

# The heterogeneous impact of a successful tobacco control campaign: a case study of Mauritius

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## ABSTRACT

**Background** Mauritius has one of the highest smoking prevalences in Africa, contributing to its high burden of non-communicable diseases. Mauritius implemented a series of tobacco control measures from 2009 to 2012, including tobacco tax increases. There is evidence that these policies reduced tobacco consumption, but it is not clear what impact they had across different socioeconomic groups.

**Method** The impact of tobacco control measures on different income groups was analysed by contrasting household tobacco expenditures reported in 2006–2007 and 2012 household expenditure surveys. We employed the seemingly unrelated regression model to assess the impact of tobacco use on other household expenditures and calculated Gini coefficients to assess tobacco expenditure inequality.

**Results** From 2006 to 2012, excise taxes and retail cigarette prices increased by 40.6% and 15.3% in real terms, respectively. These increases were accompanied by numerous non-price tobacco control measures. The share of tobacco-consuming households declined from 35.7% to 29.3%, with the largest relative drop among low-income households. The Gini coefficient of household tobacco expenditures increased by 10.4% due to decreased spending by low-income households. Low-income households demonstrated the largest fall in their tobacco budget shares, and the impact of tobacco consumption on poverty decreased by 26.2%. Households that continued purchasing tobacco reduced their expenditures on transportation, communication, health, and education.

**Conclusions** These results suggest that tobacco control policies, including sizeable tax increases, were progressive in their impact. We conclude that tobacco use increases poverty and inequality, but stronger tobacco control policies can mitigate the impact of tobacco use on impoverishment.

## INTRODUCTION

Mauritius, a country in the WHO African region, is subject to a relatively high burden of non-communicable diseases (NCDs). The main causes of death in 2012 were related to circulatory system diseases; endocrine, nutritional and metabolic diseases; cancers and respiratory diseases.<sup>1</sup> The adult smoking prevalence, one of the highest in Africa, reached 38.0% among men and 3.9% among women in 2015.<sup>2</sup> The latest youth smoking statistics from 2008 suggest that smoking prevalence among those aged 13–17 years was 13.7%.<sup>3</sup>

Faced with a heavy NCD burden, Mauritius began to implement tobacco control measures as early as 1999 and became a party to the WHO Framework

Convention on Tobacco Control in 2004.<sup>4</sup> In 2008, Mauritius adopted a four-year National Action Plan for Tobacco Control (NAPTC) focusing on prevention, smoking cessation and protection from second-hand smoke exposure.<sup>5</sup> As part of the NAPTC, the government banned cigarette advertising, promotion, sponsorship, product display at point of sale, sale of tobacco to/by minors, sale of sweets/toys in the form of cigarettes, sale of single cigarettes, sale of cigarettes from vending machines and the use of misleading descriptors such as ‘light’, ‘mild’ or ‘low tar’. Further, it introduced strong smoke-free policies and rotating pictorial warning labels and prohibited the offering of tobacco products for free or at discounted prices. These regulations came into effect on 1 March 2009 and were fully enforced as of 1 June 2009. In 2011, the government ran an intensive 3-week mass media campaign with peak-time television/radio commercials, roadside billboards and awareness discussions at schools/community centres, focusing on the health risks of tobacco use.

NAPTC was accompanied by significant changes in tobacco tax policies. In July 2008, Mauritius abolished ad valorem taxation in favour of a uniform specific tax. Mandatory tax stamps were introduced in 2009. Table 1 documents the excise tax rates from 2006 to 2012 and their impact on prices and affordability of the most popular brand, *Matinée*.<sup>6–8</sup> Affordability, or the relative income price (RIP), is measured as the percentage of annual per capita gross domestic product (GDP) required to purchase 100 packs of cigarettes.<sup>9,10</sup> The reported tax increases were a result of both changes in tax structure and higher tax rates.<sup>7</sup>

From 2006 to 2012, the excise tax increased by 87.0% (40.6% in real terms), and the retail prices of the *Matinée* brand increased by 53.3% (15.3% in real terms). Despite these tax and price hikes, the affordability of cigarettes in 2012 was similar to their affordability in 2006, a result of income growth during this period.

