

Electronic supplementary material:

International Journal of Public Health

Marked increase in measles vaccination coverage among young adults in Switzerland - a campaign or cohort effect?

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Supplementary Table 1: Sensitivity analysis, multivariate logistic regression of measles vaccination with at least 2 documented doses, measles survey 2012 and 2015, Switzerland

Model 1		unweighted						weighted					
		MAR			MCAR			MAR			MCAR		
		adj. OR	95% CI		adj. OR	95% CI		adj. OR	95% CI		adj. OR	95% CI	
Survey													
	2012	1			1			1			1		
	2015	1.57	1.19	2.08	1.72	1.28	2.30	1.50	1.05	2.14	1.67	1.15	2.42
Birth cohort													
	>=1990	1			1			1			1		
	<1990	0.43	0.31	0.59	0.41	0.30	0.56	0.41	0.28	0.61	0.41	0.28	0.61
Sex													
	female	1			1			1			1		
	male	0.64	0.51	0.80	0.70	0.54	0.91	0.55	0.41	0.75	0.58	0.42	0.82
Educational level													
	secondary	1			1			1			1		
	tertiary	0.92	0.72	1.17	0.89	0.66	1.19	0.87	0.60	1.25	0.77	0.53	1.12
Prior measles													
	surely yes	1			1			1			1		
	yes, I believe so	1.34	0.76	2.34	1.26	0.63	2.57	1.59	0.84	3.03	1.69	0.71	4.05
	no, I don't believe so	2.05	0.99	4.21	1.98	1.19	3.28	2.02	0.72	5.65	1.83	0.94	3.54
	surely not	2.65	1.81	3.88	2.72	1.76	4.14	2.55	1.42	4.58	2.46	1.43	4.23
	I don't know	1.63	0.87	3.05	1.58	0.79	3.25	1.56	0.70	3.49	1.51	0.61	3.77
Model 2													
Survey													
	2012	1			1			1			1		11
	2015	1.57	1.18	2.08	1.71	1.27	2.29	1.51	1.06	2.14	1.69	1.16	2.46
Birth cohort													
	>=1990	1			1			1			1		
	<1990	0.43	0.31	0.58	0.40	0.29	0.55	0.41	0.28	0.61	0.41	0.27	0.61
Sex													
	female	1			1			1			1		
	male	0.64	0.51	0.81	0.72	0.55	0.93	0.55	0.40	0.75	0.59	0.42	0.84
Educational level													
	secondary	1			1			1			1		
	tertiary	0.89	0.69	1.14	0.85	0.63	1.14	0.85	0.58	1.23	0.75	0.51	1.10
Prior measles													
	surely yes	1			1			1			1		
	yes, I believe so	1.33	0.76	2.34	1.32	0.66	2.72	1.56	0.82	2.99	1.70	0.71	4.08
	no, I don't believe so	2.09	1.03	4.23	2.01	1.21	3.34	2.05	0.75	5.66	1.83	0.93	3.58
	surely not	2.63	1.79	3.86	2.67	1.73	4.09	2.51	1.40	4.52	2.38	1.39	4.08
	I don't know	1.64	0.87	3.08	1.63	0.81	3.38	1.59	0.72	3.53	1.59	0.63	4.02
I can endanger others, if I am not vaccinated													
	complete agreement	1			1			1			1		
	slight agreement	0.79	0.54	1.17	0.76	0.57	1.03	0.81	0.50	1.32	0.75	0.51	1.12
	slight disagreement	0.76	0.50	1.15	0.66	0.44	1.00	0.83	0.48	1.42	0.79	0.46	1.34
	complete disagreement	0.58	0.32	1.03	0.47	0.27	0.87	0.71	0.32	1.59	0.74	0.37	1.46
	I don't know	1.26	0.43	3.74	2.09	0.81	7.16	1.27	0.38	4.28	1.84	0.42	8.09
Model 3													
Survey													
	2012	1			1			1			1		
	2015	2.22	1.77	2.78	2.51	1.94	3.28	2.00	1.49	2.70	2.3	1.63	3.23
sex													
	female	1			1			1			1		
	male	0.66	0.53	0.82	0.74	0.57	0.96	0.55	0.41	0.75	0.61	0.43	0.85
educational level													

Supplementary Table 2: Sensitivity analysis, univariate logistic regression of measles vaccination with at least 2 documented doses, measles survey 2012 and 2015, Switzerland

