SUPPLEMENTARY FILE

Methods S1. Modification of "pregnancies-at-risk approach"

The modification of pregnancies-at-risk approach has been previously applied in time-series analysis of birth outcomes.[1,2] The aim of this is to properly account for the variations of the baseline risk of the population at risk. It consists of the inclusion of an outcome-specific offset with the weekly number of on-going gestations which would be susceptible to deliver prematurely (between 22 and 36 gestational weeks) or at risk of having an early-term baby (with 37 or 38 gestational weeks). A weekly correcting factor of the offset was also introduced as an explanatory variable, with the aim of properly correcting for the temporal variation of the baseline probability of giving birth according to the mean gestational age of the pregnancies at risk included in the offset.

The weekly number of pregnancies at risk for preterm birth began to decline gradually 22 weeks before the end of the study period (December 31st 2012). It was due to the fact that December 31st 2012 was the last birthdate considered for inclusion in the study, so those on-going gestations giving birth after this date were not considered for the offset of at-risk pregnancies for the previous weeks coinciding with study period. For example, a full-term birth (42 gestational weeks) born in January 1st 2013 would not account for the offset during the preceding 20 weeks (because it would be included when it reached the 22 gestational week). To avoid the potential bias due to this fact, we decided to exclude from the analysis the last 22 weeks of the year 2012.

1. *Vicedo-Cabrera AM, Iñíguez C, Barona C, Ballester F. Exposure to elevated temperatures and risk of preterm birth in Valencia, Spain. Environ Res 2014;134C:210–7.*

2. *Vicedo-Cabrera AM, Olsson D, Forsberg B. Exposure to seasonal temperatures during the last month of gestation and the risk of preterm birth in Stockholm. Int J Environ Res Public Health 2015;12(4):3962–78.*

Methods S2. Sensitivity analysis of the before-and-after study

We firstly obtained the overall change in risk including in the meta-analysis the estimations of the cantons excluded from the main analysis (i.e. Neuchatel, Geneva and Ticino). The annual mean value of tobacco taxes was included in the time-series models as a linear term, with the aim of differentiating between the change in risk coinciding with the ban introduction and the effect due to the increase in tobacco taxes. The annual tobacco taxes per cigarette pack applied in Switzerland (from 2007 to 2012) was obtained from Federal Department of Finance (Eidgenössisches Finanzdepartement). We also assessed the potential post-ban gradual changes in risk, by adding an interaction term between the time elapsed under the smoking ban and the indicator variable for time under smoking ban. And, in case this gradual change was non-linear, we distinguished between the first 12 months of the ban and the remaining time under the ban. In addition, we introduced a natural spline function of calendar time, to explore potential non-linearities of the long-term trend in the risk of both outcomes. The number of degrees of freedom (df) was selected (choosing from 1 to 12) according to the quasi-Akaike criteria in each canton-specific model. And finally, we estimated the impact on full term birth rates (39-42 complete gestational weeks) as a "sensitivity outcome", since we should not expect an effect of the introduction of the law in this case.

Methods S3. Principal component analysis (PCA)

The PCA was performed on several cantonal specific indicators including percentage of foreign population, urban population, unemployment, gross domestic product (GDP), educational level (percentage of population with university degree or similar, or tertiary education degree), population density, family size, status index (a score representing the occupational status and earnings of the population), and different health profiles of the population derived as an average of the last three Swiss Health Surveys (2002, 2007 and 2012) for prevalence of obesity, arterial hypertension (AHT), percentage of population reporting a good health status, elevated daily consumption of alcohol, and a frequent physical activity. Correlation between indicators was assessed through Spearman rank

correlation coefficients and a varimax rotation was applied after the PCA. Three components were extracted explaining 85% of the overall variance. One was highly correlated with the socioeconomic (SES) indicators (foreign population, urban population, GDP, educational level, population density, family size, and status index). The other two components were correlated with the health indicators and the unemployment variable, respectively, and they were summarized in a composite index representing the health profile of the population. Details on the definition and sources of aggregated canton-specific indicators are presented in Table S1 of this Appendix. Descriptive results of the different indicators are shown in Table S2, and the correlation between them in Table S3.