A recent study reported that the set of policies implemented between 2009 and 2011 significantly reduced both smoking prevalence and smoking intensity among continuing smokers.<sup>7</sup> However, it is not clear whether this public health success had equal impact across all income classes. In this paper, we analyse the impact of a successful tobacco control campaign on different socioeconomic groups using household expenditure surveys that span across the treatment period. This allows us to address the issue of the regressivity of tobacco control policies in a middle-income country with a relatively high smoking prevalence.



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**Table 1** Excise tax, retail price and affordability of the most popular brand, Matinée (2006–2012)

	2006	2007	2008	2009	2010	2011	2012
Average tax per pack (MUR)	34.5	38.0	42.7	44.0	44.9	56.4	64.5
Average real tax per pack (2006–2007 MUR)	34.5	34.9	35.8	36.0	35.7	42.1	46.3
Average retail price (MUR)	75.0	75.0	80.0	85.0	85.0	110.0	115.0
Average real retail price (2006–2007 MUR)	75.0	68.9	67.0	69.5	67.5	82.0	82.6
Affordability (RIP) (%)	4.3	3.8	3.6	3.8	3.6	4.3	4.2
Average tax per pack (US\$)	1.09	1.21	1.50	1.38	1.46	1.96	2.14
Average retail price (US\$)	2.37	2.40	2.82	2.67	2.76	3.83	3.82

The average exchange rate for each year is used to convert MUR to US\$.  
MUR, Mauritian rupee; RIP, relative income price.

**DATA AND METHODS**

We used data from two waves of the Household Budget Surveys (HBS) conducted by the Statistics Mauritius Office from June 2006 to July 2007 and from January 2012 to December 2012. Both waves offer a nationally representative sample of 6720 households, selected in two stages with probability proportional to the size of the population. The data collection was deliberately extended over 12 months to account for seasonal fluctuations in expenditure. Every household member aged 15+ years (HBS 2006–2007) or 10+ years (HBS 2012) was given a pocket pad to record daily expenses for a period of 1 month, which were entered in a diary by the household head at the end of each day. The diaries were collected weekly, and the records were scrutinised to ensure that all details were properly entered. Data included information on gender, marital status, age of household head, individual income, household location and home ownership; household size, household income and urban/rural status were derived from this raw data. The expenditure categories consisted of food and non-alcoholic beverages, clothing and footwear, housing/maintenance, health, transport, communication, recreation/culture, education, restaurants/hotels (excluding any alcohol or tobacco purchases), tobacco products and alcoholic beverages, among others. All data used in our analyses were weighted to represent the population of Mauritius. Households allocating more than 30% of expenditures to tobacco (20 households in 2006–2007 and 38 households in 2012, representing 0.30% and 0.57% of the total sample for each wave, respectively) were excluded as outliers because they allocated more than the mean plus three times the SD of their budget to tobacco.

Monthly household income is defined by Statistics Mauritius as the gross income generated by all household members (regular receipts, both cash and in kind) minus compulsory deductions (such as income tax and contributions to pensions and social security schemes). In accordance with the approach used by Statistics Mauritius in its Poverty Analysis report, we employed Bank and Johnson’s non-linear equivalence scale to generate equalised monthly per capita income, which takes into account the household’s size and composition.<sup>11 12</sup> To account for in-kind benefits, we created an imputed income variable by adding an imputed rent value for non-renting households (those owning their house or getting free rental) to their reported monthly household income.<sup>11</sup> We ordered all households in 2006–2007 according to imputed monthly income per capita and divided the samples into terciles (thirds) with respective upper limits for low-income and middle income households of Mauritian rupees (MUR) 6154 (US\$195) and MUR 9671 (US\$305), which equated to MUR 8185 (US\$272) and MUR 12 863 (US\$427) in nominal 2012 MUR. These cut-off points defined low-income,

middle-income and high-income households while controlling for real income growth which can impact tobacco use.

