KEMENTERIAN KESEHATAN REPUBLIK INDONESIA

UNIVERSITAS UDAYANA

World Health Organization
Indonesia

SURVEY OF COVID-19 VACCINATION COVERAGE IN BALI PROVINCE

Collaboration of:

Faculty of Medicine Universitas Udayana
World Health Organization
Ministry of Health Republic Indonesia

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PREFACE

The Indonesian Government has set an ambitious goal to complete mass COVID-19 vaccination, covering more than 181.5 million Indonesians eligible for the vaccination. The Government implemented accelerated program in several priority areas, including Bali Province to stimulate tourism industries. The national government in collaboration with local governments has implemented the COVID-19 vaccination program since January 2021. The overall target was to vaccinate at least 70% of eligible population in Bali Province, with 100% coverage in three priority villages (namely Ubud, Nusa Dua and Sanur). This coverage will serve as a benchmark for 'Bali Reborn Initiative' – reopening Bali Province for international tourism.

As per early September 2021, the COVID-19 vaccination coverage in Bali Province was reported to reach more than 100%. However, at some point program monitoring may inaccurate, thus insufficient in reflecting the true coverage of the COVID-19 vaccination. It suggests the need to conduct regular household surveys to document the actual or true coverage of vaccination at the community level. Our large household survey in Bali Province found the COVID-19 vaccination coverage of 88% by recall and slightly reduced to 86% using validation technique. This survey reflect coverage in district level, however, in the three sub-districts where priority villages located, the survey found a coverage of 87-90% through validation method. The survey also identified that older populations were among those with the lowest coverage, mainly due to access barriers and comorbidities issues.

We hope that the study will provide a foundation for improving the current COVID-19 vaccination program in Bali Province, as well as in Indonesia more broadly. Findings from the study will inform formulations of evidence-informed policy and actions. Improving the true coverage of COVID-19 vaccination requires multifaceted strategies, including political and financial commitments of the national and local governments – from securing doses and strengthening delivery systems to reach the most needed populations. Effective vaccination program requires a robust health system, resilient communities, and effective risk communication strategies. In addition, as indicated by the study, the governments must leverage the core capacities of primary health care, public health centers and community health workers to effectively implemented mass COVID-19 vaccination program. Such strategies must be implemented in close coordination with community-based systems that exists across the province, along with transparent and consistent risk communication to promote public trust, acceptability and uptake.

COVID-19 vaccination is not a silver bullet. It should be accompanied by broader pandemic control strategies such as strengthening the healthcare system, engaging and promoting community-based health care delivery and addressing the structural and social issues that create health inequities in the first place

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As well as all staff of the Bali Provincial Health Office, District/City Health Offices, selected Public Health Centers, Schools, Village Heads, Sub-Village Heads, and 45 enumerators who have helped to facilitate this survey activities.

EXECUTIVE SUMMARY

A mass COVID-19 vaccination program in Bali Province has been implemented since January 2021. The government set out a target of 70% complete vaccination coverage for the whole Bali's population eligible for vaccination, and 100% complete vaccination coverage in the three priority villages (i.e., Sanur, Nusa Dua and Ubud). Using data reported from program monitoring may be less accurate in capturing the true coverage. The current survey aimed at identifying the true coverage of COVID-19 vaccination, including the coverage in three priority villages located in three sub-districts. The survey also aimed at documenting specific vaccination coverage based on sociodemographic characteristics, rurality status (urban vs rural), vaccination procedures, adverse events, and reasons for refusing vaccination. The survey further explored types of vaccine used, vaccination locations, levels of knowledge, sources of information, perceptions about COVID-19 prevention and vaccination, satisfaction rates, and challenges and barriers faced both at community and service provider levels.

The study adopted a concurrent mixed-methods study and was conducted between March – August 2022. A population-based survey following the 'WHO Vaccination Coverage Cluster Surveys: Reference Manual' was performed in nine districts of Bali. In-depth interviews were also conducted with selected key informants guided by the National Health System Framework. The survey target population was Bali residents aged ≥12 years old, had resided in Bali for at least three months and consented for participating as respondents. The survey should interview at least 4,724 households across 315 clusters. We selected 16 households from each cluster. As the survey also aimed at measuring several specific prevalence data, as well as answering multiple objectives at the district level, we decided to increase the total samples to improve precisions of results at the district level. We conducted a multi-stage systematic random sampling to select respondents for the survey. The distribution of selected clusters and respondents was representative across districts. A total of 5,040 households were visited, although not all respondents were successfully interviewed. Data were analyzed descriptively for all identified variables after the data cleaning. Qualitative data were analyzed using thematic analysis, and were presented using narrative approach. Qualitative data were presented to confirm and to explain variations identified from the quantitative survey.

Survey team have successfully interviewed 13,050 (85.0%) out of 15,348 target samples. As many as 900 (5.9%) respondents refused to participate in the survey and 1,398 (9.1%) respondents were unavailable due to various reasons. Overall, in Bali Province, the majority of respondents were aged between 18-65 years old (mean of 43 years), high school followed by elementary school graduates, with similar distribution between males and females, and between farmers, unemployed and entrepreneur. Moreover, the average family income was 2.8 million with similar proportion between those above and lower minimum wages for Bali Province. Across the nine districts, distribution of respondents based on sociodemographic characteristics was heterogeneous, where Denpasar, Badung and Gianyar districts tended to have similar respondent distribution based on education level and employment status. In

contrast, districts of Karangasem, Bangli, Buleleng, and Jembrana showed similar respondent distribution for all socio-demographic attributes.

The survey found the complete COVID-19 vaccination coverage by recall was 87.91% (95%CI 87.20-88.62) and by validation was 86.28% (95% CI 85.54-87.03). The vaccination coverage by validation was slightly higher among males than females. A stark contrast was identified when the coverage data were stratified based on education level, with very low coverage among respondents with no education (61.67%) in comparison to other education levels. Based on employment status, farmers or laborers (83.83%) and unemployed (79.78%) respondents tended to have lower coverage in comparison with other employment categories. A high coverage of COVID-19 vaccination in Bali Province was contributed by high perceived risks, benefits and acceptability of the vaccines. Although it fluctuates overtime, the acceptability of COVID-19 vaccination remains high, with the highest identified during the peak of omicron wave. High acceptability to COVID-19 vaccination have improved community participation, engagement, and uptake of the program.

Our qualitative inquiry identified some key factors contributing to high vaccination coverage in Bali Province: (1) active collaboration between community system and primary care providers involving integrated health post cadres, and active participation of village, community, and religious leaders in promoting safety and efficacy of the vaccination; (2) some district governments implemented incentive or disincentive mechanisms to encourage people to partake in the vaccination program; (3) inter-sectoral coordination emerges as one of the most critical features of COVID-19 vaccination program; (4) political push from local politicians in promoting COVID-19 vaccination program and in improving the overall coverage of the program; and (5) a centralized approach to procurement and distribution of vaccines may offer significant benefit during the pandemic.

The highest valid vaccination coverage was found among respondents aged between 12-17 years old (94.73%) followed by those aged between 18-45 years old (90.94%). Higher coverage among younger population and productive age groups were contributed by good acceptability and effectiveness of school-based and community-based vaccination programs. Schools and parents are supportive of the school vaccination program, mainly due to safety reasons during face-to-face interactions and activities at schools. Mandating COVID-19 vaccination has led to greater uptake of school vaccination program in Bali Province. The lowest coverage was found among elderly respondents aged ≥60 years (70.50%). For elderly, not having a family member to take them to a vaccination center can be problematic. These data suggest the importance of active vaccination activities, including outreach and door-to-door services for specific population group, including elderly population. Unfortunately, given the current demand for vaccination in health facilities and public spaces, only a small proportion of outreach and door-to-door services could be delivered with an overall proportion of less than 1%. In addition to the access barriers, the uncertainty around eligibility or contraindication for receiving COVID-19 vaccine especially among the elderly groups affect their opinion, perception, and decision for partaking in the vaccination program.

Only three districts showed the complete vaccination weighted coverage by validation of >90% (Klungkung, Tabanan, and Jembrana), four districts (Denpasar, Badung, Gianyar, Bangli) showed the complete vaccination coverage by validation of between 85-89%, one district (Buleleng) showed the coverage of between 81-84%, and one district (Karangasem) showed the coverage of <80%. The weighted complete vaccination coverage by validation across three sub-districts with priority villages, were 90.79% in Denpasar Timur, 90.60% in Kuta Selatan, and 87.13% in Ubud. Coverage variations across districts in Bali Province might be contributed by supply chain and storage capacity locally. Local storage capacity at district health offices posed a significant challenge for timely distribution and administration of the vaccines. Only few district health offices have sufficient storage capacity to stockpile large amount of vaccines. Our findings indicate the disparity of cold chain facilities may lead to disparity in vaccination coverage.

The majority of respondents accessed their 1st, 2nd, and booster vaccination through public spaces and primary care settings, with two main vaccines used were AstraZeneca and Sinovac. The primary reasons for not vaccinated was having comorbidities (70.75%), with the second and third most common reasons were much lower than the reason of comorbidities were fear of side effects (13.76%), and fear of injection (10.65%). These findings were aligned with our qualitative findings. Our interviews identified comorbidities and fear of side effects also as the most common reasons for not being vaccinated. In addition, our interviews identified various other reasons, these included: lack of knowledge, access barrier and availability, unsure of eligibility, and religious reasons. Our qualitative data showed that uncertainty around eligibility and existing comorbidities seemed to be related with low vaccination coverage among elderly.

Implementation of COVID-19 vaccination program in Bali Province have faced several challenges, including complexity of recording and reporting systems, risk communication strategies and managing hoaxes, centralized and complex supply chain and distribution, limited cold storage capacity, and increased work load of staff in primary care settings leading to disruption of routine health services. However, majority of respondents satisfied with the vaccination program (62.49%). Findings supported that health providers and staff have followed the national guidelines and procedures for COVID-19 vaccination program across various domains, including screening prior to vaccination, observation post injection although less than 30 minutes, and home monitoring for two days post vaccination (for 1st, 2nd, and booster doses). Although respondents reported higher proportion of side effects during the first dose in comparison to the second or the booster doses, seemed it did not affect the intention to obtain the second doses of vaccination.

Our study found that the overall vaccination coverage by validation in Bali Province and across districts was sufficiently high. However, our study also confirmed various reasons leading to refusal of COVID-19 vaccination. We recommend the following strategies for improving implementation and uptake of the COVID-19 vaccination. First, intensifying the outreach and active sweeping or door-to-door services to reach vulnerable individuals who eligible for vaccination, including elderly population who faces access barriers and mobility issues, people with low education levels, residents of difficult and isolated geographical areas, and people

with disabilities. Second, intensifying specific effort to address problems associated with comorbidities among eligible populations, for example by improving and simplifying referral systems and by providing online consultations to assess contra-indications for COVID-19 vaccination. Third, maintaining health promotion campaigns, including effective risk communication strategies targeting general population to sustain the high coverage for booster dose and future re-vaccination for COVID-19, as well as to maintain the high participation in COVID-19 preventative measures.

RINGKASAN EKSEKUTIF

Imunisasi COVID-19 telah dimulai sejak Januari 2021 di Bali. Ditargetkan setidaknya 70% populasi sasaran yang memenuhi syarat tervaksinasi lengkap dan 100% cakupan vaksinasi lengkap di tiga desa prioritas (Sanur, Nusa Dua dan Ubud). Data dari hasil monitoring seringkali tidak akurat untuk mencerminkan cakupan vaksinasi COVID-19. Survei cakupan di Provinsi Bali dibutuhkan untuk mengetahui besarnya cakupan imunisasi COVID-19 yang akurat, termasuk cakupan di tiga kecamatan dimana tiga desa prioritas berlokasi. Selain itu, survei juga bertujuan menggambarkan cakupan imunisasi spesifik berdasarkan karakteristik sosiodemografi dan tipe area (kota dan desa), prosedur vaksinasi, efek samping, serta alasan-alasan tidak imunisasi. Survei juga mengukur proporsi jenis vaksin yang digunakan, jenis layanan vaksinasi, tingkat pengetahuan, sumber informasi, persepsi terhadap pencegahan dan vaksinasi COVID-19 dan perilaku pencegahan COVID-19, tingkat kepuasan, dan eksplorasi hambatan imunisasi di tingkat komunitas maupun layanan.

Penelitian gabungan metode kuantitatif dan kualitatif dilakukan di Bulan Maret – Agustus 2022. Survei berbasis populasi dilakukan dengan mengacu pada pedoman survei klaster WHO dilakukan di sembilan kabupaten/kota. Studi kualitatif dilakukan melalui wawancara mendalam pada informan kunci terpilih, mengacu pada 6 dari 7 Sub-sistem Kesehatan Nasional. Populasi target survei adalah penduduk berusia ≥12 tahun yang tinggal di Bali setidaknya tiga bulan dan setuju berpartisipasi sebagai responden. Jumlah sampel minimal untuk diwawancara sebesar 4.724 rumah tangga dari 315 klaster. Sebanyak 16 rumah tangga dipilih untuk masing-masing klaster. Karena survei diharapkan menjawab cakupan spesifik dan tujuan lain, jumlah sampel ditingkatkan agar presisi hasil tetap terjaga. Kami melakukan pemilihan sampel secara acak bertingkat untuk memilih responden. Sebaran responden cukup baik di setiap kabupaten kota terpilih dan sejumlah 5.040 rumah tangga berhasil dikunjungi walaupun tidak semua anggota rumah tangga berhasil diwawancara. Analisis data dilakukan secara deskriptif setelah pembersihan data. Temuan wawancara mendalam dianalisis berdasarkan tema dan dibuatkan interpretasi serta dilakukan kombinasi untuk konfirmasi ataupun menjelaskan temuan data kuantitatif yang relevan.

Tim survei berhasil mewawancara 13.050 (85,0%) dari total 15.348 target sampel. Sebanyak 900 (5,9%) responden menolak berpartisipasi dan sebanyak 1.398 (9,1%) responden tidak bisa diwawancarai karena berbagai sebab. Di tingkat Provinsi Bali, mayoritas subyek berusia 18-65 tahun (rata-rata 43 tahun), relatif berimbang berdasarkan jenis kelamin, paling banyak berpendidikan SMA diikuti SD, dan proporsi antara petani, tidak bekerja serta wiraswasta hampir seimbang. Rata-rata penghasilan keluarga adalah 2.8 juta, dan berimbang proporsinya antara yang berpenghasilan di bawah ataupun di atas upah minimum regional (UMR) Provinsi Bali. Berdasarkan kabupaten, karakteristik sosiodemografi responden cenderung bervariasi, dimana Kota Denpasar, Badung, dan Gianyar menunjukkan kecenderungan serupa dalam hal pendidikan dan pekerjaan; sedangkan daerah Karangasem, Bangli, Buleleng dan Jembrana menunjukkan kecenderungan yang serupa untuk semua karakteristik sosial demografi.

Cakupan vaksinasi COVID-19 tertimbang hasil *recall* menunjukkan angka cakupan sedikit lebih tinggi daripada hasil validasi, yaitu: 87,91% (95%CI 87,20-88,62) dan 86,28% (95% CI 85,54-87,03). Cakupan vaksinasi valid antara laki-laki sedikit lebih tinggi dibanding perempuan. Perbedaan yang mencolok juga dijumpai berdasarkan tingkat pendidikan, dimana kelompok yang tidak berpendidikan cenderung sangat rendah (61,67%) dibandingkan kelompok lainnya. Sedangkan mereka yang bekerja sebagai petani atau buruh (83,83%) dan tidak bekerja (79,78%) juga cenderung memiliki cakupan yang lebih rendah dibandingkan kelompok pekerjaan lainnya. Hasil penelitian menemukan bahwa tingginya cakupan vaksinasi COVID-19 di Bali dikontribusi oleh persepsi resiko, persepsi manfaat, dan tingkat penerimaan yang tinggi. Walaupun tingkat penerimaan bervariasi dari waktu ke waktu, secara umum tren penerimaan masih cukup baik, terutama saat gelombang varian omicron. Tingkat penerimaan yang tinggi berkaitan dengan partisipasi masyarakat dan cakupan program.

Berdasarkan temuan kualitatif, beberapa faktor yang berhubungan dengan tingginya cakupan vaksinasi COVID-19 di Bali meliputi: (1) kolaborasi efektif antara sistem komunitas dan layanan kesehatan primer yang meliputi kader posyandu, warga dan aparat desa, dan pemuka adat/agama; (2) implementasi sistem insentif atau disinsentif oleh berbagai pemerintah daerah dan pihak desa; (3) koordinasi lintas sektor; (4) dorongan politik dari politisi lokal; dan (5) model pengadaan dan distribusi vaksin yang terpusat khususnya di awal-awal masa pandemi.

Cakupan vaksinasi valid tertinggi dijumpai pada responden berusia 12-17 tahun (94,73%) diikuti yang berusia 18-45 tahun (90,94%). Tingginya cakupan pada populasi usia muda dikontribusi oleh tingginya tingkat penerimaan dan efektivitas dari program vaksinasi sekolah dan pendekatan berbasis komunitas. Pihak sekolah dan orang tua sangat mendukung program vaksinasi sekolah, dan mewajibkan vaksinasi COVID-19 bagi siswa untuk mengikuti kegiatan pembelajaran tatap muka sangat efektif dalam meningkatkan cakupan vaksinasi bagi penduduk usia sekolah (12-17 tahun). Cakupan vaksinasi valid terendah dijumpai pada responden berusia lanjut ≥60 tahun (70,50%). Bagi penduduk usia lanjut, akses ke tempat layanan menjadi sulit apabila tidak ada anggota keluarga yang mengantar. Hal ini mengindikasikan pentingnya layanan vaksinasi aktif melalui proses penjangkauan dan layanan dari rumah ke rumah bagi orang lanjut usia. Namun, karena tingginya permintaan terhadap vaksinasi di tempat-tempat umum dan layanan kesehatan, proporsi layanan vaksinasi aktif menjadi sangat terbatas (kurang dari 1%). Di samping itu, kerancuan terkait kontra indikasi vaksinasi, persyaratan vaksinasi, dan komorbiditas seringkali juga berdampak pada persepsi dan keputusan populasi lanjut usia dalam program vaksinasi.

Tiga kabupaten menunjukkan cakupan vaksinasi lengkap tertimbang lebih dari 90% (Klungkung, Tabanan dan Jembrana), empat kabupaten (Denpasar, Badung, Gianyar, Bangli) dengan cakupan vaksinasi lengkap berkisar 85-89%, satu kabupaten (Buleleng) dengan cakupan antara 81-84%, dan satu kabupaten (Karangasem) dengan cakupan vaksinasi lengkap bawah 80%. Di tiga kecamatan dimana terdapat desa prioritas, didapatkan cakupan vaksinasi lengkap tertimbang sebesar 90,79% di Denpasar Timur, 90,60% di Kuta Selatan, dan 87,13% di Ubud. Variasi cakupan di Sembilan kabupaten/kota kemungkinan berkaitan dengan mekanisme pengadaan dan kapasitas penyimpanan vaksin di masing-masing kabupaten/kota.

Hasil wawancara menunjukkan bahwa kapasitas penyimpanan lokal masih menjadi faktor penghambat untuk penyediaan dan distribusi vaksin yang tepat waktu. Hanya beberapa dinas kesehatan kabupaten/kota yang memiliki kapasitas memadai untuk menyimpan vaksin dalam dosis yang besar. Hal ini dapat mengakibatkan adanya disparitas atau variasi cakupan vaksinasi COVID-19 antar kabupaten/kota.

Mayoritas responden mendapatkan vaksinasi pertama, kedua, dan *booster* di tempat vaksinasi masal dan layanan primer, dengan jenis vaksinasi mayoritas adalah AstraZeneca dan Sinovac. Memiliki penyakit penyerta adalah alasan terbanyak (70,75%) tidak tervaksinasi, dan alasan lain yang jauh lebih sedikit proporsinya adalah takut efek samping (13,76%) dan takut pada suntikan (10,65%). Temuan ini sejalan dengan hasil kualitatif yang menemukan bahwa adanya penyakit penyerta dan takut efek samping sebagai alasan utama penolakan vaksinasi. Hasil wawancara juga mengidentifikasi beberapa alasan lain yaitu terbatasnya tingkat pengetahuan, hambatan akses dan ketersediaan vaksin, tidak jelasnya persyaratan dan perubahan kriteria, dan pertimbangan keyakinan. Penyakit penyerta tampaknya terkait dengan rendahnya cakupan vaksinasi pada penduduk lanjut usia.

Pelaksanaan program vaksinasi COVID-19 di Provinsi Bali mengalami beberapa tantangan termasuk kompleksitas sistem pencatatan dan pelaporan, komunikasi strategi risiko dan manajemen *hoax*, sistem distribusi dan rantai dingin vaksin, keterbatasan kulkas, tingginya beban kerja staf di layanan primer karena ada layanan rutin yang masih harus dilakukan. Bagaimanapun, 62,49% responden masih menyatakan puas dengan layanan vaksinasi yang diterima. Temuan juga menunjukkan bahwa petugas kesehatan telah mengikuti pedoman nasional dan prosedur pelaksanaan vaksinasi COVID-19 dalam berbagai aspek, diantaranya telah melaksanakan prosedur skrining sebelum vaksinasi, pengamatan langsung setelah vaksinasi walaupun cenderung <30 menit dan pengamatan di rumah walaupun hanya sekitar 2 hari (vaksinasi 1-2 dan *booster*). Walaupun banyak responden melaporkan kejadian efek samping pasca pemberian vaksinasi pertama dibandingkan vaksinasi kedua (maupun *booster*), tampaknya ini tidak menyurutkan mendapatkan vaksin dosis kedua.