Methods S4. Correction to avoid the fixed-cohort bias

To avoid the fixed cohort bias, we excluded births with conception date earlier than 26 weeks before the study start (January 1st 2007, or the specific date in Vaud, Valais and Geneva), or later than 42 weeks before the study end (31st December 2012), following the procedure of Strand et al. 2011. That is, we defined the inclusion of the pregnancies in analyses by date of conception, rather than the date of birth. The bias occurs in retrospective cohorts which include all births occurring within a fixed start and end date, which means shorter pregnancies are missed at the start of the study, and longer pregnancies are missed at the end.

Strand LB, Barnett AG, Tong S. Methodological challenges when estimating the effects of season and seasonal exposures on birth outcomes. BMC Med Res Methodol 2011;11:49.

Methods S5. Information on statistical software

All statistical analyses were performed with R software (lm4, metafor, survival packages).

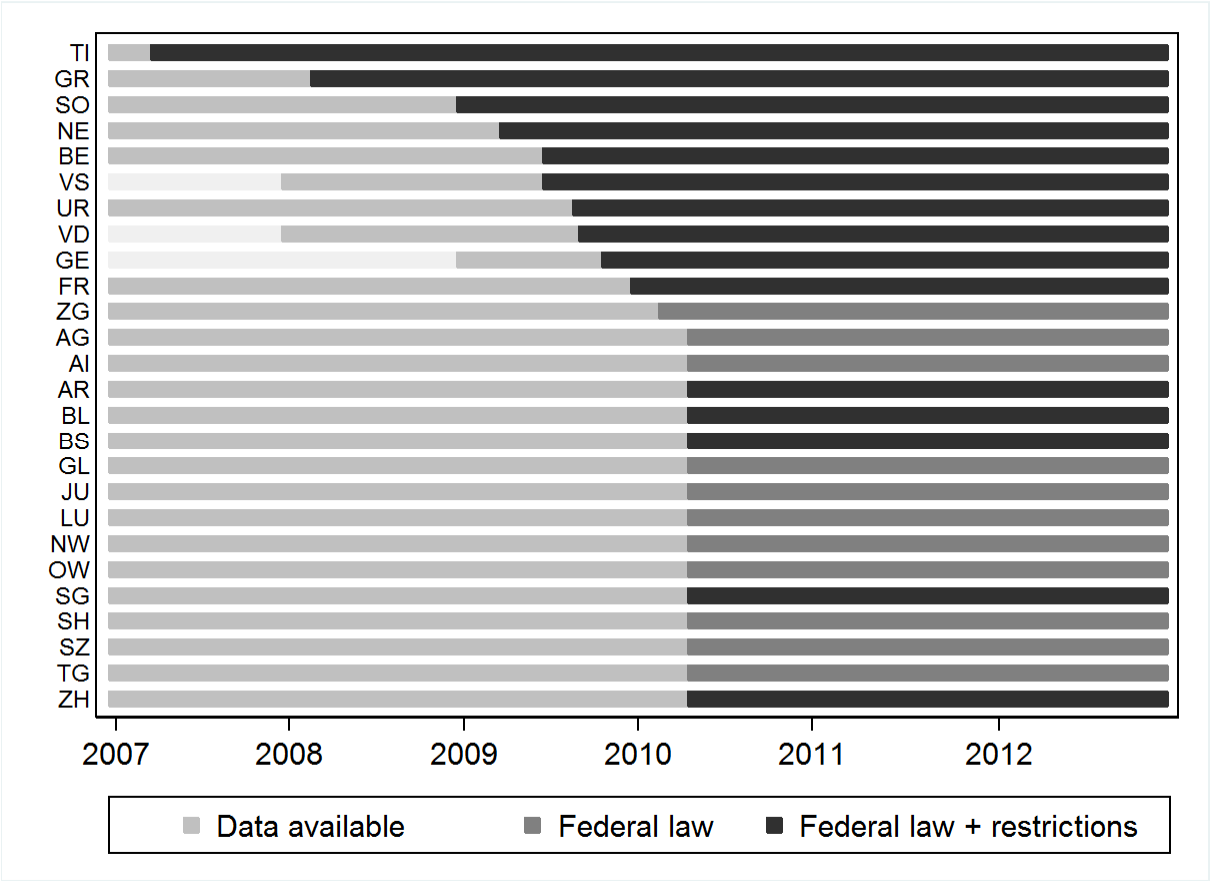

Figure S1. Graphical scheme of the dates when smoking ban were introduced, and the pre/post-ban period by type of law applied in each canton.

