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Changes in the social gradients for Pap smears and mammograms in Argentina: Evidence from the 2005 and 2009 National Risk Factor Surveys

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SUMMARY

Objectives: To identify changes in the social gradients for Pap smears and mammograms in Argentina.

Study design: Secondary analysis of the 2005 and 2009 Argentine National Risk Factor Surveys.

Methods: Logistic regression analysis was used to examine social gradients by income and education, adjusting for age and health insurance.

Results: The proportion of women who received a Pap smear in the previous 2 years increased from 51.6% in 2005 to 60.5% in 2009 ($\chi^2 = 344.8$, $P < 0.001$). A significant increase was also seen in the receipt of a mammogram in the previous 2 years by women aged ≥ 50 years, with an increase from 39.6% in 2005 to 52.6% in 2009 ($\chi^2 = 279.6$, $P < 0.001$). In 2005, low-income women were most likely not to have received a Pap test [odds ratio (OR) = 3.27, 95% confidence interval (CI) = 2.70–3.98], followed by medium-income women (OR = 1.73, 95% CI = 1.41–2.12), compared with high-income women. The gradient by education was of a similar magnitude, and both income and education gradients remained stable from 2005 to 2009. Restricting the analysis to eight provinces that have been deemed to be high priority due to their high levels of mortality from cervical cancer reveals an increasing income-based gradient in Pap smears. In contrast, inequalities in mammography diminished across the country, with a significant reduction in the social gradient measured either by income or education. In contrast to high-income women, low-income women experienced higher odds of not having a mammogram, but the gap diminished over time [OR = 4.14 (95% CI = 2.96–5.78) in 2005 vs OR = 2.37 (95% CI = 1.81–3.11) in 2009].

Conclusion: Social gradients in cancer screening are changing in Argentina. There are signs of a reduction in inequalities in mammograms, although this is attenuated by indications that inequalities in Pap smear utilization in priority provinces are growing. Surveillance of population indicators is needed to verify whether these short-term changes persist over time.

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Introduction

A growing body of literature describes socio-economic inequalities in preventive care, particularly in cancer screening.^{1,2} Analyses of population-based surveys have shown education- and income-based gradients in cancer screening in Canada and the USA,^{3–5} Spain,⁶ Belgium,⁷ Italy⁸ and elsewhere.^{9,10} However, relatively little is known about the social gradient in cancer screening in the low- and middle-income countries of the global south,^{11,12} and even less is known about how these gradients are changing over time. This is particularly important with cervical cancer, which exerts a significantly higher burden among women in the global south than it does in the richest industrialized countries. In the global south, cervical cancer represents 15% of female cancers, compared with less than 4% in the richest industrialized countries.¹² The large declines in cervical cancer mortality seen in these countries have been primarily attributed to widespread population screening.¹³

In Latin America, cervical cancer is the second most common cancer among women.¹⁴ Although Argentina has one the lowest age-standardized rates of incidence and mortality associated with cervical cancer in the region,¹⁴ there are significant within-country inequalities in both outcomes and screening coverage.^{11,15} Argentina's National Programme for Cervical Cancer Prevention, started in 1998, recommends Pap smear screening for women aged 35–64 years every 3 years, after two initial annual negative tests.^{11,16} However, provincial programmes vary significantly, with some recommending Pap smears starting at 15–18 years, and some calling for annual tests¹¹; recommendations that were in place before the dissemination of national guidelines, and which now stand as inappropriate according to the national norms. According to Arrossi *et al.*, the fragmented nature of cervical cancer prevention programmes in the country is a reason why mortality associated with cervical cancer has not decreased significantly in the last 30 years^{11,17}; a notable contrast with the dramatic declines in cervical cancer mortality rates seen in the developed world in the same period.¹²

The epidemiology of breast cancer is very different from that of cervical cancer. Breast cancer is a rare counter-gradient disease, with a higher prevalence among women from higher socio-economic classes.¹⁸ In contrast, cervical cancer is more prevalent among the poor.⁶ These outcomes therefore hold different patterns of association with socio-economic status, and according to Link *et al.*, reflect the fact that the risk factors currently identified with breast cancer offer little room for modification.¹⁹ Despite the varying associations with socio-economic status of these cancers, previous research has documented significant social gradients in screenings in both Pap smears and mammography,^{7,19} although the steepness of these gradients in countries like Argentina is just beginning to be documented. A national programme for the prevention of breast cancer has been proposed but is not yet operational.