Hasil studi menunjukkan cakupan vaksinasi valid di Provinsi Bali relatif tinggi, demikian pula di tingkat kabupaten. Beberapa alasan tidak divaksinasi juga ditemukan. Beberapa rekomendasi yang penting untuk dilakukan untuk meningkatkan efektivitas program vaksinasi COVID-19 di Provinsi Bali dan Indonesia. Pertama, perlu ditingkatkan layanan vaksinasi ke rumah-rumah melalui kegiatan penjangkauan, khususnya untuk masyarakat yang marginal dan mengalami kesulitan akses ke fasilitas kesehatan. Misalnya warga usia lanjut atau penyandang disabilitas yang memiliki kesulitan mobilitas, masyarakat dengan tingkat pendidikan rendah, ataupun warga di wilayah geografis yang sulit dijangkau. Kedua, diperlukan peningkatan upaya atau strategi untuk mengatasi hambatan terkait komorbiditas, misalnya melalui penyederhanaan mekanisme rujukan atau melalui penyediaan konsultasi *online* untuk evaluasi kontra indikasi berkaitan dengan vaksinasi COVID-19. Ketiga, diperlukan upaya yang lebih terstruktur untuk menjaga supaya kegiatan promosi kesehatan, termasuk strategi komunikasi risiko yang efektif, tetap berjalan optimal untuk menjangkau lebih banyak kelompok masyarakat. Hal ini diperlukan untuk menjaga sikap positif dari masyarakat umum sehingga cakupan vaksin

booster mengalami peningkatan, serta untuk menjaga supaya partisipasi masyarakat dalam program pencegahan penularan COVID-19.

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LIST OF ABBREVIATIONS

BPJS	: *Badan Penyelenggara Jaminan Sosial*
CHW	: Community Health Worker
CI	: Confidence Interval
COVID-19	: Coronavirus Disease of 2019
DHO	: District Health Office
ED	: Expiry Date
EPI	: Expanded Program on Immunization
EUA	: Emergency Use Authorization
HH	: Household
HRH	: Human Resource for Health
ICC	: Intraclass Correlation Coefficient
ID	: Identification
IDR	: Indonesian Rupiah
IQR	: Interquartile Range
MUI	: *Majelis Ulama Indonesia*
NIK	: *Nomor Induk Kependudukan*
NIN	: National Identification Number
PHC	: Public Health Center
PHO	: Provincial Health Office
PMI	: *Pekerja Migran Indonesia*
RC	: Recall Coverage
RCA	: Rapid Convenient Assessment
RISKESDAS	: *Riset Kesehatan Dasar*
SARS-CoV-2	: Severe Acute Respiratory Syndrome Coronavirus 2
SC	: Study Coordinator
SD	: Standard Deviation
SEARO	: South-East Asia Regional Office
SMILE	: *Sistem Monitoring Imunisasi dan Logistik Elektronik*
UNUD	: *Universitas Udayana*
VC	: Valid Coverage
WHO	: World Health Organization

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I. INTRODUCTION

1.1 Background

Indonesia had confirmed the first COVID-19 infection on 01 March 2020. In Bali Province, the government reported the first COVID-19 infection on 03 March 2020. During this early phase until end of March 2020, the total reported COVID-19 cases in Bali Province remained low – primarily concentrated amongst the overseas repatriated *Pekerja Migran Indonesia*/PMI (or Indonesian Migrant Workers). In 2020, there were more than 20,000 repatriated PMIs from Bali Province. Recognizing the potential risk of COVID-19 infection, the Bali Province COVID-19 Task Force had implemented various policy responses targeting repatriated PMIs. Given the dynamic nature of the pandemic, the task force had adapted, changed and reformulated these policies – addressing their key limitations and taking into account the evolving pandemic. For example, the task force replaced the self-isolation approach with a more centralized strategy at several designated isolation centers. In addition, the task force renewed the releasing rapid test policy for PMIs from the one-time rapid test to a two-time rapid test approach. Unfortunately, implementing new policies under 'public health emergency' was challenging, and consequently many PMIs may missed the COVID-19 screening. In April 2020, Bali reported sharply increased COVID-19 cases, even with improved policy, local transmission began in Bali and became more prominent in early May 2020.

The COVID-19 pandemic has destroyed the economy of Bali Province, which heavily reliant on tourism industries and international travels. Travel restrictions have paralyzed the Bali tourism sector since first quarter of 2020, and Bali Province is struggling to bring back international tourists until today. To revive the industries, the national and local governments targeted three villages of Sanur, Nusa Dua and Ubud located in three districts of Bali Province to piloting comprehensive measures for controlling COVID-19 transmissions. When successful, these three villages would be the first areas to re-open for international tourists and events**.**

One key strategy for achieving the above target was a mass COVID-19 vaccination program in Bali Province, including the above priority villages, initiated in early January 2021. The government set out a target of 70% complete COVID-19 vaccination coverage for the whole Bali's population eligible for vaccination, and 100% complete vaccination coverage in the three priority villages (i.e., Sanur, Nusa Dua and Ubud). In August 2021, the Bali Provincial Health Office program data reported more than 100% coverage in Bali Province. Previous study suggests that using program data and/or health service data is vulnerable to various biases leading to inaccurate estimation of the true vaccination coverage [1]. This study aligns with the WHO recommendation suggesting the needs to conduct a regular household survey for monitoring the actual coverage of the vaccination at the community level [2].

The above analysis raises four important questions: (1) What is the true coverage of COVID-19 vaccination in Bali Province; (2) Has the COVID-19 vaccination coverage in the three sub-

districts with three priority villages reached 100%; (3) What is the level of knowledge and perception related to COVID-19 infection and vaccination in Bali Province; and (4) What are the contributing factors for the implementation of COVID-19 vaccination in Bali Province.

1.2 Objectives

1. To measure provincial and district COVID-19 immunization coverage among residents aged ≥12 years old in the community in Bali Province.
2. To measure COVID-19 vaccination coverage among residents aged ≥12 years old in three priority sub-districts in Bali Province.
3. To illustrate COVID-19 vaccination coverage among residents aged ≥12 years old based on socio-demographics and village rurality status in Bali Province
4. To measure COVID-19 immunization proportion based on types of vaccine and types of health service among residents aged ≥12 years old in the community in Bali Province.
5. To describe vaccination procedures, adverse effects from the vaccination, and reasons for refusing COVID-19 vaccination in Bali Province.
6. To measure knowledge level, perception, and sources of information related to COVID-19 vaccination and preventative behaviors.
7. To describe barriers to access COVID-19 vaccination at the community and health service levels, as well as to measure satisfaction level of respondents.

1.3 Implications

1. Findings from the survey will inform planning, policy and strategy formulation for 'Bali Reborn Initiative' – re-opening Bali Province for international tourism, as well as to inform improvements in COVID-19 vaccination program, COVID-19 management and control, and preventative measures in Bali Province and Indonesia more broadly.
2. The survey can enhance learning for the university students and alumni who involved in designing, implementing and coordinating a large household survey.
3. Data from this survey, both quantitative and qualitative, will serve various academic purposes including dissemination and policy forums, seminar and conference papers, and journal publications.

1.4 Organization of The Survey

A principal investigator (PI) led the survey, supported by four co-investigators (CIs) – all from the Department of Public Health and Preventive Medicine, Faculty of Medicine, Udayana University. One qualitative field coordinator and five trained quantitative field coordinators along with 45-trained enumerators facilitated implementation and data collection processes. A data manager was responsible for data storage, cleaning and management. All field coordinators, enumerators and data manager were either students or alumni the School of Medicine, School of Public Health and Master of Public Health Program, Udayana University and Dhyanapura University. They previously were part of similar large household

surveys, or involved in various data collection activities for national surveys, including the Indonesia Basic Health Survey (or *Riset Kesehatan Dasar*/RISKESDAS). In addition, staff from Bali Province Health Office, district health offices, and various public health centers (or *Puskesmas*) assisted with local arrangements related to legal permission, field coordination with multiple stakeholders in organizing and implementing the survey, enumerator training, and vaccination status validation processes.

The World Health Organization (WHO) funded the survey, including the qualitative inquiry. Furthermore, the WHO Indonesia and the WHO SEARO provided technical inputs and feedback in the design, field monitoring and evaluation, data analysis, report review and writing.

1.5 Concept

The national government initiated the COVID-19 vaccination program since January 2021 through a phased strategy targeting more than 180 million Indonesians eligible for vaccination. The Ministry of Health Decree No. 10 (2021) outlines that front-line health worker and those working in health facilities were the first priority, followed by elderly people, public servants, and other vulnerable populations due to geospatial, social and economic reasons, and lastly the other populations [3]. Subsequent updates of the decree further included sub-population previously uncovered including foreigners and domestic migrants residing in Bali Province [4-6]. The COVID-19 vaccination program in Indonesia only uses vaccines that passed the emergency use authorization (EUA) [3]. In the early phase of the program (2020-2021), only AstraZeneca and Sinovac were available. More recently, additional vaccines are also available in Indonesia including Pfizer, Sinopharm and Moderna.

Over the last two years, COVID-19 vaccination program in Indonesia is widely available, in both health facilities and public spaces such as schools, government offices, public building, or community halls. Such intensification aims at promoting mass vaccination program and achieving the national targets. This effort included collaborations from various stakeholders: school principals and teachers, health offices, *Puskesmas*, hospitals, military and police personnel's, village offices and leaders, and private enterprises. Vaccinated individuals will receive an immunization card as a proof of vaccination. Previous study reveals various means for recording and reporting vaccination data [7], for example paper-based register, electronic register, or direct manual input into an excel spreadsheet. In Indonesia, the government had developed a central recording and reporting system for COVID-19 vaccination, called One Data System Information of COVID-19 Vaccination [3]. In practice, the recording and reporting system for COVID-19 uses systems of *PeduliLindungi*, P-Care, and SMILE. *PeduliLindungi* is a web-based system application with many sub-set applications, including for vaccination. Meanwhile, P-Care application, is a patient management, service uptake monitoring and reporting systems in primary care settings owned by BPJS Kesehatan. P-Care data are linked to the *PeduliLindungi* application. While SMILE is application to manage the logistic for COVID-19 vaccination. When people go to the public health center or hospital to have vaccination, the health provider will input at least

name, address, vaccine details, and the National Identity Number (or *Nomor Induk Kependudukan*/NIK) to the P-Care. The P-Care at the Public Health Center is linked to P-Care at the District and Province Health Office, and the individual data can be accessed in both DHO and PHO. If people install the *PeduliLindungi* application on a device (e.g., mobile phones), he/she will be able to access their COVID-19 vaccine certificate, as well as obtain text message from the system about their vaccination registration, COVID-19 related information, as well as link to COVID-19 certificates. These conditions allow confirmation of individuals' vaccination status (for validation).

Many studies suggest limitations of maternal recall as a method for measuring vaccination coverage, mainly related to its low accuracy. However, several studies showed that maternal recall has high accuracy for measuring vaccination coverage for certain immunization [1][8-9]. Measuring the true coverage of COVID-19 vaccination requires combination of recall and validation as suggested by the WHO Framework [2]. We adopted this framework in the current study to increase accuracy of the true coverage calculation of COVID-19 vaccination. Recognizing the limitations of program-based and facility-based recording and reporting system as explained above, we validated the recall vaccination coverage using several sources, such as *PeduliLindungi* and P-Care data**.**

Furthermore, we adopted the National Health System Framework [10] to describe barriers (and opportunities) to access COVID-19 vaccination, as well as to explain some variations in the vaccination coverage. The framework consists of seven sub-systems: health service delivery, human resources, logistic management, health information system, health governance, financing, and community participation. However, we excluded health financing from the analysis as the program is centrally funded. Previous study suggests that health service organization and delivery, availability of skilled human resources, types of vaccination service and its procedures, physician recommendation, and patient satisfaction and adverse event – all influence vaccination coverage at the community level [11]. We further explored the health information system to unpack challenges in recording and reporting of COVID-19 vaccination, along with related risk communication strategies implemented by the governments – that directly or indirectly influence acceptability, uptake and coverage of COVID-19 vaccination [12-13]. Similarly, various studies have found that many factors determine community participation in vaccination program or community behavior and attitudes towards vaccination [9]. For example, sociodemographic factors such as age, sex, education, occupation, and salary levels [14-15], level of knowledge and awareness [16-17], and perceived risk and impact on daily life, perceived usefulness, and perceived ease to use [16,18-21].

II. METHOD

A. Quantitative Method

2.1 Design, Study Setting, Population and Sampling

2.1.1 Design

The study adopted a concurrent mixed-methods study, consisting of a large household quantitative survey and in-depth interviews with key informants, from March to August 2022 across nine districts in Bali Province. The quantitative survey followed the WHO's Vaccination Coverage Cluster Survey reference manual [2]. In-depth interviews based on the National Health System framework with key informants from health offices, public health centers, schools and hospitals were conducted to obtain data on perceived barriers (and opportunities) to access COVID-19 vaccination in Bali Province.

2.1.2 Study Setting

Bali Province consists of nine districts (or *kabupaten*): Tabanan, Gianyar, Badung, Klungkung, Bangli, Karangasem, Jembrana, Buleleng and Denpasar. District consists of multiple sub-districts (or *kecamatan*), and each sub-district comprises of several villages (or *desa*). Furthermore, each village consists of several hamlets (or *dusun*, or *banjar* for Bali Province). In Bali, there are two types of *banjar* – *Banjar Dinas* and *Banjar Adat*. *Banjar Adat* concerns with traditional affairs including religious ceremonies at the temple, marriages, and funerals, and *Banjar Dinas* deals with formal local-government responsibilities including public or social services and civil registration.

In terms of geographical structure, Bali Province consists of one main island (Bali), and four smaller islands (Nusa Penida, Nusa Lembongan, and Nusa Ceningan in the southeast, and Menjangan Island in the northwest). Cross-district population migration rates are relatively high, predominantly due to rapid urbanization of Denpasar, Badung and Gianyar. These districts are the most developed and the center of government affairs and tourism industries. In addition, migration rates from neighboring regions, especially East Java and Nusa Tenggara, are increasing overtime.

According to the 2020 census, Bali's population is 4.32 million, with approximately 3.06 million (70.96%) are productive age groups. Buleleng District is the most populous region with 791.813 people, or >18% of the total population in Bali Province [22, 23].

2.1.3 Population and Sampling

We conducted the survey five months after the COVID-19 vaccination target timeline (September 2021) for Bali Province. As such, the target population of the survey was Bali residents aged ≥12 years old. Due to limited data available for this specific age group, we

used the provincial and district population data for population age >15 years old[1] to calculate the proportion of population per district (relative to the total population in Bali) as the basis for sample distribution per district (Annex 1).

2.1.3.1 Sample Size Calculation

We adopted the WHO coverage cluster survey manual 2018 [2] to calculate the overall sample size and distribution per district. Such approach is more representative and better reflect the COVID-19 vaccination coverage at the provincial and district levels.

We calculated sample size using the excel software provided by WHO [2] with the following parameters:

(1) The estimated immunization coverage = 99%
(2) Number of strata = 9 districts
(3) Delta = 5%
(4) Alpha = 5%
(5) Target number of respondents per cluster = 15
(6) ICC for immunization = 0.16
(7) Average number to visit to find 1 eligible subject = 1
(8) Response rate of 98%.

Based on the above calculation, the survey should visit 315 clusters in 9 districts in Bali Province with 16 households from each cluster, which resulting 5,040 households to be visited. The minimal completed interview needed to be at least 4,724 respondents across 9 districts (Annex 2). As the survey aimed at measuring several specific prevalence data, as well as answering multiple objectives at the district level, we decided to increase the total samples to improve precisions of results at the district level.

2.1.3.2 Sample Size Selection

We conducted a multi-stage systematic random sampling to select respondents for the survey. First, for each district we selected a number of villages; and second, for each village we selected several sub-villages ("*Banjar Dinas*", see section 1.6.2), then third, for each sub-village we selected a number of households. We employed the following considerations throughout the sampling processes: a) minimum clusters per district was 30 sub-villages, b) minimum villages selected per district was 15% of total villages in the district.

We obtained the sampling frame for villages and sub-villages from the district health offices and public health centers who were responsible for the surveillance and vaccination program. Moreover, we obtained the household sampling frame in each sub-village by consulting the head of sub-village. We adopted this approach to ensure that we get the latest

[1] Hasil Sensus Penduduk 2021 Provinsi Bali. Berita Resmi Statistik No. 08/01/51/Th. II, 21 Januari 2021

household data for each sub-village. A detailed breakdown of the cluster distribution per district is available in Annex 3.

Figure 1 displays the distribution of selected clusters across Bali Province. It shows that the clusters distribution was representative covering both remote and urban areas, including 10 clusters from Nusa Penida Island (in the Southern part of Klungkung District). The average distance from the sampled households to the village office was 0.4 kilometers, with a minimum distance of 0.1 kilometers and a maximum distance of 7.6 kilometers. Two areas in Bali Province are uninhabited: the hilly areas on the border of Jembrana and Buleleng district (called West Bali National Park) and the Mount Agung areas in the northeast of Karangasem District. As shown in Figure 1, the samples distribution in Denpasar City was denser than other districts.

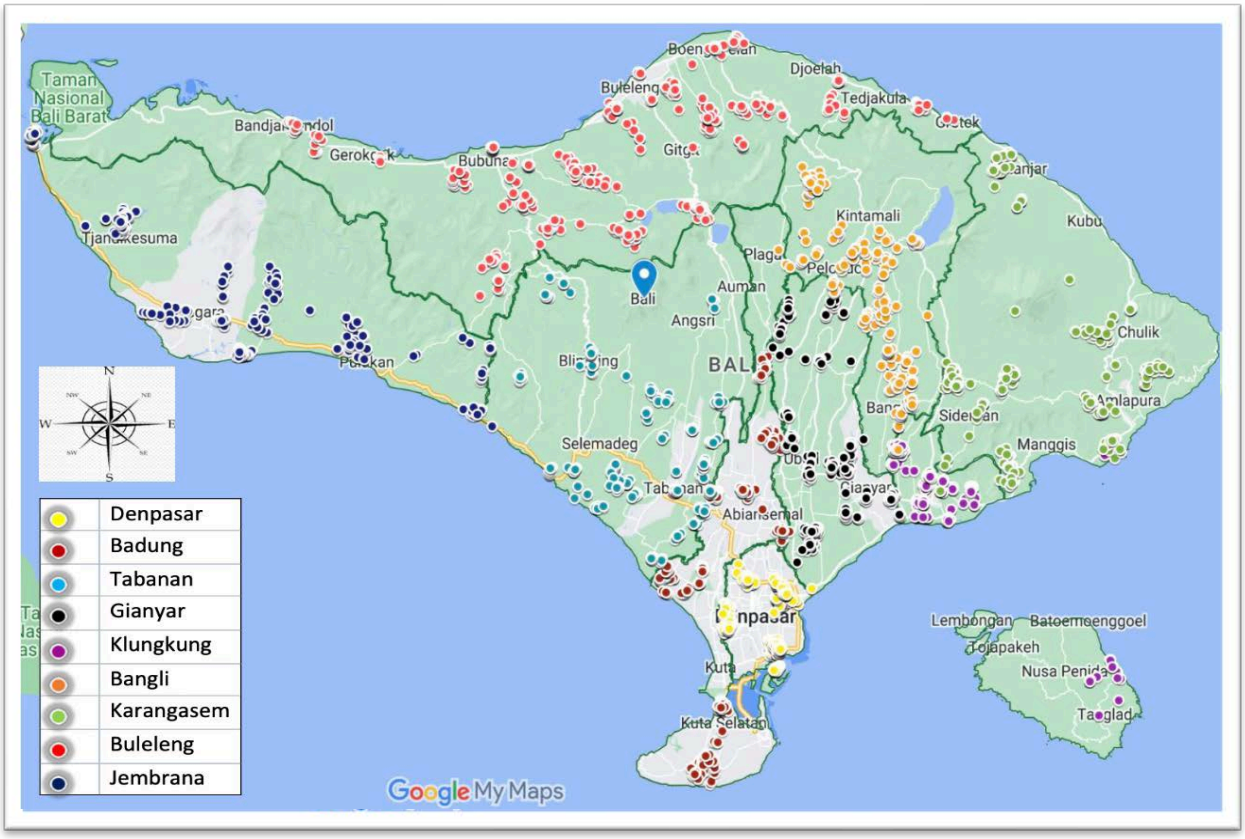

Figure 1. Distribution of Selected Clusters and Households

The research team prepared the lists of selected 16 households and shared these lists to study coordinators (SC), who then distributed the lists to the assigned enumerator. Prior to data collection, enumerators made phone calls to the respective village heads to confirm the availability of these 16 households. We sampled all eligible family members in the selected households. The inclusion criteria were aged ≥12 years old and have been resided in Bali Province for at least three months. Respondents in the survey were his/herself for adult respondents. For children and elderly respondents with communication difficulty, the interview was done to the mother or the caregiver. In a situation where eligible respondents were unavailable for the interview in the first visit, we re-visited the households one more

time (second visit). During the second visit, in some cases we used telephone interview to complete the questionnaire for respondents who were in isolation/quarantine or out of the town. We substituted the selected households with the closest neighbor only during the following conditions: (a) the household head had died and the other family members moved to another family register, or (b) the household had physically moved to another jurisdiction, but administratively still registered in the selected cluster, or (c) the household could neither be re-visited nor contacted.

We managed to visit 16 households in each cluster for all districts, with 1,310 (26.00%) households' substitution from a total of 5,040 visited households. We found a number of respondents in selected households could not complete the survey, mainly due to (a) no longer live in the household, or (b) had refused to participate, or (c) having difficulty in communication.

2.2 Variables and Definition

Table 1 and 2 depict variables and its operational definition used in the survey.