"Federal Law": cantons following the basic federal legislation on smoke-free environments in public places; "Federal Law + restrictions": cantons which applied additional restrictions to the Federal smoking ban in terms of occupational exposure, allowing smoking only in dedicated rooms of limited size.
Aargau (AG); Appenzell Innerrhoden (AI); Appenzell Ausserrhoden (AR); Bern (BE); Basel-Landschaft (BL); Basel-Stadt (BS); Fribourg (FR); Glarus (GL); Graubunden (GR); Jura (JU); Luzern (LU); Nidwalden (NW); Obwalden (OW); St. Gallen (SG); Schaffhausen (SH); Solothurn (SO); Schwyz (SZ); Thurgau (TG); Uri (UR); Vaud (VD); Valais (VS); Zug (ZG); Zurich (ZH).

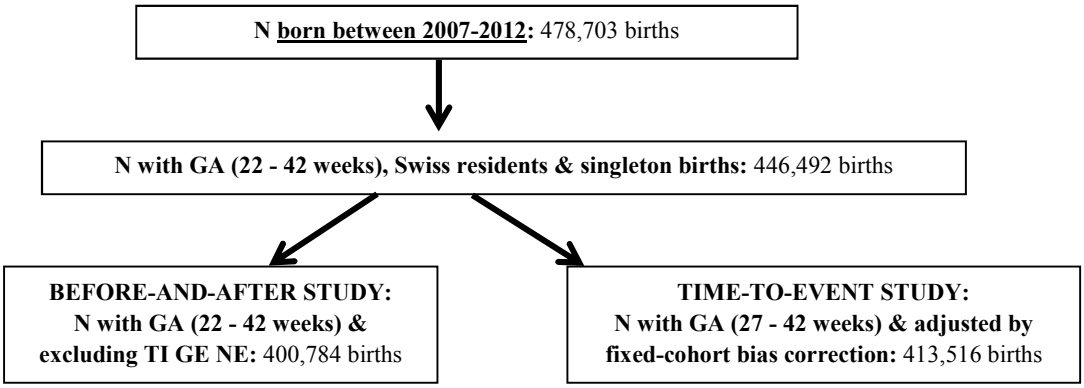

Figure S2. Selection of the study population according to the inclusion criteria defined for each sub-study.

N: number; GA: gestational age; TI: Ticino, GE: Geneva; NE: Neuchâtel.