		unweighted						weighted					
		MAR			MCAR			MAR			MCAR		
		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Survey	2012	1			1			1			1		
	2015	2.14	1.72	2.67	2.43	1.88	3.15	1.91	1.43	2.56	2.15	1.54	3.01
Birth cohort	>=1990	1			1			1			1		
	<1990	0.35	0.28	0.45	0.32	0.24	0.42	0.34	0.24	0.48	0.32	0.23	0.45
Sex	female	1			1			1			1		
	male	0.69	0.56	0.85	0.77	0.60	0.98	0.55	0.41	0.74	0.59	0.43	0.81
Nationality	Swiss	1			1			1			1		
	foreign	0.89	0.51	1.54	0.92	0.57	1.55	0.96	0.40	2.32	1.15	0.59	2.23
Language region	German	1			1			1			1		
	French	1.19	0.97	1.46	1.05	0.82	1.34	1.23	0.98	1.55	1.11	0.83	1.48
Educational level	secondary	1			1			1			1		
	tertiary	0.77	0.61	0.97	0.68	0.53	0.90	0.75	0.53	1.08	0.60	0.43	0.86
Having own children	yes	1			1			1			1		
	no	1.7	1.3	2.3	2.2	1.5	3.1	1.4	0.9	2.0	1.5	1.0	2.3
Prior measles	surely yes	1			1			1			1		
	yes, I believe so	1.1	0.7	1.9	1.0	0.5	2.1	1.4	0.7	2.5	1.4	0.6	3.3
	no, I don't believe so	2.0	1.0	3.9	1.8	1.1	3.0	2.0	0.8	5.3	1.8	1.0	3.3
	surely not	2.6	1.8	3.7	2.5	1.7	3.7	2.6	1.5	4.6	2.3	1.4	3.9
	I don't know	1.4	0.8	2.6	1.3	0.7	2.5	1.4	0.6	3.1	1.2	0.5	2.9
Can adults get measles?	surely yes	1			1			1			1		
	rather yes	1.30	1.02	1.66	1.41	1.07	1.85	1.11	0.75	1.63	1.13	0.79	1.62
	rather no	0.92	0.62	1.38	1.12	0.69	1.91	0.84	0.48	1.46	0.98	0.52	1.86
	surely no	0.97	0.25	3.73	0.83	0.29	2.94	1.00	0.12	8.73	0.85	0.25	2.89
	I don't know	0.77	0.51	1.18	0.87	0.54	1.45	0.80	0.45	1.40	0.94	0.50	1.74
Can adults catch up missing vaccinations?	surely yes	1			1			1			1		
	rather yes	1.10	0.79	1.53	1.10	0.78	1.53	1.06	0.73	1.53	1.00	0.66	1.53
	rather no	0.98	0.65	1.48	0.98	0.63	1.55	0.81	0.47	1.40	0.77	0.44	1.36
	surely no	0.76	0.24	2.44	0.89	0.41	2.15	0.84	0.19	3.68	1.65	0.63	4.37
	I don't know	0.82	0.58	1.17	0.87	0.57	1.33	0.81	0.51	1.26	0.89	0.51	1.55
I can endanger others, if I am not vaccinated	complete agreement	1			1			1			1		
	slight agreement	0.84	0.56	1.23	0.78	0.59	1.04	0.85	0.53	1.38	0.76	0.52	1.10
	slight disagreement	0.78	0.52	1.17	0.71	0.49	1.06	0.81	0.49	1.35	0.78	0.48	1.27
	complete disagreement	0.55	0.31	0.95	0.44	0.26	0.79	0.67	0.31	1.44	0.74	0.38	1.41
	I don't know	1.14	0.41	3.15	1.78	0.71	6.01	1.17	0.36	3.78	1.60	0.40	6.45
Is vaccination against measles mandatory in Switzerland?	surely yes	1			1			1			1		
	yes, I believe so	1.53	0.70	3.35	1.35	0.63	2.77	2.23	0.98	5.06	2.06	0.73	5.83
	no, I do not believe so	0.78	0.45	1.37	0.71	0.36	1.30	1.06	0.51	2.20	0.96	0.38	2.45
	surely no	0.65	0.40	1.05	0.58	0.30	1.05	0.96	0.47	1.94	0.90	0.36	2.27
	I don't know	0.81	0.41	1.62	0.69	0.30	1.54	1.36	0.37	5.08	1.33	0.43	4.09
Did you know about the collaboration of Switzerland with the WHO in eliminating measles?	yes	1			1			1			1		
	no	1.19	0.91	1.55	1.17	0.91	1.50	1.03	0.71	1.49	0.99	0.71	1.38
Is measles elimination necessary in Switzerland?	surely yes	1			1			1			1		
	rather yes	1.14	0.79	1.64	1.20	0.89	1.62	1.08	0.67	1.74	1.06	0.72	1.57
	rather no	0.76	0.56	1.02	0.80	0.56	1.14	0.70	0.46	1.07	0.74	0.46	1.17
	surely no	0.88	0.53	1.46	0.95	0.53	1.82	1.04	0.57	1.90	1.43	0.67	3.04
	I don't know	0.75	0.46	1.20	0.87	0.53	1.49	0.79	0.44	1.42	1.03	0.55	1.91
Do you have professional contact to children, pregnant women or sick persons?	yes	1			1			1			1		
	no	0.98	0.73	1.33	0.97	0.73	1.26	0.91	0.60	1.36	0.95	0.65	1.38

