Supplementary appendix: The health, poverty and financial consequences of a cigarette price increase among 500 million male smokers in 13 middle-income countries: a compartmental model study

Supplementary appendix: The health poverty and financial consequences of a cigarette price increase among 500 million male smokers in 13 middle-income countries

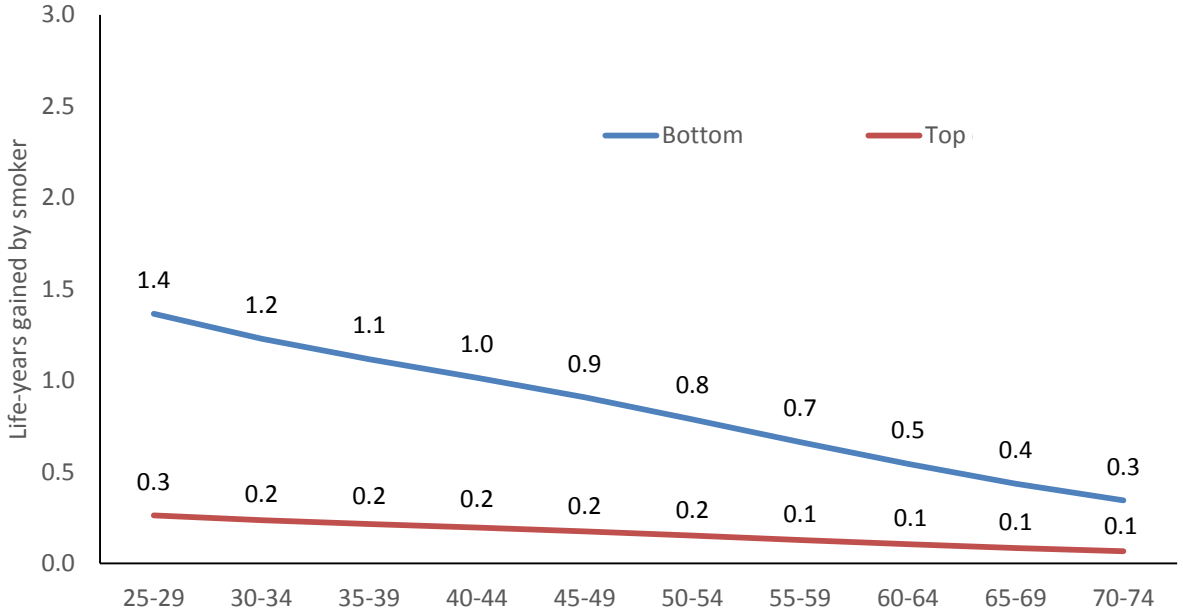
Appendix Table 1: Input parameters for 13 countries