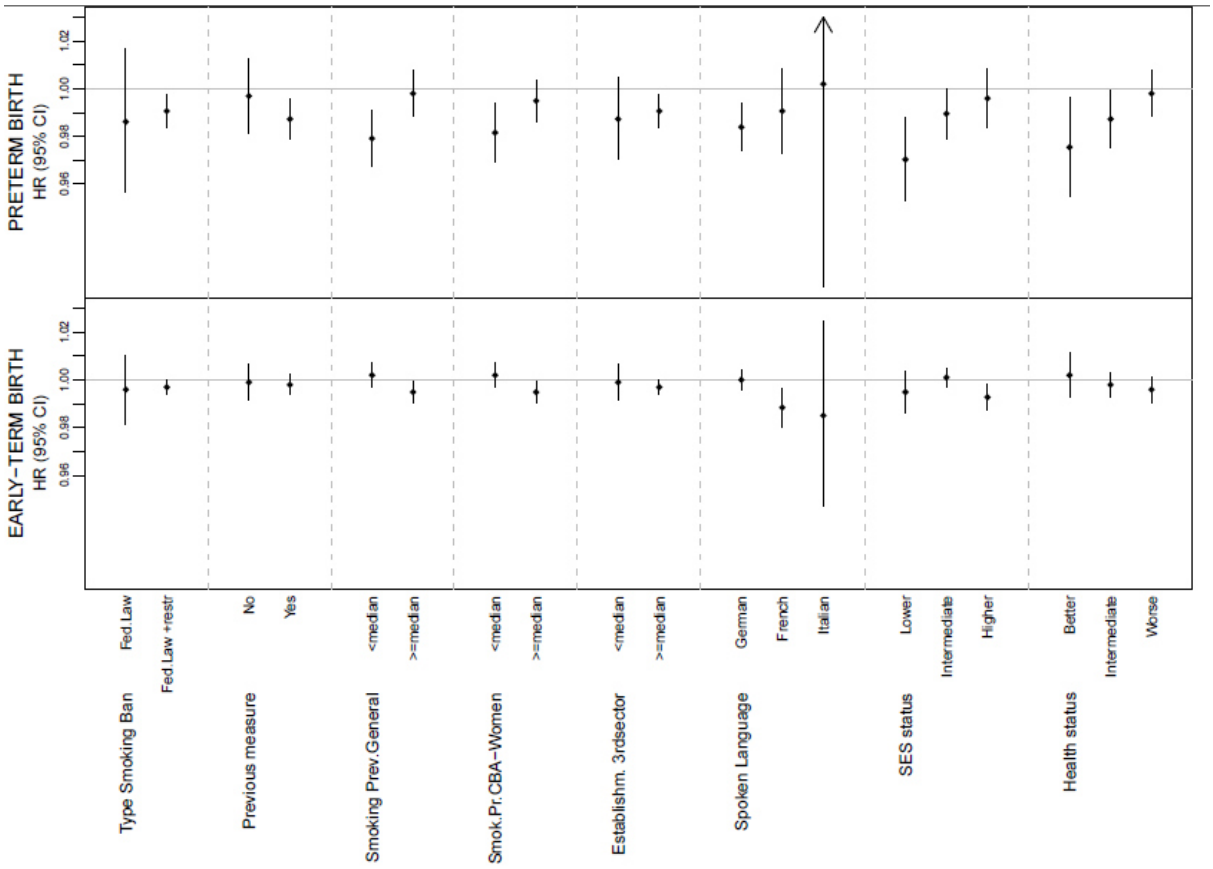

Figure S3. Hazard ratios (HR, 95% confidence interval [CI]) of preterm (26-36 gestational weeks) and early-term births (37-38 gestational weeks) for a 10%-increase in the proportion of pregnancy time under the smoking ban (whole pregnancy) per categories of contextual factors of the maternal canton of residence.

Type of smoking ban: Fed. Law: cantons which followed only the Federal Smoking Ban, Fed. Law + restr: cantons which applied additional restrictions to the Federal Smoking Ban.
Categories of smoking prevalence (adult population (general) and child-bearing-aged women (CBA-women)), and number of establishments of the 3rd sector (proxy of hospitality venues) defined as below or above the median value among all cantons.
Categories of socioeconomic status (SES) and health status based on terciles of the corresponding scores derived from the principal components analysis (SES/Health status: lower /better(1st tercile), intermediate (2nd tercile), higher /worse(3rd tercile).

Table S1. Description of the socioeconomic and health related variables collected at cantonal level.