Published analyses of the 2005 Argentine National Risk Factor Survey (Encuesta Nacional de Factores de Riesgo; ENFR) revealed significant social inequalities in Pap smear utilization in the country, with differences by educational level,

employment status, household poverty and age.¹¹ The analysis presented here builds on the work of Arrossi *et al.*¹¹ by examining whether the social gradient in Pap smear coverage changed between 2005 and 2009. Changes are examined across the country and within the eight priority provinces that have received concerted efforts to strengthen screening and treatment programme capacity for cervical cancer since 2003 (Corrientes, Chaco, Formosa, Jujuy, Misiones, Salta, Santiago del Estero and Tucumán). At the same time, the analysis is expanded by considering inequalities in screening for breast cancer, the leading cause of cancer death for women in Argentina.²⁰ The main objective of this study was to identify changes in the social gradients for Pap smears and mammograms between 2005 and 2009 in Argentina. Both income- and education-based gradients were examined, adjusting for age and health insurance.

Methods

The analysis used the 2005 and 2009 ENFRs. The surveys are both nationally and provincially representative samples of respondents aged 18 years or over. In 2005, the ENFR had a sample size of 41,392 adults and a response rate of 86.7%,²¹ whereas the 2009 survey had a sample size of 34,732 and a response rate of 79.8%.²² For analyses of Pap smears, the total number of sampled women was used, with sample sizes of 23,565 in 2005 and 19,704 in 2009. For analyses of mammography use, analyses were restricted to women aged ≥50 years, with sample sizes of 8756 in 2005 and 7620 in 2009. Both outcome measures use a recall period of 2 years. The ENFRs were performed by Argentina's Ministry of Health in co-operation with the National Institute of Statistics and Census (Instituto Nacional de Estadística y Censos; INDEC) and provincial authorities. Methodological characteristics of the ENFR have been published elsewhere.^{21,23–25}

The analysis used two indicators of socio-economic status. Following the INDEC protocol, total family income was categorized into three categories: low (the four lowest deciles), medium (the next four deciles) and high-income (the two upper deciles). Educational attainment was used to generate a secondary measure of socio-economic status. Three categories of educational attainment were created: primary school incompleting; primary school completed and/or high school incompleting; and secondary school completed or more. In Argentina, primary education amounts to 7 years of schooling, and secondary education amounts to a further 5 years of schooling.

The analysis took into account the complex sample design. The prevalence of each health measure across the categories of each socio-economic variable was described using weighted percentages. Binary logistic regression models were developed to analyse the relationship between each socio-economic indicator (explanatory variable) and each health measure (dependent variable), adjusting for age and health insurance. An interaction term between year and socio-economic indicator was used to assess the significance of changes from 2005 to 2009. Given that eight provinces have been deemed to be high priority areas by the National Programme for Cervical Cancer Prevention due to their high

Table 1 – Changes in sociodemographic characteristics and service utilization indicators, 2005–2009.

	2005	2009	χ^2	P
Private health insurance				
Yes	64.6%	74.9%	929.0	<0.001
Income				
Low	43.5%	42.2%	58.6	0.054
Medium	39.7%	42.4%		
High	16.8%	15.5%		
Education				
Low	12.9%	10.8%	228.6	<0.001
Medium	43.0%	40.0%		
High	44.1%	49.3%		
Pap test in previous 2 years				
Yes	51.6%	60.5%	344.8	<0.001
Mammogram in previous 2 years				
Yes	39.6%	52.6%	276.9	<0.001

levels of mortality from cervical cancer, the social gradients in Pap smears in priority and non-priority provinces were examined separately. The priority provinces are Corrientes, Chaco, Formosa, Jujuy, Misiones, Salta, Santiago del Estero and Tucumán. All analyses were performed using STATA Version 11.0 (STATA Corp; College Station, TX, USA).

Results

The proportion of women who had received a Pap smear in the previous 2 years increased from 51.6% in 2005 to 60.5% in 2009 ($\chi^2 = 344.8$, $P < 0.001$; see Table 1). A significant increase was also found in the receipt of a mammogram in the previous 2 years by women aged ≥ 50 years, with an increase from 39.6% in 2005 to 52.6% in 2009 ($\chi^2 = 279.6$, $P < 0.001$). Increases were also found in the proportion of women with access to private health insurance ($\chi^2 = 929.0$, $P < 0.001$), and the proportion of women with high educational attainment ($\chi^2 = 228.6$, $P < 0.001$; see Table 1).

Table 2 presents descriptive income- and education-based gradients for the receipt of Pap smears. The results contrast priority and non-priority provinces. Increases occurred in all

of the income and education groups in the priority and non-priority provinces, yet different patterns emerge: the highest increase in Pap smear utilization appears to have occurred among high-income women in priority provinces, and counter-gradient increases were seen in the rest of the country.