To assess the impact of tobacco use on expenditures on other commodities, we employed seemingly unrelated regression (SUR), where the budget shares on all categories (excluding tobacco) are modelled simultaneously using a feasible generalised least squares estimator.

where  $w_i$  is the budget share on the  $i^{th}$  expenditure category (other than tobacco), T is a dichotomous variable with the value 1 if the household has positive expenditures on tobacco (0 otherwise) and X is a vector of the household’s socioeconomic and demographic characteristics (log income per capita, log income per capita squared, age, gender and marital status of household head and urban/rural status). We also estimated the model with imputed income per capita and obtained similar results. The regression analysis was performed for each of the 2006–2007 and 2012 surveys separately to examine the impact of the tobacco control policies implemented between the two surveys. Details of the various budget categories are provided in Annex 1.

To study the impact of tobacco use on poverty, we employed the 2006–2007 relative poverty line for per capita income published by the Ministry of Finance and Economic Development of MUR 3821 (US\$121 in 2006–2007 MUR).<sup>11</sup> A standard approach was used to calculate Gini coefficients when assessing the inequality of tobacco expenditures. Data were analysed using Stata V.14.0.

**RESULTS**

Table 2 describes the sociodemographic characteristics of the sample by tobacco expenditure status.

About 35.7% and 29.3% of all households consumed tobacco in 2006–2007 and 2012, respectively. This represents a 17.9% decline in household-smoking prevalence. In absolute terms, 14280 fewer households consumed tobacco in 2012 compared with 2006–2007. The share of tobacco-consuming households dropped substantially in both urban and rural areas (with a larger relative decline in rural areas), and among both male-headed and female-headed households (with a larger relative decline among male-headed households).

Table 3 summarises household expenditure and the share of household expenditure allocated to tobacco (tobacco budget shares) by income group. The average real household expenditure on tobacco among tobacco-consuming households increased by 17.1% from MUR 875 (US\$27.66) to MUR 1016 (US\$33.71) between 2006–2007 and 2012. The largest relative increase occurred among middle-income (15.1%, from 839 to 966), followed by high-income (9.9%, from 1116 to 1226) and then low-income households (8.1%, from 721 to 780). The average tobacco budget share among tobacco-consuming households is

**Table 2** Characteristics of households by tobacco consumption status

	2006–2007			2012		
	No tobacco spending	Any tobacco spending	Full sample	No tobacco spending	Any tobacco spending	Full sample
Households in population (n)	214 541	119 053	333 594	253 044*	104 773*	357 817*
Household population (%)	64.3	35.7		70.7*	29.3*	
Region (%)						
Urban	64.0	36.0	46.6	70.4*	29.6*	47.6
Rural	64.6	35.4	53.4	71.0*	29.0*	52.4
			100.0			100.0
Sex of household head (%)						
Male	61.7	38.3	82.1	68.4*	31.7*	78.6*
Female	76.5	23.5	17.9	79.4*	20.6*	21.4*
			100.0			100.0
Marital status of household head (%)						
Married	61.9	38.1	22.9	68.4*	31.6*	26.2*
Not Married	72.4	27.6	77.1	77.2*	22.8*	73.8*
			100.0			100.0
Average age of household head (years)	50.3	47.9	49.4	53.3*	50.3*	52.4*
Average household size	3.5	3.9	3.7	3.4*	3.8*	3.5*
Real average monthly income per capita (in 2006–2007 MUR)	8802.3	7613.0	8377.9	10 103.2*	9268.0*	9858.7*
Sample households (n)	4317	2383	6700	4721*	1941*	6662

The base year for inflation adjustment is July 2006–June 2007 as reported by the Ministry of Finance and Economic Development.

\*Significant changes in statistics between 2006–2007 and 2012.

MUR, Mauritian rupee.

inversely related to income in both surveys, meaning those with lower income devote a higher share of their expenditures to tobacco. This suggests that tobacco taxes are regressive.

