Report Supplementary Material 1 – Supplementary results

RQ1 – Model fit

UK

The assumption of weak exogeneity was met. We found that first differencing and MA (MA1) offered a good fit to both the daily and current prevalence data. Based on the cross-correlation function no lags were necessary.

Adjusting for seasonality did not improve the model fit in the analyses of daily (AIC: no seasonality = 189.2 versus adjusted for seasonality = 191.0) or current (AIC: no seasonality = 191.1 versus adjusted for seasonality = 193.5) use of ECs and cigarettes.

USA

A model with first differencing and one MA term offered the best fit to both daily and current prevalence data. The sample cross-correlation function indicated that no lags were necessary. A model with no seasonality adjustment offered a good fit to the current use data (AIC: no seasonality = 154.4 versus adjusted for seasonality = 156.2) as well as daily use data (AIC: no seasonality = 134.6 versus adjusted for seasonality = 135.6).

Before conducting our sensitivity analyses using ARIMAX, we checked for the presence of exogeneity using the Granger Causality test. For USA data, the test indicated that the assumption of weak exogeneity was not met; however, due to the test limitations, we assumed the test should be interpreted with caution and its findings may be due to chance.

Japan

A model with first differencing and one MA term offered a good fit to the data capturing both daily and current cigarette smoking.

South Korea

A model with first differencing and no AR or MA term offered a good fit to the data capturing current cigarette smoking while first differencing and one AR term offered the best fit for the data capturing daily cigarette smoking.

Sweden

A model with first differencing and one MA term offered the best fit to both the daily and current use data.

RQ1 – Sensitivity analyses

Supplementary Table 1. Association between prevalence of smoking and prevalence of e-cigarette use in the UK and USA – sensitivity analysis using ARIMAX

Analysis (primary or adjusted)	**b (SE), 95%CI, and p-value ARIMA (p, I, q)$_f$[a]**			
	UK (HSE)		**USA (NIHS)**	
	Daily use ARIMA (0,1,1)$_4$	**Current use ARIMA (0,1,1)$_4$**	**Daily use ARIMA (0,1,1)$_4$**	**Current use ARIMA (0,1,1)$_4$**
Primary	-0.65 (0.45) -1.53 to 0.23 p = 0.15	-0.50 (0.26) -1.01 to 0.01 p = 0.05	0.35 (0.58) -0.79 to 1.49 p = 0.55	0.15 (0.29) -0.41 to 0.72 p = 0.60
Adjusted for policies	-0.48 (0.51) -1.48 to 0.51 p = 0.34	-0.47 (0.32) -1.10 to 0.15 p = 0.14	-0.34 (0.58) -0.80 to 1.48 p = 0.56	0.16 (0.29) -0.41 to 0.73 p = 0.58
Young users (<22 years old)	**Daily use ARIMA (0,1,1)$_4$**	**Current use ARIMA (0,1,1)$_4$**	**Daily use ARIMA (0,1,1)$_4$**	**Current use ARIMA (0,1,1)$_4$**
Primary	-0.48 (0.89) -2.23 to 1.26 p = 0.59	0.27 (0.44) -0.59 to 1.13 p = 0.54	-0.60 (0.56) -1.70 to 0.51 p = 0.29	0.24 (0.28) -0.31 to 0.79 p = 0.39
Adjusted for policies	-0.60 (0.89) -2.34 to 1.14 p = 0.50	0.21 (0.43) -0.64 to 1.06 p = 0.63	-0.61 (0.57) -1.72 to 0.50 p = 0.28	0.24 (0.28) -0.30 to 0.79 p = 0.38

EC, e-cigarette; ARIMAX, autoregressive integrated moving average with explanatory variable; SE, standard error; CI, confidence interval; ARIMA, autoregressive integrated moving average; HSE, Health Survey for England; NHIS, National Health Interview Survey;
[a] Analyses were conducted using ARIMA models. The information in the brackets (p, I, q)$_f$ indicates the number of autoregressive (AR) terms (i.e. p), the order of differencing applied to the series (i.e. I), and the number of moving average (MA) terms (i.e. q), and frequency of data available (i.e. f; e.g. 4 for quarterly data). The P, I, and Q in the second set of brackets refer to the seasonal term

RQ2 – Model fit

UK

The first differencing offered a good fit to the data. Based on comparisons of models with varying AR and MA terms as well as ACF and PACF plots, we included two MA (MA2) terms in the model. The AIC values suggested an RA(3) may offer the best fit but due to the limited number of observations, it posed the risk of overfitting (AIC=206.4 versus selected model AIC = 240.2). Based on the cross-correlation function no lags were necessary. Adjusting for seasonality improved the fit to the data (AIC = 240.2 unadjusted versus 200.2 adjusted for seasonality).

USA

The first differencing offered a good fit to the data. Based on comparisons of models with varying AR and MA terms as well as ACF and PACF plots, two AR (AR2) terms were included in the model.

Based on the cross-correlation function no lags were necessary. Adjusting for seasonality also improved the fit to the data (AIC = -92.4 unadjusted versus -105.1 adjusted for seasonality).

Sweden

The first differencing offered a good fit to the data. Based on comparisons of models with varying AR and MA terms as well as ACF and PACF plots, no RA and MA terms were necessary to model the data.

Japan

The first differencing offered a good fit to the data. Based on comparisons of models with varying AR and MA terms as well as ACF and PACF plots, we included one MA (MA1) term in the model.

South Korea

The first differencing offered a good fit to the data. Based on comparisons of models with varying AR and MA terms as well as ACF and PACF plots, no AR or MA terms were needed in the model.

RQ2 – Sensitivity analyses

Supplementary Table 2. Association between e-cigarette and cigarette sales in the UK and USA - sensitivity analysis using ARIMAX

Analysis (primary or adjusted)	**b (SE), 95%CI, and p-value** **ARIMA (p, I, q)(P, I, Q)$_f$[a]**	
	UK **ARIMA (0,1,2)(0,1,0)$_4$**	**USA** **ARIMA (2, 1, 0)(0,0,0)$_4$**
Primary	-0.11 (0.18) -0.46 to 0.25 p = 0.55	0.06 (0.03) -0.001 to 0.12 p = 0.06
Adjusted for policies	-0.12 (0.23) -0.57 to 0.33 p = 0.60	0.06 (0.03) -0.001 to 0.11 p = 0.06

EC, e-cigarette; ARIMAX, autoregressive integrated moving average with explanatory variable; SE, standard error; CI, confidence interval; ARIMA, autoregressive integrated moving average

