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Immunisation coverage of adults: a vaccination counselling campaign in the pharmacies in Switzerland

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Summary

OBJECTIVE: To assess vaccination coverage for adults living in Switzerland.
METHODS: Through a media campaign, the general population was invited during 1 month to bring their vaccination certificates to the pharmacies to have their immunisation status evaluated with the software viavac©, and to complete a questionnaire.
RESULTS: A total of 496 pharmacies in Switzerland participated in the campaign, of which 284 (57%) submitted valid vaccination information. From a total of 3,634 participants in the campaign, there were 3,291 valid cases (participants born ≤1992) and 1,011 questionnaires completed. Vaccination coverage for the participants was 45.9% and 34.6% for five and six doses of diphtheria, 56.4% and 44.0% for tetanus and 66.3% and 48.0% for polio, respectively. Coverage estimates for one and two doses of measles vaccine were 76.5% and 49.4%, respectively, for the birth cohort 1967–1992 and 4.0% and 0.8%, respectively, for the cohort ≤1966. There was a significant difference in coverage for most vaccinations between the two aforementioned birth cohorts. A plot of the measles vaccine coverage over time shows that the increase in coverage correlated with policy changes in the Swiss Immunisation Schedule.
CONCLUSIONS: Despite selection bias and low participation, this study indicates that vaccination coverage for the basic recommended immunisations in the adult population in Switzerland is suboptimal. More efforts using various means and methods are needed to increase immunisation coverage in adolescents before they leave school. An established method to determine vaccination coverage for the general population could provide invaluable insights into the effects of changes in vaccination policies and disease outbreaks.

Key words: *adult vaccination coverage; pharmacy; measles; Switzerland; immunisation registry*

Introduction

Vaccination coverage of children in Switzerland has been well established, with an active monitoring system that allows coverage of toddlers aged 24–35 months and children 8 and 16 years of age to be determined every 3 years at the cantonal and national levels [1–3]. Owing to the loss of contact, immunisation coverage in adults cannot be determined routinely, a situation typical of many developed countries [4]. Furthermore, Lee et al. (2003) showed that approximately up to one-third of healthy Swiss employees were unaware of their vaccination status [5].

As a result of their extended business hours and convenient locations, pharmacies can alleviate this loss of contact, as they are an easily accessible healthcare facility. More than 300,000 customers walk into a pharmacy every day in Switzerland [6]. As a healthcare professional, the pharmacist is obligated by Swiss law to, *inter alia*, assist patients and other healthcare professionals in all pharmaceutical issues and to assume tasks to promote and maintain health and to prevent diseases [7]. Pharmacists in several countries around the world, including the United States, United Kingdom and Portugal, have been acting as advocates for immunisations and many have been allowed to vaccinate for over a decade [8–12]. In Switzerland, vaccinations are currently not yet associated with pharmacies, although it is currently possible to get certain vaccinations in five Cantons (Neuchâtel, Zurich, Ticino, Basel-Country, Solothurn), with more to follow.

For their Public Health Campaign 2009, in collaboration with the Institute of Social and Preventive Medicine (ISPM) at the University of Zurich, pharmaSuisse (the Swiss Association of Pharmacists) introduced vaccination counselling in the pharmacies in Switzerland by means of a national media campaign. During 1 month, the general population was invited to bring their vaccination certificates to the pharmacies, to have their immunisation status evaluated and to complete a questionnaire regarding their vaccination perceptions.

This campaign offered a unique opportunity to determine the vaccination coverage of the adult population in Switzerland, to examine the perceptions of vaccinations and to evaluate the feasibility of establishing a national method to monitor vaccination coverage. The Swiss Federal Office of Public Health (FOPH) has set a goal to eliminate measles in Switzerland by 2015. We also used the database, established during the campaign, to investigate epidemiological correlations between (1.) changes in measles vaccination policies, measles outbreaks and vaccination coverage and (2.) coverage with measles-containing vaccine (MCV) introduced in Switzerland in 1966.

Methods

viavac© 2009, Version 3.16

The viavac© software uses algorithms based on the Swiss national vaccination recommendations. It allows a quick and accurate assessment of the vaccination status of any individual [13]. Data compiled in the viavac© database included name, date of birth, gender, zip code, city, nationality (default = Swiss) and serology information as well as the dates of vaccinations for diphtheria (Di), tetanus (Te), pertussis (Per), polio (Pol), *Haemophilus influenzae* type B (Hib), measles, mumps, rubella, hepatitis B (HB), varicella, pneumococcus, meningococcus type C, tick-borne encephalitis (TBE), hepatitis A (HA), human papillomavirus (HPV) and a limited number of vaccinations recommended for travelling. In addition, viavac© gave a recommendation when the vaccination status was not up to date.