Table 1. Attributes to Determine Immunization Status and Coverage

	Recall Coverage (RC)	Valid Coverage (VC)
Immunization status	**Immunized** was defined if respondent recalled being vaccinated. **Not Immunized** was defined if respondent recalled not being vaccinated.	**Valid immunization** [(a)] was defined if the evidence of immunization were available in a form of written documents (immunization card, *PeduliLindungi*, P-Care, and register at DHO and PHO). **Invalid immunization** [(b)] was defined if respondent recalled being immunized but the the evidence of immunization in a form of written documents (immunization card, *PeduliLindungi*, P-Care, and register at DHO and PHO) could not be found. **Valid not immunized** [(c)] was defined if respondent recalled not being immunized and the evidence of immunization were not available in a form of written documents (immunization card, *PeduliLindungi*, P-Care, and register at DHO and PHO)
Completeness of immunization		Immunization status was considered complete if respondent had the valid first and second immunization status.
Numerator	Number of respondents who recalled as having COVID-19 immunization	Number of respondents who fulfilled the criteria for valid immunization.
Denominator	Total number of eligible respondents participating	Total number of eligible respondents = a + b + c.
Vaccination coverage	Numerator/Denominator x 100	Numerator/Denominator x 100
Type of numbers	Crude and weighted	Crude and weighted

Table 2. Other Variables and Definition

No	Variables	Definition
1	Type of vaccine	The type of vaccine taken by the respondent such as Sinovac, AstraZeneca, Moderna and others as stated by the respondent.
2	Time of immunization	Date of immunization which were crosschecked with the written documents.
3	Priority area	Priority areas are those that selected for the pilot project of "Bali Reborn Initiative" which include sub-districts of Kuta Selatan (Nusa Dua Village), Ubud (Ubud Village), and Denpasar Timur (Sanur Village).
4	Type of service	Place of immunization (immunization post, community hall, *Puskesmas*, school, hospital and other health facilities)
5	Procedure	The extent in which the procedures of COVID-19 immunization have followed the guidelines and understood by the people (the presence of written/oral information from the stake holders, screening process, the presence of parents during immunization for children, post immunization monitoring)
6	Adverse event	Suffering adverse events in 30 minutes after the injection and until 30 days following the immunization (Yes/No), which can be local or systemic (type), duration (hours-days), action taken (no action/ medication/consult to health provider)
7	Reason for refusing COVID-19 vaccination	Comorbidity, contraindication, culture, religion, not know etc.
8	Socio-demographics	- Age (year) - Education (not go to school, elementary, junior high school, high school, bachelor, master) - Occupation (housewife, private, government employee, other) - Salary (monthly salary, produce by all member of the family)
9	Disease history	History of illnesses that are comorbidities of COVID-19 infection or contraindications to COVID-19 immunization
10	Knowledge	Knowledge related to COVID-19 and COVID-19 immunization (definition, cause, severity, high risk population, methods of prevention)
11	Perception	Perception of risks (susceptibility/severity), perception of benefits of COVID-19 immunization, and perception of barriers
12	Satisfaction	Rates of satisfaction related to COVID-19 immunization services (rating scale 1-5)
13	Factor affecting the implementation of COVID-19 vaccination	Barriers to access and implementation of COVID-19 vaccination program, including resources (logistic, number of targets, timeline, staffing, support from family and providers, norms or cultures) and immunization process (planning, organizing, actuating, controlling)

2.3 Instruments

We developed the survey instruments (questionnaires) in both paper-based and web-based (KoboToolbox) formats. We used both coded and close-ended questions. The electronic questionnaire format was designed to minimize missing data and incorrect responses by implementing some commands to restrict the invalid value for some questions (e.g., coding of categorical data; age; date of immunization). When missing data were detected, enumerators would not be able to save the information until the missing data were fixed. We used a unique ID number to allow data linkage and to prevent double entry.

There were three types of instrument forms used in the survey.

1. Form 1 (family data), included characteristics of the household head and family members listed on the family card, the average household income, and household location (coordinate). This form was used to screen the potential eligible samples living in the household (Annex 4).
2. Form 2 (individual data), was the main questionnaire for all eligible and consented respondents living in the household. It included sociodemographic characteristics, history of vaccination, knowledge, perception, and satisfaction of vaccination. We adopted questions from questionnaires of Sero-Survey SARS-CoV-2 in Bali 2020 [24] to explore family and household information. In addition, we adopted questions from the Coverage Survey JE Vaccination 2018 in Bali [25] to explore sources of information and perceptions toward COVID-19 vaccination, with modifications informed by literature as defined in the concept section. We attached the questionnaires in Annex 5.
3. Form 3 (household visit per cluster), was the summary data of household visit in each cluster. This form enabled us to assess if substitution is required, identify respondents who refused to participate, or those who were eligible but could not be interviewed for various reasons, or those who need to be revisited. We used this form to determine the number of non-response subjects per cluster and per household to count for weighting (Annex 6).

We implemented a field test prior to the data collection to assess if questions used in the questionnaire are understandable by interviewers and respondents, total time required to complete the interview per sample and per household, and ensuring the instruments are working properly. We did some revisions of the questionnaire based on the field test results.

2.4 Data Collection and Management

We provided training to the SC and enumerators prior to the data collection, reorienting them with the study objectives, concept of cluster survey, structure of data collection tools and purpose of each item included in the instruments, and their roles and responsibilities. We also provided them with practice sessions for the interview among enumerators, especially in using the web-based questionnaire. In addition, additional interview practice was conducted with mock respondents during the field test. We evaluated the instruments after the field test, identified limitations of the instruments and revised them accordingly.

Enumerators collected the data by interviewing respondents or caregiver from household to household using the paper-based questionnaire. They then entered the information into the KoboToolBox. During this process, enumerators double-checked the completeness of the information. Unfortunately, SCs were unable to extract and validate information entered by enumerators on a regular basis for consistencies, completeness and accuracy. The primary reason was the respondents' availability for the interview leading to difficulties to complete the whole household in one visit. Similarly, as the interviews for each cluster were scheduled, often it was difficult for the enumerators to complete data entry into the KoboToolBox on a daily basis leading to delayed data validation by SCs.

All data entered by enumerators and SCs were regularly backed-up by our data manager in the primary server. The data manager also regularly extracted the data from the server into an excel spreadsheet and stored in a hard drive. These excel documents were provided to the research team, and were crosschecked to ensure completeness, correctness, and consistencies. We conducted evaluation meetings with SCs and enumerators to ensure all data collected were valid, consistent and complete. We cleaned the data from any invalid, unclear and ambiguous result. The cleaned data were imported to STATA-12 for analysis.

All surveyed households were allocated a unique ID that linked to the respondent ID. This unique ID consisted of a sequence of numbers, which included cluster number (three digits), household number (two digits) and sample number (two digits). Cluster number was organized in a way that allowed the research team to identify the district of interest.

Research team supervised SCs and enumerators during the data collection in four districts (Denpasar, Klungkung, Karangasem and Buleleng). We evaluated the correctness in which enumerators selected the household samples, discussed obstacles or barriers faced during the data collection, target attainment, and data entry from the paper-based instrument to the KoboToolbox. Alongside with this process evaluation, we also discussed and evaluated the timeline for reporting to the research team.

2.5 Data Validation

We asked all vaccinated respondents by recall to show the proof of their vaccination – either vaccination card, short text message from 1199 (*PeduliLindungi*) containing a link to the vaccination certificate, or checking respondents' *PeduliLindungi* application in their mobile phone if applicable. Enumerators took photos of the available proof documents and uploaded them to the Google Drive. These documents were grouped by cluster data and managed by SCs. Each file was re-named using the respondent's unique ID. In addition, SCs re-checked appropriateness and correctness of data entered in the KoboToolbox with the proof documents for each respondent by enumerator.

Upon completion of data collection, we identified 3,067 (23.5%) vaccinated respondents by recall were unable to provide any proof of vaccination, and they were marked as 'required a follow-up'. Out of these 3,067 respondents, 2,822 (92%) were for 1st dose, 2,592 (84.5%) were for 2nd dose, and 1,465 (47.8%) were for booster dose. We listed respondents who

unable to provide a proof of vaccination, then we entered the National Identification Number (NIN) into the recording system at the provincial health office (P-Care). We crosschecked if vaccination status of any of these respondents could be validated through such strategy. Finally, we re-checked consistency of vaccination data in the KoboToolbox with the P-Care data, and refined them accordingly. After such processes, we identified 376 (12.3%) respondents could not be validated using the provincial P-Care data. We searched their vaccination status data at the district health office P-Care and *Puskesmas* registers. It is evident that these multi-layered validation processes are extremely challenging and time consuming. Despite these difficulties, we managed to validate additional 132 (35.1%) respondents. We re-checked again paper-based questionnaires of the remaining 244 respondents. We found that enumerators have entered incorrectly National Identification Number for 12 respondents. We crosschecked these 12 respondents by entering their NIN into the provincial P-Care system. We discontinued the validation processes at fourth week of July 2022 to proceed with data analysis and writing-up report. We considered those who could not be found in the system as unvaccinated people. We repeated the same processes for 930 respondents who recalled not being vaccinated to double-check if they were truly unvaccinated people and to reduce recall bias. We found 63 (6.8%) unvaccinated respondents by recall had proof of vaccination documents in the P-Care. We considered these 63 respondents as vaccinated people.

2.6 Data Analysis

Weighting factors were calculated based on sampling strategies at district, village, sub-village (cluster), and household levels. In addition, we also accounted for non-response to reduce possible biases. We compared characteristics of our respondents to the Bali populations for biological sex and age groups (Annex 7). For the biological sex variable, our data were comparable to the Bali populations for each district. Moreover, the age group data in our study were comparable to the Bali populations at the provincial level. Sub-analysis for each district for age group data could not be performed because the age group data are only available for the provincial level. Consequently, we were unable to conduct weighting processes for age and sex variables. Because of limited population data characteristics available at provincial, district, village, and cluster levels, we were also unable to conduct weighting processes for some variables. We conducted a post-stratification weighting during data analysis only at the provincial level.

We performed descriptive analysis for all identified variables and presented the data using tables, graphs/figures, and narrative descriptions. We calculated the vaccination coverage at the district level, both crude and weighted coverage. Furthermore, we calculated specific coverage for the provincial level based on age, sex, education level, employment, and rurality status of the village (rural/urban). In addition, we analyzed and calculated specific vaccination coverage in three sub-districts with priority village (Denpasar Timur, Kuta Selatan, and Ubud). We calculated the vaccination proportion based on types of vaccine and types of health service. We also conducted descriptive analysis for level of knowledge,

source of information, satisfaction level, and perceptions on vaccination and COVID-19 preventative behavior.

We validated questions used for measuring level of knowledge upon completion of data entry. We found all questions were reliable with alpha Cronbach of >80%, except for three questions (Q2, Q8, Q11) which have lower validity score ($r<0.3$). As such, we omitted these three questions in the final analysis for measuring knowledge levels. In addition, the content of these three questions were ambiguous resulting from rapid changing policy and practice related to COVID-19 and the vaccination. We present a detailed information of this validation in Annex 8.

B. Qualitative Method

2.7 Design and Settings

The provision of COVID-19 vaccination involves various actors, including governments, health providers, community systems, and schools. This qualitative inquiry interrogated their perspectives related to implementation of the COVID-19 vaccination program; particularly key challenges faced by these actors. Qualitative approach was selected because it can provide rich explanations of complex phenomena and perspectives. It also allows greater latitude to explore participants' beliefs, attitudes, and experiences. It provides opportunity to uncover significant voices that may be relevant to the research objectives. Due to the open-ended nature of qualitative approaches, rich data can be collected with participants' views framed within the wider social contexts of health system. This study employed in-depth interviews, allowing researchers to guide the interview process using prepared questions (see Annex 9 – In-depth interview guides), while also providing flexibility for participants to elaborate on their responses. The conversational nature of in-depth interviews encouraged greater participant engagement and sharing of opinions/perspectives. The interviews explored implementation of COVID-19 vaccination program, with primary focus was on understanding various challenges of its implementation from the lens of health system building blocks – both from supply and demand perspectives.

2.8 Research Participants and Recruitment Strategies

Participants in this study were various actors involved in the implementation of COVID-19 vaccination program in Bali Province, including provincial and district health offices, hospital staff, public health centers, and school representatives. Their involvement allowed researchers to collect richer, more comprehensive data related to supply and demand side such as acceptability, distribution and supply chain, management and governance, service delivery, human resource challenges, and health information system.

Recruitment began once ethics approval was obtained. Research team directly approached potential informants. Upon agreement, research team contacted the informants to set a date and time for the interview. We asked the participants to nominate a date and time that was most convenient for them. We successfully interviewed 45 informants guided by the

interview guide. These informants included provincial health office (1 participant), district health offices (9 participants), schools (10 participants), hospitals (5 participants), and public health centers (20 participants) (see Table 3), with the socio-demographic characteristics of our informants was presented in Table 4.

Table 3. Key Informants

No	Level	Number of Respondent
I	**Provinces**	
	EPI managers at PHO	1 person
II	**District**	
	EPI managers at DHO	1 person for each district
III	**Public Health Centers**	
	EPI programmer at PHC	2 persons in 10 PHCs (5 rural and 5 urban)
IV	**Hospital**	
	EPI programmer at Hospital	1 person in 5 Hospitals (2 rural and 3 urban)
V	**School**	
	Head of school	1 person in 10 Schools (5 rural and 5 urban)

Table 4. Socio-Demographic Characteristics of Informants

Characteristic	Frequency	Percentage
Median Age (IQR)= 40 (16)		
≤40	22	51.11
>40	23	48.89
Sex		
Male	19	42.22
Female	26	57.78
Education		
Senior High School	1	2.22
Diploma	9	28.89
Bachelor	22	48.89
Post-graduate	13	28.89
Institution		
Health offices (Provincial and District Health Office)	10	22.22
Health providers (Public Health Center and Hospital)	25	55.56
School	10	22.22
Total	**45**	**100**

2.9 Data Collection and Analysis

Data were collected through in-depth interviews to explore experiences and perspectives of the informants regarding the implementation and challenges to implement COVID-19 vaccination program in Bali Province. Interviews were conducted in Bahasa Indonesia and took between 45-90 minutes each to complete. Interviews were audio-recorded and detailed notes were taken with participant permission. Interview recordings were transcribed using a third-party transcription service, subject to appropriate confidentiality provisions.

Data were analyzed using thematic analysis, which identified, categorized and reported themes within the data. Analysis was conducted using manual coding to identify initial codes, axial codes, categories and themes. Interview transcripts were read repeatedly to assist this process. Codes were developed inductively from all transcripts. Data were grouped into codes, then organized into categories. These categories were further evaluated to identify new connections and explanations to reveal themes. Key themes were descriptively presented using a narrative approach supported by direct quotes from the transcripts. Key themes were used to address the research question by linking the data to draw conclusions.

C. Ethical Consideration and Permission

We obtained informed consent prior to interviews with all the respondents. A copy of informed consent was given to the respondent while the other copy will be stored in the cabinet at the Department of Public Health and Preventive Medicine Faculty of Medicine Universitas Udayana for 3 years. Confidentiality of the data collected was maintained by limiting personal information accessibility to the core staff only. Upon completion of the report, paper-based contained personal information will be destroyed under-surveillance of the research team at the Faculty of Medicine Office in October 2022. Electronic data containing personal information are only available for data manager and researchers. Upon completion of data cleaning, we decoded all data to remove personal identification.

We secured an ethical approval (No. 537/UN14.2.2.VII.14/LT/2022) for the protocol from the ethical committee of Faculty of Medicine Udayana University/Sanglah General Hospital prior to the data collection (dated 16 March 2022). We also obtained approval and permission for the survey from the Bali Province Governor through the *Dinas Penanaman Modal dan Perijinan Terpadu Satu Pintu Provinsi Bali* (No. B.30.070/719.E/IZIN-C/DPMPTSP) dated 9 March 2022 and the Bali Province COVID-19 Task Force (No. 540/SatgasCovid19/III/2022) dated 28 March 2022.

III. FINDINGS

3.1 Cluster and Household Characteristics

Table 5. Description of Surveyed Cluster

District	Target Cluster*	Target HH**	Eligible Respondent	Interviewed N (%)	Refused N (%)	Unavailable N (%)
Denpasar	46	736	2,437	1,899 (78.0)	227 (9.3)	311 (12.8)
Badung	35	560	1,834	1,596 (87.0)	145 (7.9)	93 (5.1)
Tabanan	31	496	1,383	1,272 (92.0)	59 (4.3)	52 (3.8)
Gianyar	33	528	2,009	1,672 (83.2)	172 (8.6)	165 (8.2)
Klungkung	30	480	1,543	1,307 (84.7)	104 (6.7)	132 (8.6)
Bangli	30	480	1,357	1,192 (87.8)	66 (4.9)	99 (7.3)
Karangasem	31	496	1,338	1,164 (87.0)	46 (3.4)	128 (9.6)
Buleleng	49	784	2,072	1,758 (84.8)	43 (2.1)	271 (13.1)
Jembrana	30	480	1,375	1,190 (86.5)	38 (2.8)	147 (10.7)
Bali	**315**	**5,040**	**15,348**	**13,050 (85.0)**	**900 (5.9)**	**1,398 (9.1)**

* All target clusters were successfully visited
** All target households were successfully visited

Table 5 depicts characteristics of survey sampling attributes at provincial and district levels. We interviewed 85% of planned respondents with the highest participation rate was in Tabanan District and the lowest was in Denpasar City. We faced quite high non response rate in Denpasar and Buleleng, because respondents were not at home, work/study at another district, and other reasons. Effort to reach potential respondents have been done by second visit as well as making a phone call.

3.2 Characteristics of Respondents

Table 6 presents sociodemographic characteristics of all respondents. The mean age for all respondents was 43.5 years old, with higher proportion among the productive age (18-59 years old). Overall, male was slightly higher than female, mostly graduated senior high school, except for Karangasem, Bangli, and Buleleng districts where more respondents were elementary school graduates and no education. Majority of respondents were farmer/laborer, entrepreneur, and unemployed. A stark contrast across districts was shown, for example a higher proportions of office workers in Denpasar and Badung but predominantly farmers in other districts. The average family income was quite balance between those below or upper of regional minimum income across five districts, but more of below standard in other four districts.

Table 6. Socio-Demographic Characteristics of Respondents

Characteristics of Respondent	Bali Province (N=13,050) n (%)	District								
		Denpasar (N= 1,899) n (%)	Badung (N= 1,596) n (%)	Tabanan (N= 1,272) n (%)	Gianyar (N= 1,672) n (%)	Klungkung (N= 1,307) n (%)	Bangli (N= 1,192) n (%)	Karangasem (N= 1,162) n (%)	Buleleng (N= 1,758) n (%)	Jembrana (N= 1,190) n (%)
Age (Mean (SD))	43.50 (17.55)	41.98 (16.88)	42.12 (17.27)	45.89 (18.39)	43.41 (17.29)	43.84 (18.31)	42.68 (17.39)	43.92 (18.11)	43.84 (17.45)	44.95 (16.97)
>12 – 17 y.o.	1,094 (8.38)	181 (9.53)	133 (8.33)	88 (6.92)	125 (7.48)	129 (9.87)	106 (8.89)	103 (8.85)	141 (8.02)	88 (7.39)
18 – 45 y.o.	5,755 (44.10)	853 (44.92)	746 (46.74)	516 (40.57)	750 (44.86)	556 (42.54)	565 (47.40)	524 (45.02)	780 (44.37)	465 (39.08)
46 – 59 y.o.	3,716 (28.48)	573 (30.17)	465 (29.14)	358 (28.14)	488 (29.19)	347 (26.55)	304 (25.50)	290 (24.91)	504 (28.67)	387 (32.52)
≥60 y.o.	2,485 (19.04)	292 (15.38)	252 (15.79)	310 (24.37)	309 (18.48)	275 (21.04)	217 (18.20)	247 (21.22)	333 (18.94)	250 (21.01)
Sex										
Male	6,583 (50.44)	948 (49.92)	795 (49.81)	643 (50.55)	835 (49.94)	661 (50.57)	616 (51.68)	586 (50.34)	905 (51.48)	594 (49.92)
Female	6,467 (49.56)	951 (50.08)	801 (50.19)	629 (49.45)	837 (50.06)	646 (49.43)	576 (48.32)	578 (49.66)	853 (48.52)	596 (50.08)
Education										
No education	1,025 (7.85)	61 (3.21)	81 (5.08)	38 (2.99)	117 (7.00)	145 (11.09)	112 (9.40)	249 (21.39)	167 (9.50)	55 (4.62)
Elementary	3,714 (28.46)	318 (16.75)	260 (16.29)	404 (31.76)	427 (25.54)	329 (25.17)	463 (38.84)	400 (34.36)	717 (40.78)	396 (33.28)
Junior High	2,126 (16.29)	259 (13.64)	206 (12.91)	200 (15.72)	250 (14.95)	241 (18.44)	250 (20.97)	179 (15.38)	327 (18.60)	214 (17.98)
Senior High	4,509 (34.55)	800 (42.13)	757 (47.43)	475 (37.34)	649 (38.82)	438 (33.51)	263 (22.06)	239 (20.53)	459 (26.11)	429 (36.05)
Tertiary	1,676 (12.84)	461 (24.28)	292 (18.30)	155 (12.19)	229 (13.70)	154 (11.78)	104 (8.72)	97 (8.33)	88 (5.01)	96 (8.07)
Employment										
Farmer/Laborer	3,364 (25.78)	95 (5.00)	169 (10.59)	426 (33.49)	344 (20.57)	300 (22.95)	608 (51.01)	386 (33.16)	667 (37.94)	369 (31.01)
Unemployed	3.263 (25.00)	517 (27.22)	421 (26.38)	273 (21.46)	405 (24.22)	362 (27.70)	208 (17.45)	332 (28.52)	435 (24.74)	310 (26.05)
Entrepreneur	2,724 (20.87)	537 (28.28)	338 (21.18)	212 (16.67)	478 (28.59)	284 (21.73)	138 (11.58)	194 (16.67)	325 (18.49)	218 (18.32)
Private sector	1,634 (12.52)	354 (18.64)	368 (23.06)	167 (13.13)	224 (13.40)	155 (11.86)	66 (5.54)	86 (7.39)	115 (6.54)	99 (8.32)
Student	958 (7.34)	162 (8.53)	140 (8.77)	87 (6.84)	119 (7.12)	92 (7.04)	94 (7.89)	84 (7.22)	108 (6.14)	72 (6.05)
Government employee	464 (3.56)	112 (5.90)	61 (3.82)	53 (4.17)	45 (2.69)	52 (3.98)	31 (2.60)	31 (2.66)	33 (1.88)	46 (3.87)
Housewife	433 (3.32)	74 (3.90)	73 (4.57)	34 (2.67)	39 (2.33)	37 (2.83)	33 (2.77)	36 (3.09)	52 (2.96)	55 (4.62)
Other	210 (1.61)	48 (2.53)	26 (1.63)	20 (1.57)	18 (1.08)	25 (1.91)	14 (1.17)	15 (1.29)	23 (1.31)	21 (1.76)
Family Income Level (N= 5040)		**N= 736**	**N= 560**	**N= 496**	**N= 528**	**N= 480**	**N= 480**	**N= 496**	**N= 784**	**N= 480**
Mean (In IDR Million)	2.82	4.44	3.71	2.62	3.21	2.78	2.30	1.85	1.91	2.10
Below standard	2,810 (55.75)	206 (27.99)	217 (38.75)	277 (55.85)	240 (45.45)	256 (53.33)	318 (66.25)	389 (78.43)	586 (74.74)	342 (71.25)
Above standard	2,230 (44.25)	530 (72.01)	343 (61.25)	219 (44.15)	288 (54.55)	224 (46.67)	162 (33.75)	107 (21.57)	198 (25.26)	138 (28.75)

3.3 COVID-19 Vaccination Coverage

3.3.1 COVID-19 Vaccination Coverage by Recall Among Ever Vaccinated Respondents

We found in total 12,120 (92.9%) respondents recalled to receive at least one dose. Of those who said they had received vaccination, 4.32% was incomplete vaccination (only first vaccine), 31.06% was complete vaccination (first and second doses), and 64.62% was complete vaccination plus booster dose. The overall vaccination coverage by recall for at least one dose was 95.69% (unweighted) and 95.52% (weighted). This coverage was heterogenous across districts, from 90.98% in Karangasem to 97.86% in Jembrana. Additionally, specific to the three sub-districts with priority village, the weighted vaccination coverage by recall was very high - Denpasar Timur (96.74%), Kuta Selatan (96.53%) and Ubud (97.96%).