[a] Analyses were conducted using ARIMA models. The information in the brackets (p, I, q)$_f$ indicates the number of autoregressive (AR) terms (i.e. p), the order of differencing applied to the series (i.e. I), and the number of moving average (MA) terms (i.e. q), and frequency of data available (i.e. f; e.g. 4 for quarterly data).The P, I, and Q in the second set of brackets refer to the seasonal term

RQ1 - Association between prevalence of smoking and prevalence of AND use stratified by SES and age

Supplementary Table 3. Association between prevalence of smoking and e-cigarette use in different SES groups in the UK and USA

Country (survey, time points) **GLS (p, I, q)$_f$**[a]	**Coefficient (SE), 95%CI and p-value**	
UK (HSE, N=56)	**Primary**	**Adjusted for policies**
Daily use, high SES GLS (1, 1, 1)$_4$	0.11 (0.63) -1.13 to 1.35 p=0.86	0.10 (0.81) -1.68 to 1.48 p=0.90
Daily use, low SES GLS (0, 1, 1)$_4$ with seasonality	0.003 (0.32) -0.62 to 0.63 p=0.99	-0.17 (0.53) -1.20 to 0.87 p=0.75
Current use, high SES GLS (0, 1, 1)$_4$	0.05 (0.44) -0.82 to 0.92 p=0.91	-0.10 (0.49) -1.05 to 0.85 p=0.84
Current use, low SES GLS(0,1,1)$_4$	0.10 (0.22) -0.34 to 0.54 p=0.65	0.17 (0.38) -0.58 to 0.92 p=0.66
USA (NIHS, N=60)	**Primary**	**Adjusted for policies**
Daily use, high SES GLS (0, 1, 1)$_4$	0.46 (0.49) -0.50 to 1.41 p=0.35	0.39 (0.41) -0.42 to 1.21 p=0.34
Daily use, low SES GLS (0, 1, 1)$_4$	-0.55 (0.51) -1.54 to 0.45 p=0.28	-0.33 (0.53) -1.37 to 0.72 p=0.54
Current use, high SES GLS (0, 1, 1)$_4$	0.19 (0.22) -0.24 to 0.61 p=0.39	0.13 (0.14) -0.14 to 0.41 p=0.34
Current use, low SES GLS (0, 1, 1)$_4$	0.13 (0.29) -0.44 to 0.71 p=0.66	0.22 (0.29) -0.36 to 0.80 p=0.45

EC, e-cigarette; SES, socioeconomic status; GLS, generalised least squares; SE, standard error; CI, confidence interval; HSE, Health Survey for England; NHIS, National Health Interview Survey

[a] Analyses were conducted using GLS models. The information in the brackets (p, I, q)$_f$ indicates the number of autoregressive (AR) terms (i.e. p), the order of differencing applied to the series (i.e. I), and the number of moving average (MA) terms (i.e. q), and frequency of data available (i.e. f; 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled using cubic splines.

Supplementary Table 4. Association between prevalence of smoking and prevalence of e-cigarette use in young people in the UK and USA

Country (survey, time points) **GLS (p, I, q)$_f$**[a]	**Coefficient (SE), 95%CI and p-value**	
UK (HSE, N=56)	**Primary**	**Adjusted for policies**
Daily use GLS (0, 1, 1)$_4$	-0.22 (0.88) -1.96 to 1.51 p = 0.80	-0.46 (0.89) -2.20 to 1.28 p = 0.60
Current use GLS (0, 1, 1)$_4$	0.35 (0.43) -0.50 to 1.20 p = 0.42	0.29 (0.43), -0.55 to 1.14 p = 0.50
USA (NIHS, N=60)	**Primary**	**Adjusted for policies**
Daily use GLS (0, 1, 1)$_4$	-0.35 (0.52) -1.37 to 0.67 p = 0.50	-0.26 (0.52) -1.28 to 0.77 p = 0.62
Current use GLS (0, 1, 1)$_4$	0.34 (0.25), -0.16 to 0.83 p = 0.18	0.43 (0.25), -0.06 to 0.92 p = 0.08
USA (NYTS, N=15)	**Primary**	**Adjusted for policies**
Daily use GLS (0, 1, 0)$_1$	0.21 (0.13) -0.04 to 0.46 p = 0.10	0.18 (0.14) -0.10 to 0.46 p = 0.21
Current use GLS (0, 1, 0)$_1$	0.14 (0.08) -0.02 to 0.31 p = 0.08	0.14 (0.09) -0.04 to 0.32 p = 0.13

EC, e-cigarette; GLS, generalised least squares; SE, standard error; CI, confidence interval; HSE, Health Survey for England; NHIS, National Health Interview Survey; NYTS, National Youth Tobacco Survey

[a] Analyses were conducted using Generalised Least Squares (GLS) models. The information in the brackets (p, I, q)$_f$ indicates the number of AR terms (i.e. p), the order of differencing applied to the series (i.e. I), and the number of MA terms (i.e. q), and frequency of data available (i.e. f; 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled using cubic splines.

RQ3 - Differences in time trends of smoking prevalence and cigarette sales between the UK and USA versus Australia

Supplementary Table 5. RQ3 model fit indices (AIC) for the UK, USA and Australia

Model	UK	USA	Australia
Linear	185.5*	135.8	11.4
Quadratic	187.3	139.3	13.3
Cubic	186.6	129.8*	1.5*
logarithmic	196.2	145.7	18.5
Power	197.6	148.6	19.5
Exponential	184.0	139.2	9.6

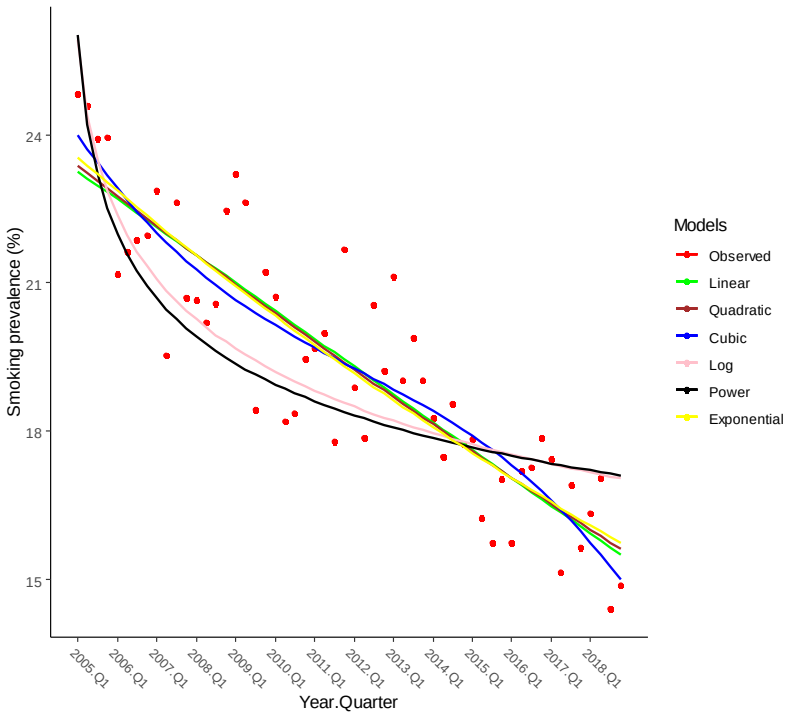
RQ, research question; AIC, akaike information criterion

* indicates best fitting model

UK (HSE)

The AIC values indicated that a linear model with no AR or MA term offered the best fit to the daily data and adjusting the models for seasonality did not improve the fit for daily (AIC = 187.3). The linear model captures a decreasing trend over time.

