Childhood Immunisation Recall in Swiss Employees

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Abstract: Childhood Immunisation Recall in Swiss Employees: Julian Schilling, et al. Institute of Social and Preventive Medicine, University of Zurich—During the workplace health promotion project “Check Bus”, we asked 10,321 employees (4,070 women, 6,251 men, mean age=39 yr) of two nationwide Swiss enterprises, a large bank and an industrial company, about their vaccination status by using a self-administered questionnaire. Among all respondents, 43.8% reported having a valid (up to date) tetanus vaccination (<10 years old), 29.9% a pertussis vaccination, 74.2% a poliomyelitis vaccination, 53.8% a tuberculosis vaccination, 22.7% a rubella vaccination and 12.7% an MMR vaccination (measles, mumps, rubella). A large number of respondents had no knowledge of their personal immunisation status. We found significant socio-demographic differences. For all vaccinations, age, gender (with the exception of MMR) and language independently predicted vaccination status. Hierarchic occupational rank was an independent and significant predictor for pertussis, poliomyelitis and tuberculosis vaccinations. Our study showed that especially elderly people, males and Italian speaking participants had a very limited knowledge of their personal vaccination status.

Key words: Vaccination recall, Childhood immunisations, Workplace screening

Vaccination coverage of the working population may be relevant regarding herd immunity and the distribution of infectious diseases. Outbreaks of infectious diseases in the workplace have economic consequences, such as work absenteeism. Crowded working or living conditions may facilitate transmission by allowing infection to spread from the workplace to the community through household contacts or vice versa.¹⁻²¹.

The objective of our study was to show a profile of the perceived vaccination status among a population of 15–72 yr old employees in Switzerland for tetanus, pertussis, poliomyelitis, tuberculosis, MMR and rubella vaccinations which usually take place in childhood. Adults should receive tetanus boosters every 10 yr. Depending on risks at the workplace or travel to endemic areas other vaccination boosters should be considered, e.g. against poliomyelitis. A short overview of the Swiss childhood immunisation schedule, dates of introduction and withdrawal of vaccines and current immunisation rates of infants are given in Table 1.

We also aimed to show how well informed people are about their own vaccination status. It is important for individuals to be aware of their personal vaccination status when travelling or in case of injury, (e.g. tetanus booster). Physicians, clinicians and health care providers depend on patient information when making immunisation decisions. Uncertain vaccination status could lead to missed opportunities to vaccinate or to overvaccination.³¹. Overvaccination with tetanus immunoprophylaxis in wound care is common.⁴¹. A study among US children showed that 21% of them were extraimmunised for at least one vaccination.⁵¹. We gathered data using a questionnaire survey, based on records in individual vaccination booklets or individual recall. In Switzerland, national vaccination booklets with a personal vaccination record have been in use for more than 20 yr. Data were analysed with a particular focus on differences between the genders, age groups, hierarchic occupational rank and linguistic groups. Vaccination status of earlier generations provides a view back to tendencies of vaccination rates over a longer period of time.

Methods

In celebration of a jubilee, the Institute of Social and Preventive Medicine in Zurich was commissioned by a large Swiss bank to conduct a health promotion project at the workplace named “Check Bus”. Two large nationwide
Enterprises (the bank and a large industrial company) took part in the project between August 1996 and August 1998. A medical team visited all branches of the two companies throughout Switzerland and invited all employees to participate. A total of 10,321 employees, 4,070 women and 6,251 men (15–72 yr old), took part in health examinations and completed an extensive self-administered questionnaire on their health status. The questionnaire was available in the three national languages: German, French and Italian. The overall participation rate was 41%. Participation rates for men and women were 36.8% and 40.0%, respectively, and increased with age.

Part of the questionnaire concerned the immunisation status of the employees. Questions could be answered by either writing down the year of vaccination or replying with “never vaccinated” or “don’t know”, respectively. Participants were encouraged to check their vaccination booklets for verification. As the project “Check Bus” was not primarily concerned with the study of vaccination status we were subject to certain limitations and were unable to verify participants’ replies for correctness.

We analysed the data to determine differences between gender, age, hierarchy and the three national linguistic groups. Age was categorised into the following five groups: 15–24 yr, 25–34 yr, 35–44 yr, 45–54 yr and 55+ yr of age. Hierarchical occupational rank of the employees comprised upper level (e.g. director), mid-level (e.g. supervisor) and low level (staff).

