

Swiss primary care physicians reporting of utility and use of recommended vaccinations for adults

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Summary

Question: To determine how recommended vaccinations in adults are perceived and used by primary care physicians in Switzerland.

Methods: A cross-sectional mail survey of primary care physicians randomly selected from the register of the Swiss medical association was conducted, including specific items measuring perceived utility and reported use for fourteen recommended vaccinations for adults. The answers were standardized to have a minimum of 0 and a maximum of 100. Other items assessed socio-demographic and work characteristics, opinion regarding the use of vaccinations, sources of recommendations used for vaccinations, and patient and organisational barriers. Frequency tables and cross-tabulations were used to describe differences in perceived utility and reported use across these characteristics.

Results: After three reminders, 1166 physicians participated in the survey (response rate 64%). Perceived utility was the highest for rubella immunisation in young women (93.6; 95% CI: 92.8 to 94.3) and hepatitis B immunisation in high-risk adults (91.9; 95% CI: 91.0 to 92.7); it was the low-

est for immunisations against measles (56.7; 95% CI: 55.3 to 58.2) and pneumococcal diseases (55.2; 95% CI: 53.8 to 56.7). The highest levels of use were reported for diphtheria-tetanus booster after a wound (91.7; 95% CI: 90.7 to 92.7) and poliomyelitis immunisation of travelers (89.5; 95% CI: 88.4 to 90.6); the lowest for immunisations against measles (40.3; 95% CI: 38.5 to 42.1) and pneumococcal diseases (33.3; 95% CI: 31.8 to 34.8). Lower reported use was associated with reports of physicians not having the time to verify vaccination status and convince a patient to be immunised, and other logistic issues related to physician's practice, but not with reports of patient's refusal of immunisation.

Conclusion: There are several avenues to strengthen promotion programs aiming at improving immunisation use by Swiss primary care physicians in adults, among which a high better recognition of time spent for health promotion activities should have priority.

Key words: immunisations; vaccinations; adult; attitudes; primary care

Introduction

Over the last two decades, aggressive policies and campaigns aimed at maximizing immunisation coverage in children have led, particularly in industrialised countries [1], to dramatic reductions in the incidence of vaccine preventable diseases in the younger age groups of the population. Although for some conditions regional elimination (e.g. measles [2–4]) and even eradication (e.g. polio [5]) are on the horizon, for most vaccine preventable diseases, a high residual burden of disease is still observed in adolescents [6], adults [7–9], and the elderly [10–16]. Some adolescents and adults

have never received the recommended primary vaccinations and remain unidentified. Other adults have weak immunity against diphtheria and tetanus, for instance, because they did not receive the recommended booster immunisations. Finally, there are common misperceptions regarding the circumstances that place adults at higher risk of vaccine-preventable infections (e.g., sexual activity, travel, chronic medical conditions, and older age).

Swiss general practitioners are in a position to reinforce adult immunisation coverage at the na-

tional level since they provide basic medical care to the majority of the population. Prior to the development of new strategies for promoting adult immunisation in Switzerland, it is essential to better understand practitioners' attitude toward adult immunisation and the constraints they face in implementing the national immunisation recommendations.

Methods

Sample and study design

We surveyed a representative sample of community-based primary care physicians across Switzerland. Physicians were identified from the professional membership file of the Swiss medical association (*Federatio Medicorum Helveticorum*) that includes more than 25 000 doctors. Of 2000 practitioners selected by simple random sampling from the 5678 physicians certified as general practitioners or general internist, or without a specialty qualification, 190 proved ineligible (did not practice clinical medicine or did not practice as primary care practitioner, 183; deceased, 3; participated in the pretest, 2; incorrect address, 2); 1810 were eligible for the survey. Between February and July 1999, the first mailing and the 3 reminders were sent; each mailing was sent every 4-6 weeks to all eligible physicians that had not yet responded to the survey. For each mailing, all questionnaires were sent the same day.

Measurement of reported use and perceived utility of recommended vaccinations

At the time of the survey, national guidelines [17, 18] included 14 recommendations for use of vaccine in adults (Annexe 1). To determine physicians' attitude toward these recommendations, physicians were asked how frequently they would use a specific vaccine, in a given situation (e.g. primo-vaccination against diphtheria-tetanus for all adults who have not yet been vaccinated; answer scale: always - often - sometimes - rarely - never), and how useful for their patients each recommendation was. The word "useful" was defined for the responding physician as evidence of clear benefit for his patient. The sentence we used in French was: "Indiquez pour chacune des recommandations vaccinales suivantes dans quelle mesure vous êtes personnellement convaincu de son utilité (bénéfice clairement établi pour votre patient) ou de son inutilité [absence de bénéfice pour votre patient]"; in German: "Geben Sie für jede der aufgeführten Impfeempfehlungen an, inwieweit Sie persönlich von deren Nützlichkeit (klar etablierter Vorteil für Ihren Patienten) oder von deren Unnützlichkeit (kein klar etablierter Vorteil) überzeugt sind"; and in Italian: "Per ogni raccomandazione relativa alle seguenti vaccinazioni, indichi in che misura lei è personalmente convinto della sua utilità (chiaro beneficio per il suo paziente) o della sua inutilità (assenza di un chiaro beneficio per il suo paziente)". Perceived utility was rated on a 1 (totally useless) to 7 (totally useful) Likert scale.