			Lower middle Income				Upper middle Income							
Indicators	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**ARM**	**CHN**	**MEX**	**TUR**	**BRA**	**COL**	**THA**	**CHL**	**Source**
Population (males in millions)														(1)
0-4	65.1	12.7	7.8	5.7	3.8	0.1	44.6	6.0	3.5	7.7	1.9	2.0	0.6	
5-9	66.9	11.8	8.0	5.3	34	0.1	42.4	6.2	3.4	7.9	2.0	2.1	0.6	
10-14	66.9	12.1	8.4	5.1	3.6	0.1	40.4	6.2	3.4	8.9	2.1	2.1	0.6	
15-19	64.9	11.8	8.2	5.1	4.5	0.1	42.0	6.2	3.4	8.9	2.1	2.2	0.7	
20-24	62.1	10.7	7.7	4.8	4.4	0.1	55.9	5.6	3.2	8.4	2.1	2.3	0.7	
25-29	58.7	9.9	7.2	4.2	4.0	0.1	67.0	5.0	3.2	8.8	2.0	2.3	0.7	
30-34	54.1	10.7	6.6	3.7	3.6	0.1	51.1	4.8	3.2	8.9	1.9	2.5	0.7	
35-39	47.2	10.0	5.8	3.3	3.3	0.1	48.8	4.7	3.0	8.1	1.7	2.8	0.6	
40-44	41.8	9.3	5.0	3.0	3.0	0.1	61.0	4.0	2.6	7.0	1.5	2.8	0.6	
45-49	36.5	8.3	4.5	2.7	2.7	0.1	62.7	3.4	2.3	6.4	1.5	2.8	0.6	
50-54	31.9	6.9	3.7	2.3	2.2	0.1	50.6	2.9	2.0	5.9	1.3	2.5	0.6	
55-59	26.9	5.6	2.6	1.9	1.5	0.1	40.1	2.2	1.7	4.8	1.1	2.2	0.5	
60-64	21.7	4.0	1.7	1.4	0.8	0.1	39.2	1.8	1.3	3.8	0.9	1.7	0.4	
65-69	14.2	2.5	1.5	1.0	0.5	<0.1	25.4	1.3	0.9	2.7	0.6	1.2	0.3	
70-74	9.6	1.7	1.1	0.6	0.4	<0.1	16.8	1.1	0.7	1.8	0.4	0.8	0.2	
Smoking prevalence, by age														(2–14)
15-19	4%	21%	12%	19%	12%	26%	14%	19%	21%	9%	7%	34%	38%	
20-24	9%	47%	29%	29%	42%	35%	49%	29%	47%	20%	19%	52%	46%	
25-29	9%	54%	34%	39%	45%	43%	53%	27%	54%	18%	26%	48%	51%	
30-34	13%	52%	38%	49%	58%	52%	52%	22%	52%	20%	25%	49%	55%	
35-39	12%	51%	36%	49%	62%	60%	58%	24%	51%	24%	21%	50%	56%	
40-44	12%	50%	33%	48%	56%	66%	68%	19%	50%	24%	17%	50%	55%	
45-49	14%	45%	36%	48%	62%	68%	67%	23%	45%	27%	13%	50%	53%	
50-54	12%	42%	31%	47%	60%	67%	58%	21%	42%	29%	16%	47%	49%	
55-59	10%	32%	26%	45%	64%	64%	58%	17%	32%	27%	17%	44%	44%	
60-64	8%	33%	19%	43%	47%	60%	47%	19%	33%	24%	19%	44%	40%	
65-69	7%	20%	18%	40%	45%	55%	38%	15%	20%	20%	21%	34%	35%	
70-74	6%	16%	22%	36%	34%	51%	21%	10%	16%	16%	21%	34%	31%	
Smoking prevalence, by five income groups (fifths)														(2–14)
Q1	8%	72%	26%	32%	58%	49%	59%	21%	32%	31%	16%	48%	30%	
Q2	11%	63%	29%	31%	53%	61%	63%	26%	41%	27%	18%	57%	38%	
Q3	10%	52%	26%	28%	42%	59%	58%	24%	50%	22%	19%	46%	46%	
Q4	10%	51%	33%	27%	40%	49%	44%	27%	45%	22%	17%	40%	48%	
Q5	10%	41%	26%	24%	38%	42%	44%	27%	34%	15%	18%	18%	51%	
Number of cigarettes consumed daily per person														(2–14)
Q1	4	18	8	10	14	24	16	13	18	6	6	9	18	
Q2	4	19	8	9	10	24	16	10	19	11	8	9	15	
Q3	4	18	7	10	10	24	14	8	18	14	8	7	11	
Q4	4	17	7	9	10	24	13	9	17	11	8	9	11	
Q5	4	16	8	7	9	24	13	8	16	12	10	10	10	
Share to the total deaths														(15)
COPD	23%	9%	31%	10%	11%	7%	19%	8%	15%	2%	19%	83%	14%	
Stroke	18%	50%	16%	35%	47%	24%	39%	12%	24%	5%	22%	37%	34%	
Heart disease	44%	40%	49%	49%	28%	63%	30%	47%	46%	7%	52%	33%	42%	
Lung cancer	15%	2%	5%	6%	13%	6%	12%	33%	15%	1%	7%	16%	10%	
Annual treatment cost from tobacco attributable diseases (in USD PPP-adjusted)														(7,8,16–28)
COPD	240	2 977	431	601	400	425	2 256	767	1 604	879	1 289	426	552	

	Lower middle Income						Upper middle Income							
Indicators	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**ARM**	**CHN**	**MEX**	**TUR**	**BRA**	**COL**	**THA**	**CHL**	**Source**
Stroke	895	825	431	1 873	866	350	2 197	3 527	1 850	2 963	1 446	937	4 433	
Heart disease	494	3 935	431	774	1 384	1 724	11 774	4 152	1 537	1 484	968	1 163	3 946	
Lung cancer	895	5 372	644	720	1 319	4 781	14 794	11 811	1 902	2 308	10 240	2 399	21 738	
Probability of seeking care														(7,8,25,29–34)
COPD	65%	70%	41%	80%	52%	25%	33%	96%	70%	79%	70%	99%	88%	
Stroke	67%	70%	41%	80%	52%	75%	80%	96%	70%	88%	70%	99%	88%	
Heart disease	70%	70%	41%	80%	52%	75%	81%	96%	70%	87%	70%	99%	88%	
Lung cancer	72%	70%	41%	80%	52%	40%	50%	96%	70%	90%	70%	99%	88%	
Health utilization (relative)														(7,8,,19,30,35–42)
Q1	0.8	0.6	0.5	0.8	0.6	0.7	0.79	0.8	0.8	0.7	1.0	1.0	0.9	
Q2	0.9	0.7	0.9	0.9	0.7	0.7	0.98	0.8	1.0	0.9	1.1	1.0	1.0	
Q3	1.0	1.0	1.0	1.0	1.0	1.0	1.00	1.0	1.0	1.0	1.0	1.0	1.0	
Q4	1.1	1.2	1.7	1.0	0.9	1.1	1.08	1.1	1.1	1.1	1.1	1.0	1.2	
Q5	1.2	1.5	2.0	1.1	1.2	1.2	1.15	1.1	1.2	1.1	1.2	1.0	1.4	
Insurance coverage rate														(7,8,29,43–53)
	11%	55%	26%	88%	60%	28%	97%	91%	85%	100%	91%	98%	90%	
Financial support														(26,43,44,46–49,54–56)
	40%	70%	40%	40%	60%	100%	30%	70%	100%	80%	100%	100%	90%	
Household income per capita (in USD PPP-adjusted)														(57–65)
	1 559	1 940	1 437	2 888	2 436	2 888	5 405	4183	10 865	7 511	3 075	7 788	9 419	
Gini														
	0.3	0.4	0.3	0.4	0.4	0.3	0.5	0.5	0.4	0.5	0.5	0.4	0.5	(66)
Individual Income (by five income groups (fifths))														Authors' calculation
Q1	899	1 008	857	1 393	1 309	1 739	2 435	1 861	5 567	3 017	1 192	4 158	3 886	
Q2	1 243	1 478	1 164	2 125	1 883	2 346	3 866	2 972	8 229	5 100	2 055	6 009	6 467	
Q3	1 501	1 841	1 391	2 711	2 326	2 792	5 027	3 886	10 310	6 881	2 797	7 438	8 654	
Q4	1 791	2 264	1 645	3 401	2 831	3 292	6 423	4 980	12 712	9 042	3 721	9 065	11 293	
Q5	2 352	3 104	2 133	4 795	3 823	4 255	9 260	7 227	17 492	13 550	5 641	12 292	16 813	
Price elasticity														(28 67–79)
	-0.35	-0.30	-0.49	-0.87	-0.53	-0.56	-0.54	-0.52	-0.39	-0.38	-0.78	-0.39	-0.21	
PPP conversion factor														(80)
	19	4 800	31	20	8 836	202	4	10	2	2	1 292	13	376	

