



# Cancelled routine vaccination appointments due to COVID-19 pandemic in Germany



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## ABSTRACT

Pandemic measures to mitigate the outbreak of SARS-CoV-2 in Germany led to cancellations of routine vaccination appointments for both adults and children. Survey data indicate that, with easing pandemic restrictions, many cancelled appointments were rescheduled or caught up. Nevertheless, 40% of cancelled appointments were still not rescheduled and were primarily cancelled by patients. Therefore, doctors should regularly remind patients of vaccinations and use every visit to improve their vaccination statuses.

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## 1. Introduction

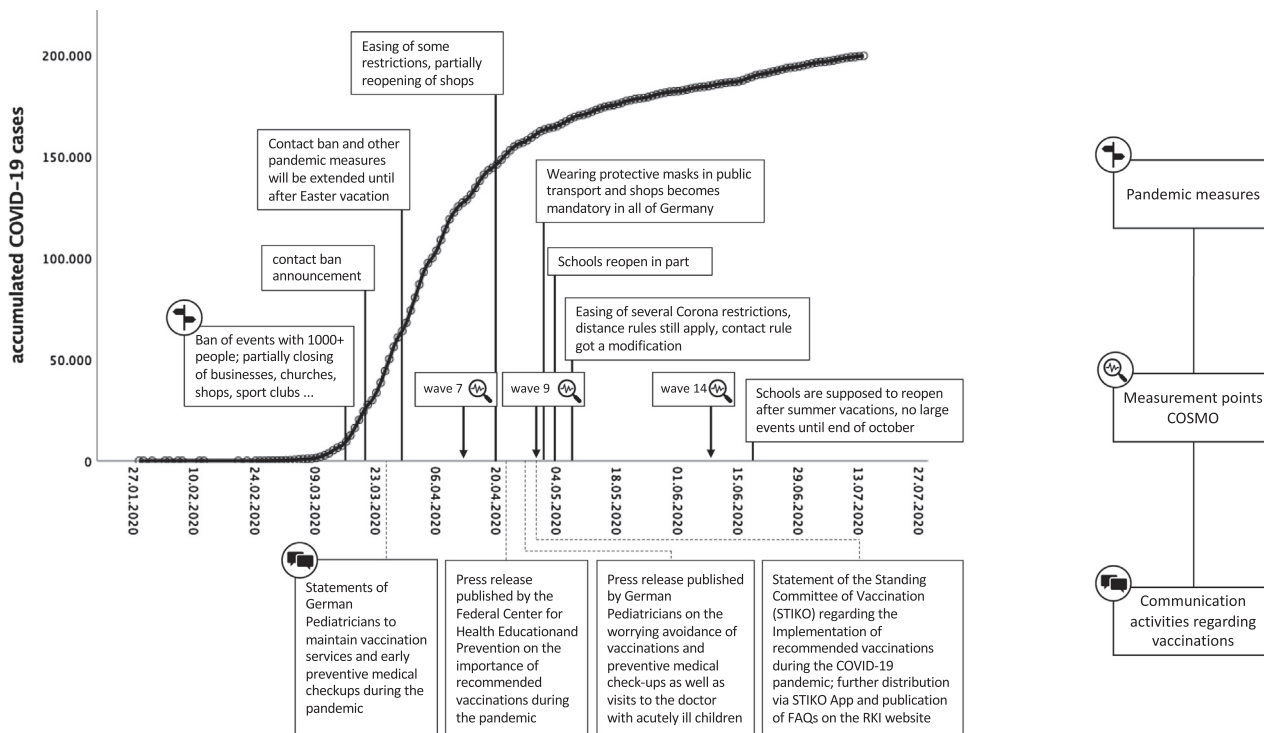
At the end of January 2020, the outbreak of the newly emerged coronavirus (SARS-CoV-2) hit Germany, leading to more than 33,000 defined cases within eight weeks. Measures, such as contact bans or closing of shops, were taken by the federal government from mid-March onwards to mitigate effects of the pandemic (Fig. 1). In addition, elective surgeries were postponed to reserve resources for COVID-19 patients. All measures also aimed to reduce the outbreak's impact and to prevent overburdening of the German healthcare system. As a consequence, a decrease in the use of health care services, such as regular check-ups, was observed [1].

