Equity Analysis of Maternal Health Services in Nepal: Trends and Determinants, 2011–2022 Nepal DHS Surveys

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Resham Khatri, Komal Prasad Dulal, Kapil Timelsena, Manoj Tamrakar, Rebecca Rosenberg, Sabita Tuladhar

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This is one of 11 reports from a further analysis activity undertaken as part of the follow-up to the 2022 Nepal Demographic and Health Survey (NDHS). ICF provided technical assistance for the activity while USAID Learning for Development coordinated the activity. USAID Learning for Development also provided quality assurance and led the analysis of eight of the 11 reports, coordination with government stakeholders, and dissemination. ICF led the analysis of three of the reports.

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PREFACE

The 2022 Nepal Demographic and Health Survey (2022 NDHS) is the sixth survey of its kind implemented in the country as part of the worldwide Demographic and Health Surveys (DHS) Program. It was implemented under the aegis of the Ministry of Health and Population (MoHP) of the Government of Nepal with the objective of providing reliable, accurate, and up-to-date data for the country. The survey received funding from the United States Agency for International Development (USAID). 2022 NDHS information has assisted policymakers and program managers in policy formulation, monitoring, and designing programs and strategies for improving health services in Nepal. The 2022 NDHS is a key data source for tracking the progress of the Nepal Health Sector Strategic Plan 2023–2030 and the Sustainable Development Goal indicators.

The 2022 NDHS further analysis reports provide additional in-depth knowledge and insights into key issues that emerged from the 2022 NDHS. This information provides guidance for planning, implementing, refocusing, monitoring, and evaluating health programs in Nepal. This further analysis is also an important initiative to strengthen the technical capacity of Nepali professionals for analyzing and using large-scale data to better understand specific issues related to the country's needs. We are glad that in the sixth round of the NDHS, we were able to produce 11 further analysis reports. We urge that all policymakers, program administrators, program managers, health workers, and other key stakeholders optimally use the information from these reports in program planning and management. High-quality evidence should be the basis of our health programs planning, implementation, monitoring, and evaluation.

Finally, we would like to appreciate the leadership of the Policy Planning and Monitoring Division, and the efforts of the different individuals of the MOHP, and the Department of Health Services in generating these reports. We are thankful to USAID Nepal for their continued support in implementing the NDHS and further analysis studies in Nepal.

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FOREWORD

The 2022 Nepal Demographic and Health Survey (2022 NDHS) is the sixth nationally representative comprehensive survey conducted as part of the worldwide Demographic and Health Surveys (DHS) Program in the country. The survey was implemented by New ERA under the aegis of the Ministry of Health and Population (MoHP). Technical support for this survey was provided by ICF, with financial support from the United States Agency for International Development (USAID) through its mission in Nepal.

The standard format of the survey's final report included descriptive presentations of findings and trends but not of analytical methods that could ascertain the significance of differences and associations among variables. Thus, although largely sufficient, the final report is limited, particularly in providing answers to "why" questions-answers those are essential for reshaping important policies and programs. After the dissemination of the 2022 NDHS, the MoHP, USAID, and other health development partners convened and agreed on key areas that are necessary for assessing progress, gaps, and determinants in high-priority public health programs being implemented by the MoHP. In this context, 11 further analysis studies have been conducted by Nepali consultants under the direct leadership of the MoHP. The consultants were supported by USAID through the Leaming for Development Activity in Nepal and through The DHS Program.

The primary objective of the analysis studies was to provide more in-depth knowledge and insights into key issues that emerged from the 2022 NDHS. This information provides guidance for planning, implementing, refocusing, monitoring, and evaluating health programs in Nepal. One of the learning objectives is to strengthen the technical capacity of Nepali professionals for analyzing and using data from complex national population and health surveys to better understand specific issues related to country needs.

The further analysis of the 2022 NDHS was the concerted effort of many individuals and institutions, and it is with the great pleasure that we acknowledge the work involved in producing this useful document. The participation and cooperation of the officials of the MoHP and the Department of Health Services are highly valued. We would like to extend our appreciation to USAID Nepal for providing financial support for the further analysis. We would also like to acknowledge The DHS Program for its technical assistance at all stages. Our sincere thanks also goes to the USAID Learning for Development Activity team for the overall management and coordination of the entire process. Our special appreciation goes to the Policy Planning and Monitoring Division, MoHP, for their efforts and dedication to the completion of the further analysis of the 2022 NDHS.