India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam (VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL)
Note: The population values for Armenia are similar across age-group in this table. However, unrounded-off values were used in the analysis.

Appendix figure 1: Life-years gained per smoker by age and income five income groups (fifths)



Appendix Table 2. Number of individuals avoiding catastrophic health expenditure and averting poverty

	Lower middle Income					Upper middle Income		Range of income group share	Median (share)	Mean (share)
Five income groups (fifths)	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**CHN**	**MEX**	**Min-Max (%)**		
Number of people avoiding catastrophic expenditures from treatment related costs (in millions)										
Q1 (bottom 20%)	0.43	0.64	0.07	0.23	0.11	2.78	0.16	24-34	29	27
Q2	0.55	0.50	0.11	0.19	0.09	2.95	0.16	24-31	26	27
Q3	0.41	0.43	0.08	0.14	0.08	2.07	0.15	18-23	22	21
Q4	0.29	0.34	0.12	0.09	0.04	1.12	0.13	11-19	16	16
Q5 (top 20%)	0.16	0.16	0.05	0.04	0.03	0.58	0.06	6-10	8	8
Total=15.5	1.83	2.07	0.44	0.70	0.35	9.49	0.66			
Q1/Q5	**2.6**	**3.9**	**1.3**	**5.5**	**4.1**	**4.8**	**2.5**			
Number of people averting poverty from treatment related costs (in millions)										
Q1 (bottom 20%)	0.38	0.59	0.06	0.22	0.11	2.69	0.16	16-68	37	38
Q2	0.55	0.50	0.11	0.16	0.08	0.91	0.16	23-37	31	31
Q3	0.35	0.43	0.08	0.12	0.01	0.18	0.12	5-27	21	18
Q4	0.22	0.08	0.11	0.07	<0.01	0.10	0.04	2-12	8	10
Q5 (top 20%)	0.13	0.02	0.01	<0.01	<0.01	0.05	0.02	0-4	1	2
Total=8.8	1.63	1.62	0.37	0.57	0.20	3.93	0.50			
Q1/Q5	**0.2**	**0.4**	**0.2**	**0.4**	**0.5**	**0.7**	**0.3**			

Note: India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam (VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL). We only include countries with low UHC. We did not include Armenia because of negligible estimates.

Appendix Table 3a: Sensitivity Analysis- additional life years gained (in millions)