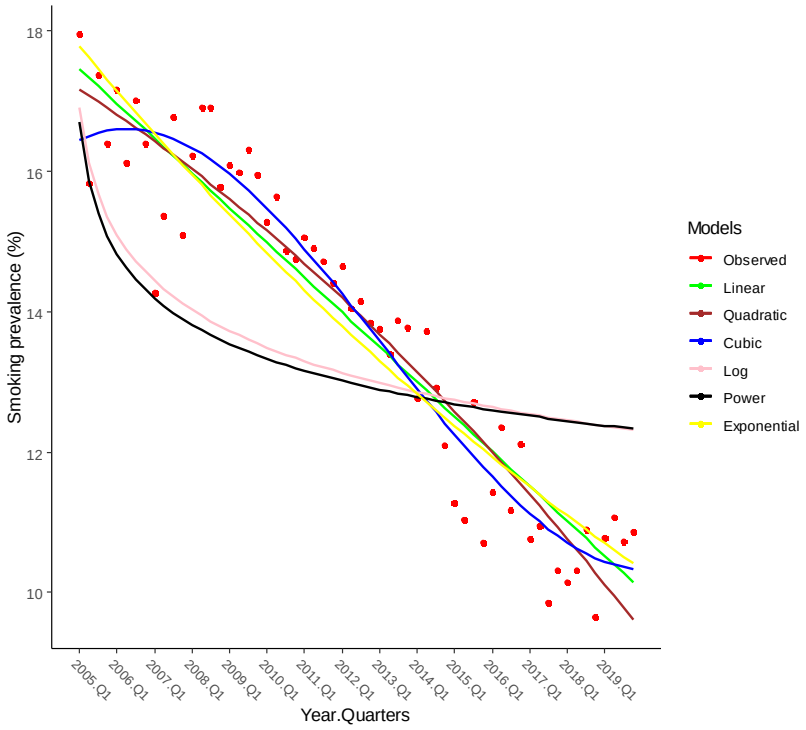
Supplementary Figure 1. Observed versus fitted values for daily smoking in the UK



USA (NHIS)

The AIC values indicated that a cubic model with no MA or AR term offered the best fit to the data. Adjusting the models for seasonality did not improve the fit (AIC = 131.7)

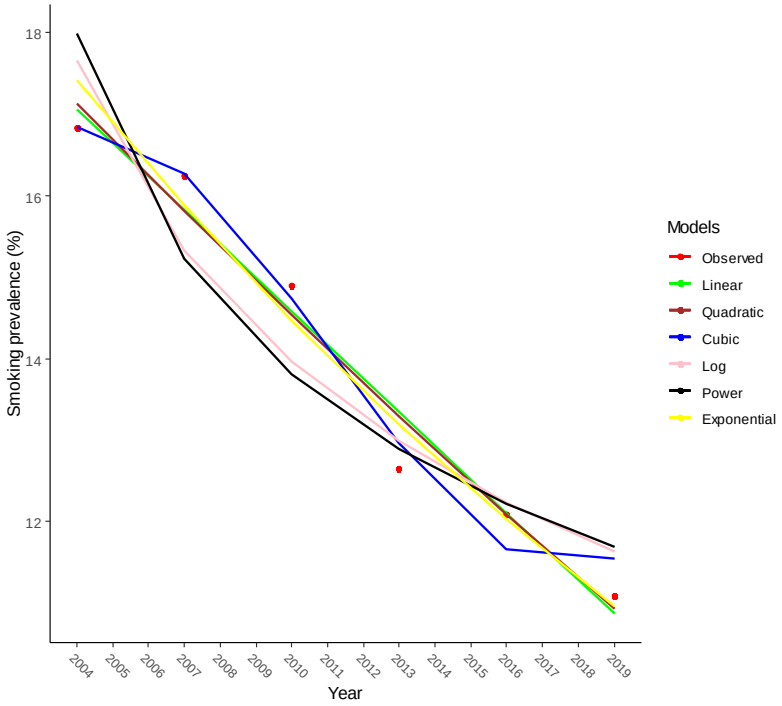
Supplementary Figure 2. Observed versus fitted values for daily smoking in the USA



Australia (NDSHS)

The AIC values indicated that the cubic model with one MA (MA1) and one AR (AR1) term offered the best fit to the data; however, given the limited number of time points available for the Australian data and the fact that the linear model offered a fairly good fit to the data, we report results from the linear model only.

Supplementary Figure 3. Observed versus fitted values for daily smoking in Australia



Supplementary Table 6. Time trends of daily smoking prevalence in the UK, USA and Australia based on best fitting models

Country (time points) **GLS $(p, q)_f$[a] – selected model**	**Coefficient (SE), p-value, and 95%CI**	
UK (N=56)	**Unadjusted**	**Adjusted for policies**
GLS $(0, 0)_4$- linear Time	-0.14 (0.01) p<0.001 -0.16 to -0.12	-0.12 (0.02) p<0.001 -0.17 to -0.07
USA (N=60)	**Unadjusted**	**Adjusted for policies**
GLS $(0, 0)_4$- cubic Time Time^2 Time^3	 0.08 (0.05) p=0.12 -0.02 to 0.19 -0.01 (0.002) p=0.0002 -0.01 to -0.004 0.0001 (0.00002) p=0.0006 0.00003 to 0.0001	 0.03 (0.06) p=0.62 -0.09 to 0.15 -0.007 (0.002) p=0.001 -0.01 to -0.003 0.00007 (0.00002) p=0.001 0.00003 to 0.0001
Australia (N=6)[b, c]	**Unadjusted**	**Adjusted for policies**
GLS $(1, 1)_1$- linear Time	 -0.10 (0.01) p<0.001 -0.12 to -0.09	 -0.10 (0.02) p<0.001 -0.13 to -0.06