GROUP VARIABLE	DATA	ORIGIN	CHARACTERISTICS	AVAILABLE PERIOD	TEMPORAL AGGREG. LEVEL	GEO AGGREG. LEVEL
SES – urbanity status	*Foreign population*	Federal Office of Statistics	% of foreign population.	2007 to 2012	Annual	Cantonal
	Urban population	Federal Office of Statistics	% of urban population.	2007 to 2012	Annual	Cantonal
	Gross domestic product	Federal Office of Statistics	CHF per inhabitant	2008 to 2011	Annual	Cantonal
	Unemployment	Federal Office of Statistics	% of unemployed population (registered unemployed people/active population).	2007 to 2012	Annual	Cantonal
	Educational level	Federal Office of Statistics	Distribution of the population by percentage in each level (Without post-compulsory, secondary, tertiary level) in Swiss permanent pop >25years	2010 to 2012	Annual	Cantonal
	*Status Index**	Federal Office of Statistics	Composite index representing the occupational status and earnings of the population.	2000	Annual	Cantonal
	Population density	Federal Office of Statistics	Number of inhabitants per km2 of surface (total or productive)	2008 to 2012	Annual	Cantonal
	Family size	Federal Office of Statistics	Mean number of members per family	2012	Annual	Cantonal
Health status	*Good or very good health condition*	Swiss Health Survey	% population reporting his/her health is good or very good	2002, 2007, 2012	Annual	Cantonal (not all)
	Hypertension	Swiss Health Survey	% population (>15y) reporting high blood pressure or having taken anti-HTA drugs the last 7 years	2002, 2007, 2012	Annual	Cantonal (not all)
	Obesity	Swiss Health Survey	% population (>18y) with BMI >= than 30.	2002, 2007, 2012	Annual	Cantonal (not all)
	Alcohol consumption	Swiss Health Survey	% pop (>15y) with a diary consumption of alcohol representing a risk for health (according to the quantity of alcohol reported)	2002, 2007, 2012	Annual	Cantonal (not all)
	Physical activity	Swiss Health Survey	% pop (>15y) considered as physically active (2.5h of semi-intense physical activity, or intense activity 10 times per week)	2002, 2007, 2012	Annual	Cantonal (not all)
Smoking covariates	Overall Smoking prevalence	Swiss Health Survey	Prevalence (%) of smokers (at least 1 cigarette per day)	2002, 2007, 2012	Annual	Cantonal (not all)
	Smoking prevalence in women between 18 to 44 years old	Swiss Health Survey	Prevalence (%) of smokers (at least 1 cigarette per day) in women between 18 to 44 years old	2002, 2007, 2012	Annual	Cantonal (not all)
	Number of 3rd sector establishments	Federal Office of Statistics	Number of establishments of the 3rd sector.	2011	Annual	Cantonal

Swiss Health Survey (Federal Office of Statistics): Sample survey carried out every 5 years since 1992 using computer assisted telephone interviews followed by a written questionnaire. A representative sample of resident population in private households aged 15 or over is surveyed in each canton.
Data was not available in some cantons in all three surveys, especially for the smaller regions, due to the low representativeness of the sample surveyed. The missing estimate (no data for any of the surveys, or with just one out of the three) was imputed through a linear regression using the SES indicators as predictors, since both health and SES data are *a priori* correlated.

*Status Index is a weighted sum of different occupational and income-related indicators, representing the socioeconomic status of the population. The higher is the value the higher is the socio-occupational profile.

Status Index = 2.5 * TER – 2 * PRI + OMF – PBS + 4 * HEK – 2 * NEK

TER = tertiary education degree; PRI = primary education; OMF = managers and professionals ; PBS = unskilled employees; HEK = high income (above 95,000 swiss francs per year); NEK = low income (below 50,000 swiss francs per year)

Other public health measures against tobacco: (tobacco publicity restrictions in public spaces, limitation on tobacco sales to youth or in automatic vending machines).

Table S2. Distribution of the canton-specific mean values of the socio-economic (SES), health and smoking-related indicators obtained for the study period (excluding the cantons of Geneva, Neuchatel and Ticino).

