

Global consumption of prescription opioid analgesics between 2009-2019

Supplementary material

Table S1: IQVIA MIDAS data availability – 2009 to 2019

Country (market share*)	Hospital	Retail	Country (market share*)	Hospital	Retail
ALGERIA (80%)	-	2009-2019	LEBANON (77%)	-	2009-2019
ARGENTINA (73%)	-	2009-2019	LITHUANIA	2009-2019	2009-2019
AUSTRALIA	2009-2019	2009-2019	LUXEMBOURG (97%)	-	2009-2019
AUSTRIA	2009-2019	2009-2019	MALAYSIA	2009-2019	2009-2019
BANGLADESH (85%)	-	2009-2020	MEXICO	2009-2019	2009-2019
BELARUS	2009-2019	2009-2019	MOROCCO (88%)	-	2009-2019
BELGIUM	2009-2019	2009-2019	NETHERLANDS	2009-2019	2011-2019
BOSNIA (75%)	-	2011-2019	NEW ZEALAND	2009-2019	2009-2019
BRAZIL	2009-2019	2009-2019	NORWAY	2009-2019	2009-2019
BULGARIA	2009-2019	2009-2019	PAKISTAN (85%)	-	2009-2019
CANADA	2009-2019	2009-2019	PERU (67%)	-	2009-2019
CENTRAL AMERICA (77%)	-	2009-2019	PHILIPPINES	2009-2019	2009-2019
CHILE (71%)	-	2009-2019	POLAND	2009-2019	2009-2019
CHINA	2009-2019	2011-2019	PORTUGAL	2010-2019	2009-2019
COLOMBIA (71%)	-	2009-2019	PUERTO RICO	2009-2019	2009-2019
CROATIA	2009-2019	2009-2019	ROMANIA	2009-2019	2009-2019
CZECH REPUBLIC	2009-2019	2009-2019	RUSSIA	2009-2019	2009-2019
DENMARK	2009-2019	2009-2019	SAUDI ARABIA	2009-2019	2009-2019
DOMINICAN REPUBLIC (78%)	-	2009-2019	SERBIA (76%)	-	2011-2019
ECUADOR (75%)	-	2009-2019	SINGAPORE	2009-2019	2009-2019
EGYPT (75%)	-	2009-2019	SLOVAKIA	2009-2019	2009-2019
ESTONIA (88%)	-	2009-2019	SLOVENIA (73%)	-	2009-2019
FINLAND	2009-2019	2009-2019	SOUTH AFRICA	2009-2019	2009-2019
FRANCE	2009-2019	2009-2019	SPAIN	2009-2019	2009-2019
FRENCH WEST AFRICA (86%)	-	2009-2019	SRI LANKA (58%)	-	2009-2019
GERMANY	2009-2019	2009-2019	SWEDEN	2009-2019	2009-2019
HONG KONG (36%)	-	2009-2019	SWITZERLAND	2009-2019	2009-2019
HUNGARY	2009-2019	2009-2019	TAIWAN	2009-2019	2009-2019
INDIA	2009-2019	2009-2019	THAILAND	2009-2019	2009-2019
INDONESIA (31%)	-	2009-2019	TUNISIA	2011-2019	2009-2019
IRELAND	2009-2019	2009-2019	TURKEY	2009-2019	2009-2019
ITALY	2009-2019	2009-2019	UAE (45%)	-	2009-2019
JAPAN	2009-2019	2009-2019	UK	2009-2019	2009-2019
JORDAN (71%)	-	2009-2019	UKRAINE	2010-2019	2010-2019
KAZAKHSTAN	2009-2019	2009-2019	URUGUAY (77%)	-	2009-2019
KOREA	2009-2019	2009-2019	US	2009-2019	2009-2019
KUWAIT (35%)	-	2009-2019	VENEZUELA (78%)	-	2009-2019
LATVIA	2013-2019	2009-2019	VIETNAM	2009-2019	2009-2019

*Estimated retail sector market share.

Source: IQVIA

Table S2. Consumption rates (MME per 1,000 inhabitants per day) for methadone by country income group - 2009 & 2019

	2009			2019		
	Median	IQR	95% CI	Median	IQR	95% CI
High income	52.6	9.3 – 193.0	13.4 - 128.2	54.5	10.4 - 211.0	24.7 - 147.2
Upper-middle	0.4	0.2 – 1.0	0.1 – 1.2	3.2	0.4 – 3.9	0.3 – 4.3
Low & lower-middle	NA	NA	NA	NA	NA	NA

CI - bootstrapped confidence intervals.