	Lower middle Income						Upper middle Income									
Five income groups (fifths)	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**ARM**	**CHN**	**MEX**	**BRA**	**TUR**	**COL**	**CHL**	**THA**	**Range of income group share Min- Max (%)**	**Median (share)**	**Mean (share)**
25%																
Q1	6.1	11.2	2.7	2.7	2.8	0.1	41.8	1.9	3.3	1.6	0.5	0.4	2.2	26-40	31	33
Q2	6.8	7.9	2.4	2.0	2.0	0.1	35.8	1.9	2.2	1.7	0.4	0.4	2.1	26-32	28	29
Q3	4.7	4.8	1.6	1.4	1.2	0.1	24.6	1.3	1.3	1.5	0.3	0.4	1.3	17-25	20	20
Q4	3.0	3.2	1.3	0.9	0.8	<0.05	12.3	0.9	0.9	0.9	0.2	0.3	0.7	10-16	12	13
Q5	1.6	1.2	0.5	0.4	0.4	<0.05	6.0	0.5	0.3	0.3	0.1	0.1	0.2	2-8	5	5
Total	**22.3**	**28.3**	**8.6**	**7.3**	**7.1**	**0.2**	**120.5**	**6.4**	**8.0**	**6.1**	**1.5**	**1.5**	**6.5**			
50%																
Q1	12.3	22.5	5.4	5.3	5.6	0.1	83.6	3.7	6.5	3.3	0.9	0.8	4.5	26-40	31	33
Q2	13.7	15.8	4.8	4.0	4.1	0.1	71.6	3.8	4.5	3.4	0.8	0.8	4.2	26-32	28	29
Q3	9.4	9.7	3.3	2.8	2.4	0.1	49.2	2.5	2.7	3.1	0.7	0.7	2.6	17-25	20	20
Q4	6.0	6.3	2.7	1.8	1.5	0.1	24.6	1.9	1.8	1.8	0.4	0.5	1.5	10-33	13	17
Q5	3.2	2.5	1.1	0.8	0.7	<0.05	12.0	0.9	0.6	0.7	0.2	0.3	0.3	2-8	5	5
Total	**44.7**	**56.8**	**17.2**	**14.7**	**14.3**	**0.5**	**241.0**	**12.8**	**16.1**	**12.2**	**3.0**	**3.1**	**13.0**			
100%																
Q1	24.6	44.9	10.8	10.6	11.2	0.3	167.0	7.4	13.0	6.5	1.8	1.6	9.0	26-40	31	33
Q2	27.3	31.6	9.6	8.1	8.1	0.3	143.0	7.5	8.9	6.8	1.7	1.6	8.4	26-32	28	29
Q3	18.9	19.4	6.6	5.6	4.8	0.2	98.4	5.1	5.4	6.1	1.3	1.4	5.1	17-25	20	20
Q4	12.0	12.6	5.4	3.5	3.1	0.1	49.2	3.8	3.7	3.6	0.8	1.0	2.9	10-16	12	13
Q5	6.4	4.9	2.1	1.5	1.4	<0.05	24.0	1.9	1.2	1.3	0.4	0.5	0.6	2-8	5	5
Total	**89.2**	**113.4**	**34.4**	**29.3**	**28.6**	**1.0**	**481.6**	**25.7**	**32.2**	**24.3**	**6.0**	**6.2**	**26.0**			
50% (country-specific elasticity)																
Q1	10.7	16.8	6.6	11.6	7.4	0.2	113.0	4.8	6.1	3.2	1.8	0.4	4.4	26-40	31	33
Q2	11.9	11.9	5.9	8.8	5.4	0.2	96.6	4.9	4.2	3.3	1.6	0.4	4.1	26-32	28	29
Q3	8.2	7.3	4.0	6.1	3.2	0.1	66.4	3.3	2.5	3.0	1.3	0.4	2.5	17-25	20	20
Q4	5.2	4.7	3.3	3.8	2.0	0.1	33.2	2.4	1.7	1.8	0.8	0.3	1.4	10-52	13	18
Q5	2.8	1.8	1.3	1.7	0.9	<0.05	16.2	1.2	0.6	0.6	0.4	0.1	0.3	2-8	5	5
Total	**38.8**	**42.6**	**21.1**	**31.9**	**18.9**	**0.7**	**325.4**	**16.7**	**15.1**	**11.9**	**5.9**	**1.6**	**12.8**			

Note: India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL). We only include countries with low UHC. We did not include Armenia because of negligible estimates.

Appendix Table 3b: Sensitivity Analysis- Additional tax revenue (in billions)