However, while the total amount spent on tobacco increases with income, this amount declined from 30.8 to 21.2 million MUR for the low-income group and increased for both the middle-income (from 35.7 to 36.6 million MUR) and high-income (from 37.7 to 48.7 million MUR) groups. At the same time, the largest relative decline in the proportion of tobacco-consuming households was observed among low-income households (a 26.8% decrease). These findings suggest that tobacco control policies implemented between the two surveys reduced the regressivity of tobacco tax.

To further investigate the issue of regressivity, we analysed changes in the share of tobacco expenditures in total household expenditures. Between 2006–2007 and 2012, the tobacco budget shares across all households decreased from 2.7% to 2.3% or by 14.8%. Among all low-income households, budget shares dropped by 18.2%, while the declines of 2.1% and 5.3% among the middle-income and high-income households, respectively, were not statistically significant. As expected, the Gini coefficient of household tobacco expenditures (ordered according to income) increased by 10.4% from 0.088 to 0.103 between 2006–2007 and 2012, indicating a relatively lower contribution of households at the lower end of the income spectrum to total tobacco expenditures within the economy. While the number of low-income households as a proportion of all households decreased by only 19.0%, their tobacco expenditures as a proportion of total tobacco expenditure declined by 32.8% (from 29.6% to 19.9%). At the same time, there was a larger-than-proportional increase in the expenditure share on tobacco of both middle-income and upper-income households. These results demonstrate a net decrease in the relative regressivity of tobacco expenditures between 2006–2007 and 2012.

Among households that continued to smoke, the largest relative increase in the tobacco budget share (12.2%) occurred among middle-income households, followed by low-income households (10.6%) and high-income households (6.3%) (although the increase for the high-income group was not statistically significant).

The crowding-out effect of tobacco expenditures is described in table 4, which presents coefficients of the dichotomous variable T in equation (1) for both the pooled sample and the individual surveys. The reason for pooling was to increase the number of observations and, thus, the statistical power of our estimates when stratifying by income groups. The sign indicates whether a tobacco-consuming household lowered (a negative sign) or increased (a positive sign) its budget allocation for a particular item.

$$w_i = \alpha + \beta T + \lambda X + \varepsilon \quad (1)$$

In the pooled sample, tobacco consumption was associated with reduced expenditures on transportation, health and education but increased spending on alcoholic beverages and restaurants/hotels among all income groups. Low-income and middle-income tobacco-consuming households further cut their expenditures on communication. The association between tobacco and food expenditures was inconsistent across income groups. Such an inconsistency is not unique to this data and has been reported elsewhere, specifically in low-middle income countries.<sup>13 14</sup> This is likely due to our inability to distinguish between different categories of food, as research suggests that tobacco spending is likely to affect choices in food quality.<sup>13</sup>

Having the results from individual surveys allow us to study the dynamics of household expenditure allocations before and after the implementation of a set of tobacco control measures (including higher taxes). All the negative and statistically significant coefficients in the full 2006–2007 sample (except for

**Table 3** Average real monthly household expenditure by income tercile and tobacco consumption status (in 2006–2007 MUR)