There is great concern that this decreased interaction with the health care system could also result in decreased access to routine childhood immunization services, which has been already observed in other countries [2,3]. As a consequence, an accumulation of susceptible individuals and, thus, a higher likelihood of out-

breaks of vaccine-preventable diseases in the future is possible. Unlike some other medical services such as prescriptions, which can be done preparatory to the lockdown, childhood vaccinations need to be done on time and in practice. The German Standing Committee on Vaccination (STIKO) stated in April 2020 that, even in the pandemic, all recommended vaccinations should be carried out at the recommended age (Fig. 1) [4]. Protection is particularly important for immunocompromised persons or persons with other health risk factors. In particular, the recommended vaccinations in the first two years of life should be started in a timely manner and completed as early as possible. Moreover, individuals aged 60 years and older should receive vaccinations against pneumococci, shingles, and influenza [4]. The Federal Institution for Prevention and Health Promotion also published a press release on timely vaccinations during the pandemic, especially targeting childhood vaccinations [5]. To emphasize the importance of immunization services during the COVID-19 pandemic and to ensure safe vaccinations, the World Health Organization's Regional Office for Europe (WHO/Europe) published comprehensive guidelines in March 2020 [6]. Associations of German paediatricians repeatedly published statements pleading for the safe maintenance of vaccination services and early preventive medical check-ups for babies during the pandemic [1,7]. In this situation of recurring warnings not to

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**Fig. 1.** Overview of the (course of) the SARS-CoV-2 pandemic with additional information on a) milestones of pandemic measures (Robert Koch Institute (RKI), dl-de/by-2-0), b) COSMO data collections, and c) selected communication activities.

overburden the health system and encouragements to receive routine vaccinations, we aimed to assess the extent of cancelled vaccinations in Germany for children and adults at different points in time. We also examined whether cancellations depended on factors associated with vaccine hesitancy [8]. Finally, we investigated the efforts made to catch patients up on vaccinations.

**2. Rapid monitoring with the COVID-19 snapshot monitoring (COSMO)**

Data were collected within three waves (waves 7, 9, and 14) of COSMO, a serial cross-sectional survey monitoring public perceptions of risk, trust, knowledge, and misinformation on COVID-19 measures. Since March 3, 2020, about 1000 participants constituted a weekly (since June, fortnightly) online quota-representative sample, mirroring Germany’s age by gender distribution, as well as federal states. Results of COSMO are used to inform the government, journalists, and health organizations of the psychosocial COVID-19 situation in Germany and to help derive direct recommendations for action and implementation [9].

The first data collection on 4/14/20 assessed self-reported vaccination behaviours and vaccinations’ psychological antecedents, such as trust in the safety and effectiveness of vaccines (confidence) or the willingness to protect others by one’s own vaccination (collective responsibility). A subsample of adults with children under the age of 18 provided information on their children’s vaccinations, as well. Self-reported behaviour was also assessed in the second data collection on 4/28/20. The second and third data collections on 6/9/20, also focused on the question of whether cancelled vaccination appointments were caught up. Table 1 presents an overview of all variables reported, including sample items, answer formats, and the date of data collection. The original data and syntax of the following analyses are provided at <https://doi.org/10.17605/OSF.IO/AV9WF> [10,11,12].