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The further analysis of the 2022 Nepal Demographic and Health Survey (2022 NDHS) was conducted under the aegis of the Policy Planning and Monitoring Division of the Ministry of Health and Population (MoHP). The United States Agency for International Development (USAID) provided financial support, with technical assistance provided by the Demographic and Health Surveys (DHS) Program. Overall coordination, recruitment of local consultants, facilitation, administration, and logistic support were provided by the USAID Learning for Development Activity.

I am indebted to Dr. Bikash Devkota, Additional Secretary of the MoHP, for his unwavering guidance throughout the analysis process. I would like to acknowledge the efforts of Dr. Push pa Raj Poudel, Mr. Ravi Kanta Mishra, Mr. Manoj Tamrakar from the Policy Planning and Monitoring Division/MoHP. My special gratitude goes to all the co-authors for their input, coordination, data analysis, and writing of reports. My special thanks go to the co-authors from the MoHP and the Department of Health Services (DoHS) who provided significant contribution to ensure that the analysis aligned with our data needs and to improve the quality of the reports. My sincere appreciation goes to the peer reviewers: Dr. Gunanidhi Sharma from MoHP, Kabita Aryal, Sagar Dahal, Dr. Abhiyan Gautam, Dr. Uttam Pachya, Dr. Poma Thapa, and Dr. Bibek Lal from the DoHS; Pradeep Poudel from USAID Learning for Development; Tirtha Tamang from the United Nations Population Fund; Milima Dangol; Bidur Bastola from the USAID Adolescent Reproductive Health project; Dr. Rahul Pradhan from the World Health Organization; Abhilasha Gurung, and Naveen Poudyal from the United Nations Children's Fund; and Dr. Saroj Dhakal, Dr. Jaganath Sharma, and Sabita Tuladhar from USAID for reviewing the reports.

Special thanks to Sabita Tuladhar from USAID for her continuous support of this process. My sincere appreciation to Dr. Kerry L. D. MacQuarrie from The DHS Program, Jade Lamb, Tarun Adhikari, Sagar Neupane, Lokesh Bhatta, and Alexandra Cervini from USAID Learning for Development for their hard work in supporting the completion of these 11 further analysis reports.

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ABSTRACT

Over the past three decades, Nepal has made significant progress in improving access to and use of maternal health services and in reducing maternal morbidities and mortalities. However, the pace has been slow, the maternal mortality ratio is still high, and some disadvantaged groups still have disproportionately high rates of maternal morbidity and mortality. These groups might either have poor access to maternal health services or be receiving suboptimal quality of care. Thus, this study aimed to investigate trends in and determinants of use of key maternal health services, considering selected socioeconomic and demographic factors in Nepal.

We conducted trend analyses of maternal health services using data from the 2011 Nepal Demographic and Health Survey (NDHS) (n = 1,057), the 2016 NDHS (n = 964), and the 2022 NDHS (n = 981) among women age 15–49 who had at least one live birth in the 1 year prior to each survey. Outcome variables were at least four antenatal care visits, institutional delivery, postnatal care, and completion of all maternal care visits. We also identified the determinants of use of these services by analyzing data from the 2022 NDHS (n = 981). Outcome variables were institutional delivery, place of institutional delivery, delivery by cesarean section, and uptake of maternity incentives. Independent variables included selected background characteristics and the marginalization status of women. Marginalization status was an intersectional variable that incorporated wealth status, ethnicity, and education to identify multiple forms of disadvantage.

Analyses revealed low completion and high discontinuation of services along the maternity care continuum and increasing trends in institutional delivery and delivery by cesarean section in private health facilities (HFs). Institutional delivery was high among women who had at least four antenatal care visits and low among women from Karnali province, those with multiple disadvantages (women in the lower wealth quintiles who had no education and were from disadvantaged ethnic groups), Maithili and Bhojpuri native speakers, and women with a high birth order. Similarly, delivery in private HFs was most common in Koshi, Bagmati, Madhesh, and Lumbini provinces and among women with single or no disadvantages. Delivery in private HFs was less likely among women working in manual labor or those with a high birth order. Delivery by cesarean section was most common among pregnant women of older ages, Maithili native speakers, and women in provinces with high rates of delivery in private HFs. Low rates and a decreasing trend were found for uptake of maternity incentives in private HFs and in Koshi, Bagmati, Madhesh, and Lumbini provinces.