Selection of pharmacies

Before the campaign began, all member pharmacies of pharmaSuisse were informed of this new public health campaign and were invited to participate. In order to prepare for the campaign, the pharmacists in the participating pharmacies were obligated to participate in a two-part workshop, which was conducted in French or German, depending on the location. The first part refreshed the pharmacists' medical knowledge regarding vaccinations (immunology, side effects, coverage) whereas the second technical part involved used of the viavac© software for entering and exporting data.

Campaign

Through media exposure, the general population was invited to bring their vaccination certificate to the pharmacy to have their immunisation status evaluated. The media campaign included national advertisements via radio, television, magazines and posters emphasising the importance of vaccination and keeping it up to date. From 12th October to 7th November 2009, interested participants were counselled on their vaccination status by a pharmacist. The recommended price for this consultation during the campaign was CHF 19.00. Participants were also asked to complete a questionnaire which included four questions pertaining to measles and HPV vaccination.

At the end of the campaign, pharmacies were requested to send their exported viavac© data by email and the questionnaires by mail to ISPM for processing and evaluation. If necessary, pharmaSuisse sent the pharmacies three reminders to transmit the data. Follow-ups were done by telephone or email by ISPM to all those who sent invalid data (wrong format) or incomplete data (only questionnaires or only viavac© files).

Analysis

The viavac© files and questionnaires were anonymous, therefore names were not available. Information collected from the participants included: date of birth, gender, zip code, city and vaccination and serology information. Only data for participants aged ≥18 years (year of birth ≤1992) and whose vaccination data were extracted from a vaccination certificate were considered in the analysis.

Calculated coverage estimates were not weighted since the data collected did not stem from a sampling survey. To determine coverage estimates, we grouped the data into two birth cohorts: individuals who were born before 1967 and individuals born between 1967 and 1992. To study how the year of birth affected MCV coverage, the birth cohorts were defined as: those born in or before 1966, 1967–1971, 1972–1976, 1977–1981, 1982–1986, and 1987–1992. The vaccination status in 2009 was considered. 95% Wald confidence intervals were also calculated for coverage estimates. Data processing and analysis were done in MySQL (Community Server, GPL, version 5.511) and R (version 2.14.0, The R Foundation for Statistical Computing) [14].

Results

Participation

Of the 1,724 pharmacies in Switzerland, 1,351 (78%) were members of pharmaSuisse in 2009 (table 1). A total of 496 (36.7%) member pharmacies of pharmaSuisse bought the software for the campaign, with distribution across linguistic region being 312 (63%) in the German-, 154 (31%) in the French-, and 30 (6%) in the Italian-speaking regions. Of these, 284 (57%) submitted valid vaccination information and 55 (11%) had either technical problems exporting the data or simply did not have any customers interested in the campaign. Of the 284 pharmacies involved in the campaign, 219 (77%) of those in the German-speaking region of Switzerland involved in the campaign, sent a valid viavac©file, whereas there were only 51 (18%) in the French- and 14 (5%) in the Italian-speaking parts.

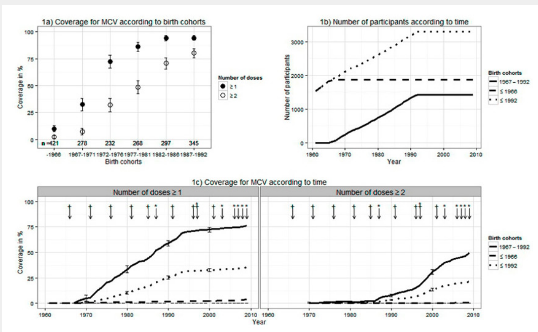

Figure 1

(a) Measles-containing vaccine (MCV) coverage for various birth cohorts at one and two doses; n represents the size of the birth cohort. (b) Number of participants according to year and birth cohort ≤1966, 1967–1992 and ≤1992. Starting in 1993 the curve is flat since no new participants were considered. (c) MCV coverage over time for birth cohorts ≤1966, 1967–1992 and ≤1992. Arrows labelled with (+) indicate when changes to the measles / measles-mumps-rubella recommendations were made in the Swiss Immunization Schedule and arrows labelled with (*) show the occurrences of large measles outbreaks in Switzerland that were published. The bars on the coverage data represent Wald confidence intervals.