Figure A1. Methadone consumption trends of the high-income countries with the top six highest consumption rates in 2019.

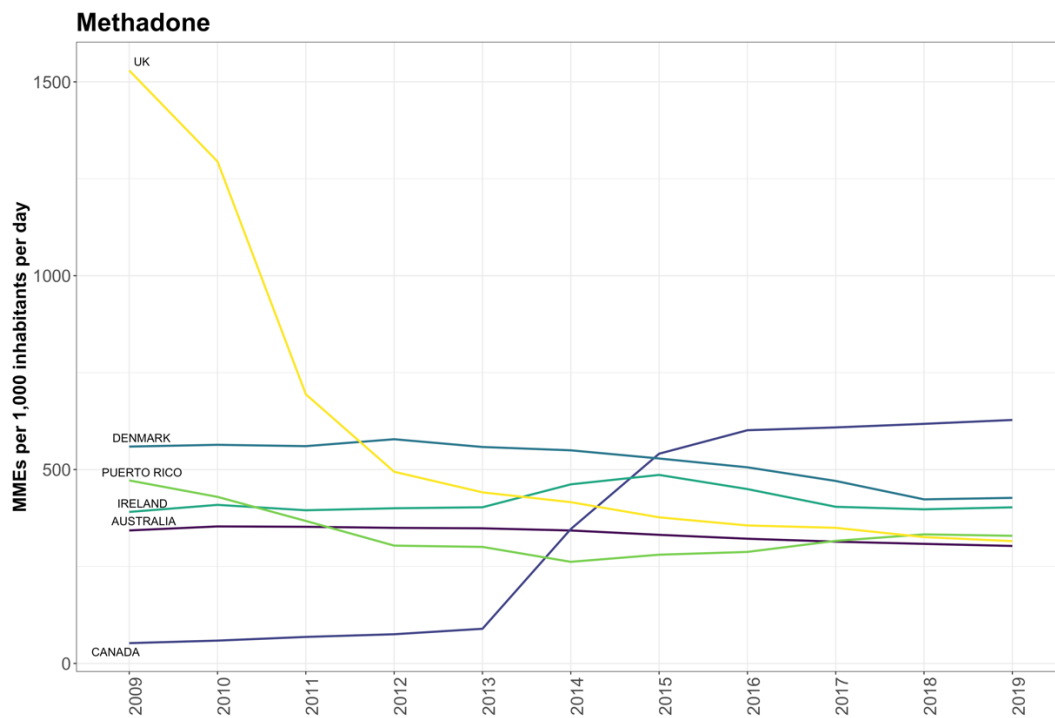


Table S3. Change in the national opioid consumption rate between 2009 and 2019 in morphine milligram equivalents (MME) per 1,000 inhabitants per day.

Country	Change in the consumption rate between 2009 & 2019	Country	Change in the consumption rate between 2009 & 2019
ALGERIA	4.77	LITHUANIA	17.70
ARGENTINA	14.03	LUXEMBOURG	-90.19
AUSTRALIA	-15.68	MALAYSIA	0.65
AUSTRIA	65.70	MEXICO	9.78
BANGLADESH	16.66	MOROCCO	7.10
BELARUS	-1.76	NETHERLANDS	264.05
BELGIUM	129.92	NEW ZEALAND	-5.74
BRAZIL	24.06	NORWAY	188.69
BULGARIA	33.82	PAKISTAN	10.37
CANADA	-606.32	PERU	2.82
CHILE	15.33	PHILIPPINES	1.21
CHINA	10.60	POLAND	229.48
COLOMBIA	10.56	PORTUGAL	408.97
CROATIA	127.39	PUERTO RICO	-72.54
CZECH REPUBLIC	175.64	ROMANIA	54.74
DENMARK	-175.16	RUSSIA	-13.94
DOMINICAN REPUBLIC	1.67	SAUDI ARABIA	5.66
ECUADOR	11.85	SINGAPORE	15.28
EGYPT	-62.01	SLOVAKIA	44.92
ESTONIA	121.59	SLOVENIA	-22.41
FINLAND	36.57	SOUTH AFRICA	63.27
FRANCE	149.68	SPAIN	500.31
GERMANY	-1544.96	SRI LANKA	0.34
HONG KONG	22.80	SWEDEN	-42.00
HUNGARY	46.16	SWITZERLAND	320.47
INDIA	2.43	TAIWAN	45.89
INDONESIA	0.76	THAILAND	10.57
IRELAND	81.96	TUNISIA	15.48
ITALY	166.09	TURKEY	5.75
JAPAN	61.84	UAE	0.08
JORDAN	-0.49	UK	90.25
KAZAKHSTAN	10.20	URUGUAY	28.17
KOREA	58.99	VENEZUELA	-9.30
KUWAIT	0.53	VIETNAM	8.44
LATVIA	77.08	FRENCH W. AFRICA	5.02
LEBANON	-16.48	CENTRAL AMERICA	14.95
USA	-1219.62		