Determinants of reported use and perceived utility of recommended vaccinations

Specific items assessed physician's socio-demographic (age, sex, region) and work characteristics (medical specialty, estimated number of patients seen per week, solo vs. group and part- vs. full time practice, rural vs. urban location). Other items addressed physician's opinions about the use of vaccinations in general and the role

This study was designed to assess the perception and use of recommended adult's vaccinations in a representative sample of primary care physicians in Switzerland and characteristics associated with more favourable perception and greater reported use of vaccinations in adults.

of public health authorities in vaccination, sources of recommendations used for vaccinations, and patient- and practice-related barriers to vaccination. Likert scales were used to rate opinion (totally disagree, disagree, not sure, agree, totally agree), sources of recommendations used (never, rarely, sometimes, often, always), and patient- and practice-related barrier items (never, rarely, sometimes, often, always).

Translation of the questionnaire

The questionnaire was designed in French and pre-tested among a small group of primary care physicians for acceptability and clarity. Then, 3 independent translations of all items were performed in German and Italian by bilingual physicians and professional translators. Obtained by consensus, the final versions of the translated questionnaires were also pre-tested among physicians for acceptability and clarity.

Data analysis

Data were analysed with SPSS software (version 11.0). Descriptive statistics of reported use and perceived utility were computed for the 14 recommendations. Because we measured attitudes, we decided from a pragmatic viewpoint to analyse data from rating scales as if they were intervals. This approach has justification on theoretical ground [19], which assumes that attitudes and underlying constructs can be measured with error by interval scales and is unlikely to introduce appreciable bias [20].

To facilitate comparisons, the answers were standardized on a 0-100 scale. For reported use, 0 corresponds to "never" and 100 to "always"; for perceived utility, 0 corresponds to "totally useless" and 100 to "totally useful". Because most distributions were not normal, correlation between use and utility was assessed with the Spearman's coefficient, a measure of association between rank orders, where coefficient values range between -1 (a perfect negative relationship) and +1 (a perfect positive relationship), and where a value of 0 indicates no linear relationship between the two scales. A correlation greater than 0.6 was considered strong and a correlation between 0.6 and 0.4 moderate [21]. Spearman's coefficient is an appropriate measure of correlation between two ordinal scores whether these scores represent an underlying bivariate normal distribution or not.

To study the relationships between physician's characteristics, and perceived utility of vaccinations, an overall score of perceived utility was constructed by averaging the answers to the 14 recommendations, whenever at least half were present. An overall score of reported use was similarly calculated to study relations between physician's characteristics and use of recommended vaccinations. Both scores were standardized on a 0-100 scale. For simplicity, we will refer to them as "score of utility" and "score of use".

Likert answer scales were dichotomized in the follow-

ing way: for general opinion regarding the use of vaccinations, the answers “agree” and “totally agree” were grouped together; for patient and practice-related barriers, the answers “sometimes”, “often”, and “always” were grouped together; and for sources of recommendations

used for vaccinations, the answers “often” and “always” were grouped together to define a frequent use. Frequency tables, cross-tabulations, χ^2 -tests, and ANOVA were used when appropriate to study associations. All statistical tests were two-tailed, with a significance level of 0.05.

Results

After the initial mailing and three reminders, 1166 eligible physicians responded to the survey (response rate: 64%). Compared to the population they were drawn from, participants were younger and more frequently certified generalists or internists, working full time, and practicing in a rural location (table 1). Respondents had been running their medical practice for a mean time of 13 years (SD: 7.1). Their mean age was 49 years. Eighty-five percent were men; 47% were generalist, 30% internists, and 23% had no specialty qualification.

Perceived utility of recommended vaccines

Rubella vaccination in child-bearing age women, primo-vaccinations against diphtheria-tetanus and poliomyelitis, and hepatitis B vaccination for adults at risk were considered “totally useful” by more than two-thirds of respondents (table 2). Approximately half of participants expressed the same judgment for diphtheria-tetanus and poliomyelitis boosters, influenza vaccination for patients with co-morbidities, and hepatitis A vaccination for traveler. Vaccinations against measles, influenza in willing and older adults, and pneumococcal diseases were only rarely perceived as “totally useful”.