	Lower middle Income						Upper middle Income							Range of income group share	Median (share)	Mean (share)
Five income groups (fifths)	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**ARM**	**CHN**	**MEX**	**BRA**	**TUR**	**COL**	**CHL**	**THA**	**Min- Max (%)**		
25%																
Q1	0.7	2.0	0.2	0.2	0.4	<0.05	8.2	0.3	0.2	0.8	<0.05	0.1	0.5	9-27	15	15
Q2	1.2	2.0	0.3	0.2	0.3	<0.05	10.3	0.4	0.4	1.5	<0.05	0.2	0.6	16-24	19	19
Q3	1.2	2.3	0.3	0.2	0.3	<0.05	9.7	0.3	0.6	2.1	0.1	0.2	0.5	15-26	20	21
Q4	1.5	3.0	0.5	0.2	0.3	<0.05	7.6	0.5	0.5	2.2	0.1	0.2	0.7	17-27	24	23
Q5	2.0	2.0	0.5	0.2	0.3	<0.05	8.5	0.5	0.4	1.8	0.1	0.3	0.4	15-31	20	21
Total	**6.6**	**11.3**	**1.9**	**1.0**	**1.6**	**0.2**	**44.2**	**2.1**	**2.2**	**8.4**	**0.3**	**1.0**	**2.7**			
50%																
Q1	0.9	2.1	0.2	0.2	0.5	<0.05	9.5	0.3	0.2	0.6	<0.05	0.1	0.4	5-22	10	11
Q2	1.6	2.6	0.4	0.2	0.4	0.1	14.2	0.5	0.5	1.6	0.1	0.2	0.8	13-21	17	17
Q3	1.9	3.4	0.5	0.3	0.4	0.1	14.9	0.4	0.8	2.8	0.1	0.2	0.8	16-26	21	21
Q4	2.5	4.8	0.8	0.4	0.5	0.1	12.7	0.8	0.8	3.2	0.1	0.3	1.0	19-30	27	26
Q5	3.5	3.4	0.8	0.3	0.5	0.1	15.0	0.9	0.7	2.9	0.1	0.4	0.7	19-35	23	26
Total	**10.4**	**16.4**	**2.6**	**1.5**	**2.4**	**0.3**	**66.3**	**2.9**	**3.1**	**11.1**	**0.4**	**1.3**	**3.6**			
100%																
Q1	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0-4	0	1
Q2	1.3	1.5	0.1	0.1	0.4	<0.05	10.4	0.1	0.2	0.1	<0.05	<0.05	0.2	0-14	7	7
Q3	2.3	3.9	0.4	0.4	0.6	0.1	18.3	0.4	0.9	2.6	0.1	0.2	0.8	14-25	21	20
Q4	3.8	7.2	1.1	0.5	0.8	0.1	19.5	1.1	1.2	4.5	0.1	0.5	1.5	26-40	34	33
Q5	6.2	6.0	1.4	0.6	0.9	0.1	26.4	1.5	1.3	4.7	0.2	0.8	1.2	31-51	35	38
Total	**13.5**	**18.6**	**3.0**	**1.6**	**2.7**	**0.3**	**74.6**	**3.1**	**3.6**	**11.9**	**0.5**	**1.5**	**3.7**			
50% (country-specific elasticity)																
Q1	1.1	3.4	<0.05	<0.05	0.3	<0.05	3.0	<0.05	0.3	0.7	<0.05	0.3	0.4	0-17	8	6
Q2	1.8	3.5	0.2	<0.05	0.3	<0.05	8.6	0.3	0.6	1.7	<0.05	0.4	0.8	0-21	17	14
Q3	2.0	4.0	0.4	<0.05	0.4	<0.05	11.5	0.3	0.8	2.9	<0.05	0.4	0.8	5-26	19	19
Q4	2.6	5.3	0.7	0.2	0.5	0.1	11.1	0.7	0.9	3.3	0.1	0.4	1.0	22-40	27	29
Q5	3.6	3.6	0.8	0.3	0.5	0.1	14.2	0.8	0.7	2.9	0.1	0.5	0.7	18-64	27	32
Total	**11.1**	**19.8**	**2.1**	**0.5**	**1.9**	**0.2**	**48.4**	**2.1**	**3.3**	**11.4**	**0.2**	**2.0**	**3.7**			

Note: India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam (VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL)

Appendix Table 3c: Sensitivity Analysis- Number of treatment cost averted (in billions)

			Lower middle Income						Upper middle Income					Range of income group share Min- Max (%)	Median (share)	Mean (share)
Five income groups (fifths)	**IND**	**IDN**	**BGL**	**PHL**	**VNM**	**ARM**	**CHN**	**MEX**	**BRA**	**TUR**	**COL**	**CHL**	**THA**			
25%																
Q1	0.4	2.1	<0.05	0.3	0.1	<0.05	16.7	1.1	0.9	0.2	0.2	0.2	0.4	16-34	29	28
Q2	0.5	1.6	0.1	0.3	0.1	<0.05	17.7	1.1	0.9	0.3	0.2	0.2	0.4	24-32	27	27
Q3	0.4	1.4	0.0	0.2	0.1	<0.05	12.4	1.0	0.6	0.3	0.1	0.2	0.3	19-26	22	22
Q4	0.3	1.1	0.1	0.1	0.1	<0.05	6.7	0.8	0.4	0.2	0.1	0.2	0.1	11-27	15	16
Q5	0.2	0.5	0.0	0.1	0.0	<0.05	3.5	0.4	0.1	0.1	0.0	0.1	<0.05	2-12	7	7
Total	**1.7**	**6.7**	**0.3**	**1.0**	**0.5**	**<0.05**	**57.0**	**4.4**	**3.0**	**1.0**	**0.6**	**1.0**	**1.3**			
50%																
Q1	0.8	4.1	0.1	0.6	0.3	<0.05	33.4	2.2	1.9	0.4	0.4	0.5	0.9	16-34	29	28
Q2	1.0	3.2	0.1	0.5	0.2	<0.05	35.5	2.3	1.7	0.6	0.4	0.5	0.8	24-32	27	27
Q3	0.8	2.8	0.1	0.4	0.2	<0.05	24.9	2.0	1.2	0.5	0.3	0.4	0.5	19-26	22	22
Q4	0.5	2.2	0.1	0.3	0.1	<0.05	13.4	1.6	0.9	0.3	0.2	0.4	0.3	11-27	15	16
Q5	0.3	1.1	0.1	0.1	0.1	<0.05	7.0	0.8	0.3	0.1	0.1	0.2	0.1	2-12	7	7
Total	**3.5**	**13.4**	**0.5**	**2.0**	**0.9**	**0.1**	**114.2**	**8.8**	**5.9**	**2.0**	**1.2**	**2.0**	**2.6**			
100%																
Q1	1.6	8.2	0.2	1.3	0.6	<0.05	66.8	4.3	3.7	0.9	0.7	0.9	1.8	16-34	29	28
Q2	2.1	6.4	0.3	1.1	0.5	<0.05	70.9	4.5	3.4	1.1	0.7	1.0	1.7	24-32	27	27
Q3	1.6	5.5	0.2	0.8	0.4	<0.05	49.8	4.0	2.3	1.1	0.5	0.9	1.0	19-26	22	22
Q4	1.1	4.4	0.3	0.5	0.2	<0.05	26.9	3.2	1.8	0.6	0.3	0.7	0.6	11-27	15	16
Q5	0.6	2.1	0.1	0.2	0.1	<0.05	14.0	1.6	0.6	0.3	0.2	0.4	0.1	2-12	7	7
Total	**7.0**	**26.7**	**1.0**	**3.9**	**1.8**	**0.1**	**228.4**	**17.7**	**11.8**	**4.0**	**2.5**	**4.0**	**5.1**			
50% (country-specific elasticity)																
Q1	0.7	3.1	0.1	1.4	0.4	<0.05	45.1	2.8	1.7	0.4	0.7	0.2	0.9	16-34	29	28
Q2	0.9	2.4	0.2	1.2	0.3	<0.05	47.9	2.9	1.6	0.6	0.7	0.3	0.8	24-32	27	27
Q3	0.7	2.1	0.1	0.9	0.3	<0.05	33.6	2.6	1.1	0.5	0.5	0.2	0.5	19-26	22	22
Q4	0.5	1.6	0.2	0.6	0.2	<0.05	18.1	2.1	0.8	0.3	0.3	0.2	0.3	11-27	15	16
Q5	0.3	0.8	0.1	0.3	0.1	<0.05	9.4	1.1	0.3	0.1	0.2	0.1	0.1	2-12	7	7
Total	**3.0**	**10.0**	**0.6**	**4.3**	**1.2**	**0.1**	**154.1**	**11.5**	**5.5**	**1.9**	**2.4**	**1.0**	**2.5**			

