Perceptions and demand for routine immunization and other maternal and child health services during COVID-19 pandemic among caregivers and healthcare providers in Indonesia

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Executive summary

This study aimed to better understand the influence of the COVID-19 pandemic on access to routine immunization, other maternal and child health services and COVID-19 vaccination amongst caregivers of young children and healthcare providers in Central Java and West Nusa Tenggara, Indonesia. In total, 1399 caregivers and 604 healthcare providers from eight districts or cities across the two provinces, Central Java and West Nusa Tenggara, participated. Data collection of the study was conducted in March to April 2022.

The University of Sydney and Universitas Indonesia undertook this research on behalf of UNICEF East Asia Pacific Regional Office (EAPRO). A technical advisory group with members from Centers for Disease Control and Prevention Indonesia and the US Centres of Diseases Control and Prevention (here after USCDC), Indonesian National Ministry of Health, UNICEF Indonesia, and WHO Indonesia provided regular advice.

Caregiver survey findings

Caregivers reported high acceptance and positive perceptions of routine childhood immunization, however only 40% of children aged two and younger were fully vaccinated for age. Drop-outs were more common among older children; for example, among 18–24 month olds, only 17% had received their Measles-Rubella (MR) 2 dose. Two-thirds (67.3%) of caregivers reported it was very easy to get routine immunizations for their child, yet over half (52.8%) reported missing or delaying routine immunizations. The most commonly reported reasons for missing or delaying included the child or other household members being sick and vaccine unavailability. A smaller proportion of caregivers also reported missing or delaying other maternal and child health services, such as antenatal care (11.3%). Personal reasons, such as forgetting the schedule or competing priorities were the most commonly reported reasons for missing or delaying other maternal and child health services.

There was moderate uptake of the primary COVID-19 vaccination series (2 doses) among caregivers (58%), however booster uptake was low (8.6%). Caregiver perceptions were mixed about the importance of the COVID-19 vaccine; 70% perceived it as very important for their health while 16% were not at all or only a little concerned about COVID-19. Exposure to misinformation was common; 79% of caregivers reported hearing information about COVID-19 that they found difficult to determine as right or wrong. Word of mouth was reported to be the most common source of this information.

Healthcare provider survey findings

Healthcare providers (HCP) reported several disruptions that affected the delivery of routine immunization and other maternal and child health services. Nearly 90% of HCP said that the deployment of health service staff to COVID-19 management was a disruption, while two-thirds reported stock-outs of routine vaccines. Various strategies were used to overcome these disruptions, including community outreach, phone calls to patients and task shifting. About two-thirds of HCP (64%) reported experiencing trauma or burnout, mostly related to long hours and about one-third reported being treated poorly by the community in the workplace.

Uptake of three doses of the COVID-19 vaccine among HCP was high (87%). HCP reported overall positive perceptions of the COVID-19 vaccine; two-thirds said that they were very confident to

respond to patient questions about COVID-19. Exposure to misinformation was common; about half (50.8%) of HCP reported hearing information about the COVID-19 vaccine which they found difficult to determine as right or wrong. Word of mouth was the most common source of this information.

Recommendations

Recommendations for routine immunization, MCH services and COVID-19 vaccination within Central Java and West Nusa Tenggara include the following:

The study found generally positive perceptions of routine immunization among caregivers. This reflects a program which has successfully maintained high confidence in these populations. This resilience is a strength which can be maintained with ongoing community engagement and good services. To address the high proportion of children with incomplete immunization for age, efforts should focus on restoring service delivery to improve ease of access to routine immunization, as well as a better understanding of the factors that make getting routine immunizations challenging. With over half of caregivers missing or delaying routine immunization, and 'sick child' as a main reason for this, immunization program managers may help to improve the health literacy of caregivers on when delayed vaccination is necessary or unnecessary. This information, along with the importance of timely and complete vaccination, may help to minimize some personal barriers to missing or delaying routine immunization. Increasing access points to a range of alternative vaccination locations, such as schools or neighbourhood halls may also help improve convenience for caregivers. Similarly, improving communication to caregivers outside of routine programs, through WhatsApp groups or messaging may help to reduce personal reasons for missing or delaying other MCH services, such as forgetting the schedule.

Identification of strategies to prevent future disruptions to routine immunization programs and other MCH services are recommended for pandemic preparedness and response planning, including contingency plans. As part of this plan, there is a need to strengthen the supply of vaccines, operational planning and to address workforce-related barriers. Long term policy planning focused on ensuring a sufficient number of HCP, timely training and supportive environments for HCP will be important to improve service users' experiences. This planning will also help to reduce health workforce strain, including addressing workforce trauma and burnout as part of a broader pandemic recovery plan.

To increase uptake of COVID-19 vaccines amongst caregivers and HCP, targeted strategies which reflect current national and local priorities are recommended. These may focus on improving understanding of the importance of receiving a booster dose, particularly as boosters become more responsive to new variants. Education and communication strategies with a multigenerational focus may help to create a stronger enabling environment for caregivers to receive the COVID-19 vaccine. Noting the role "word of mouth" plays in relay of information including misinformation, community-level social listening activities could help to gain a better understanding of the nature and source of misinformation, and to address it early. Active efforts to engage with community and religious leaders as part of promoting vaccination will leverage the strengths of partnerships between the public and civil society.

Introduction

Ensuring access to high-quality pregnancy, postnatal care, and immunization services is critical for the reduction of maternal, neonatal, and child mortality.[1][2] Expanded immunization programs (EPI) started with smallpox eradication globally in 1969 and in 1972 for Indonesia.[3] The successful EPI program in smallpox eradication in 1974 was followed by polio eradication in 2014.[4][5]

Since 2001, Indonesia has made important gains towards increasing routine immunization coverage of children and closing immunity gaps. For example, between 2002 to 2019, Diphtheria Tetanus Toxoid and Pertussis third dose (DTP3) increased from 70% to 85%, measles-containing vaccine (MCV) first dose coverage increased from 72% to 88%, and Bacillus Calmette–Guérin (BCG) increased from 82% to 90%[6][7][8].

In recent years however, stalled or reversed progress on measles vaccination coverage in many WHO regions has focused increased attention on under-vaccination. These recent trends offer stark reminders that strong and resilient routine immunization programs are needed to sustain high levels of uptake, so as to achieve disease elimination and eradication targets. The disruptions caused by the COVID-19 pandemic, and the increased risk of incidence of measles and other vaccine preventable diseases, have led to an increased focus on addressing low vaccination uptake. The global coverage of DTP3 dropped from 86% in 2018 to 81% in 2021, and from 85% in 2018 to 81% in 2021 for MCV1.[9][10] There is a need to systematically measure the drivers of vaccination to support a greater understanding of the causes of low coverage and prioritize interventions.

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[1] McGovern ME, Canning D. (2015). Vaccination and all-cause child mortality from 1985 to 2011: Global evidence from the demographic and health surveys. American Journal of Epidemiology, 182(9): 791-798. https://doi.org/10.1093/aje/kwv125

[2] WHO, UNICEF. (2020). Ending preventable newborn deaths and stillbirths by 2030: Moving faster towards high-quality universal health coverage in 2020-2025. https://data.unicef.org/resources/ending-preventable-newborn-deaths-and-stillbirths-by-2030/

[3] Maulida, R., Rahmartani, L.D., Hairani, L.K., & Wahyono, TYM. (2018). Coverage and determinants of second-dose measles vaccination among under-five children in Aceh Jaya District, Aceh Province, Indonesia. Jurnal Epidemiologi Kesehatan Indonesia, 2(1): 27-33. http://journal.fkm.ui.ac.id/epid/article/view/3049/pdf

[4] Neelakantan, V. (2010). Eradicating smallpox in Indonesia: The archipelagic challenge. Health History, 12: 61-87.https://pubmed.ncbi.nlm.nih.gov/20973337/#:~:text=The%20vaccination%20efforts%20in%20the,of%20mass%20vaccination%20and%20surveillance.

[5] Azizatunnisa, L., Cintyamena, U., Mahendradhata, Y., & Ahmad, R.A. (2021). Ensuring sustainability of polio immunization in health system transition: lessons from the polio eradication initiative in Indonesia. BMC Public Health, 21, https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11642-7

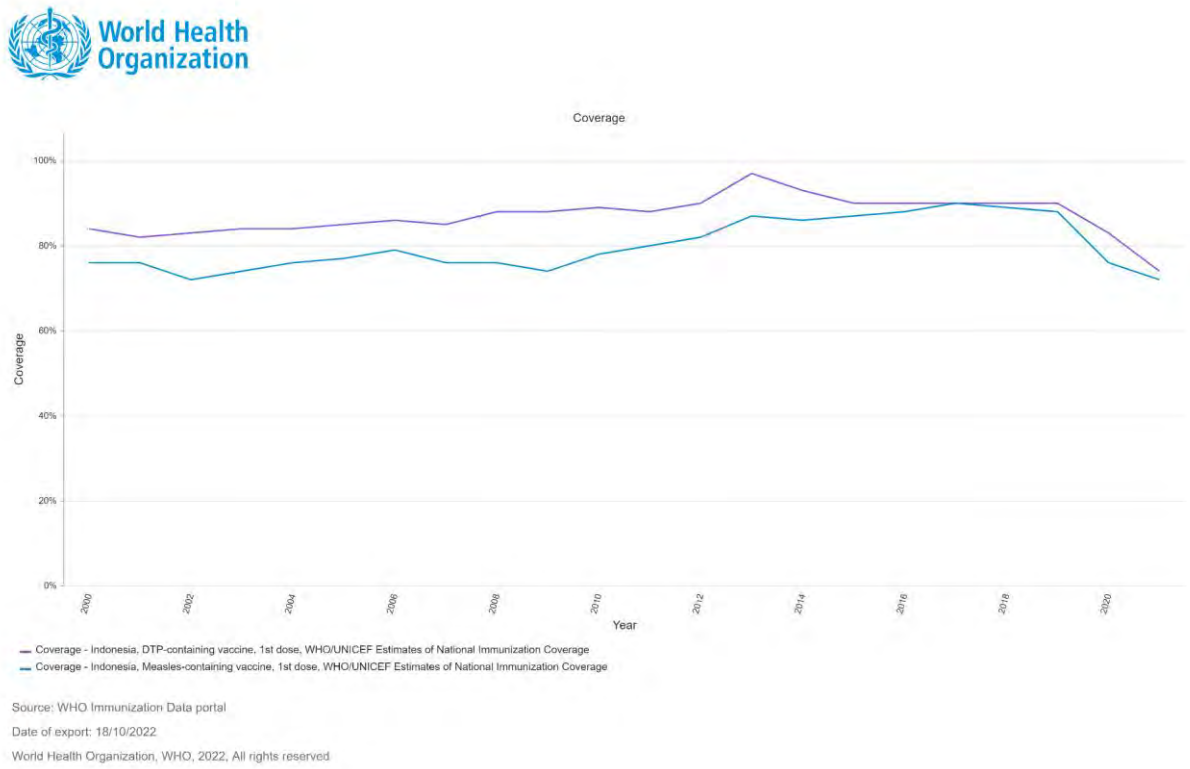
[6] WUENIC. Bacillus Calmette–Guérin (BCG) vaccination coverage, 2022. https://immunizationdata.who.int/pages/coverage/bcg.html

[7] WUENIC. Diphtheria tetanus toxoid and pertussis (DTP) vaccination coverage, 2022.https://immunizationdata.who.int/pages/coverage/dtp.html

[8] WUENIC. Measles vaccination coverage, 2022. https://immunizationdata.who.int/pages/coverage/mcv.html

[9] WUENIC. Global diphtheria tetanus toxoid and pertussis (DTP) vaccination coverage, 2022. https://immunizationdata.who.int/pages/coverage/DTP.html?CODE=Global&ANTIGEN=DTPCV3&YEAR=

[10] WUENIC. Global measles vaccination coverage, 2022. https://immunizationdata.who.int/pages/coverage/MCV.html?CODE=Global&ANTIGEN=MCV1&YEAR=



Impact of pandemic on routine immunization in Indonesia

Between 2019 and 2021, DTP3 coverage dropped from 85% to 67% and MCV1 dropped from 88% to 72%.[11] The COVID-19 pandemic has negatively affected many aspects of healthcare, including routine immunization and maternal and child health (MCH) services. In the first few months of the pandemic, 84% of all health facilities reported immunization service interruption either through the closure of immunization services, halting of home visits, or the closure of schools where large scale immunization often takes place.[12] Prior to COVID-19, about 90% of children were vaccinated in community health centers. During the pandemic, a shift was noted towards use of private clinics and hospitals, explained by reduced availability of immunization services in community clinics, service suspension, caregiver fear of contracting COVID-19.[13][14] Reluctance to bring their child to immunization services was also noted. Caregivers feared becoming exposed to COVID-19 at health facilities, were dissuaded from seeking services by rumors and misinformation, or that HCP were

[11] WUENIC. Immunization coverage dashboard. https://data.unicef.org/resources/immunization-coverage-estimates-data-visualization/

[12] UNICEF Ministry of Health, 'Routine Immunization for Children during the COVID-19 Pandemic in Indonesia: Perceptions of Parents and Caregivers' (Jakarta, Indonesia: Ministry of Health and WHO, August 2020), https://www.unicef.org/indonesia/media/6066/file/Routine%20immunization%20for%20children%20during%20the%20COVID-19%20pandemic%20in%20Indonesia:%20Perceptions%20of%20parents%20and%20caregivers.pdf.

[13] UNICEF Ministry of Health, 'Report of Rapid Health Assessment: Ensuring Sustainability of Essential Health Services for Children and Mothers During the COVID-19 Pandemic in Indonesia' (Jakarta, Indonesia, July 2020).

[14] UNICEF Ministry of Health, 'Routine Immunization for Children during the COVID-19 Pandemic in Indonesia: Perceptions of Parents and Caregivers'

hesitant to provide services to the public for fear they may be exposed to the virus.[15][16][17]

Impact of the pandemic on maternal and child health (MCH) services

Similarly, COVID-19 also impacted MCH services across Indonesia. By July 2020, there were decreased rates of visitation to MCH services for pregnant women and a higher number of women gave birth without the aid of a skilled HCP.[18] This can be explained by the temporary closure and suspension of community-level health services, and the impact of the pandemic on HCP who were either diverted to respond to COVID-19, in isolation as a result of COVID-19, or sick and died from COVID-19.[19] Early modelling estimates of the indirect effects of COVID-19 pandemic suggested the potential for significant increases in maternal deaths and deaths to children under five years.[20]

COVID-19 vaccination acceptance and demand

Indonesia had its first report of COVID-19 cases in March 2020, and by March 2022, when this study commenced, there were over 5.6 million cases recorded. By April 2020, all public health intervention programs and health services including immunization and MCH programmes were adversely impacted. Health services saw a decrease in the number of visiting persons in all government and private health facilities.[21]

Indonesia began COVID-19 vaccination mid-January 2021, with health staff initially targeted, followed by public service personnel and the elderly (55+ years). The Ministry of Health (Kementerian Kesehatan Republik Indonesia) had an initial vaccine target population of 160 million people; in August 2021, the target increased to 208 million.

By the end of April 2022 and at the start of this study, 113,851,728 people in the adult population (80.63%) had received their first dose of COVID-19 vaccine, 93,401,686 (66.14%) had received their second dose, while 28,176,784 (19.95%) had received their third dose. Indonesia has a target of vaccinating 234,666,020 people.[22]

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[15] World Health Organization. (2020). Pulse survey on continuity of essential health services during the COVID-19 pandemic: interim report, 27 August 2020 (No. WHO/2019-nCoV/EHS_continuity/survey/2020.1). World Health Organization.

[16] Apisarnthanarak, A., Apisarnthanarak, P., Siripraparat, C., Saengaram, P., Leeprechanon, N., & Weber, D. J. (2020). Impact of anxiety and fear for COVID-19 toward infection control practices among Thai healthcare providers. Infection Control & Hospital Epidemiology, 41(9), 1093-1094

[17] Ahinkorah, B. O., Ameyaw, E. K., Hagan Jr, J. E., Seidu, A. A., & Schack, T. (2020). Rising above misinformation or fake news in Africa: Another strategy to control COVID-19 spread. Frontiers in Communication, 5, 45.

[18] UNICEF Ministry of Health, 'Routine Immunization for Children during the COVID-19 Pandemic in Indonesia: Perceptions of Parents and Caregivers

[19] Nurmala Selly Saputri et al., 'The Impact of the COVID-19 Pandemic on Nutrition and Maternal and Child Health (MCH) Services: Case Study in Five Regions in Indonesia | The SMERU Research Institute' (Jakarta, Indonesia: SMERU Institute, August 2020), https://smeru.or.id/en/content/impact-covid-19-pandemic-nutrition-and-maternal-and-child-health-mch-services-case-study.

[20] Roberton T, Carter ED, Chou VB, Stegmuller AR, et al. (2020). Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: A modelling study. The Lancet, 8, e901-e908. https://doi.org/10.1016/S2214- 109X(20)30229-1

[21] Satuan Tugas Penanganan COVID-19, Data Sebaran, 16/11/2022. https://covid19.go.id/id

[22] Ministry of Health, Republic of Indonesia, Vaksinasi COVID-19 Nasional, 16/11/2022. https://vaksin.kemkes.go.id/#/vaccines

This report provides the main results from a cross-sectional survey conducted to describe perceptions and experiences related to immunization and other maternal and child health services among caregivers of children under two and HCPs, conducted in two provinces in Indonesia in March–April 2022. While caregivers were asked about their child's receipt of routine immunization (by review of the immunization card or through recall), the research was not designed as an immunization coverage study. Therefore, interpretation of routine immunization uptake estimates should be tempered. We provide recommendations to inform strategies for systems strengthening during the pandemic and for communications activities during COVID-19 vaccine introduction and roll-out.

Aims and objectives

The primary aim of the study was to better understand the influence of the COVID-19 pandemic on caregivers of children and HCP acceptance and access to routine immunization, other MCH services, and COVID-19 vaccination in Indonesia.

The study team were commissioned to:

Caregiver survey

- Describe health-seeking behaviors among caregivers related to routine immunization and key MCH services in the context of COVID-19
- Assess caregiver perceptions of immunization and other MCH services since the start of COVID-19 pandemic
- Describe caregiver acceptance of, demand for, and confidence in COVID-19 vaccines
- Describe caregiver exposure to and influence of COVID-19 related rumors or misinformation

Healthcare provider (HCP) survey

- Describe HCP experiences with COVID-19 and perceived risk of infection
- Describe HCP perspectives on how COVID-19 has affected routine immunization and other MCH service delivery
- Identify HCP strategies used to address disruptions to routine immunization and other MCH services
- Assess HCP self-efficacy to provide routine immunization and MCH services during COVID-19 pandemic
- Describe HCP exposure to and influence of COVID-19 related rumors or misinformation, and how they have addressed it
- Describe HCP acceptance of, demand for, and confidence in COVID-19 vaccines
- Describe HCP perspectives on challenges and enablers for delivering COVID-19 vaccines

Methods

Governance

A Technical Advisory Group was appointed to advise on the study implementation. Members included representatives of Indonesian Ministry of Health, UNICEF Indonesia and UNICEF EAPRO Offices, Centres for Disease Control and Prevention Indonesia and the US-CDC, WHO Indonesia Office and study research team leads.

In addition to Ethics approval, we received approvals from the Director General of Politics and General Administration within the Ministry of Domestic Affairs, Indonesia and provincial Director Generals of Politics and General Administration of Central Java and West Nusa Tenggara. Letters of permission were also obtained from the Ministry of Health in Indonesia, Provincial Health Offices, District Health Offices, health centres and sub-district governments, and village governments.

Study location

This study was conducted in two purposively selected provinces: Central Java and West Nusa Tenggara Provinces in Indonesia.

These provinces were purposively selected based on COVID-19 incidence as reported by the National Taskforce for COVID-19 (Satgas Nasional 2021) in September 2021 (project start following approval by UNICEF) and feedback from Universitas Indonesia study leads based on their knowledge of the context. To understand the differences in impact on routine immunization and other MCH services in urban and rural settings, the Universitas Indonesia team also advised on the purposive selection of two cities and districts in each of the provinces. In Central Java, the cities of Surakarta and Semarang and districts of Demak and Purbalingga were selected. In West Nusa Tenggara, the cities of Mataram and Bima and districts of Central Lombok and Sumbawa were selected.

Study design

We conducted a cross-sectional survey using quantitative methods to collect data from caregivers and HCP. A qualitative study of HCP was also conducted, the results for which are reported separately.[23]

The sample size for the caregiver and HCP surveys were calculated using the Lemeshow's formula for estimation of proportions. We applied a design effect=2 for variety effect to account for the two-stage sampling design. The sample size for each province with α=0,05, 1-ß= 80% P1=0,5 and p1-p2 for caregivers (0.08) was estimated to be 633 (rounded to 700) for caregivers. The sample size with α=0,05, 1-ß= 80% P1=0,5 and p1-p2 for HCPs (0.12) was estimated to be 282 (rounded to 300) for HCPs per province.

Formula: $n = Z^2 P(1-P) + Z^2 ß\ (P1\ (1-P1) + P2\ (1-P2)\ /\ (P1-P2)^2$

***Caregiver survey*:** The selected cities and selected districts formed four urban and rural clusters. Villages were the primary sampling unit, independently sampled from each cluster through

[23] Oktarinda, Tri Yunis Miko Wahyono, Fitriyani Sukesmi, Lintang Saraswati et al (2022). Perception and demand on COVID-19 vaccine, and impact for routine immunization and other maternal and child health service during COVID-19 pandemic among community and healthcare providers in two provinces in Indonesia 2022

probability proportionate to size sampling. In each of these clusters, 350 households were randomly selected. In each selected village, households with children aged two and under were the secondary sampling unit. Attendance lists from village health posts (Posyandu) provided the sampling frame to identify and randomly select ten households per village. An additional four also identified as substitute households. If a house on the primary list of 10 was unable to participate, enumerators would go to the first randomly selected household in the substitute list.

Key eligibility and inclusion criteria were that the household must have a child aged two years or younger. Only one caregiver per household was allowed to participate; this caregiver had to be 18 years of age or older.

***Healthcare provider survey*:** HCPs involved in routine immunization and other maternal and child health or COVID-19 vaccination were identified through District/City Health Office registration lists. The sample included doctors, nurses, midwives and village midwives from both the public and private sector. In each district/city, the sample of each HCP group was proportional to population size for those groups.

Key eligibility and inclusion criteria were that the HCP was primarily involved in routine immunization and other maternal and child health services, or COVID-19 vaccination, and was a doctor, nurse, midwife or village midwife. HCP had to be 18 years of age or older to participate.

Data collection

Data were collected by the field teams between 21 March 2022 and 8 April 2022 using paper-based questionnaires described below.

Both questionnaires included items developed by the study team, with inputs from UNICEF and the study's Technical Advisory Group; items derived from the World Health Organisation (WHO) Behavioural and Social Drivers of Vaccination Child immunization Survey and COVID-19 vaccination intentions survey;[24] and items from other relevant surveys(Appendix 12 and 13).[25]

Caregiver survey: covered four main topics (or "modules"); (1) routine childhood immunization; (2) access to routine childhood immunization during the COVID-19 pandemic; (3) access to other MCH services during the COVID-19 pandemic; and (4) COVID-19 vaccination. These modules covered key aspects relating to caregivers' awareness and attitudes, and barriers and facilitators to vaccination and other MCH services including routine growth monitoring, antenatal care, postnatal care and family planning.

HCP survey: covered three main modules: (1) service delivery disruptions to key MCH services during the COVID-19 pandemic; (2) COVID-19 vaccination take-up and perceptions; and (3) self-efficacy, which is a belief about one's confidence and competence to undertake specific behaviours.

Prior to data collection, researchers from Universitas Indonesia conducted pilot testing of the survey tools. This involved cognitive interviews with a sample of 30 caregivers and 7 HCP in Depok (Jakarta) and Semarang (Central Java). Each cognitive interview involved administering the survey questions

[24] World Health Organization. (2022). Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake. World Health Organization. https://apps.who.int/iris/handle/10665/354459. License: CC BY-NC-SA 3.0 IGO

[25] UNICEF-RFA PICTs survey, Generalised Self Efficacy Scale. Schwarzer, R., & Jerusalem, M. (1995), WHO Pulse Survey, UNICEF Multiple Indicator Cluster Survey, CAIR-PIQ.

to determine question interpretation and duration of the interview. Questions were modified as needed prior to finalising the questionnaires.

The data collection field teams in each province were recruited and trained in how to use the survey tools by the Universitas Indonesia team with support from the University of Sydney during a three-day training workshop. The field teams administered the questionnaire face to face amongst caregivers of children under two and HCPs in the two provinces.

Data collection occurred simultaneously for the caregiver and HCP surveys. Enumerators systematically visited villages/sub-districts that were furthest away from the basecamp first and completed data collection in a given area in the cluster before moving to the next area. Following informed consent, survey data was collected from all participants.

The data collection adhered to a strict COVID-19 safety protocol to ensure the protection of the data collection team and participants. At the start of each day, enumerators travelled from the study location basecamp to the selected village with a printed list of randomly selected households or HCP provided by the field coordinator. For the caregiver survey, local HCPs such as village cadres helped the field team locate the households for each of the randomly selected caregivers. For the HCP survey, enumerators travelled to the place of work listed for each HCP. Numerators approached the household/workplace, explained the study, followed the informed consent procedures and confirmed eligibility of the participants. Once written consent was obtained, the enumerator administered the questionnaire by reading the questions and recording the answers on a hard-copy form. Administration of the questionnaire took approximately 35-40 minutes.

Data analyses

We calculated antigen-specific coverage as proportions, and are presented unadjusted.

We used descriptive statistics to summarise the distribution of participants by demographic characteristics and key variables measuring caregiver and HCP attitudes, experiences and uptake of vaccination and MCH services. For multiple response items in both surveys, enumerators did not read out a list of possible answers; instead, they coded the participant's response as a nearest fit to one of the predefined options. Two coders independently coded responses in the 'other' category to come to agreement on either 1) deriving new topics under which responses were coded or 2) by matching them to the pre-defined options. For presentation purposes, these responses were coded into three broad categories: 'personal factors', 'service-related reasons' and 'factors specifically identified as COVID-related'. Due to the nature of responses given however, personal and service-related factors may not be mutually exclusive from being caused or exacerbated by the pandemic. Condensed tables are provided in the main text, full tables are available in Appendix 11.

For the regression analyses, any variables with a p-value of <0.20 in bivariate analyses or with known association to the outcome variable were included in the multivariable logistic regression model. Final models for all analyses were determined through manual backward elimination of variables and are presented in the main text of the report. Models with all variables of known association or p-value of <0.20 are presented in Appendix 10 for reference. For both surveys, we used "svy set" in STATA to estimate odds ratios (OR) and 95% confidence intervals (CI) to measure the relationship between outcome variables and factors associated with them.

Caregiver survey

We adjusted for survey design using "svy set" and applied population weights to account for clustering in the survey design.

We used logistic regression to estimate OR with 95% CI to determine factors associated with *Intention to receive routine immunizations*, *Uptake of routine immunizations*, and *Uptake of COVID-19 vaccinations*. The outcome variable *Intention for child to receive routine immunizations* had three response categories (none, some, all). We combined the responses "None" and "Some" into "None/some". The outcome variable *Uptake of routine immunizations* was calculated as whether a child was up-to-date for their age group using immunization record and recall of receipt for individual antigens outlined in the Indonesian routine immunization schedule for children under five.[26] Calculation of completeness for age included a grace period to account for minor delays in receipt. These up to date for age rules (Appendix 2) were determined based on the schedule as well as in consultation with research team members and UNICEF. The outcome variable *Uptake of routine immunizations* had three response categories (no vaccinations recorded, partially up to date for age, fully up to date for age). We combined the responses "no vaccinations recorded" and "partially up to date for age" into "No vaccinations recorded/partially up to date for age". The outcome variable *Uptake of COVID-19 vaccinations* had four response categories (no, one dose, two doses, three or more). For caregivers, we combined the responses "None" and "One dose" into "None/one dose". We combined "Two doses" and "Three or more" into "Two/three or more doses".