**2.1. Cancelled vaccination appointments**

Table 2 displays planned and cancelled vaccination appointments and reasons for cancellation for all three data collections. The first data collection (4/14/20) indicated that 120 out of 1032 respondents had vaccination appointments in the last six weeks (children: 73/306). Almost half of the vaccination appointments were cancelled, both for adults (53/120 = 44.17%) and children (31/73 = 42.47%). Nearly all of them were cancelled because of the pandemic situation (adults: 42/53 = 79.25%, children: 26/31 = 83.87%). Two thirds of the respondents indicated their physicians had cancelled their appointments due to the pandemic (for adults: 28/42 = 66.67%); half of them indicated that their paediatrician cancelled the childhood vaccination appointment (12/26 = 46.15%). The remaining cancelled appointments were cancelled by the patients themselves (adults: 14/42 = 33.33%, children: 14/26 = 53.85%).

The second data collection (4/28/20) revealed that, for adults, as many appointments were cancelled as before (53/123 = 43.09%). The most common reason for cancellation remained the pandemic situation (43/53 = 81.13%). In contrast to the previous data collection, where appointments were more often cancelled by physicians, appointments were now more frequently cancelled by patients (24/43 = 55.81%) than physicians (19/43 = 44.19%). For children, the overall proportion of cancelled appointments decreased. A higher percentage of the initially planned vaccination appointments took place (43/57 = 75.44%), while the reason most frequently given for cancellation remained the pandemic situation (12/14 = 85.71%). One third of the vaccination appointments for children were cancelled by the physician (4/12 = 33.33%) and two thirds by parents (8/12 = 66.66%).

In June 2020, the data collection revealed that more than half of the vaccination appointments took place for adults (73/135 = 54.07%), as well as for children (48/82 = 58.54%), although many appointments were still cancelled.

**Table 1**  
Dependent Variables with Sample Items and Answer Formats.

Construct	Item Example and Source	Answer Format	Used in Data Collection
<b>Dependent Variables</b>			
Vaccination appointment (adult/child)	“Did you get vaccinated during the last six weeks?” “Did your youngest children get vaccinated during the last six weeks?”	<ul style="list-style-type: none"> <li>• Yes, the vaccination appointment was carried out as planned.</li> <li>• No vaccination appointment planned.</li> <li>• No, I cancelled it due to the corona situation.</li> <li>• No, the physician cancelled it due to the corona situation.</li> <li>• No, it was cancelled for another reason, ... [open text answer].</li> </ul>	4/14/20 4/28/20
Catch-up appointment (adult/child)	“Have you already made up a catch-up appointment with your physician?” “Have you already made up a catch-up appointment for your youngest child with your physician?”	<ul style="list-style-type: none"> <li>• Yes</li> <li>• No</li> <li>• Other</li> </ul>	4/28/20
Vaccination appointment and catch-up appointments (adult/child)	“Please think of the last three months. Was a vaccination appointment planned during this period, and did you get the vaccination?” “Please think of the last three months. Was a vaccination appointment planned for your youngest child during this period, and did your child get the vaccination?”	<ul style="list-style-type: none"> <li>• No vaccination planned during this time.</li> <li>• A vaccination was planned and given on the agreed date.</li> <li>• A vaccination was postponed but already caught up.</li> <li>• A vaccination was postponed, and the catch-up appointment is pending.</li> <li>• A vaccination was postponed. It hasn't been caught up yet, and no catch-up date has been appointed.</li> </ul>	6/9/20
5C psychological antecedents of vaccination (short scale)	Confidence: “I am completely confident that vaccines are safe.” (Betsch et al., 2018)	Likert-scale (1 strongly disagree/ 7 strongly agree)	4/14/20

**Table 2**  
Comparison of data collections on 4/14/20, 4/28/20, and 6/9/20 with respect to the cancellation of vaccination appointments.