Age-adjusted logistic regression models of Pap smear utilization are presented in Table 3. In 2005, low-income women were most likely not to have received a Pap test in the previous 2 years [odds ratio (OR) = 3.27, 95% confidence interval (CI) = 2.70–3.98], followed by medium-income women (OR = 1.73, 95% CI = 1.41–2.12), compared with high-income women. The gradient by education was of a similar magnitude, and both income and education gradients remained stable from 2005 to 2009, with the interaction effect between socio-economic indicator and year failing to attain significance in all cases.

Income and education gradients for Pap smears in the eight priority provinces show stable or increasing inequalities, with medium-income women faring particularly badly over this period of time [OR = 1.64 (95% CI = 1.27–2.10) in 2005 vs OR = 2.40 (95% CI = 1.80–3.20) in 2009]. This is due to the relatively larger increase in Pap smear utilization among high-income women in these provinces, as shown in Table 2.

Table 4 presents descriptive income- and education-based gradients for the receipt of mammograms. Within an overall increase in utilization, counter-gradient changes are observable, and low-income/low-education women had the highest increases in utilization.

Inequalities in mammography diminished, with a significant reduction in the social gradient measured either by income or education (see Tables 4 and 5). In contrast to high-income women, low-income women experienced a higher odds of not having had a mammogram, but the gap diminished over time [OR = 4.14 (95% CI = 2.93–5.78) in 2005 vs OR = 2.37 (95% CI = 1.81–3.11) in 2009, $P < 0.05$]. The gap also diminished for medium-income women, but the interaction between income and year was not significant [OR = 2.20 (95% CI = 1.55–3.12) in 2005 vs OR = 1.54 (95% CI = 1.16–2.05) in 2009, $P = 0.12$]. The gradient by education displayed a similar pattern of diminishing inequality, although the change was only significant for low-education women [OR = 5.32 (95%

Table 2 – Descriptive gradients for Pap smear in the last 2 years, by income and education.

	Women in priority provinces			Women in the rest of the country		
	2005	2009	Change	2005	2009	Change
Overall	37.5%	48.1%	10.6%	54.1%	62.8%	8.7%
Income						
Low	31.0%	41.7%	10.8%	42.3%	52.7%	10.4%
Medium	46.6%	54.4%	7.8%	59.8%	65.9%	6.2%
High	58.6%	73.9%	15.4%	73.5%	78.8%	5.3%
Education						
Low	26.0%	29.5%	3.5%	29.7%	43.4%	13.7%
Medium	32.7%	44.4%	11.6%	49.6%	55.2%	5.6%
High	48.2%	57.3%	9.1%	65.5%	72.7%	7.2%

All gradients are significant by year (Chi-squared test; $P < 0.001$). Priority provinces include Corrientes, Chaco, Formosa, Jujuy, Misiones, Salta, Santiago del Estero and Tucumán.

Table 3 – Changes in income and education gradients for not receiving a Pap smear in the last 2 years, overall and in selected priority provinces.

	Total					Women in priority provinces					Women in the rest of the provinces				
	2005		2009		P	2005		2009		P	2005		2009		P
	OR	95% CI	OR	95% CI		OR	95% CI	OR	95% CI		OR	95% CI	OR	95% CI	
Income															
High	1.00		1.00			1.00		1.00			1.00		1.00		
Medium	1.73	1.41–2.12	1.90	1.59–2.26	0.51	1.64	1.27–2.10	2.40	1.80–3.20	<0.05	1.84	1.47–2.31	1.92	1.54–2.38	0.79
Low	3.27	2.70–3.98	3.12	2.64–3.68	0.69	3.23	2.50–4.16	4.02	3.09–5.23	0.23	3.68	2.98–4.55	3.17	2.64–3.82	0.30
Education															
High	1.00		1.00			1.00		1.00			1.00		1.00		
Medium	1.65	1.44–1.89	1.88	1.73–2.04	0.10	1.93	1.68–2.21	1.70	1.46–1.99	0.24	1.84	1.58–2.15	2.06	1.88–2.25	0.22
Low	3.29	2.68–4.03	2.91	2.33–3.63	0.45	2.74	2.33–3.21	3.33	2.49–4.44	0.24	4.04	3.16–5.15	3.10	2.53–3.79	0.11

OR, odds ratio; 95% CI, 95% confidence interval.

All models include age and health insurance. P-values indicate the significance of the interaction between year and socio-economic indicator.