Reported use of recommended vaccines

Reported use varied greatly across vaccine recommendations. The highest levels of use were reported for diphtheria-tetanus and poliomye-

litis booster, followed by diphtheria-tetanus and poliomyelitis primo-vaccinations, influenza vaccination in all willing adults or in patients with co-morbidities, hepatitis A vaccination in travelers, hepatitis B vaccination in adults at risk, and rubella vaccination. At least 75% of respondents reported implementing diphtheria-tetanus, poliomyelitis, influenza, and hepatitis A vaccines recommendations “always” or “often”, whereas only half “always” or “often” used hepatitis B vaccination in adolescent. The least frequently followed recommendations pertained to immunisations against measles and pneumococcal diseases.

Overall scores of reported use and perceived utility

Based on the answers to the 14 recommendations, an overall score was computed for over 99% of the respondents. Both overall scores had a distribution that was close to normal; the mean value for the score of reported use was 74.2 (95% CI: to; quartiles: 68–77–83) and 79.8 (95% CI: to; quartiles: 75–81–88) for the score of perceived utility.

The relationship between reported use and perceived utility was moderate for most recommendations (Spearman coefficient of 0.4–0.6; table 2). A stronger correlation was observed only for influenza and pneumococcal diseases vaccinations of patients older than 65 years, and for hepatitis B vaccination in adolescents.

Table 1

Characteristics of survey participants compared to those of all non-paediatric primary care practitioners registered with the Swiss Medical Association.

	all Swiss primary care practitioners (n = 5678)	practitioners who participated (N = 1166)
Age (years), mean (SD)	49.3 (7.0)	48.6 (6.7)
Men, No (%)	4617 (81)	992 (85)
<i>Region, No (%)</i>		
German-speaking	4025 (71)	835 (72)
French-speaking	1432 (25)	296 (25)
Italian-speaking	221 (4)	35 (3)
<i>Medical specialty, No (%)</i>		
Generalist	2166 (38)	546 (47)
General internist & internal medicine specialist	1788 (32)	352 (30)
None	1724 (30)	268 (23)
<i>Practice characteristics, No (%)</i>		
Solo (vs. group)	3854 (68)	785 (67)
Part-time (vs. full time)	707 (13)	109 (9)
Rural (vs. non rural)	614 (11)	153 (13)
Number of years since diploma, mean (SD)	21.6 (6.9)	21.4 (6.6)
Number of years in private practice, mean (SD)	13.2 (7.2)	13.2 (7.1)

Table 2

Perceived utility and reported use of fourteen adult vaccinations recommended by national guidelines among 1166 non-paediatric Swiss primary care physicians.

	Perceived utility					reported use					correlation r_s (Spearman coefficient)
	Valid N	totally useful (%)	totally useless (%)	mean score*	(95% CI)	valid N	always (%)	never (%)	mean score*	(95% CI)	
Rubella	1156	75	<1	93.6	(92.8 to 94.3)	1146	55	4	78.6	(76.9 to 80.3)	.41
Di-Tè primo all adults	1160	68	<1	91.9	(91.0 to 92.7)	1148	55	2	81.3	(79.9 to 82.8)	.34
Hepatitis B all at risk adults	1157	67	<1	91.7	(90.9 to 92.6)	1156	46	1	80.6	(79.3 to 81.9)	.43
Polio primo all adults	1161	66	1	91.2	(90.3 to 92.1)	1147	68	2	86.1	(84.7 to 87.5)	.40
Di-Tè booster wound	1155	61	1	88.2	(87.1 to 89.3)	1150	76	1	91.7	(90.7 to 92.7)	.53
Polio booster	1161	55	<1	87.8	(86.8 to 88.8)	1157	70	1	89.5	(88.4 to 90.6)	.45
Di-Tè booster	1161	51	1	86.2	(85.1 to 87.2)	1155	42	1	78.5	(77.2 to 79.9)	.45
Influenza at risks	1159	48	1	86.2	(85.1 to 87.2)	1156	40	1	80.9	(79.8 to 82.1)	.43
Hepatitis A	1159	48	1	84.9	(83.8 to 86.0)	1155	49	<1	84.1	(83.0 to 85.1)	.57
Influenza older than 65	1159	27	2	74.1	(72.7 to 75.5)	1155	23	6	71.2	(69.8 to 72.7)	.63
Hepatitis B all adolescents	1149	24	3	67.9	(66.3 to 69.4)	1131	15	8	58.1	(56.4 to 59.8)	.62
Influenza all willing adults	1160	16	2	63.8	(62.3 to 65.2)	1159	59	1	84.4	(83.1 to 85.7)	.40
Measles	1142	9	5	56.7	(55.3 to 58.2)	1152	8	24	40.3	(38.5 to 42.1)	.58
Pneumococcal diseases	1166	7	3	55.2	(53.8 to 56.7)	1156	2	24	33.3	(31.8 to 34.8)	.60

* Answers to the items of perceived utility of each recommended vaccination were standardized on a 0-100 scale (0: Totally useless - 100: Totally useful).

