calle et al. (1993), for example, found that women with low income and educational attainment were significantly more likely to have never had a Pap test when compared with women with higher income and education.[15] Surveys of US and Canadian women also reported higher Pap test rates in women with higher income or education, compared with others.[16]

The present study was able to show a similar gradient in Pap test rates by area-based SES as shown by previous studies,[6,13-18] however, the magnitude and level of statistical significance is lower. In short, individual measures of SES are stronger predictors of reported Pap screening behaviour than area-based SES measures. In combination, at least in Australia, educational attainment and occupational status are more strongly associated with reported Pap screening than income.

The usefulness of this study is that no Australian studies have reported on variation in cervical screening and individual SES markers in comparison with area-based SES measures in the same sample. This study shows that area-based SES analysis underestimates the SES differences in cervical screening based on individual measures.

This study highlights in more detail than hitherto which women are not Pap screening. It is evident that women not just from low SES areas, but women with lower education and occupational status are not screening appropriately, or not at all. The broader implication of this study on recruitment policy is that targeting women on the basis of their individual SES measures, not just area-based SES measures would maximise the recruitment effort.

Table 2: Effects of individual measures of SES on having a Pap test within three years, controlling for each other and confounders.

Individual measures of SES	Odds ratio[a]	95% confidence interval	*p*-value
Occupational status			
White collar (referent)	1.00	–	–
Not employed (unemployed or not in labour force)	0.90[b]	0.81-0.99	<0.04
Blue Collar	0.77[b]	0.68-0.87	<0.001
Effect of occupational status: $\chi^2_{(2)} = 18.68$, $p<0.0001$			
Linear trend for occupation: $\chi^2_{(1)}=203.55$, $p<0.0001$			
Gross annual personal income			
$40,000 or more (referent)	1.00	–	–
$20,000-$39,999	1.01	0.91-1.12	ns
<$20,000	1.10	0.88-1.37	ns
Effect of gross annual personal income: $\chi^2_{(2)} = 3.25$, $p<0.1965$			
Educational qualification			
Bachelor degree or higher (referent)	1.00	–	–
Trade or diploma	0.90	0.76-1.05	ns
No qualification	0.79[b]	0.67-0.92	<0.003
Effect of educational qualification: $\chi^2_{(2)} = 19.40$, $p<0.0001$			
Linear trend for educational qualification: $\chi^2_{(1)}=79.68$, $p<0.0001$			

Notes:
(a) Adjusted for age, country-of-birth, rurality, survey and individual measures of SES. Women aged 20-69 years.
(b) Statistically significant at p<0.05.
ns Not significant.

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