	2006–2007			2012		
	No tobacco spending	Any tobacco spending	Full sample	No spending	Any tobacco spending	Full sample
<b>All income</b>						
Households in population (n)	214541	119053	333594	253 044*	104 773*	357 817*
Household population (n)	64.3	35.7		70.7*	29.3*	
Household expenditure	14411	14161	14322	16 019*	15 999*	16 013*
Household expenditure on tobacco	0	875	312	0	1 016*	298*
Share of household expenditure on tobacco (%)	0.0	7.5	2.7	0.0	8.0*	2.3*
Total amount spent on tobacco (MUR, million)	0	104.2		0	106.4	
<b>Low income</b>						
Households in population (n)	68542	42684	111226	69 408*	27 186*	96 594*
Household population (%)	61.6	38.4		71.9*	28.1*	
Household expenditure	7773	9100	8 282	7759*	9122*	8143*
Household expenditure on tobacco	0	721	277	0	780*	220*
Share of household expenditure on tobacco (%)	0.0	8.5	3.3	0.0	9.4*	2.7*
Total amount spent on tobacco (MUR, million)	0	30.8		0	21.2*	
<b>Middle income</b>						
Households in population (n)	68632	42548	111180	75 378*	37 873*	113 251*
Household population (%)	61.7	38.3		66.6*	33.4*	
Household expenditure	11 710	12 572	12 040	11 784*	12 994*	12 188*
Household expenditure on tobacco	0	839	321	0	966*	323*
Share of household expenditure on tobacco (%)	0.0	7.4	2.8	0.0	8.3*	2.8
Total amount spent on tobacco (MUR, million)	0	35.7		0	36.6*	
<b>High income</b>						
Households in population (n)	77367	33822	111189	108 259*	39 713*	147 972*
Household population (%)	69.6	30.4		73.2*	26.8*	
Household expenditure	22687	22546	22 644	24 264*	23 574*	24 079*
Household expenditure on tobacco	0	1116	339	0	1226*	329*
Share of household expenditure on tobacco (%)	0.0	6.3	1.9	0.0	6.7	1.8
Total amount spent on tobacco (MUR, million)	0	37.7		0	48.7*	
<b>Gini coefficient for tobacco expenditures (all income)</b>			0.088			0.103*

The base year for inflation adjustment is July 2006–June 2007 as reported by the Ministry of Finance and Economic Development.

\*Significant changes in statistics between 2006–2007 and 2012.

MUR, Mauritian rupee.

transport) increased in magnitude by 2012, suggesting that those who continued to smoke cut their expenditures on health, education and communication even further. However, the only statistically significant change in coefficient size was for communication. Some 2006–2007 coefficients that were negative but not statistically significant for the middle-income group became significant in 2012, indicating that the negative impact of tobacco expenditures on household budget allocations increased among this income group as well. In fact, households across all income categories that consumed tobacco in 2012 cut their expenditures on health, education and transport. Across all income groups and in both surveys, tobacco-consuming households allocated more resources to alcohol and to restaurants and hotels and did not seem to cut expenditures on household essentials such as clothing, housing and food.

Previous studies pointed out the endogeneity of T in this type of analysis,<sup>13 15</sup> so we followed Chelwa and Van Walbeek's<sup>15</sup> approach and instrumented tobacco expenditure with the household sex ratio to estimate a three-stage least squares model. Similar to Chelwa and Van Walbeek, we found that SUR estimates do not display upward bias but are instead attenuated towards zero (results available on request).

This means that our results are conservative and provide a lower bound estimate of the impact of tobacco expenditure on the household budget.

To study the impact of tobacco use on poverty, we compared two poverty measures in table 5: measure 1, a standard poverty measure based on per capita income and measure 2, an alternative poverty measure based on per capita income minus tobacco expenses. This approach, which is derived from the cost of basic needs, is based on the notion that tobacco is not essential for living and can therefore be subtracted from income when evaluating the rate of poverty.<sup>16</sup>

Using measure 1, we found that household poverty in Mauritius decreased 25.0%, from 8.0% to 6.6%, between 2006–2007 and 2012. Using measure 2, we estimated a 10.3% higher poverty rate in 2006–2007 (with 2745 additional poor households) and a 7.6% higher poverty rate in 2012 (with 1784 additional poor households). The relative gap between these two poverty measures thus reduced by 26.2% between 2006–2007 and 2012 after the implementation of higher taxes and other tobacco control measures. This indicates a greater relative reduction in poverty after subtracting tobacco expenditures from income.