Table 3

Relations between opinions about the use of adult vaccinations and overall score of utility of recommended adult vaccinations among 1166 non-paediatric Swiss primary care practitioners.

	N	(%)	overall score of utility of recommended vaccinations mean score	p-value
Vaccination of adults is:				
A public health priority				<0.001
Strongly agree - agree	900	(78)	81.6	
Not sure - disagree - totally disagree	254	(22)	74.1	
Efficient to decrease health care costs				<0.001
Strongly agree - agree	857	(74)	82.5	
Not sure - disagree - totally disagree	296	(26)	72.7	
A task of primary care practitioners				<0.001
Strongly agree - agree	1109	(96)	80.2	
Not sure - disagree - totally disagree	45	(4)	73.7	
A task of specialized centers				0.69
Strongly agree - agree	10	(1)	78.5	
Not sure - disagree - totally disagree	1136	(99)	79.9	
Promoted adequately at the regional level				0.04
Strongly agree - agree	534	(46)	79.2	
Not sure - disagree - totally disagree	616	(54)	80.6	
Promoted adequately at the national level				0.34
Strongly agree - agree	576	(50)	79.6	
Not sure - disagree - totally disagree	573	(50)	80.2	

Due to missing data, numbers may sum to less than 1166.

Socio-demographic and work characteristics associated with scores of vaccination utility and use

Respondents from the German-speaking region of the country scored significantly lower on the score of utility of recommended vaccinations (German-speaking: 79.2; French-speaking: 81.8;

Italian-speaking: 84.8; $p < 0.001$), whereas practitioners without a specialty qualification scored significantly lower on both utility and use of vaccinations (score of utility: practitioners without a specialty qualification: 77.5; internists: 81.2; generalists: 80.4; $p < 0.001$; score of use: 71.5 vs. 74.6 vs. 75.3 respectively, $p < 0.001$). Neither score of util-

Table 4

Relations between potential barriers to vaccination and overall score of use of recommended adult vaccinations among 1166 non-paediatric Swiss primary care practitioners.

	N	(%)	overall score of use of recommended vaccinations Mean score	p-value
How frequently do you come across the following problems:				
Patient with a known allergy to a vaccine				0.006
Often – sometimes *	86	(7)	70.6	
Rarely – never	1072	(93)	74.5	
Patient expresses a categorical no to vaccination				0.78
Often – sometimes *	525	(45)	74.1	
Rarely – never	636	(55)	74.3	
Lack of time to convince a patient to be immunised				0.04
Often – sometimes *	306	(73)	73.0	
Rarely – never	850	(27)	74.7	
Lack of time to verify the vaccination status of a patient				0.008
Always – sometimes	430	(63)	73.1	
Rarely – never	725	(37)	75.0	
Lack of material / personal to perform the vaccination				<0.001
Always – sometimes	54	(5)	64.4	
Rarely – never	1102	(95)	74.8	

* no respondent for the “Always” category. Due to missing data, numbers may sum to less than 1166.

ity nor score of use were related to respondent’s age, sex and practice characteristics (solo or group, part- vs. full time, rural vs. urban).

Opinions about vaccinations and score of vaccination utility

A majority of physicians (over 75%) considered immunisation of adults a public health priority and an important asset for reducing health care costs (table 3). Respondents also quasi unanimously (96%) indicated that the responsibility for immunisations should rest with primary care practitioners. The promotion of immunisation at the regional and national level, however, was rated as adequate by only one respondent out of two.

Respondents who considered vaccination of adults a public health priority and an efficient mean for controlling health care costs, and respondents who reported that immunisation of adults is the task of primary care practitioners scored significantly higher on vaccination utility.

Sources of recommendations used and score of vaccination utility

Of the respondents, 82% reported a frequent use of the publications of the Federal Office of Public Health as a source of recommendations vs. 60% for Swiss medical journals and 19% for international medical journals. Specialized software and internet websites were the sources of recommendations the least regularly used (6%).

We observed a consistent association between a regular use of the different sources of recommendations and scoring higher on the vaccination utility score, except when colleagues served as the source of recommendation (results not shown).