Figure A3. Tramadol consumption trends of the upper-middle income countries (UMICs) with the top six highest consumption rates in 2019, expressed in morphine milligram equivalents per 1,000 inhabitants per day (MID).

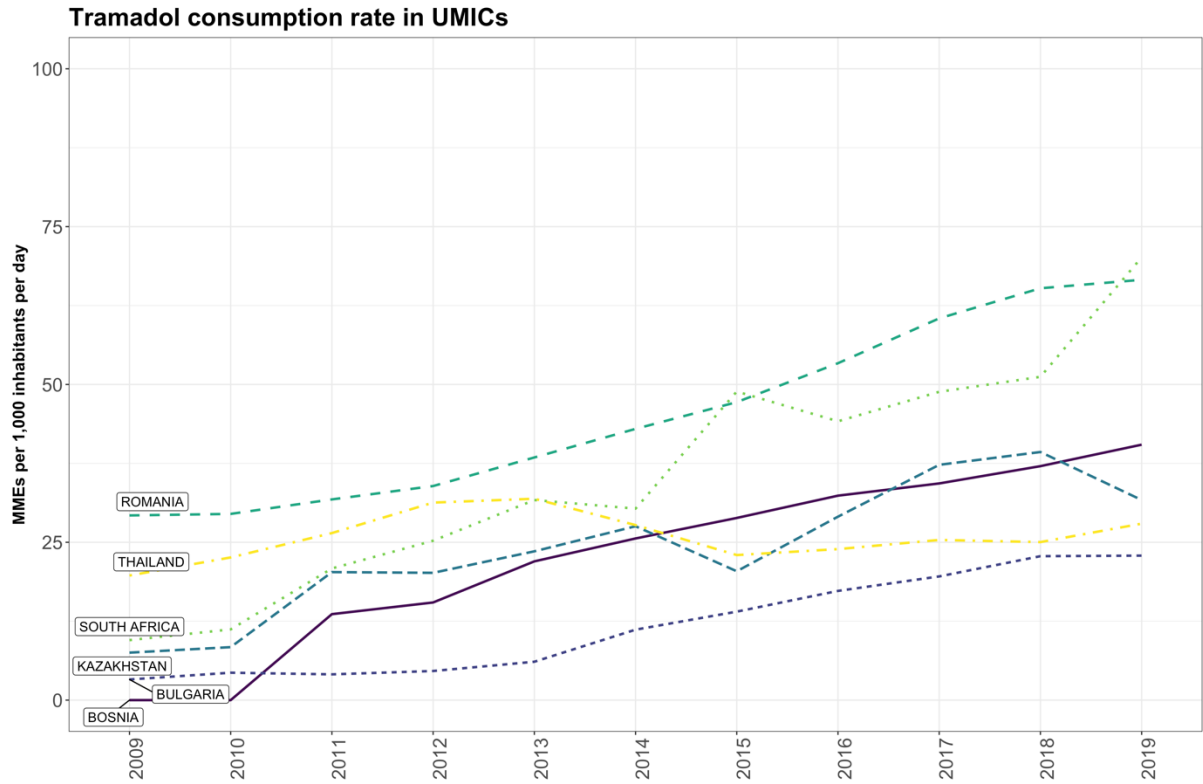


Table S4. Fixed effects regression analysis of factors associated with opioid consumption – summary statistics from 2009 - 2019