HCP survey

Data from HCP survey was not adjusted for survey design due to incomplete denominator data. However, we believe the clustering in HCP to be limited and are less likely to influence the study findings. We used logistic regression to estimate OR with 95% CI to determine factors associated with *Uptake of COVID-19 vaccinations* and *Confidence to respond to patient questions about COVID-19*. For HCP, "None", "One dose" and "Two doses" were combined into "None/one/two doses". The outcome variable *Confidence to respond to patient questions about COVID-19* had four response categories (not at all, a little, moderately and very confident). We combined the responses "Not at all confident", "A little confident" and "Moderately confident" into "Not at all/a little/moderately confident".

All analyses were undertaken in STATA v16.1.

Ethics

Ethical approvals for this study were gained from the Human Ethics Research Committee University of Sydney (2022/010) and the University of Indonesia (protocol number Ket-23/UN2.F10.D11/PPM.00.02/2022). All field activities were carried out in a culturally appropriate and sensitive manner with locally engaged field teams. Permission to conduct the surveys and interviews was also obtained from relevant governing bodies in Indonesia as detailed under the governance section. All study materials were translated into Bahasa Indonesia and pilot tested prior to data collection.

[26] https://immunizationdata.who.int/pages/schedule-by-country/idn.html?DISEASECODE=&TARGETPOP_GENERAL=

Results - Caregivers

A total of 1399 caregivers aged 18 years and above participated in the study - 699 (50%) from Central Java and 700 (50%) from West Nusa Tenggara. In the urban areas in Central Java (Semarang and Surakarta), 23% of caregivers were from a substitute household, compared to 20% in West Nusa Tenggara (Demak and Purbalingga). In the rural areas in West Nusa Tenggara (Mataram and Bima), 19% of caregivers were from a substitute household compared to 20% in Central Lombok and Sumbawa.

Among caregivers, 97.7% (1367/1399) were female and 2.3% (32/1399) were male (Appendix 1). Most of the participants were homemakers (70.3%; 984/1399) and over 80% (1144/1399) had a secondary school education or higher. The participants had a median of two children per family (range 1 – 7).

Routine immunization

Importance and access to routine immunization

Among caregivers of children two and under, 85.5% (1196/1399) perceived routine immunizations to be very important for their child's health (Figure 1) (Appendix 3). The majority of caregivers had family members who would want their child to be vaccinated (92.7%; 1297/1399) (Figure 2). Sixty seven percent (941/1399) found getting routine immunizations for their child very easy (Figure 3), while 60.7% (849/1399) found it very cheap. Over half the caregivers in the sample attended Puskesmas (51.8%; 714/1378) or Posyandu (54.6%; 753/1378) for routine immunization (Figure 4).

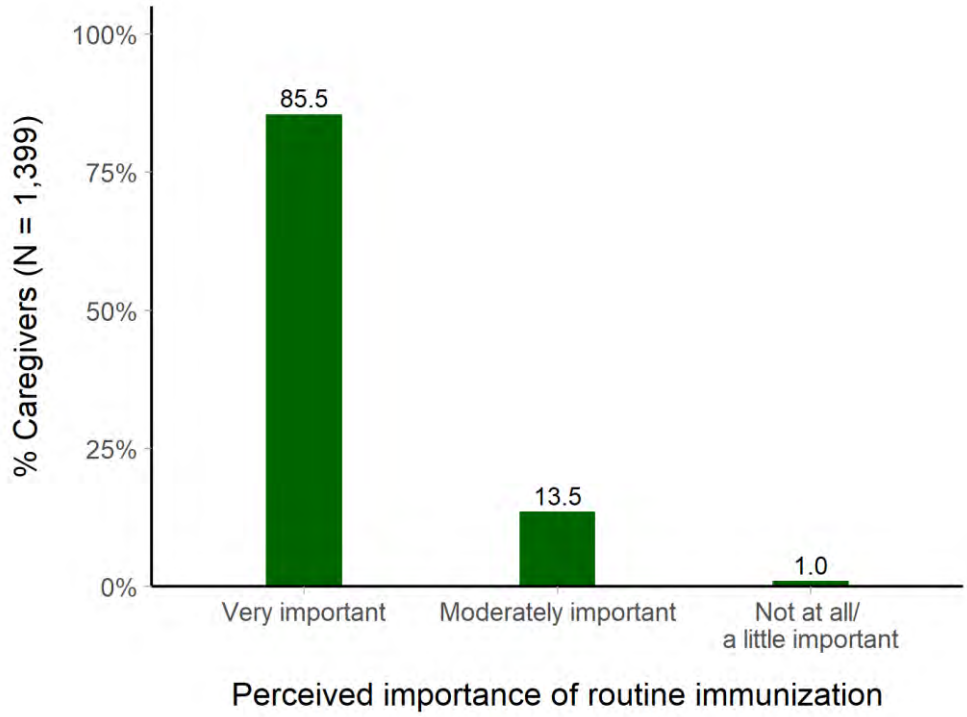

Figure 1. Perceived importance of routine immunization for their child's health among caregivers of children two years and younger in Central Java and West Nusa Tenggara, March–April 2022

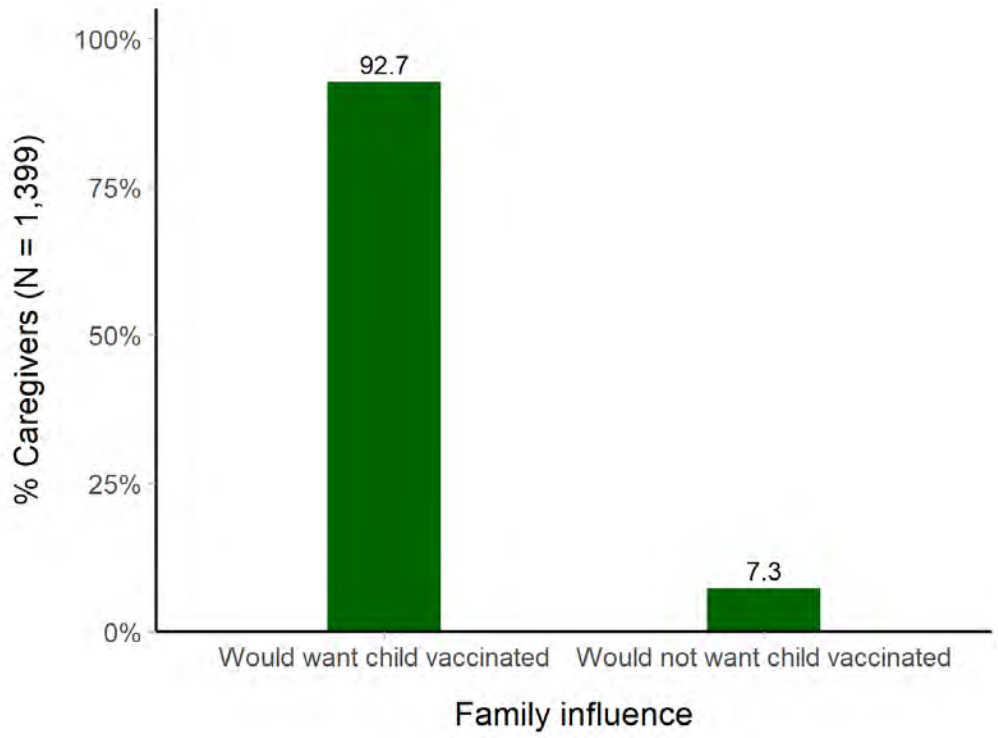

Figure 2. Proportion of caregivers of children two years and younger who reported having family who would or would not want their child vaccinated in Central Java and West Nusa Tenggara, March–April 2022

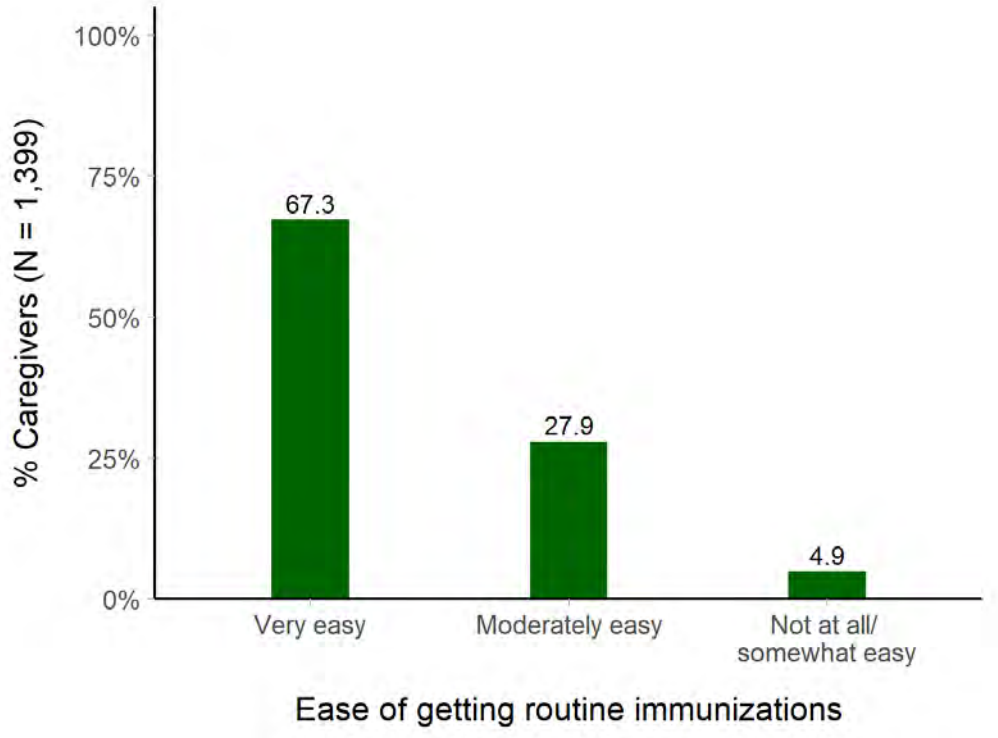

Figure 3. Ease of access to routine immunizations among caregivers of children two years and younger in Central Java and West Nusa Tenggara, March–April 2022

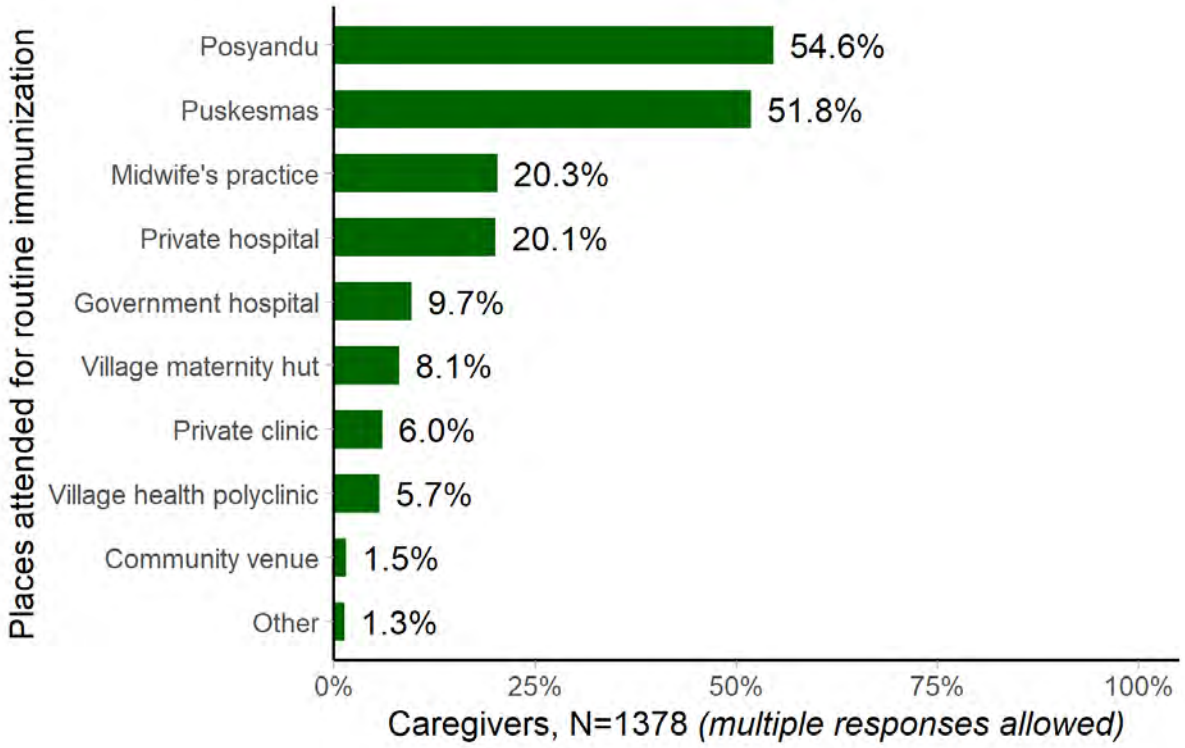

Figure 4. Places that caregivers of children two years and younger from Central Java and West Nusa Tenggara accessed routine immunization services, March–April 2022 (N=1378)[27]

Of caregivers who accessed routine immunization services prior to the pandemic, 29.1% (260/893) found that access to services during the pandemic was harder than before. Fifty three percent (738/1399) of all caregivers missed or delayed receipt of routine immunizations for their child during the pandemic. Over half of these caregivers (54.8%; 404/738) reported personal factors as a reason for missing or delaying routine immunizations. Around two-thirds (36.2%; 267/738) reported service-related factors such as perceived vaccine unavailability and 23.8% (176/738) reported COVID-19 related reasons (Table 1).

*Table 1. Reasons for missing/delaying routine immunizations during the pandemic among caregivers of children two years and younger in Central Java and West Nusa Tenggara provinces in Indonesia, March–April 2022**

Reasons for missing/delaying routine immunization (n=738)	**N**	**%**
Personal factors	**404**	**54.8**
Child or household member sick	323	43.8
Unavailable to attend (caregiver away, working or busy)	49	6.6
Personal reasons (forgot or competing priorities)	24	3.3
No vaccinations needed	6	0.8
Could not afford costs associated with RI	2	0.3

[27] Note: Caution must be taken in interpreting these findings, some of the locations may not be mutually exclusive.

Service-related factors	**267**	**36.2**
Perceived vaccine unavailability	208	28.1
Hard to get an appointment	21	2.9
Accessibility of service	19	2.6
Availability of information from immunization service	8	1.1
Availability of HCW	6	0.8
Health facility did not provide vaccination for children	5	0.7
Factors specifically identified as COVID-related	**176**	**23.8**
COVID-19 related service closures or restrictions [a]	123	16.6
Concerns about getting COVID-19 [b]	53	7.2
Other [c]	**34**	**4.6**

* Multiple responses allowed

[a] healthcare provider recommended missing/delaying RI, Posyandu closed/open fewer days or shorter hours, vaccination clinic closed/open fewer days or shorter hours, government rules

[b] at clinic, enroute to clinic or perceived to have COVID-19, afraid to go anywhere

[c] child asleep, child not old enough, gender barriers, medicine stockout, weather, other

Intention for child to receive routine immunizations

The overwhelming majority of caregivers (96%; 1339/1399) reported that they wanted their child to receive all routine immunizations (Figure 5).

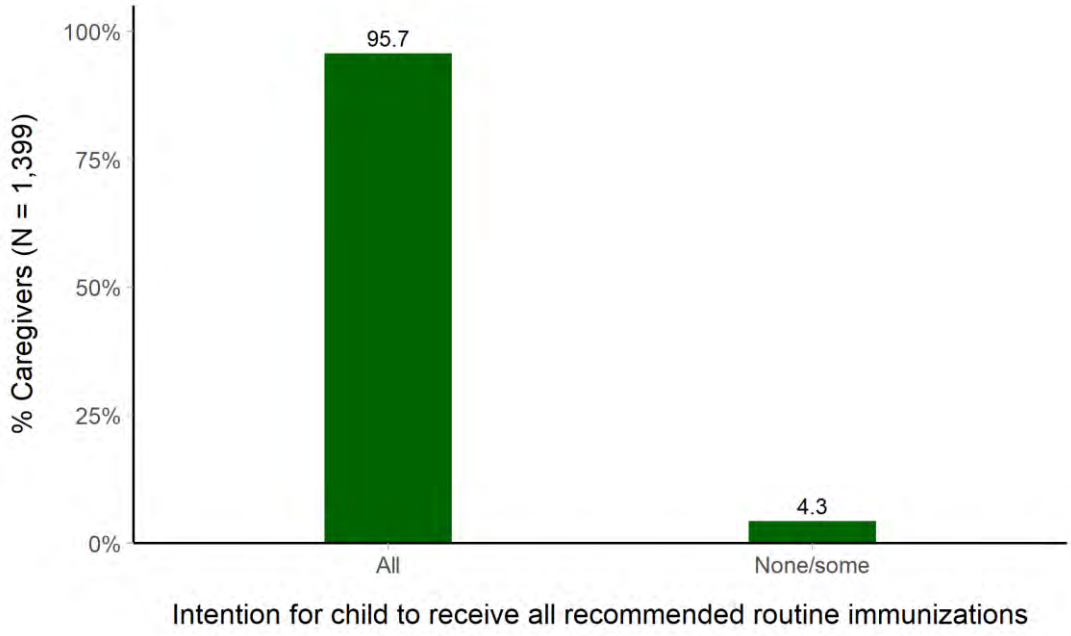

Figure 5. Proportion of caregivers of children two years and younger who intended for their child to receive all recommended routine immunizations in Central Java and West Nusa Tenggara, March–April 2022

The dependent variable *Intention for child to receive all routine immunizations* was analysed in multivariable analysis, adjusting for the independent variables *family norms*, *knowing where to go for vaccinations*, *perceived importance of vaccinations for child's health*, *ease of getting routine*

immunizations, and *receipt of COVID-19 vaccination*. After adjusting for survey design, examination of factors associated with intention to vaccinate (Table 2) showed:

- Caregivers with family members who want their child vaccinated had 2.5 higher odds of intending for their child to receive all immunizations, compared to caregivers with family who do not want their child vaccinated (aOR: 2.5, 95% CI 1.13–5.54).
- Caregivers who felt immunizations were very important for their child's health had 8.62 higher odds of intending for their child to receive all immunizations, compared to caregivers who felt immunizations were not at all, a little or moderately important (aOR: 8.62, 95% CI 4.38–17.00).

Table 2. Factors associated with intention for child to receive routine immunizations (none/some vs all routine immunizations) among caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

Factors associated with intention for child to receive routine immunizations	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Highest level of education of caregiver[#]					
Primary and below	254 (18.2)	Reference			
Secondary school	942 (67.3)	2.05 (0.96–4.38)	0.07		
Tertiary education	202 (14.5)	1.26 (0.47–3.35)	0.65		
Family norms*					
No, family wouldn't want child vaccinated	102 (7.3)	Reference		Reference	
Yes, family would want child vaccinated	1297 (92.7)	3.34 (1.57–7.11)	0.002	**2.50 (1.13–5.54)**	**0.03**
Know where to go for vaccinations*					
No	21 (1.5)	Reference		Reference	
Yes	1378 (98.5)	5.46 (1.25–23.83)	0.02	4.27 (0.43–42.45)	0.21
Importance of vaccinations for child's health*					
Not at all/a little/ moderately important	203 (14.5)	Reference		Reference	
Very important	1196 (85.5)	9.75 (4.92–19.32)	<0.001	**8.62 (4.38–17.00)**	**<0.001**
Affordability of routine immunizations					
Not at all/a little cheap	79 (5.6)	Reference			
Moderately cheap	471 (33.7)	1.62 (0.49–5.29)	0.43		
Very cheap	849 (60.7)	1.72 (0.60–4.97)	0.31		
Ease of getting routine immunizations**					
Not at all/a little easy	68 (4.9)	Reference			
Moderately easy	390 (27.9)	1.85 (0.54–6.38)	0.33		
Very easy	941 (67.3)	3.50 (1.07–11.52)	0.04		
Had COVID-19					
Yes	92 (6.6)	Reference			
No/not sure	1307 (93.4)	1.86 (0.63–5.49)	0.26		
COVID-19 vaccination**					
None/one dose	467 (33.4)	Reference		Reference	

At least two doses	932 (66.6)	2.69 (1.38–5.22)	0.004	2.00 (0.98–4.09)	0.06
Heard confusing information about COVID vaccine					
No	297 (21.2)	Reference			
Yes	1102 (78.8)	0.94 (0.42–2.12)	0.89		
Access to services during pandemic (n=893)					
About the same/easier during pandemic	633 (70.9)	Reference			
Harder during pandemic	260 (29.1)	0.80 (0.35–1.82)	0.60		
Quality of services during pandemic (n=893)					
About the same/better during pandemic	809 (90.6)	Reference			
Lower during pandemic	84 (9.4)	0.42 (0.14–1.30)	0.13		

*Variable included in multivariable analysis due to bivariate results or known association to outcome
**Variable included in multivariable analysis but dropped in backward elimination of variables
#Variable dropped from multivariable analysis as it violated goodness of fit

Uptake of routine immunizations

Vaccination status for individual antigens was determined for children aged 12–24 months (63.3%; 885/1399), using vaccination record data and caregiver recall (Appendix 2). Combined data showed that uptake of antigens was variable, with some such as BCG very high (98.2%; 869/1399) while others were lower. Just over half the children aged 12–24 months (54.1%; 479/885) had received the inactivated polio vaccine (IPV). Between provinces, there were some differences in coverage of routine immunizations (Figure 6).

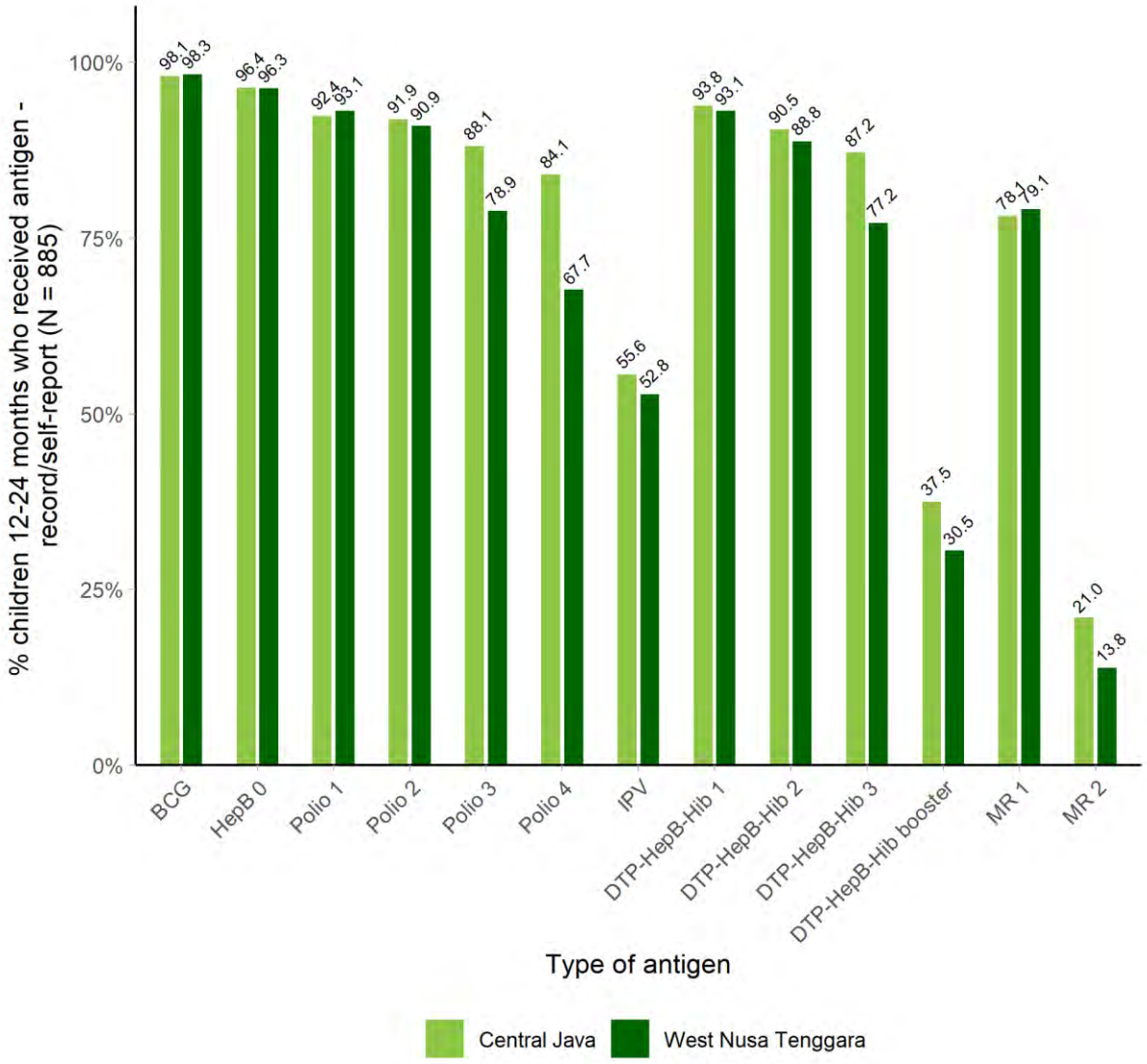

Figure 6. Routine immunization coverage among children aged 12–24 months in Central Java and West Nusa Tenggara, March–April 2022 (n=885)

Up-to-date completion of routine immunizations for age was calculated for children of 1385 participants (Appendix 3); children under the age of two months (n=14) were excluded. Nearly sixty percent (59.7%; 827/1385) of children had either no vaccinations recorded or were partially up-to-date for their age, while 40.3% (558/1385) were completely up-to-date for age (Figure 7).