3.3.2 Weighted Complete COVID-19 Vaccination Coverage by Recall and Validation

Among total 13,050 respondents, the vaccination coverage by recall was 87.91% (95% CI 87.20% - 88.62%). The vaccination coverage by recall was varied, where 5 districts (Tabanan, Klungkung, Bangli, Gianyar and Jembrana) have higher coverage (90%-94%), while other districts have lower coverage (82%-89%). In three sub-districts with priority villages, the vaccination coverage by recall was 88%-90%. (Table 7)

Table 7. COVID-19 Vaccination Coverage in Provincial and District Level

District	Total Sample (N)	Unweighted Coverage						Weighted Coverage					
		Recall (%)	95% CI		Validation (%)	95% CI		Recall (%)	95% CI		Validation (%)	95% CI	
			Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Denpasar	1,899	87.99	86.53	89.46	87.89	86.42	89.36	88.71	87.11	90.31	88.54	86.93	90.16
Badung	1,596	89.16	87.64	90.69	88.53	86.97	90.10	89.69	88.12	91.26	89.24	87.65	90.83
Tabanan	1,272	92.77	91.34	94.19	91.43	89.89	92.97	91.70	89.87	93.53	90.79	88.93	92.66
Gianyar	1,672	89.47	88.00	90.95	87.38	85.79	88.97	89.55	87.81	91.30	86.93	84.97	88.89
Klungkung	1,307	92.50	91.07	93.93	90.67	89.09	92.24	93.50	91.81	95.20	91.71	89.80	93.62
Bangli	1,192	91.86	90.31	93.42	89.77	88.04	91.49	90.95	88.86	93.05	88.72	86.37	91.07
Karangasem	1,164	82.05	79.84	84.25	79.55	77.24	81.87	81.69	79.06	84.31	79.05	76.28	81.81
Buleleng	1,758	82.37	80.58	84.15	80.43	78.58	82.29	82.71	80.67	84.75	81.18	79.10	83.25
Jembrana	1,190	94.12	92.78	95.46	91.01	89.38	92.64	93.30	91.55	95.04	90.52	88.56	92.47
Bali	**13,050**	**88.87**	**88.33**	**89.41**	**87.23**	**86.66**	**87.81**	**87.91**	**87.20**	**88.62**	**86.28**	**85.54**	**87.03**
Sub-Districts with Priority Village													
Denpasar Timur	639	91.08	88.86	93.30	91.24	89.04	93.44	90.45	87.92	92.98	90.79	88.30	93.29
Kuta Selatan	277	89.89	86.32	93.46	90.25	86.74	93.77	90.29	86.72	93.85	90.60	87.08	94.12
Ubud	290	88.97	85.34	92.59	86.90	82.99	90.80	88.13	83.76	92.50	87.13	82.76	91.51

The weighted vaccination coverage by validation was only slightly lower than by recall with range from 87.91% (95% CI 87.20%-88.62%) to 86.28% (95% CI 85.54%-87.03%). Three districts have weighted coverage by validation above 90% (Tabanan, Klungkung and Jembrana), four districts (Denpasar, Badung, Gianyar, Bangli) showed the complete vaccination coverage by validation of between 85-89%, one district (Buleleng) showed the coverage of between 81-84%, and one district (Karangasem) showed the coverage of <80%. These conditions may relate to combining characteristics such as lower education level, less knowledge, older, work as farmers/labors (Annex 10) that limit their information and access to vaccination services.

A high coverage of COVID-19 vaccination in Bali Province and the nine districts was contributed by acceptability of COVID-19 vaccines. Although it fluctuates overtime, the acceptability of COVID-19 vaccination remains high, with the highest identified during the peak of omicron wave. High acceptability to COVID-19 vaccination have improved community participation, engagement, and uptake of the program.

> *"Pada awalnya sih bagus ya penerimaan pelayanan vaksinasi COVID-19 karena banyaknya kasus yang terjadi, wabah yang terjadi banyak apa namanya sasaran mau meminta vaksinasi termasuk di wilayah-wilayah pariwisata itu ya sehingga cakupan kita sudah 105 lebih ya, 105% lebih kemudian untuk yang keduanya ini agak menurun animonya mungkin karena merasa pandemi itu sudah berkurang dimana sehingga cakupannya kita agak menurun" [Dinkes Provinsi Bali]*

A strong interest from the community to partake in the vaccination program was motivated by higher perceived risk and severity of the COVID-19 infection, especially among the elderly population where the majority of deaths had occurred. Our interviews also revealed that attitude, enthusiasm, and participation in the vaccination program during the first and second doses and the booster are differed significantly. Community participation in the second dose increases only when the government made 1st and 2nd doses of COVID-19 vaccination as a mandatory requirement for entering public venues, travel and public administration, contributing to improve vaccination coverage.

> *"… kemudian untuk boosternya ini juga masih kurang, masih kurang animonya masyarakat untuk mendapatkan vaksin booster, kecuali pada saat pemerintah melakukan tindakan-tindakan seperti membatasi kalau tidak booster tidak boleh pergi ke mall atau tidak boleh pergi ke luar wilayah itu bisa meningkatkan sedikit cakupan kita" [Puskesmas Dentim 1]*

Our qualitative data further identified several system level factors contributing to COVID-19 vaccination coverage. First, active collaboration between community system and primary care providers involving integrated health post cadres, and active participation of village, community, and religious leaders in promoting safety and efficacy of the vaccination. Additionally, personal testimonies about the safety of the vaccines from community and

religious leaders were particularly powerful in encouraging communities to come forward for the vaccination.

> *"Kita ada kerjasama dengan majelis Desa Adat juga, terus kita sama juga bekerjasama dengan, dengan apa namanya itu ada sih salah satu ormas di ormas islam sih tapi saya lupa namanya tu" [Dinkes Jembrana]*
> *"Jadi lurahnya kemudian perangkat desanya, kepala lingkungannya, sehingga warganya sudah melihat mereka vaksin dan melihat tidak ada efek samping… Jadi wargapun berbondong – bondong untuk ikut vaksinasi setelah itu" [Puskesmas Densel 3]*

Second, some district governments implemented incentive or disincentive mechanisms to encourage people to partake in the vaccination program. For example, access the COVID-19 cash transfer payment, access to basic necessities/supplies (locally called *sembako*), and access to public services such as legal documents, hospital admission, travel in and out of Bali Province, work requirement for some occupations, and face-to-face school attendance.

> *"… ada yang memberikan kayak sembako seperti itu; alasan utamanya ya, ya itu karena pemberian sembako karena itu sih yang banyak" [Dinkes Jembrana]*
> *"Kemudian kalau misalnya di kalangan pegawai negeri kan semuanya sudah sesuai pasti diwajibkan untuk vaksin" [Densel 3 SKM]*
> *"Otomatis dia kan tidak boleh ke sekolah, jadi daring dia di rumah. Dia datang ke sekolah "ini belum divaksin", kan begitu" [SMPN3 Nuspen]*
> *"… dia mengurus itu BLT kan harus paling tidak vaksin lengkap dan booster gitu, kalau tidak kita tidak melayani untuk pengambilan BLTnya atau urusan admnistrasi apapun baik di Perbekel tingkat bawahnya sampai di Kecamatan" [Dinkes Jembrana]*

Third, inter-sectoral coordination emerges as one of the most critical features of COVID-19 vaccination program. For example, led by the Bali Provincial Health Office, procurement and distribution of the vaccines involved district health offices, police department and/or military units, public health centers, and private enterprises including tourism industries. Additionally, inter-sectoral partnerships also evidenced during the implementation of the COVID-19 vaccination program and risk communication efforts by involving community systems, non-health government sectors, private enterprises, and local/municipalities governments.

> *"… distribusi vaksin itu kita pakai pengawalan polisi…" [Dinkes Dps]*
> *"…sosialisasi, edukasi, penyiapan logistik vaksinnya bekerjasama dengan pusat kemudian bekerjasama dengan kabupaten/kota dan TNI POLRI, kita juga dengan perusahan-perusahaan untuk dalam distribusi vaksinnya…" [Dinkes Prov]*
> *"… berkoordinasi dengan lintas sektor dalam menyiapkan faskes atau vaksinasi masal kayak di banjar-banjar itukan tidak ada faskes pelaksananya jadi bekerjasama sama klian desa atau banjar…" [Dinkes Badung]*

Fourth, political push from local politicians in promoting COVID-19 vaccination program and in improving the overall coverage of the program. For example, members of legislative (local politicians) would organize mass vaccination campaigns across multiple locations in their jurisdictions by collaborating with health offices and community health centers. This political commitment has led to improved coverage of vaccination program, especially for the 1st dose, to traditional markets and villages. Our findings indicate that the uncertainty of the pandemic situation, the national government vaccination target, and the urgency for re-opening has propelled the inter-sectoral partnerships in procuring and delivering COVID-19 vaccines to the communities as fast as possible.

> *"… anggota DPR dia melakukan kegiatan masal di wilayah mungkin di tempat dia dapat masa disana melakukan kegiatan kita yang diminta membawakan vaksin atau membantu petugasnya juga" [Dinkes Prov]*

Lastly, a centralized approach to procurement and distribution of vaccines may offer significant benefit during the pandemic. However, as the pandemic progressed, such approach will have to change following the routine supply change mechanism. Supply chain, distribution, and storage capacity across districts might lead to coverage variations across districts in Bali Province. For example, Inadequate cold chain system is one of key challenges in implementing the mass COVID-19 vaccination program, especially for vaccines that require low temperatures such as Pfizer. Local storage capacity at district health offices posed a significant challenge for timely distribution and administration of the vaccines. Only few district health offices have sufficient storage capacity to stockpile large amount of vaccines. Our findings indicate the disparity of cold chain facilities may lead to disparity in vaccination coverage.

> *"… di Kabupaten Kota kan tidak semua punya cold room yang memadai sehingga tidak bisa menampung semua yang di alokasikan sehingga harus kita simpan dulu di Provinsi" [Dinkes Prov]*
> *"Ketersediaan cukup… kebetulan kan, di Jembrana kan punya cold room sendiri ya. Jadi kita bisa lumayan menampung ketersediaan vaksin kalau memang kita membutuhkan banyak" [Dinkes Jembrana]*

3.3.3 Weighted Specific COVID-19 Vaccination Coverage by Recall and Validation

Table 8 showed that the weighted COVID-19 vaccination coverage was higher among younger (12-17 years old) and productive age (18-45 years old) when compared to older populations (46-59 and ≥ years old). The weighted coverage was slightly higher among male than female groups, as well as between urban and rural areas. It was higher among respondents with high education level and very low among those with no education. Supported the low coverage among certain districts previously, further analysis revealed that 79% of elderly respondents in the survey were elementary school graduates or had no formal education. Among unvaccinated respondents, 63.98% were also elementary school

graduates or had no formal education, and 38.17% were aged >65 years old. In terms of employment status, the weighted coverage was high among public servants, private sector employees, entrepreneurs, and students. Other employment categories including farmer, housewife, and unemployed were found to have lower weighted coverage.

Table 8. Specific COVID-19 Vaccination Coverage by Recall and Validation in Bali Province

Characteristics	Total Sample (N)	Recall Vaccination (N)	Weighted Coverage			Validated Vaccination (N)	Weighted Coverage		
			Recall (%)	95% CI			Validation (%)	95% CI	
				Lower	Upper			Lower	Upper
Age	**13,050**	**11,597**				**11,384**			
>12 – 17 y.o.	1,094	1,052	96.14	94.87	97.42	1,036	94.73	93.16	96.30
18 – 45 y.o.	5,755	5,344	92.66	91.85	93.46	5,250	90.94	90.06	91.82
46 – 59 y.o.	3,716	3,319	88.70	87.38	90.02	3,265	87.36	86.01	88.71
≥60 y.o.	2,485	1,882	72.44	70.19	74.68	1,833	70.50	68.21	72.78
Sex	**13,050**	**11,597**				**11,384**			
Male	6,583	5,915	88.84	87.86	89.81	5,788	87.03	86.01	88.06
Female	6,467	5,682	86.97	85.94	88.01	5,596	85.52	84.45	86.60
Education	**13,050**	**11,597**				**11,384**			
No education	1,025	715	65.53	61.85	69.22	683	61.67	57.91	65.44
Elementary	3,714	3,118	83.21	81.71	84.70	3,057	81.82	80.29	83.35
Junior High	2,126	1,966	92.01	90.57	93.45	1,934	90.41	88.84	91.98
Senior High	4,509	4,199	92.82	91.88	93.76	4,129	91.26	90.25	92.28
Tertiary	1,676	1,599	95.35	94.09	96.62	1,581	94.45	93.10	95.79
Employment	**13,050**	**11,597**				**11,384**			
Farmer/Laborer	3,364	2,946	86.45	85.00	87.90	2,864	83.83	82.27	85.39
Unemployed	3,263	2,705	80.70	78.95	82.45	2,663	79.78	78.02	81.53
Entrepreneur	2,724	2,452	90.05	88.66	91.45	2,424	88.87	87.40	90.33
Private sector	1,634	1,545	94.94	93.72	96.16	1,511	92.75	91.31	94.20
Student	958	925	96.49	95.20	97.78	909	94.60	92.82	96.38
Gov. employee	464	452	97.27	95.63	98.92	448	96.42	94.54	98.30
Housewife	433	385	88.10	84.35	91.84	381	87.16	83.32	91.00
Other	210	187	84.07	77.04	91.10	184	83.24	76.18	90.31
Type of Village	**13,050**	**11,597**				**11,384**			
Urban	7,153	6,380	88.50	87.55	89.45	6,312	87.58	86.60	88.55
Rural	5,897	5,217	87.24	86.18	88.31	5,072	84.83	83.69	85.96

The highest coverage among young population is contributed by the implementation and acceptability of school-based COVID-19 vaccination program. Schools and parents are supportive of the school vaccination program, mainly due to safety reasons during face-to-face interactions and activities at schools. Mandating COVID-19 vaccination has led to greater uptake of school vaccination program in Bali Province. Those who were sick and were unable to participate in the school vaccination program will be referred by the school to a health center for the vaccination. Our participants viewed this arrangement (school

vaccination program) as quick, time and resource efficient, and convenience, leading to greater coverage of COVID-19 vaccination.

> *"Menerima dengan positif bu, dari orang tua juga merelakan anak-anaknya untuk ikut vaksin kecuali pas pada saat itu sakit ya kemudian baru ada operasi itu tertunda saja bu. Nanti kami ajukan kembali anak-anak yang belum itu. Kami ajukan kembali ke pihak puskesmas, beberapa orang yang belum itu untuk dibuatkan jadwal. Lalu dikasi jadwal untuk melakukan vaksin di puskesmas" [SMPN 3 Nuspen]*

On the contrary, our survey found the lowest coverage was among the elderly population. For elderly, not having a family member to take them to a vaccination center can be problematic. These data suggest the importance of active vaccination activities, including outreach and door-to-door services for specific population group, including elderly population. Unfortunately, given the current demand for vaccination in health facilities and public spaces, only a small proportion of outreach and door-to-door services could be delivered with an overall proportion of less than 1%. In some cases, unavailability of certain vaccines also influences people's decision, for example, due to fear of side effects people will demand certain labels or brands. Unavailability of such vaccines can deter people away from the program, and they refuse to take the available vaccines, leading to reduced overall coverage.

> *"… manula yang lansia itu karena tidak ada yang menganter itu aja" [DinProv]*
> *"… misalnya dia minta yang tidak menimbulkan KIPI seperti minta sinovac padahal pelayanan sinovac kan udah di hentikan untuk dewasa … dia menolak ga jadi vaksin gitu" [DinProv]*
> *"Dia menolak karena apa namanya karena tidak ada vaksin itu sih ga karena vaksin sesuai keinginannya dia… mintanya vaksin moderna padahal sebenernya tidak vaksin moderna dia dapetnya harusnya astra kayak gitu" [Dinkes Dps]*

In addition to the access barriers, the uncertainty around eligibility or contraindication for receiving COVID-19 vaccine especially among the elderly groups affect their opinion, perception, and decision for partaking in the vaccination program. Part of the reason is the inconsistent information provided by the governments, changing eligibility criteria and fake news circulated widely within the communities. Our interviews also found that patients and vaccinators are unaware of eligibility criteria, particularly for certain comorbidities such as people with hypertension, diabetes, and breast-feeding mothers. People with certain health conditions were asked by vaccinators to provide referral letters from their doctors explaining that they are indeed eligible for the COVID-19 vaccination. Such approach discourages many people for taking the vaccine, especially elderly population who also face access barriers to health care.

> *"Ragu-ragu dia, misalkan punya riwayat penyakit kronis apa terus misalkan ada yang menyusui, itu biasanya ragu dah dia vaksin, ga tahu boleh atau ga nya" [Dokter 1]*

"Ada juga beberapa yang mempunyai riwayat penyakit sistemik karena keterbatasan informasi mungkin mereka dengan penyakit yang diderita, mereka itu ragu "apakah boleh ngga sih saya itu divaksin?", gitu tapi mereka pilih bertanya terus kita sarankan untuk konsultasi sama dokternya, gitu" [Dentim 2]

Table 9 depicts locations and types of vaccine received by respondents. The majority of COVID-19 vaccination (1st, 2nd, and booster) were delivered in public spaces and primary care settings. Meanwhile, home visit as the way to reach less accessed persons were still very limited, thus ineffective to increase vaccination coverage.

Table 9. Location of COVID-19 Vaccination and Type of Vaccine in Bali Province

Variable	Vaccine 1 (N= 12,120)		Vaccine 2 (N= 11,597)		Vaccine Booster (N= 7,832)	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Location of Vaccination						
Public space	5,639	46.53	5,281	45.54	4,345	55.48
Primary care	3,960	32.67	4,042	34.85	2,636	33.66
School	1,280	10.56	1,219	10.51	217	2.77
Hospital	729	6.01	672	5.79	384	4.90
Government agency	328	2.71	233	2.01	122	1.56
Work place	101	0.83	84	0.72	68	0.87
Religious place	53	0.44	42	0.36	55	0.70
Home visit	30	0.25	24	0.21	5	0.06
Type of Vaccine						
AstraZeneca	6,631	54.71	6,340	54.67	5,490	70.10
Sinovac/Coronavac	4,460	36.80	4,293	37.02	46	0.59
Moderna	32	0.26	35	0.30	371	4.74
Sinopharm	28	0.23	25	0.22	12	0.15
Pfizer	3	0.02	4	0.03	1,293	16.51
Johnson&Johnson	2	0.02	1	0.01	1	0.01
Didn't know	964	7.95	899	7.75	619	7.90

*The data above based on respondents' recall

As observed in Figure 2, the main reasons for refusing vaccination were comorbidities, fear of side effects, and fear of injection. Further analysis showed that among those who were not vaccinated 50.2% were the elderly. While among the elderly, 74.3% stated having comorbidities. Moreover, at very low percentage, other reasons included sick during vaccination schedule, vaccination is not important, elderly and due to pregnancy and breastfed.