GLS, generalised least squares; SE, standard error; CI, confidence interval

[a] Analyses were conducted using GLS models. The information in the brackets $(p, q)_f$ indicates the number of autoregressive (AR) terms (i.e. p), moving average (MA) terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Estimates have high relative standard errors (51% to 90%) indicating the data have high sampling errors

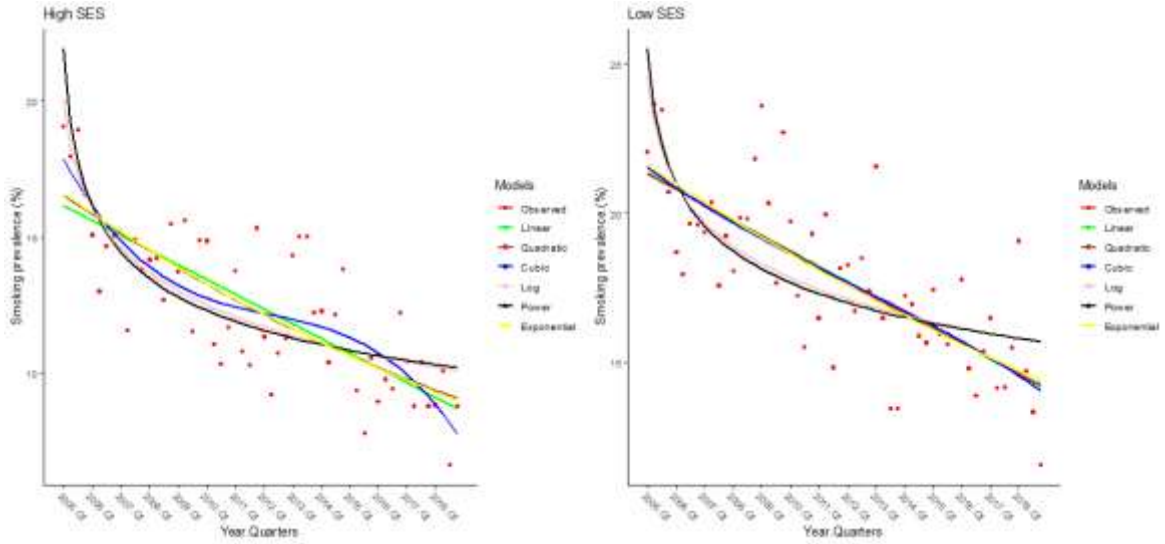
[c] Slopes were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data.

Trends of smoking prevalence in the UK, USA and Australia stratified by SES

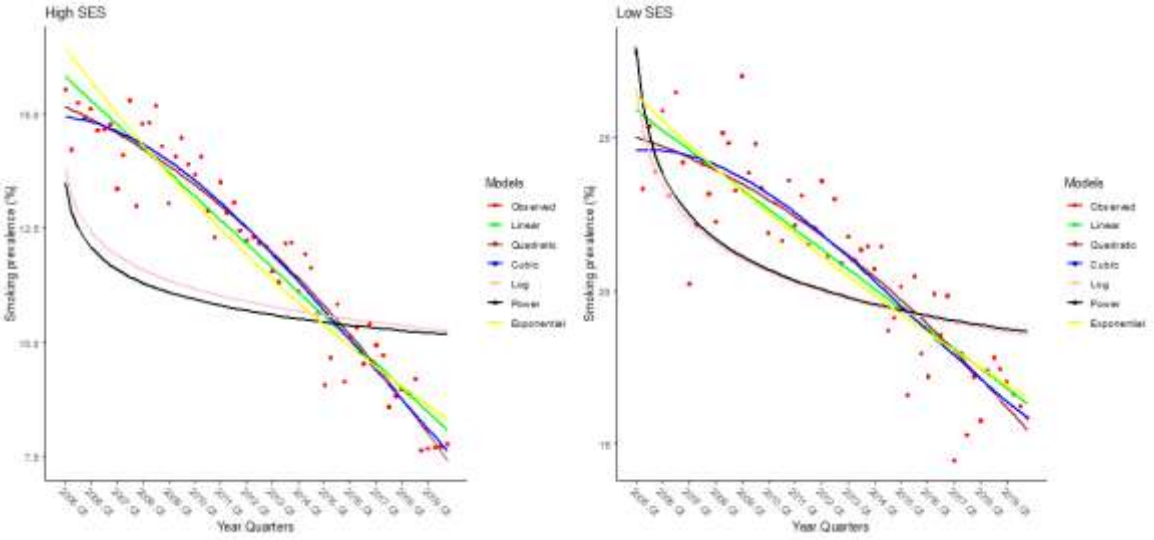
For the UK data a cubic model offered the best fit to the data for high SES, capturing an initial increase followed by a decrease in rates, while a linear model appeared to fit the data well for low SES capturing a negative trend. For the USA quadratic models offered the best fit to the data capturing reduction in rates. For Australia a cubic model best fit the data for both high and low SES indicating an initial increase followed by a decrease; however, as for the primary analyses, Australian data was analysed using a linear model as the cubic model may be overfitting the data.

RQ3 - Trends in smoking prevalence in the UK, USA and Australia stratified by SES

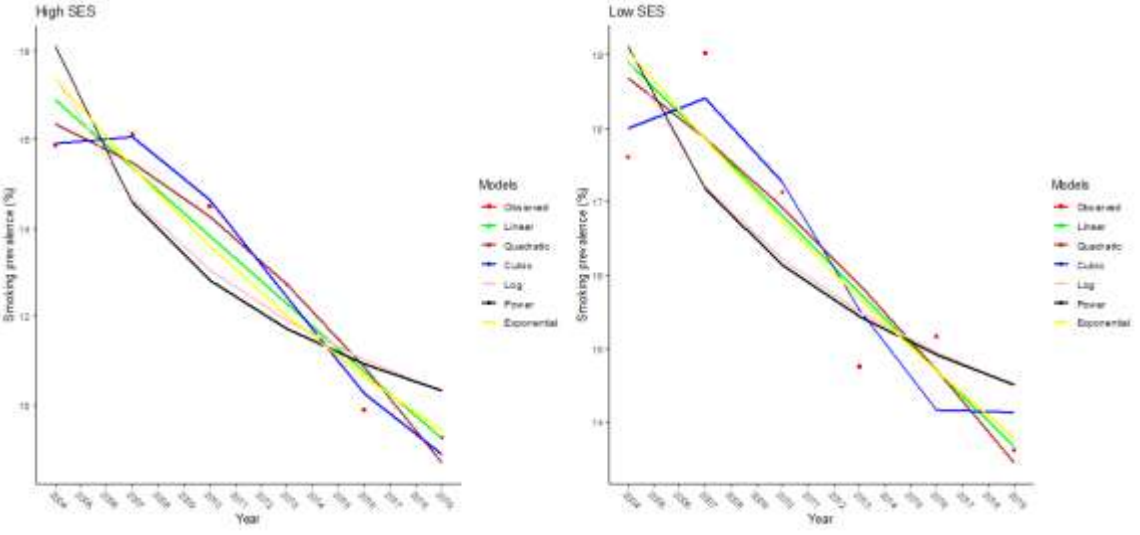
Supplementary Figure 4. Observed and fitted data for smoking prevalence in the UK, USA, and Australia by SES