Note: India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam (VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL)

Appendix Table 3d: Sensitivity Analysis- Number of individuals averting catastrophic expenditures from treatment related costs (in millions)

Five income groups (fifths)	Lower middle Income					Upper middle Income		Range of income group share Min- Max (%)	Median (share)	Mean (share)
	IND	IDN	BGL	PHL	VNM	CHN	MEX			
25%										
Q1	0.21	0.32	0.03	0.11	0.06	1.39	0.08	16-33	29	27
Q2	0.27	0.25	0.06	0.10	0.04	1.47	0.08	24-31	26	27
Q3	0.20	0.21	0.04	0.07	0.04	1.03	0.08	19-23	22	21
Q4	0.14	0.17	0.06	0.05	0.02	0.56	0.06	12-27	16	16
Q5	0.08	0.08	0.03	0.02	0.01	0.29	0.03	6-12	8	8
Total	**0.92**	**1.03**	**0.22**	**035**	**0.17**	**4.75**	**0.33**			
50%										
Q1	0.43	0.64	0.07	0.23	0.11	2.78	0.16	16-33	29	27
Q2	0.55	0.50	0.11	0.19	0.09	2.95	0.16	24-31	26	27
Q3	0.41	0.43	0.08	0.14	0.08	2.07	0.15	19-23	22	21
Q4	0.29	0.34	0.12	0.09	0.04	1.12	0.13	12-27	16	16
Q5	0.16	0.16	0.05	0.04	0.03	0.58	0.06	6-12	8	8
Total	**1.83**	**2.07**	**0.44**	**0.70**	**0.35**	**9.49**	**0.66**			
100%										
Q1	0.86	1.28	0.14	0.46	0.23	5.55	0.31	16-33	29	27
Q2	1.09	1.00	0.23	0.38	0.18	5.90	0.33	24-31	26	27
Q3	0.81	0.86	0.17	0.29	0.15	4.14	0.31	19-23	22	21
Q4	0.57	0.68	0.23	0.18	0.09	2.23	0.25	12-27	16	16
Q5	0.33	0.33	0.11	0.08	0.06	1.16	0.12	6-12	8	8
Total	**3.66**	**4.14**	**0.87**	**1.40**	**0.70**	**18.98**	**1.32**			
50% country specific elasticity										
Q1	0.37	0.48	0.15	0.50	0.15	3.75	0.20	23-33	31	29
Q2	0.48	0.37	0.12	0.42	0.12	3.98	0.21	24-31	25	27
Q3	0.35	0.32	0.10	0.31	0.10	2.79	0.20	21-23	22	22
Q4	0.25	0.25	0.06	0.20	0.06	1.51	0.16	12-19	13	14
Q5	0.14	0.12	0.04	0.09	0.04	0.78	0.08	6-9	8	8
Total	**1.59**	**1.55**	**0.46**	**1.52**	**0.46**	**12.81**	**0.86**			

Note: India(IND); Indonesia (IDN); Bangladesh (BGD); Philippines (PHL); Vietnam (VNM); Armenia (ARM): China (CHN); Mexico (MEX); Turkey (TUR); Brazil (BRA); Colombia (COL); Thailand (THA); Chile (CHL)

Appendix Table 4: Estimated impact excluding China and India and including females in Colombia Mexico and Chile