Overall, women from the most disadvantaged groups had lower uptake of routine maternity care visits, higher rates of discontinuation of antenatal through postnatal care, and wider equity gaps than more advantaged groups. Increasing trends in delivery in private HFs and delivery by cesarean section, coupled with limited or no maternity incentives, could lead to financial burdens for those already left behind. Health systems need to focus on designing and implementing targeted and contextual strategies and approaches in Madhesh and Karnali provinces and among women with multiple disadvantages.

Key words: institutional delivery, cesarean section, maternity incentive, private health facilities, health equity, multiple marginalization

ACRONYMS AND ABBREVIATIONS

ANC	antenatal care
AOR	adjusted odds ratio
CI	confidence interval
CS	cesarean section
DHS	Demographic and Health Survey
DoHS	Department of Health Services
GESI	gender equality and social inclusion
HF	health facility
MMR	maternal mortality ratio
MNH	maternal and newborn health
MoHP	Ministry of Health and Population
NDHS	Nepal Demographic and Health Survey
NMR	neonatal mortality rate
PNC	postnatal care
SDG	Sustainable Development Goal
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

1 INTRODUCTION

The World Health Organization (WHO) defines equity in health as "the absence of unfair and avoidable or remediable differences in health among populations or groups defined socially, economically, demographically, or geographically."[1] Health equity is about creating opportunities, removing barriers, and reducing or eliminating health disparities while not worsening the health of advantaged groups.[2] In other words, health equity is the absence of avoidable or remediable health differences (for example, in disease prevalence, health outcomes, and access to health care) among groups with different levels of underlying social, economic, demographic, or geographic disadvantages.[3] Also recognizing the structural nature of health equity, Braveman[4] suggests that health equity or fairness is associated with an obligation among those with political power over the distribution of resources, rights, and opportunities to share these resources, rights, and opportunities proportionately.

Health inequities are generally manifested through population differences in exposure and vulnerability, health care services (access to health services and use of quality health services), health status (for example, disease prevalence), and health outcomes (for example, mortalities).[5] According to Graham,[6] inequity in health is the systematic difference in health outcomes among people occupying unequal positions in society. Similarly, Whitehead[7] defines health inequity as health differences that are avoidable, unnecessary, and unjust, linked to structural inequities (for example, poverty, discrimination, racism, and ableism). Lynch[8] further argues that health inequity is the manifestation of structural inequities that are technically difficult to solve through the efforts of health systems alone. Framing health inequity as a health issue rather than a social one, rooted in sociostructural and political causes, is a fundamental problem.[8,9] Sociopolitical interventions are required to address social injustice; thus, paradigms should shift to the more equity-based political economy of health that considers health as a long-term investment, rather than focus on fixing the consequences of inequity.[10]

The terms "inequality" and "inequity" (as well as "disparity") are often used interchangeably, but they are not synonymous.[4] Health inequalities include all differences in health across population groups created by biological/genetic or random factors. Health inequities differ from health inequalities in that the differences are systemic and based on structural disadvantages (for example, low wealth or ethnic minority), are caused by social factors, and are created and sustained by unjust social arrangements, resulting in the unequal distribution of resources that are essential for good health.[11,12] Equity is subjective—based on social justice and fairness—and political—based on fair distribution of power, whereas equality is objective and is about similarities in a numerical sense.[13] Health disparities and inequalities are similar concepts because both denote differences in the presence of disease, health outcomes, or access to health care between population groups, although the literature lacks a description of whether those differences are avoidable, unjust, or unfair.[14]

Health equity can be vertical (for example, those with greater needs use greater health services) and/or horizontal (for example, those with equal needs use equal health services).[15] From this perspective, horizontal equity is similar to equality and can provide a pathway for achieving vertical equity. In other words, health equity is the desired ethical goal, and health equality is a metric for reaching that goal.[16] When equity in health is achieved, services are provided to those with the greatest need in a socially just manner.