From a total of 3,634 participants in the campaign, 3,291 (90.6%) valid cases (participants ≥18 years) were exported from viavac© and 1,011 (27.8%) questionnaires completed.

Vaccination coverage

Vaccination coverage for participants born ≤1992 was: 45.9% and 34.6% for five and six doses of Di, 56.4% and 44.0% for Te and 66.3% and 48.0% for Pol, respectively (table 2). Coverage estimates for one and two doses of MCV were 76.5% and 49.4%, respectively, for those born 1967–1992, and 4.0% and 0.8%, respectively, for those born ≤1966; 35.1% of the participants were vaccinated with two doses against HA and 27.7% with three doses against HB. Almost one-quarter (22.3%) had received at least three doses of the vaccine against TBE. Except for polio at six doses, influenza, HA and TBE vaccinations, individuals in the birth cohort 1967–1992 had a much higher coverage for most vaccinations than those from the cohort ≤1966.

For comparative purposes, the national vaccination coverage for adolescents aged 16 years (birth cohort 1991) living in Switzerland from the Swiss National Vaccination Coverage Survey (SNVCS) from 2005–2007 [2] is also displayed in table 2. Except for Di, Te and Pol at six doses, coverage for the teenagers in the SNVCS was consistently higher than those from the birth cohort 1967–1992.

Figure 1 shows MCV coverage at one and two doses by time and birth cohort after 1966, with the number of participants in the campaign according to time. According to figure 1a, the younger birth cohorts had higher coverage than the older ones, with the slope saturating at about 95% after the birth cohort 1982–86 at one dose. Figure 1c shows MCV coverage together with the changes to the recommendations for measles-mumps-rubella (MMR) and monovalent measles vaccines, and the occurrences of large measles outbreaks in Switzerland since 1966. Measles vaccine coverage at one dose increased quickly for the birth cohort 1967–1992 after 1971, when MMR vaccine was first introduced, until approximately 1993, when the slope levelled off. Coverage with two doses also began to in-

Table 1: Characteristics of the pharmacies, the participants in the campaign and the population of Switzerland in 2009.

			Linguistic region[a]		
	No.	**Average**	**D**	**F**	**I**
Swiss population (age ≥18)[b]	6,416,153	–	71%	25%	4%
Pharmacies					
Pharmacies in Switzerland[c]	1,724	–	50%	39%	11%
Membership in pharmaSuisse[c]	1,351	78%[d]	59%	29%	13%
Campaign					
Campaign pharmacies	496	–	63%	31%	6%
Pharmacies which delivered valid files	284	57%[e]	77%	18%	5%
Participants	3,634	–	84%	13%	3%
Average number of participants per pharmacy which sent files		12.8	14	9.2	7.1
Demographic information for the participants (Percentages reflect distribution of the demographic variable for each linguistic region)					
Vaccination data (viavac©)	3,291				
Sex					
Female		63%[f]	63%	66%	66%
Male		37%	37%	34%	34%
Birth cohort					
1967–1992		43%[g]	40%	59%	71%
≤1966		57%	60%	41%	29%
Questionnaires	1,011				
Sex					
Female		66%	66%	64%	74%
Male		34%	34%	36%	26%
Birth cohort					
1967–1992		32%	29%	49%	74%
≤1966		68%	71%	51%	26%
Demographic information for Switzerland 2009[b]	6,416,153				
Sex					
Female		51%	51%	52%	52%
Male		49%	49%	48%	48%
Birth cohort					
1967–1992		46%	45%	47%	42%
≤1966		54%	55%	53%	58%

[a] Linguistic region: D German, F French and I Italian.
[b] Reference: Federal Statistical Office (FSO), 2009.
[c] Reference: pharmaSuisse, 2009.
[d] Percentage is related to total pharmacies.
[e] Percentage is related to campaign pharmacies.
[f] Distribution of gender in campaign differs from Swiss population (p <0.001).
[g] Distribution of birth cohorts in campaign differs from Swiss population (p= 0.008).

crease in 1985 and in 1996, possibly as a result of the two large measles outbreaks in 1987 and 1996 during this time. Although a second dose of measles vaccine was first recommended in 1996, the increase in coverage at two doses before this date suggested that doctors vaccinated their patients again during an outbreak, regardless of whether records showed that the person had been already vaccinated once.