Barriers to vaccination and score of vaccination use

Three patient and organizational factors were perceived by a large fraction of practitioners as being “always”, “often”, or “sometimes” a barrier to vaccination: lack of time to convince the patient (73%), lack of time to verify the vaccination status (63%), and patient expressing a categorical no to vaccination (45%; table 4). In comparison, only a minority of respondents perceived a known allergy to a vaccine and lack of material and/or personnel as important deterrents. With the exception of patient expressing a categorical no to vaccination, reporting that a factor was always – sometimes a barrier to immunisation was consistently associated with a lower score of vaccination use.

Assessment of the potential for non response bias

Statistically speaking, a response rate of 64% is sub-optimal; therefore, to estimate the extent to which the results were affected by non-response bias, we examined scores of reported use and perceived utility according to the mailing study participants responded to. Overall mean scores of reported use were 74.0 for respondents to the 1st mailing, 75.0 for respondents to the 1st reminder, 73.7 for respondents to the 2nd reminder, and 74.4 for respondents to the 3rd reminder ($p > 0.05$). Overall mean scores of perceived utility were 80.2, 79.8, 79.6, and 76.7 for respondents to the successive mailings (ANOVA, linear trend test: $p = 0.03$). When looking at each recommended immunisation separately, we did not identify any clear decreasing trend in reported use or perceived utility by mailing groups.

Discussion

Swiss primary care physicians seemed convinced of the general utility of adult vaccinations and ready to take responsibility for their delivery to the population. Nevertheless, though a large majority reported that vaccination of adults was a public health priority and a measure likely to reduce health care costs, primary care practitioners also reported in the same survey dedicating more efforts to cardio-vascular health promotion activities (screening for hypertension and dyslipidemia, smoking cessation and dietary advices, promotion of physical exercise) than promotion of adult vaccination [22].

Organisational barriers, such as lack of time to convince a patient or verify his immunisation status, were associated with lower reported use. Allergy to a vaccine and lack of material and/or personal to perform the vaccination were also associated with lower use, but this was rare. Patients' refusal, though frequently reported by the physicians as a barrier to recommendations implementation, was unrelated to lower use. These results are in line with some of the causes of missed opportunities commonly reported by medical professionals [23, 24].

Opinions about the utility of each recommendation varied greatly and was moderately associated with reported use for most of the 14 recommendations. Immunisation against influenza of people older than 65 years, against pneumococcal diseases, against hepatitis B of all adolescents and against measles were among the recommendations with the lowest reported utility, which correlated strongly with lower use.

These results deserve some comments in the light of the different public health policies implemented over the last years in the country. Efforts to promote immunisation against influenza of elderly were first initiated in the early 1990' in the French-speaking part of the country. Soon after, differential use of the influenza vaccination was reported across the three main linguistic regions [25]. These differences have faded away however since 2001, the year the Swiss Office of Public Health launched its first annual campaign of national promotion of influenza vaccination [26, 27]. Continuing efforts now focus on health professionals [28] and the organisation of a national immunisation day against influenza by the college of primary care medicine [29]. A similar promotion is still lacking for immunisation of the elderly against pneumococcal diseases, however, and reported utility and use for this vaccine have remained low throughout the country both among physicians and patients [25]. This pattern strongly suggests that use of influenza vaccine increased, due to improved awareness of both patients and physicians. It also poses that immunisation coverage against pneumococcal diseases is unlikely to improve, as long as the debate about the efficacy

of the polysaccharidal vaccine is not settled [30-35].

In 1997, two years before our survey, the Swiss Federal Office of Public Health launched a national campaign to immunise all adolescents of ages 11-15 years against hepatitis B [18, 36]. In our survey, primary care practitioners expressed a lack of enthusiasm for the recommendation. As indicated by recent surveillance data, the situation has probably improved during the last 5 years since the incidence of acute hepatitis B has decreased by 84% between 1999 and 2002 in the 15-19 years age group (4.6 to 0.7/100 000) compared to only 20% in the rest of the population (2.8 to 2.3/100 000) [37].

For measles, the opinion of primary care physicians about the utility of a booster dose in adults was really low in our survey. Probably reflecting the current Swiss policy that concentrates on fully vaccinating young children before the age of 2 [38, 39], less than 30% of respondents reported always or often immunizing adolescents and adults against measles and only 7% considered totally useful to give a booster dose at their consultations to members of these age groups. Nonetheless, in the recent outbreak of measles [40], 17% (79/457) of cases were aged 15-19 years and 8% (37/457) 20 year-old or older; the rate of complication was significantly higher in the older group (20 year and older, 24% vs. 7% for children aged 1-4). Although the majority of cases occurred in young children and the outbreak was largely due to an insufficient vaccination coverage among young children, the substantial burden of infection observed in adults underscore the necessity to take every opportunity to immunize non immune persons against measles no matter their age [41], to avoid recurring outbreaks and avoidable complications among adolescents and adults [42].