1.1 Health Equity in Nepal

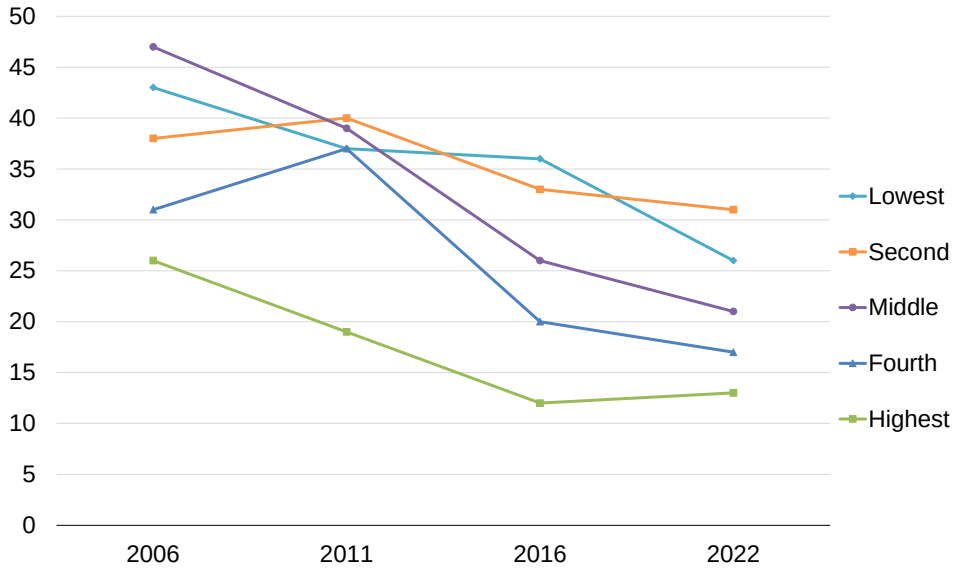
Over the past few decades in Nepal, household income, wealth status, life expectancy, and access to education and basic health services have improved.[17] These improvements in socioeconomic status and access to services have resulted in improvements in health indicators. However, huge equity gaps in wealth, access to education, and health outcomes still exist. Wealth inequity has a proportional relationship with access to health services; for instance, people with lower income or wealth status typically have limited access to quality health services, which leads to poorer health outcomes.[18] Progress in health indicators has been unequal within population groups and geographic regions in the country. Inequitable access to and use of health services can lead to inequitable socioeconomic development within the country.

Care during pregnancy and childbirth influences neonatal health outcomes, children's physical and mental development, and individuals' intellectual and earning capacity. For example, neonatal deaths account for a large share of all infant deaths. Most infant deaths occur in the first month after birth. The infant mortality rate is taken into consideration when estimating life expectancy at birth,[19,20] and life expectancy is one indicator of the human development index.[21] In other words, poor health of mothers and newborns impacts the socioeconomic development of the country.[22]

Evidence suggests that inequities in access to maternal health services and outcomes in Nepal have widened over the past two decades.[23–25] Reductions in the maternal mortality ratio (MMR) (reported as deaths of mothers per 100,000 live births) and neonatal mortality rate (NMR) (reported as deaths per 1,000 live births), have been slow at best.[26,27] For example, from 2006 to 2016, the MMR decreased from 281 to 259 deaths per 100,000 live births nationally,[22] and the NMR has been stagnant since 2016.[21] A study conducted in 2009 showed a higher MMR among some population groups, such as Muslims (MMR = 318) and women of Madheshi ethnicity (MMR = 307), than among more privileged groups such as those of Brahmin/Chhetri ethnicity (MMR = 182).[28] However, no recent data are available on MMR by population groups.