CI = 4.01–7.05) in 2005 vs OR = 2.96 (95% CI = 2.33–3.76) in 2009, $P < 0.01$].

Discussion

This study found that substantial changes occurred in the socio-economic patterning of preventive cancer screening among Argentine women between 2005 and 2009. Overall, access to Pap smears and mammograms increased. In the case of Pap smears, these changes have benefitted all socio-economic groups, although the pattern of difference between women with low, medium and high-income/education has remained stable. The eight priority provinces are an exception to this notion, and display signs of a steepening income-based gradient. In these provinces, the relative measure of inequality increased as a result of higher utilization of Pap tests by high-income women in 2009. These results support the findings of Arrossi *et al.*,¹¹ and provide a new understanding of the dynamics of Pap smear utilization in Argentina.

Argentina's National Programme for Cervical Cancer Prevention has focused on improving the quality of care as well as on transfers of diagnostic resources to the priority provinces. The programme's main target population is

women aged 35–64 years without private insurance, and who attend the Government's primary healthcare centres and hospitals. As such, the programme ought to contribute to a higher utilization of Pap smears by women with low and medium socio-economic status. It may be that without this programme, the social gradient could have steepened even more. Further research is needed to examine this notion, and in particular, qualitative studies are needed to better understand the impact of the programme on local communities.

In contrast to the patterns observed with Pap smears, changes in access to mammograms have benefitted all socio-economic groups and have simultaneously diminished inequalities based on income and education. This is a reflection of increased access of low- and medium-income women to mammograms. This contrasts with Puddu *et al.*'s analysis of socio-economic inequalities in mammography use in Belgium,⁷ where inequalities by socio-economic status remained stable 3 years after the launch of a national screening programme, despite an overall increase in mammography use from 59% to 71% of the population. In the case of Argentina, modest levelling of the social gradient in mammograms has

Table 4 – Descriptive gradients for mammogram in the last 2 years, women aged > 50 years of age by income and education.

	2005	2009	Change
Overall	39.6%	52.6%	13.0%
Income			
Low	26.1%	41.7%	15.6%
Medium	45.7%	57.5%	11.8%
High	68.1%	70.1%	2.0%
Education			
Low	17.2%	35.8%	18.6%
Medium	36.8%	46.6%	9.8%
High	62.8%	70.3%	7.5%

All gradients are significant by year (Chi-squared tests, $P < 0.001$).

Table 5 – Changes in income and education gradients for not receiving a mammogram in the last 2 years, women aged > 50 years.

	Mammogram				P
	2005		2009		
	OR	95% CI	OR	95% CI	
Income					
High	1.00		1.00		
Medium	2.20	1.55–3.12	1.54	1.16–2.05	0.12
Low	4.14	2.96–5.78	2.37	1.81–3.11	<0.05
Education					
High	1.00		1.00		
Medium	2.27	1.79–2.88	2.30	1.97–2.69	0.92
Low	5.32	4.01–7.05	2.96	2.33–3.76	<0.01

OR, odds ratio; 95% CI, 95% confidence interval.

All models include age and health insurance. P-values indicate the significance of the interaction between year and socio-economic indicator.

occurred without the presence of a strong national programme for the promotion of breast cancer screening.

This study has several limitations. First, it is limited to a 4-year window, as only two waves of the ENFR have been performed to date. This is a relatively short period over which to see major changes in social gradients; future research should incorporate new data from the ENFR as they become available. Second, the models are limited to analysis of individual characteristics. Future analyses could incorporate insights from multilevel techniques to explore how the social gradients identified in this work may be influenced by contextual effects.²⁶ This is particularly important when considering gradients in mammography, where heterogeneity in provincial and local capacity may restrict the availability of services.

Understanding how inequalities in preventive screenings change over time is a critical goal in public health. Indeed, the WHO Commission on the Social Determinants of Health concluded with a strong call to action for the routine monitoring of health inequalities.²⁷ Until recently, this has not been possible at the national level of analysis in many Latin American countries. However, recent developments in surveillance systems for chronic diseases in the region – and in Argentina in particular, the availability of data from nationally representative risk factor surveys from 2005 to 2009 – have now enabled analyses of changing gradients in health.

Building on the present study, analysis is needed on the dynamics of health inequalities as measured in other preventive services. Future work could also develop a comparative perspective by contrasting social gradients in cancer screening in Argentina with those in other Latin American countries. Such work would help to elucidate the relationships between public policy, healthcare services, and screening behaviour among women of varying socio-economic status.

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Ethical approval

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Competing interests

None declared.

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