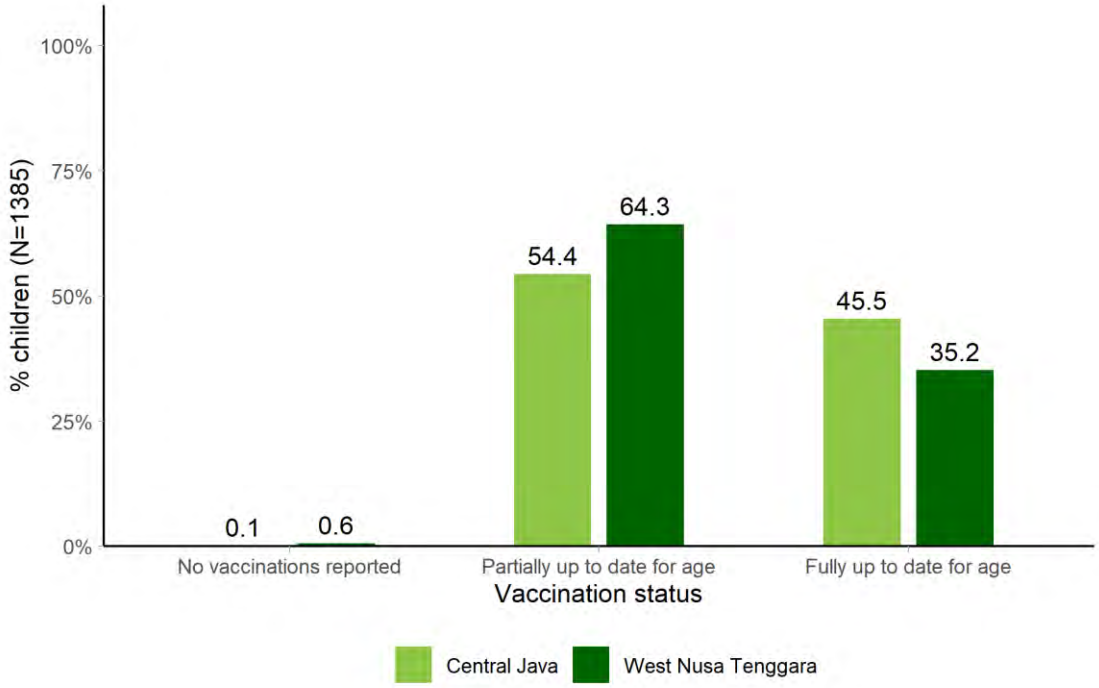

Figure 7. Routine immunization completion for age among children 2-24 months old in Central Java and West Nusa Tenggara, March–April 2022 (n=1385)

The dependent variable *Uptake of all routine immunizations for age* was analysed in multivariable analysis, adjusting for *level of education*, *setting*, *household income*, *number of children in household*, *intention for child to receive recommended routine immunizations*, *family norms*, *knowing where to go for vaccinations*, *affordability of vaccinations*, *ease of getting routine immunizations*, and *confidence in benefits of vaccination*. After adjusting for survey design, the examination of factors associated with uptake of routine immunizations among children aged 2-24 months old (Table 3) showed:

- Children of parents with a tertiary education had 1.76 higher odds of being fully up-to-date for age, compared to children whose parents had a primary education or lower (aOR: 1.76, 95% CI 1.02–3.05).
- Children from households with a monthly income between 1.5 and 2.9 million Rupiah had 1.54 higher odds of being fully up-to-date for age compared to children from households with a monthly income of less than 1.5 million Rupiah (aOR: 1.54, 95% CI 1.09–2.18).
- Children whose parents found it *moderately* easy to get immunizations had 2.26 times higher odds of being fully up-to-date for age, compared to children whose parents found it *not at all* or *a little* easy (aOR: 2.26, 95% CI 1.06–4.83).
- Children whose parents found it *very* easy to get immunizations had 2.22 times higher odds of being fully up to date for age, compared to children whose parents found it *not at all* or *a little* easy (aOR: 2.22, 95% CI 1.06–4.69)

Table 3. Factors associated with uptake of routine immunization (fully vaccinated for age vs no vaccinations recorded/partially vaccinated for age) among children 2–24 months old in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Highest level of education of caregiver (N=1384)*					
Primary and below	252 (18.2)	Reference		Reference	
Secondary school	931 (67.3)	1.33 (0.92–1.91)	0.13	1.29 (0.88–1.90)	0.19
Tertiary education	201 (14.5)	1.55 (0.90–2.66)	0.11	**1.76 (1.02–3.05)**	**0.04**
Setting*					
Urban	695 (50.2)	Reference		Reference	
Rural	690 (49.8)	1.26 (0.87–1.83)	0.22	1.36 (0.94–1.95)	0.10
Household income (N=1328)*					
Less than 1.5 million Rp/month[a]	456 (34.3)	Reference		Reference	
1.5 <3 million Rp/month	492 (37.0)	1.50 (1.06–2.13)	0.02	**1.54 (1.09–2.18)**	**0.02**
3 million Rp/month or more	381 (28.7)	1.07 (0.72–1.58)	0.74	1.11 (0.75–1.64)	0.59
Number of children in household**					
One child	549 (39.6)	Reference			
Two or more	836 (60.4)	0.86 (0.66–1.13)	0.27		
Intention for child to receive routine immunizations**					
All	1385 (95.7)	Reference			
None/some	60 (4.3)	0.65 (0.30–1.39)	0.26		
Family norms*					
No, family wouldn't want child vaccinated	102 (7.4)	Reference			
Yes, family would want child vaccinated	1283 (92.6)	0.87 (0.47–1.61)	0.65		
Know where to go for vaccinations*					
No	20 (1.4)	Reference		Reference	
Yes	1365 (98.6)	1.20 (0.40–3.57)	0.74	2.61 (0.82–8.27)	0.10
Affordability of vaccinations*					
Not at all/a little cheap	79 (5.7)	Reference		Reference	
Moderately cheap	468 (33.8)	1.43 (0.81–2.54)	0.22	1.32 (0.70–2.49)	0.39
Very cheap	838 (60.5)	1.87 (1.08–3.22)	0.03	1.70 (0.92–3.14)	0.09
Ease of getting routine immunizations*					
Not at all/a little easy	68 (4.9)	Reference		Reference	
Moderately easy	387 (27.9)	2.21 (1.05–4.67)	0.04	**2.26 (1.06-4.83)**	**0.04**
Very easy	930 (67.2)	2.49 (1.25–4.95)	0.01	**2.22 (1.06-4.69)**	**0.04**
Confidence in benefits of vaccination**					
Not at all/a little/moderately important	202 (14.6)	Reference			
Very important	1183 (85.4)	1.36 (0.94-1.97)	0.10		
Access to services during pandemic (n=884)					
About the same/easier during pandemic	628 (71.0)	Reference			
Harder during pandemic	256 (29.0)	0.89 (0.65-1.23)	0.50		

*Variable included in multivariable analysis due to bivariate results or known association to outcome

**Variable included in multivariable analysis but dropped in backward elimination of variables

[a] 3 million Rp is approximately $300 AUD/$195 USD

Maternal and Child Health services

Among caregivers who accessed child health services both before and during the pandemic (n=893), 73.4% (655/893) found access to those services was about the same and 81.1% (724/893) found the quality of the services to be about the same (Appendix 3). Thirty-six percent of caregivers (508/1399) reported missing the monthly Posyandu service during the pandemic, while 5.6% (78/1399) reported missing vitamin A supplementation during the pandemic (Table 4).

Table 4. Caregivers of children two years and younger who reported missing or delaying key maternal and child health services in Central Java and West Nusa Tenggara, March–April 2022

	Total (%)	Central Java (%)	West Nusa Tenggara (%)
Missed/delayed routine immunization	738/1399 (52.7)	453/699 (64.8)	285/700 (40.7)
Missed/delayed well-child services	508/1399 (35.3)	282/699 (40.3)	226/700 (32.3)
Missed/delayed family planning services	169/1091 (15.6)	122/488 (25.0)	47/603 (7.8)
Missed/delayed antenatal care	141/1256 (11.3)	83/616 (13.5)	58/640 (9.1)
Missed/delayed postnatal care	95/1247 (7.6)	39/591 (6.6)	56/656 (8.5)
Missed vitamin A supplementation	78/1399 (5.6)	41/699 (5.9)	37/700 (5.3)
Missed facility-based birth	24/1278 (1.9)	4/618 (0.5)	20/660 (3.0)

Among 508 caregivers who reported missing routine growth monitoring at the Posyandu during the pandemic, 59.6% (303/508) cited personal reasons and 35.2% (179/508) reported COVID-19 related reasons (Table 5). Of the 78 caregivers who reported missing routine vitamin A supplementation for their child, both issues with service provision (vitamin A unavailable, issues with schedule, availability of information) and factors specifically identified as COVID-19 related were the most commonly cited (28.2%; 22/78).

Among caregiver participants who were the biological mother of the child, 74.5% (957/1285) had accessed maternal health services before the pandemic (Appendix 4). Of these caregivers, 85.1% (814/957) found maternal health services easier or about the same to access during the pandemic as compared to before the pandemic. Similarly, 92.4% (884/957) found the quality of maternal health services to be the same or higher during the pandemic compared to before. Across maternal health services during the pandemic, 11.3% (141/1256) missed or delayed antenatal care services, 1.9% (24/1278) did not give birth inside a health facility, 7.6% (95/1247) missed or delayed postnatal care and 15.6% (169/1091) missed or delayed family planning (Table 5).

Personal factors were the main reason that caregivers reported missing or delaying all key MCH services except for vitamin A supplementation and antenatal care. The majority of caregivers missed or delayed these services due to factors specifically identified as COVID-19 related or issues with service provision (Table 5).

*Table 5. Reasons identified by caregivers/mothers of children two years and younger for missing/delaying routine maternal and child health services in Central Java and West Nusa Tenggara, March–April, 2022**

Reasons for missing routine weighing at Posyandu (n=508)	**N**	**%**

Personal factors	**303**	**59.6**
Unavailable to attend (caregiver away, working or busy)	124	24.4
Child reasons (child sick/fussy or sleeping)	85	16.7
Caregiver or household member sick	50	9.8
Personal reasons (forgot, other personal reasons)	44	8.7
Service-related factors	**58**	**11.4**
Accessibility of Posyandu	35	6.9
Availability of information from Posyandu	23	4.5
Could not afford costs associated with visiting the Posyandu	-	-
Factors specifically identified as COVID-related	**179**	**35.2**
COVID-19 related service closures or restrictions [a]	150	29.5
Concerns about getting COVID-19 [b]	29	5.7
Other [c]	**18**	**3.5**

Reasons for missing vitamin A (n=78)	**N**	**%**
Personal factors	**15**	**19.3**
Child reasons (sleeping or sick)	5	6.4
Unavailable to attend (busy/working)	8	10.3
Caregiver or household member sick	2	2.6
Service-related factors	**22**	**28.2**
Issues with service provision [d]	22	28.2
Factors specifically identified as COVID-related	**22**	**28.2**
COVID-19 related service closures or restrictions	20	25.6
Concerns about getting COVID-19	2	2.6
Other (accessibility of service, forgot, gender barriers, other)	**16**	**20.5**

Reasons for missing antenatal care (n=141)	**N**	**%**
Personal factors	**73**	**51.9**
Personal reasons (including forgot, competing priorities, other personal reasons)	21	14.9
Antenatal care not needed	17	12.1
Caregiver sick	17	12.1
Unavailable to attend (caregiver away, working or busy)	13	9.2
Could not afford costs associated with visiting antenatal care clinic	5	3.6
Service-related factors	**6**	**4.3**
Hard to get an appointment	6	4.3
Factors specifically identified as COVID-related	**86**	**61.1**
COVID-19 related service closures or restrictions [a]	30	21.3
Concerns about getting COVID-19 [b]	56	39.8
Other [e]	**19**	**13.5**

Reasons for not giving birth in health facility (N=24)	**N**	**%**
Personal factors	**18**	**75.1**
Child born at home	9	37.5
Preferred not to give birth in a health facility	4	16.7

Did not reach health facility in time	4	16.7
Could not afford costs associated with giving birth in a facility	1	4.2
Service-related factors	-	-
Hard to get an appointment	-	-
Factors specifically identified as COVID-related	**6**	**25.0**
Concerns about getting COVID-19 [b]	5	20.8
COVID-19 related service closures or restrictions [a]	1	4.2
Other	**4**	**16.7**

Reasons for missing/delaying postnatal care (n=95)	**N**	**%**
Personal factors	**75**	**79.0**
Postnatal care not needed	62	65.3
Unavailable to attend (busy/sick)	6	6.3
Personal reasons (forgot, other personal reasons)	5	5.3
Could not afford costs associated with visiting postnatal care clinic	2	2.1
Service-related factors	**7**	**7.4**
Accessibility of postnatal care service	7	7.4
Factors specifically identified as COVID-related	**18**	**18.9**
Concerns about getting COVID-19 [b]	12	12.6
COVID-19 related service closures or restrictions [a]	6	6.3
Other (unaware it was needed, other)	**6**	**6.3**

Reasons for missing/delaying family planning (n=169)	**N**	**%**
Personal factors	**135**	**79.9**
Do not want or need contraception	70	41.4
Other personal reasons [f]	25	14.8
Fear of contraception procedure or side effects	23	13.6
Timing issues	15	8.9
Could not afford costs associated with visiting family planning clinic	2	1.2
Service-related factors	**8**	**4.7**
Issues with service provision (accessibility, lack of information on service)	7	4.1
Hard to get an appointment	1	0.6
Factors specifically identified as COVID-related	**17**	**10.1**
Concerns about getting COVID-19 [b]	9	5.3
COVID-19 related service closures or restrictions [a]	8	4.8
Other (not permissible by religion, have not found right contraception)	**15**	**8.9**

* Multiple responses allowed

[a] healthcare provider recommended missing/delaying RI, Posyandu closed/open fewer days or shorter hours, vaccination clinic closed/open fewer days or shorter hours, government rules

[b] at clinic, enroute to clinic or perceived to have COVID-19, afraid to go anywhere

[c] availability of HCP, gender barriers, waiting times, weather, other

[d] vitamin A unavailable, issues with schedule, availability of information

[e] accessibility of service, child reasons, health service availability, pandemic-related, other

[f] forgot, busy, sick, use other contraceptive methods, gender barriers

COVID-19 vaccines

Access to COVID-19 vaccines among caregivers

All 1399 caregivers responded to questions about their personal experience with COVID-19 vaccines. Eighty-four percent (1360/1399) were moderately or very concerned about getting COVID-19 while 71.3% (882/1399) considered getting a COVID-19 vaccine as 'very important' (Appendix 5). Seventy-one percent (994/1399) said that costs related to getting the COVID-19 vaccine were 'very cheap'. Sixty-five percent (909/1399) found it 'very easy' to get a COVID-19 vaccine. Among caregivers who reported difficulties getting a COVID-19 vaccine, waiting times (46.8%), difficulty making an appointment (10.9%) and health reasons (10.2%) were the main barriers (Figure 8).

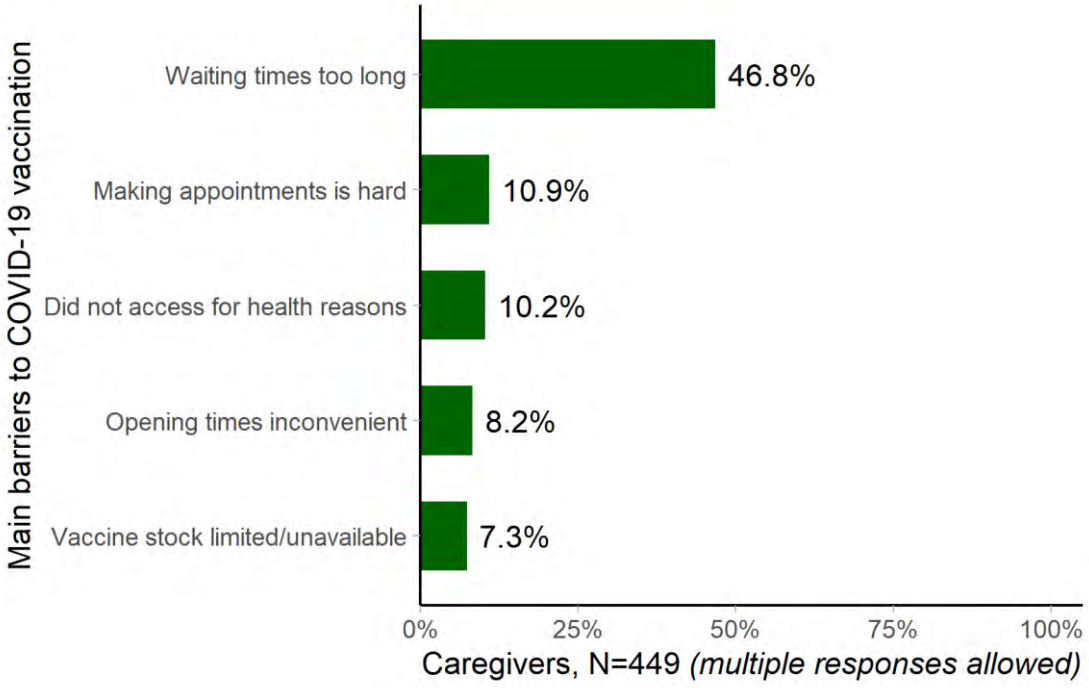

Figure 8. Barriers to getting COVID-19 vaccine experienced by caregivers of children two years and younger in Central Java and West Nusa Tenggara, March–April, 2022 (N=449)

Sources of information about COVID-19 vaccines

Over eighty percent (81.2%; 1136/1399) of caregivers reported that they had heard something worrying about COVID-19 vaccines, with 78.8% (1102/1399) having encountered information about the vaccine that they found hard to determine as right or wrong. Of these 1102 caregivers, this information was from a number of sources, with word of mouth (71.8%) reported as the most common source (Figure 9).

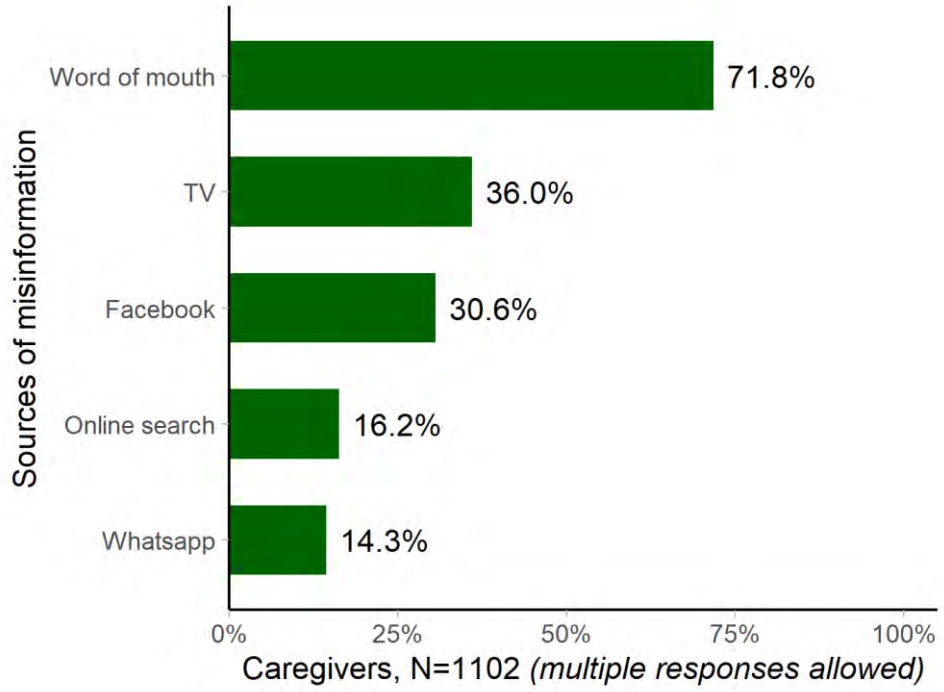

Figure 9. Sources of misleading or confusing information about COVID-19 vaccines reported by caregivers of children two years and younger in Central Java and West Nusa Tenggara, March–April, 2022 (n=1102)

The most commonly reported sources of trusted information included television (63.1%; 882/1399), other persons, relative or neighbours (59.0%; 825/1399), HCPs (54.1%; 757/1399) and social media (37.6%; 526/1399) (Appendix 5).

Uptake of COVID-19 vaccines among caregivers

Over eighty percent of caregivers (81.8%; 1145/1399) had received at least one dose of a COVID-19 vaccine, with the majority having received two doses (Figure 10). Of those who had not received any dose or were not sure (n=254), 41.7% (106/254) reported wanting to receive a COVID-19 vaccine.

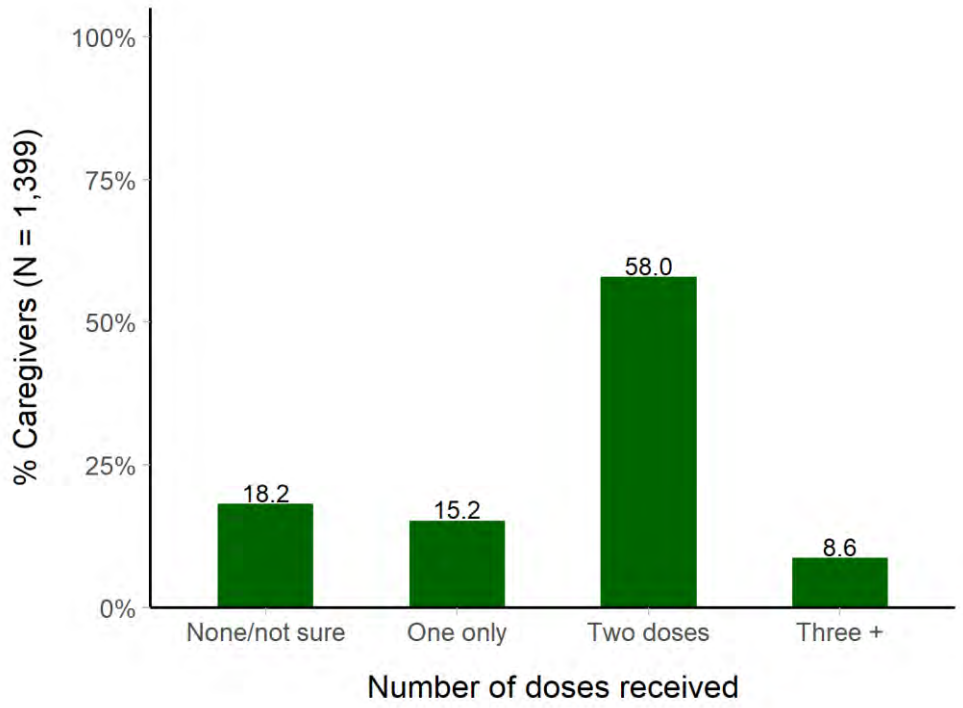

Figure 10. Number of COVID-19 vaccine doses received by caregivers of children two years and younger in Central Java and West Nusa Tenggara, March–April 2022

The dependent variable *Uptake of two COVID-19 vaccine doses among caregivers* was analysed in multivariable analysis, adjusting for *age of participants*, *level of education*, *setting*, *household income*, *intention for child to receive recommended routine immunizations*, *family norms*, *knowing where to go for COVID-19 vaccinations*, *affordability of COVID-19 vaccinations*, *ease of getting COVID-19 vaccinations*, and *confidence in benefits of COVID-19 vaccination*. After adjusting for survey design, examination of factors associated with uptake of COVID-19 vaccination among caregivers (Table 6) showed:

- Caregivers aged 51 years or older had 3.30 higher odds of receiving two or more doses of COVID-19 vaccine, compared to caregivers aged 18-30 (aOR: 3.30, 95% CI 1.40–7.76).
- Caregivers from households with a monthly income between 1.5 million and 2.9 million Rupiah had 1.59 higher odds of receiving two or more doses of COVID-19 vaccine, compared to caregivers from households with a monthly income of less than 1.5 million Rupiah (aOR: 1.59, 95% CI 1.09–2.32).
- Caregivers with family and friends who want them to be vaccinated had 2.26 higher odds of receiving two or more doses of COVID-19 vaccine, compared to caregivers with family or friends who do not want them vaccinated (aOR: 2.26, 95% CI 1.58–3.23).
- Caregivers who know where to go to receive the vaccine had 4.15 higher odds of receiving two or more doses of COVID-19 vaccine, compared to caregivers who do not know where to get the vaccine (aOR: 4.15, 95% CI 1.95–8.84).
- Caregivers who thought getting the COVID-19 vaccine was *moderately important* for their health had 3.81 higher odds of receiving two or more doses of COVID-19 vaccine, compared to those who thought it was *not at all* or a *little* important (aOR: 3.81, 95% CI 1.77–8.20).

- Caregivers who thought getting the COVID-19 vaccine was *very important* for their health had 5.41 higher odds of receiving two or more doses of COVID-19 vaccine, compared to those who thought it was *not at all* or a *little* important (aOR: 5.41, 95% CI 2.70–10.84).

Table 6. Factors associated with two dose completion of COVID-19 vaccination among caregivers of children two years and younger (two or more doses vs none/one dose[a]) in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age group of participants*					
18-30	736 (52.6)	Reference		Reference	
31-40	530 (37.9)	1.25 (0.92–1.71)	0.16	1.20 (0.85–1.68)	0.30
41-50	84 (6.0)	1.96 (1.11–3.49)	0.02	1.83 (0.94–3.56)	0.07
51+	49 (3.5)	2.77 (1.23–6.23)	0.01	**3.30 (1.40–7.76)**	**0.007**
Highest level of education**					
Primary and below	254 (18.2)	Reference			
Secondary school	942 (67.3)	0.97 (0.65–1.44)	0.87		
Tertiary education	202 (14.5)	1.65 (0.95–2.85)	0.08		
Setting**					
Urban	700 (50.04)	Reference			
Rural	699 (49.96)	0.83 (0.64–1.09)	0.18		
Household monthly income*					
Less than 1.5 million Rp/month[a]	458 (34.1)	Reference		Reference	
1.5 <3 million Rp/month	501 (37.3)	1.44 (1.02–2.04)	0.04	1.28 (0.89–1.84)	0.018
3 million Rp/month or more	383 (28.5)	2.02 (1.36–2.98)	0.001	**1.59 (1.09–2.32)**	**0.02**
Intention for child to receive routine immunizations*					
All	1339 (95.7)	Reference		Reference	
None/some	60 (4.3)	0.37 (0.19–0.72)	0.004	0.44 (0.19–1.01)	0.054
Family norms*					
No, family wouldn't want participant vaccinated	220 (15.7)	Reference		Reference	
Yes, family would want participant vaccinated	1179 (84.3)	3.63 (2.58–5.12)	<0.001	**2.26 (1.58–3.23)**	**<0.001**
Know where to go for COVID-19 vaccinations*					
No	64 (4.6)	Reference		Reference	
Yes	1335 (95.4)	6.38 (3.20–12.72)	<0.001	**4.15 (1.95–8.84)**	**<0.001**
Ease of getting COVID-19 vaccinations*					
Not at all/a little easy	58 (4.1)	Reference		Reference	
Moderately easy	432 (30.9)	1.63 (0.80–3.35)	0.18	1.76 (0.69–4.49)	0.23
Very easy	909 (65.0)	2.53 (1.25–5.11)	0.01	2.16 (0.90–5.19)	0.09
Affordability of COVID-19 vaccinations**					
Not at all/a little cheap	39 (2.8)	Reference			
Moderately cheap	366 (26.1)	1.22 (0.60–2.45)	0.58		
Very cheap	994 (71.1)	1.16 (0.56–2.39)	0.68		
Concern about COVID-19					
Very concerned	882 (63.1)	Reference			
Moderately concerned	296 (21.2)	1.13 (0.83–1.55)	0.44		
Not at all/a little concerned	221 (15.8)	1.12 (0.75–1.69)	0.58		
Confidence in benefits of COVID-19					

vaccination*					
Not at all/a little important	91 (6.5)	Reference		Reference	
Moderately important	310 (22.2)	5.03 (2.52–10.02)	<0.001	**3.81 (1.77–8.20)**	**0.001**
Very important	998 (71.3)	8.38 (4.47–15.72)	<0.001	**5.41 (2.70–10.84)**	**<0.001**

*Variable included in multivariable analysis due to bivariate results or known association to outcome

**Variable included in multivariable analysis but dropped in backward elimination of variables

[a] At time of data collection, 2 doses was recommended for this population

[b] 3 million Rp is approximately $300 AUD/$195 USD

Results – Healthcare providers

A total of 604 HCP aged over 18 years participated in the study. The majority of HCPs were female (84.6%; 511/604) and had a professional diploma (75.5%; 456/604). The majority of HCP were midwives (40.2%; 243/604), followed by nurses (30.8%; 186/604), village midwives (22.4%; 135/604), and doctors (6.6%; 40/604), with 56.8% (343/604) of all HCP having 10 or more years of experience in their role. Seventy-eight percent of HCP reported the Puskesmas as their primary place of work (78.2%; 472/604) (Appendix 6).

Service delivery disruptions during the COVID-19 pandemic

Among HCPs who were involved in routine child immunization or COVID-19 vaccination (n=565), around half (50.8%; 287/565) had received formal training in immunization (Appendix 7). Sixty-three percent (355/565) reported stock-outs of routine vaccines. Two-thirds of those HCPs reported stockouts of IPV (63.9%; 227/355) (Figure 11).