Our results were obtained among a large and fairly representative sample of primary care practitioners. But our study had several limitations. Its cross-sectional nature precludes any definite evaluation of temporality and causality of the observed relationships, in particular between perceived utility and reported use. The exclusive reliance on self-reported rating raises the issue of measurement error related to systematic positive or negative response tendencies. Furthermore, as physicians reported attitudes were measured with errors, this could have decreased the size of the correlations we observed. Finally, although the participation rate was excellent (surveys among physicians rarely exceed 50%) and complementary analyses indicated limited potential for substantial response bias, we cannot be certain that non respondents truly shared the same attitudes toward immunisations as the physicians who responded to the survey.

Conclusion

Since 1999, several new promotion programs have been implemented with success to strengthen immunisation coverage in adolescents (hepatitis B [18, 43]) and adults (influenza [44, 45]). A commonality among these initiatives has been the central role assigned to primary care physicians. Because their opinions and attitudes are important determinants of vaccine use in adults and can be modified by appropriate promotion campaigns, every effort should be made to provide primary care practitioners with appropriate and regular scientific update [46–48]. Several recent initiatives go in this direction, such as InfoVac, an academic network of infectious diseases experts available free of charge at a central e-mail address to answer Swiss physicians' questions about immunisations [49]. These initiatives should continue to be supported and developed. But more might be needed, since a majority of the Swiss primary care physicians also asked for more support in the form of media actions, provision of information, material for their practice (leaflet, brochure), and solutions to the issues of missing or lost immunisation booklet and erroneous recall of previous vaccinations as children. All these efforts will be necessary to continue to improve immunization utilization and maintain a high proportion of Swiss adults properly immunized.

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Contributors

PAB participated in the formulation of the primary study hypothesis, discussed core ideas, and participated in the protocole design, data collection, statistical analysis, interpretation of the data and writing the paper.

MBG initiated the research, participated in the formulation of the primary study hypothesis, discussed core ideas, and participated in the protocole design, data analysis, interpretation of the data and editing the paper.

EC discussed core ideas of the research, reviewed the study protocol, and participated in interpretation of data and writing the paper.

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Appendix 1

Recommended vaccinations for adults (1999, Switzerland, [17, 18]).

Recommendation	Abbreviated wording in tables
1. Primo-vaccination against diphtheria-tetanus of adults who have not yet been vaccinated	Di-Te primo all adults
2. Booster dose against diphtheria-tetanus every 10 years of previously immunized adults	Di-Te booster
3. Booster dose against diphtheria-tetanus of adults following a recent wound	Di-Te booster wound
4. Primo-vaccination against poliomyelitis of adults traveling to a country where poliomyelitis is endemic and who have not yet been vaccinated	Polio primo all adults
5. Booster dose against poliomyelitis every 10 years of previously immunized adults traveling to a country where poliomyelitis is endemic	Polio booster
6. Vaccination against influenza of all patients over 65	Influenza older than 65
7. Vaccination against influenza of all patients presenting health conditions which increases the risk of complication	Influenza at risks
8. Vaccination against influenza of all willing adults, regardless of age or health conditions	Influenza all willing adults
9. Vaccination against pneumococcal diseases for all patients over 65	Pneumococcal diseases
10. Vaccination against hepatitis A for all adults traveling to a country where hepatitis is endemic	Hepatitis A
11. Vaccination against hepatitis B of all adolescents (11 to 15 year-old)	Hepatitis B all adolescents
12. Vaccination against hepatitis B of adults presenting an increased risk of exposure	Hepatitis B all at risk adults
13. Vaccination against rubella of child-bearing age women, who have not yet been vaccinated	Rubella
14. Booster dose against measles of adolescents and adults	Measles