UK



USA



Australia

SES, socioeconomic status

Supplementary Table 7. RQ3 model fit indices (AIC) stratified by SES for the UK, USA and Australia

Model	UK		USA		Australia	
	High SES	Low SES	High SES	Low SES	High SES	Low SES
Linear	226.5	235.0*	128.4	223.1	18.9*	18.9*
Quadratic	227.8	237.0	115.6*	220.2*	18.4	20.6
Cubic	223.7*	238.9	116.0	221.3	1.2	18.6
logarithmic	225.5	242.7	144.6	234.1	25.8	24.2
Power	229.9	242.3	148.7	234.6	26.9	24.0
Exponential	225.2	234.1	136.7	223.6	20.3	18.3

RQ, research question; AIC, akaike information criterion; SES, socioeconomic status

* indicates the selected model

Supplementary Table 8. Time trends of smoking prevalence in the UK, USA and Australia stratified by SES

Country (time points)	Coefficient (SE), p-value, and 95%CI	
UK (N=56) **GLS (p, q)$_f$[a]**	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS (0, 0)$_4$ Time Time^2 Time^3	 -0.51 (0.15) p<0.001 -0.80 to -0.22 0.02 (0.01) p=0.01 0.004 to 0.03 -0.0002 (0.0001) p=0.01 -0.0003 to -0.00003	 -0.98 (0.22) p<0.001 -1.40 to -0.55 0.03 (0.01) p<0.001 0.01 to 0.04 -0.0003 (0.0001) p=0.0003 -0.0004 to -0.0001
Daily use, low SES, GLS (0, 0)$_4$ with splines for seasonality Time	 -0.13 (0.01) p<0.001 -0.16 to -0.10	 -0.16 (0.04) p<0.001 -0.23 to -0.09
USA (N=60)	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS (0, 0)$_4$ Time	 -0.06 (0.02)	 -0.05 (0.03)

	p=0.001 -0.10 to -0.02	p=0.11 -0.12 to 0.01
Time^2	-0.001 (0.0003) p<0.001 -0.002 to -0.0006	-0.001 (0.0004) p=0.003 -0.002 to -0.0004
Daily use, low SES, GLS $(0, 0)_4$ Time	-0.07 (0.04) p=0.12 -0.15 to 0.02	-0.20 (0.07) p=0.01 -0.34 to -0.05
Time^2	-0.002 (0.0007) p=0.03 -0.003 to -0.0002	-0.00004 (0.001) p=0.97 -0.002 to 0.002
Australia (N=6) [b c]	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS $(0,0)_1$ Time	-0.13 (0.02) p<0.001 -0.16 to -0.09	-0.14 (0.03) p<0.001 -0.21 to -0.07
Daily use, low SES, GLS $(0,1)_1$ Time	-0.09 (0.01) p<0.001 -0.11 to -0.07	-0.06 (0.05) p=0.18 -0.15 to 0.03

SES, socioeconomic status; SE, standard error; CI, confidence interval; GLS, generalised least squares

[a] Analyses were conducted using GLS models. The information in the brackets $(p, q)_f$ indicates the number of autoregressive (AR) terms (i.e. p), moving average (MA) terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Estimates based on the Australian data (NDSHS) have a high relative standard errors (25% to 50%) indicating that results need to be interpreted with caution

[c] Slopes were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data.

Supplementary Table 9. Time trends of smoking prevalence between the UK, USA and Australia stratified by SES, based on the linear model

Country (time points) **GLS $(p, q)_f$** [a]	**Coefficient (SE), p-value, 95%CI, beta and CARR (SE)**	
UK (N=56)	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS $(0, 0)_4$ Time	-0.14 (0.01) p<0.001 -0.16 to -0.11 CARR = 1.10% (0.12)	-0.09 (0.03) p=0.01 -0.16 to -0.02

Daily use, low SES, GLS $(0, 0)_4$ with splines for seasonality Time	 -0.13 (0.01) p<0.001 -0.16 to -0.10 CARR = 0.73% (0.08)	 -0.16 (0.04) p<0.001 -0.23 to -0.09
USA (N=60)	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS $(0, 0)_4$ Time	 -0.13 (0.01) p<0.001 -0.14 to -0.12 CARR = -1.15% (0.05)	 -0.15 (0.01) p<0.001 -0.16 to -0.13
Daily use, low SES, GLS $(0, 0)_4$ Time	 -0.16 (0.01) p<0.001 -0.18 to -0.14 CARR = -0.79% (0.06)	 -0.020 (0.02) p<0.001 -0.23 to -0.17
Australia (N=6)[b c]	**Unadjusted**	**Adjusted for policies**
Daily use, high SES, GLS $(0, 0)_1$ Time	 -0.13 (0.02) p<0.001 -0.16 to -0.09 CARR = 1.0% (se = 0.2%)	 -0.14 (0.03) p<0.001 -0.21 to -0.07
Daily use, low SES, GLS $(0, 1)_1$ Time	 -0.09 (0.01) p<0.001 -0.11 to -0.07 CARR = -0.5% (0.1)	 -0.06 (0.05) p=0.18 -0.15 to 0.03

SES, socioeconomic status; GLS, generalised least squares; SE, standard error; CI, confidence interval; CARR, compound annual reduction rate

[a] Analyses were conducted using GLS models. The information in the brackets $(p, q)_f$ indicates the number of autoregressive (AR) terms (i.e. p), moving average (MA) terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Estimates have a high relative standard errors (25% to 50%) indicating that results need to be interpreted with caution

[c] Slopes were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data.

RQ3 - Differences in time trends of smoking prevalence between the UK, USA and Australia in young people

The best fitting model for the UK data was logarithmic, while a cubic model best fitted the USA data and a linear model was best for Australia.