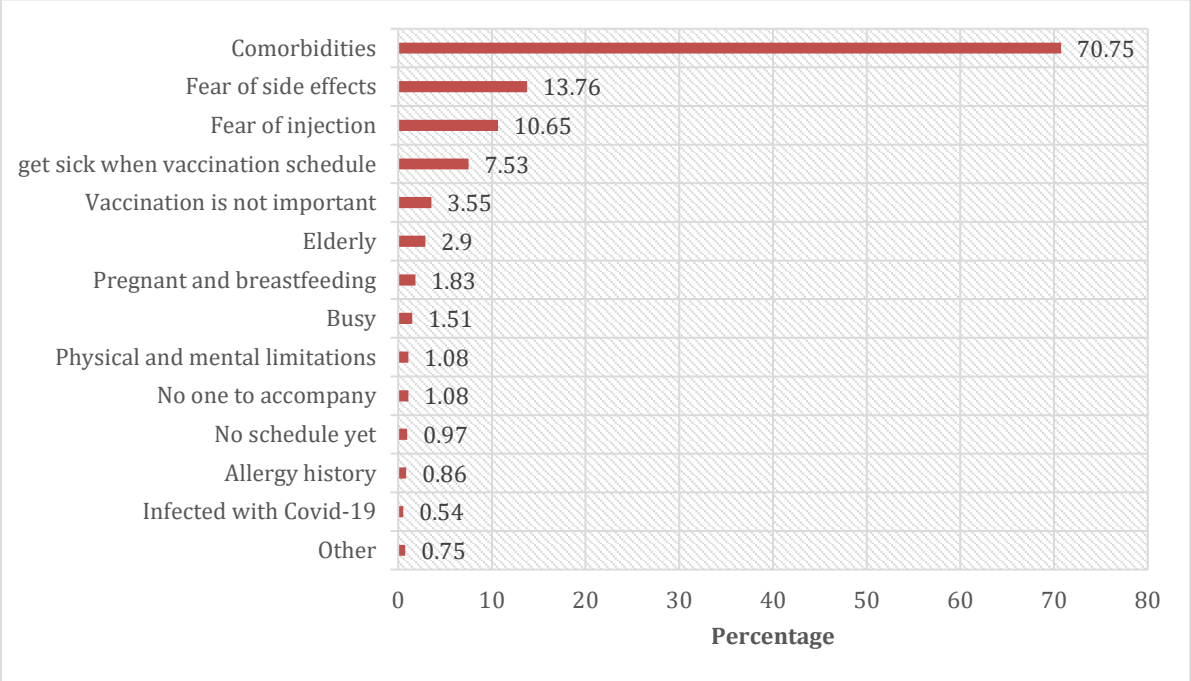

Figure 2. Reason for Not Being Vaccinated

Our interviews with multiple stakeholders, including health providers at the public health centers, identified several reasons as to why people are reluctance to participate in the COVID-19 vaccination program, for either 1st dose or 2nd dose. As indicated in the quantitative survey, the main reasons for not participating in the COVID-19 vaccination program included comorbidities, fear of side effects, and fear of injection . These findings were aligned with our qualitative findings. Our interviews identified comorbidities and fear of side effects also as the most common reasons for not being vaccinated. In addition, our interviews identified various other reasons, these included: lack of knowledge, access barrier and availability, unsure of eligibility, and religious reasons. Our informants argued that people are unsure about the side effects of newly developed vaccines, leading to reduced participation in the program. Personal experiences of side effects during the first injection have led to delayed uptake for the 2nd dose. Stories about side effects from the vaccination further discourage people from participating in the program. Collectively, such fear and personal experiences of side effects influence people's decision to participate in the COVID-19 vaccination program, lower acceptability, and reduced coverage.

> *"…yang menolak itu kebanyakan karena dia awalnya dia melakukan vaksin kemudian dia kena KIPI ringan, dengan adanya Kejadian Ikutan Pasca Imunisasi ringan itu dia menunda untuk datang mendapatkan vaksinasi gitu" [Puskesmas Densel 3]*

Moreover, during the early phase of COVID-19 vaccination rollout, many people had refused the vaccine due to religious reason, especially among Moslem communities. During that phase, the *Majelis Ulama Indonesia* (MUI) made no official statement if the available vaccines were halal or not, leading to a strong reluctance from some communities to take the vaccinations. According to our informants, the enthusiasm and willingness to partake in

the vaccination program were resumed soon after the MUI made its official statement that COVID-19 vaccines are halal.

> *"… penerimaan pertama itu memang tidak terlalu antusias masyarakat terkait vaksinasi COVID-19, karena banyak yang juga disini kan banyak yang isu halal haramnya itu yang pertama, terus yang kedua juga jadinya banyak masyarakat yang merasa tidak berkepentingan dengan apa namanya dengan vaksinasi ini" [Dinkes Jembrana]*

3.4 Knowledge and Perceptions of COVID-19 Vaccination

Figure 3 shows the distribution of level of general knowledge about COVID-19 in Bali Province as indicated by the gradation of color change from green (good knowledge) to red (poor knowledge). The highest level of general knowledge was found in Badung District (68.42%), while the lowest was found in Karangasem District (53.09%).

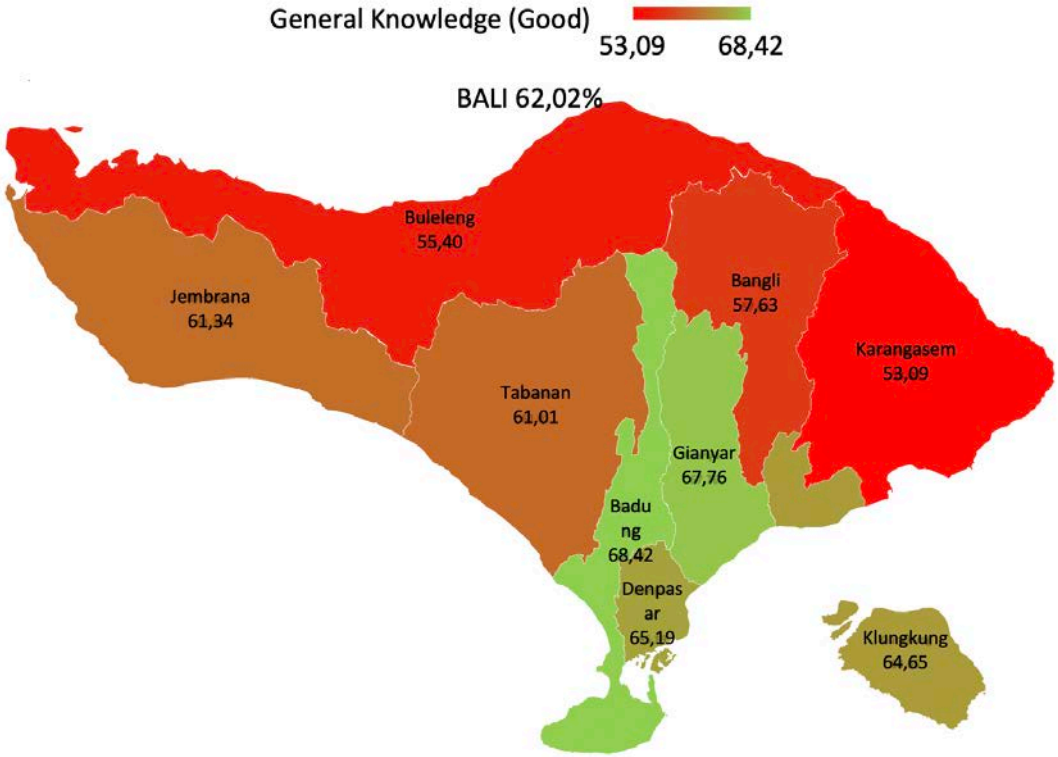

Figure 3. Distribution of Level of General Knowledge About COVID-19 in Bali Province

Table 10 shows levels of knowledge and sources of information related to COVID-19 and vaccination among respondents. We found that the majority of respondents have good level of knowledge related to COVID-19 preventative measures and vaccination. Similar trend was observed for seven districts of Denpasar, Badung, Tabanan, Gianyar, Klungkung, Buleleng and Jembrana. In contrast, the proportion of good knowledge level related to COVID-19 vaccination was lower than poor knowledge level in Bangli and Karangasem districts. Additionally, the common sources of information related to COVID-19 prevention and vaccination included health promotion campaigns and friends/families, both at provincial and district levels.

Table 11 presents perceptions and satisfaction towards vaccination program in Bali Province. We found that the majority of respondents have a high-perceived risk, severity, and benefit. However, we also identified almost more than two third of respondents have a high-perceived barriers to access COVID-19 vaccination program. This was aligned with the moderate proportion of good satisfaction among respondents towards vaccination program.

Lower health literacy also influences people's perceptions regarding the side effects and efficacy of the newly developed vaccines. Health literacy relates to the capacity of individual or community to navigate and screen health information. Our interviews identified that people with lower knowledge level and lower perceived risk and benefit will likely to not partaking in the COVID-19 vaccination program. This aligns with data from the quantitative survey. While the majority of respondents have a good knowledge about preventative measures (58.40%) and COVID-19 vaccination (54.00%), there are still substantial proportion of our respondents who have poor knowledge about COVID-19 vaccination (between 51.93% in Bangli District to 52.66% in Karangasem District). Low level of knowledge about COVID-19 vaccination will influence the uptake of the vaccination. In addition, our quantitative survey found that the coverage among respondent with low education level (no education to elementary school) was lower (61.7% and 81.8%) compare to those with high education level (91.3-94.5%). Furthermore, our survey data found that the majority of respondents obtain the information from health promotion activities both offline and online health education (68.23%). This also aligns with findings from our interviews, which found that health providers and governments have utilized various modalities both online and offline to provide correct and consistent information about COVID-19 vaccination. For example, using social media platforms, social campaign, outreach education using community health workers, community engagement through community and religious leaders, and village-based education program.

Widely circulated hoaxes in online channels as well as social media (e.g., Facebook, WhatsApp Group, Instagram) further complicate the already ineffective risk communication strategies implemented by the governments, leading to increased fear to COVID-19 vaccination. Fake news has been circulating during the pandemic influencing people's opinion about vaccine and their participation in the vaccination program. Our informants further argued that promoting acceptance of COVID-19 vaccination requires improvement in individual or collective ability to detect fake news through consistent education and communication programs.

> *"… karena ada beberapa yang menjadi takut e karena dibilang apa sih yang dulu beritanya itu bahwa vaksin menyebabkan kematian, vaksin dimasukkan chip.. he eh yaa sempet takut mereka" [Densel 3 SKM]*
>
> *"… menerima berita-berita dari medsos itu bahwa ada setelah di vaksin itu meninggal,ada yang sakit sampai tidak bisa bangun itu yang utama sih,lebih kepada efek samping efek simpang dari vaksin itu,itu yang mereka takutkan" [Dinkes Jembrana]*

Table 10. Level of Knowledge and Source of Information

Variable	Bali Province (N=13,050) n (%)	District								
		Denpasar (N= 1,899) n (%)	Badung (N= 1,596) n (%)	Tabanan (N= 1,272) n (%)	Gianyar (N= 1,672) n (%)	Klungkung (N= 1,307) n (%)	Bangli (N= 1,192) n (%)	Karangasem (N= 1,164) n (%)	Buleleng (N= 1,758) n (%)	Jembrana (N= 1,190) n (%)
Level of knowledge (N= 13,050)*										
General knowledge	Maximal score= 12, Mean (SD)= 8.54 (2.44), Median= 9									
- Good (≥9)	8,093 (62.02)	1,238 (65.19)	1,092 (68.42)	776 (61.01)	1,133 (67.76)	845 (64.65)	687 (57.63)	618 (53.09)	974 (55.40)	730 (61.34)
Prevention measures	Maximal score= 6, Mean (SD)= 5.20 (1.27), Median= 6									
- Good (≥6)	7,621 (58.40)	1,112 (58.56)	1,036 (64.91)	704 (55.35)	1,077 (64.41)	803 (61.44)	699 (58.64)	582 (50.00)	913 (51.93)	695 (58.40)
COVID-19 vaccination	Maximal score= 6, Mean (SD)= 3.33 (1.54), Median= 4									
- Good (≥4)	7,047 (54.00)	1,114 (58.66)	952 (59.65)	676 (53.14)	935 (55.92)	701 (53.63)	573 (48.07)	551 (47.34)	882 (50.17)	663 (55.71)
Source of information	**N= 12,120**	**N= 1,735**	**N= 1,464**	**N= 1,206**	**N= 1,557**	**N= 1,246**	**N= 1,142**	**N= 1,065**	**N= 1,561**	**N= 1,144**
Health promotion	8,270 (68.23)	823 (47.44)	963 (65.78)	891 (73.88)	1,070 (68.72)	881 (70.71)	854 (74.78)	764 (71.74)	1,166 (74.70)	858 (75.00)
Friends/families	3,847 (31.74)	627 (36.14)	488 (33.33)	379 (31.43)	527 (33.85)	391 (31.38)	311 (27.23)	318 (29.86)	455 (29.15)	351 (30.68)
Electronic media	1,758 (14.50)	435 (25.07)	234 (15.98)	211 (17.50)	204 (13.10)	171 (13.72)	106 (9.28)	127 (11.92)	175 (11.21)	95 (8.30)
Internet	1,682 (13.88)	538 (31.01)	275 (18.78)	233 (19.32)	215 (13.81)	141 (11.32)	55 (4.82)	80 (7.51)	82 (5.25)	63 (5.51)
School	1,179 (9.73)	167 (9.63)	118 (8.06)	103 (8.54)	156 (10.02)	131 (10.51)	120 (10.51)	131 (12.30)	159 (10.19)	94 (8.22)
Work place	237 (1.96)	67 (3.86)	51 (3.48)	31 (2.57)	20 (1.28)	21 (1.69)	17 (1.49)	11 (1.03)	11 (0.70)	8 (0.70)
Paper-based media	182 (1.50)	86 (4.96)	24 (1.64)	17 (1.41)	11 (0.71)	12 (0.96)	2 (0.18)	7 (0.66)	8 (0.51)	15 (1.31)

*Level of knowledge category= good and poor

Table 11. Perceptions and Satisfaction of COVID-19 Vaccination

Variable	Bali Province (N=13,050) n (%)	District								
		Denpasar (N= 1,899) n (%)	Badung (N= 1,596) n (%)	Tabanan (N= 1,272) n (%)	Gianyar (N= 1,672) n (%)	Klungkung (N= 1,307) n (%)	Bangli (N= 1,192) n (%)	Karangasem (N= 1,162) n (%)	Buleleng (N= 1,758) n (%)	Jembarana (N= 1,190) n (%)
Perceptions*										
Perceived Risk										
- High	9,430 (72.26)	1,261 (66.40)	1,121 (70.24)	949 (74.61)	1,280 (76.56)	971 (74.29)	899 (75.42)	809 (69.50)	1,228 (69.85)	912 (76.64)
Perceived Severity										
- High	11,071 (84.84)	1,459 (76.83)	1,349 (84.52)	1,103 (86.71)	1,455 (87.02)	1,138 (87.07)	1,044 (87.58)	981 (84.28)	1,460 (83.05)	1,082 (90.92)
Perceived Benefit										
- High	12,061 (92.42)	1,631 (85.89)	1,466 (91.85)	1,194 (93.87)	1,542 (92.22)	1,215 (92.96)	1,141 (95.72)	1,108 (95.19)	1,625 (92.43)	1,139 (95.71)
Perceived Obstacle										
- High	9,384 (71.91)	1,234 (64.98)	1,089 (68.23)	961 (75.55)	1,278 (76.44)	939 (71.84)	871 (73.07)	881 (75.69)	1,262 (71.79)	869 (73.03)
Satisfaction**	**N= 12,120**	**N= 1,735**	**N= 1,464**	**N= 1,206**	**N= 1,557**	**N= 1,246**	**N= 1,142**	**N= 1,065**	**N= 1,561**	**N= 1,144**
Satisfied	7,574 (62.49)	988 (56.95)	822 (56.15)	703 (58.29)	966 (62.04)	740 (59.39)	782 (68.48)	677 (63.57)	1,050 (67.26)	846 (73.95)

*Perceptions category= high and low

**Satisfaction category= satisfied and less satisfied

Our informants argued the fundamental role of health education, socialization, risk communication, and health literacy in improving acceptability and uptake of COVID-19 vaccination. These efforts could be delivered through online and offline strategies, for example public education through social media as well as offline education during community gatherings and school outreach programs targeting young populations. In addition, while carries significant risk for circulating fake news, our informants argued that WhatsApp Group served as an effective education channel for the communities, especially when health workers at the public health centers managed the group. They used the group to distribute educational posters, schedule and location of mass vaccination programs, and educational news.

> *"…petugas sekolah covid-19 itu, tugas utama jadi mengkoordinir kegiatan apa namanya.. bukan hanya vaksin bu, kita adakan prokes bu, protokol kesehatan"*
> *"Kalau awal-awal kan pada takut, gitu "ini aman ngga ya? aman ngga ya?" tapi setelah dikasih edukasi kan ya mereka berani"*
> *"Di WA pun kita banyak grup diantaranya grup kader, grup posyandu, kemudian grup edukasi masyarakat umum di wilayah kerja kami… berbagi poster, jadwal vaksin dan kayak dateline informasi" [Densel 3 SKM]*

Vaccines hesitancy driven by religious beliefs bring inevitable consequences for acceptability and vaccination coverage. As previously stated, during the early phase of the vaccination rollout, the notion of non-halal and fasting period have hampered the uptake of COVID-19 vaccination among Islamic communities. However, our informants further argued that religious activities have provided opportunities for outreach programs for both vaccination services and campaigns. For example, opening up mass vaccination centers at multiple mosques, risk communication and vaccination campaign during religious activities (e.g., tarawih, ceremonies in temples). Our findings indicate that communication strategies and outreach vaccination program targeted at specific religious events are essential in improving acceptance and COVID-19 vaccination coverage. In such settings, local religious leaders were effectively involved through announcements in mosques, churches, or temples about the safety and efficacy of the vaccines during periodic religious sermons.

> *"…kayak kemarin waktu puasa, ada orang tarawih, kita buka layanan vaksinasi. Karena kan banyak yang berpikiran, kalau selama puasa nggak boleh divaksin… kita yang datang jemput bola, membuka layanan vaksinasi di Masjid. Setelah mereka Tarawih mereka di vaksin" [Dinkes Jembrana]*
> *"… kemarin ada mangku juga datang ke tempat kita kemudian vaksin. Dan merekapun mengajak kerabatnya yang sama profesinya untuk vaksin segala macem dan mereka menginformasikan ketika ada seperti kalau di islam itu dibilang dakwah gitu ya mba, jadi mereka menginformasikan juga. Sangat ini sih sangat berpengaruh" [Densel 3 SKM]*

3.5 Procedures and Adverse Effect of COVID-19 Vaccination

Table 12 shows that the majority of COVID-19 vaccination staff has fulfilled their main duties. For example, filling medical history form and screening for medical conditions, checking eligibility criteria for vaccination, injecting vaccine on the left arm, and observing respondents post injection although for less than 30 minutes.

Table 12. Procedures of COVID-19 Vaccination in Bali Province

Variable	Vaccine 1 (N= 12,120)	Vaccine 2 (N= 11,597)	Vaccine Booster (N= 7,832)
	Yes N (%)	Yes N (%)	Yes N (%)
Filling form about medical history	9,540 (78.71)	8,876 (76.54)	5,920 (75.59)
Asked about medical history	11,955 (98.64)	11,436 (98.61)	7,715 (98.51)
Checked for vaccination eligibility	12,026 (99.22)	11,503 (99.19)	7,767 (99.17)
Location of Injection			
- Right arm	573 (4.73)	518 (4.47)	391 (4.99)
- Left arm	11,116 (91.72)	10,691 (92.19)	7,248 (92.54)
- Didn't know	431 (3.56)	388 (3.35)	193 (2.46)
Supervised by health workers after immunization[(A)]	8,719 (71.94)	8,320 (71.74)	5,629 (71.87)
Length of supervision*			
- <30 minutes	7,119 (81.65)	6,822 (82.00)	4,672 (83.00)
- 30-60 minutes	1,566 (17.96)	1,471 (17.68)	942 (16.73)
- >60 minutes	18 (0.21)	17 (0.20)	10 (0.18)
- Didn't know	16 (0.18)	10 (0.12)	5 (0.09)
Asked to monitor adverse effects at home[(B)]	2,573 (21.23)	2,416 (20.83)	1,566 (19.99)
Length of monitoring in days (Mean (SD))**	2.06 (1.85)	2.05 (1.77)	2.07 (1.81)

*Length of supervision was based from those who answered "Yes" on [(A)]
**Length of monitoring was calculated from those who answered "Yes" on [(B)]

Of all vaccinated respondents, the prevalence of adverse events across first, second, and booster doses were 22.6%, 9.8%, and 15.5% respectively. Across the three doses, the most common local side effect was localised pain within the injection site; and the most common systemic adverse event was fever. Most respondents experienced these side effects for between 1 - 2.3 days. The majority of respondents did nothing to these side effects or did self-medicating only to manage the symptoms. Most respondents who had side effects perceived the symptoms as mild (Table 13).