**Table 4** Crowding out of tobacco expenditure by income groups

Category	Pooled sample							
	Low income	Middle income	High income	Full sample				
Food and beverages	-0.43	0.68*	0.73*	0.56**				
Alcoholic drinks	2.85***	2.39***	2.19***	2.47***				
Clothing footwear	0.36*	0.02	0.20	0.18				
Housing	-0.14	0.40	0.72**	0.43**				
Health	-0.84***	-1.04***	-0.83***	-0.94***				
Transport	-1.00***	-2.00***	-2.60***	-2.09***				
Communication	-0.50***	-0.23*	-0.02	-0.24***				
Recreation and culture	0.07	-0.19	0.17	0.01				
Education	-0.66***	-0.66***	-0.74***	-0.71***				
Restaurant and hotel	0.60***	0.68***	0.89***	0.70***				
Sample households (n)	4175	4279	4892	13346				
	2006–2007 sample				2012 sample			
	Low income	Middle income	High income	Full sample	Low income	Middle income	High income	Full sample
Food and beverages	-0.11	0.43	0.57	0.36	-0.01	1.58***	0.98*	1.08***
Alcoholic drinks	2.65***	2.22***	2.09***	2.35***	3.06***	2.43***	2.25***	2.56***
Clothing and footwear	0.18	-0.38	0.10	-0.02	0.26	0.25	0.26	0.25
Housing	-0.25	0.85*	0.86*	0.65**	-0.30	-0.32	0.68	0.20
Health	-0.79***	-0.34	-0.65*	-0.63***	-0.85***	-1.51***	-1.01***	-1.23***
Transport	-1.14***	-2.53***	-3.18***	-2.42***	-0.92**	-1.56***	-2.21***	-1.84***
Communication	-0.44***	-0.04	0.07	-0.16*	-0.61***	-0.44**	-0.09	-0.35***
Recreation and culture	0.13	-0.35	0.33	0.02	-0.07	-0.14	0.03	-0.06
Education	-0.56***	-0.44*	-0.27	-0.46***	-0.70**	-0.87***	-1.11***	-0.94***
Restaurant and hotel	0.51***	0.57***	0.64***	0.56***	0.61***	0.73***	1.07***	0.82***
Sample households (n)	2286	2206	2194	6686	1889	2073	2698	6660

The numbers are the coefficients on the tobacco expenditure dummy in a system of seemingly unrelated regressions, where the household expenditure shares on all but one (other) category are regressed on a set of variables described in the method section. A coefficient gives the percentage point effect of tobacco consumption on the share of the budget allocated to a specific type of spending.

\*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

**Table 5** Household poverty by poverty indicator

	2006–2007		2012	
	Income per capita	Income per capita less per capita tobacco expenditure	Income per capita	Income per capita less per capita tobacco expenditure
Households under the poverty line (n)	26733	29478	23568	25352
Households under the poverty line (%)	8.0	8.8	6.6	7.1
Households under the poverty line that spend on tobacco (%)	37.9	43.7	29.7	34.7
Share on tobacco in household expenditure (for tobacco-consuming households) (%)	8.7	9.7	10.5	11.3
Share on tobacco in household expenditure (for all households) (%)	3.3	4.2	3.1	3.9

## DISCUSSION

In this analysis, we investigated the impact of a 40.6% real tobacco tax increase and other tobacco control policies between 2006–2007 and 2012 on household expenditures. We found a 12.0% drop in the number of households consuming tobacco (14 280 fewer households), with the largest drop in the proportion of tobacco-consuming households among low-income families (a 10.3% point decline from 38.4% to 28.1% or a 26.8% decline). This is consistent with greater price sensitivity among low-income consumers.<sup>17 18</sup>

Despite many households eliminating tobacco from their budgets, total monthly expenditures on tobacco in Mauritius increased from MUR 104.2 million (US\$3.3 million) in

2006–2007 to MUR 141.6 million (US\$4.7 million) or MUR 106.4 million in 2006–2007 MUR in 2012. At the same time, the significance of household tobacco expenditures in the economy, measured by the share of tobacco expenditures in GDP, has declined by 15.6%, as it represented 0.488% and 0.412% of GDP in 2006 and 2012, respectively. Households below the poverty line that stopped purchasing tobacco jointly saved MUR 31.2 million (US\$1.2 million) on tobacco purchases in 2012. This saving is likely to result in reduced future healthcare expenditures and improved labor productivity among this vulnerable group, thus further multiplying the positive impact of eliminating tobacco from the household budget.