Perceptions of measles and HPV vaccination

Answers to the four questions in table 3 examining disease perceptions indicated that more women than men considered measles to be dangerous. The respondents also stated that it made sense to vaccinate against measles, that measles vaccination should be mandatory and that HPV vaccination made sense. Adults born 1967–1992 agreed more often that measles was dangerous and that vaccination made sense as compared to those in the birth cohort ≤1966. A total of 69.0% of the population stated that measles was a dangerous disease (69.7% from the German-speaking region, 67.3% from the French-speaking region and 57.9% from the Italian-speaking region), compared with 2.5% who found it not dangerous and 14.7% who found it not very dangerous. A total of 76.9% thought measles vaccination made sense (D: 75.8%, F: 82.2%, I: 86.8%); however, only 43.7% believed it should be mandatory (D: 42.8%, F: 49.5%, I: 50.0%). For HPV vaccination, more adults in the French- and Italian-speaking regions thought vaccination made sense than in the German-speaking region (D: 54.7%, F: 76.2%, I: 60.5%).

Discussion

This public health campaign in 2009 was the first national attempt by pharmaSuisse to introduce vaccination counselling in the pharmacies in Switzerland using the software viavac©. Although a generalisation of the vaccination coverage estimates obtained from the campaign to the entire Swiss population was not possible as a result of selection bias and low participation, the results obtained were interesting and should be further investigated.

As visits to physicians decline and vaccination coverage data become scarce once adolescents graduate from school, it is important to find alternative sources to increase coverage data. Because of their accessibility, convenient hours, location and rising acceptance as alternative immunisation providers, pharmacists can make an impact on public health, by counselling on and also administering vaccinations [8–12, 15]. During the campaign month, approximately 3,600 individuals were interested in having their immunisation status evaluated. Previous studies have confirmed that vaccinations provided in pharmacies combined the productivity and efficiency of mass vaccination clinics, with the attention to detail and personalisation of a scheduled primary care visit, while increasing the vaccine coverage rates [9, 16–19]. Recently, there have been discussions about allowing pharmacists to vaccinate in Switzerland. The authorisation to vaccinate lies solely in the jurisdiction of each canton. Several cantons have already authorised pharmacists with the required training as provided in the postgraduate certificate Foederatio Pharmaceutica Helvetiae (FPH) to vaccinate clients in the pharmacy. Since its establishment in 2012, approximately 154 pharmacists have obtained this certificate.

Vaccination data obtained from this campaign could be useful to estimate coverage level in the adult population. When comparing the birth cohort 1967–1992 with the school children (birth cohort 1991) from the SNVCS 2005–07 data, coverage estimates for Di, Te and Pol vaccination in the campaign group for the birth cohort 1967–1992 were significantly lower than the estimates for the adolescents in the SNVCS at 5 doses (see table 2). This, however, was reversed at six doses, since a booster shot was required for tetanus every 10 years until recently and because of travel to countries where vaccinations, especially against polio, are recommended.

HA vaccine coverage is about 35%, similar to the prevalence of hepatitis A virus risk factors calculated for Switzerland [20]. As HA is recommended for those travelling abroad regardless of age, the difference in coverage between the two birth cohorts (≤1966 and 1967–1992) became smaller. For HB, a significant difference between the younger and older age groups was observed (see table 2) as HB vaccination has been included in the recommended Swiss Immunisation Schedule (SIS) since 1998, targeting the pre-teen age group owing to their potential increased risk behaviours [21]. Furthermore, HB vaccinations are offered free of charge to students in school.

Especially notable was the MCV coverage, which was very low for the cohort ≤1966 since many were assumed to have acquired the antibodies through natural infection during childhood. The low MCV coverage (76.5% at one dose and 49.4% at two doses) for the cohort 1967–1992 compared with 76.6% at two doses for the 16–year olds (birth cohort 1991) indicates that much more effort needs to be expended to increase coverage for the teenagers since the level did not increase once they left school. Moreover, about one-quarter of those born 1967–1992 were not vaccinated against measles, this being a conservative estimate because of selection bias. A recent survey conducted by the FOPH estimated that MCV coverage for 20–29-year-olds living in Switzerland was 93% at one dose and 77% at two doses, which was also observed in our study as shown in figure 1a for birth cohorts 1982–1992 [22].