Variable	All countries	High	Upper middle	Low & lower-middle
GDP per capita, median (IQR)	23844 (12592 -41965)	40004 (28797 - 50855)	14308 (11617 - 18041)	6712 (4373 - 9713)
Imports as percentage of GDP, median (IQR)	39 (27 - 59)	41 (29 -69)	39 (26 - 56)	29 (23 - 43)
Physicians per 1,000 people, median (IQR)	2.5(1.6 – 3.4)	3.2 (2.6 – 3.8)	1.8 (1.3 – 2.3)	0.8 (0.5 – 1.0)
Urban population % of total population, median (IQR)	73 (58 - 85)	81 (69 - 88)	71 (57 - 78)	39 (33 - 50)

Abbreviations: GDP, gross domestic product; IQR, interquartile range.

Gross domestic product (GDP) per capita in current international dollars converted by purchasing power parity (PPP) conversion factor.

Appendix 1

Other opioids consumed in 2009

High income countries - 2009

Morphine, codeine, tilidine, hydromorphone, dextropropoxyphene, buprenorphine, dihydrocodeine, oxymorphone, opium, pethidine, pentazocine, diamorphine, tapentadol, butorphanol, piritramide, levomethadone, nalbuphine, ketobemidone, dipipanone, trimeperidine, levorphanol, nicomorphine, ethylmorphine, dextromoramide, eptazocine and bezitramide.

Upper-middle income countries

Bucinnazine, oxycodone, methadone, dihydrocodeine, pethidine, buprenorphine, opium, trimeperidine, butorphanol, pentazocine, nalbuphine, hydrocodone, tilidine, hydromorphone, dipipanone, dihydroetorphine and dezocine.

Low and lower-middle income countries

Methadone, morphine, buprenorphine, fentanyl, butorphanol, oxycodone, pethidine, dextromoramide, opium, hydromorphone and dihydrocodeine.

Other opioids consumed in 2019

High income countries

Morphine, codeine, tapentadol, buprenorphine, hydromorphone, tilidine, opium, dihydrocodeine, oxymorphone, butorphanol, levomethadone, diamorphine, piritramide, pethidine, nalbuphine, pentazocine, levorphanol, trimeperidine, ketobemidone, ethylmorphine, sufentanil, dipipanone, dextropropoxyphene, prosidol, eptazocine, alfentanil and bezitramide.

Upper-middle income countries

Fentanyl, methadone, dihydrocodeine, butorphanol, bucinnazine, buprenorphine, nalbuphine, tapentadol, pethidine, hydrocodone, hydromorphone, pentazocine, trimeperidine, opium, dextropropoxyphene, tilidine, eptazocine and dihydroetorphine.

Low and lower-middle income countries

Buprenorphine, fentanyl, pentazocine, dextropropoxyphene, butorphanol, opium, oxycodone, pethidine, methadone, trimeperidine, hydromorphone and oxymorphone.

Appendix 2

Figure A4. Opioid consumption rate by country for 2009 in MMEs per 1,000 inhabitants per day, after imputing missing hospital sector data