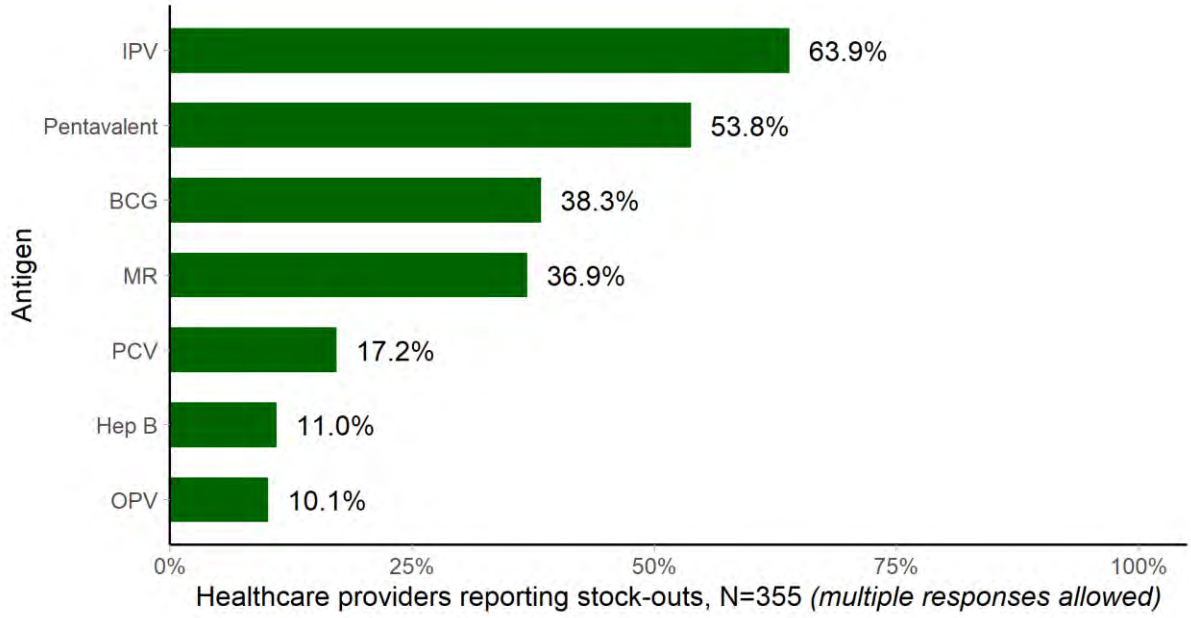

Figure 11. Vaccine stock-outs reported by HCPs in Central Java and West Nusa Tenggara, March–April 2022 (n=355)

All HCPs reported on service disruptions they had experienced during the pandemic (Appendix 7). Staff redeployment to COVID-19 management (87.9%; 531/604) was the main service disruption reported by HCPs (Figure 12). Community outreach (75.5%; 456/604) and phone calls to patients (72.4%; 437/604) were two commonly reported strategies to help overcome disruptions (Figure 13).

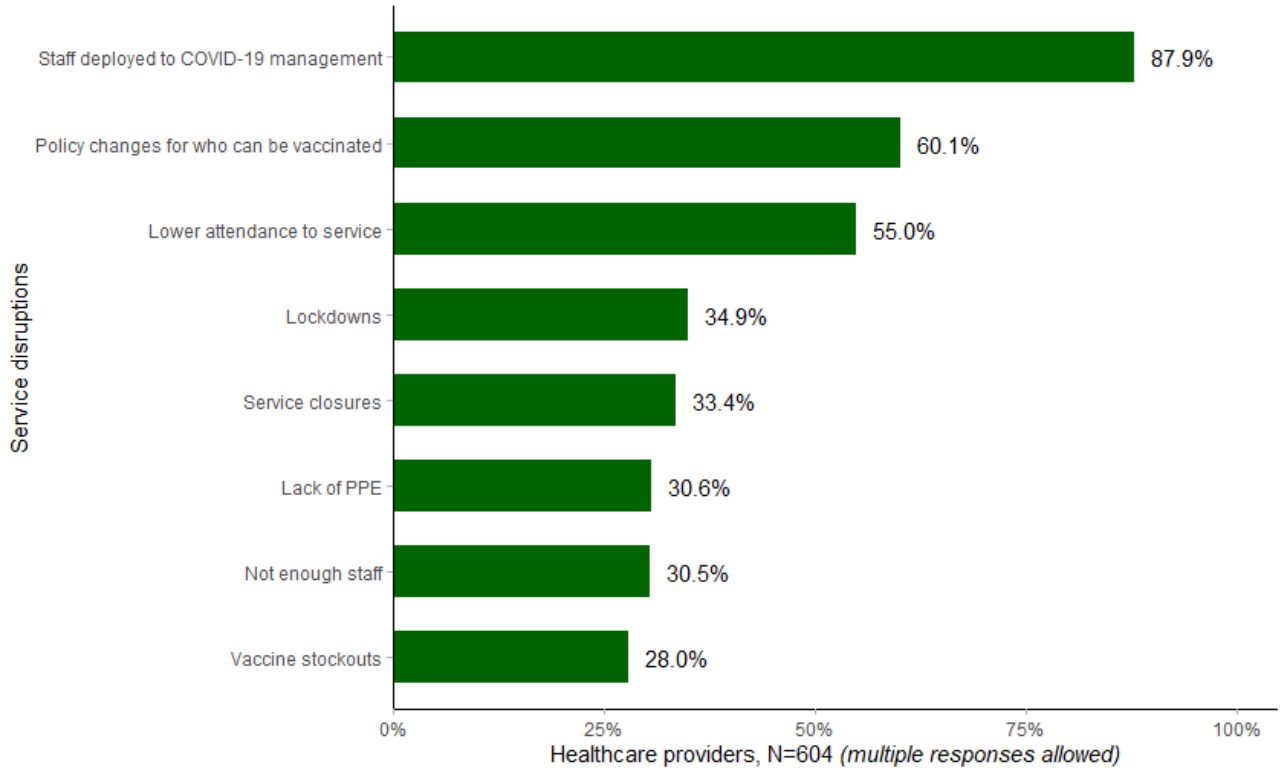

Figure 12. Service disruptions experienced by HCPs during the COVID-19 pandemic in Central Java and West Nusa Tenggara, March–April 2022 (N=604)

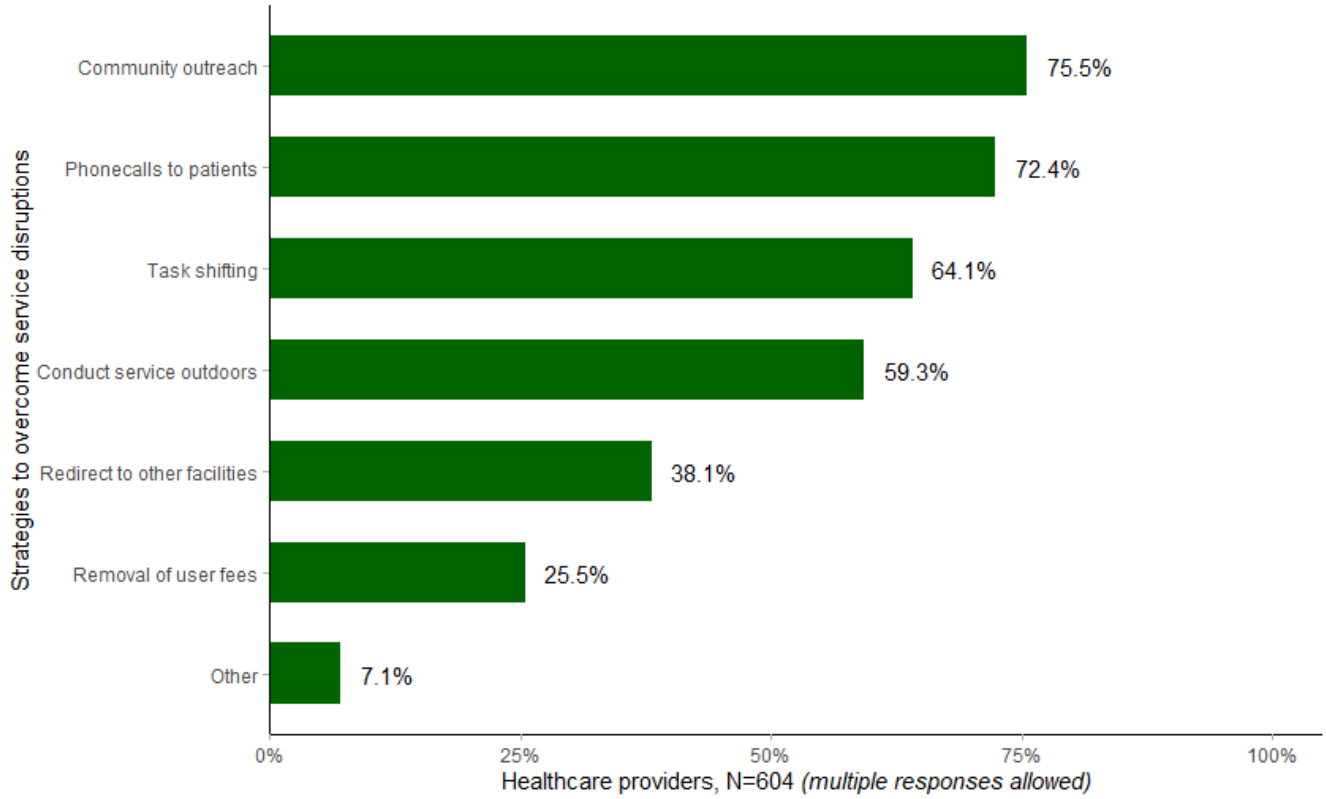

Figure 13. Strategies identified by HCPs in Central Java and West Nusa Tenggara to help overcome COVID-19 related service disruptions, March–April 2022 (N=604)

COVID-19 vaccines

Access to COVID-19 vaccines

All HCPs responded to questions about COVID-19 vaccines. Thirty-eight percent (231/604) were very concerned about getting COVID-19 while 53.4% (323/604) were concerned about their patients getting COVID-19. The vaccine was perceived as 'very important' among 91.6% (553/604) of participants. Ninety percent (89.7%; 542/604) found it 'very easy' to get a COVID-19 vaccine and 90.4% (546/604) found it to be 'very cheap' (Appendix 8).

Uptake of COVID-19 vaccines

The majority of HCPs (87%; 527/604) had received three or more doses of COVID-19 vaccines (Figure 14) and 98.9% (597/604) had received two or more doses (Appendix 8).

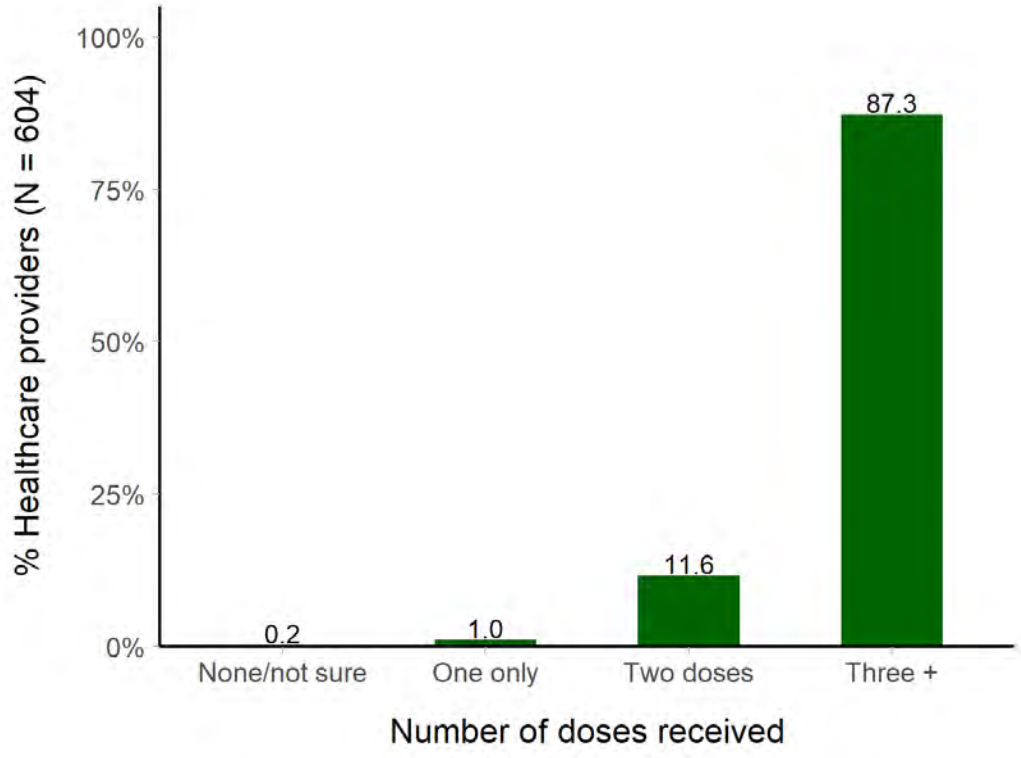

Figure 14. Number of COVID-19 vaccine doses received by HCPs in Central Java and West Nusa Tenggara, March–April 2022

The dependent variable *Uptake of three COVID-19 vaccine doses among HCP* was analysed in multivariable analysis, adjusting for *age of participants*, *gender of participants*, *level of education*, *setting*, *type of HCP*, *concern about COVID-19* and *confidence in benefits of COVID-19 vaccination*. After adjusting for survey design, examination of factors associated with uptake of COVID-19 vaccination among HCP (Table 7), showed:

HCPs who thought that receiving a COVID-19 vaccine was *very* important for their health had a 2.35 higher odds of receiving three or more doses, compared to HCPs who thought it to be *not at all*, a *little* or *moderately* important (aOR: 2.35, 95% CI 1.16–4.75).

Table 7. Factors associated with three dose receipt of COVID-19 vaccinations (three doses vs none/one/two doses) among HCPs in Central Java and West Nusa Tenggara, Indonesia, March/April 2022

	N (%)	OR (95% CI)	*p*-value	aOR (95% CI)	*p*-value
Province					
Central Java	304 (50.3)	Reference			
West Nusa Tenggara	300 (49.7)	0.80 (0.49–1.29)	0.36		
Age of respondent*					
18-30	157 (26.0)	Reference		Reference	
31-40	269 (44.5)	0.98 (0.54–1.80)	0.96	0.99 (0.54–1.82)	0.97
41-50	122 (20.2)	1.15 (0.55–2.44)	0.71	1.17 (0.55–2.50)	0.68
51+	56 (9.3)	0.50 (0.23–1.12)	0.09	0.50 (0.22–1.11)	0.09
Gender of respondent*					
Male	93 (15.4)	Reference		Reference	
Female	511 (84.6)	0.43 (0.18–1.01)	0.05*	0.48 (0.20–1.16)	0.10
Highest level of education*					
Diploma	456 (75.5)	Reference		Reference	
Undergraduate/professional degree/Postgraduate	148 (24.5)	1.53 (0.83–2.83)	0.17	1.40 (0.74–2.63)	0.30
Setting**					
Urban	154 (25.5)	Reference			
Rural	450 (74.5)	0.88 (0.50–1.54)	0.65		
Type of healthcare provider**		0.86 (0.65–1.13)	0.28		
Doctor	40 (6.6)	Reference			
Nurse	186 (30.8)	0.44 (0.10–1.95)	0.28		
Midwife	243 (40.2)	0.27 (0.06–1.15)	0.08		
Village Midwife	135 (22.4)	0.42 (0.09–1.92)	0.27		
Know where to go for COVID-19 vaccination					
No	6 (1.0)	Reference			
Yes	598 (99.0)	1.37 (0.16–11.92)	0.77		
Family norms					
No, family wouldn't want participant vaccinated	14 (2.3)	Reference			
Yes, family would want participant vaccinated	590 (97.7)	1.14 (0.25–5.21)	0.86		
Ease of getting COVID-19 vaccinations					
Not at all/a little/moderately easy	62 (10.3)	Reference			
Very easy	542 (89.7)	1.18 (0.56–2.51)	0.66		
Affordability of COVID-19 vaccinations					
Not at all/a little cheap	13 (2.2)	Reference			
Moderately cheap	45 (7.5)	2.55 (0.38–17.16)	0.34		
Very cheap	546 (90.4)	1.20 (0.26–5.51)	0.82		
Concern about COVID-19**					
Very concerned	231 (38.3)	Reference			
Moderately concerned	170 (28.2)	0.55 (0.30–1.02)	0.06		
Not at all/a little concerned	203 (33.6)	0.76 (0.42–1.39)	0.38		
Confidence in benefits of COVID-19* vaccination					
Not at all/a little/moderately	51 (8.4)	Reference		Reference	

important					
Very important	553 (91.6)	2.31 (1.15–4.64)	0.02	**2.35 (1.16–4.75)**	**0.02**

*Variable included in multivariable analysis due to bivariate results or known association to outcome
**Variable included in multivariable analysis but dropped in backward elimination of variables

Experiences in service delivery during pandemic

Over half of all HCP (52.5%; 317/604) had received formal training in delivering COVID-19 vaccinations and 35.4% (214/604) of all HCP had experienced stock-outs of COVID-19 vaccines in their health facility (Figure 15).

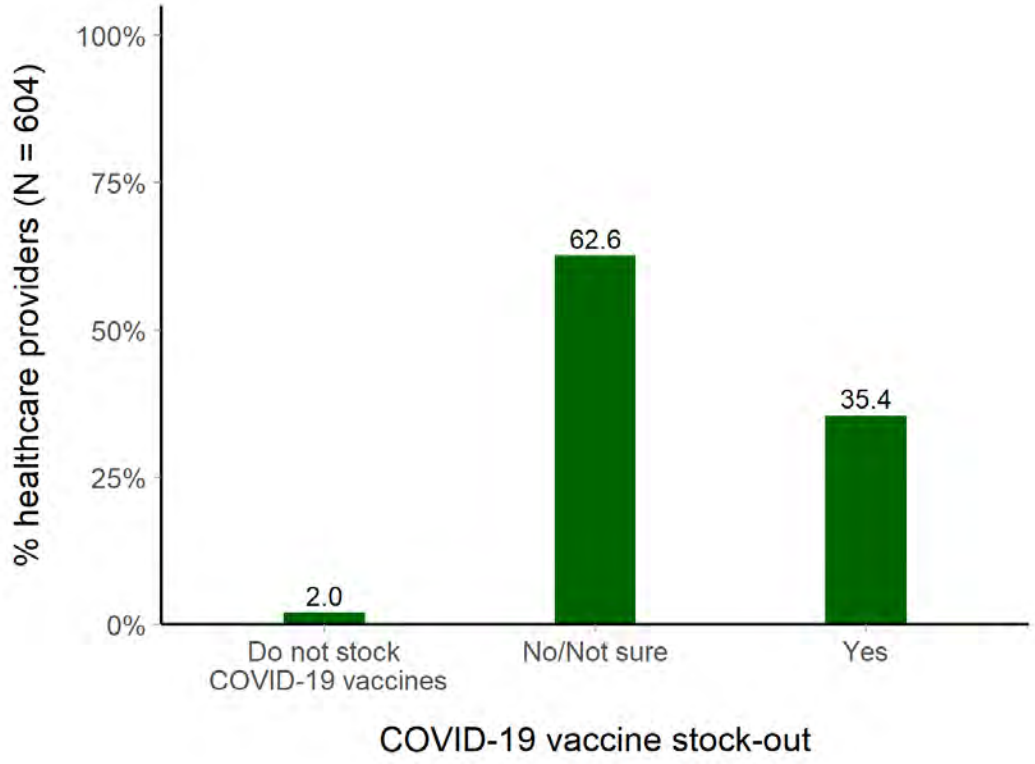

Figure 15. HCPs reporting stock-outs of COVID-19 vaccines in Central Java and West Nusa Tenggara, March–April 2022 (N=604)

Ninety-four percent (565/604) of HCP said that there was a perception of increased risk at work (Appendix 8). Around two-thirds (67.4%; 407/604) of HCP said that delivering the COVID-19 vaccine had not disrupted their other work priorities. Thirty-five percent (213/604) said that they were treated poorly in their place of work, with long wait times (23.0%) the most common reason for this (Figure 16) and 64.1% (387/604) had experienced trauma or burnout in the workplace.[28] Longer work hours (60.2%) were among the top five reasons for trauma or burnout (Figure 17). Nearly one-

[28] Participants were asked "Would you say you've experienced trauma or burnout related to the COVID-19 pandemic?"

quarter of HCPs (23.5%; 142/604) reported that their mental health had been moderately, very or extremely worsened by the COVID-19 pandemic (Appendix 8).

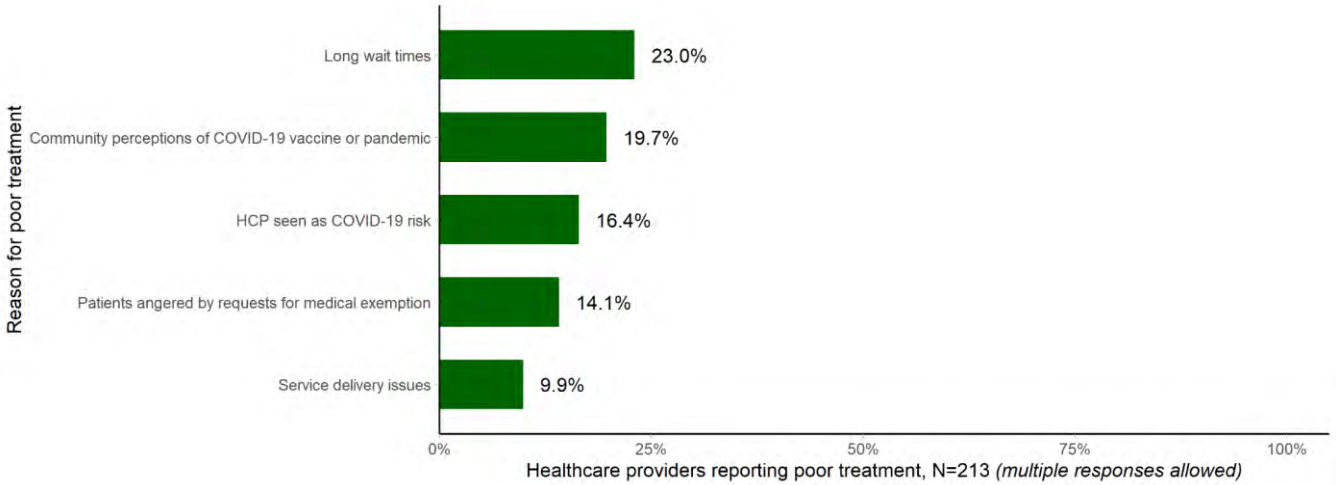

Figure 16. Reasons reported for poor treatment in workplace among HCPs in Central Java and West Nusa Tenggara, March–April 2022 (N=213)

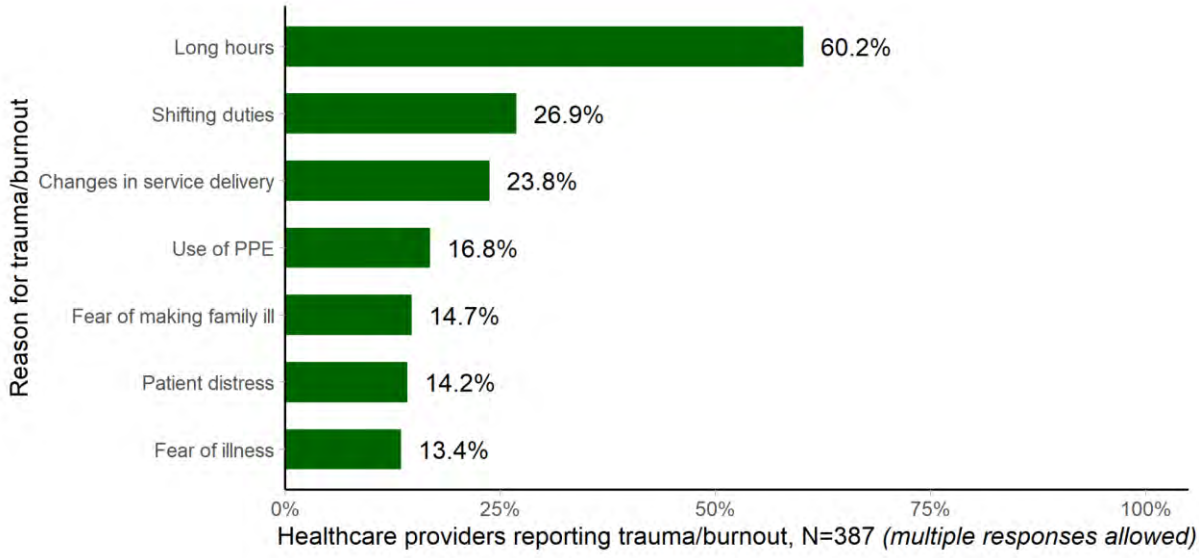

Figure 17. Reasons reported for trauma or burnout among HCPs in Central Java and West Nusa Tenggara, March–April 2022 (N=387)

Sources of information about COVID-19 vaccines

Among HCPs, 37.3% (225/604) had heard something worrying about the COVID-19 vaccine and 50.8% (307/604) had encountered information where it was hard to determine whether it was right or wrong (Appendix 8). Fifty-seven percent (344/604) though, felt 'very confident' to respond to misinformation. Word of mouth (48.5%) was the most commonly reported source of misinformation by HCPs (Figure 18).

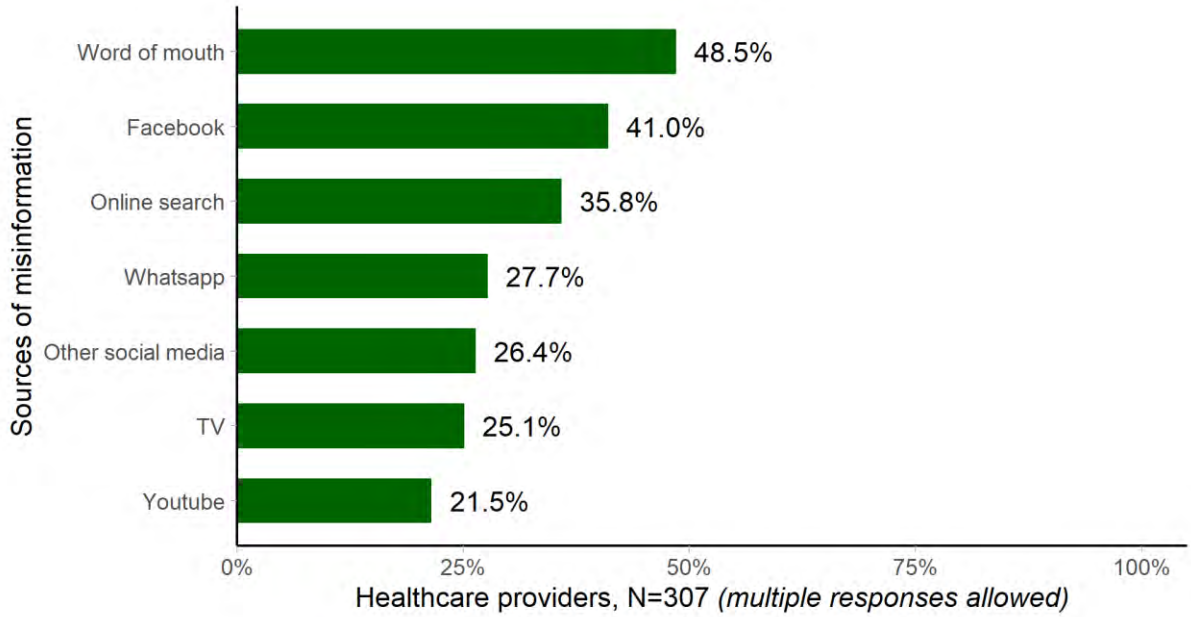

Figure 18. Sources of misinformation reported by HCPs in Central Java and West Nusa Tenggara, March–April 2022 (N=307)

Responding to patient questions about COVID-19

Sixty-three percent (382/604) of HCPs felt 'very confident' to respond to patient questions about COVID-19.