This study also shows the potential of establishing a central immunisation registry in Switzerland. Just recently, the Swiss Parliament approved further investment into a national electronic system to maintain patient information, such as vaccination data. Currently, individuals are able to upload their vaccination data on the Internet platform www.myvaccines.ch. The FOPH also promoted this service during the European Immunisation Week as part of their measles elimination campaign [23]. However, because the national immunisation coverage could be overestimated as a result of selection bias, it is vital that participation in such a system is high and representative of the population to yield valid epidemiological data. Furthermore, a central immunisation registry could not only monitor the effects of the changes in the national recommendations for immunisation and occurrences of outbreaks as reflected in the figure 1, but could also detect variation in vaccine acceptance by the population. After the steep increase of MCV coverage at one dose after 1971, which was probably due to the FOPH introduction of MMR into the SIS following the introduction of the first monovalent measles vaccine in 1966, the slope began to level off in 1993 as a result of (1.) no new birth cohort entering the database and (2.) the slight increase in the slope due to catch-up shots among the teenagers and adults, reflecting the changes in the recommendations in the SIS. The data

Table 2: Vaccination coverage and 95-% confidence intervals (in %) of adults in birth cohort 1967–1992 and those in birth cohort ≤ 1966 from campaign. The last column is the coverage rate of teens 16 years of age from the Swiss National Vaccination Coverage Survey 2005–2007. Coverage is not weighted.