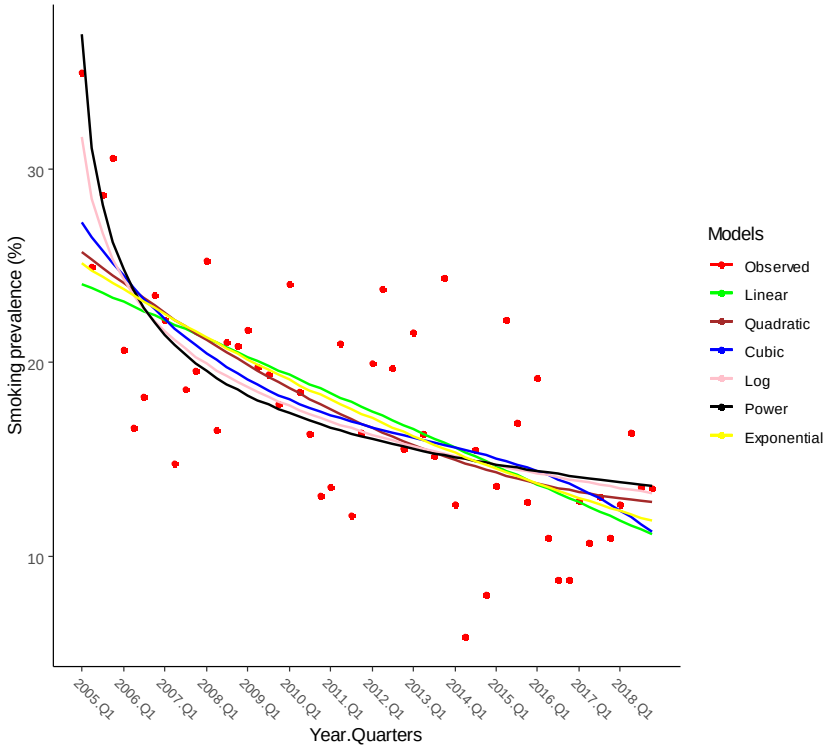
Supplementary Table 10. RQ3 model fit indices (AIC) for young users only (<22 years old) in the UK, USA and Australia

Model	UK	USA	Australia
	Daily use	Daily use	Daily use
Linear	325.5	291.5	20.2*
Quadratic	325.5	288.8*	24.0
Cubic	326.1	289.7	20.6
logarithmic	318.7*	304.2	22.5
Power	329.2	300.9	25.8
Exponential	328.7	296.4	21.1

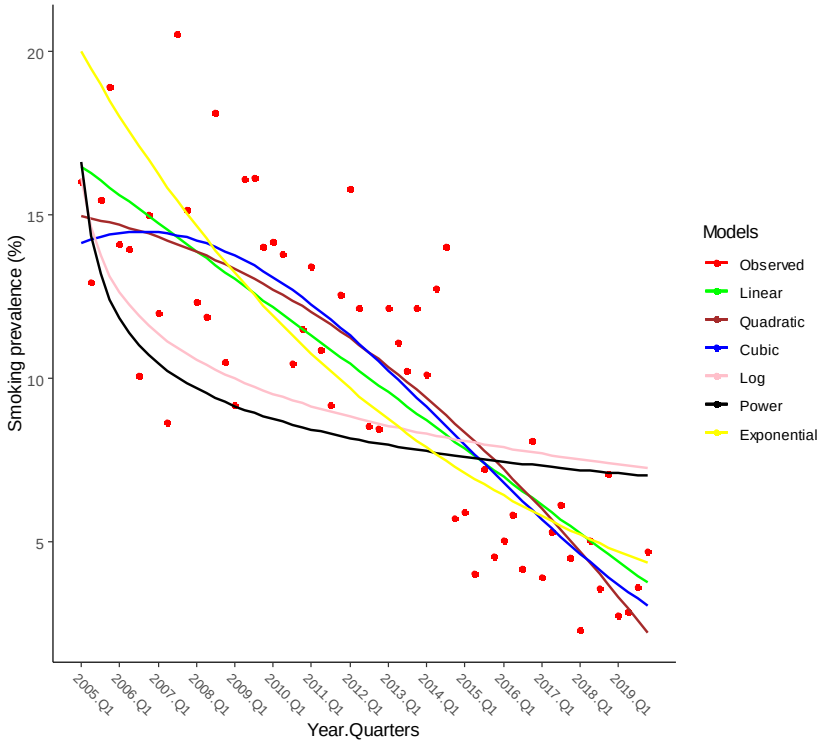
RQ, research question: AIC, akaike information criterion

* indicates best fitting model

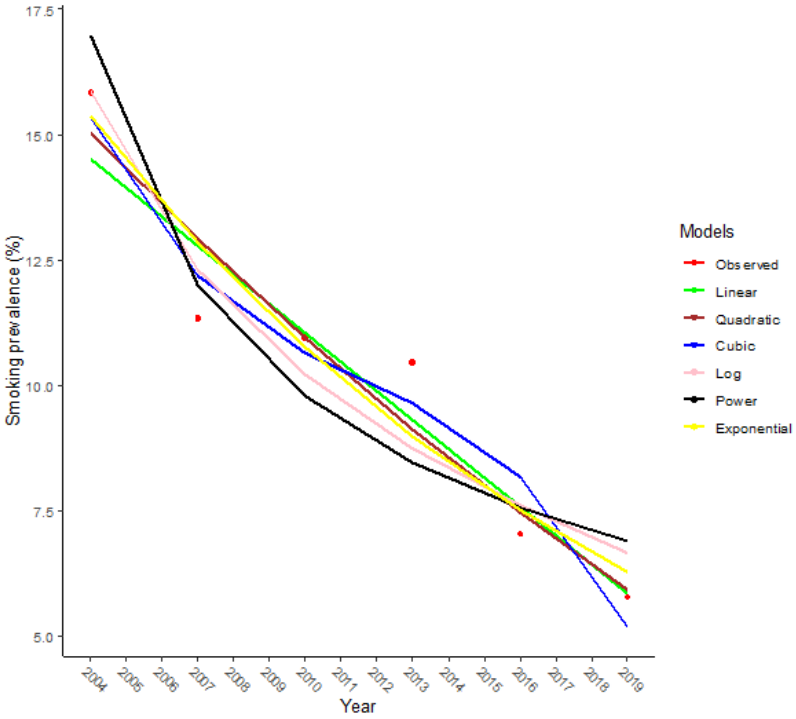
Supplementary Figure 5. Observed and fitted data for smoking prevalence in the UK, USA, and Australia for young adults only (<22 years old)



UK



USA



Australia

Supplementary Table 11. Time trends of daily smoking prevalence in the UK, USA and Australia for young people only (<22 years old) based on the best fitting model