The dependent variable *Confidence to respond to patient questions about COVID-19* was analysed in multivariable analysis, adjusting for *age of participants*, *level of education*, *setting*, *type of HCP*, *receipt of training in routine immunization*, *encountering misinformation* and *self-efficacy*.
After adjusting for survey design, examination of factors associated with confidence to respond to patient questions about COVID-19 (Table 8), showed:

- HCPs with an undergraduate/professional degree or postgraduate degree had 1.76 higher odds of feeling very confident to respond to patients' questions about COVID-19, compared to HCPs with a diploma as their highest level of education (aOR: 1.76, 95% CI 1.14–2.72) .
- HCPs who had encountered information about COVID-19 which they found hard to determine as right or wrong had lower odds of feeling very confident to respond to patient questions about COVID-19, compared to HCPs who had not encountered information they found difficult to discern as right or wrong (aOR 0.64; 95% CI 0.45–0.92).
- HCPs with higher self-efficacy had 2.33 higher odds of feeling very confident to respond to patient questions about COVID-19, compared to HCPs who had moderate self-efficacy (aOR: 2.33, 95% CI 1.60–3.38).

Table 8. Factors associated with confidence to respond to patient questions (high confidence vs low/moderate confidence) about COVID-19 among HCPs in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (N=565)

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age group**					
18-30	157 (26.0)	Reference			
31-40	269 (44.5)	1.07 (0.71–1.60)	0.75		
41-50	122 (20.2)	1.39 (0.84–2.28)	0.20		
51+	56 (9.3)	1.27 (0.67–2.40)	0.46		
Highest level of education*					
Diploma	456 (75.5)	Reference		Reference	
Undergraduate/professional degree/Postgraduate	148 (24.5)	1.96 (1.29–2.96)	0.001	**1.76 (1.14–2.72)**	**0.01**
Setting**					
Urban	154 (25.5)	Reference			
Rural	450 (74.5)	0.81 (0.55–1.19)	0.28		
Type of healthcare provider**					
Doctor	40 (6.6)	Reference			
Nurse	186 (30.8)	0.46 (0.19–1.09)	0.08		
Midwife	243 (40.2)	0.28 (0.12–0.66)	0.004		
Village Midwife	135 (22.4)	0.34 (0.14–0.82)	0.02		
Years working					
Between two and less than five years	88 (14.6)	Reference			
Less than two years	35 (5.8)	0.82 (0.36–1.83)	0.62		
Five years or more	481 (79.6)	0.93 (0.58–1.50)	0.78		
Received formal training for administering routine immunizations (N=565)*					
No	278 (49.2)	Reference		Reference	
Yes	287 (50.8)	1.15 (0.82–1.63)	0.42	1.29 (0.90–1.84)	0.17
Received formal training for administering COVID-19 vaccinations**					
No	287 (47.5)	Reference			
Yes	317 (52.5)	1.20 (0.86–1.68)	0.27		
Encountered information which was hard to determine whether right or wrong*					
No	297 (49.2)	Reference		Reference	
Yes	307 (50.8)	0.59 (0.42–0.83)	0.002	**0.64 (0.45–0.92)**	**0.02**
Self-efficacy score*					
Moderate self-efficacy	198 (32.8)	Reference		Reference	
High self-efficacy	406 (67.2)	2.30 (1.62–3.26)	<0.001	**2.33 (1.60–3.38)**	**<0.001**

*Variable included in multivariable analysis due to bivariate results or known association to outcome

**Variable included in multivariable analysis but dropped in backward elimination of variables

Discussion and recommendations

This study provides valuable insights into the perceptions of and uptake of both routine immunizations and the COVID-19 vaccination as of March-April 2022 in Central Java and West Nusa Tenggara. The findings will be presented by respondent type and followed by key recommendations.

Caregiver survey findings

Caregivers of children two and younger showed very positive perceptions of routine immunization for their child. Nearly all caregivers (99%) thought that routine vaccines were 'moderately' or 'very' important for their child's health, with 96% wanting their child to receive 'all' of the recommended vaccines. This intention to receive 'all' vaccines was associated with positive family influence about routine immunization and perception of vaccines as 'very' important.

Despite positive perceptions of routine immunization, only 40% of children aged 2-24 months in the sample were fully vaccinated for their age. Antigen-specific coverage showed that drop-outs were more common among older children; for example, while 78.6% of 12-24 month olds had the first dose of measles-containing vaccine, only 17% of children aged 18-24 months had received the second dose in this sample. Full vaccination uptake for age was associated with higher caregiver education, moderate or easy access to routine immunization and higher household income.

Two-thirds 67% of caregivers found it 'very' easy to access routine immunizations for their child, yet over half the sample (52.8%) reported missing or delaying routine immunization during the COVID-19 pandemic. Although COVID-19 related factors such as service closures and fear of illness were factors, the most commonly reported reasons for missing or delaying included sickness in the household (either their child, themselves or another member) and vaccine unavailability. A smaller proportion of caregivers also reported missing or delaying other key maternal and child health services during the pandemic; well-child services (e.g. growth monitoring) were missed/delayed more than maternal health services (e.g. antenatal care). Personal reasons, such as forgetting the schedule or competing priorities were the most commonly reported reasons for missing or delaying other maternal and child health services.

There was moderate uptake of the primary COVID-19 vaccination series (2 doses) among caregivers (58%), however booster uptake was low (8.6%). Caregiver perceptions were mixed about the importance of the COVID-19 vaccine; 70% perceived it as very important for their health while 16% were not at all or only a little concerned about COVID-19. Two-dose uptake of the COVID-19 vaccine among caregivers in this sample was associated with older age of the respondent, higher household income, higher number of children in the household, positive family influence about the COVID-19 vaccine, knowing where to access the vaccine and the perception of the vaccine as 'very' important.

Exposure to misinformation was common; 79% of caregivers reported hearing information about COVID-19 that they found difficult to determine as right or wrong. Word of mouth was reported to be the most common source of this information.

Healthcare provider survey findings

Healthcare providers (HCP) reported several disruptions that affected the delivery of routine immunization and other maternal and child health services during the COVID-19 pandemic. Nearly 90% of HCP said that the deployment of health service staff to COVID-19 management was a disruption, while just under two-thirds of HCP (63%) reported vaccine stock-outs in their place of

work. Of these HCP, IPV was the most commonly reported as stocked-out. Other commonly reported disruptions were policy changes regarding who was eligible for who could be vaccinated (60%) and changes to caregiver attendance (55%). Health care providers did however report that a number of strategies were utilised to overcome these disruptions. This included community outreach (76%) and phone calls to caregivers (72%).

HCP reported a number of challenges in service delivery which impacted on their wellbeing. Mistreatment in the workplace was common (35%), with patient anger due to long wait times the most common reason for this. Further, 64% of HCP reported that they had experienced burnout in the workplace; this was most commonly due to long work hours.

Uptake of three doses of the COVID-19 vaccine among HCP was high (87%). Uptake of three or more doses was associated with the perception of the vaccine as 'very' important. HCP reported overall positive perceptions of the COVID-19 vaccine; 99% of HCPs thought a vaccine was 'moderately' or 'very' important for their health and two-thirds said that they were very confident to respond to patient questions about COVID-19. Exposure to misinformation was common; about half (50.8%) of HCP reported hearing information about the COVID-19 vaccine which they found difficult to determine as right or wrong. Word of mouth was the most common source of this information.

Recommendations

Taking findings from both the caregiver and HCP surveys into account, there are a number of recommendations relating to routine immunization, MCH services and COVID-19 vaccination within Central Java and West Nusa Tenggara. These recommendations are presented in two parts; routine immunization and other MCH services followed by recommendations for COVID-19 vaccination.

Routine immunization and other MCH services

The study found generally positive perceptions of routine immunization among caregivers. This reflects a program in these populations which has successfully maintained high confidence in these populations. This resilience is a strength which can be maintained with ongoing community engagement and good services.

Despite these successes, there are challenges with maintaining high uptake: 60% of children had missed or delayed any of their routine immunizations according to the Indonesian immunization schedule[29]. A third of participants noted that routine immunization access was not at all or only a little easy. Therefore, there is likely value in ongoing recovery efforts that focus on restoring service delivery to improve ease of access to routine immunization. Increasing access points to a range of alternative vaccination services, such as schools or drive-through clinics may improve convenience for caregivers. In this study, some caregivers were accessing routine immunization at the village or neighbourhood level, suggesting that there are already grassroots initiatives to expand routine immunization access. This presents opportunities to formalize such approaches within local immunization programs, with each area determining a model of engagement which suits the community they are targeting. Close engagement with communities will play an important role in helping to determine the model of immunization service delivery at the village or sub-district level.

[29] WHO Indonesia immunization schedule https://immunizationdata.who.int/pages/schedule-by-country/idn.html?DISEASECODE=&TARGETPOP_GENERAL=

It may be also helpful to conduct further investigations to better understand the barriers for this group, for example with community consultation or qualitative interviews. Since having a sick child or household member was one of the main reasons for delaying vaccination, and sometimes mildly ill children are delayed in being vaccinated, immunization program managers may help to improve the health literacy of caregivers on when delayed vaccination is necessary or unnecessary and why timely and complete vaccination is important for children's health.

Identification of strategies to prevent future disruptions to routine immunization programs and other maternal and child health services are recommended for pandemic preparedness and response planning, including contingency plans. As part of this plan, there is a need to strengthen the supply of vaccines, operational planning and to address workforce-related barriers. Efforts should be made to look at how the procurement and supply of routine vaccines can be improved from the national down to local levels. Depending on procurement processes, this may need a district-by-district approach to ensure these processes can be accommodated by local health systems.

At a service-level, formalised documentation of strategies found to be effective in addressing the effects of pandemic-related disruptions may aid in strengthening future operational planning and in reducing workforce-related barriers. Long term policy planning which focuses on ensuring a sufficient number of HCP, timely training and supportive environments for HCP will be important to improve service users' experiences and also reduce health workforce strain, including addressing workforce trauma and burnout as part of a broader pandemic recovery plan. For example, exploring whether there is a need to have a separate workforce to focus on COVID-19 (or other vaccine-preventable infectious disease) vaccination in order to reduce strain on HCP involved in routine care duties. Identification of strategies to reduce patient frustration within healthcare services due to factors such as long waiting times may also be impacted by additional support to the workforce, as well as by other modifications to the waiting process that improve patient experience.

While the rates of missed or delayed attendance to other maternal and child health services was lower than that of routine immunization, the prominence of personal reasons for this suggests that increased efforts should be made to find ways to encourage and prioritize attendance amongst caregivers. Improved communication with caregivers to update them of appointments or service opening times (e.g. through WhatsApp communication) may be one strategy to support this. Digitization of reporting and recording information systems should also be optimized in order to improve services.

COVID-19 vaccination

With high rates of three-dose uptake among HCPs, there may be lessons learned from how high coverage was obtained (e.g. as a requirement of role); whether these processes can be feasibly maintained in the future or whether alternative measures may be needed to encourage ongoing booster uptake in the changing landscape of the pandemic. Amongst caregivers and HCP, consideration should be given to the design of targeted strategies which best represent the priority focus of the national as well as local-level governments in encouraging uptake of further doses. While caregivers in this sample had positive perceptions of the COVID-19 vaccine, positive family perceptions were associated with uptake. Education and communication strategies with a multigenerational focus may help to create a stronger enabling environment for caregivers to receive the COVID-19 vaccine. A focus on these strategies may be in emphasising the importance of the vaccine for personal health.

Misinformation, predominantly but not limited to the COVID-19 pandemic and vaccination continues to be a significant problem. With word of mouth the most common source of misinformation amongst both caregivers and HCPs in this sample, there should be a comprehensive strategy that brings together a number of approaches, including social listening activities, risk communication and community engagement, advocacy and social mobilisation activities. Social listening activities which go beyond just focusing on social media platforms may help generate better understandings about the dynamics of how misinformation is transmitted within communities and how this links to information obtained online. This should be done in consultation with community leaders (both formal and informal) and religion leaders, with plans for actions to fill the misinformation gap by providing quality information via trusted spokespersons. Forward thinking strategies to strengthen the digital literacy amongst future caregivers and HCP may also have value in counteracting the effects of misinformation. HCP have an important role to play in 'immunizing against misinformation'; as trusted sources of information, they may benefit from training in how to assess and respond to rumours or misinformation.

Strengths and limitations of this study

This study had a number of strengths. It was a large multi-stage survey with representative samples. The survey tools utilised core items from the Behaviour and Social Drivers of vaccination tool (BeSD), which have been field tested and validated. Data collection among both caregivers of children two years and younger as well as HCPs involved in routine immunization, COVID-19 vaccination, and maternal and child health, as well as qualitative data collection also allowed for triangulation of the data to strengthen our interpretation of the findings. This is one of the largest and most comprehensive dataset on measuring perceptions to immunization during the pandemic in Indonesia.

The study also has a number of limitations. The cross-sectional study design is only able to measure responses at one point in time. A lack of baseline data also means that we were unable to make robust comparisons on service delivery prior to the pandemic. The study was conducted in two purposively selected provinces. Due to this, and the considerable heterogeneity between provinces in Indonesia, the results cannot be generalised but offer some insight into challenges related with delivery of vaccination programs. Lastly, the second stage of sampling for households with children two years and younger utilised village health facility (Posyandu) registration lists. This approach was confirmed with UNICEF Indonesia for its likelihood of capturing the majority of households in a village with a child aged two or under; however, there is also the possibility that there were households which were not registered with the Posyandu resulting in recruitment bias.

Caution should also be taken in interpretation of antigen-specific coverage data. While best efforts were undertaken to capture this data using standardized Demographic Health Survey (DHS)/ UNICEF Multiple Indicator Cluster Survey (MICS) questions, this was not a coverage survey. Antigen-specific coverage data was calculated as received at any time and as such does not take into account the timeliness of immunization. As the sample was not stratified with age quotas, the higher age groups were a small sample leaving greater error around the point estimates for coverage estimates. Lastly, the survey was not designed to explore reasons for antigen-specific coverage so is unable to provide in-depth detail on this. Furthermore, for the question on location of routine immunization, some of the options listed in the questionnaire may not have been mutually exclusive. In the future, closer

attention to detail in pilot testing for this type of question may ensure that the options provided are mutually exclusive.

The HCP survey utilised district or city health office lists to recruit HCP involved in routine immunization, maternal and child health and COVID-19 vaccination. A challenge with these lists is their inability to completely capture all health workers in the private sector. This recruitment approach was agreed as the most pragmatic however, there were potential recruitment biases by not having complete estimates of all private health workforce in the two provinces. As only a specific subset of HCP comprised the sampling frame in this study, we did not have complete denominator data of the broader healthcare workforce and were unable to adjust this sample to account for survey design. However, we believe the clustering in HCP to be limited and are less likely to influence the study findings.

Appendices

Appendix 1: Demographic characteristics of caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (n=1399)

Demographic characteristics	Total N (%)	Urban[a] N (%)	Rural[b] N (%)
Province			
Central Java	699 (50.0)	350 (50.0)	349 (49.0)
West Nusa Tenggara	700 (50.0)	350 (50.0)	350 (50.0)
Gender of respondent			
Female	1367 (97.7)	677 (96.7)	690 (98.7)
Male	32 (2.3)	23 (3.3)	9 (1.3)
Age (years)			
18 - 24	253 (18.1)	93 (13.7)	157 (22.5)
25 - 30	483 (34.5)	246 (35.1)	237 (33.9)
31 - 40	530 (37.9)	274 (39.1)	256 (36.6)
41 - 50	84 (6.0)	47 (6.7)	37 (5.3)
51 and above	49 (3.5)	37 (5.3)	12 (1.7)
Relationship to child under 2 years			
Mother	1285 (91.9)	620 (88.6)	665 (95.1)
Father	24 (1.7)	15 (2.1)	9 (1.3)
Grandparent	64 (4.6)	47 (6.7)	17 (2.4)
Aunt/Uncle	19 (1.4)	13 (1.9)	6 (0.9)
Brother/sister	1 (0.1)	1 (0.1)	-
Other	6 (0.4)	4 (0.5)	2 (0.3)
Religion			
Islam	1333 (95.3)	641 (91.6)	692 (99.0)
Christian Protestant	12 (0.9)	9 (1.3)	3 (0.4)
Catholicism	16 (1.1)	15 (2.1)	1 (0.1)
Buddhism	37 (2.6)	34 (4.9)	3 (0.4)
Confucianism	1 (0.1)	1 (0.1)	-
Not affiliated/not sure/declined to answer	-	-	-
Education			
Primary and below	254 (18.2)	92 (13.1)	162 (23.2)
Secondary school	942 (67.3)	472 (67.4)	470 (67.2)
Tertiary education	202 (14.4)	136 (19.4)	66 (9.4)
Don’t know	1 (0.1)	-	1 (0.1)
Employment			
Employed/student	331 (23.7)	172 (24.6)	159 (22.8)
Homemaker	984 (70.3)	478 (68.3)	506 (72.4)
Other	84 (6.0)	50 (7.1)	64 (4.9)
Other carer in household for child under 2			
Yes	570 (40.7)	271 (38.7)	299 (42.8)
No	829 (59.3)	429 (61.3)	400 (57.2)
Relationship of other carer to child under 2			
Mother	83 (14.6)	57 (21.0)	26 (8.7)
Father	122 (21.4)	54 (19.9)	68 (22.7)
Grandparent	272 (47.7)	113 (41.7)	159 (53.2)
Aunt/Uncle	40 (7.0)	20 (7.4)	20 (6.7)
Brother/sister	17 (3.0)	5 (1.9)	12 (4.0)
Other	36 (6.3)	22 (8.1)	14 (4.7)

Education of other carer			
Primary and below	233 (40.9)	72 (26.6)	161 (53.9)
Secondary school	269 (47.2)	151 (55.7)	118 (39.5)
Tertiary education	48 (8.4)	37 (13.7)	11 (3.7)
Don't know	20 (3.5)	11 (4.1)	9 (3.0)
Employment of other carer			
Employed/student	266 (46.7)	122 (45.0)	144 (48.2)
Homemaker	216 (37.9)	112 (41.3)	104 (34.8)
Other/don't know	88 (15.4)	37 (13.7)	51 (17.1)
Number of children in the family			
Median (range)	2 (1-7)	2 (1-7)	2 (1-6)
One child	556 (39.7)	324 (46.3)	232 (33.2)
Two or more	883 (60.3)	376 (53.7)	467 (66.8)

[a] Urban settings in this study were Semarang City and Surakarta City (Central Java); Mataram City and Bima city in West Nusa Tenggara

[b] Rural settings in this study were Demak and Purbalingga Districts in Central Java; Central Lombok and Sumbawa Districts in West Nusa Tenggara

Appendix 2: Vaccination status of children aged 12–24 months in Central Java and West Nusa Tenggara, Indonesia, as reported in survey March–April 2022 (n=885)

	Indonesia immunization schedule	Vaccination records	Caregiver self-report	Combined
		N (%)	N (%)	N (%)
		N =719	N=166	N=885
BCG	Birth	707 (98.3)	162 (97.6)	869 (98.2)
Hep B 0	Birth	697 (96.9)	156 (94.0)	853 (96.4)
DTP-HepB-Hib				
1	Month 2	693 (96.4)	134 (80.7)	827 (93.5)
2	Month 3	666 (92.6)	127 (76.5)	793 (89.6)
3	Month 4	632 (87.9)	93 (56.0)	725 (81.9)
4 (booster) [a]	Month 18	158 (39.1)	10 (10.6)	168 (33.7)
Polio (OPV)				
1	Month 1	697 (96.9)	124 (74.7)	821 (92.8)
2	Month 2	689 (95.8)	120 (72.3)	809 (91.4)
3	Month 3	659 (91.7)	78 (47.0)	737 (83.3)
4	Month 4	624 (86.8)	44 (26.5)	668 (75.5)
Polio (IPV)	Month 4	348 (48.4)	131 (78.9)	479 (54.1)
MR				
1	Month 9	572 (79.6)	124 (74.7)	696 (78.6)
2 [a]	Month 18	63 (15.6)	22 (23.4)	85 (17.0)

[a] Calculated as proportion of children 18-24 months; total n=499 , vaccination record n =405; caregiver self-report n = 94

Appendix 3: Perceptions of routine immunization, access to routine immunization and well child services among caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (n=1399)

	Total n (%)
Intention to vaccinate child under 2	
None/Don't know	15 (1.2)
Some	45 (3.2)
All	1339 (95.7)
Vaccination status of children 2-24 months in sample (n=1385) [b]	
Fully up to date for age	558 (40.3)
Partially up to date for age	822 (59.4)
No vaccinations recorded	5 (0.3)
Vaccination status of other children aged under 5 in household (n=215)	
Fully vaccinated for age	170 (79.0)
Partially vaccinated for age	35 (16.3)
Not vaccinated/Don't know	10 (4.7)
Perceived importance of vaccines for child health	
Not at all important or a little important	14 (1.0)
Moderately important	189 (13.5)
Very important	1196 (85.5)
Family and friends want the respondent to get their child vaccinated	
No	102 (7.3)
Yes	1297 (92.7)
Know where to go for child's vaccinations	
No/Don't know	21 (1.5)
Yes	1378 (98.5)
Location of child's vaccination [a] (n=1378)	
Posyandu	753 (54.6)
Puskesmas	714 (51.8)
Midwife's practice (including village midwife)	280 (20.3)
Private hospital	277 (20.1)
Government hospital	133 (9.7)
Village maternity hut (Polindes)	112 (8.1)
Private clinic	83 (6.0)
Village health polyclinic	78 (5.7)
Community venues	21 (1.5)
Other	18 (1.3)
Affordability of routine immunizations	
Not at all/a little cheap	79 (5.7)
Moderately cheap	471 (33.7)
Very cheap	849 (60.7)
Ease of getting routine immunizations	
Not at all/somewhat easy	68 (4.9)
Moderately easy	390 (27.9)
Very easy	941 (67.3)
Routine immunization service access during pandemic compared to before COVID-19 (n=893)	
Easier to access	55 (6.2)

About the same	578 (64.7)
Harder to access	260 (29.1)
Routine immunization service quality during pandemic compared to before COVID-19 (n=893)	
Higher	116 (13.0)
Same	693 (77.6)
Lower	84 (9.4)
Routine immunization service quality improvement [a]	
No need for improvement	932 (66.6)
Expand open days or hours	77 (5.5)
Reduce waiting times	109 (7.8)
Improved COVID-19 precautions	15 (1.2)
Improved facility cleanliness	22 (1.6)
Better staff training/knowledge/skills	27 (1.9)
Improve respectful care and communication	44 (3.2)
Increase time with staff during visit	23 (1.6)
Other	217 (15.5)
Receipt of routine immunization during pandemic	
Missed or delayed routine immunization because of pandemic	143 (10.2)
Missed or delayed routine immunization for other reasons	595 (42.5)
Did not miss or delay routine immunization	650 (46.5)
Do not know	11 (0.8)
Reason for missed or delayed RI [a] (n=738)	
Personal factors	404 (54.8)
Service-related factors	262 (36.2)
COVID-19 related factors	176 (23.8)
Other	34 (4.6)
Child health service access during pandemic compared to before COVID-19 (n=893)	
Easier to access	81 (9.1)
About the same	655 (73.4)
Harder to access	157 (17.6)
Child health service quality during pandemic compared to before COVID-19 (n=893)	
Higher	97 (10.9)
Same	724 (81.1)
Lower	72 (8.1)
Child health service quality improvement [a]	
No need for improvement	1079 (77.1)
Expand open days or hours	48 (3.4)
Reduce waiting times	87 (6.2)
Improved COVID-19 precautions	18 (1.3)
Improved facility cleanliness	12 (0.9)
Better staff training/knowledge/skills	19 (1.4)
Improve respectful care and communication	38 (2.7)
Increase time with staff during visit	15 (1.1)
Other	82 (5.9)
Posyandu attendance during pandemic (weighing services)	
Missed due to pandemic	139 (9.9)
Missed for other reasons	369 (26.4)
Did not miss	869 (62.1)
Do not know	22 (1.6)

Reason for missed or delayed weighing [a] (n=508)	
Personal factors	303 (59.6)
Service-related factors	58 (11.4)
COVID-19 related factors	179 (35.2)
Other	18 (3.5)
Receipt of vitamin A supplementation during pandemic	
Missed/delayed due to pandemic	16 (1.1)
Missed/delayed for other reasons	62 (4.4)
Did not miss or delay	1290 (92.2)
Do not know	31 (2.2)
Reason for missed or delayed vitamin A supplementation [a] (n=78)	
Personal factors	15 (19.3)
Service-related factors	22 (28.2)
COVID-19 related factors	22 (28.2)
Other	16 (20.5)
Changes to reduce pandemic impact	
No/Don't know	1243 (88.9)
Yes	156 (11.2)
Changes made to services [a] (n=156)	
Instead of face-to-face visits, telehealth services were offered by staff	73 (46.8)
Instead of face-to-face visits, the staff made phone calls or contacted patients via Whatsapp	45 (28.9)
Other (received information from Mosque, improved accessibility, other reasons)	21 (13.4)
Improved administrative processes (appointment bookings, scheduling processes, online queues, online registration)	17 (10.8)
Staff conducted care visits outside facility ie in the car park, drive-through or home visit	8 (5.1)

[a] Multiple response options allowed

[b] Vaccinations scheduled between birth and 4 months were given a grace period of 2 months based on the Indonesian routine immunization schedule.. Vaccinations scheduled at month 9 were given a 3-month grace period, and vaccinations scheduled at month 18 were given a 6-month grace period (Refer to Indonesian routine immunization schedule in Table 2).