Table 13. Adverse Effect of COVID-19 Vaccination in Bali Province

Variable	Vaccine 1 (N= 12,120)	Vaccine 2 (N= 11,597)	Vaccine Booster (N= 7,832)
	Yes N (%)	Yes N (%)	Yes N (%)
Experiencing adverse effect[(A)]	2,733 (22.55)	1,133 (9.77)	1,212 (15.47)
Local adverse effect*	1,093 (39.99)	542 (47.84)	662 (54.62)
- Local pain	1,028 (37.61)	516 (45.54)	614 (50.66)
- Redness	47 (1.72)	12 (1.06)	14 (1.16)
- Swelling	107 (3.92)	31 (2.74)	67 (5.53)
- Numbness	51 (1.87)	19 (1.68)	44 (3.63)
Systemic adverse effect*	2,242 (82.03)	773 (68.23)	799 (65.92)
- Fever	1,792 (65.57)	540 (47.66)	542 (44.72)
- Muscle pain	253 (9.26)	89 (7.86)	139 (11.47)
- Joint pain	183 (6.70)	67 (5.91)	96 (7.92)
- Lethargy	305 (11.16)	126 (11.12)	130 (10.73)
- Headache	289 (10.57)	89 (7.86)	87 (7.18)
- Nausea/Vomiting	74 (2.71)	25 (2.21)	18 (1.49)
- Other	45 (1.65)	17 (1.50)	16 (1.32)
Length of adverse effect in days (Mean (SD))*	2.15 (4.32)	2.02 (1.75)	2.05 (3.43)
Reporting adverse effect	62 (2.27)	17 (1.50)	16 (1.32)
Adverse effect treatment*			
- Doing nothing	529 (19.36)	288 (25.42)	325 (26.82)
- Self treatment	2,130 (77.94)	820 (72.37)	871 (71.86)
- Go to health service	74 (2.71)	25 (2.21)	16 (1.32)
Level of adverse effect*			
- Not disturbing	981 (35.89)	464 (40.95)	515 (42.49)
- A little bit disturbing	1,279 (46.80)	494 (43.60)	539 (44.47)
- Quite disturbing	361 (13.21)	139 (12.27)	119 (9.82)
- Very disturbing	112 (4.10)	36 (3.18)	39 (3.22)

*Detail of adverse event was based from those who answered "Yes" on [(A)]

3.6 Health System Opportunities and Barriers of COVID-19 Vaccination

3.6.1 Key Opportunities

3.6.1.1 Multi-Sectoral Approaches

Implementing and delivering mass vaccination program during a public health emergency requires multi sectoral coordination involving health and non-health actors. Our interviews identified one of the key determinants of successful implementation of COVID-19 vaccination program in Bali Province is this multi sectoral approach. Implementation of COVID-19

vaccination in Bali Province involved governments at provincial, district, sub-district and village levels, public and private health providers, police department, military personnel, community health workers, community and religious entities, education sector, social and welfare institution, non-government organizations, and private enterprises. While the approach is multi sectoral, the main actor and probably the most important player in the delivery of the COVID-19 vaccination is the community health centers located in every sub-district along with their health posts and community health workers located in each village. In addition to service provider, community health centers also critical in providing vaccine education and campaign strategies for demand generation.

> *"… puskesmas bekerjasama dengan TNI sama POLRI itu yang banyak membantu dalam pelaksanaan masal vaksinasi covid itu, disamping itu juga Rumah Sakit Swasta sama sekolah-sekolah kesehatan itu banyak membantu" [Dinkes Dps]*

3.6.1.2 Simultaneous Active and Passive Approaches

Simultaneous active and passive approaches by providing vaccination services within the health facilities in hospitals, clinics, and public health centers; as well as by implementing outreach vaccination services at workplaces, schools, community halls, religious events, traditional markets, and other public spaces. In some circumstances, health providers also conducted sweeping method and door-to-door services to increase vaccination coverage among vulnerable groups, especially elderly population and people with disabilities. Although approach is both time and labor intensive, our interviews found that this approach is crucial to improve coverage and access equity.

> *"… kalo ada Kabupaten yang cakupannya rendah kita akan membantu membuat posko,membantu kesana dengan tenaga pelayanan kesehatan" [Dinkes Prov]*
> *"… kader dan ibu PKK juga ikut turun membantu mencari ke rumah-rumah apalagi orang tua dan penyandang cacat dibantu juga" [Puskesmas Dentim]*
> *"… kita masih berusaha tetep mencari yang bolong-bolong itu dengan sweeping dengan pendekatan oleh Babinsa di lapangan kalo memang ada yang belum tervaksinasi 1 dan 2, orang tua biasanya…" [DinProv]*

3.6.1.3 Informality and Volunteerism

In addition to formal collaboration with health provider networks facilitated by health offices, informal volunteers from private clinics or practitioners have provided extra workforce to implement active/mass vaccination services, especially in public locations and village halls. The governments also mobilized police and military units to manage the crowds and participants for the vaccination services. Such volunteers were crucial especially during the weekends or public holiday, or when health staff from public health centers fall short due to isolation.

3.6.1.4 Availability of Skilled Health Worker

As for staff competencies, our findings indicate that staff and vaccination team are competent as they are all trained health workers. The provincial health office in collaboration with district health offices have provided the health center staff with additional trainings and supervisions during the implementation of the COVID-19 vaccination program. Technical guideline is available to assist further health providers in implementing the program to the highest standard as possible.

> *"… pelatihannya itu bekerjasama dengan Dinas Kesehatan Provinsi dan Bapelkes … Jadi mereka juga beberapa sudah dilatih, sudah ada pelatihannya" [Dinkes Prov]*
> *"… sebelum menjadi vaksinator itu sudah mendapat pelatihan nggih. Jadi untuk segi.. apa namanya... untuk segi kemampuan dan keterampilannya itu sudah sesuai dengan juknis bagaimana dengan pemberian vaksinasi" [Dinkes Badung]*

3.6.2 Key Challenges

3.6.2.1 Staff Workload and COVID Re-Deployment

Our interviews identified that insufficient staff to perform additional tasks associated with COVID-19 vaccination has led to increased workload and reduced coverage, especially for the most vulnerable populations such as elderly population and door-to-door activities. Data management, recording and reporting have added extra workload to the existing health workers at the public health centers. Our interviews identified without appropriate workload management, this increased workload may lead to human errors in data management as well as staff burnout, especially during the early phase of the vaccination program. Moreover, our informants argued that staff burnout and increased workload would have a significant impact on vaccine management, supply distribution, and availability. At the same time, due to redeployment of health staff into COVID-19 related responses including mass vaccination program, it has unintended consequences to the delivery of routine health programs in the public health centers. For example, limited staff to do outdoor preventative measures, or disruption of outpatient services due to reduced staff availability to provide the services.

> *"… kadang-kadang temen-temen ya namanya sudah kecapean gimana tidak meng-upload data stok riilnya per-hari itu,itu yang kadang terkendala untuk penyediaan vaksin itu dilapangan terjadi apa keterlambatan pengiriman atau tidak mendapatkan alokasi" [Dinkes Prov]*
> *"Awal itu karena banyak vaksinasi, susah ngatur layanan di puskesmas, misalnya kayak turun ke lapangan melakukan penyuluhan PTM jadi terganggu juga, tapi mau gimana harus dijalanakan vaksinasinya" [Dentim SKM]*
> *"… kadang-kadang temen-temen ya namanya sudah kecapean kadang susah jadinya apalagi harus turun vaksinasi dan ada yang sakit atau isolasi, layanan dalam gedung juga terganggu, masih bisa jalan tapi lebih lambat karena staff berkurang" [Puskesmas Tabanan Dokter]*

3.6.2.2 Procurement and Distribution Challenges

Our interviews revealed that the phased manner of delivery and administration of COVID-19 vaccination was appropriate and effective in ensuring the most vulnerable population get the vaccines, such as the front-line and essential workers and elderly population. However, a vertical supply chain system is complex; and does not fit for the emergency setting that requires quick and simple distribution mechanisms. COVID-19 procurement involves the central government, provincial government, district government, and health providers who deliver the vaccination services. This leads to many distribution and administration challenges. For example, often the number of doses received by health centers was less than the requested, and in many settings with short expiry date (ED). The short ED has created extra workload for the providers to administer quickly the vaccines to the population, for example by conducting door-to-door sweeping, outreach vaccinations, and in some conditions swap supplies with other health facilities.

> *"… kadang alokasi yang diberikan dari pusat itu tidak sesuai sama permintaan kita jadi menunggu lagi kayak gitu" [Dinkes Dps]*
> *"Karena ED dari vaksin itu agak pendek soalnya ya. [DinProv]--sehingga kita tidak berani nyetok banyak banyak, kan nanti expired dia" [Dinkes Prov]*

3.6.2.3 Complex Recording and Reporting Procedures

COVID-19 vaccination programs involve several online reporting systems to facilitate effective, efficient and accurate reporting mechanisms. These online applications included P-Care system (BPJS Kesehatan), SMILE, PeduliLindungi, along with manual register and vaccination log at the provider level. Our interviews found that the online reporting systems, from vaccine logistics monitoring (through SMILE system), P-Care or PeduliLindungi portal (vaccination status), have helped frontline health workers with their monitoring and reporting tasks. As the data are directly available at the district level, our informants argued that these online systems have informed decisions and strategies related to vaccination program.

> *"Lewat system itu kita selalu berupaya kita memantau cakupan misalnya cakupan per Kabupaten Kota kemudian kalau Kabupaten mana yang kira-kira cakupannya agak lambat meningkatnya kita akan membantu dengan tim dari Provinsi dan kemudian koordinasi dengan TNI POLRI untuk membantu peningkatan disana" [Dinkes Prov]*

In some settings, manual recording system has also been performed, for example in sweeping program or door-to-door vaccination or mass vaccination outreach, and then they transferred the data to these online applications. Our informants argued that the dual systems had increased their workload, especially during the pandemic where staff are stretched with COVID and non-COVID tasks. Additionally, manual recording using vaccination log/register and then transfer the data into the online reporting system are vulnerable to human error or reporting error, including missing data, incomplete data, and incorrect input of unique ID, leading to discrepancy in coverage data between program level and online platforms.

"Terutama bagi sasaran yang sudah vaksinasi, mungkin karena di lapangan temen temen yang kerja dia mencatat manual dulu, mau dimasukkan ke PCare, tapi kelupaan, mungkin juga bisa begitu" [Dinkes Prov]
"Iya...salah ketik karena,misalnya sekarang si A tu dah itu datang si B dipanggil si B tapi NIKnya ga di ganti karena dia copy paste jadi NIKnya ga di ganti namanya aja diganti gitu" [Dinkes Tabanan]

Data management for COVID-19 logistics and vaccination status are complex, and they are constantly shifting making it difficult to determine the cut-off of logistical data. Alongside, there are various types of COVID-19 vaccine, and each of this type has a different dose and origin making the data collection for each vaccine extremely complex and detailed. Even with the integrated COVID-19 vaccination monitoring available, due to the independence of the data entry mechanism, many incomplete data can emerge. Validation and re-entry of these data are difficult given the large volume of data available

3.6.2.4 Difficulty in Identifying and Listing of Target Population

Our interviews further revealed that identification of target population lists for each village and hamlet is problematic. The health providers in collaboration with village midwives and Community Health Workers (CHWs) will manually identify population target and create lists of eligible target population. They then sent the lists to the village and sub-district head. While this approach is appropriate and feasible, it is indeed a time-consuming exercise for the already overload health workforce in primary care settings. Often, heads of village do not have adequate data resulting in the CHW and health workers to conduct door-to-door survey or data crosschecking with civil registration office. This approach is highly vulnerable to human errors, including incorrectly input the unique ID. Moreover, this approach does not account for many mobile populations residing in Bali Province, including newly arrived migrant population from other provinces, or transient population who stays only for few weeks in their current residential address. Furthermore, our interviews identified that the unique ID (NIN) may has been used by other people to access COVID-19 vaccination. Our informants stated that when the unique ID was entered into the P-Care, the name appeared in the P-Care is different to the listing. Due to data mismatch, some patient data on P-Care are not linked with *PeduliLindungi*, and such cases the providers had provided patients with a manual vaccination card.

"Kadang biasanya di sistem P-Care nya itu yang sering bermasalah. Kita input NIK yang ini, yang keluar namanya ini. Itu sih yang lebih sering" [Dinkes Karangasem]
"… pihak desa tidak memiliki data yang memang kita perlukan. Jadi puskesmas yang seharusnya tidak dipendataan kategori masyarakat itu terpaksa turun sendiri melalui kader" [Densel 3]

3.6.2.5 Unstable Internet Connection and Information System

Our interviews found that unstable internet connection is another issue associated with online reporting platforms. Slow internet connection influences the speed of data entry, and in some

circumstances may delay data entry or reporting. It leads to coverage discrepancy between program level data at health centers and district/provincial level data. In addition, unstable internet connection often addressed by health provider by using their own cellular data without appropriate remuneration from the program/governments. In long terms, it could affect the morale and attitudes of health staff towards online reporting systems. Implementation of online and integrative reporting systems must be supported by adequate hardware and software at the health facility level.

> *"Kendalanya ya sekarang itu kan mungkin internet yang kendalanya kan internet itu biasanya… kadang-kadang lama pelaporannya lama ga masuk kan gitu kendala namanya sistem kan" [Dinkes Karangasem]*
>
> *"Terutama itu wifi jadi kita pakai hotspot pribadi biasanya. Petugas yang pake hotspot pribadi itu susahnya kami disitu. Jadi kan uang dalem istilahnya uang kita" [Puskesmas Tabanan]*

V. CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Several conclusions can be drawn from our quantitative and qualitative analysis:

1. The weighted complete vaccination coverage by validation among populations aged >12 years old in Bali Province and across nine districts was sufficient. The overall true complete vaccination coverage by validation was 86.28% (95%CI 85.54-87.03), with some variations across districts ranging from 79.05% (95%CI 76.28-81.81) in Karangasem District to 91.71% (95%CI 89.80% - 93.62%) in Klungkung District.
2. The majority of COVID-19 vaccination was delivered through public spaces and primary care settings, with small proportion was delivered through schools, hospitals and work places. The most commonly used vaccines were AstraZeneca and Sinovac.
3. The weighted complete vaccination coverage across three sub-districts with priority village was sufficient, from 90.79% (95%CI 88.30-93.29) in Denpasar Timur, 90.60% (95%CI 87.08-94.12) in Kuta Selatan, and 87.13% (95%CI 82.76-91.51) in Ubud.
4. The complete vaccination coverage was declined with increasing age groups, slightly higher among male respondents, and higher among respondents with good education level. Moreover, the complete vaccination coverage was higher amongst students, government employees, and private sectors in comparison to other occupation groups. The survey also found higher complete vaccination coverage in urban than rural settings.
5. The majority of respondents have good general knowledge and good perceptions about COVID-19, preventative measures and COVID-19 vaccination. Primary sources of information related to COVID-19 preventative measures and vaccination were health promotion campaigns, families/friend, and electronic media.
6. Health providers have implemented the COVID-19 vaccination program following the national guidelines and procedures. Adverse events mainly occurred during the first vaccination (1st dose). Two main reasons for refusing COVID-19 vaccination included comorbidities and fear of side effects.
7. A key strategy allowing success implementation of mass COVID-19 vaccination in Bali Province was an effective multi and inter sectoral approach for managing and delivering the mass vaccination program. These include government and non-government actors, formal and informal sectors, health and non-health actors, including community systems and community health workers.
8. Implementation of COVID-19 vaccination program in Bali Province have faced several challenges, including complexity of recording and reporting systems, risk communication strategies and managing hoaxes, centralized and complex supply chain and distribution, limited cold storage capacity, and increased work load of staff in primary care settings leading to disruption of routine health services.

5.2 Recommendations

Our study found that the overall vaccination coverage by validation in Bali Province and across districts was sufficiently high. However, our study also confirmed various reasons leading to refusal of COVID-19 vaccination. We recommend the following strategies for improving implementation and uptake of the COVID-19 vaccination:

1. Intensifying the outreach and active sweeping or door-to-door services to reach vulnerable individuals who eligible for vaccination, including elderly population who faces access barriers and mobility issues, people with low education levels, residents of difficult and isolated geographical areas, and people with disabilities.
2. Intensifying specific effort to address problems associated with comorbidities among eligible populations, for example by improving and simplifying referral systems and by providing online consultations to assess contra-indications for COVID-19 vaccination.
3. Maintaining health promotion campaigns, including effective risk communication strategies targeting general population to sustain the high coverage for booster dose and future re-vaccination for COVID-19, as well as to maintain the high participation in COVID-19 preventative measures.

REFERENCE

1. Murray CJL, Shengelia B, Gupta N, Moussavi S, Tandon A, Thieren M. Validity of reported vaccination coverage in 45 countries. Lancet. 2003;362(9389):1022–7.
2. WHO. World Health Organization vaccination coverage cluster surveys: Reference manual [Internet]. Geneva (Switzerland); 2018. Available from: http://apps.who.int/bookorders
3. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Nomor 10 Tahun 2021 Tentang Pelaksanaan Vaksinasi dalam Rangka Penanggulangan Pandemi Corona Virus Disease 2019 (COVID-19) [Internet]. Permenkes RI 2021 p. 33. Available from: https://persi.or.id/wp-content/uploads/2021/02/pmk10-2021.pdf
4. Kementerian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 18 Tahun 2021 Tentang Perubahan Atas Peraturan Menteri Kesehatan Nomor 10 Tahun 2021 Tentang Pelaksanaan Vaksinasi dalam Rangka Penanggulangan Pandemi Corona Virus Disease 2019 (COVID-19) [Internet]. 2021. Available from: https://peraturan.bpk.go.id/Home/Details/171447/permenkes-no-18-tahun-2021
5. Kementrian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 19 Tahun 2021 Tentang Perubahan Kedua Atas Peraturan Menteri Kesehatan Nomor 10 Tahun 2021 Tentang Pelaksanaan Vaksinasi dalam Rangka Penanggulangan Pandemi Corona Virus Disease 2019 (COVID-19) [Internet]. 2021. Available from: https://peraturan.bpk.go.id/Home/Details/171448/permenkes-no-19-tahun-2021
6. Kementrian Kesehatan Republik Indonesia. Peraturan Menteri Kesehatan Republik Indonesia Nomor 19 Tahun 2021 Tentang Perubahan Ketiga Atas Peraturan Menteri Kesehatan Nomor 10 Tahun 2021 Tentang Pelaksanaan Vaksinasi dalam Rangka Penanggulangan Pandemi Corona Virus Disease 2019 (COVID-19) [Internet]. 2021. Available from: https://covid19.hukumonline.com/wp-content/uploads/2021/08/peraturan_menteri_kesehatan_nomor_23_tahun_2021-1.pdf
7. Sawitri AAS, Yuliyatni PCD, Ariawan MD, Sari KAK, Susanti R, Sutarsa IN. Limitations of immunization registers at community health centers for measuring immunization coverage: a case study of the Japanese encephalitis mass immunization program in Bali Province, Indonesia. Osong Public Heal Res Perspect [Internet]. 2021 Jun 30;12(3):158–68. Available from: http://ophrp.org/journal/view.php?doi=10.24171/j.phrp.2020.0241
8. Ramakrishnan R, Rao T V, Sundaramoorthy L, Joshua V. Magnitude of recall bias in the estimation of immunization coverage and its determinants. Indian Pediatr [Internet]. 1999 Sep;36(9):881–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/10744865

9. Akwataghibe NN, Ogunsola EA, Broerse JEW, Popoola OA, Agbo AI, Dieleman MA. Exploring Factors Influencing Immunization Utilization in Nigeria—A Mixed Methods Study. Front Public Heal [Internet]. 2019 Dec 20;7. Available from: https://www.frontiersin.org/article/10.3389/fpubh.2019.00392/full
10. Presiden Republik Indonesia. Peraturan Presiden Republik Indonesia Nomor 72 Tahun 2012 Tentang Sistem Kesehatan Nasional. 72 2012 p. 7.
11. Omer SB, Salmon DA, Orenstein WA, Halsey N. Vaccine Refusal, Mandatory Immunization, and the Risks of Vaccine-Preventable Diseases. N Engl J Med [Internet]. 2009;360(19):1981–8.
12. Suardani N, Wirawan DN, Sawitri AAS. The role of information sources and characteristics of children in the acceptance of Japanese encephalitis (JE) mass immunization in Bali Province. Public Heal Prev Med Arch. 2019;7(2):75–84.
13. Groom H, Hopkins DP, Pabst LJ, Morgan JM, Patel M, Calonge N, et al. Immunization information systems to increase vaccination rates: A community guide systematic review. J Public Heal Manag Pract. 2015;21(3):227–47.
14. Asif AM, Akbar M, Tahir MR, Arshad IA. Role of Maternal Education and Vaccination Coverage: Evidence from Pakistan Demographic and Health Survey. Asia-Pacific J Public Heal. 2019;31(8):679–88.
15. Modi RN, King C, Bar-Zeev N, Colbourn T. Caregiver recall in childhood vaccination surveys: Systematic review of recall quality and use in low- and middle-income settings. Vaccine [Internet]. 2018 Jul;36(29):4161–70. Available from: https://www.sciencedirect.com/science/article/pii/S0264410X18307552
16. Kamal A-HM, Sarkar T, Khan MM, Roy SK, Khan SH, Hasan SMM, et al. Factors Affecting Willingness to Receive COVID-19 Vaccine Among Adults: A Cross-sectional Study in Bangladesh. J Health Manag [Internet]. 2021 Oct 14;097359842110506. Available from: http://journals.sagepub.com/doi/10.1177/09735984211050691
17. Bhattarai MD, Adhikari P, Bhattarai MD, Kane A, Uprety T, Wittet S. Rapid Assessment of Perceptions, Knowledge, and Practices Related to Immunization Injection Safety in Nepal. 2001;1–41.
18. Akther T, Nur T. A model of factors influencing COVID-19 vaccine acceptance: A synthesis of the theory of reasoned action, conspiracy theory belief, awareness, perceived usefulness, and perceived ease of use. Dragan D, editor. PLoS One [Internet]. 2022 Jan 12;17(1):e0261869. Available from: https://dx.plos.org/10.1371/journal.pone.0261869
19. Suk JE, Lopalco P, Celentano LP. Multidisciplinary Perspectives on Vaccine Hesitancy and Contemporary Vaccination Coverage [Internet]. PLoS Currents. 2015 [cited 2022 Jul 28]. Available from: http://currents.plos.org/outbreaks/perspectives-on-vaccine-hesitancy-and-vaccination-coverage/
20. Peretti-Watel P, Ward JK, Schulz WS, Verger P, Larson HJ. Vaccine Hesitancy: Clarifying a Theoretical Framework for an Ambiguous Notion. PLoS Curr [Internet]. 2015; Available from: https://currents.plos.org/outbreaks/article/vaccine-hesitancy-clarifying-a-theoretical-framework-for-an-ambiguous-notion/

21. Suk JE, Pierluigi Lopalco, Celentano LP. Hesitancy, Trust and Individualism in Vaccination Decision-Making [Internet]. PLoS Currents. 2015 [cited 2022 Jul 28]. Available from: http://currents.plos.org/outbreaks/article/hesitancy-trust-and-individualism-in-vaccination-decision-making/
22. Badan Pusat Statistik. Bali dalam Angka (Bali in Numbers). [Internet]. Denpasar; 2020. Available from: https://bali.bps.go.id/publication/2020/04/27/c2d74be21e44651b07e2658e/provinsi-bali-dalam-angka-2020.html
23. Badan Pusat Statistik Provinsi Bali. Berita Resmi Statistik No. 08/01/51/Th. II. WwwBaliBpsGoId. 2021;(08):1–13.
24. Sawitri AAS, Sitohang V, Yuliyatni PCD, Noviyanti R, Trianty L, Astuti PAS. SERO-Survei SARS-CoV-2 di Provinsi Bali.
25. Sawitri AAS, Yuliyatni PCD, Ariawan MD, Sari KAK. Coverage Evaluation of Japanese Encephalitis Supplementary Immunization Activities (JE SIA) in Bali Island 2018. Denpasar; 2018.