Indicators	13 countries (main analysis)	12 countries (excluding China)	11 countries (excluding China and India)	11 countries (excluding China and India but including females in Chile, Colombia and Mexico)
Number of smokers (in millions)	490	199	153	160
Number of life-years gained (in millions)	449	208	164	171
Disease cost averted (in billion USD) PPP-adjusted	157	43	39	44
Marginal tax gained (in billion USD) PPP-adjusted	122	55	45	47
Number of individuals averting catastrophic expenditure (Q1/Q5)	18.2	18.5	22.2	19.0
Number of individuals averting poverty (Q1/Q5)	4.0	3.2	3.5	3.3

Appendix Table 5: Estimated number of resources to achieve 5% government health expenditure/GDP and SDG

Countries	Government health expenditure		Share of government health expenditure to GDP	Estimated government health expenditure to reach 5% of the current GDP		Deficit per capita (in USD)	Additional revenue		Share of additional revenue to deficit	Share of additional revenue needed to reach 2030 health SDGs
	Total (in million USD)	per capita		Total	per capita		Total (in million USD)	per capita		
India	29 538	23	1.4%	104 442	80	57	3 548	4	7%	1%
Indonesia	9 674	38	1.1%	43 097	167	130	7 779	35	27%	7%
Bangladesh	1 385	9	0.7%	9 754	61	52	901	6	11%	1%
Philippines	4 667	46	1.6%	14 623	145	99	804	6	6%	1%
Vietnam	7 058	77	3.6%	9 680	106	29	983	11	37%	2%
Armenia	210	69	2.0%	526	174	105	119	36	35%	8%
China	321 085	234	2.9%	553 233	403	169	41 065	27	16%	6%
Mexico	44 528	351	3.9%	57 190	450	100	1 427	11	11%	2%
Thailand	12 034	177	3.0%	19 758	291	114	1 233	24	21%	6%
Chile	10 098	563	4.2%	12 040	671	108	924	40	37%	10%
Turkey							3 046	65	NA	16%
Brazil			already attained the target threshold				2 763	14	NA	4%
Colombia							162	4	NA	1%
Median	**9886**	**73**	**2.4%**	**17191**	**171**	**103**	**1108**	**18**	**19%**	**4%**

Derivation of outcomes

We estimated the impact of a 50% price increase in cigarette prices on the following health and financial outcomes for each of the 13 countries:

a. Baseline number of male smokers by age and five income groups (fifths)
b. Years of life gained after price intervention
c. Treatment cost averted
d. Individuals averting catastrophic health expenditures and poverty
e. Additional tax revenue

Baseline number of male smokers by age and five income groups (fifths)

Data Sources: (1) 2015 population from UN Population Division; (2) smoking prevalence, by five income groups (fifths) and age-group (5-year) from GATS and similar local surveys.

We defined a current smoker as one who smokes cigarettes either daily or at least once every week. We focused only on manufactured cigarettes and not on bidis, small and locally-grown cigarettes sold commonly in India and Bangladesh. We used asset index as measure of income. For countries without readily (Available asset index in their respective surveys, we used educational attainment as proxy, and applied the relative prevalence of smoking among illiterate or completion of primary, secondary or high school or college. The following countries have readily: Available asset index: Bangladesh (GATS) Philippines (National Nutrition Survey 2013), Chile Colombia (National Government of the Republic of Colombia. Estudio Nacional de Consumo de Sustancias Psicoactivas 2013-2014), and Mexico (GATS).

Procedure:

In each income group (i) and for each 5-year age group (a), we applied the estimates of smoking prevalence, $Prev_{a,i}$ from the most recent rounds of the Global Adult Tobacco Survey (GATS) or similar nationally representative survey for all $a > 15$. For future smokers i.e. $a < 15$ we assume the same smoking prevalence as for the 15-19 year olds. If P is the population and $P_{i,a}$ is the smoking prevalence of income group i and age group a, then the baseline number, bl of smokers, $Sk_{bl,i,a}$ can be calculated by the following formula:

$$Smk_{\ bl,i,a} = P_{i,a} Prev_{a,i} \qquad \text{(i)}$$

Years of life gained after price intervention

Data Sources: (1) risk-reduction by age-group from Verguet et al; [(81) and (2) model-based estimates from the IHME's Global Burden of Disease.

Procedure*:*

A price increase results in reduction of number of smokers and is subject to the responsiveness of smoker to price change. The price elasticity, ϵ of a smoker in turn is influenced by a and i. As per the literature, the ϵ for cigarettes is about -0.4 meaning a 50% price increase will reduce smoking by about 20%.[82,83] Of this reduction, about half (10%) is attributable to participation elasticity i.e. quitting by current smokers and half to demand elasticity resulting in less amount smoked. Consistent with the published literature showing greater price responsiveness in the young and among the poor[82,83], we doubled the national ϵ among younger smokers (15-24 years old), and also applied this higher price elasticity to future smokers below 15 years old that have not yet started to smoke.[84,85] Similarly, we used a relative weighted price elasticity matrix by income and age drawn from existing studies with the smokers in the bottom fifth (20%) of the population being more price responsive compared to the top fifth. Therefore, the number of quitters is estimated by:

$Quit_{\ i,a} = Smk_{\ bl,i,a} - Smk_{\ cur,i,a}$, where;

$$Smk_{\ cur,i,a} = Smk_{\ bl,i,a}\left(\frac{1}{2}\epsilon_p \frac{\Delta price}{price} + 1\right) \qquad \text{(ii)}$$