Appendix 4: Access to maternal health services among mothers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (n=1285)

	Total n (%)
Maternal health service access during pandemic compared to before COVID-19 (n=957)	
Easier to access	78 (8.2)
About the same	736 (76.9)
Harder to access	143 (14.9)
Maternal health service quality during pandemic compared to before COVID-19 (n=957)	
Higher	92 (9.6)
Same	792 (82.8)
Lower	73 (7.6)
Maternal health service quality improvement [a] (n=1285)	
No need for improvement	1047 (81.5)
Expand open days or hours	31 (2.4)
Reduce waiting times	51 (4.0)
Improved COVID-19 precautions	16 (1.3)
Improved facility cleanliness	14 (1.1)
Better staff training/knowledge/skills	30 (2.3)
Improve respectful care and communication	41 (3.2)
Increase time with staff during visit	25 (2.0)
Other	57 (4.4)
Receipt of antenatal care during pandemic (n=1256)	
Missed/delayed due to pandemic	56 (4.5)
Missed/delayed for other reasons	85 (6.8)
Did not miss or delay	1115 (88.8)
Reason for missed/delayed antenatal care [a] (n=141)	
Personal factors	73 (51.9)
Service-related factors	6 (4.3)
COVID-19 related factors	86 (61.1)
Other	19 (13.5)
Health facility birth during pandemic (n=1278)	
Outside facility due to pandemic	4 (0.3)
Outside facility for other reasons	20 (1.6)
Inside health facility	1254 (98.1)
Reason for birth outside facility [a] (n=24)	
Personal factors	18 (75.1)
Service-related factors	0 (0.0)
COVID-19 related factors	6 (25.0)
Other	4 (16.7)
Receipt of postnatal care during pandemic (n=1247)	
Missed/delayed due to pandemic	11 (0.9)
Missed/delayed for other reasons	84 (6.7)
Did not miss or delay	1152 (92.4)
Reason for missed/delayed postnatal care [a] (n=95)	
Personal factors	75 (79.0)
Service-related factors	7 (7.4)

COVID-19 related factors	18 (18.9)
Other	6 (6.3)
Receipt of family planning services during pandemic (n=1091)	
Missed/delayed due to pandemic	18 (1.7)
Missed/delayed for other reasons	151 (13.9)
Did not miss or delay	922 (84.5)
Reason for missed/delayed family planning [a] (n=169)	
Personal factors	135 (79.6)
Service-related factors	8 (4.7)
COVID-19 related factors	17 (10.1)
Other	15 (8.9)
Changes to reduce pandemic impact	
No/Don't know	1165 (99.7)
Yes	120 (9.3)
Changes made to services [a] (n=120)	
Instead of face-to-face visits, telehealth services were offered by staff	69 (57.5)
Instead of face-to-face visits, the staff made phone calls	28 (23.3)
Use of online registration	18 (14.6)
Use of Whatsapp to communicate with patients	10 (8.3)
Staff conducted care visits outside i.e. in the car park	1 (0.9)
Other	4 (3.3)

[a] Multiple response options allowed

Appendix 5: Experience and perceptions of COVID-19 and COVID-19 vaccinations among caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (n=1399)

	Total n (%)
Had COVID-19	
No	1275 (91.1)
Yes	92 (6.6)
Not sure	32 (2.3)
Severity of COVID-19 (n=92)	
Mild/moderate	83 (90.2)
Severe	7 (7.6)
Not sure	2 (2.2)
Confirmed by test (n=92)	
Yes	80 (87.0)
No	12 (13.0)
Hospitalised for COVID-19 (n=92)	
No	73 (79.3)
Yes	19 (20.7)
Know someone who had COVID-19	
No/not sure	987 (70.6)
Yes, family	117 (8.4)
Yes, other people	224 (16.0)
Yes, other people and family	71 (5.1)
Family and friends would want participant to receive vaccine	
No/not sure	220 (15.7)
Yes	1179 (84.3)
Know where to get COVID-19 vaccine	
No	64 (4.6)
Yes	1335 (95.4)
Receipt of vaccine	
No/not sure	254 (18.2)
One only	213 (15.2)
Two doses	811 (58.0)
Three or more	121 (8.6)
One or two doses	*1024 (73.2)*
One, two or three doses	*1145 (81.8)*
Additional doses needed (n=1145)	
No additional needed	411 (35.9)
One or more doses needed	632 (55.2)
Not sure	102 (8.9)
Record of vaccination (n=1145)	
Yes	1102 (96.3)
No	43 (3.7)
Want COVID-19 vaccine (n=254)	
No	131 (51.6)
Yes	106 (41.7)
Not sure	17 (6.7)
Ease of getting COVID-19 vaccine	

Not at all easy/A little easy	58 (4.1)
Moderately easy	432 (30.9)
Very easy	909 (65.0)
Difficulty getting COVID-19 vaccine [a]	
Nothing, it's not hard	950 (67.9)
The waiting time takes too long (n=449)	210 (46.8)
Making an appointment is hard (n=449)	49 (10.9)
Did not access for health reasons (n=449)	46 (10.2)
The opening times are inconvenient (n=449)	37 (8.2)
COVID-19 vaccine unavailable/limited stock (n=449)	33 (7.3)
Afraid of COVID-19 vaccination (n=449)	33 (7.3)
COVID-19 vaccination is not yet available for me (n=449)	29 (6.5)
Personal reasons (n=449)	22 (4.9)
The vaccination site is hard to get to (n=449)	19 (4.2)
Sometimes people are turned away without vaccination (n=449)	8 (1.8)
Gender barriers (n=449)	8 (1.8)
I can't go on my own (I have a physical limitation) (n=449)	6 (1.3)
Other	5 (1.1)
Cost of COVID-19 vaccine	
Not at all/a little cheap	39 (2.8)
Moderately cheap	366 (26.1)
Very cheap	994 (71.1)
Concern about getting COVID-19	
Not at all/a little concerned	221 (15.8)
Moderately concerned	296 (21.1)
Very concerned	882 (63.1)
Perceived importance of COVID-19 vaccine	
Not at all/ a little important	91 (6.5)
Moderately important	310 (22.2)
Very important	998 (71.3)
Heard something worrying about COVID-19 vaccine	
No	263 (18.8)
Yes	1136 (81.2)
Encountered information which was hard to determine as right or wrong	
No	297 (21.2)
Yes	1102 (78.8)
Source of information [a] (n=1102)	
Word of mouth	791 (71.8)
TV	397 (36.0)
Facebook	337 (30.6)
Online search	179 (16.2)
WhatsApp	158 (14.3)
Social media (Twitter, TikTok, Instagram, Snapchat)	142 (12.9)
YouTube	83 (7.5)
Other	7 (0.6)
Important sources of information [a]	
TV	882 (63.1)
Other person, relatives, neighbours	825 (59.0)

Healthcare providers	757 (54.1)
Social media	526 (37.6)
Internet	336 (24.0)
Mobile phone application (Whatsapp)	176 (12.6)
Church/mosque	103 (7.4)
Public doctor	87 (6.2)
Government	72 (5.2)
Private doctor	56 (4.0)
Printed media	19 (1.4)
Radio	18 (1.3)
Other	18 (1.3)
Printed education materials	8 (0.6)
Alternative health providers	7 (0.5)

[a] Multiple response options allowed; responses not listed by enumerator in data collection

Appendix 6. Demographics and participant characteristics of healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 (n=604)

Demographic characteristics	Total n (%)	Urban n (%)	Rural n (%)
Location	**604**	**154**	**450**
Central Java	304 (50.3)	120 (77.9)	184 (40.9)
West Nusa Tenggara	300 (49.7)	34 (22.1)	266 (59.1)
Gender			
Female	511 (84.6)	134 (87.0)	377 (83.8)
Male	93 (15.4)	20 (13.0)	73 (16.2)
Age			
18 - 30	157 (26.0)	35 (22.7)	122 (27.1)
31 - 40	269 (44.5)	58 (37.7)	211 (46.9)
41 - 50	122 (20.2)	33 (21.4)	89 (19.8)
51 and older	56 (9.3)	28 (18.2)	28 (6.2)
Education			
Diploma	456 (75.5)	100 (64.9)	356 (79.1)
Undergraduate/professional degree	138 (22.8)	48 (31.2)	90 (20.0)
Masters/PhD	10 (1.7)	6 (3.9)	4 (0.9)
Current role			
Doctor	40 (6.6)	22 (14.3)	18 (4.0)
Nurse	186 (30.8)	53 (34.4)	133 (29.6)
Midwife	243 (40.2)	78 (50.6)	165 (36.7)
Village midwife	135 (22.4)	1 (0.7)	134 (29.8)
Years in role			
Less than 2	35 (5.8)	8 (5.2)	37 (6.0)
2 < 5	88 (14.6)	22 (14.3)	66 (14.7)
5 < 10	138 (22.8)	28 (18.2)	110 (24.4)
10 or more	343 (56.8)	96 (62.3)	247 (54.9)
Primary place of work			
Puskesmas	472 (78.1)	123 (79.9)	349 (77.6)
Poskesdes	42 (7.0)	0 (0.0)	42 (9.3)
Polindes	22 (3.6)	1 (0.7)	21 (4.7)
Pustu	17 (2.8)	1 (0.7)	16 (3.6)
Independent midwife practice	33 (5.5)	23 (14.9)	10 (2.2)
Private clinic	4 (0.7)	0 (0.0)	4 (0.9)
Other	14 (2.3)	6 (3.9)	8 (1.8)
Secondary place of work [a]			
None	429 (71.0)	126 (81.8)	303 (67.3)
Puskesmas	45 (7.5)	4 (2.6)	41 (9.1)
Poskesdes	21 (3.5)	0 (0.0)	21 (4.7)
Pustu	8 (1.3)	0 (0.0)	8 (1.8)
Independent midwife practice	78 (12.9)	7 (4.6)	71 (15.8)
Private clinic	19 (3.2)	9 (5.8)	10 (2.2)
Other	28 (4.6)	10 (6.5)	18 (4.0)
Health services [a]			
Routine child Immunization	384 (63.6)	97 (63.0)	287 (63.8)
COVID-19 Immunization	470 (77.8)	120 (77.9)	350 (77.8)

Antenatal care	376 (62.3)	86 (55.8)	290 (64.4)
Labour and birth	294 (48.7)	56 (36.4)	238 (52.9)
Postnatal care	338 (56.0)	71 (46.1)	267 (59.3)
Family planning	356 (58.9)	83 (53.9)	273 (60.7)
Baby and child services (weighing, vitamin A supplementation, etc)	285 (47.2)	82 (53.3)	203 (45.1)
Other	187 (31.0)	56 (36.4)	131 (29.1)

[a] Multiple response options allowed

Appendix 7: Service provision during the COVID-19 pandemic among healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 n=604

	Total n (%)
Systems to track missed vaccines/defaulters (n=565)	
No/Not sure	236 (41.8)
Yes	329 (58.2)
Vaccine stock-out (n=565)	
No/not sure	210 (37.2)
Yes	355 (62.8)
Vaccines stock-outs [a] (n=355)	
BCG	136 (38.3)
HepB	39 (11.0%)
OPV	36 (10.1)
IPV	227 (63.9)
DPT-HN-Hib	191 (53.8)
PCV	61 (17.2)
MR	131 (36.9)
Other	34 (9.6)
Vaccine equipment stock-outs [a] (n=565)	
None	544 (96.3)
Syringes	11 (2.0)
Needles	15 (2.7)
Diluent	12 (2.1)
Formal training in immunization (n=565)	
No	278 (49.2)
Yes	287 (50.8)
Routine immunization standard operating procedure available (n=565)	
No/Don't know	54 (9.6)
Yes	511 (90.4)
Service disruptions experienced [a] (n=604)	
Staff providing COVID-19 relief	531 (87.9)
Change in vaccination policies	363 (60.1)
Fewer parents/caregivers attending for other reasons	332 (55.0)
Lockdowns hindering parent/caregiver access	211 (34.9)
Closure of service	202 (33.4)
Insufficient PPE	185 (30.6)
Not enough staff	184 (30.5)
Stock-outs of vaccines or equipment	169 (28.0)
Other	23 (3.8)
Strategies to overcome disruptions [a] (n=604)	
Community outreach	456 (75.5)
Phone calls to parents/caregivers	437 (72.4)
Task shifting/role delegation	387 (64.1)
Parents/caregivers seen outdoors from facility	358 (59.3)
Redirection of parents/caregivers to alternative services	230 (38.1)
Government removal of user fees	154 (25.5)
Other	43 (7.1)

Appendix 8: Experience and perceptions of COVID-19, COVID-19 vaccinations and impacts on service delivery among healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022 n=604

	Total n (%)
Had COVID-19	
No	334 (55.3)
Yes	262 (43.4)
Not sure	8 (1.3)
Severity of COVID-19 (n=262)	
Mild/moderate	230 (87.8)
Severe	25 (9.5)
Not sure	7 (2.7)
Confirmed by test (n=262)	
Yes	255 (97.3)
No	7 (2.7)
Hospitalised for COVID-19 (n=262)	
No	238 (90.8)
Yes	24 (9.2)
Know someone who had COVID-19 (n=604)	
No/not sure	72 (11.9)
Yes, family	65 (10.8)
Yes, other people	270 (44.7)
Yes, other people and family	197 (32.6)
Family and friends would want participant to receive vaccine	
No	14 (2.3)
Yes	590 (97.7)
Know where to get COVID-19 vaccine	
No	6 (1.0)
Yes	598 (99.0)
Receipt of vaccine	
No/not sure	1 (0.2)
One only	6 (1.0)
Two doses	70 (11.6)
Three or more	527 (87.3)
Additional doses needed	
No additional needed	255 (42.3)
One or more doses needed	320 (53.1)
Not sure	28 (4.6)
Receipt of 3+ doses by type of healthcare worker	
Doctor	38 (95.0)
Nurse	166 (89.3)
Midwife	203 (83.5)
Village midwife	120 (88.9)
Record of vaccination	
Yes	599 (99.3)
No	4 (0.7)
Want COVID-19 vaccine (n=1)	
No	1 (100.0%)

Yes	0 (0.0)
Ease of getting COVID-19 vaccine	
Not at all easy/A little easy	3 (0.5)
Moderately easy	59 (9.8)
Very easy	542 (89.7)
Difficulty getting COVID-19 vaccine [a]	
Nothing, it's not hard	539 (89.2)
COVID-19 vaccination is not yet available for me	10 (1.7)
Making an appointment is hard	6 (1.0)
I can't go on my own (I have a physical limitation)	0 (0.0)
The vaccination site is hard to get to	1 (0.2)
The opening times are inconvenient	0 (0.0)
Sometimes people are turned away without vaccination	1 (0.2)
The waiting time takes too long	12 (2.0)
Other	41 (6.8)
Cost of paying for COVID-19 vaccine	
Not at all/a little cheap	13 (2.2)
Moderately cheap	45 (7.5)
Very cheap	546 (90.4)
Concern about getting COVID-19	
Not at all/a little concerned	203 (33.6)
Moderately concerned	170 (28.2)
Very concerned	231 (38.3)
Concern about patients getting COVID-19	
Not at all/a little concerned	106 (17.5)
Moderately concerned	175 (29.0)
Very concerned	323 (53.4)
Perceived importance of COVID-19 vaccine	
Not at all/ a little important	7 (1.2)
Moderately important	44 (7.3)
Very important	553 (91.6)
Confidence to answer questions about COVID-19	
Not at all/a little confident	8 (1.3)
Moderately confident	214 (35.4)
Very confident	382 (63.3)
Heard something worrying about COVID-19 vaccine	
No/not sure	379 (62.7)
Yes	225 (37.3)
Encountered information which was hard to determine as right or wrong	
No	297 (49.2)
Yes	307 (50.8)
Source of information [a] (n=307)	
Word of mouth	149 (48.5)
Facebook	126 (41.0)
Online search	110 (35.8)
WhatsApp	85 (27.7)
Social media (Twitter, TikTok, Instagram, Snapchat)	81 (26.4)
TV	77 (25.1)
YouTube	66 (21.5)
Other health professionals	25 (8.1)

Confidence to respond to misinformation	
Not at all/a little confident	29 (4.8)
Moderately confident	231 (38.2)
Very confident	344 (57.0)
Formal training in COVID-19 vaccination	
No	287 (47.5)
Yes	317 (52.5)
COVID-19 vaccine stock-out	
No/not sure	378 (62.6)
Do not stock	12 (2.0)
Yes	214 (35.4)
COVID-19 vaccination disrupted other priorities	
Do not deliver COVID-19 vaccination	72 (11.9)
Not at all/slightly	407 (67.4)
Moderately	95 (15.7)
Very	30 (5.0)
Treated poorly during pandemic	
No/not sure	391 (64.7)
Yes	213 (35.3)
Reasons for poor treatment [a] (n=213)	
Patients angered by longer wait times	49 (23.0)
Patient perceptions of COVID or pandemic	42 (19.7)
Patients believe I am a COVID-19 risk	35 (16.4)
Patients angered by request for medical exemption	30 (14.1)
Service delivery issues (vaccine stockouts, referral issues, vaccine certificate issues)	21 (9.9)
Patients angered by the vaccine brands offered	21 (9.9)
Other patient COVID-19 fears or stigma	19 (8.9)
Negative perceptions of healthcare providers	10 (4.7)
Challenges with patient adherence to safety protocols	10 (4.7)
Patients angry at service closures	5 (2.4)
Other	15 (7.0)
Experienced trauma/burnout	
No/not sure	217 (35.9)
Yes	387 (64.1)
Reasons for trauma/burnout [a] (n=387)	
Long work hours	233 (60.2)
Shifting work duties	104 (26.9)
Changes in service delivery	92 (23.8)
Use of PPE	65 (16.8)
Fear of making family ill	57 (14.7)
Patient distress	55 (14.2)
Fear of illness	52 (13.4)
Other personal factors	10 (5.0)
Other service-delivery factors	18 (4.6)
Other patient-related factors	17 (4.4)
Other	15 (3.9)
Perception of increased risk at work	
No	39 (6.5)
Yes	565 (93.5)

Mental/emotional health worsened by pandemic	
Not at all/slightly	462 (76.5)
Moderately	118 (19.5)
Very/Extremely	24 (4.0)

[a] Multiple response options allowed

Appendix 9: Self-efficacy scores for healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

Generalised self-efficacy score (0-40)	
Mean (±SD)	32.5 (±3.7)
Median (range)	32 (22-40)
	n (%)
Moderate self-efficacy (<30)	198 (32.8)
High self-efficacy (30-40)	406 (67.2)

Appendix 10. Supplementary bivariate and multivariable analyses - 'full' model for caregiver and healthcare worker analyses

Table 1. Factors associated with intention for child to receive routine immunizations (none/some vs all routine immunizations) among caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Highest level of education of caregiver (N=1398)					
Primary and below	254 (18.2)	Reference			
Secondary school	942 (67.3)	2.05 (0.96–4.38)	0.07		
Tertiary education	202 (14.5)	1.26 (0.47–3.35)	0.65		
Family norms*					
No, family wouldn't want child vaccinated	102 (7.3)	Reference		Reference	
Yes, family would want child vaccinated	1297 (92.7)	3.34 (1.57–7.11)	0.002	**2.60 (1.16–5.80)**	**0.02**
Know where to go for vaccinations*					
No	21 (1.5)	Reference		Reference	
Yes	1378 (98.5)	5.46 (1.25–23.83)	0.02	4.27 (0.42–42.89)	0.23
Importance of vaccinations for child's health*					
Not at all/a little/ moderately important	203 (14.5)	Reference		Reference	
Very important	1196 (85.5)	9.75 (4.92–19.32)	<0.001	**7.65 (3.75–15.61)**	**<0.001**
Affordability of routine immunizations					
Not at all/a little cheap	79 (5.6)	Reference			
Moderately cheap	471 (33.7)	1.62 (0.49–5.29)	0.43		
Very cheap	849 (60.7)	1.72 (0.60–4.97)	0.31		
Ease of getting routine immunizations*				1.43 (0.80–2.55)	0.23
Not at all/a little easy	68 (4.9)	Reference		Reference	
Moderately easy	390 (27.9)	1.85 (0.54–6.38)	0.33		
Very easy	941 (67.3)	3.50 (1.07–11.52)	0.04		
Had COVID-19					
Yes	92 (6.6)	Reference			
No/not sure	1307 (93.4)	1.86 (0.63–5.49)	0.26		
COVID-19 vaccination*					
None/one dose	467 (33.4)	Reference		Reference	
At least two doses	932 (66.6)	2.69 (1.38–5.22)	0.004	1.99 (0.98–4.69)	0.06
Heard confusing information about COVID vaccine					
No	297 (21.2)	Reference			
Yes	1102 (78.8)	0.94 (0.42–2.12)	0.89		
Access to services during pandemic (n=893)					
About the same/easier during pandemic	633 (70.9)	Reference			
Harder during pandemic	260 (29.1)	0.80 (0.35–1.82)	0.60		
Quality of services during pandemic					

(n=893)			
About the same/better during pandemic	809 (90.6)	Reference	
Lower during pandemic	84 (9.4)	0.42 (0.14–1.30)	0.13

*Variable included in multivariable analysis due to bivariate results or known association to outcome

Table 2. Factors associated with uptake of routine immunization (fully vaccinated for age vs no vaccinations recorded/partially vaccinated for age) among children 2–24 months old in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Highest level of education of caregiver (N=1384)*					
Primary and below	252 (18.2)	Reference		Reference	
Secondary school	931 (67.3)	1.33 (0.92–1.91)	0.13	1.24 (0.84–1.82)	0.28
Tertiary education	201 (14.5)	1.55 (0.90–2.66)	0.11	**1.71 (0.99–2.93)**	**0.05**
Setting*					
Urban	695 (50.2)	Reference		Reference	
Rural	690 (49.8)	1.26 (0.87–1.83)	0.22	1.36 (0.93–1.98)	0.11
Household income (N=1329)*					
Less than 1.5 million Rp/month[a]	456 (34.3)	Reference		Reference	
1.5 <3 million Rp/month	492 (37.0)	1.50 (1.06-2.13)	0.02	**1.58 (1.12–2.23)**	**0.01**
3 million Rp/month or more	381 (28.7)	1.07 (0.72–1.58)	0.74	1.12 (0.76–1.67)	0.57
Number of children in household*					
One child	549 (39.6)	Reference		Reference	
Two or more	836 (60.4)	0.86 (0.66–1.13)	0.27*	0.84 (0.63–1.11)	0.22
Intention for child to receive routine immunizations*					
All	1385 (95.7)	Reference		Reference	
None/some	60 (4.3)	0.65 (0.30–1.39)	0.26	0.61 (0.26–1.47)	0.27
Family norms*					
No, family wouldn't want child vaccinated	102 (7.4)	Reference		Reference	
Yes, family would want child vaccinated	1283 (92.6)	0.87 (0.47–1.61)	0.65	0.82 (0.45–1.47)	0.50
Know where to go for vaccinations*					
No	20 (1.4)	Reference		Reference	
Yes	1365 (98.6)	1.20 (0.40–3.57)	0.74	2.78 (0.86–8.98)	0.09
Affordability of vaccinations*					
Not at all/a little cheap	79 (5.7)	Reference		Reference	
Moderately cheap	468 (33.8)	1.43 (0.81–2.54)	0.22	1.31 (0.69–2.47)	0.40
Very cheap	838 (60.5)	1.87 (1.08–3.22)	0.03	1.69 (0.92–3.11)	0.09
Ease of getting routine immunizations*					
Not at all/a little easy	68 (4.9)	Reference		Reference	
Moderately easy	387 (27.9)	2.21 (1.05–4.67)	0.04	**2.24 (1.05–4.80)**	**0.04**
Very easy	930 (67.2)	2.49 (1.25–4.95)	0.01	**2.14 (1.02–4.49)**	**0.04**
Confidence in benefits of vaccination*					
Not at all/a little/moderately important*	202 (14.6)	Reference		Reference	
Very important	1183 (85.4)	1.36 (0.94–1.97)	0.10	1.11 (0.72–1.70)	0.64
Access to services during pandemic (n=884)					
About the same/easier during pandemic	628 (71.0)	Reference			
Harder during pandemic	256 (29.0)	0.89 (0.65–1.23)	0.50		

*Variable included in multivariable analysis due to bivariate results or known association to outcome

[a] 3 million Rp is approximately $300 AUD/$195 USD

Table 3. Factors associated with two dose completion of COVID-19 vaccination among caregivers of children two years and younger in Central Java and West Nusa Tenggara, Indonesia (two or more doses vs none/one dose)[a] March–April 2022

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age group of participants*					
18-30	736 (52.6)	Reference		Reference	
31-40	530 (37.9)	1.25 (0.92–1.71)	0.16	1.21 (0.85–1.71)	0.29
41-50	84 (6.0)	1.96 (1.11–3.49)	0.02	1.95 (0.96–3.94)	0.06
51+	49 (3.5)	2.77 (1.23–6.23)	0.01	**3.67 (1.42–9.53)**	**0.008**
Highest level of education*					
Primary and below	254 (18.2)	Reference		Reference	
Secondary school	942 (67.3)	0.97 (0.65–1.44)	0.87	1.12 (0.69–1.80)	0.64
Tertiary education	202 (14.5)	1.65 (0.95–2.85)	0.08	1.62 (0.84–3.17)	0.15
Setting*					
Urban	700 (50.04)	Reference		Reference	
Rural	699 (49.96)	0.83 (0.64–1.09)	0.18	1.04 (0.77–1.40)	0.78
Household monthly income*					
Less than 1.5 million Rp/month[a]	458 (34.1)	Reference			
1.5 <3 million Rp/month	501 (37.3)	1.44 (1.02–2.04)	0.04	1.27 (0.88–1.82)	0.20
3 million Rp/month or more	383 (28.5)	2.02 (1.36–2.98)	0.001	1.48 (0.99–2.20)	0.06
Intention for child to receive routine immunizations*					
All	1339 (95.7)	Reference		Reference	
None/some	60 (4.3)	0.37 (0.19–0.72)	0.004	0.45 (0.20–1.00)	0.05
Family norms*					
No, family wouldn't want participant vaccinated	220 (15.7)	Reference		Reference	
Yes, family would want participant vaccinated	1179 (84.3)	3.63 (2.58–5.12)	<0.001	**2.23 (1.57–3.17)**	**<0.001**
Know where to go for COVID-19 vaccinations*					
No	64 (4.6)	Reference		Reference	
Yes	1335 (95.4)	6.38 (3.20–12.72)	<0.001	**4.04 (1.89–8.63)**	**<0.001**
Ease of getting COVID-19 vaccinations*					
Not at all/a little easy	58 (4.1)	Reference		Reference	
Moderately easy	432 (30.9)	1.63 (0.80–3.35)	0.18	1.70 (0.66–4.40)	0.27
Very easy	909 (65.0)	2.53 (1.25–5.11)	0.01	**2.39 (1.00–5.68)**	**0.05**
Affordability of COVID-19 vaccinations*					
Not at all/a little cheap	39 (2.8)	Reference		Reference	
Moderately cheap	366 (26.1)	1.22 (0.60–2.45)	0.58	1.00 (0.39–2.56)	0.98
Very cheap	994 (71.1)	1.16 (0.56–2.39)	0.68	0.71 (0.25–1.99)	0.52
Concern about COVID-19					
Very concerned	882 (63.0)	Reference			
Moderately concerned	296 (21.2)	1.13 (0.83–1.55)	0.44		
Not at all/a little concerned	221 (15.8)	1.12 (0.75–1.69)	0.58		
Confidence in benefits of COVID-19 vaccination*					
Not at all/a little important	91 (6.5)	Reference		Reference	
Moderately important	310 (22.2)	5.03 (2.52–10.02)	<0.001	**3.64 (1.69–7.81)**	**0.001**
Very important	998 (71.3)	8.38 (4.47–15.72)	<0.001	**5.40 (2.64–11.03)**	**<0.001**

*Variable included in multivariable analysis due to bivariate results or known association to outcome

[a] At time of data collection, 2 doses was recommended for this population
[b] 3 million Rp is approximately $300 AUD/$195 USD

Table 4. Factors associated with three dose receipt of COVID-19 vaccinations (three doses vs none/one or two doses) among healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022

