SUPPLEMENTARY FILE 1

METHODS

Statistical analysis

APCC analysis

In the age-period-cohort-characteristics (APCC) model, cohort characteristics, instead of actual birth year were used to estimate risks of cigarette smoking. The model includes A-1 dummy variables for age categories, and P-1 dummy variables for period categories and cohort characteristics, where A and P are the number of age groups and periods, respectively. Linear relationships of age, period and cohort characteristics are modeled in the APCC analysis.

In our study, the APCC model was only applied to investigate the effects of smoke-free legislation, due to non-significant changes in the smoking behavior associated with cigarette price increases. As cohort effects represent the shared experiences of a group of individuals during the same time period, the school grade of adolescents when they first encountered the ban on tobacco use in schools was used as a cohort characteristic.

Smoking initiation and cessation

Using KYRBS, a proxy variable that represents the proportion of adolescents who initiate and quit smoking can be derived. Adolescents who first tried smoking within 1.5 years of the survey were defined as recent initiators. The proportion of smoking initiators was calculated as the number of recent initiators over the total number of respondents. Conversely, the proportion of those showing smoking cessation was calculated as the number of non-current smokers over the number of recent initiators. Sex-stratified estimates of both proportions were calculated between 2011, when smoke-free legislation was not yet implemented (as the survey was

conducted before December) and 2014, a year before when cigarette prices increased, to capture the overall impacts of smoke-free legislation.

RESULTS

APC model

The goodness-of-fit test for each model suggested that the full APC (IE) model provided the best fit for both sexes (Table S1).

Table S1 Goodness-of-fit for each models

	Boys			Girls		
	Deviance (df)	Log likelihood	AIC	Deviance (df)	Log likelihood	AIC
Age	177556 (77)	-89285	2126.011	201784 (77)	-101357	2413.439
Age-cohort	16577 (60)	-8796	210.0016	12377 (60)	-6654	158.9972
Age-period	44702 (66)	-22859	544.6852	14620 (66)	-7776	185.5645
Age-period-cohort (intrinsic estimator)	9119 (50)	-5067	121.464	5727 (50)	-3329	80.07882
Age-period-cohort characteristics	9468 (55)	-5242	125.4984	6042 (55)	-3487	83.70923

APCC model

The estimated effects of age, period and cohort characteristics on the prevalence of cigarette smoking are reported in Table S2. Similar to the results of the APC model, the PRRs for smoking increased with increasing age, and decreased with increasing calendar years (period). Regarding the cohort characteristics, boys and girls who first encountered tobacco-free schools at grades 7–11 had higher PRRs compared to those who had never encountered smoke-free

schools. Overall, PRRs for cigarette smoking decreased from grade 7 onwards, i.e., with earlier encounters with smoke-free schools.

Table S2 Estimated age-period-cohort characteristic effects for cigarette smoking prevalence

	Boys			Girls		
	PRs	**95% CI**		**PRs**	**95% CI**	
		Lower	**Upper**		**Lower**	**Upper**
Age						
12	REF			REF		
13	1.48	1.47	1.49	1.27	1.25	1.28
14	2.45	2.43	2.48	1.78	1.76	1.81
15	3.54	3.50	3.57	2.36	2.33	2.39
16	4.48	4.43	4.52	3.05	3.01	3.09
17	5.09	5.04	5.14	3.32	3.27	3.36
18	5.54	5.48	5.60	3.49	3.44	3.54
Period						
2006	REF			REF		
2007	1.08	1.07	1.08	0.96	0.96	0.97
2008	1.03	1.02	1.03	0.87	0.87	0.88
2009	1.03	1.02	1.03	0.78	0.77	0.78
2010	0.96	0.95	0.96	0.71	0.70	0.71
2011	0.95	0.95	0.96	0.63	0.62	0.63
2012	0.93	0.92	0.93	0.56	0.55	0.57
2013	0.82	0.81	0.83	0.43	0.42	0.43
2014	0.81	0.81	0.82	0.37	0.37	0.38
2015	0.73	0.72	0.74	0.30	0.30	0.31
2016	0.66	0.65	0.67	0.28	0.27	0.28
2017	0.75	0.74	0.76	0.36	0.35	0.36
Cohort characteristics*						
Never encountered	REF			REF		
Grade 11	1.06	1.06	1.07	1.11	1.10	1.12
Grade 10	1.12	1.11	1.13	1.19	1.18	1.20
Grade 9	1.15	1.15	1.16	1.21	1.20	1.23
Grade 8	1.15	1.14	1.16	1.23	1.21	1.24
Grade 7	1.03	1.02	1.04	1.15	1.13	1.17
Grade 6	0.86	0.85	0.87	0.99	0.97	1.01
Grade 5	0.76	0.75	0.77	0.87	0.85	0.89
Grade 4	0.58	0.58	0.59	0.81	0.79	0.84
Grade 3	0.50	0.49	0.51	0.76	0.73	0.78
Grade 2	0.42	0.41	0.43	0.52	0.50	0.55
Grade 1	0.20	0.19	0.22	0.27	0.25	0.30

*Grade at first encounter to schools where tobacco use is not allowed.

Smoking initiation and cessation

Estimated proportions of smoking initiation and cessation are presented in Table S3. Smoking initiation decreased from 8.7% in 2011 to 4.9% in 2014, a relative decrease of 44%. Conversely, smoking cessation increased from 57.9% in 2011 to 61.3% in 2014, a relative increase of 6%.

Table S3 Estimated smoking initiation and cessation for selected calendar years

	Calendar years			
	2011	**2012**	**2013**	**2014**
Smoking initiation				
All	8.7	7.2	5.7	4.9
Boys	11.1	9.4	8.0	7.0
Girls	6.0	4.9	3.2	2.6
Smoking cessation				
All	57.9	58.6	59.4	61.3
Boys	55.8	56.0	58.4	60.4
Girls	62.1	64.3	62.2	64.2