SPSS 9.0 was used for all statistical tests. We performed \( \chi^2 \) test statistics to compare group sizes and Mantel-Haenszel \( \chi^2 \) to analyse linear trends. Logistic regression analysis was used to calculate the collective influence of the background variables, gender, age, linguistic group and hierarchy. A p value of less than 0.01 was accepted as significant.

Results

An overview of participants’ responses to all vaccinations is shown in Table 2.

A significantly higher proportion of women than men reported “vaccinated” (\( p<0.001 \) for all vaccinations, except tuberculosis \( p<0.05 \)), but also a higher proportion of women than men reported “never vaccinated” for tetanus (\( p<0.001 \)), tuberculosis (\( p<0.05 \)) and MMR (\( p<0.001 \) (Fig. 1). Significantly more men than women were unaware of their vaccination status (\( p<0.001 \) for all vaccinations). A higher proportion of men reported expired tetanus vaccinations (\( p<0.001 \)).
In general, vaccination rates were higher for younger people. For all vaccinations there was a notable age dependent decrease in the proportion of people reporting to be vaccinated (Fig. 2). Significantly less German-speaking employees responded with "don't know" compared with French- and Italian-speaking employees (p<0.001). German-speaking participants answered more often with "vaccinated" for tetanus, poliomyelitis, tuberculosis, rubella and MMR vaccinations but also more often with "never vaccinated" for pertussis, rubella and MMR vaccinations than their French- and Italian-speaking counterparts (p<0.001). Italian-speaking employees replied more often with "never vaccinated" for poliomyelitis (p<0.01) and tuberculosis (p<0.001).

Employees with low hierarchic occupational rank answered more often with "vaccinated" for tetanus, MMR, rubella, pertussis (p<0.001) and less often with "vaccinated" for poliomyelitis (p<0.01) than the two higher occupational ranks. No difference was found for tuberculosis.

**Multivariate analyses**

By logistic regression analysis, younger age independently predicted vaccination status (p<0.001) for all vaccinations, as well as the gender "female" with the exception of MMR (tetanus, poliomyelitis and rubella p<0.001, pertussis p<0.01, tuberculosis p<0.05, MMR
Hierarchy (occupational rank) independently predicted vaccination status for pertussis, poliomyelitis and tuberculosis (all p<0.001), but not for tetanus (p=0.45), rubella (p=0.40) and MMR (p=0.88) when controlling for the other variables mentioned.

Language independently predicted the vaccination status for all vaccinations (p<0.001 for all, except pertussis and MMR p<0.01).

**Discussion**

Vaccination assessments at the workplace are easy to carry out and may lead to a large number of employees spreading important information about vaccination on to family members, relatives and friends.

We were unable to determine the true vaccination status of our study population, as sera antibody measurements were not carried out. Furthermore, although participants were asked to check their vaccination status against their certificates, no data were available on how many followed this advice. We consequently do not know how many participants simply relied on their own recall. Many employees reported an unclear vaccination status (“don’t know”) and we must conclude that many participants did not have their vaccination booklets at hand. Suarez et al.7) suggested, in a validation study of parental recall of child immunisations, the exclusion of the “don’t know” group from the calculation of vaccination coverage, as approximately half of the unknown groups’ vaccination status was up-to-date according to medical records. In the same study, 18% of the parents overestimated the up-to-date vaccination status of their children.7) Because we requested participants to write down the year of their last immunisation, we assume that we have more accurate details of their vaccination status.

The proportion of people reporting an unknown vaccination status differed greatly for each vaccine. Although about 25% of the respondents did not know whether they were vaccinated against tetanus or poliomyelitis, over 50% reported an unknown vaccination status for rubella and MMR. A similar trend is seen in not responding to the question (Tetanus 2.5%, MMR 8.0%). This may be an indication of the lack of interest people have in their own immunisation status for the various vaccinations or it might be a function of recall (memory gap), depending on the last time of immunisation.

For all vaccines, significantly less women reported an unknown vaccination status than men. Consequently, women more often reported vaccinated (for all vaccines) or never vaccinated (for tetanus, MMR). Despite
mandatory tetanus vaccinations for men entering military service significantly fewer women reported an unknown tetanus vaccination status than men. The difference between the genders is not surprising for rubella as the monovalent rubella vaccination was introduced selectively to girls before childbirth age. A large proportion of women were unaware of their rubella vaccination status. Rubella has not yet been eliminated and still occurs in women of childbearing age in Switzerland. However, pregnant women are routinely tested for rubella antibodies if there is no proof of immunisation.