References

- Zimmermann HP, Pfiffner D, Bourquin C, Matter H. Epidemiology of diseases preventable by vaccination. *Rev Med Suisse Romande* 1998;118:301-8.
- Swiss Federal Office of Public Health. Les Amériques sont très proches de l'élimination de la rougeole. *Bull OFSP* 2004;23:388-9.
- Peltola H, Heinonen OP, Valle M, Paunio M, Virtanen M, Karanko V, et al. The elimination of indigenous measles, mumps, and rubella from Finland by a 12-year, two-dose vaccination program. *N Engl J Med* 1994;331:1397-402.
- de Quadros CA, Izurieta H, Venczel L, Carrasco P. Measles eradication in the Americas: progress to date. *J Infect Dis* 2004;189(Suppl 1):S227-35.
- Progress toward global eradication of poliomyelitis, January 2003-April 2004. *Wkly Epidemiol Rec* 2004;79:229-34.
- Bouvier P, Batou M, Brenner E, Loutan L, Vouilloz M, Rouge-mont A. Couverture vaccinale de la jeune population genevoise en 1990. *Bull OFSP* 1994;49:830-4.
- Loutan L, Maitre B, Zuber P. Les étudiants en médecine sont-ils bien vaccinés? Résultats d'une étude sérologique et de couverture vaccinale. *Soz Praeventivmed* 1994;39:86-92.
- Swiss Federal Office of Public Health. Couverture vaccinale antipoliomyélique de l'adulte. *Bulletin OFSP* 1989;39:521-6.
- Swiss Federal Office for Statistics. Enquête suisse sur la santé 1997. Swiss Federal Office for Statistics, Neuchâtel, 1999.
- Fedson DS, Hirota Y, Shin HK, Cambillard PE, Kiely J, Ambrosch F, et al. Influenza vaccination in 22 developed countries: an update to 1995. *Vaccine* 1997;15:1506-11.
- Ambrosch F, Fedson DS. Influenza vaccination in 29 countries. An update to 1997. *Pharmacoeconomics* 1999;16(Suppl1):47-54.
- Ammon CE. A survey of institutional influenza vaccination in Switzerland. *Soz Praeventivmed* 2000;45:182-7.
- Knottnerus JA. Influenza in The Netherlands. *Pharmacoeconomics* 1996;9(Suppl 3):46-9; discussion 50-3.
- Nicholson KG. Socioeconomics of influenza and influenza vaccination in Europe. *Pharmacoeconomics* 1996;9(Suppl 3):75-8.
- Szucs T. The socio-economic burden of influenza. *J Antimicrob Chemother* 1999;44(Suppl B):11-5.
- McBean AM, Hebert PL. New estimates of influenza-related pneumonia and influenza hospitalizations among the elderly. *Int J Infect Dis* 2004;8:227-35.
- Swiss Federal Office of Public Health. Plan de vaccination de routine. in *Classeur «Maladies infectieuses: diagnostic et prévention»* Vol. Chap. 1, Suppl. VIII; mise à jour décembre 1997 (ed. OFSP) OFSP, Berne, 1997.
- Swiss Federal Office of Public Health. Nouveau plan de vaccination et recommandations pour la vaccination contre l'hépatite B: Vaccination généralisée contre l'hépatite B des adolescents de 11 à 15 ans. *Bull OFSP* 1998;5:4-5.
- Borgatta EF, Bohrnstedt GW. Level of measurement: Once over again. *Social Methods Res* 1980;147-60.
- Streiner DL, Norman GR. Scaling response. *Health measurement scales: a practical guide to their development and use*. New York, Oxford University Press, 1995: p. 38.
- Franzblau A. A primer of statistics for non-statisticians: Harcourt, Brace & World, 1958.
- Bovier P, Bovier Gallacchi M. Vaccination des adultes en Suisse: l'opinion des médecins de premier recours. *Bull OFSP* 2000;11:220-5.
- Williams WW, Hickson MA, Kane MA, Kendal AP, Spika JS, Hinman AR. Immunization policies and vaccine coverage among adults. The risk for missed opportunities. *Ann Intern Med* 1988;108:616-25.
- Watson MA, Feldman KW, Sugar NF, Sommer CJ, Thomas ER, Lin T. Inadequate history as a barrier to immunization. *Arch Pediatr Adolesc Med* 1996;150:135-9.
- Bovier PA, Chamot E, Bovier Gallacchi M, Loutan L. Importance of patients' perceptions and general practitioners' recommendations in understanding missed opportunities for immunisations in Swiss adults. *Vaccine* 2001;19:4760-7.
- Müller DA. Troisième année de la campagne: la priorité est donnée au personnel médical et soignant. *Bull Med Suisses* 2003;84:2024-26.