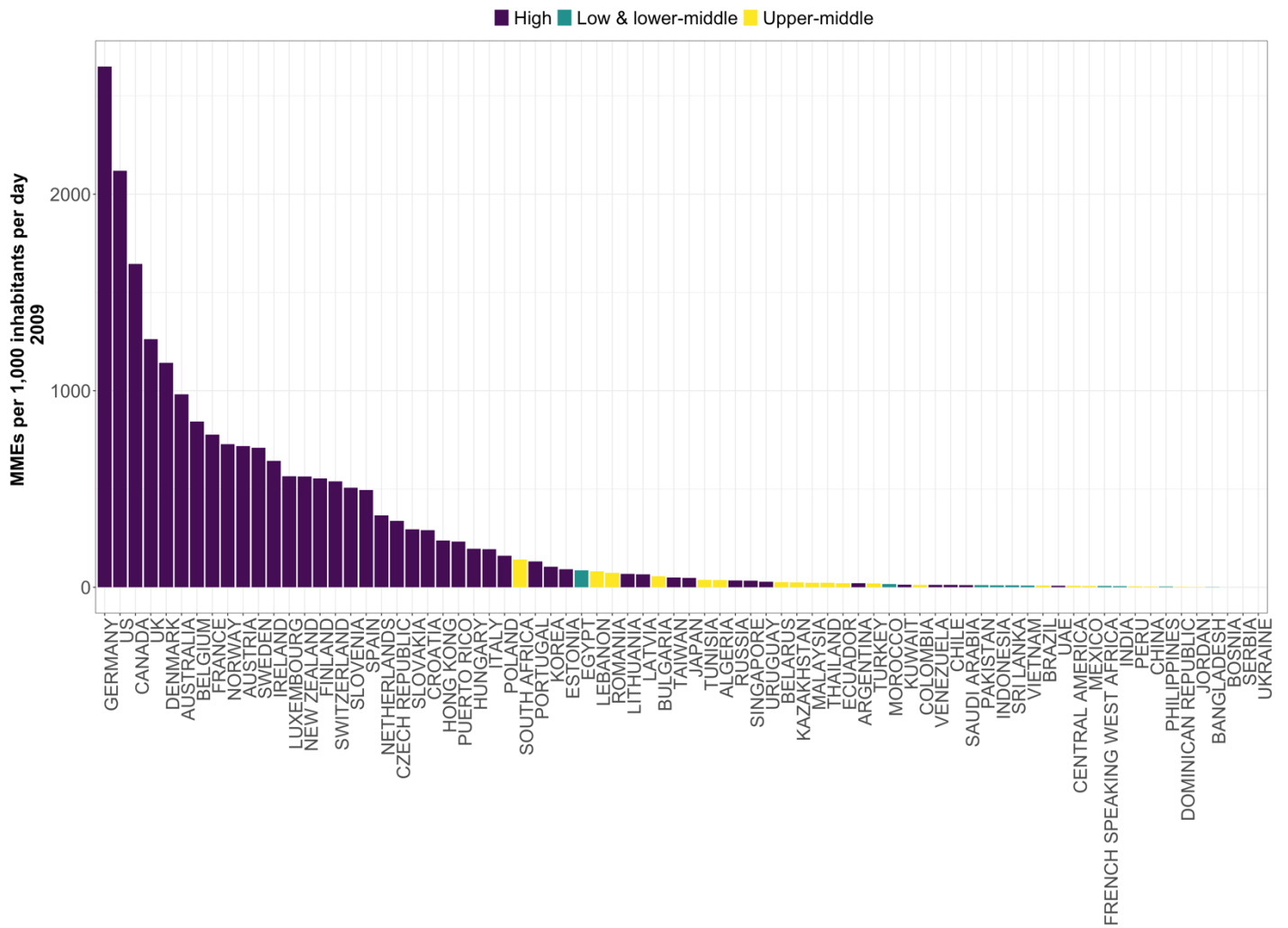


Figure A5. Opioid consumption rate by country for 2019 in MMEs per 1,000 inhabitants per day, after imputing missing hospital sector data