		Campaign						SNVCS	
	Number of shots			Adults (birth cohorts)				Teens	
		1967-1992	95%-CI	≤ 1966	95%-CI	≤ 1992	95%-CI	16 years old 95%-CI	
		(n=1,423)		(n=1,868)		(n=3,291)		(n=9,301)	
Diphtheria	0	9.2	(7.7-10.7)	16.9	(15.2-18.6)	13.6	(12.4-14.8)	0.9	(0.7-1.1)
	≥1	90.8	(89.3-92.3)	83.1	(81.4-84.8)	86.4	(85.2-87.6)	99.1	(98.9-99.3)
	≥4	82.6	(80.6-84.5)	34.3	(32.1-36.4)	55.2	(53.5-56.8)	93.7	(93.2-94.2)
	≥5	76.0	(73.8-78.3)	23.0	(21.1-24.9)	45.9	(44.2-47.6)	87.9	(87.2-88.5)
	≥6	62.1	(59.5-64.6)	13.8	(12.2-15.3)	34.6	(33.0-36.3)	61.4	(60.4-62.3)
Tetanus	0	8.4	(6.9-9.8)	9.8	(8.5-11.1)	9.2	(8.2-10.2)	0.7	(0.5-0.8)
	≥1	91.6	(90.2-93.1)	90.2	(88.9-91.5)	90.8	(89.8-91.8)	99.3	(99.2-99.5)
	≥4	83.6	(81.7-85.6)	51.9	(49.7-54.2)	65.6	(64.0-67.3)	94.2	(93.8-94.7)
	≥5	79.1	(77.0-81.2)	39.1	(36.9-41.3)	56.4	(54.7-58.1)	88.5	(87.8-89.1)
	≥6	66.8	(64.3-69.2)	26.7	(24.7-28.7)	44.0	(42.3-45.7)	62.1	(61.1-63.1)
Pertussis	0	24.2	(22.0-26.5)	78.5	(76.6-80.3)	55.0	(53.3-56.7)	10.6	(9.9-11.2)
	≥1	75.8	(73.5-78.0)	21.5	(19.7-23.4)	45.0	(43.3-46.7)	89.4	(88.8-90.1)
	≥2	73.0	(70.7-75.3)	19.3	(17.5-21.1)	42.5	(40.8-44.2)	86.6	(85.9-87.3)
	≥3	70.7	(68.3-73.1)	17.6	(15.8-19.3)	40.5	(38.9-42.2)	84.0	(83.3-84.7)
Polio	0	12.0	(10.3-13.7)	10.0	(8.6-11.3)	10.9	(9.8-11.9)	1.0	(0.8-1.2)
	≥1	88.0	(86.3-89.7)	90.0	(88.7-91.4)	89.2	(88.1-90.2)	99.0	(98.8-99.2)
	≥4	80.0	(78.0-82.1)	70.2	(68.2-72.3)	74.5	(73.0-76.0)	93.8	(93.3-94.3)
	≥5	73.7	(71.4-75.9)	60.8	(58.5-63.0)	66.3	(64.7-67.9)	84.8	(84.1-85.5)
	≥6	46.7	(44.1-49.3)	48.9	(46.6-51.1)	48.0	(46.2-49.7)	19.2	(18.4-20.0)
Measles	0	23.5	(21.3-25.7)	96.0	(95.1-96.9)	64.7	(63.0-66.3)	6.2	(5.7-6.7)
	≥1	76.5	(74.3-78.7)	4.0	(3.1-4.9)	35.3	(33.7-37.0)	93.8	(93.3-94.3)
	≥2	49.4	(46.8-52.0)	0.8	(0.4-1.2)	21.8	(20.4-23.2)	76.6	(75.7-77.4)
Mumps	0	37.3	(34.8-39.8)	96.7	(95.9-97.5)	71.0	(69.5-72.6)	7.0	(6.5-7.5)
	≥1	62.7	(60.2-65.2)	3.3	(2.5-4.1)	29.0	(27.4-30.5)	93.0	(92.5-93.5)
	≥2	26.2	(23.9-28.5)	0.6	(0.2-0.9)	11.7	(10.6-12.8)	75.6	(74.8-76.5)
Rubella	0	18.6	(16.5-20.6)	76.0	(74.1-78.0)	51.2	(49.5-52.9)	7.0	(6.4-7.5)
	≥1	81.5	(79.4-83.5)	24.0	(22.0-25.9)	48.8	(47.1-50.5)	93.0	(92.5-93.6)
	≥2	39.4	(36.8-41.9)	2.0	(1.4-2.7)	18.2	(16.9-19.5)	75.4	(74.5-76.2)
Hepatitis A	0	51.9	(49.3-54.5)	63.0	(60.8-65.1)	58.2	(56.5-59.8)	83.5	(82.8-84.3)
	≥1	48.1	(45.5-50.7)	37.0	(34.9-39.2)	41.8	(40.2-43.5)	16.5	(15.7-17.2)
	≥2	41.5	(39.0-44.1)	30.3	(28.2-32.3)	35.1	(33.5-36.8)	13.4	(12.7-14.1)
Hepatitis B	0	41.6	(39.0-44.2)	79.0	(77.2-80.9)	62.8	(61.2-64.5)	30.6	(29.7-31.6)
	≥1	58.4	(55.8-61.0)	21.0	(19.1-22.8)	37.2	(35.5-38.8)	69.4	(68.4-70.3)
	≥2	55.7	(53.1-58.2)	19.2	(17.4-20.9)	34.9	(33.3-36.6)	65.0	(64.0-66.0)
	≥3	42.5	(39.9-45.0)	16.5	(14.8-18.2)	27.7	(26.2-29.2)	25.5	(24.6-26.3)
Human papillomavirus[a]	0	92.6	(91.2-93.9)	100.0	–	96.5	(95.9-97.1)	–	–
	≥1	7.4	(6.1-8.8)	0.0	–	3.5	(2.9-4.1)	–	–
	≥2	6.7	(5.4-8.0)	0.0	–	3.2	(2.6-3.8)	–	–
Tick-borne encephalitis	0	76.1	(73.9-78.3)	71.7	(69.6-73.7)	73.6	(72.1-75.1)	91.5	(91.0-92.1)
	≥1	23.9	(21.7-26.1)	28.3	(26.3-30.4)	26.4	(24.9-27.9)	8.5	(7.9-9.0)
	≥2	22.8	(20.7-25.0)	27.3	(25.2-29.3)	25.3	(23.9-26.8)	7.9	(7.3-8.4)
	≥3	19.8	(17.7-21.8)	24.3	(22.3-26.2)	22.3	(20.9-23.7)	6.3	(5.8-6.8)
Haemophilus influenzae type B	0	85.0	(83.1-86.8)	99.3	(98.9-99.7)	93.1	(92.2-94.0)	40.2	(39.2-41.2)
	≥1	15.0	(13.2-16.9)	0.7	(0.3-1.1)	6.9	(6.0-7.8)	59.8	(58.8-60.8)
	≥2	8.2	(6.8-9.6)	0.2	(0.0-0.3)	3.7	(3.0-4.3)	32.9	(31.9-33.8)
Influenza	0	99.3	(98.9-99.7)	97.9	(97.2-98.5)	98.5	(98.1-98.9)	–	–
	≥1	0.7	(0.3-1.1)	2.1	(1.5-2.8)	1.5	(1.1-1.9)	–	–
	≥2	0.0	–	0.2	(0.0-0.3)	0.1	(0.0-0.2)	–	–
Tuberculosis	0	57.6	(55.0-60.1)	65.7	(63.6-67.9)	62.2	(60.5-63.9)	–	–
	≥1	42.5	(39.9-45.0)	34.3	(32.1-36.4)	37.8	(36.1-39.5)	–	–
	≥2	8.1	(6.7-9.5)	8.4	(7.1-9.7)	8.3	(7.3-9.2)	–	–

[a] Coverage only includes females where n=984 for birth cohort 1967-1992, n=1,098 for ≤ 1966 and n=2,082 for ≤ 1992.

also indicated that coverage increased steadily and quickly until the 1982 birth cohort, where MCV coverage at one dose was saturated at about 95%. Around 5% of the young participants remained unvaccinated against measles. The MCV coverage determined could also be used as a baseline to measure the effectiveness of the FOPH measles elimination campaign, which will begin only in 2014.