Information on vaccination appointments	Date of data collection					
	4/14/20 (adults)	4/28/20 (adults)	6/9/20 (adults)	4/14/20 (children)	4/28/20 (children)	6/9/20 (children)
Sample Size	1032	1018	955	306	267	273
<i>Vaccination appointment</i>						
Not planned	912 (88.4)	895 (87.9)	820 (85.9)	233 (76.1)	210 (78.7)	191 (70.0)
Planned	120 (11.6)	123 (12.1)	135 (14.1)	73 (23.9)	57 (21.3)	82 (30.0)
<i>Planned vaccination appointment</i>						
Took place	67	70	73	42	43	48
Postponed/cancelled	53	53	62	31	14	34
<i>Reason for cancellation</i>						
Other reasons	11	10	-	5	2	-
Corona-related	42	43	-	26	12	-
<i>Corona-related cancellation</i>						
By physician	28	19	-	12	4	-
By patient	14	24	-	14	8	-
<i>Catch-up for vaccination appointment</i>						
Already done	-	-	25	-	-	22
Planned	-	12	12	-	6	5
Not planned	-	41	25	-	8	7

Note. Sample size indicates the number of respondents who answered the questions, e.g., parents answering questions about vaccination appointments for their children. Percentages are shown in parentheses. Missing values (-) indicate that the variable was not part of the respective wave.

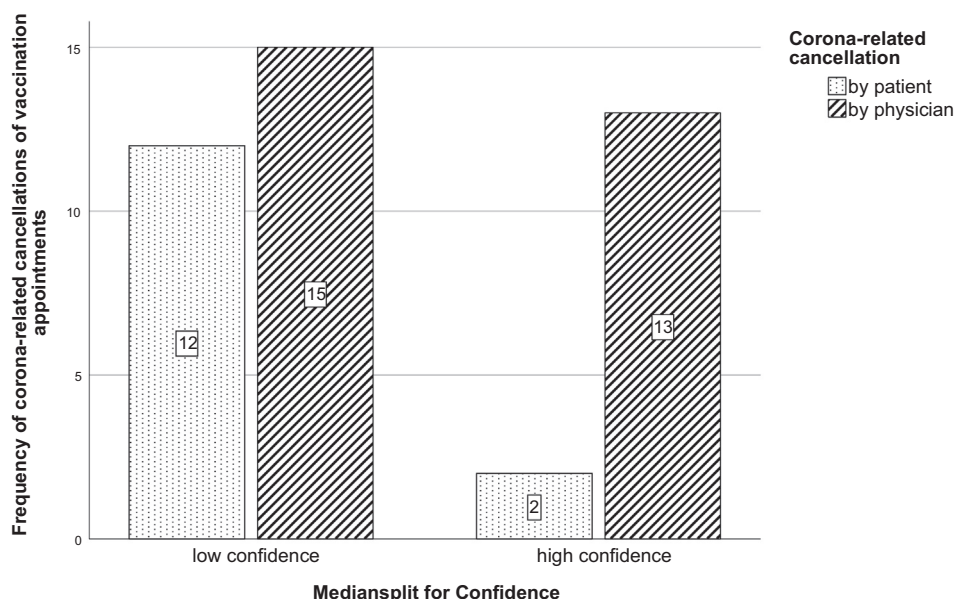
2.2. Cancelled appointments and vaccine hesitancy

For the first data collection in April 2020, we explored the association between factors predicting vaccine hesitancy and patients' decisions to cancel vaccination appointments for themselves or their children. Of all potential psychological antecedents (confidence, constraints, complacency, calculation, and collective responsibility) [8], only confidence was associated with cancelling appointments. Fig. 2 shows the number of vaccination appointments cancelled for adults, by patients (dotted) or physicians (striped), depending on their confidence in vaccinations (high vs. low, separated by a median split). While cancellations by the physician did not depend on the patient's confidence level, patients

with low confidence cancelled appointments significantly more often than patients with high confidence in vaccinations,  $\chi^2((1, n = 42) = 4.2, p = 0.040$ . For children's vaccination appointments, there was no statistical association with any of the psychological antecedents.

2.3. Catch-up appointments

In data collections on 4/28/20 and 6/9/20, we asked whether there was a catch-up appointment planned for any of the cancelled appointments and whether cancelled appointments had been caught up. For children, almost two thirds of the cancelled vaccination appointments had already been caught up (22/34 = 64.71%).