	Mean (SD)	CV	Min	33th Pctl	Median	66th Pctl	Max
SES-related variables							
Foreign population (%)	18.7 (5.9)	0.3	9.6	16.1	19.1	21.2	32.0
Urban population (%)	57.4 (32.1)	0.6	0.0	50.8	62.5	75.1	100.0
GDP (swiss francs)	66575.7 (24498.5)	0.4	47657.5	56000.6	57768.0	64964.8	148972.8
Unemployment rate (%)	2.5 (0.9)	0.4	1.1	2.0	2.5	2.8	4.7
Tertiary educational level (%)	25.7 (5.4)	0.2	18.4	23.7	25.6	26.1	37.4
Status Index	47.9 (4.5)	0.1	41.3	45.7	47.7	48.3	58.1
Population density (%)	449.7 (1020.0)	2.3	27.1	161.6	218.9	262.9	5044.3
Family size (N)	2.3 (0.1)	0.1	1.9	2.3	2.4	2.4	2.6
Health-related variables*							
Good or very good health condition (%)	86.3 (2.7)	0.0	81.1	85.4	86.5	87.3	91.2
Prevalence of Arterial Hypertension (%)	16.1 (2.1)	0.1	12.8	14.9	15.5	17.2	20.0
Prevalence of Obesity (%)	8.9 (1.1)	0.1	6.7	8.1	8.8	9.4	11.2
High alcohol consumption (%)	4.7 (1.3)	0.3	2.6	4.0	4.5	5.0	7.8
Frequent physical activity (%)	69.7 (5.6)	0.1	56.8	68.2	70.1	73.0	77.4
Smoking-related variables							
*Overall smoking prevalence (%)**	21.5 (3.7)	0.2	14.2	19.6	21.5	22.8	32.7
*Smok. Prev. women child-bearing age (%)**	20.9 (5.8)	0.3	8.7	18.1	21.5	23.6	29.4
Number of 3rd sector establishments (N)	18171.9 (20837.8)	1.1	1032.0	4797.4	13934.0	15086.0	90386.0

*Results from the imputed data.
SD: standard deviation; CV: coefficient of variation; Min: minimum; Max: maximum; Pctl: percentile.

Table S3. Spearman rank correlation coefficients between the socio-economic (SES), health and smoking-related indicators, and the SES and health components obtained from the principal component analysis (excluding the cantons of Geneva, Neuchatel and Ticino).

	Foreign pop.	Urban pop.	GDP	Unempl.	Tertiary educ.	Status Index	Pop. density	Family size	Good health	AHT	Obesity	High alcohol cons.	Freq. phys. activity	SES comp.	Health comp.	Overall Smok. Prev.	Smok. Prev. W*CBA*	Estab. 3rd sector
Foreign pop.	1																	
Urban pop.	0.614	1																
GDP	0.694	0.687	1															
Unemployment	0.642	0.436	0.446	1														
Tertiary educ.	0.573	0.781	0.724	0.339	1													
Status Index	0.575	0.818	0.627	0.311	0.884	1												
Pop. density	0.685	0.738	0.668	0.488	0.774	0.811	1											
Family size	-0.600	-0.652	-0.816	-0.393	-0.562	-0.603	-0.499	1										
Good health	-0.402	-0.331	-0.369	-0.874	-0.178	-0.195	-0.314	0.414	1									
AHT	0.013	0.335	0.216	0.445	0.296	0.436	0.275	-0.407	-0.632	1								
Obesity	-0.173	0.169	-0.041	0.297	0.049	0.011	0.005	0.107	-0.512	0.609	1							
High alcohol cons.	0.570	0.180	0.360	0.756	0.055	-0.076	0.102	-0.360	-0.693	0.034	0.070	1						
Freq phys.activity	-0.450	-0.439	-0.382	-0.878	-0.334	-0.187	-0.354	0.295	0.819	-0.340	-0.428	-0.783	1					
SES component	0.722	0.903	0.840	0.449	0.887	0.903	0.823	-0.775	-0.346	0.372	0.056	0.173	-0.376	1				
Health component	0.392	0.427	0.363	0.876	0.256	0.248	0.338	-0.390	-0.958	0.676	0.629	0.645	-0.861	0.389	1			
Overall Smok. Prev.	0.192	0.467	0.152	0.359	0.229	0.198	0.205	0.022	-0.157	-0.094	0.126	0.212	-0.497	0.254	0.253	1		
Smok. Prev. W*CBA*	0.083	0.481	0.074	0.490	0.292	0.430	0.314	-0.107	-0.412	0.403	0.197	0.072	-0.489	0.323	0.463	0.698	1	
Estab. 3rd sector	0.621	0.513	0.624	0.612	0.628	0.551	0.506	-0.547	-0.440	0.285	0.048	0.437	-0.562	0.640	0.485	0.214	0.318	1

AHT: Arterial Hypertension; WCBA: women in child-bearing age (18 to 44 years old)

Table S4. Results from the sensitivity analysis.