Among persistent smokers, about half of prolonged smokers who do not quit are killed by smoking. This risk is particularly relevant to smokers below age 35 years in LMIC who are likely to have smoked from early in adult life. [86] Here, we conservatively assumed half of current and future smokers would be killed, given that smoking cessation rates in most LMICs are far lower than that in high-income countries. [86,87] Reductions in the excess (all-cause) mortality from smoking are greatest in smokers who quit early in life (and naturally in those who do not start). We applied age-specific benefits of cessation from epidemiological studies in the US and the UK among men and women, [77,88,89] corresponding roughly 97% of smokers avoided excess mortality by quitting by at 15-44 to about 25% avoided excess mortality by quitting by age 65 years. We adopted the risk reduction estimates $RR(a)$ by age group from Verguet et al. Further, we

fitted a cubic spline to derive the age-specific life years gained from smoking cessation for all ages $Y(a)$. [81] To be conservative, we ignored the beneficial effects of reduced smoking amount. We proportioned the reductions in overall mortality across income groups and across four main causes of smoking-related mortality: chronic obstructive pulmonary disease (COPD), stroke, heart disease and tobacco attributable cancers from model-based estimates from the Global Burden of Disease. [15] For China and India, we were able to compare the GBD with direct large epidemiological studies, which yielded generally consistent results for male smoking deaths, but not for women where the GBD estimated wrongly that about 8% of Chinese adult female deaths are due to smoking when the prevalence of adult female smoking is only 2% and even lower in the cohort of women born after 1950. [89] This discrepancy did not, however affect the calculations for males. The total deaths averted are estimated by:

$$D_{averted,i} = (\tfrac{1}{2}\textstyle\sum_{a=1}^{18} Quit_{i,a})\ RR(a) \qquad \text{(iii)}$$

Further, the life years gained (LYG) are estimated by:

$$LYG_{i,a} = \left(Quit_{i,a}\right) Y(a) \qquad \text{(iv)}$$

Treatment cost averted

Data Sources: (1) treatment cost, insurance coverage rate, financial support, and healthcare utilization were obtained from peer-reviewed journals and country reports; (2) Purchasing Power Parity (PPP) adjustment factor, and Consumer Price Index were obtained from World Bank

Procedure:

We calculated the treatment cost averted by smokers who quit after price intervention. We obtained local treatment cost estimates, C_d for each of the 4 disease conditions d each country. To equalize the purchasing power of local currencies, we adjusted our cost estimates using a 2015 PPP conversion factor. We estimated the averted total healthcare expenditure (treatment cost), $TC_{averted,i,d}$ conditional to seeking health-care or being ill, HC using the following formula:

$$TC_{averted,i,d} = D_{averted,i,d}\ C_d HC_{i,d} \qquad \text{(v)}$$

We also derived the averted OOP health expenditure, $OOP_{averted,i,d}$ by adjusting the treatment cost with coverage rate of the publicly-funded system, Cov, probability of seeking health-care conditional on being ill, HC, and the percentage of total costs covered by the public healthcare system, $Copay$:

$$OOP_{averted,i,d} = D_{averted,i,d}\ HC_{i,d}\ EC \text{ where, } EC = Cov\ Copay\ C_d \qquad \text{(vi)}$$

Individuals averting catastrophic health expenditures and poverty

Data Sources: (1) Gini Coefficient from the World Bank; (2) average household income capita (2015) were obtained from statistical offices of countries (PPP-adjusted).

Procedure:

Individuals averting catastrophic health expenditures i.e. greater than 10% of their income, attributable to tobacco: We applied the World Bank definition of poverty i.e. earn less than US$ 1.9 /day/capita, World Health Organization's definition of catastrophic health expenditures meaning when out-of-pocket treatment costs exceed 10% of an individual's income for our analysis. We used average household income per capita obtained from statistics offices of respective countries and Gini Coefficient from World Bank to construct gamma distribution of per capita household income.[90] The probability $P_{i,d}$ of individuals falling into poverty or incurring catastrophic health expenditures was derived from this distribution of household income. We estimated the total number of individuals having catastrophic health care expenditures attributed to out-of-pocket cost $C_d EC$ that would be averted by a 50% increase in price by following formula:

$$\textstyle\sum_d D_{averted,i,d}\ P_{i,d} HC_{i,d}$$

Additional tax revenue

Data Sources: (1) price of most sold brand cigarette, and the share of tax to retail price from the World Health Organization; (2) average number of cigarette of current smokers from GATS.

Procedure:
The tax collected at the baseline is given by the formula:

$Total\ tax_{bl,q} = Smk_{\ bl,i,a}\left(365\frac{Cig_q}{20}\right)TR_{bl}$ and, (vii)

$Total\ tax_{post,q} = Smk_{\ cur,i,a}\left(365\frac{Cig_q}{20}\right)TR_{new}$, where; (viii)

Cig_q is the average number of sticks consumed by smokers in income group q, TR_{bl} is the tax rate per pack of cigarettes at the baseline, and TR_{new} is the new tax rate post price increase. Thus, marginal tax revenues, $MTax_i$ gained is given by:

$MTax_i = Total\ tax_{post,q} - Total\ tax_{post,q}$ (ix)

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