Households that continued to buy tobacco in 2012 spent MUR 1351 (US\$44.87) each month on tobacco, a 16.1% increase in real terms since 2006–2007. A study on Mauritius has suggested that continuous smokers did not change their smoking intensity (at about 9.9 cigarettes per day).<sup>19–21</sup> Our data confirm this: from 2006–2007 to 2012, the average real price of cigarettes increased by 15.3%, while real tobacco expenditures in tobacco-consuming households increased by 16.1%, implying a nearly constant level of tobacco consumption.

An average smoking household allocated 8.0% of their budget to tobacco in 2012. This is on par with some middle-income countries such as Turkey (8.2% in 2011) but substantially higher than in South Africa (5.3% in 2012) or Brazil (2.3% in 2009), for example.<sup>22–24</sup>

Even though low-income households as a whole reduced their tobacco use from 2006 to 2012, tobacco-consuming low-income households still devoted the largest share of their budget to tobacco, and this share increased from 8.5% in 2006–2007 to 9.4% in 2012 or by 10.6%. However, the largest increase in the budget share spent on tobacco occurred among middle-income tobacco-consuming households (12.2%). This suggests that tobacco taxes continue to be regressive for those who continue to smoke, even though their regressivity has declined. Cessation services targeting low-income households would enhance the overall progressive nature of tobacco control policies.

We found that households with tobacco expenditures do not reduce expenditures on food, clothing and housing. This is consistent with results from an earlier study reporting that only 11% of smokers in Mauritius felt that spending on cigarettes deprived them of money for household essentials.<sup>19</sup> However, we found a negative association between tobacco consumption and healthcare expenditures. Public healthcare is free in Mauritius, so this finding must relate to private healthcare services that are considered to be of better quality. Mauritius also provides free primary and secondary education; therefore, we interpret our negative association between tobacco and educational expenditures as cutting investments into tertiary education and/or private schooling.

Our key finding is that the tobacco control policies adopted in Mauritius, which included increases in tobacco taxes, have had a heterogeneous impact across income groups. Moreover, these policy changes were, in fact, marginally progressive, as suggested by the tobacco expenditures Gini coefficient and led to a relative reduction in tobacco-related poverty and income inequality over the study period. We conclude that tobacco use increases poverty and inequality, but stronger tobacco control policies (including tax increases) can mitigate the impact of tobacco use on impoverishment.

## LIMITATIONS

Our study has several limitations. First, there was a slight change in the data collection method between 2006–2007 and 2012, when even younger family members started to record their expense. This would result in underestimating household expenditures in 2006–2007, rendering our estimates more conservative. We used cross-sectional household data, so we were not able to detect changes in prevalence and smoking intensity on an individual level or longitudinal changes in smoking behaviour. Statistics Mauritius determined that expenditure on tobacco and alcoholic drinks in the HBS data was under-reported (compared with other available data on local sales); the raw data were therefore adjusted by the Statistics Mauritius to correct this. Finally,

## What this paper adds

- ▶ Tobacco control policies implemented between 2009 and 2012 in Mauritius have significantly reduced tobacco consumption, but it is not clear what impact these policies had across different socioeconomic groups.
- ▶ Our results suggest that the newly implemented tobacco control policies, including higher tobacco tax, were progressive in their impact, as prevalence dropped most among low-income households and least among high-income households.
- ▶ Tax increases, combined with other tobacco control policies, also decreased the impact of tobacco consumption on impoverishment and shifted the burden of tobacco expenditures towards high-income households.
- ▶ Low-income households that continued to use tobacco increased their tobacco budget shares. These households should be targeted with cessation services.

the generalisability of our findings for other African countries is limited, because Mauritius does not represent a typical country on the continent.

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