**Fig. 2.** Low general confidence in vaccination was related to postponing one's own vaccination appointments during the pandemic. Boxes in bars show the number of participants in the respective groups.

For adults, the percentage was somewhat lower (25/62 = 40.32%). Additional catch-up appointments were planned for both patient groups (adults: 12/62 = 19.35%, children: 5/34 = 14.71%). However, for about a fifth of the cancelled vaccination appointments for children, no catch-up appointment (7/34 = 20.59%) was scheduled. For adults, this proportion was almost twice as high: 40.32% (25/62).

### 3. Discussion

Like in many other countries, Germany's vaccination appointments were postponed during the SARS-CoV-2 pandemic, and this trend has likely not stopped completely. Appointment cancellations affected both adults' and children's vaccinations. Low confidence in vaccination [8] was associated with more frequent cancellations by the patients, while there was no association to any other psychological antecedent of vaccination. While we assume that most cancellations were pandemic-driven, rather than being deliberate decisions against vaccination due to a critical attitude towards vaccinations, the uncertainty of service delivery and safety around the process of getting vaccinated may have served as an excuse for those who have been unsure of vaccinations in the first place. Active service delivery conveying confidence, both in the value of vaccination during a pandemic and the practical management of infection risks in the medical practice, seems to be especially important to reach those with weak intentions to vaccinate. For people who might suffer from increasing anxiety disorders due to the pandemic and therefore avoid crowded places like medical practices, or whose excessive media consumption could have increase COVID-19 specific anxiety disorders, actively communicating confidence could also be a good support [13,14].

Even after easing restrictions, up to 40% of vaccination appointments were still cancelled, though less often by physicians. In particular, vaccinations for adults were not caught up. A special challenge with adult vaccination is that there is usually no fixed timeframe to receive a vaccine, compared to children where vaccines are usually given at a certain age. Thus, postponing adult vaccinations can easily lead to lack of follow-through. As forgetfulness has always been a major reason for neglected vaccinations in the German population [15], stringent reminders seem crucial, especially during situations of heightened uncertainty, such as the pan-

dem. The decreased percentage of cancellations by physicians over time may be due to increasing awareness of the importance of vaccinations during the pandemic, potentially due to repeatedly published statements and communication activities during the pandemic [1,4-7]. Nevertheless, despite easing restrictions that could have facilitated access to physicians (Fig. 1) from May onwards, parents and adults did not fulfill all of the planned vaccination appointments.

Considering limitations, the relatively small sample size, especially regarding information about children's vaccinations, and a possible online selection bias, leading to a higher percentage of highly educated respondents, should be mentioned. Presumed associations are based on correlational data and have to be interpreted with caution. Statements on vaccination behaviours depend on self-reported data and are, therefore, less reliable than routine data, e.g., vaccination rates of specific vaccinations, even though paediatricians and practitioners confirmed that routine appointments were frequently cancelled [7].

Despite alarming reports from the WHO about decreasing vaccination activities worldwide during the pandemic, in Germany, cancellations of childhood vaccinations seem to be mostly temporary. Despite first indications that most appointments, at least for children are being rescheduled, physicians and paediatricians alike are urged to regularly remind their patients of vaccinations. Moreover, physicians should use every visit to screen for vaccination status and offer catch-up vaccinations.

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### CRediT authorship contribution statement

**Nora Katharina Schmid-Küpke:** Conceptualization, Formal analysis, Writing - original draft, Writing - review & editing.

**Dorothea Matysiak-Klose:** Formal analysis, Writing - review & editing. **Anette Siedler:** Formal analysis, Writing - review & editing. **Lisa Felgendreff:** Conceptualization, Software, Writing - review & editing. **Lothar Wieler:** Writing - review & editing. **Heidrun M. Thaiss:** Writing - review & editing. **Cornelia Betsch:** Conceptualization, Software, Writing - review & editing.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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