		PRETERM BIRTH %change in risk (95%CI)	EARLY-TERM BIRTHS %change in risk (95%CI)
M	*Main analysis*	*-3.56 (-9.29 to 2.53)*	*-5.04 (-7.53 to -2.48)*
S1: All cantons	SB	-3.72 (-8.85 to 1.70)	-4.42 (-6.71 to -2.07)
S2: + tobacco taxes	SB	-4.64 (-10.79 to 1.93)	-6.08 (-8.38 to -3.72)
	Tax (per 1 unit increase)	-0.79 (-3.60 to 2.11)	-3.64 (-4.71 to -2.56)
S3: + post-ban gradual change	SB immediate (step change)	-3.84 (-8.69 to 1.26)	-5.56 (-7.78 to -3.29)
	SB gradual change (per year)	0.52 (-4.68 to 6.01)	0.78 (-1.70 to 3.32)
S4: + post-ban gradual change (parametrized)	SB immediate (step change)	-1.78 (-8.05 to 4.91)	-5.77 (-8.90 to -2.54)
	SB gradual change (up to 1 year) (per year)	-3.42 (-15.84 to 10.84)	2.20 (-2.30 to 6.92)
	SB after 1 year (step change)	-4.95 (-11.55 to2.14)	-5.86 (-8.80 to -2.83)
	SB gradual change (from 1 year onwards) (per year)	2.30 (-3.58 to 8.54)	2.06 (-1.43 to 5.68)
S5: + non-linear long-term trend‡	SB	-0.27 (-6.24 to 6.08)	-4.29 (-6.66 to -1.86)
S6: full-term births	SB	-0.8 (-2.51 to 0.92)	

SB: Smoking ban impact
The cantons of Geneva, Neuchatel and Ticino were excluded from the analysis, except in S1.
All models adjusted by: long-term and seasonal trends, number of days per week, correcting factor of the offset.
‡Number of df selected per canton according to quasi-AIC, by alphabetic order: preterm: 1,1,2,10,1,3,1,2,1,3,1,1,1,1,1,2,1,1,1,1,1,1,4,2,2; early-term: 1,1,2,10,1,3,1,2,1,3,1,1,1,1,1,1,2,1,1,1,1,1,1,4,2,2.

Table S5. Date implementation smoking bans by canton

Canton		Date of smoking ban implementation	Type of ban*	
			Federal Law	Federal Law + Restrictions
Appenzell Ausserrhoden	AG	01/05/2010	x	
Appenzell Innerrhoden	AI	01/05/2010	x	
Aargau	AR	01/05/2010		x
Bern	BE	01/07/2009		x
Basel-Landschaft	BL	01/05/2010		x
Basel-Stadt	BS	01/04/2010		x
Fribourg	FR	01/01/2010		x
Geneva**	GE	01/11/2009		x
Glarus	GL	01/05/2010	x	
Graubünden	GR	01/03/2008		x
Jura	JU	01/05/2010	x	
Lucerne	LU	01/05/2010	x	
Neuchâtel	NE	01/04/2009		x
Nidwalden	NW	01/05/2010	x	
Obwalden	OW	01/05/2010	x	
St. Gallen	SG	01/05/2010		x
Schaffhausen	SH	01/05/2010	x	
Solothurn	SO	01/01/2009		x
Schwyz	SZ	01/05/2010	x	
Thurgau	TG	01/05/2010	x	
Ticino	TI	12/04/2007		x
Uri	UR	01/09/2009		x
Vaud	VD	15/09/2009		x
Valais	VS	01/07/2009		x
Zug	ZG	01/03/2010	x	
Zürich	ZH	01/05/2010		x

*"Federal Law": cantons following the basic federal legislation on smoke-free environments in public places; "Federal Law + restrictions": cantons which applied additional restrictions to the Federal smoking ban in terms of occupational exposure, allowing smoking only in dedicated rooms of limited size.

** Two consecutive smoking bans were implemented in the canton of Geneva: a legislative smoking ban in public places was implemented after a popular vote on 1 July 2009 which was cancelled by the Supreme Court three months later. A second vote led to a permanent smoking ban, which was applied from 30 October 2009. To simplify our approach, we decided to consider in the analysis only this second ban.