	N (%)	OR (95% CI)	*p*-value	aOR (95% CI)	*p*-value
Province					
Central Java	304 (50.3)	Reference			
West Nusa Tenggara	300 (49.7)	0.80 (0.49–1.29)	0.36		
Age of respondent*					
18-30	157 (26.0)	Reference		Reference	
31-40	269 (44.5)	0.98 (0.54–1.80)	0.96	0.93 (0.50–1.73)	0.83
41-50	122 (20.2)	1.15 (0.55–2.44)	0.71	1.10 (0.50–2.42)	0.80
51+	56 (9.3)	0.50 (0.23–1.12)	0.09	0.52 (0.23–1.18)	0.12
Gender of respondent*					
Male	93 (15.4)	Reference		Reference	
Female	511 (84.6)	0.43 (0.18–1.01)	0.05	0.51 (0.19–1.37)	0.18
Highest level of education*					
Diploma	456 (75.5)	Reference		Reference	
Undergraduate/professional degree/Postgraduate	148 (24.5)	1.53 (0.83–2.83)	0.17	1.14 (0.56–2.33)	0.73
Setting					
Urban	154 (25.5)	Reference			
Rural	450 (74.5)	0.88 (0.50–1.54)	0.65		
Type of healthcare provider*					
Doctor	40 (6.6)	Reference		Reference	
Nurse	186 (30.8)	0.44 (0.10–1.95)	0.28	0.45 (0.09–2.15)	0.32
Midwife	243 (40.2)	0.27 (0.06–1.15)	0.08	0.36 (0.07–1.81)	0.21
Village Midwife	135 (22.4)	0.42 (0.09–1.92)	0.27	0.57 (0.11–3.01)	0.51
Know where to go for COVID-19 vaccination					
No	6 (1.0)	Reference			
Yes	598 (99.0)	1.37 (0.16–11.92)	0.77		
Family norms					
No, family wouldn't want participant vaccinated	14 (2.3)	Reference			
Yes, family would want participant vaccinated	590 (97.7)	1.14 (0.25–5.21)	0.86		
Ease of getting COVID-19 vaccinations					
Not at all/a little/moderately easy	62 (10.3)	Reference			
Very easy	542 (89.7)	1.18 (0.56–2.51)	0.66		
Affordability of COVID-19 vaccinations					
Not at all/a little cheap	13 (2.2)	Reference			
Moderately cheap	45 (7.5)	2.55 (0.38–17.16)	0.34		
Very cheap	546 (90.4)	1.20 (0.26–5.51)	0.82		
Concern about COVID-19*					
Very concerned	231 (38.2)	Reference		Reference	
Moderately concerned	170 (28.2)	0.55 (0.30–1.02)	0.06	0.72 (0.40–1.30)	0.28
Not at all/a little concerned	203 (33.6)	0.76 (0.42–1.39)	0.38	1.34 (0.72–2.49)	0.36
Confidence in benefits of COVID-19 vaccination*					
Not at all/a little/moderately	51 (8.4)	Reference		Reference	

important					
Very important	553 (91.6)	2.31 (1.15–4.64)	0.02	**2.42 (1.18–4.96)**	**0.02**

*Variable included in multivariable analysis due to bivariate results or known association to outcome

Table 5. Factors associated with confidence to respond to patient questions (high confidence vs low/moderate confidence) about COVID-19 among healthcare providers in Central Java and West Nusa Tenggara, Indonesia, March–April 2022, N=565

	N (%)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Age group*					
18-30	157 (26.0)	Reference		Reference	
31-40	269 (44.5)	1.07 (0.71–1.60)	0.75	0.91 (0.58–1.43)	0.69
41-50	122 (20.2)	1.39 (0.84–2.28)	0.20	1.26 (0.72–2.22)	0.42
51+	56 (9.3)	1.27 (0.67–2.40)	0.46	1.10 (0.54–2.22)	0.80
Highest level of education*					
Diploma	456 (75.5)	Reference		Reference	
Undergraduate/professional degree/Postgraduate	148 (24.5)	1.96 (1.29–2.96)	0.001	1.34 (0.81–2.24)	0.26
Setting*					
Urban	154 (25.5)	Reference		Reference	
Rural	450 (74.5)	0.81 (0.55–1.19)	0.28	0.94 (0.60–1.47)	0.78
Type of healthcare provider*					
Doctor	40 (6.6)	Reference		Reference	
Nurse	186 (30.8)	0.46 (0.19–1.09)	0.08	0.59 (0.23–1.55)	0.29
Midwife	243 (40.2)	0.28 (0.12–0.66)	0.004	0.39 (0.14–1.07)	0.07
Village Midwife	135 (22.4)	0.34 (0.14–0.82)	0.02	0.54 (0.19–1.56)	0.26
Years working					
Between two and less than five years	88 (14.6)	Reference			
Less than two years	35 (5.8)	0.82 (0.36–1.83)	0.62		
Five years or more	481 (79.6)	0.93 (0.58–1.50)	0.78		
Received formal training for administering routine immunizations (N=565)*					
No	278 (49.2)	Reference		Reference	
Yes	287 (50.8)	1.15 (0.82–1.63)	0.42	1.28 (0.86–1.91)	0.22
Received formal training for administering COVID-19 vaccinations*					
No	287 (47.5)	Reference		Reference	
Yes	317 (52.5)	1.20 (0.86–1.68)	0.27	0.92 (0.62–1.36)	0.68
Encountered information which was hard to determine whether right or wrong*					
No	297 (49.2)	Reference		Reference	
Yes	307 (50.8)	0.59 (0.42–0.83)	0.002	**0.68 (0.47–0.98)**	**0.04**
Self-efficacy score*					
Moderate self-efficacy	198 (32.8)	Reference		Reference	
High self-efficacy	406 (67.2)	2.30 (1.62–3.26)	<0.001	**2.43 (1.67–3.55)**	**<0.001**

*Variable included in multivariable analysis due to bivariate results or known association to outcome

Appendix 11. Supplementary tables - reasons for missing or delaying MCH services

Table 1. Reasons identified by caregivers of children two years and younger for missing/delaying routine immunizations in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing/delaying routine immunization (n=738)	N (%)	%
Personal factors	**404**	**54.8**
Child or household member sick	323	43.8
Unavailable to attend (caregiver away, working or busy)	49	6.6
Personal reasons (forgot or competing priorities)	24	3.3
No vaccinations needed	6	0.8
Could not afford costs associated with routine immunization	2	0.3
Service-related factors	**267**	**36.2**
Vaccine stock-out	208	28.1
Hard to get an appointment	21	2.9
Accessibility of service	19	2.6
Availability of information from immunization service	8	1.1
Availability of HCW	6	0.8
Health facility did not provide vaccination for children	5	0.7
Factors specifically identified as COVID-related	**176**	**23.8**
Health provided recommended missing/delaying routine immunization	66	8.9
Posyandu closed	39	5.3
Concern about getting COVID-19 at clinic	20	2.7
Afraid to go anywhere	16	2.2
Concern about getting COVID-19 enroute to clinic	15	2.0
Posyandu open fewer days/shorter hours	6	0.8
Vaccination clinic open fewer days/shorter hours	5	0.7
Vaccination clinic closed	4	0.5
Government rules	3	0.4
Concern others will think I have COVID-19 if I go to the clinic	2	0.3
Other (includes child asleep, child not old enough, gender barriers, medicine stockout, other, weather)	**34**	**4.6**

Table 2. Reasons identified by caregivers of children two years and younger for missing routine weighing at Posyandu in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing routine weighing at Posyandu (n=508)	N	%
Personal factors	**303**	**59.6**
Unavailable to attend (caregiver away, working or busy)	124	24.4
Child reasons (child sick/fussy or sleeping)	85	16.7
Caregiver or household member sick	50	9.8
Personal reasons (forgot, other personal reasons)	44	8.7
Service-related factors	**58**	**11.4**
Accessibility of Posyandu	35	6.9
Availability of information from Posyandu	23	4.5
Could not afford costs associated with visiting the Posyandu	-	-
Factors specifically identified as COVID-related	**179**	**35.2**
Posyandu closed	131	25.7
Concern about getting COVID-19 at clinic	14	2.8
Concern about getting COVID-19 enroute to clinic	9	1.8
Health provided recommended missing/delaying weighing at Posyandu	8	1.6
Posyandu open fewer days/shorter hours	8	1.6
Afraid to go anywhere	6	1.2
Government rules	3	0.6
Concern others will think I have COVID-19 if I go to the clinic	-	-
Other (availability of HCW, gender barriers, waiting times, weather, other)	**18**	**3.5**

Table 3. Reasons identified by caregivers of children two years and younger for missing routine vitamin A supplementation at Posyandu in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing vitamin A (n=78)	N	%
Personal factors		
Child reasons (child sleeping or sick)	5	6.4
Unavailable to attend (busy/working)	8	10.3
Caregiver or household member sick	2	2.6
Could not afford costs associated with visiting the Posyandu	-	-
Service-related factors	**22**	**28.2**
Issues with service provision (vitamin A unavailable, issues with schedule, availability of information)	22	28.2
Factors specifically identified as COVID-related		
Posyandu closed	10	12.8
Health provided recommended missing a visit to the Posyandu	7	6.9
Posyandu open fewer days/shorter hours	3	3.9
Concern about getting COVID-19 enroute to clinic	1	1.3
Concern others will think I have COVID-19 if I go to the clinic	1	1.3
Concern about getting COVID-19 at clinic	-	-
Afraid to go anywhere	-	-
Government rules	-	-
Other (accessibility of service, forgot, gender barriers, other)	**16**	**20.5**

Table 4. Reasons identified by mothers of children two years and younger for missing/delaying routine antenatal care appointments in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing antenatal care (n=141)	N	%
Personal factors	**73**	**51.9**
Personal reasons (including forgot, competing priorities, other personal reasons)	21	14.9
Antenatal care not needed	17	12.1
Caregiver sick	17	12.1
Unavailable to attend (caregiver away, working or busy)	13	9.2
Could not afford costs associated with visiting antenatal care clinic	5	3.6
Service-related factors	**6**	**4.3**
Hard to get an appointment	6	4.3
Factors specifically identified as COVID-related	**86**	**61.1**
Concern about getting COVID-19 at clinic	28	19.9
Concern about getting COVID-19 enroute to clinic	20	14.2
Antenatal care closed	8	5.7
Antenatal care open fewer days/shorter hours	8	5.7
Afraid to go anywhere	8	5.7
Health provided recommended missing a visit to the antenatal care clinic	6	4.3
Pandemic-related (unspecified)	4	2.8
Government rules	2	1.4
Concern about being made to have covid-19 vaccine at clinic	2	1.4
Other (accessibility of service, child reasons, health service availability, pandemic-related, other)	**19**	**13.5**

Table 5. Reasons identified by mothers of children two years and younger for not giving birth in a health facility in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for not giving birth in health facility (N=24)	N	%
Personal factors	**18**	**75.1**
Child born at home	9	37.5
Preferred not to give birth in a health facility	4	16.7
Did not reach health facility in time	4	16.7
Could not afford costs associated with giving birth in a facility	1	4.2
Service-related factors	-	-
Hard to get an appointment	-	-
Factors specifically identified as COVID-related	**6**	**25.0**
Concern about getting COVID-19 at facility	3	12.5
Concern about getting COVID-19 enroute to facility	2	8.3
Concern about being made to have covid-19 vaccine at facility	1	4.2
Facility for birth closed	-	-
Facility for birth open fewer days/shorter hours	-	-
Health provided recommended not giving birth in facility	-	-
Government rules	-	-
Afraid to go anywhere	-	
Other	**4**	**16.7**

Table 6. Reasons identified by mothers of children two years and younger for missing/delaying routine postnatal care in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing/delaying postnatal care (n=95)	N (%)	%
Personal factors	**75**	**79.0**
Postnatal care not needed	62	65.3
Unavailable to attend (busy/sick)	6	6.3
Personal reasons (forgot, other personal reasons)	5	5.3
Could not afford costs associated with visiting postnatal care clinic	2	2.1
Service-related factors	**7**	**7.4**
Accessibility of postnatal care service	7	7.4
Hard to get an appointment	-	-
Factors specifically identified as COVID-related	**18**	**18.9**
Afraid to go anywhere	5	5.3
Concern about getting COVID-19 enroute to clinic	4	4.2
Concern about getting COVID-19 at clinic	3	3.2
Health provided recommended missing a visit to the postnatal care clinic	3	3.2
Postnatal care service open fewer days/shorter hours	2	2.1
Postnatal care service closed	1	1.1
Concern about being made to have covid-19 vaccine at clinic	-	-
Government rules	-	-
Other (unaware it was needed, other)	**6**	**6.3**

Table 7. Reasons identified by mothers of children two years and younger for missing/delaying family planning in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for missing/delaying family planning (n=169)	N (%)	%
Personal factors	**135**	**79.9**
Do not want or need contraception	70	41.4
Other personal reasons ((forgot, busy, sick, use other contraceptive methods, gender barriers)	25	14.8
Fear of contraception procedure or side effects	23	13.6
Timing issues	15	8.9
Could not afford costs associated with visiting family planning clinic	2	1.2
Service-related factors	**8**	**4.7**
Service-related reasons (accessibility, lack of information on service)	7	4.1
Hard to get an appointment	1	0.6
Factors specifically identified as COVID-related	**17**	**10.1**
Concern about getting COVID-19 at clinic	4	2.4
Concern about getting COVID-19 enroute to clinic	3	1.8
Health provided recommended missing a visit to family planning clinic	3	1.8
Family planning service closed	3	1.8
Afraid to go anywhere	2	1.2
Family planning service open fewer days/shorter hours	2	1.2
Concern about being made to have covid-19 vaccine at clinic	-	-
Government rules	-	-
Other	**15**	**8.9**

Table 8. Reasons identified by healthcare providers for experiencing trauma or burnout in Central Java and West Nusa Tenggara, March–April, 2022

Reasons for trauma/burnout (N=387)	N(%)	%
Shifting work duties	104	2609
Long hours/increased workload	233	60.2
Changes in service delivery	92	23.8
Use of PPE	65	16.8
Other service delivery factors	18	4.6
Lockdowns	*7*	*1.8*
Lack of PPE	*9*	*2.3*
Training requirements	*2*	*0.5*
Patient distress	55	14.2
Other patient-related factors	17	4.4
Community do not believe in COVID-19 or reject safety protocols	*10*	*2.6*
Treated poorly by patients	*7*	*1.8*
Fear of making family ill	57	14.7
Fear of illness	52	13.4
Other personal factors	10	5.0
Personal experience with COVID-19	*13*	*3.4*
Personal reasons for trauma/burnout	*6*	*1.6*

Other	15	3.9

Appendix 12. Caregiver survey

A.	DATA COLLECTION GENERAL INFORMATION	
A1	Province 1. Central Java 2. West Nusa Tenggara	[ ]
A2	District 1. Semarang City 2. Demak District 3. Purbalingga District 4. Surakarta City 5. Mataram City 6. Central Lombok District 7. Sumbawa District 8. Bima City	[ ]
A3	Subdistrict See code list for subdistricts	[ ] [ ]
A4	Village See code list for villages	[ ] [ ]
A5	Substitute respondent	[ ] yes [ ] no
A6	Unique interview ID	[ ] [ ]
A7	Interview date	___/___/____
A8	Interview start time	____ ____
A9	Interview finish time	____ ____
A10	Interviewer name	
A11	Interviewer initials	
B	CHECKING STATUS AND DATA ENTRY	
B1	Checking date by field coordinator	___/___/____
B2	Field coordinator name	
B3	Field coordinator initials	
B4	Date of data entry	___/___/____
B5	Data entry officer initials	

	Section 1: Demographics	**Response Code**
Note: PRIMARY CAREGIVER is the person who MOST COMMONLY or DOMINANTLY takes care of the child aged under 2 everyday, including preparing the food and feeding the subject, playing, giving a bath, etc.		
C0	Could you tell me your name for the purpose of this interview? _____	

C1	Are you the parent or primary caregiver of any children who are younger than 2 years old? 1. No [*identify primary carer in household of any children under 2 before continuing*] 2.Yes *[continue to the following questions]*	[ ]
C2	What is your relationship to this child? Would you say… 1. Mother 2. Father 3. Grandparent 4. Uncle or Aunt 5. Brother or Sister 6. Other, please specify _____	[ ]
C3	Gender of respondent *[interviewer to observe only]* 1. Female 2. Male	[ ]
C4	How old are you? years	[ ]
C5	What is your religion? 1. Islam 2. Christian Protestant 3. Catholicism 4. Buddhism 5. Hinduism 6. Confucianism 7. I am not affiliated with any religion 8. Not sure 9. Declined to answer	[ ]
C6	What is your highest level of education? 1. Did not attend school 2. Did not complete Primary school 3. Completed primary school 4. Completed middle school 5. Completed high school 6. Completed a diploma 7. Bachelor's degree and above 8. Don't know	[ ]
C7	What is your employment status 1. Student 2. Self-employed (own business) 3. Civil servant 4. Formally employed full time 5. Formally employed part time 6. Farmer 7. Unemployed/Home maker 8. Other, specify _____	[ ]

C8	Does the child aged under 2 for whom you are the primary caregiver have another main caregiver in your household? 1. No *(skip to C13)* 2.Yes *(continue to C9)*	[ ]
C9	What is their relationship to this child? 1. Mother 2. Father 3. Grandparent 4. Uncle or Aunt 5. Brother or Sister 6. Other, please specify _____	[ ]
C10	What is their highest level of education attended? 1. Did not attend school 2. Did not complete Primary school 3. Completed primary school 4. Completed middle school 5. Completed high school 6. Completed a diploma 7. Bachelor's degree and above 8. Don't know	[ ]
C11	What is their employment status? 1. Student 2. Self-employed (own business) 3. Civil servant 4. Formally employed full time 5. Formally employed part time 6. Farmer 7. Home maker/carer 8. Other, please specify _____ 9. Don't know	[ ]
C12	Are they in charge as the main financial provider or breadwinner for the household? 1. Yes, I am only 2. Yes, I and my husband/wife 3. No, another member of the household is the main financial provider, please specify _____ 5. Don't know	[ ]
C13	Total household income per month? Rp _____ *(Write 99 if 'don't know)*	
C14	Thinking about the child under 2, how many siblings do they have in total? siblings	[ ]
C15	Thinking about all the siblings aged under 5, what are their ages, gender and immunization status? Start with the oldest child aged under 5, *[If no children under the age of 2, terminate interview]*	
C15	Age of child	[ ]

CHILD 1	Gender of child 1. Male 2. Female	[ ]
	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C15 CHILD 2	Age of child	[ ]
	Gender of child 1. Male 2. Female	[ ]
	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C15 CHILD 3	Age of child	[ ]
	Gender of child 1. Male 2. Female	[ ]
	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C15 CHILD 4	Age of child	[ ]
	Gender of child 1. Male 2. Female	[ ]
	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C15 CHILD 5	Age of child	[ ]
	Gender of child 1. Male 2. Female	[ ]

	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C15 CHILD 6	Age of child	[ ]
	Gender of child 1. Male 2. Female	[ ]
	Immunisation status 1. Complete basis by age 2. Complete routine immunizations according to age (≥18 months) 3. Incomplete/partial 4. No immunizations 5. Don't know	[ ]
C16	Thinking about your eldest child who is under 2 years of age, what is their date of birth? *If exact date of birth is unknown, ask for approximate month and year.* D D M M Y Y Y Y	
C17	Could you tell me the name of this child? _____	
	Section 2: Routine Immunisation	
	Inform participants that the following questions relate to their oldest child under 2, whose name they just provided. Then state the name of the child to refer to the relevant questions.	
D1	The Indonesian government has a number of vaccines recommended for children. Do you want [NAME] to get none of these vaccines, some of these vaccines, or all of these vaccines? Would you say… *(The options are read)* 1. None 2. Some 3. All 4. Don't know	[ ]
D2	How important do you think vaccines are for your child's health? Would you say… *(The options are read)* 1. Not at all important 2. A little important 3. Moderately important 4. Very important	[ ]
D3	Do you think most of your close family and friends want you to get your child vaccinated? 1. No 2. Yes	[ ]
D4	Do you know where to go to get your child vaccinated?	[ ]

	1. No (*Skip to D5)* 2. Yes *(continue to D4a)* 3. Don't know *(continue to D5)*	
D4a	Where do you go to get your child vaccinated? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Puskesmas	A.
	B. Posyandu	B.
	C. Clinic	C.
	D. Midwife's practice	D.
	E. Government hospital	E.
	F. Private hospital	F.
	G. Other, specify	G.
D5	How cheap is it to pay for vaccination? When you think about the cost, please consider any payments to the clinic, the cost of getting there, plus the cost of taking time away from work. Would you say… 1. Not at all cheap 2. A little cheap 3. Moderately cheap 4. Very cheap	[ ]
D5a	How easy is it to get vaccination services for your child? Would you say… 1. Not at all easy 2. A little easy 3. Moderately easy 4. Very easy	[ ]
D6	For [NAME], do you have an Immunisation Record, child health record, immunisation records from a private health provider or any other document where your child's vaccinations are written down? 1. Yes, only has immunization record or child health record *(continue to D7)* 2. Yes, has only other document *(continue to D7)* 3. Yes, has immunization record or child health record and other document *(continue to D7)* 4. Yes, but she/he could not show them *(Skip to D9)* 5. No, has no immunization record, child health and no other document *(skip to D9)*	[ ]
D7	May I see the card(s) and/or other documents? 1. Yes, only card(s) seen *(continue to D8)* 2. Yes, only other document seen *(continue to D8)* 3. Yes, card(s) and other document seen *(continue to D8)* 4. No cards and no other document seen *(skip to D9)*	[ ]
D8	Has [NAME] received or not received the following:	

	1. If the complete immunization record is available for all types of immunization (date and checklist), then fill in the question D8 and do not need to fill in D9-D19 *2. If the immunization record is available but incomplete for all types of immunization (date or checklist mark) then ask question D8 (fill in the available immunization record) and fill in questions D9-D18* *3. If the immunization record is not available, then immediately fill in questions D9-D18 and do not need to fill in questions D8*	

No	Question	Option	Answer
1.	BCG	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
2.	DPT 1	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
3.	DPT 2	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
4.	DPT 3	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
5.	POLIO 1	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
6.	POLIO 2	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
7.	POLIO 3	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
8.	POLIO 4	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
9.	HepB 0	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
10	Pentavalen (DPT-HB-HiB) 1	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
11	Pentavalen (DPT-HB-HiB) 2	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
12	Pentavalen (DPT-HB-HiB) 3	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
13	Measles	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
14	Booster / (DPT-HB-HiB) 4	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
15	Booster/MR 2	Date/+/0/1	[ ]
		Place of Immunization service	[ ]
16	Immunization status	Not immunized	[ ]
		Partially immunized	[ ]

		Fully immunized	[ ]
17	Fully immunized before age 1	Yes = 1 No = 2 NA = 3	[ ]

Note: Date/+/0/1

Place of immunization service:

Date = copy the date from the immunization card
1 = outreach facility
2 = government's hospital
3= private clinics
4= private hospitals
5= health centres
6= Other

	[Only ask participant D9-18 If immunization card or other documentation is unavailable. If immunizations are recorded in D8, continue to Section E]	
D9	Has [NAME] ever received a BCG vaccination against tuberculosis – that is, an injection in the arm or shoulder that usually causes a scar? 1. Yes 2. No 3. Don't know	[ ]
D10	Did [NAME] receive a Hepatitis B vaccination – that is an injection on the outside of the thigh to prevent Hepatitis B disease – within the first 24 hours after birth? 1. Yes, within 24 hours 2. Yes, but not within 24 hours 3. No 4. Don't know	[ ]
D11	Has [NAME] ever received any vaccination drops in the mouth to protect (him/her) from polio when he/she aged one or two months old? 1. Yes *(continue to D12)* 2. No *(skip to D14)* 3. Don't know *(skip to D14)*	[ ]
D12	Were the first polio drops received in the first two weeks after [NAME] birth? 1. Yes 2. No 3. Don't know	[ ]
D13	How many times were the polio drops received? 1. Number of times _____ 2. Don't know	[ ]
D14	Did [NAME] get an injection to protect against polio? 1. Yes 2. No 3. Don't know	[ ]
D15	Has [NAME] ever received a Pentavalent (DPT-HB-Hib) vaccination – that is, an injection in the thigh to prevent (him/her) from getting tetanus, whooping cough, diphtheria, Hepatitis B disease, and Haemophilus influenzae type b? 1. Yes *(continue to D16)* 2. No *(skip to D17)* 3. Don't know *(skip to D17)*	[ ]
D16	How many times was the Pentavalent (DPT-HB-Hib) vaccine received? 1. 1. Number of times _____ 2. 2. Don't know	[ ]
D17	Has [NAME] ever received a MMR/MR vaccine – that is, a shot in the arm at the age of 9 months or older - to prevent (him/her) from getting measles, mumps and rubella? 1. Yes *(continue to D18)* 2. No *(skip to Section 3)* 3. Don't know *(skip to Section 3)*	[ ]

D18	How many times was the MMR/MR vaccine received? 1. Number of times _____ 2. Don't know	[ ]
	Section 3: Impact of COVID-19 on Routine Immunisation and Child Health Services	
E1	Compared to before COVID-19, would you say that child immunization services have been easier to access during the pandemic, harder to access, or about the same? 1. Easier to access during the pandemic 2. About the same access during the pandemic 3. Harder to access during the pandemic 4. Not applicable -I don't have children who need immunizations before the pandemic *(skip to E3)*	[ ]
E2	Compared to before COVID-19, would you say that child immunization services have been higher quality during the pandemic, lower quality, or about the same? 1. Higher quality during the pandemic 2. About the same quality during the pandemic 3. Lower quality during the pandemic 4. Not applicable – I don't have children who need immunizations before the pandemic	[ ]
E3	How can the quality of child immunization services be improved? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Expand open days or hours	A.
	B. Reduce waiting times	B.
	C. Improved COVID-19 precautions	C.
	D. Improved facility cleanliness	D.
	E. Better staff training/knowledge/skills	E.
	F. Improve respectful care and communication	F.
	G. Increase time with staff during visit	G.
	H. Other, specify	H.
	I. Don't know	I.
E4	Did [NAME] miss or delay receiving any routine vaccine because of the COVID-19 pandemic? 1. Yes, [NAME] missed a vaccine because of the pandemic *(continue to E5)* 2. Yes, [NAME] delayed a vaccine because of the pandemic *(continue to E5)* *3. Yes, [NAME] missed or delayed a vaccine but not because of the pandemic (continue to E5)* 4. No, [NAME] did not miss or delay a vaccine *(skip to E6)* 5. Don't know *(skip to E6)*	[ ]
E5	What is the reason that [NAME] missed or delayed vaccination? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer*	

	MUST NOT read out the answer options, but select the option mentioned which is closest]	
	A. Posyandu closed	A.
	B. Posyandu open fewer days/shorter hours	B.
	C. Closed vaccination clinic	C.
	D. Vaccination clinic open fewer days/shorter hours	D.
	E. Concern about getting COVID-19 while travelling to the clinic	E.
	F. Concern about getting COVID-19 at the vaccination clinic	F.
	G. Concern that others will think I have COVID-19 if I go to the vaccination clinic	G.
	H. Didn't need vaccination	H.
	I. A healthcare provider recommended missing or delaying vaccines	I.
	J. Couldn't afford the costs related to getting vaccinated	J.
	K. The government said that people can go out only for essential services	K.
	L. Hard to get an appointment	L.
	M. Health facility did not provide vaccination for children	M.
	N. Household member was sick	N.
	O. Afraid to go anywhere	O.
	P. Other, specify	P.
E6	Compared to before COVID-19, would you say that child health services have been easier to access during the pandemic, harder to access, or about the same? 1. Easier to access during the pandemic 2. About the same access during the pandemic 3. Harder to access during the pandemic 4. Not applicable - I did not have a child who needed any health services before the pandemic *(skip to E8)*	[ ]
E7	Compared to before COVID-19, would you say that child health services have been higher quality during the pandemic, lower quality, or about the same? 1. Higher quality during the pandemic 2. About the same quality during the pandemic 3. Lower quality during the pandemic 4. Not applicable – I did not have a child who needed any health services before the pandemic	[ ]
E8	How can the quality of child health services be improved? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Expand open days or hours	A.
	B. Reduce waiting times	B.
	C. Improved COVID-19 precautions	C.
	D. Improved facility cleanliness	D.
	E. Better staff training/knowledge/skills	E.
	F. Improve respectful care and communication	F.