Our results showed that, although the majority of the participants believed measles is a dangerous disease and measles vaccination made sense, less than half agreed with compulsory measles immunisation. Many participants were still unsure about HPV vaccination. Thus, we see that more efforts could be invested in disseminating information regarding the benefits of compulsory measles immunisation and HPV vaccination, particularly with the difference in perception between the linguistic regions and the two age groups. This information could help the FOPH plan their strategy for reaching their goals to eliminate measles in Switzerland by 2015, such as vaccination policies in the schools. Preliminary in-depth analysis of the SNVCS 2005–10 showed that teenagers living in the German-speaking cantons that provided vaccination in the schools with the help of a school nurse were significantly better vaccinated with two doses of MMR than teenagers living in the German-speaking cantons where the schools had not offered this service [24]. The effectiveness of school-based vaccinations has also been confirmed in many previous studies [25–27].

Selection bias and the low participation level were major limitations in the campaign. As those who participated in this campaign were generally more concerned with their health, the results do not necessarily reflect the general population. Furthermore, there was a significant difference between the proportions of males and females participating in the campaign, as seen in table 1, confirming that women were more concerned with their health than men. This discrepancy, however, was consistent with the profiles of participants in other vaccination coverage studies conducted in the pharmacies [28–29]. Consequently, because of these limitations, we did not feel the results should be weighted to reflect the Swiss population, but only the participants in the campaign. However, although not reported, coverage data were also poststratified by linguistic region, sex and birth cohort; the weighted coverage rates were almost identical to those reported here.

Additional problems affecting participation in the campaign included: (1.) although reduced, the cost of CHF 19.00 was a barrier for participation, and (2.) time of the implementation of the campaign was also not ideal, as the population was perhaps overwhelmed with information regarding the possible outbreak of the swine influenza (H1N1) and its prevention through vaccination during this period.

Direct promotion and high acceptance of an electronic central immunisation registry would overcome some of these limitations, but only if the participation level is high enough to reduce selection and nonresponse bias so that the results from the data could be applicable to the general population.

Conclusion

Immunisation coverage data attained from this campaign is the first attempt to determine coverage in the adult population. Vaccine coverage for the basic recommended immunisations in the adult population in Switzerland is suboptimal, whereas vaccination coverage for vaccinations recommended for travelling abroad is quite high. More efforts are needed to vaccinate adolescents before they leave school, since vaccinations that are not needed for travelling tend to be forgotten.

Table 3: Distribution (%) of the responses to the questionnaire according to linguistic region, sex and age group. D, F and I are the German-, French- and Italian-speaking regions, respectively.

	All	**Linguistic region**			**Sex**		**Birth cohort**	
		D	**F**	**I**	**Female**	**Male**	**1967–1992**	**≤1966**
	n = 1,011	**n = 872**	**n = 10**	**n = 38**	**n = 671**	**n = 340**	**n = 327**	**n = 684**
1. Do you think that measles is:								
Dangerous	69.0	69.7	67.3	57.9	72.7	61.8	72.5	67.4
Not very dangerous	14.7	14.3	13.9	26.3	13.3	17.6	16.8	13.7
Not dangerous	2.5	2.6	2.0	0.0	2.7	2.1	2.4	2.5
Don't know	12.1	11.7	13.9	15.8	9.7	16.8	7.3	14.3
No answer	1.7	1.6	3.0	0.0	1.6	1.8	0.9	2.0
2. Do you think that vaccination against measles makes sense?								
Yes	76.9	75.8	82.2	86.8	81.5	67.6	84.7	73.1
No	5.2	5.6	3.0	2.6	4.9	5.9	3.7	6.0
Don't know	16.5	17.3	11.9	10.5	12.2	25.0	11.0	19.2
No answer	1.4	1.3	3.0	0.0	1.3	1.5	0.6	1.8
3. Do you think that vaccination against measles should be mandatory?								
Yes	43.7	42.8	49.5	50.0	45.5	47.4	40.3	42.0
No	31.2	31.8	24.8	34.2	31.9	29.7	27.2	33.0
Don't know	23.2	23.6	22.8	15.8	20.6	28.5	23.9	23.0
No answer	1.9	1.8	3.0	0.0	2.1	1.5	1.5	2.0
4. Do you think that vaccination against human HPV for young girls makes sense?								
Yes	57.1	54.7	76.2	60.5	58.3	54.7	60.9	55.3
No	7.8	8.5	2.0	7.9	9.5	4.4	6.7	8.3
Don't know	33.8	35.7	18.8	31.6	31.0	39.4	31.8	34.8
No answer	1.3	1.1	3.0	0.0	1.2	1.5	0.6	1.6