Country (time points) **GLS $(p, q)_f$ [a] – selected model**	**Coefficient (SE), p-value, and 95%CI**	
UK (N=56)	**Unadjusted**	**Adjusted**
GLS $(0, 0)_4$- logarithmic Time	-4.57 (0.60) p<0.001 -5.75 to -3.38	-6.34 (1.31) p<0.001 -8.91 to -3.78
USA (N=60)	**Unadjusted**	**Adjusted**
GLS $(0, 0)_4$ - quadratic Time Time^2	-0.05 (0.08) p=0.50 -0.21 to 0.10 -0.003 (0.001) p=0.03 -0.005 to -0.0002	-0.15 (0.14) p=0.27 -0.42 to 0.12 -0.002 (0.002) p=0.38 -0.005 to 0.002
Australia (N=6) [b c]	**Unadjusted**	**Adjusted**
GLS $(0, 1)_1$ – linear Time*	-0.15 (0.02) p<0.001 -0.20 to -0.11	-0.18 (0.04) p<0.001 -0.26 to -0.09

GLS, generalised least squares; SE, standard error; CI, confidence interval

[a] Analyses were conducted using GLS models. The information in the brackets $(p, q)_f$ indicates the number of autoregressive (AR) terms (i.e. p), moving average (MA) terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Estimates based on the Australian data (NDSHS) have a high relative standard errors (25% to 50%) indicating that results need to be interpreted with caution

[c] Slopes were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data.

Supplementary Table 12. Time trends of smoking prevalence in the UK, USA and Australia in young users only (<22 years old) based on the linear model

Country (time points) **GLS $(p, q)_f$ [a]**	**Coefficient (SE), p-value, 95%CI and CARR (SE)**	
UK (N=56)	**Unadjusted**	**Adjusted**
Daily use, GLS $(0, 0)_4$ Time	-0.24 (0.04) p<0.001 -0.30 to -0.17 CARR = -1.36% (0.22)	-0.29 (0.08) p=0.001 -0.45 to -0.13
USA (N=60)	**Unadjusted**	**Adjusted**
Daily use, GLS $(0, 0)_4$ Time	-0.22 (0.02) p<0.001 -0.25 to -0.18 CARR = -2.55% (0.23)	-0.26 (0.03) p<0.001 -0.32 to -0.21
Australia [b] [c] (N=6)	**Unadjusted**	**Adjusted**
Daily use, GLS $(0, 1)_1$ Time	-0.15 (0.02) p<0.001 -0.20 to -0.11 CARR [c] = -1.5% (0.2)	-0.18 (0.04) p<0.001 -0.26 to -0.09

GLS, generalised least squares; SE, standard error; CI, confidence interval; CARR, compound annual reduction rate

[a] Analyses were conducted using GLS models. The information in the brackets $(p, q)_f$ indicates the number of autoregressive (AR) terms (i.e. p), moving average (MA) terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Estimates based on the Australian data (NDSHS) have a high relative standard errors (25% to 50%) indicating that results need to be interpreted with caution

[c] Slopes and CARR were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data.

RQ3 Cigarette sales

Supplementary Table 13. RQ3 model fit indices (AIC) for sales analyses in the UK, USA and Australia

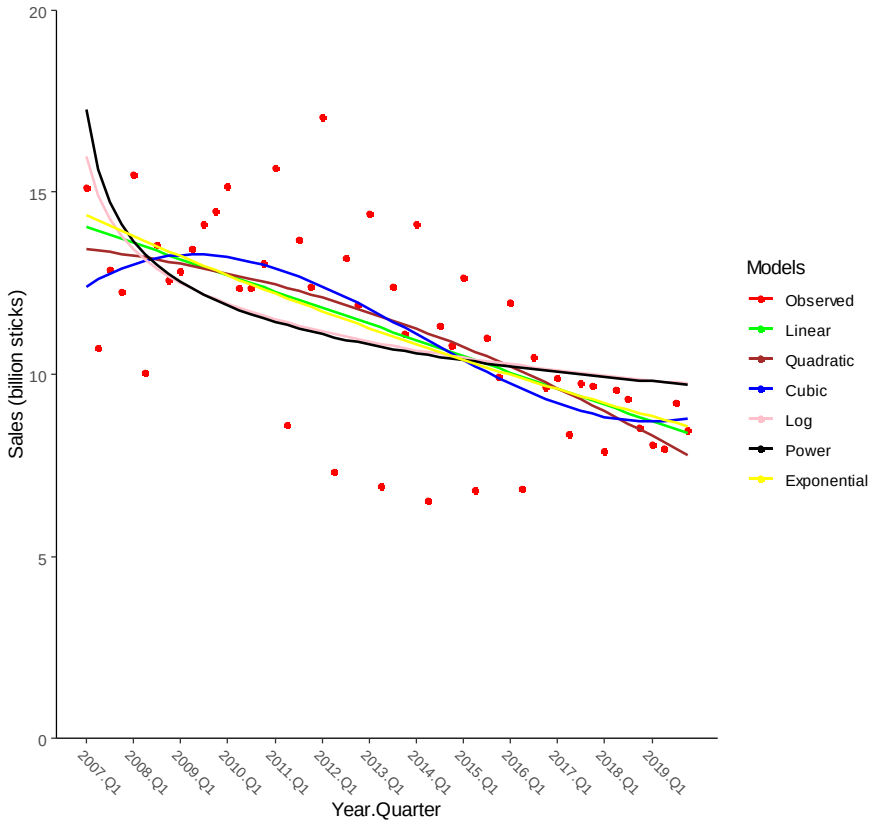
Model	**UK**	**USA**	**Australia**
Linear	216.8	-85.8*	16.5
Quadratic	216.0	-86.5	12.8*
Cubic	211.5*	-86.4	14.5
logarithmic	236.8	-86.9	39.2
Power	238.5	-84.0	40.6
Exponential	220.4	-82.8	19.0

RQ, research question; AIC, akaike information criterion * indicates best fitting model

UK

Analyses were restricted to years 2007 to the latest year (i.e. 2019) to include the same time frame as Australia (the comparator). The best fitting model was the cubic model with one autocorrelation (AR1) term and seasonality modelled using cubic splines (AIC = 178.1).