Supplementary Table 3: Vaccination coverage with 2 doses by birth cohort 1982 to 1995 at 16-years and 20- to 29-years weighted and assuming missing completely at random, measles survey 2012 and 2015, Switzerland

birth cohort	survey 2012	survey 2015	Total	vaccinated with 2 doses at time of survey 2012	standard error	vaccinated with 2 doses until age of 16-years, survey 2012	standard error	vaccinated with 2 doses at time of survey 2015	standard error	vaccinated with 2 doses until age of 16-years, survey 2015	standard error	vaccinated with 2 doses at time of survey, pooled	standard error	vaccinated with 2 doses until age of 16-years, pooled	standard error	SNCVS* vaccinated with 2 doses at 16-years	catchup, pooled**	standard error
1982	58	0	58	55%	(±8%)	42%	(±8%)	NA	NA	NA	NA	55%	(±8%)	42%	(±8%)	NA	13%	(±6%)
1983	95	0	95	61%	(±6%)	55%	(±6%)	NA	NA	NA	NA	61%	(±6%)	55%	(±6%)	54%	6%	(±2%)
1984	76	0	76	70%	(±7%)	59%	(±7%)	NA	NA	NA	NA	70%	(±7%)	59%	(±7%)	54%	11%	(±4%)
1985	77	0	77	76%	(±6%)	73%	(±6%)	NA	NA	NA	NA	76%	(±6%)	73%	(±6%)	54%	3%	(±2%)
1986	70	64	134	71%	(±7%)	65%	(±7%)	76%	(±7%)	61%	(±8%)	73%	(±5%)	63%	(±5%)	54%	10%	(±3%)
1987	52	62	114	71%	(±9%)	62%	(±9%)	77%	(±7%)	69%	(±7%)	74%	(±6%)	66%	(±6%)	54%	9%	(±3%)
1988	72	71	143	84%	(±5%)	76%	(±6%)	90%	(±3%)	82%	(±5%)	87%	(±3%)	79%	(±4%)	NA	8%	(±3%)
1989	76	83	159	84%	(±5%)	75%	(±6%)	83%	(±6%)	65%	(±7%)	84%	(±4%)	69%	(±5%)	76%	14%	(±4%)
1990	93	84	177	87%	(±4%)	80%	(±5%)	95%	(±2%)	79%	(±6%)	91%	(±2%)	79%	(±4%)	76%	12%	(±4%)
1991	110	112	222	91%	(±3%)	85%	(±4%)	86%	(±5%)	75%	(±5%)	88%	(±3%)	79%	(±4%)	76%	9%	(±2%)
1992	24	119	143	NA	NA	NA	NA	95%	(±2%)	81%	(±4%)	94%	(±3%)	83%	(±4%)	85%	11%	(±3%)
1993	0	129	129	NA	NA	NA	NA	91%	(±3%)	81%	(±4%)	91%	(±3%)	81%	(±4%)	85%	10%	(±3%)
1994	0	173	173	NA	NA	NA	NA	90%	(±3%)	85%	(±3%)	90%	(±3%)	85%	(±3%)	85%	6%	(±2%)
1995	0	151	151	NA	NA	NA	NA	92%	(±2%)	90%	(±3%)	92%	(±2%)	90%	(±3%)	89%	2%	(±1%)

* External data source, Swiss National Vaccination Coverage Survey

** catch-up vaccination is the difference between the total number of respondents vaccinated with two doses at time of survey minus those, which had been vaccinated with 2 doses at age of 16-years.

"pooled" means that the data are analyzed disregarding the survey.

Supplementary Table 4: Logistic regression models of documented vaccination coverage, weighted and assuming missing completely at random, measles survey 2012 and 2015, Switzerland

	univariate analysis			multivariate analysis		
	OR	95% CI		adj. OR	95% CI	
Survey						
2012	1			1		
2015	2.20	1.50	3.00	1.29	0.82	2.03
Birth cohort						
1982	1			1		
1983	1.30	0.57	2.90	1.30	0.57	3.00
1984	1.90	0.80	4.60	2.13	0.86	5.29
1985	2.70	1.10	6.60	2.99	1.19	7.49
1986	2.30	1.00	5.00	2.22	0.96	5.09
1987	2.40	1.00	5.50	2.24	0.92	5.44
1988	5.60	2.50	12.00	5.43	2.30	12.80
1989	4.20	1.80	9.70	3.78	1.58	9.06
1990	8.60	3.70	20.00	8.37	3.43	20.40
1991	6.20	2.70	14.00	5.68	2.44	13.20
1992	12.00	4.30	33.00	10.80	3.55	32.90
1993	8.60	3.30	22.00	7.31	2.48	21.60
1994	7.70	3.30	18.00	6.45	2.43	17.10
1995	10.00	4.10	25.00	8.59	3.02	24.50
Prior measles						
surely yes	1			1		
yes, I believe so	1.43	0.62	3.28	1.92	0.82	4.52
no, I don't believe so	1.79	0.97	3.31	1.91	0.98	3.71
surely not	2.33	1.40	3.89	2.72	1.57	4.73
I don't know	1.19	0.49	2.91	1.74	0.70	4.36
OR Odds ratio, CI confidence interval						

Supplementary Table 5: Evaluation of the outcome "vaccination card absent yes=1 and no=0", measles survey 2012 and 2015, Switzerland

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