ANNEX 1 – Number of Population ≥15 Years Old in Bali Province

District	Total > 15 years old	Percentage from total*
Jembrana	251,318	7.34
Tabanan	366,020	10.69
Badung	434,842	12.70
Gianyar	408,820	11.94
Klungkung	164,007	4.79
Bangli	205,095	5.99
Karangasem	390,673	11.41
Buleleng	627,953	18.34
Denpasar	575,224	16.80
Bali	**3,423,952**	**100**

* Percentage derived from total number of populations from all age group

ANNEX 2 – Sample Size Calculation

The sample size is calculated by identifying a set of five numbers to multiply together: A x B x C x D x E. With all parameters are explained below, where:

A = Number of strata

B = Sample size per stratum (the *effective sample size)*

C = Design effect (DEFF)

D = Average number of households you'll need to visit

E = Expected non-response due to persons not being at home after at least two revisits, or eligible persons who refuse to participate.

A (Number of Strata)	9
B (Effective sample size)	162
B1 (Expected Coverage)	0.99
B2 (Desired precision)	0.05
B3 (Alpha)	0.05
C (Design effect)	3.24
C1 (Target number of respondents per cluster (m))	15
C2 (Intracluster correlation coefficient)	0.16
D (Average number of HH to visit to find 1 eligible respondent)	1
E (Non-response inflation factor)	1,020
E1 (Response rate)	0.98
AxBxC=N_cs (Total completed interviews needed)	4724
N_csxDxE (Total number of HH to visit)	4821
BxCxDxE (Number of HH to visit in each stratum)	536
BxC/m (Number of clusters per stratum)	35
DxExm (Number of HH per cluster)	16
Num clusters per stratum x A (Total number of cluster)	315

ANNEX 3 – Number of Villages and Clusters (*Banjar*) per District

District	Number of selected clusters	Percentage from total*	Number of villages	Number of selected villages
Jembrana	30	7.34	51	8
Tabanan	31	10.69	129	19
Badung	35	12.70	62	9
Gianyar	33	11.94	70	11
Klungkung	30	4.79	55	8
Bangli	30	5.99	64	10
Karangasem	31	11.41	75	11
Buleleng	49	18.34	148	22
Denpasar	46	16.80	43	6
Bali	**315**	**100**	**697**	**104**

* Percentage derived from total number of populations from all age group

ANNEX 4 – Questionnaire Form 1 (Family Data)

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KUESIONER

Mulai Wawancara: WITA			
I. PENGENALAN TEMPAT			
1	Kabupaten/Kota	1. Denpasar 2. Badung 3. Tabanan 4. Gianyar 5. Klungkung 6. Bangli 7. Karangasem 8. Buleleng 9. Jembrana	
2	Kecamatan		
3	Desa/Kelurahan		
4	Banjar/Klaster		
5	Nomer Urut Klaster		
6	Nomer Urut KK		
7	Koordinat Rumah (Location)		
II. KETERANGAN PENGUMPUL DATA			
1	Nama Enumerator		Tanda Tangan Enumerator
2	No. HP		
3	Tanggal Pengumpulan Data		
4	Nama Koordinator Lapangan		Tanda Tangan Koordinator Lapangan
5	No. HP		
6	Tanggal Pengecekan		
III. KETERANGAN KELUARGA			
1	Nama Kepala Keluarga		
2	No HP (WA) KK/anggota keluarga		
3	Berapa jumlah anggota keluarga? (Jumlah orang yg tercatat di Kartu Keluarga)	orang	
4	Berapa jumlah anggota keluarga yang tinggal di rumah ini?	orang	
5	Berapa jumlah orang selain keluarga yang tinggal di rumah ini? (Tidak tercatat di KK)	orang	
6	Berapa jumlah anggota keluarga yang berusia diatas 12 tahun yang tinggal di rumah ini? (Tahun lahir ≤ 2009)	orang	
7	Berapa penghasilan rumah tangga per bulan?	Rp.	

ANNEX 5 – Questionnaire Form 2 (Individual Data)

Nama Enumerator:			**Nama SC:**	
IV. KETERANGAN INDIVIDU				
1	ID Responden (No. Urut Klaster + No. Urut KK + No. Urut anggota keluarga)	Contoh: KK no urut 1, Anggota keluarga kedua, No. urut klaster 105 (ID = 1050102)		
2	Nama Responden			
3	NIK			
4	No. HP			
5	Jenis Kelamin	1. Laki-laki 2. Perempuan		
6	Tanggal lahir/Umur	dd/mm/yyyy		Tahun
7	Alamat sesuai KTP			
8	Alamat Domisili			
9	Pendidikan	1. Tidak tamat SD 2. SD 3. SMP	4. SMA 5. D1/D2/D3 6. D4/S1/S2/S3	
10	Pekerjaan	1. Praktisi Kesehatan 2. PNS 3. Pariwisata 4. Wiraswasta 5. Tidak bekerja 6. Lainnya.....		

V. STATUS KESEHATAN						
	Jika Responden Perempuan					
1	Apakah [ANDA] sedang hamil?	1. Ya	2. Tidak			
2	Apakah [ANDA] sedang menyusui?	1. Ya	2. Tidak			
3	Apakah [ANDA] memiliki riwayat					
	Hipertensi	1. Ya	2. Tidak	Penyakit Paru Kronis	1. Ya	2. Tidak
	Stroke	1. Ya	2. Tidak	Penyakit Infeksi Paru (pneumonia/TBC)	1. Ya	2. Tidak
	Asma	1. Ya	2. Tidak	HIV/AIDS	1. Ya	2. Tidak
	Penyakit Jantung	1. Ya	2. Tidak	Kelainan darah (ex.Thalasemia, Hemofilia)	1. Ya	2. Tidak
	Penyakit Ginjal	1. Ya	2. Tidak	Diabetes Mellitus	1. Ya	2. Tidak
	Kanker	1. Ya	2. Tidak	Hipertiroid/Hipotiroid	1. Ya	2. Tidak
	Penyakit Saluran pencernaan kronis	1. Ya	2. Tidak	Autoimun (ex.Lupus, Sjogren, Vaskulitis)	1. Ya	2. Tidak
4	Apakah [ANDA] merokok dalam setahun terakhir?	1. Ya	2. Tidak			
5	Apakah [ANDA} minum minuman beralkohol dalam setahun terakhir?	1. Ya	2. Tidak			

VI. STATUS VAKSINASI			
1	Apakah [ANDA] sudah mendapatkan vaksinasi COVID-19?	1. Ya (lanjut ke no. 3) 2. Tidak (lanjut ke no. 2)	
2	Jika TIDAK, apa alasan Anda belum mendapatkan vaksinasi COVID-19? (Boleh lebih dari 1 pilihan) (Lanjut ke VII. Pengetahuan Tentang COVID-19 dan Imunisasi COVID-19)	a. Belum ada jadwal b. Sebelumnya terinfeksi COVID-19 c. Ada penyakit penyerta yang belum terkontrol d. Sakit saat ada jadwal vaksinasi e. Tidak ada info dari puskesmas/banjar f. Tidak ada yang mengantar ke lokasi g. Takut disuntik h. Takut terhadap efek samping vaksin i. Sibuk/tidak ada waktu j. Merasa vaksinasi tidak penting k. Alasan agama/kepercayaan l. Lainnya	
3	Berapa kali sudah mendapatkan vaksin COVID-19?	1. 1 kali 2. 2 kali 3. 3 kali	
4	Darimana [ANDA] mendapatkan informasi tentang vaksinasi COVID-19? (Boleh lebih dari 1 pilihan)	a. Media elektronik b. Media cetak c. Internet d. Penyuluhan di Balai Banjar	

		e. Informasi dari sekolah f. Informasi dari keluarga,kerabat, tetangga g. Lainnya……..		
5	Bagaimana [ANDA] melakukan pendaftaran untuk mendapatkan vaksinasi COVID-19 untuk pertama kalinya? (Pendaftaran yang akhirnya membuat responden jadi mendapatkan vaksinasi)	1. undangan dari instansi tempat kerja 2. undangan dari Klian Banjar/Puskesmas 3. mendaftar secara online ke website pedulilindungi atau pendaftaran online fasyankes 4. mendaftar langsung ke fasyankes atau pos imunisasi terdekat 5. lainnya……		
		Vaksin ke-1	Vaksin ke-2	Vaksin ke-3
6	Jenis Vaksin	1. Sinovac/Coronavac 2. Astrazeneca 3. Moderna 4. Pfizer 5. Tidak tahu 6. Lainnya……	1. Sinovac/Coronavac 2. Astrazeneca 3. Moderna 4. Pfizer 5. Tidak tahu 6. Lainnya……	1. Sinovac/Coronavac 2. Astrazeneca 3. Moderna 4. Pfizer 5. Tidak tahu 6. Lainnya……
7	Tanggal Vaksin (dd/mm/yyyy)			
8	Tempat layanan vaksinasi	1. Rumah sakit 2. Puskesmas 3. Balai banjar 4. Hotel/Mall 5. Lainnya ……	1. Rumah sakit 2. Puskesmas 3. Balai banjar 4. Hotel/Mall 5. Lainnya ……	1. Rumah sakit 2. Puskesmas 3. Balai banjar 4. Hotel/Mall 5. Lainnya ……
9	Apakah [ANDA] memiliki bukti sudah divaksinasi?	1.Ya (Lanjut ke no. 10) 2.Tidak	1.Ya (Lanjut ke no. 10) 2.Tidak	1.Ya (Lanjut ke no. 10) 2.Tidak
10	Jika YA, apa bukti vaksinasi yang [ANDA] miliki? (Boleh lebih dari 1 bukti) **(Ingat dokumentasi bukti dan kirim dengan nama file ID Responden)**	a. Kartu vaksin b. SMS c. PeduliLindungi	a. Kartu vaksin b. SMS c. PeduliLindungi	a. Kartu vaksin b. SMS c. PeduliLindungi
11	Prosedur Vaksinasi	Vaksin ke-1	Vaksin ke-2	Vaksin ke-3
a	Apakah sebelum imunisasi [ANDA] diminta mengisi formulir tentang riwayat kesehatan [ANDA]?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
b	Apakah sebelum imunisasi [ANDA] ditanya tentang riwayat kesehatan [ANDA] oleh petugas kesehatan?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
c	Apakah sebelum imunisasi [ANDA] diperiksa oleh petugas kesehatan untuk memastikan kelayakan imunisasi [ANDA]?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
d	Di bagian tubuh mana imunisasi COVID-19 pada [ANDA] disuntikkan?	1. disuntik di lengan kanan 2. disuntik di lengan kiri 3. Tidak tahu	1. disuntik di lengan kanan 2. disuntik di lengan kiri 3. Tidak tahu	1. disuntik di lengan kanan 2. disuntik di lengan kiri 3. Tidak tahu
e	Apakah setelah imunisasi, [ANDA] diawasi oleh petugas kesehatan di ruang khusus?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
f	Berapa lama pengawasan tersebut dilakukan?	1. kurang dari 30 menit 2. 30-60 menit 3. lebih dari 60 menit 4. tidak tahu	1. kurang dari 30 menit 2. 30-60 menit 3. lebih dari 60 menit 4. tidak tahu	1. kurang dari 30 menit 2. 30-60 menit 3. lebih dari 60 menit 4. tidak tahu
g	Apakah [ANDA] diminta mengawasi adanya keluhan/gejala pada [ANDA] di rumah setelah diimunisasi?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
h	Berapa lama pengawasan harus dilakukan?	hari	hari	hari
12	Apakah [ANDA] mengalami keluhan setelah diimunisasi (KIPI)?	1.Ya 2.Tidak (Lanjut ke VII)	1.Ya 2.Tidak (Lanjut ke VII)	1.Ya 2.Tidak (Lanjut ke VII)
a	Bila YA, gejala KIPI lokal pada lokasi suntikan yang dialami:			
	Nyeri lokal	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Kemerahan	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Pembekakan	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak

	Kesemutan/Baal	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Tidak ada gejala lokal	1.Ya	1.Ya	1.Ya
b	Bila YA, gejala KIPI sistemik yang dialami:			
	Demam	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Nyeri Otot	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Nyeri sendi	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Lemas	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Sakit kepala	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Mual	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Muntah	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
	Lainnya			
	Tidak ada gejala sistemik	1.Ya	1.Ya	1.Ya
13	Berapa lama [ANDA] mengalami gejala KIPI?	hari	hari	hari
14	Apakah [ANDA] melaporkan KIPI yang dialami ke nomor kontak tempat mendapat layanan vaksinasi?	1.Ya 2.Tidak	1.Ya 2.Tidak	1.Ya 2.Tidak
15	Apa yang [ANDA] lakukan untuk menangani keluhan KIPI yang dialami?	1. Tidak melakukan apa-apa 2. Menangani sendiri (kompres, minum obat bebas, istirahat) 3. Datang ke layanan kesehatan	1. Tidak melakukan apa-apa 2. Menangani sendiri (kompres, minum obat bebas, istirahat) 3. Datang ke layanan kesehatan	1. Tidak melakukan apa-apa 2. Menangani sendiri (kompres, minum obat bebas, istirahat) 3. Datang ke layanan kesehatan
16	Menurut penilaian [ANDA] seberapa mengganggu KIPI yang [ANDA] alami terhadap kegiatan sehari-hari?	1. Tidak mengganggu 2. Sedikit mengganggu 3. Cukup mengganggu 4. Sangat mengganggu	1. Tidak mengganggu 2. Sedikit mengganggu 3. Cukup mengganggu 4. Sangat mengganggu	1. Tidak mengganggu 2. Sedikit mengganggu 3. Cukup mengganggu 4. Sangat mengganggu

VII. PENGETAHUAN TENTANG COVID-19 DAN IMUNISASI COVID-19

No	Pertanyaan	Benar	Salah	Tidak Tahu
1	COVID-19 merupakan penyakit yang disebabkan virus	1		
2	Penularan COVID-19 dari hewan ke manusia		1	
3	Penyebaran COVID-19 dapat melalui percikan dahak dari orang yang sakit ke yang sehat	1		
4	Penularan COVID-19 lebih berisiko terjadi jika beraktivitas di ruangan tertutup	1		
5	COVID-19 dapat dicegah dengan mencuci tangan dengan sabun dan air mengalir sesering mungkin	1		
6	Gejala COVID-19 yang khas adalah hilang rasa penciuman	1		
7	Risiko COVID-19 dapat berkurang dengan melakukan imunisasi	1		
8	Imunisasi untuk COVID-19 dilakukan hanya 1 kali saja		1	
9	Imunisasi dapat diberikan pada penderita Hipertensi dengan anjuran dokter	1		
10	Imunisasi COVID-19 tidak boleh diberikan pada ibu hamil	1		
11	Imunisasi COVID-19 hanya bisa didapatkan di puskesmas		1	
12	Mereka yang sudah menderita COVID-19, dapat diimunisasi setelah 6 bulan dari hasil negatif	1		
13	Semakin banyak yang imunisasi COVID-19, maka semakin cepat terbentuk kekebalan bersama (komunitas)	1		
14	Setelah imunisasi COVID-19 dapat terjadi keluhan bengkak di area suntikan	1		
15	Mereka yang setelah imunisasi COVID-19 mengalami demam, lebih kebal terhadap COVID-19 dibandingkan yang tidak mengalami demam		1	

VIII. PERSEPSI TENTANG IMUNISASI COVID-19

Seberapa besar keyakinan Anda untuk melakukan hal-hal berikut?
Berikan penilaian dalam skala 1-5 (1= sangat tidak yakin, 2= tidak yakin, 4= yakin, 5= sangat yakin)

1	Seberapa besar keyakinan anda bahwa anda memiliki risiko terkena COVID-19	1	2	4	5
2	Seberapa besar keyakinan anda bahwa COVID-19 dapat disembuhkan	1	2	4	5
3	Seberapa besar keyakinan anda bahwa COVID-19 dapat dicegah dengan memakai masker	1	2	4	5
4	Seberapa besar keyakinan anda bahwa anda dapat terhindar dari COVID-19 dengan melakukan imunisasi	1	2	4	5
5	Seberapa besar keyakinan anda bahwa anda akan baik-baik saja (tidak akan terkena COVID-19) meskipun tidak diimunisasi	1	2	4	5

6	Seberapa besar keyakinan anda bahwa imunisasi COVID-19 merupakan hal yang penting untuk dilakukan	1	2	4	5
7	Seberapa besar keyakinan anda bahwa bahan vaksin COVID-19 mengandung zat yang aman bagi tubuh	1	2	4	5
8	Seberapa besar keyakinan anda bahwa anda tidak mengalami gejala / keluhan setelah imunisasi	1	2	4	5
9	Seberapa besar keyakinan anda bahwa petugas kesehatan telah terlatih memberikan imunisasi	1	2	4	5
10	Seberapa besar keyakinan anda bahwa setelah imunisasi, anda tidak perlu menggunakan masker di tempat umum	1	2	4	5
IX. KEPUASAN TERHADAP PELAYANAN IMUNISASI COVID-19					
Seberapa besar tingkat kepuasan Anda terhadap aspek pelayanan imunisasi COVID-19 **PERTAMA** yang Anda terima? Berikan penilaian dalam skala 1-5 (1 = sangat tidak setuju, 2 = tidak setuju, 4 = setuju, 5 = sangat setuju)					
	TANGIBLES				
1	Saya merasa ruang tunggu saat imunisasi bersih dan nyaman	1	2	4	5
2	Saya merasa ruang tunggu saat imunisasi sudah menerapkan protokol menjaga jarak antar tempat duduk dengan baik	1	2	4	5
3	Saya merasa tempat mencuci tangan atau handsanitizer telah disediakan dan berfungsi dengan baik	1	2	4	5
4	Saya merasa petugas imunisasi sudah menggunakan alat pelindung diri dengan lengkap (masker medis, face shield, hazmat, dan sarung tangan)	1	2	4	5
	RELIABILITY				
1	Saya merasa petugas pelayanan imunisasi berkompeten dapat memberikan layanan (mulai dari persiapan hingga penyuntikan vaksin)	1	2	4	5
2	Saya merasa petugas pelayanan imunisasi dapat memberikan pelayanan dengan cepat dan efisien (waktu tunggu mulai dari pendaftaran hingga penyuntikan vaksin tidak terlalu lama)	1	2	4	5
3	Saya merasa petugas pelayanan imunisasi memberikan perlakuan yang sama kepada semua calon penerima vaksin dalam memberikan layanan	1	2	4	5
4	Saya merasa mendapatkan perlakuan yang berbeda oleh petugas pelayanan imunisasi dibandingkan dengan calon penerima vaksin lainnya	1	2	4	5
	RESPONSIVENESS				
1	Saya merasa petugas telah memberikan penjelasan terkait alur pelayanan imunisasi COVID-19 yang dapat saya pahami	1	2	4	5
2	Saya merasa diberikan kesempatan untuk bertanya dan mendapatkan respons yang cepat dari petugas pelayanan imunisasi	1	2	4	5
3	Saya merasa petugas pelayanan imunisasi telah melakukan pengawasan dan penanganan KIPI sesuai dengan prosedur yang berlaku	1	2	4	5
	ASSURANCE				
1	Saya merasa petugas pelayanan imunisasi memberikan rasa aman kepada saya selama proses pelayanan imunisasi	1	2	4	5
2	Petugas pelayanan imunisasi membuat saya merasa tidak nyaman selama proses pelayanan imunisasi	1	2	4	5
3	Saya merasa petugas pelayanan imunisasi tidak memberikan penjelasan yang cukup dan tidak memberikan bukti imunisasi	1	2	4	5
	EMPHATY				
1	Saya merasa petugas pelayanan imunisasi kurang memberikan perhatian penuh kepada saya selama proses pelayanan imunisasi	1	2	4	5
2	Saya merasa dilayani dengan ramah dan sopan oleh petugas pelayanan imunisasi	1	2	4	5
CATATAN					
Wawancara berakhir: WITA Lama wawancara: menit					

VERIFIKASI OLEH STUDY COORDINATOR

□ SUDAH **□ BELUM** **□ TIDAK BISA DIVERIFIKASI**

FORMULIR KUNJUNGAN RUMAH

Nama Enumerator: 1. ……., 2. ……., 3. ……. Nama SC: …….

Kabupaten: ……. Kecamatan: ……. Desa: …….

Kluster: ……. Kode Kluster: ……. Tanggal: …….

No	Nama Kepala Keluarga	Jumlah Anggota KK Eligible	Nama Anggota KK Eligible	Nama Anggota KK Eligible yang Bersedia Diwawancara	Nama Anggota KK Eligible yang Tidak Diwawancara (Menolak/Tidak di Rumah/Revisit)	Karakteristik Anggota KK Eligible yang Tidak Diwawancara (JK, Umur, Pendidikan, Pekerjaan)
01	……. (Substitusi: Ya/Tidak) …….					
02	……. (Substitusi: Ya/Tidak) …….					
03	……. (Substitusi: Ya/Tidak) …….					
04	……. (Substitusi: Ya/Tidak) …….					
05	……. (Substitusi: Ya/Tidak) …….					