- Zimmerli S, Mühlemann K. La prévention de la grippe aujourd'hui. *Bull Med Suisses* 2001;82:2071-76.
- Müller DA. Campagne nationale de prévention de la grippe - nouveaux progrès en vue. *Bull Med Suisses* 2004;85:2245-8.
- Grüniger U. Après la 1ère Journée nationale de vaccination contre la grippe des médecins de premier recours. *Primary Care* 2004;4:971-2.
- Melegaro A, Edmunds WJ. The 23-valent pneumococcal polysaccharide vaccine. Part I. Efficacy of PPV in the elderly: a comparison of meta-analyses. *Eur J Epidemiol* 2004;19:353-63.
- Hutchison BG, Oxman AD, Shannon HS, Lloyd S, Altmayer CA, Thomas K. Clinical effectiveness of pneumococcal vaccine. Meta-analysis. *Can Fam Physician* 1999;45:2381-93.
- Watson L, Wilson BJ, Waugh N. Pneumococcal polysaccharide vaccine: a systematic review of clinical effectiveness in adults. *Vaccine* 2002;20:2166-73.
- Fine MJ, Smith MA, Carson CA, Meffe F, Sankey SS, Weissfeld LA, et al. Efficacy of pneumococcal vaccination in adults. A meta-analysis of randomized controlled trials. *Arch Intern Med* 1994;154:2666-77.
- Cornu C, Yzebe D, Leophonte P, Gaillat J, Boissel JP, Cucherat M. Efficacy of pneumococcal polysaccharide vaccine in immunocompetent adults: a meta-analysis of randomized trials. *Vaccine* 2001;19:4780-90.
- Jackson LA, Neuzil KM, Yu O, Benson P, Barlow WE, Adams AL, et al. Effectiveness of pneumococcal polysaccharide vaccine in older adults. *N Engl J Med* 2003;348:1747-55.
- Prevention of Hepatitis B in Switzerland by general vaccination. *Soz Praeventivmed* 1998;43(Suppl 1):S1-151.
- Masserey Spicher V, Zimmermann H, Lang L, Koch D. Hepatitis B adolescent immunisation program in Switzerland: short-term results. in *22nd Annual Meeting of the European Society for Paediatric Diseases, Tampere, Finland, 2004*.
- Swiss Federal Office of Public Health. Vaccination des enfants en bas âge: Enquête représentative sur la couverture vaccinale en Suisse 1998. *Bulletin de l'OFSP* 1999;20:356-61.
- Swiss Federal Office of Public Health. Les vaccinations: recommandation générales. in *Classeur «Maladies infectieuses: diagnostic et prévention»* Vol. Suppl. XVI (ed. OFSP) OFSP, Berne, 2003. 1-27.
- Richard JL, Boubaker K, Doutaz M, Schubiger G. Déclaration oligatoire de la rougeole en Suisse: forte augmentation du nombre de cas au printemps 2003. *Bull Med Suisses* 2003;84:1445-9.
- Siegrist CA. Vaccinologie - épidémie de rougeole. *Med Hyg* 2004;62:139-43.
- Swiss Federal Office of Public Health. La rougeole. *Bull OFSP* 2003;39:668-9.
- Zimmermann H, Vaudaux B, Kammerlander R. Introduction of general hepatitis B vaccination in Switzerland. *Soz Praeventivmed* 1998;43(Suppl 1):S65-8, S138-42.
- Lancement d'une Journée Nationale de Vaccination contre la Grippe. *Primary Care* 2004;4:505.
- Swiss Federal Office of Public Health. Recommandations pour la prévention de la grippe. *Bull OFSP* 2000;Supp XIII:1-18.
- Freed GL, Bordley WC, Clark SJ, Konrad TR. Family physician acceptance of universal hepatitis B immunization of infants. *J Fam Pract* 1993;36:153-7.
- Freed GL, Bordley WC, Clark SJ, Konrad TR. Universal hepatitis B immunization of infants: reactions of pediatricians and family physicians over time. *Pediatrics* 1994;93:747-51.
- Loewenson PR, White KE, Osterholm MT, MacDonald KL. Physician attitudes and practices regarding universal infant vaccination against hepatitis B infection in Minnesota: implications for public health policy. *Pediatr Infect Dis J* 1994;13:373-8.
- Siegrist C, Desgrandchamps D, Heininger U, Vaudaux B. How to improve communication on vaccine issues at the national level? INFOVAC-PED: an example from Switzerland. *Vaccine* 2001;20(Suppl 1):S98-S100.

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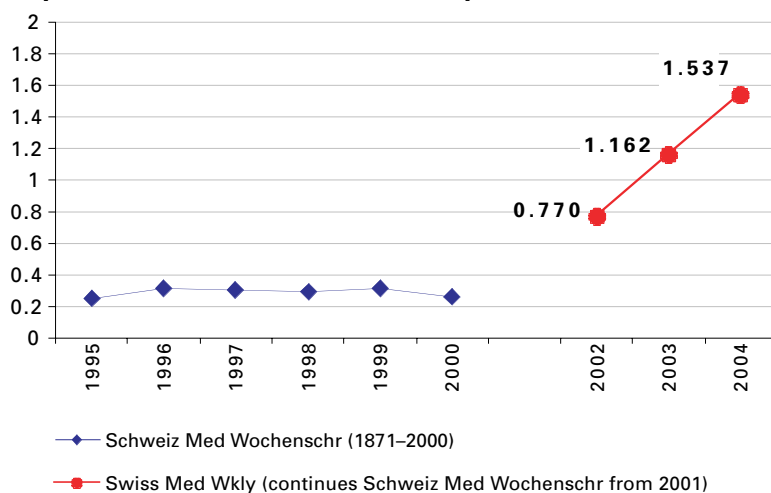
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