German speaking employees less often reported an unknown vaccination status than French- and Italian-speaking employees. There are social differences between the three language groups. In the French- and Italian-speaking regions of Switzerland there is a higher rate of unemployment and a higher percentage of foreign citizens than in the German-speaking region. National income per capita is highest in the German-speaking part and lowest in the Italian-speaking part of Switzerland. There are also differences in educational attainment, which is lowest in the Italian speaking part. In the French-speaking region more people obtain a university degree than in the German-speaking region, but there are also more people with only compulsory education. These factors may influence attitudes towards health in general. This makes it impossible for us to compare data on non-participants as we were denied access to this information. This makes it impossible for us to compare data on non-participants as we were denied access to this information.

Logistic regression analyses showed that hierarchy alone does not explain the high proportion of people vaccinated against tetanus, MMR and rubella among low hierarchic occupational ranks. Lower age and a higher proportion of women among low hierarchic ranks could explain this finding, but low hierarchic rank independently predicted higher reporting of pertussis vaccinations and lower reporting of poliomyelitis vaccinations compared to higher ranks.

For all vaccinations, the proportion of people reporting to be vaccinated decreased with increasing age. This is most likely a cohort effect, i.e. a result of the late introduction of certain vaccines combined with changing vaccination recommendations and campaigns over time. Older age cohorts have not received routine vaccinations with most vaccines. For example there is a marked decrease with increasing age in the proportion of people reporting, “vaccinated” for MMR vaccination, in accordance with its late introduction. The current MMR mass immunisation rate for infants (first dose) in Switzerland of approximately 80% is still too low, as a rate higher than 95% must be achieved in order to eliminate measles, mumps and rubella. The incidence of measles in Switzerland from 1996 to 1999 was 7.8–38.9 per 1,000,000, 43–54% occurring in people over 20 yr of age. A similar situation is seen in Canada and the United States with 38% and 32% respectively of cases occurring in over 20 yr olds in 1997 (incidence 1.9, 0.05 per 100,000 respectively). There is a risk of age-dependent complications when measles is contracted during adulthood, e.g. measles encephalitis becomes more frequent with increasing age.

Our data confirm earlier findings of insufficient tetanus immunisation protection in the elderly. Although the rate of mass inoculation of infants in Switzerland in 1998 was 92–95%, the immunisation recommendations somehow failed to alert the older population despite the fact that tetanus in Switzerland and other western countries, e.g. Germany and the United States is primarily a disease of adults. But from 1989 to 1999 only 1–5 cases of tetanus were registered in Switzerland annually. This suggests that the tetanus booster remains effective longer than the recommended 10-yr interval.

Among all vaccinations, poliomyelitis (PM) showed the highest percentage of people answering “vaccinated” (74.2% overall) which may indicate that this immunisation is well accepted. The mass immunisation rate for infants in 1998 of 92–95% indicates that this immunisation also encounters very little scepticism among today’s parents. Potential severity of complications of PM undoubtedly helped raise public awareness and ensured a good acceptance of the vaccination. Another possible reason is that the vaccine is available as an oral agent and people might also remember the national PM immunisation campaigns which took place in medical practices and pharmacies throughout Switzerland every five years between 1975 and 1985. In 1990, the planned campaign was no longer executed as the Swiss Federal Office of Public Health concluded that a booster immunisation was generally no longer necessary for adults. Exceptions are listed in Table 1.

One important weakness of our study is the lack of data on non-participants as we were denied access to this information. This makes it impossible for us to compare participants with non-participants in order to detect any bias due to different participation. Details of representativeness have been discussed in our methods paper.

The Check Bus Project was performed during a period of major restructuring in one of the two enterprises involved, which mostly concerned employees in the French-speaking part of Switzerland where the participation rate was consequently lower. This restructuring could have negatively influenced the participation rate. We did not send out reminders and the Check Bus visited the different company sites only once. In view of this the participation rate of 41% may be regarded as rather high.
In summary, age, gender (with the exception of MMR) and language independently predicted reported vaccination status. Elderly people, males and Italian-speaking participants have been identified in our study as those with particularly low vaccination status, unknown vaccination status, and need to be targeted specifically by physicians and public health workers for more awareness. Further research is needed to examine why large proportions of the population lack information on their personal immunisation status.

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References