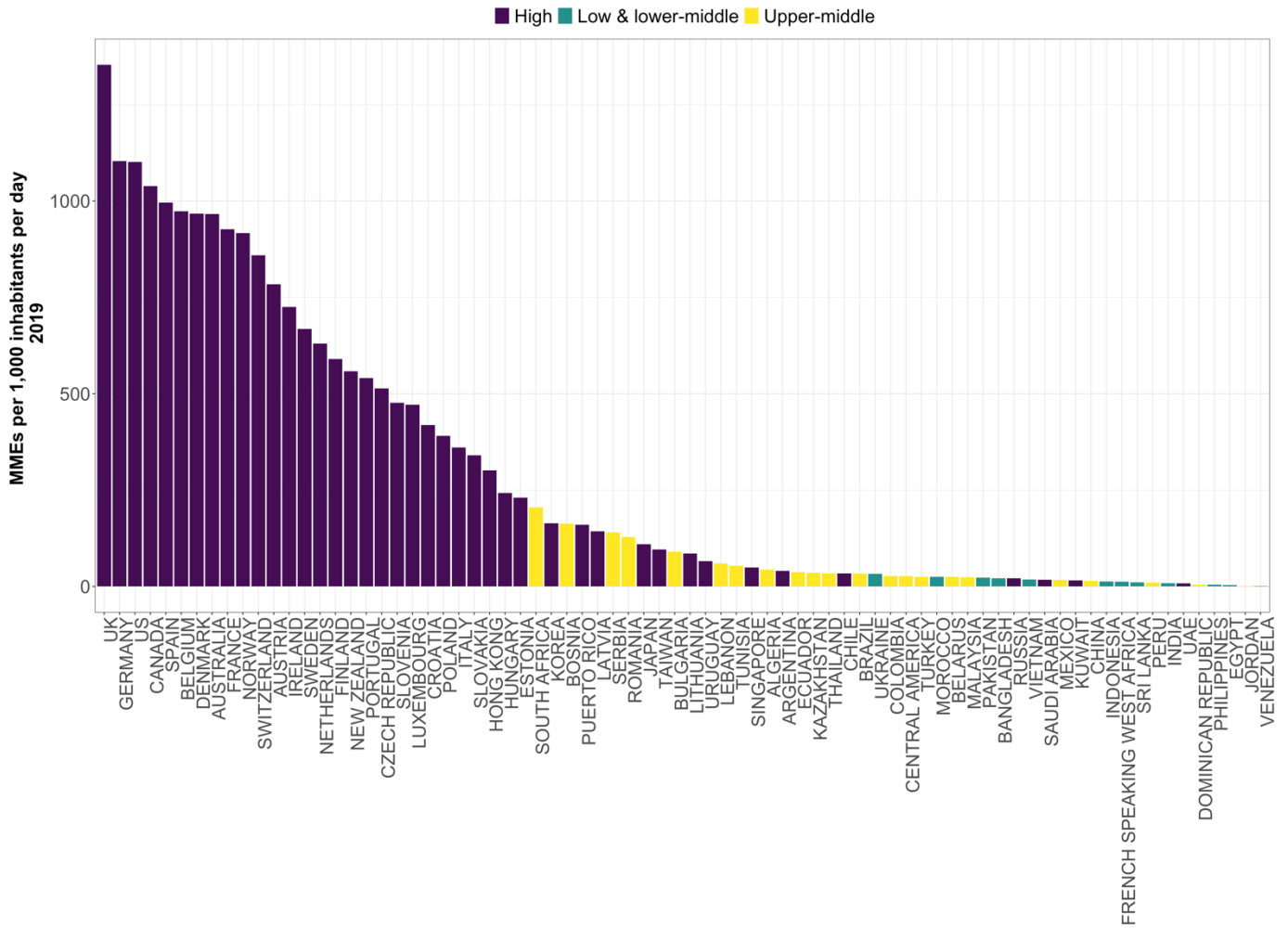


Figure A6. Median opioid consumption rate in MMEs per 1,000 inhabitants per day by country income classification, after imputing missing hospital sector data