	G. Increase time with staff during visit	G.
	H. Other, specify	H.
	I. Don't know	I.
E9	Did [NAME] miss any visits to Posyandu for weighing because of COVID-19? 1. Yes, [NAME] missed a Posyandu visit for weighing because of the pandemic *(continue to E10)* 2. Yes, [NAME] missed a Posyandu visit for weighing, but not because of the pandemic *(continue to E10)* 3. No, [NAME] did not miss any of their Posyandu visits for weighing *(skip to E11)* 4. Don't know *(skip to E11)*	[ ]
E10	What is the reason that [NAME] missed a visit to the Posyandu for weighing? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Posyandu closed	A.
	B. Posyandu open fewer days/shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the Posyandu	C.
	D. Concern about getting COVID-19 at the Posyandu	D.
	E. Concern that others will think I have COVID-19 if I go to the Posyandu	E.
	F. A healthcare provider recommended missing a visit to the Posyandu	F.
	G. Couldn't afford the costs related to attending the Posyandu	G.
	H. The government said that people can go out only for essential services	H.
	I. Household member was sick	I.
	J. Afraid to go anywhere	J.
	K. Others, specify	K.
E11	Did [NAME] miss or delay Vitamin A supplementation? 1. Yes, [NAME] missed a vitamin A supplementation because of the pandemic *(continue to E12)* 2. Yes, [NAME] had a delayed vitamin A supplementation because of the pandemic *(continue to E12)* 3.Yes, [NAME] missed or delayed vitamin A supplementation, but not because of the pandemic *(continue to E12)* 4. No, [NAME] did not miss or delay a vitamin A supplementation *(skip to E13)* 5. Don't know *(skip to E13)*	[ ]
E12	What is the reason that [NAME] missed or delayed vitamin A supplementation? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Posyandu closed	A.

	B. Posyandu open fewer days/shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the Posyandu	C.
	D. Concern about getting COVID-19 at the Posyandu	D.
	E. Concern that others will think I have COVID-19 if I go to the Posyandu	E.
	F. A healthcare provider recommended missing a visit to the Posyandu	F.
	G. Couldn't afford the costs related to attending the Posyandu	G.
	H The government said that people can go out only for essential services	H.
	I. Household member was sick	I.
	J. Afraid to go anywhere	J.
	K. Other, specify	K.
E13	Were there any changes to routine immunization or child health services to help reduce the impact of COVID, such as telehealth, phone calls or other? 1. Yes *(continue to E14)* 2. No *(skip to Section 4)* 3. Don't know *(skip to Section 4)*	[ ]
E14	What changes were made? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Instead of face-to-face visits, telehealth services were offered by staff	A.
	B. instead of face-to-face visits, the staff made phone calls	B.
	C. Staff conducted care visits outside ie in the car park	C.
	D. Staff visited house to house	D.
	E. Other, specify	E.
	Section 4: Impact of COVID-19 on Routine MCH services	
	[I am now going to ask you some questions about your experiences with maternal and child health services during the COVID-19 pandemic.]. These questions F1 – F13 are only for participants who are the child's biological mother (refer to C2)	
F1	Compared to before COVID-19, would you say that maternal and child health services you attended, such as family planning and antenatal care, have been easier to access during the pandemic, harder to access, or about the same? 1. Easier to access during the pandemic 2. About the same access during the pandemic 3. Harder to access during the pandemic 4. Not applicable - I did not need maternal and child health services before the pandemic *(skip to F3)*	[ ]
F2	Compared to before COVID-19, would you say that maternal and child health services you attended, such as family planning and antenatal care, have been higher quality during the pandemic, lower quality, or about the same? 1. Higher quality during the pandemic	[ ]

	2. About the same quality during the pandemic 3. Lower quality during the pandemic 4. Not applicable – I did not need maternal and child health services before the pandemic	
F3	How can the quality of maternal and child health services be improved? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Expand open days or hours	A.
	B. Reduce waiting times	B.
	C. Improved COVID-19 precautions	C.
	D. Improve facility cleanliness	D.
	E. Better staff training/knowledge/skills	E.
	F. Improve respectful care and communication	F.
	G. Increase time with staff during visit	G.
	H. No need for improvement	H.
	I. Other, specify	I.
	J. Don't know	J.
F4	Did you miss or delay any antenatal care visits because of COVID-19? *Interviewer to read options.* 1. Yes, I missed an antenatal care visit because of the pandemic *(continue to F5)* 2. Yes, I delayed an antenatal care visit because of the pandemic *(continue to F5)* 3. Yes, I missed or delayed an antenatal care visit, but not because of the pandemic *(continue to F5)* 4. No, I did not miss or delay any antenatal care visit *(skip to F6)* 5.Not applicable - I have not needed any antenatal care since the pandemic started *(skip to F6)* 6. Don't know *(skip to F6)*	
F5	What is the reason you missed or delayed an antenatal care visit? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Antenatal care service closed	A.
	B. Antenatal care service open fewer days or shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the clinic	C.
	D. Concern about getting COVID-19 at the antenatal care service	D.
	E. Concern about being made to have the COVID-19 vaccine at the clinic	E.
	F. Didn't need antenatal care	F.
	G. A healthcare provider recommended missing or delaying antenatal care	G.
	H Couldn't afford the costs related to antenatal care	H.

	I. The government said that people can go out only for essential services	I.
	J. Hard to get an appointment	J.
	K. Afraid to go anywhere	K.
	L. Other, specify	L.
F6	Did you have a birth outside of a health facility because of COVID-19? 1. Yes, I gave birth outside of a health facility because of pandemic *(continue to F7)* 2. Yes, I gave birth outside of a health facility, but not because of the pandemic *(continue to F7)* 3. No, I still gave birth in a facility *(skip to F8)* 4. Not applicable - I have not given birth during the COVID-19 pandemic *(skip to F8)*	[ ]
F7	What is the reason you gave birth outside of a health facility? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Facility for birth closed	A.
	B. Facility for birth open fewer days or shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the facility	C.
	D. Concern about getting COVID-19 at the birth facility	D.
	E. Concern about being made to have the COVID-19 vaccine at the facility	E.
	F. Preferred not to give birth in a facility	F.
	G. A healthcare provider recommended I do not give birth in a facility	G.
	H Couldn't afford the costs related to giving birth in a facility	H.
	I. The government said that people can go out only for essential services	I.
	J. Hard to get an appointment	J.
	K. Afraid to go anywhere	K.
	L. Other, specify	L.
F8	Did you miss or delay any postnatal care visits because of COVID-19? *Interviewer to read options.* 1. Yes, I missed a postnatal care visit because of the pandemic *(continue to F9)* 2. Yes, I delayed a postnatal care visit because of the pandemic *(continue to F9)* 3. Yes, I missed or delayed a postnatal care visit, but not because of the pandemic *(continue to F9)* 4. No, I did not miss or delay a postnatal care visit *(skip to F10)* 5. Not applicable – I have not needed a postnatal care visit since the pandemic started *(skip to 10)* 6. Don't know *(skip to F10)*	[ ]
F9	What is the reason that you missed or delayed a postnatal care visit? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer*	

	MUST NOT read out the answer options, but select the option mentioned which is closest]	
	A. Postnatal service closed	A.
	B. Postnatal service open fewer days or shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the clinic	C.
	D. Concern about getting COVID-19 at the postnatal care service	D.
	E. Concern about being made to have the COVID-19 vaccine at the clinic	E.
	F. Didn't need postnatal care	F.
	G. A healthcare provider recommended missing or delaying postnatal care	G.
	H. Couldn't afford the costs related to postnatal care	H.
	I. The government said that people can go out only for essential services	I.
	J. Hard to get an appointment	J.
	K. Afraid to go anywhere	K.
	L. Other, specify	L.
F10	Did you miss or delay any family planning visits because of COVID-19? *Interviewer to read options.* 1. Yes, I missed a family planning visit because of the pandemic *(continue to F11)* 2. Yes, I delayed a family planning visit because of the pandemic *(continue to F11)* 3. Yes, I missed or delayed a family planning visit, but not because of the pandemic *(continue to F11)* 4. No, I did not miss or delay a family planning visit *(skip to F12)* 5. Not applicable- I have not needed a family planning visit since the pandemic started *(skip to F12)* 6. Don't know *(skip to F12)*	[ ]
F11	What is the reason that you missed or delayed a family planning visit? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Family planning service closed	A.
	B. Family planning service open fewer days or shorter hours	B.
	C. Concern about getting COVID-19 while travelling to the clinic	C.
	D. Concern about getting COVID-19 at the family planning service	D.
	E. Concern about being made to have the COVID-19 vaccine at the clinic	E.
	F. Didn't need family planning	F.
	G. A healthcare provider recommended missing or delaying family planning	G.
	H. Couldn't afford the costs related to family planning	H.
	I. The government said that people can go out only for essential services	I.
	J. Hard to get an appointment	J.
	K. Afraid to go anywhere	K.
	L. Other, specify	L.

F12	Were there any changes to maternal child health services to help reduce the impact of COVID, such as telehealth, phone calls or other? 1. Yes *(continue to F13)* 2. No *(skip to Section 5)* 3. Don't know *(skip to Section 5)*	[ ]
F13	What changes were made? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Instead of face-to-face visits, telehealth services were offered by staff	A.
	B. instead of face-to-face visits, the staff made phone calls	B.
	C. Staff conducted care visits outside ie in the car park	C.
	D. Other, specify	D.
	Section 5: COVID-19 (for all participants)	
G1	Have you ever had COVID-19? 1. No *(skip to G6)* 2. Yes *(continue to G2)* 3. Not sure *(skip to G6)*	[ ]
G2	In your opinion, based on the symptoms you suffered/felt, was it mild, moderate or severe? 1. Mild 2. Moderate 3. Severe 4. Not Sure	[ ]
G3	Was it confirmed by a test? 1. Confirmed by a test *(continue to G4)* 2. Not confirmed by a test *(skip to G5)*	[ ]
G4	If confirmed by tests, what tests were performed? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. PCR test	A.
	B. Antigen test	B.
	C. Antibody test	C.
	D. Others, please specify	D.
	E. Don't know	E.
G5	Were you hospitalized? 1. No 2. Yes	[ ]
G6	Has anyone you know had COVID-19? 1. No 2. Yes, family only 3. Yes, other people (not family) 4. Yes, family and other people 5. Not sure	[ ]

G7	Do you know where to go to get a COVID-19 vaccine for yourself? 1. No 2. Yes	[ ]
G8	Have you received a COVID-19 vaccine? Would you say: 1. No *(skip to G11)* 2. Yes, you received one dose *(continue to G9)* 3. Yes, your received two doses *(continue to G9)* 4. Yes, you received three or more doses? *(continue to G9)* 5. Not sure *(skip to G11)*	[ ]
G9	Do you still need another dose of COVID-19 vaccine? Would you say… 1. No, you do not need another dose 2. Yes, you do need another dose or doses 3. Not sure	[ ]
G10	Do you have a vaccine card/certificate? 1. Yes, showable (peduli lindungi/card) *(ask to view the card)* 2. Yes, but can't be shown 3. No	[ ]
G11	*[If respondent is not vaccinated – see G8]* Do you want to get COVID-19 vaccine? Would you say: 1. No, you do not want to 2. Yes, you do want to, or are you 3. Not sure	[ ]
G12	Do you think most of your close family and friends would want you to get a COVID-19 vaccine? 1. No 2. Yes	[ ]
G13a	How easy is it to get a COVID vaccine for yourself? Would you say… 1. Not at all easy 2. A little easy 3. Moderately easy 4. Very easy	[ ]
G13b	What makes it hard for you to get a COVID-19 vaccine? Would you say… *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer may read out the answer options]*	
	A. COVID-19 vaccination is not yet available for me	A.
	B. Making an appointment is hard	B.
	C. I can't go on my own (I have a physical limitation)	C.
	D. The vaccination site is hard to get to	D.
	E. The opening times are inconvenient	E.
	F. Sometimes people are turned away without vaccination	F.
	G. The waiting time takes too long	G.
	H. Something else, please specify	H.
	I. Nothing. It's not hard	I.
G14	How cheap is it to pay for COVID-19 vaccination? When you think about the cost, please consider any payments to the clinic, the	[ ]

	cost of getting there, plus the cost of taking time away from work. Would you say…. 1. Not at all cheap 2. A little cheap 3. Moderately cheap 4. Very cheap	
G15	How much did you pay for COVID-19 vaccination, including any payments to the clinic, the cost of getting there, plus the cost of taking time away from work? Rp____	
G16	How concerned are you about getting COVID-19? Would you say… 1. Not at all concerned 2. A little concerned 3. Moderately concerned 4. Very concerned	[ ]
G17	How concerned are you about your close family and friends getting COVID-19 from you? Would you say… 1. Not at all concerned 2. A little concerned 3. Moderately concerned 4. Very concerned	[ ]
G18	How important do you think getting a COVID-19 vaccination will be for your health? Would you say… 1. Not at all important 2. A little important 3. Moderately important 4. Very important	[ ]
G19	In the last year, have you seen or heard anything that made you worry about the COVID-19 vaccine? 1. No 2. Yes	[ ]
G20	Have you encountered information on COVID-19 where you found it hard to decide whether it was right or wrong? For example, information about ways to prevent COVID-19 or to recover? 1. No *(skip to G21)* 2. Yes *(continue to G20)*	[ ]
G21	Where did you see or hear this information? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Via an online search	A.
	B. Facebook	B.
	C. WhatsApp	C.
	D. YouTube	D.
	E. Twitter	E.
	F. TikTok	F.
	G. Instagram	G.
	H. Snapchat	H.

	I. Word of mouth	I.
	J. Other, specify	J.
G22	In the last year, what were the 3 most important sources of information that helped you make decisions about COVID-19? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Healthcare workers	A.
	B. Private doctor	B.
	C. Public doctor	C.
	D. Radio	D.
	E. Printed education materials	E.
	F. Printed media	F.
	G. Church/mosque	G.
	H. Other person, relatives, neighbours	H.
	I. TV	I.
	J. Internet	J.
	K. Mobile phone application (Whatsapp)	K.
	L. Social media	L.
	M. Alternative health providers	M.
	N. Other, please specify	N.

Appendix 13- Healthcare provider survey

	DATA COLLECTION GENERAL INFORMATION	Answer Code
A1	Province 1. Central Java 2. West Nusa Tenggara	[ ]
A2	District 1. Semarang City 2. Demak District 3. Purbalingga District 4. Surakarta City 5. Mataram City 6. Central Lombok District 7. Sumbawa District 8. Bima City	[ ]
A3	Subdistrict See code list for subdistricts	[ ] [ ]
A4	Village See code list for villages	[ ] [ ]
A5	Health Facility Type 1. Posyandu 2. Puskesmas/Pustu 3. Clinic 4. Independent midwife practice 5. Hospital 6. Other, specify	[ ]
A6	Selected respondent number	[ ] [ ]
A7	Unique interview ID	[ ] [ ]
A8	Substitute respondent	[ ] yes [ ] no
A9	Interview date	___/___/____
A10	Interview start time	____ ____
A11	Interview finish time	____ ____
A12	Interviewer name	
A13	Interviewer Initials	
	CHECKING STATUS AND DATA ENTRY	
B1	Checking date by field coordinator	___/___/____
B2	Field coordinator name	
B3	Field coordinator initials	
B4	Date of data entry	___/___/____
B5	Data entry officer initials	

	Section 1: Demographics	**Response code**
C0	Could you tell me your name, for the purposes of this interview?	
C1	Gender of respondent *[interviewer to observe only]* 1. Female 2. Male	[ ]

C2	How old are you? years	[ ]
C3	C3. What is your highest level of education? 1. Completed high school 2. Completed a diploma (D3) 3. Completed diploma (D4) 4. Undergraduate degree 5. Profession degree 6. Masters 7. PhD	[ ]
C4	What is your current role? 1. Doctor 2. Nurse 3. Midwife 4. Allied health 5. Community health worker/village midwife 6. Traditional healer 7. Other, specify	[ ]
C5	How many years have you worked in this professional role? 1. Less than 2 years 2. Between 2 and less than 5 years 3. Between 5 and less than 10 years 4. 10 years or more	[ ]
C6	What health facility do you primarily work in? 1. Puskesmas *(continue to C7)* 2. Poskesdes *(continue to C7)* 3. Polindes *(continue to C7)* 4. Pustu *(continue to C7)* 5. Independent midwife practice *(continue to C7)* 6. Private clinic *(continue to C7 & C8)* 7. Other, specify *(continue to C7)*	[ ]
C7	Do you work in any other health facility? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. No	A.
	B. Yes, Puskesmas	B
	C. Yes, Poskesdas	C.
	D. Yes, Pustu	D.
	E. Yes, independent midwife practice	E.
	F. Yes, private clinic	F.
	G. Other, specify	G.
C8	*[If respondent answered 'Yes' for private clinic in C6 OR C7, ask the question below. If the respondent does not work in a private clinic continue to C9]* How would you describe the private clinic you work in. Is it:	

	[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]	
	A. Not for profit - Religiously affiliated	A.
	B. Not for profit – not religiously affiliated	B.
	C. For profit	C.
	D. Other, specify	D.
	E. Don't know	E.
C9	Which health services do you support? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Routine child Immunization	A.
	B. COVID-19 Immunization	B.
	C. Antenatal care	C.
	D. Labor and birth	D.
	E. Postnatal care	E.
	F. Family planning	F.
	G. Baby and child services (weighing, vitamin A supplementation, etc)	G.
	H. Other, specify	H.
	Section 2: Impact of COVID-19 on Routine Immunisation and MCH services	
	If the respondent did not select 'routine child immunisation' or 'COVID-19 immunisation' in Section 1 , C9, proceed to D8.	
D1	Do you have systems in place to track people who miss out on routine vaccines or defaulters? 1. No 2. Yes 3. Not sure	[ ]
D2	In the past year have you had a stock-out of any routine vaccines? 1. No *(skip to D4)* 2. Yes *(continue to D3)* 3. Not sure *(skip to D4)*	[ ]
D3	Which vaccines have been stocked out? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. BCG	A.
	B. HepB	B.
	C. OPV	C.
	D. IPV	D.

	E. Pentavalent (DPT-HB-Hib)	E.
	F. PCV	F.
	G. MMR/MR	G.
	H. Other, specify	H.
D4	In the past year have you had a stock out of any injection equipment? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. No	A.
	B. Yes, syringes	B.
	C. Yes, needles	C.
	D. Yes, diluent	D.
	E. Don't know	E.
D5	Apart from your basic professional training, have you had any formal training in immunisation? 1. No 2. Yes	[ ]
D6	Do you have a copy of the standard operating procedure for routine immunisation in your clinic? 1. No 2. Yes 3. Don't know	[ ]
D7	If required, would it bother you to give more than one injection during a vaccine encounter? 1. No 2. Yes	[ ]
D8	In the facility that you primarily work in (service mentioned earlier), did you experience any of the following disruptions due to COVID-19?	
	8a. Closure of the service 1. No 2. Yes 3. Don't know	[ ]
	8b. Lockdowns hindering access to the service for parents or caregivers 1. No 2. Yes 3. Don't know	[ ]
	8c. Fewer parents/caregivers presenting to service for reasons other than lockdown 1. No 2. Yes	[ ]

	3. Don't know	
	8d. Not enough staff to provide services 1. No 2. Yes 3. Don't know	[ ]
	8e. Staff deployed to provide COVID-19 relief 1. No 2. Yes 3. Don't know	[ ]
	8f.Insufficient personal protective equipment (PPE) available for health care providers to provide services 1. No 2. Yes 3. Don't know	[ ]
	8g. Unavailability/stock out of vaccines or injecting equipment at service 1. No 2. Yes 3. Don't know	[ ]
	8h. Changes in policies for who can be vaccinated 1. No 2. Yes 3. Don't know	[ ]
	8i. Others (please specify what are the other causes of this disruption and/or changes in service utilization):	
D9	In the facility that you primarily work in (service mentioned earlier), what approaches were used to overcome the disruptions due to COVID-19? Did you see…..	
	9a.Task shifting / role delegation 1. No 2. Yes 3. Don't know	[ ]
	9b. Redirection of parents or caregivers to alternative health care facilities 1. No 2. Yes 3. Don't know	[ ]
	9c. Community outreach to explain service disruptions and changes 1. No 2. Yes 3. Don't know	[ ]
	9d. Patients or caregivers seen outdoors from the facility 1. No 2. Yes 3. Don't know	[ ]
	9e. Government removal of user fees 1. No 2. Yes	[ ]

	3. Don't know	
	9f. Phone calls to patients or caregivers 1. No 2. Yes 3. Don't know	[ ]
	9g. Others, describe what other approaches are being used	[ ]
	Section 3: COVID-19	
E1	Have you ever had COVID-19? 1. No *(skip to E6)* 2. Yes *(continue to E2)* 3. Not sure *(skip to E6)*	[ ]
E2	In your opinion, based on the symptoms you suffered/felt, was it mild, moderate or severe? 1. Mild 2. Moderate 3. Severe 4. Not Sure	[ ]
E3	Was it confirmed by a test? 1. Confirmed by a test *(continue to E4)* 2. Not confirmed by a test *(Skip to E5)*	[ ]
E4	If confirmed by tests, what tests were performed? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. PCR test	A.
	B. Antigen test	B.
	C. Antibody test	C.
	D. Other, specify	D.
	E. Don't know	E.
E5	Were you hospitalized? 1. No 2. Yes	[ ]
E6	Has anyone you know had COVID-19? 1.. No 2. Yes, family only 3. Yes, other people only (not family) 4. Yes, family and other people 5. Not sure	[ ]
E7	Do you know where to go to get a COVID-19 vaccine for yourself? 1. No 2. Yes	[ ]
E8	Have you received a COVID-19 vaccine? Would you say… 1. No *(skip to E11)* 2. Yes, you received one dose *(continue to E9)* 3. Yes, your received two doses *(continue to E9)* 4. Yes, you received three or more doses? *(continue to E9)* 5. Not sure *(skip to E11)*	[ ]

E9	Do you still need another dose of COVID-19 vaccine? Would you say… 1. No, you do not need another dose 2. Yes, you do need another dose or doses 3. Not sure	[ ]
E10	Do you have a vaccine card/certificate? 1. Yes, showable (peduli lindungi/card) *(ask to view the card)* 2. Yes, but can't be shown 3. No	[ ]
E11	*[If respondent is not vaccinated – see E8]* Do you want to get a COVID-19 vaccine? Would you say… 1. No, you do not want to 2. Yes, you do want to, or are you 3. Not sure	[ ]
E12	Do you think most of your close family and friends would want you to get a COVID-19 vaccine? 1. No 2. Yes	[ ]
E13a	How easy is it to get a COVID vaccine for yourself? Would you say… 1. Not at all easy 2. A little easy 3. Moderately easy 4. Very easy	[ ]
E13b	What makes it hard for you to get a COVID-19 vaccine? Would you say… *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer may read out the answer options]*	
	A. COVID-19 vaccination is not yet available for me	A.
	B. Making an appointment is hard	B.
	C. I can't go on my own (I have a physical limitation)	C.
	D. The vaccination site is hard to get to	D.
	E. The opening times are inconvenient	E.
	F. Sometimes people are turned away without vaccination	F.
	G. The waiting time takes too long	G.
	H. Something else, specify	H.
	I. Nothing. It's not hard	I.
E14	How cheap is it to pay for COVID-19 vaccination? When you think about the cost, please consider any payments to the clinic, the cost of getting there, plus the cost of taking time away from work. Would you say… 1. Not at all easy 2. A little easy 3. Moderately easy 4. Very easy	[ ]

E15	How concerned are you about getting COVID-19? Would you say… 1. Not at all concerned 2. A little concerned 3. Moderately concerned 4. Very concerned	[ ]
E16	How concerned are you about your patients getting COVID-19 from you? Would you say… 1. Not at all concerned 2. A little concerned 3. Moderately concerned 4. Very concerned	[ ]
E17	How important do you think getting a COVID-19 vaccination will be for your health? Would you say… 1. Not at all important 2. A little important 3. Moderately important 4. Very important	[ ]
E18	How confident are you that you could answer patient questions about getting a COVID-19 vaccine? Would you say… 1. Not at all confident 2. A little confident 3. Moderately confident 3. Very confident	[ ]
E19	In the last year, have you seen or heard anything that made you worry about the COVID-19 vaccine? 1. No 2. Yes	[ ]
E20	Have you encountered information on COVID-19 where you found it hard to decide whether it was right or wrong? For example, information about ways to prevent the disease or to recover? 1. No *(skip to E22)* 2. Yes *(continue to E21)*	[ ]
E21	Where did you see or hear this information? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Via an online search	A.
	B. Facebook	B.
	C. WhatsApp	C.
	D. YouTube	D.
	E. Twitter	E.
	F. TikTok	F.
	G. Instagram	G.
	H. Snapchat	H.
	I. Word of mouth	I.
	J. Other, specify	J.
E22	How confident are you that you could respond to misinformation about the COVID-19 vaccine? 1. Not at all confident	[ ]

	2. A little confident 3. Moderately confident 4. Very confident	
E23	Apart from your basic professional training, have you had any formal training on the COVID-19 vaccination? 1. No 2. Yes	[ ]
E24	In the past year have you had a stock-out of the COVID-19 vaccines? 1. No 2. Yes 3. Not sure 4. Do not stock the COVID-19 vaccine	[ ]
E25	Has delivering COVID-19 vaccination taken you away from other priorities? 1. Not at all 2. Slightly 3. Moderately 4. Very 5. I have not delivered the COVID-19 vaccination	[ ]
E26	Have you been treated poorly during the COVID-19 pandemic because you are a health worker? 1. No *(skip to E28)* 2. Yes *(continue to E27)* *3.* Not sure *(skip to E28)*	[ ]
E27	What were the reasons for this? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer MUST NOT read out the answer options, but select the option mentioned which is closest]*	
	A. Patients angry at service closures	A.
	B. Patients angered by the vaccine brands offered	B.
	C. Patients angered by request for medical exemption	C.
	D. Patients angered by longer wait times	D.
	E. Patients believe I am a COVID-19 risk	E.
	F. Other, specify	F.
E28	Would you say you've experienced trauma burnout related to the COVID-19 pandemic? 1. No *(skip to E30)* 2. Yes *(continue to E29)* 3. Not sure *(skip to E30)*	[ ]
E29	What are the main reasons you have felt trauma or burnout in your job related to COVID-19? *[Can have more than one response. Mark (write the number 1 on all the answers mentioned by the respondent). The interviewer*	

	MUST NOT read out the answer options, but select the option mentioned which is closest]	
	A. Shifting work duties	A.
	B. Changes in service delivery	B.
	C. Long work hours	C.
	D. Patient distress	D.
	E. Use of PPE	E.
	F. Lack of access to PPE	F.
	G. Fear of illness	G.
	H. Fear of making family ill	H.
	I. Training requirements	I.
	J. Other, specify	J.
E30	Do you feel like your job has increased risk of exposure to COVID-19? 1. No 2. Yes	[ ]
E31	How much has your mental/emotional health been worsened by the COVID-19 pandemic? 1. Not at all 2. Slightly 3. Moderately 4. Very 5. Extremely	[ ]
	Section 4: Self-efficacy	
	Now I will ask you some questions, each with four responses and would like to think about how true these are in regard to your current role. (Use Option Card/Kartu Bantu)	
F1	I can always manage to solve difficult problems if I try hard enough 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F2	If someone opposes me, I can find the means and ways to get what I want. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F3	It is easy for me to stick to my aims and accomplish my goals. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F4	I am confident that I could deal efficiently with unexpected events. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]

F5	Thanks to my resourcefulness, I know how to handle unforeseen situations. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F6	I can solve most problems if I invest the necessary effort. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F7	I can remain calm when facing difficulties because I can rely on my coping abilities. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F8	When I am confronted with a problem, I can usually find several solutions. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F9	If I am in trouble, I can usually think of a solution. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]
F10	I can usually handle whatever comes my way. 1. Not true at all 2. Hardly true 3. Moderately true 4. Exactly true	[ ]