This campaign has shown that pharmacies have a potential to make an impact in public health, such as vaccination counselling, through their convenient hours and location. It also shows the importance and feasibility of establishing a central immunisation registry. Although the results from this campaign cannot be generalised due to selection bias and low participation, a well-established national immunisation registry with a high representative participation will yield invaluable epidemiological evaluation, as well as immunisation coverage, as the potential has been demonstrated with this small database.

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Figures (large format)

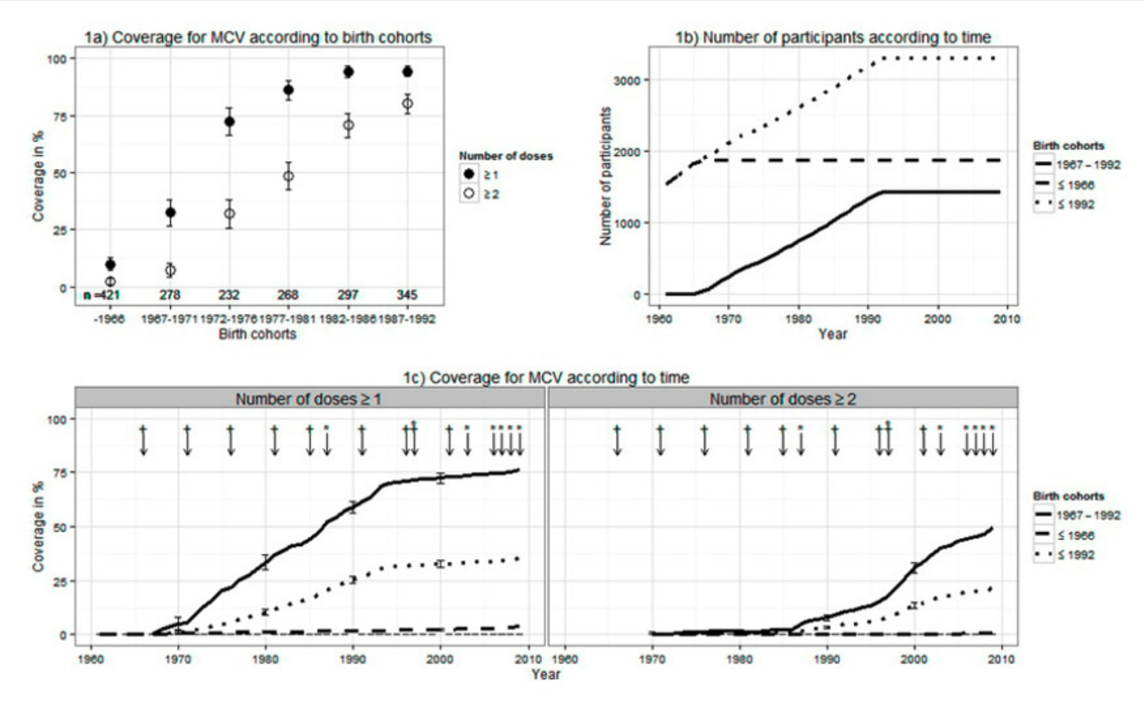

Figure 1

(a) Measles-containing vaccine (MCV) coverage for various birth cohorts at one and two doses; n represents the size of the birth cohort. (b) Number of participants according to year and birth cohort ≤1966, 1967–1992 and ≤1992. Starting in 1993 the curve is flat since no new participants were considered. (c) MCV coverage over time for birth cohorts ≤1966, 1967–1992 and ≤1992. Arrows labelled with (+) indicate when changes to the measles / measles-mumps-rubella recommendations were made in the Swiss Immunization Schedule and arrows labelled with (*) show the occurrences of large measles outbreaks in Switzerland that were published. The bars on the coverage data represent Wald confidence intervals.