Supplementary Figure 6. Observed versus fitted values for cigarette sales in the UK (RQ3)

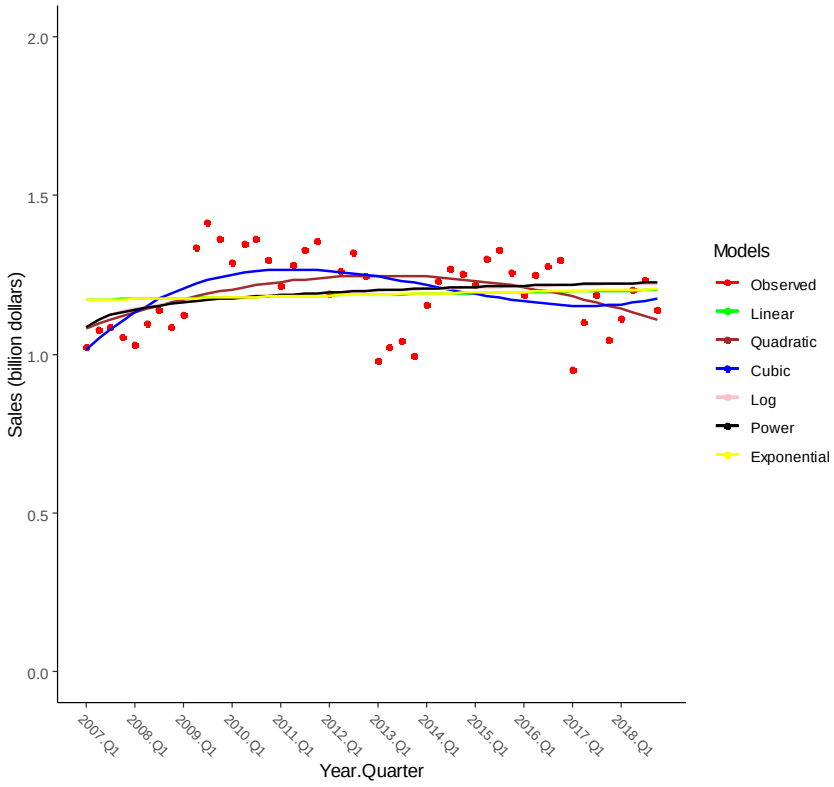


RQ, research question

USA

Analyses were restricted to years 2007 to the latest year (i.e. 2019) to include the same time frame as Australia (the comparator); however, the data captured a 2.5x sales increase in 2019 which could not easily be explained so data from 2019 was excluded (i.e. final timeframe 2007 to 2018). We found a linear model with one AR term and seasonality modelled as cubic splines offered the best fit to the data (AIC = -103.3).

Supplementary Figure 7. Observed versus fitted values for cigarette sales in the USA up to 2018 (RQ3)

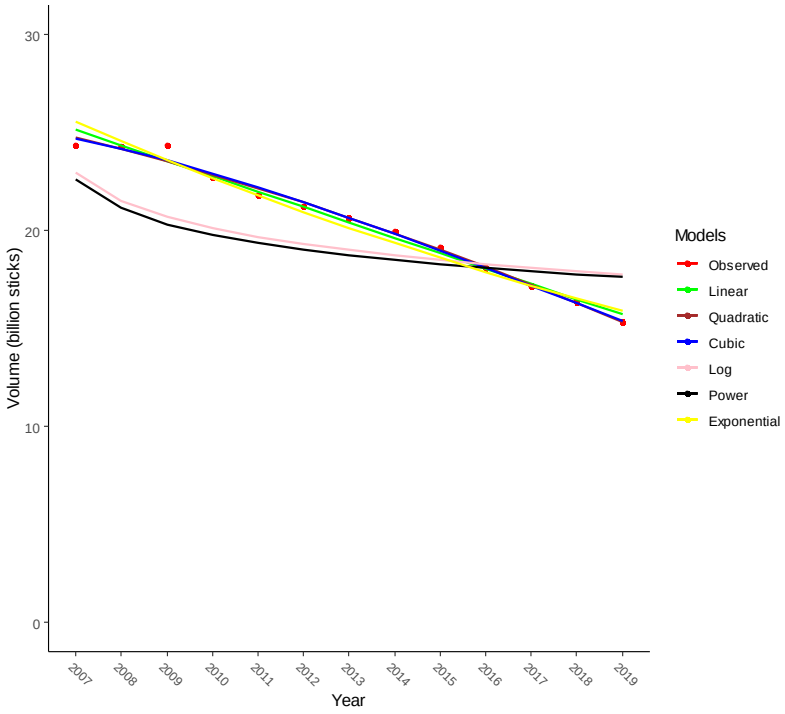


RQ, Research question

Australia

The analyses showed that the quadratic model with no AR or MA term offered the best fit to the entire time series.

Supplementary Figure 8. Observed versus fitted values for cigarette sales in Australia (RQ3)



RQ, Research question

Supplementary Table 14. Time trends of cigarette sales in the UK, USA and Australia based on best fitting models

Country (time points) **GLS $(p, q)_f$[a] – selected model**	**Coefficient (SE), p-value, and 95%CI**	
UK (N=52)	**Unadjusted**	**Adjusted for policies**
GLS (1, 0) with seasonality- cubic		
Time	0.22 (0.09) p=0.01 0.05 to 0.39	0.36 (0.13) p=0.005 0.11 to 0.61
Time^2	-0.01 (0.004) p<0.001 -0.02 to -0.006	-0.02 (0.006) p<0.001 -0.03 to -0.01
Time^3	0.0002 (0.0001) p<0.001 0.00006 to 0.0002	0.0002 (0.0001) p<0.001 0.0001 to 0.0003
USA to 2018 (N=48)[b]	**Unadjusted**	**Adjusted for policies**
GLS (1, 0) with seasonality- linear		
Time	0.0004 (0.004) p=0.91 -0.006 to 0.007	-0.003 (0.003) p=0.23 -0.008 to 0.002
Australia (N=13)[c]	**Unadjusted**	**Adjusted for policies**
GLS (0, 0)- quadratic		
Time	-0.03 (0.01) p<0.001 -0.05 to -0.02	-0.01 (0.01) p=0.27 -0.02 to 0.01
Time^2	-0.0001 (0.00003) p=0.02 -0.0001 to -0.00001	-0.0002 (0.00003) p<0.001 -0.0002 to -0.0001

GLS, generalised least squares; SE, standard error; CI, confidence interval

[a] Analyses were conducted using Generalised Least Squares (GLS) models. The information in the brackets $(p, q)_f$ indicates the number of AR terms (i.e. p), MA terms (i.e. q) included in the model while f indicates the frequency of data available (i.e. 4 for quarterly data and 1 for yearly data). Seasonality for quarterly data was modelled, if necessary, using cubic splines.

[b] Given the raw data are showing a 2.5x increase in cigarette sales in 2019, which cannot be easily explained, analyses were conducted up to 2018 only

[c] Slopes were estimated to reflect change in smoking prevalence for each quarter of a year, in line with USA and UK data