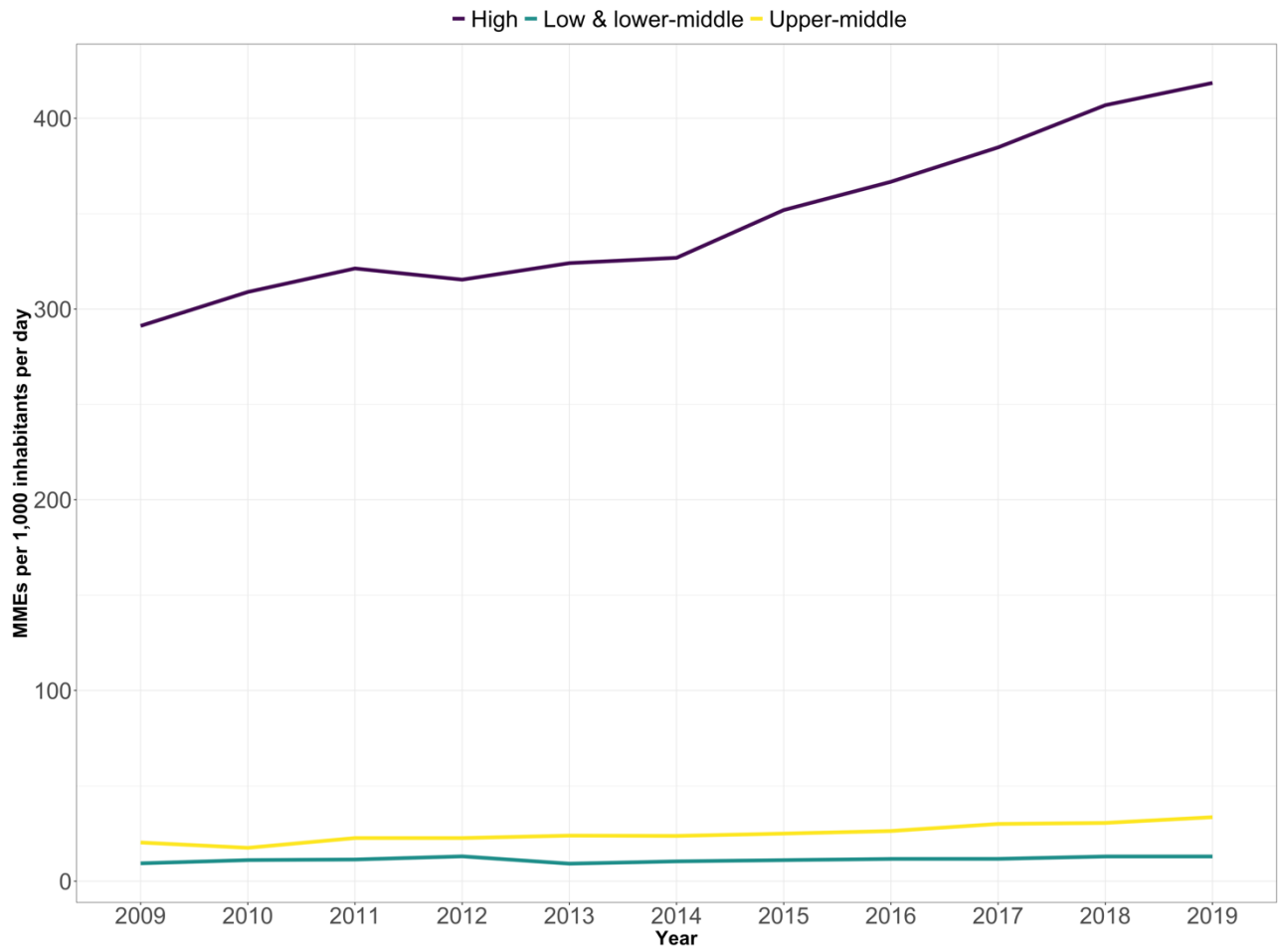


Table S5. Fixed-effects regression analysis of factors associated with global opioid consumption (MME per capita): 2009-2019, after imputing missing hospital sector data

Factor	Low & lower-middle		Upper middle		High	
	Coefficient(95% CI)	P value	Coefficient(95% CI)	P value	Coefficient(95% CI)	P value
GDP per capita(log)	-1.41(-14.5 to 11.7)	0.815	22.75(3.0 to 42.5)	0.026	-38.49(-150.7 to 73.7)	0.492
Imports as percentage of GDP (log)	8.00(-3.4 to 19.4)	0.149	16.01(0.1 to 32.0)	0.049	21.96(-66.0 to 109.9)	0.616
Physicians (per 1,000 people)	2.55(1.7 to 3.4)	0.000	1.73(-4.5 to 8.0)	0.569	0.63(-20.6 to 21.9)	0.952
Urban population (% of total population)	0.65(-0.5 to 1.8)	0.253	-0.16(-1.2 to 1.0)	0.758	12.28(-6.2 to 30.8)	0.188
Number of countries	11		22		41	
Number of observations	121		242		451	

Robust standard errors, clustered by country.

Appendix 3

Search terms used on Ovid MEDLINE for rapid scoping review

Concept 1 (Opioid analgesics)	AND	Concept2 (Prescribing/dispensing/pain management)	AND	Concept 3 (Utilisation/outcomes)
opioid\$.ti,ab,kw		prescri\$.ti,ab,kw		Utili#ation.ti,ab,kw
OR		OR		OR
opiate\$.ti,ab,kw		guideline\$.ti,ab,kw		behavio?r\$.ti,ab,kw
OR		OR		OR
analgesi\$.ti,ab,kw		guidance.ti,ab,kw		mortality.ti,ab,kw
OR		OR		OR
narcotic\$.ti,ab,kw		regulat\$.ti,ab,kw		death\$.ti,ab,kw
		OR		OR
		polic\$.ti,ab,kw		fatalit\$.ti,ab,kw
		OR		OR
		pain.ti,ab,kw		morbidity.ti,ab,kw
		OR		OR
		pain management.ti,ab,kw		dependence.ti,ab,kw
		OR		OR
		palliative.ti,ab,kw		addiction.ti,ab,kw