No	Nama Kepala Keluarga	Jumlah Anggota KK Eligible	Nama Anggota KK Eligible	Nama Anggota KK Eligible yang Bersedia Diwawancara	Nama Anggota KK Eligible yang Tidak Diwawancara (Menolak/Tidak di Rumah/Revisit)	Karakteristik Anggota KK Eligible yang Tidak Diwawancara (JK, Umur, Pendidikan, Pekerjaan)
06	..... (Substitusi: Ya/Tidak)					
07	..... (Substitusi: Ya/Tidak)					
08	..... (Substitusi: Ya/Tidak)					
09	..... (Substitusi: Ya/Tidak)					
10	..... (Substitusi: Ya/Tidak)					
11	..... (Substitusi: Ya/Tidak)					

No	Nama Kepala Keluarga	Jumlah Anggota KK Eligible	Nama Anggota KK Eligible	Nama Anggota KK Eligible yang Bersedia Diwawancara	Nama Anggota KK Eligible yang Tidak Diwawancara (Menolak/Tidak di Rumah/Revisit)	Karakteristik Anggota KK Eligible yang Tidak Diwawancara (JK, Umur, Pendidikan, Pekerjaan)
12	..... (Substitusi: Ya/Tidak)					
13	..... (Substitusi: Ya/Tidak)					
14	..... (Substitusi: Ya/Tidak)					
15	..... (Substitusi: Ya/Tidak)					
16	..... (Substitusi: Ya/Tidak)					
CATATAN:						

ANNEX 7 – Comparison of Respondents Characteristics (Weighting Factors)

Area	Population Projection *		Number of Samples		Population Ratio	Samples Ratio
	Male	Female	Male	Female		
Bali	2219,6	2195,5	6583	6467	1,010976998	1,01793722
Denpasar	367	359,9	948	951	1,019727702	0,996845426
Badung	275,2	274,4	795	801	1,002915452	0,992509363
Tabanan	235,2	234,1	643	629	1,004698847	1,022257552
Gianyar	262,7	261,3	835	837	1,005357826	0,997610514
Klungkung	107,2	106,8	661	646	1,003745318	1,023219814
Bangli	134,5	132,6	616	576	1,014328808	1,069444444
Karangasem	259	252,3	586	578	1,026555688	1,01384083
Buleleng	414,8	410,4	905	853	1,010721248	1,060961313
Jembrana	164,1	163,8	594	596	1,001831502	0,996644295

*Projection of Population Based on Gender and Regency in Bali Province, 2022 (in thousand inhabitants)

Age Group	Population Projection*	Number of Samples	% Population	% Samples
0 - 4 y.o.	302,7	0	6,86%	0,00%
5 - 9 y.o.	297,9	0	6,75%	0,00%
10 - 14 y.o.	317,6	461	7,19%	3,53%
15 - 19 y.o.	336,8	1077	7,63%	8,25%
20 - 24 y.o.	343,8	953	7,79%	7,30%
25 - 29 y.o.	342,8	793	7,76%	6,08%
30 - 34 y.o.	336,6	886	7,62%	6,79%
35 - 39 y.o.	329,5	1009	7,46%	7,73%
40 - 44 y.o.	331,3	1390	7,50%	10,65%
45 - 49 y.o.	319,9	1422	7,25%	10,90%
50 - 54 y.o.	294,5	1448	6,67%	11,10%
55 - 59 y.o.	258,6	1126	5,86%	8,63%
60 - 64 y.o.	208,2	885	4,72%	6,78%
65 - 69 y.o.	157,9	657	3,58%	5,03%
70 - 74 y.o.	109,8	452	2,49%	3,46%
75 + y.o.	127	491	2,88%	3,76%
Total	**4415,1**	**13050**	**100,00%**	**100,00%**

*Projection of Population Based on Age group in Bali Province, 2022 (in thousand inhabitants)

ANNEX 8 – Validation for Questions of Knowledge

Reliability and Validity

Question	Alpha Cronbach	Correlation (r)
1	0.8485	0.5144
2	0.8495	0.2524
3	0.8418	0.6205
4	0.8413	0.6232
5	0.8507	0.5401
6	0.8465	0.6055
7	0.8486	0.5864
8	0.8550	0.1623
9	0.8440	0.6087
10	0.8476	0.3288
11	0.8532	0.1401
12	0.8434	0.5840
13	0.8411	0.6368
14	0.8446	0.5080
15	0.8462	0.3564

ANNEX 9 – In-Depth Interview Guides

PEDOMAN WAWANCARA MENDALAM STAKEHOLDER

Hambatan dalam implementasi program vaksinasi COVID-19 di Provinsi Bali

Penelitian ini bertujuan untuk menggali pandangan Bapak/Ibu terkait dengan hambatan, tantangan dan upaya perbaikan terhadap program vaksinasi COVID-19 di Provinsi Bali. Kami ingin mengetahu persepsi dan pengalaman Bapak/Ibu terkait faktor penghambat implementasi program vaksinasi COVID-19 baik dari sisi penyedia layanan ataupun penerima layanan. Hal ini meliputi ketersediaan sumber daya, aspek manajemen serta penerimaan dari masyarakat. Sebelum kita memulai wawancara, apakah ada pertanyaan?

No	Pertanyaan Utama	Probing	Domain	Keterangan
A. Karakteristik Informan				
A1	Apakah saya bisa konfirmasi kembali nama Bapak/Ibu?	-	Karakteristik demografi	
A2	Saat ini, berapakah umur Bapak/Ibu?	Tahun lahir?	Karakteristik demografi	
A3	Jenis kelamin?	[observasi]	Karakteristik demografi	
	Pendidikan terakhir	[gelar tertinggi]		
A4	Peran lembaga dalam program vaksinasi COVID-19?	Apa posisi Bapak/Ibu di lembaga ini?	Riwayat pekerjaan dan posisi	
		Secara umum, apa peran dan fungsi lembaga Bapak/Ibu terkait vaksinasi COVID-19		
		Sudah berapa lama di posisi saat ini?		
		Sebelum posisi yang sekarang, apa posisi Bapak/Ibu?		

No	Pertanyaan Utama	Probing	Domain	Keterangan
B. Pandangan Terkait Vaksin COVID-19 Uptake- to explore range of vaccination positions				
B1	Menurut Bapak/Ibu, bagaimanakah uptake vaksin COVID-19 saat ini di Provinsi Bali?	Apakah masyarakat menerima program vaksinasi COVID-19 dengan baik?		
		Apa alasan penerimaan dari masyarakat? Apakah instansi Bapak/Ibu berkontribusi dalam meningkatkan penerimaan tersebut?		
		Apakah ada kelompok – kelompok tertentu yang masih ragu? Kira-kira mengapa?		
		Apakah ada gerakan anti-vaksin? Apakah ada kelompok yang menolak? Mengapa mereka menolak?		
		Bagaimanakan peran pemerintah dalam mendorong uptake vaksin?		

		Bagaimanakan peran media atau media sosial dalam meningkatkan atau menghambat uptake vaksin?		
		Apakah ada kelompok-kelompok advokat untuk mendorong uptake vaksinasi?		
B2	Menurut pandangan Bapak/Ibu, apakah alasan utama penolakan vaksinasi COVID-19 oleh masyarakat Bali?	Masalah berkaitan dengan keamanana dan efektivitas vaksin?		
		Masalah berkaitan dengan keterbatasan informasi dan berita-berita yang tidak benar?		
		Masalah berkaitan dengan efek samping jangka panjang atau reaksi terhadap vaksin?		
B3	Menurut pandangan Bapak/Ibu, hal-hal apa yang memotivasi masyarakat Bali untuk mendapatkan vaksin COVID-19?	Ketakutan untuk terinfeksi COVID-19?		
		Keinginan/motivasi untuk melindungi masyarakat rentan atau keluarga dekat?		
		Kepercayaan terhadap pemerintah dan sistem kesehatan?		
		Kepercayaan terhadao keamanan dan efektivitas vaksin?		
		Rekomendasi dari petugas kesehatan?		
		Peran dari role model atau tokoh-tokoh tertentu?	Tokoh adat, pemuka agama, artis, tokoh masyarakat?	
B4	Menurut pandangan Bapak/Ibu, apakah ada stimulus/rangsangan sosial yang mendorong masyarakat dalam program vaksinasi?	Peran lingkungan tempat kerja atau masyarakat?		
		Norma 'vaksinasi' di tempat kerja?		
		Diharuskan oleh tempat kerja atau untuk kepentingan perjalanan?		
		Direkomendasikan oleh tenaga kesehatan, tokoh adat dan agama, tokoh masyarakat?		

No	Pertanyaan Utama	Probing	Domain	Keterangan
C. Akses Terhadap Vaksin COVID-19				
C1	Menurut pandangan Bapak/Ibu, bagaiamanakah ketersediaan dan akses tehadap vaksin COVID-19 saat ini di Bali?	Apakah masyarakat mengetahui dimana dapat mengakses vaksin?		
		Apakah masyarakat telah mendapatkan informasi terkait ketersediaan, lokasi vaksin dan pendaftaran/booking?		
		Apakah vaksin COVID-19 dapat diakses dengan mudah oleh masyarakat? Jelaskan?		
		Apakah lokasi vaksinasi mudah dijangkau dan sesuai dengan kebutuhan masyarakat? Jelaskan?		
C2	Menurut pandangan Bapak/Ibu, apakah ada upaya-upaya khusus yang dapat dilakukan untuk meningkatakn akses dan cakupan vaksin COVID-19?	Menyediakan layanan on-site?		
		Jam layanan yang fleksibel?		
		Melakukan vaksinasi berbasis masyarakat?		
		Program vaksinasi outreach bagi kelompok tertentu? Pelibatan LSM?		
		Layanan vaksinasi drive-through?		
		Pelibatan praktek swasta baik dokter umum, klinik?		
		Program aktivasi atau reminder bagi kelompok eligible?		
		Vaksinasi sekolah?		
C4	Menurut Bapak/Ibu, apa peran dan fungsi lembaga Bapak/Ibu untuk meningkatkan partisipasi masyarakat dalam upaya meningkatatkan penerimaan dan akses terhadap vaksin?	Secara fungsi, administrasi, politik, dan finansial?		
C5	Menurut pandangan Bapak/Ibu, bagaimana posisi sosial dan budaya dalam upaya vaksinasi COVID-19 di Bali? (e.g. peran banjar adat, peran ibu/perempuan, peran pemangku agama)			

No	Pertanyaan Utama	Probing	Domain	Keterangan
D. Aspek Manajemen dan Sumber Daya				
D1	Menurut pandangan Bapak/Ibu, bagaimanakah situasi manajemen vaksin COVID-19 saat ini?	Sudah efesien dan menjamin ketersediaan tepat waktu? Jika belum, aspek apa yang perlu diperbaiki?		
D2	Menurut pandangan Bapak/Ibu, bagaimana dukungan sumber daya manusia (kesehatan) untuk menyedikan layanan vaksin COVID-19?	Ketersediaan tenaga kesehatan untuk melakukan vaksinasi? Aspek apa yang perlu diperbaiki?		
		Apakah petugas kesehatan memiliki keterampilan/skil untuk menjalankan program?		
		Apa yang dapat dilakukan untuk meningkatkan jumlah vaksinator jika diperlukan?		
		Apakah program vaksin COVID-19 berdampak pada beban kerja petugas kesehatan? Apa yang bisa dilakukan untuk mengatasinya?		
		Apakah diperlukan relawan vaksinator? Siapa yang bisa dijadikan relawan?		
		Selain relawan vaksinator, jenis relawan dan dukungan SDM apakah yang diperlukan untuk mendukung implementasi program vaksinasi COVID-19?		
D3	Menurut pandangan Bapak/Ibu, bagaimanakah situasi ketersediaan vaksin COVID-19 di Bali?	Sudah tersedia cukup dan dapat diakses? Jika belum, apa saja kendalanya? Apa yang dapat dilakukan untuk mengatasi kendala tersebut?		
		Bagaimana manajemen pengadaan vaksinya? Apakah ada hambatan supply chain?		
		Apakah ada hambatan koordinasi dengan pemerintah pusat terkait pengadaan vaksin?		
		Bagaimana terkait dengan distribusi vaksin dari Dinkes ke pusat layanan? Apakah ada kendala? Upaya untuk mengatasi kendala tersebut?		
		Apakah ada isu-isu terkait dengan transportasi vaksin dari Dinkes ke layanan?		

		Bagaiamana dengan isu penyimpanan vaksin di tempat layanan?		
D4	Menurut pandangan Bapak/Ibu, bagaimanakah implementasi program vaksinasi COVID-19 saat ini di Bali?	Pandangan terkait dengan target dan sasaran? Apakah sudah jelas dan mencerminkan situasi masyarakat?		
		Pandangan terkait waktu implementasi untuk mencapai target? Apakah terlalu singkat? Jika ya, strategi apa yang diperlukan untuk mencapai target dalam waktu singkat?		
		Khusus berkaitan dengan perencanaan dan organisasi program, apakah ada kendala yang perlu kita perhatikan? Apa strategi yang dilakukan untuk mengatasi isu tersebut?		
		Apakah tersedia upaya penjaminan mutu, baik mutu vaksin ataupun implementasi program? Apakah ada mekanisme penjaminan mutu dan tim kendali mutu? Siapa mereka dan apa saja perannya?		
		Apakah tersedia mekanisme monitoring dan kontroling yang jelas? Apakah ada kendala dalam proses monitoring dan kontroling? Jalan keluarnya apa saja?		
D5	Bagaiamanakah mekanisme pencatatan dan pelaporan dari program vaksinasi COVID-19 saat ini?	Bagaiamana mekanisme pencatatan dan pelaporannya?		
		Apa saja kendalanya? Apakah tersedia sistem khusus? Bagaimana rekam/registrasi status vaksinasi? Upaya verifikasi?		
		Apakah ada potensi salah catat atau salah lapor?		
		Upaya apa yang dapat dilakukan untuk memperbaiki pencatatan dan pelaporan?		
D5	Apakah ada hal-hal lain yang ingin Bapak/Ibu tambahkan terkait dengan topik diskusi kita?			

Terima kasih atas partisipasi Bapak/Ibu, wawancara dapat kita akhiri.

ANNEX 10 – Specific Coverage in Karangasem and Buleleng District

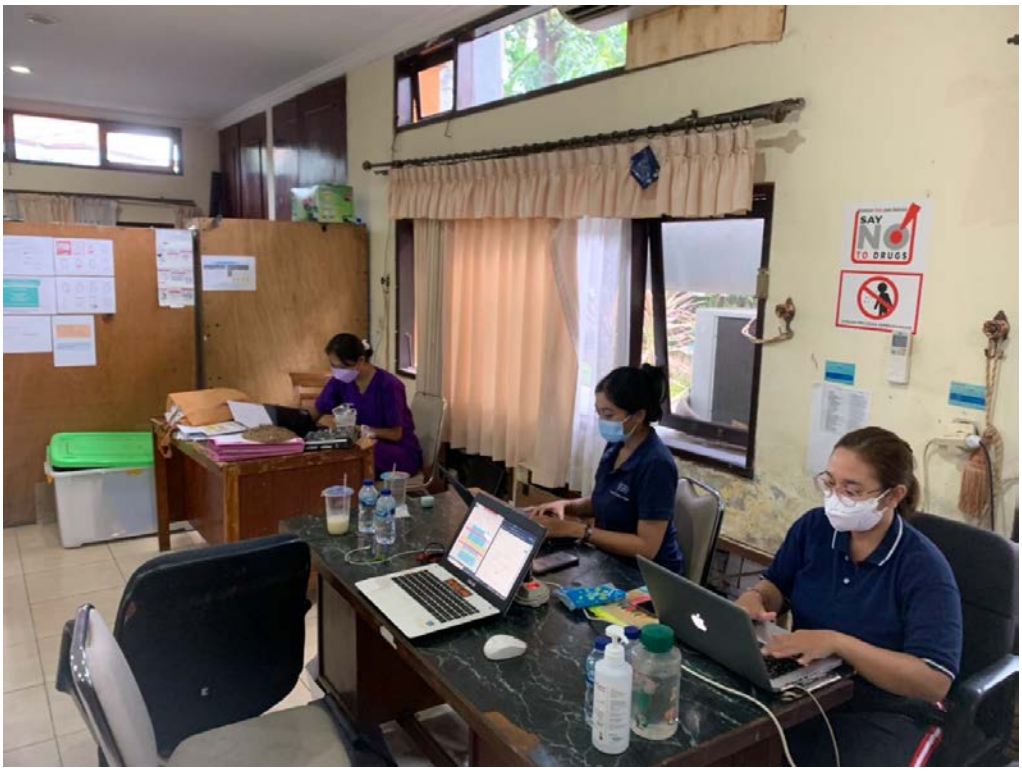
Characteristics	Karangasem District				
	Total Sample (N)	Validated Vaccination (N)	Weighted Coverage		
			Validation (%)	95% CI	
				Lower	Upper
Age	**1,164**	**926**			
>12 – 17 y.o.	103	93	90.45	83.83	97.08
18 – 45 y.o.	524	452	88.04	85.03	91.04
46 – 59 y.o.	290	235	80.16	74.73	85.60
≥60 y.o.	247	146	54.66	47.26	62.05
Education	**1,164**	**926**			
No education	249	130	47.69	40.55	54.82
Elementary	400	323	82.34	77.99	86.69
Junior High	179	164	91.18	85.95	96.41
Senior High	239	216	92.52	89.08	95.96
Tertiary	97	93	94.84	89.10	100
Employment	**1,164**	**926**			
Farmer/Laborer	386	298	78.34	73.67	83.01
Unemployed	332	227	64.77	58.46	71.08
Entrepreneur	194	172	89.75	85.15	94.35
Private sector	86	81	95.42	90.02	100
Student	84	76	89.96	82.31	97.60
Gov. employee	31	30	97.37	92.22	100
Housewife	36	27	74.74	59.13	90.35
Other	15	15	100	100	100
Level of Knowledge					
General Knowledge	**1,164**	**926**			
Good	618	540	87.58	84.53	90.63
Poor	546	386	69.17	64.56	73.78
Prevention Measures	**1,164**	**926**			
Good	582	509	87.98	84.96	91.00
Poor	582	417	69.23	64.69	73.77
COVID-19 Vaccination	**1,164**	**926**			
Good	551	481	86.89	83.46	90.32
Poor	613	445	72.22	68.07	76.36

Characteristics	Buleleng District				
	Total Sample (N)	Validated Vaccination (N)	Weighted Coverage		
			Validation (%)	95% CI	
				Lower	Upper
Age	**1,758**	**1,448**			
>12 – 17 y.o.	141	128	92.54	88.14	96.94
18 – 45 y.o.	780	654	85.47	82.81	88.13
46 – 59 y.o.	504	417	82.69	78.75	86.63
≥60 y.o.	333	215	62.98	57.03	68.92
Education	**1,758**	**1,448**			
No education	167	119	70.60	62.72	78.47
Elementary	717	542	76.96	73.49	80.44
Junior High	327	274	84.99	80.66	89.32
Senior High	459	394	85.94	82.17	89.70
Tertiary	88	85	96.27	92.01	100
Employment	**1,758**	**1,448**			
Farmer/Laborer	667	529	80.55	77.20	83.89
Unemployed	435	334	76.72	72.19	81.26
Entrepreneur	325	260	81.90	76.99	86.81
Private sector	115	101	88.12	81.74	94.50
Student	108	102	95.25	91.09	99.41
Gov. employee	33	32	97.61	92.94	100
Housewife	52	38	75.02	62.63	87.40
Other	23	18	71.66	48.53	94.80
Level of Knowledge					
General Knowledge	**1,758**	**1,448**			
Good	974	819	85.09	82.62	87.56
Poor	784	595	76.50	73.06	79.94
Prevention Measures	**1,758**	**1,448**			
Good	913	757	84.00	81.37	86.64
Poor	845	657	78.34	75.13	81.54
COVID-19 Vaccination	**1,758**	**1,448**			
Good	882	731	83.28	80.46	86.10
Poor	876	683	78.97	75.91	82.03

ANNEX 11 – List of Enumerators

1. Luh Pasek Nopiasih
2. Kadek Cantika Dewi
3. Ni Putu Intan Pratiwi
4. Ni Putu Mirananda Pradevi
5. Kadek Darmawan
6. Ni Wayan Ghytta Anandhya Pritayanti
7. Ni Luh Nu Kariasih
8. A. A. Sagung Ningrat Dwi Mahaeswari
9. Ni Putu Yunik Artha Sari
10. Putu Krisna Pebyanthi
11. I Putu Okta Diwian Jaya Putra
12. Luh Gede Martina Devi
13. Ni Nyoman Ayu Ardiningsih
14. Ni Nyoman Intan Widya Sari
15. Dewa Ayu Hari Krisna Dewi
16. Ni Made Rahayu Pradnyasari
17. Ni Kade Sari Cihnawati
18. Luluk Rahmawati
19. Anggita Nur Fahmi
20. Dewa Ayu Sri Agung
21. Ni Putu Suprianti
22. Ni Putu Meiliana Dewantari
23. Made Pasek Arya Suwahdendi
24. Martin Rinaldi Pasaribu
25. Teguh Permana
26. Ni Kadek Sri Desmiari
27. A. A. Putu Tia Pradnyana Iswari
28. Luh Komang Arysma Dewi
29. Kadek Dhiyo Mamhista Kumara
30. Putu Riky Adi Pratama
31. Ni Made Putri Widiantari
32. Dewa Ayu Vera Julyari
33. Putu Anindya Eka Putri
34. Kadek Candra Dwi Wahyuni
35. Ni Made Nujita Mahartati
36. Siluh Ayu Made Dwita Adriani
37. Ni Made Ria Sanistya Kusuma
38. Luh Eka Rahayu Ambarawati
39. Ni Putu Eva Adriana Putri
40. Ni Komang Widiantari
41. Septian Winata
42. I Gusti Agung Ayu Ari Febiyanti
43. I Luh Dewi Kusumaning Ayu
44. Indah Aulia
45. Luh Putu Deria Devita Putri

ANNEX 12 – Documentation of Activities


SAY
NO
TO DRUGS