Similar equity gaps exist in NMR (national average = 21 deaths per 1,000 live births) between women in the lowest (poorest) wealth quintile (NMR = 31) and those in the highest (richest) wealth quintile (NMR = 13)[29] (Figure 1). High equity gaps exist not only in health outcomes but also in the uptake of routine health services. For example, uptake of institutional delivery among women in the lowest wealth quintile increased from 4% in 2006 to 66% in 2022, while it increased from 55% to 98% among those in the highest wealth quintile in the same period.[26–29] Equity gaps in uptake of institutional delivery have also been seen between disadvantaged ethnic groups, such as Dalit (70%) and Madheshi (76%) women, and privileged ethnic groups such as Brahmin/Chhetri women (87%).[29] Inequities in health services at the provincial level have also been observed, such as a low institutional delivery rate among women living in Madhesh province (67%) compared with women living in Sudurpaschim (87%) in 2022.[29,30]

Figure 1 **Trends in neonatal mortality per 1,000 live births, stratified by wealth quintile, 2006–2022 Nepal DHS surveys**



Source: Figure created using data from the previous four Nepal Demographic and Health Surveys[26,27,29,31]

1.2 Nepal's Health System Policy Context for Maternal Health

The Government of Nepal has prioritized health equity issues in their policies and programs aligned with global agendas, including Millennium Development Goals (2000–2015) and current health-related Sustainable Development Goals (SDGs).[32] One of the SDG targets for health (SDG 3.1) is to reduce the national MMR to 70 or fewer deaths per 100,000 live births by 2030.[33]

Nepal has made notable policy, programmatic, and strategic contributions toward improved access to maternal health services (Table 1). Among them are a policy on skilled birth attendants, establishment of birthing centers at the peripheral level, and introduction of the Aama Surakshya Karyakrum program, which provides maternity incentives for women who complete four antenatal care visits as per the national protocol (at 4, 6, 8, and 9 months of pregnancy) and who give birth in health facilities (HFs). The Nepal Safe Motherhood and Newborn Health Road Map 2030 aims to increase the availability of high quality maternal and newborn health (MNH) services, leaving no one behind.[34] In addition, the Nepal health sector's strategy on gender equality and social inclusion (GESI) (2009, revised in 2018) emphasizes creating an enabling environment for social inclusion and strengthening health services for marginalized groups.[35] As of its most recent revision in 2018, the GESI strategy aims to ensure and achieve universal health coverage of quality health services.[35]

To meet the SDG equity target, global communities are committed to ensuring universal coverage of quality essential health services, including maternal health services. Similarly, Nepal's National Strategy for Reaching the Unreached (2016–2030) envisions achieving universal health coverage for disadvantaged populations by addressing demand-side and supply-side challenges of the health system.[36] The recently endorsed Nepal Health Sector Strategic Plan 2023–2030 aims to address the drivers of inequities in health services through the use of disaggregated data and social mapping; targeted interventions to reach the unreached; satellite clinics in hard-to-reach areas; implementation of the national guidelines on elderly- and

disability-inclusive health; strengthening and expansion of psychosocial counseling and one-stop crisis management centers; and GESI-responsive planning, budgeting, and health service delivery. Despite these policy and programmatic provisions, persistent equity gaps remain. Tracking and monitoring inequities in health is essential for targeting interventions for better outcomes for priority populations.[37]

Table 1 Major provisions for improving access to and use of maternal health services in Nepal

Year	Policies, programs, and strategies	Major provisions
1994	• National Safe Motherhood Plan of Action	• Initiation of plans and programs for safer motherhood
1998	• National Safe Motherhood Policy	• Prioritization of maternal health program and implantation of interventions
2002	• National Safe Motherhood Plan (2002–2017) • Birth Preparedness Package Program • Abortion legalized	• Strengthening of infrastructure for the reproductive health service delivery • Delivery of interventions through female community health volunteers • Policy provisions for legal abortion
2005	• Maternity incentive program • Nepal Health Sector Strategy I (2004–2009)	• Free delivery services at HFs • Implementation plan, sector-wide approach, and health sector reform agenda
2006	• National Policy on Skilled Birth Attendants • Safe Motherhood and Neonatal Health Long-Term Plan (2006–2017) • Safe delivery incentive program • Chlorhexidine cord care program • Technical Working Group (National Plan of Action) for newborns • Free health care program	• Task shifting with medical doctors performing cesarean sections, nurses for midwifery, and anesthesia assistants for anesthetic services • Expansion of basic emergency obstetric and newborn care and comprehensive emergency obstetric and newborn care • Added incentives for health workers and free institutional delivery care • Provision of free health care services from local-level HFs
2007	• Safe delivery incentive	• A cash incentive to health workers attending all forms of deliveries: normal, complicated, and cesarean section
2009	• Revision of maternity incentive program • Remote areas guideline for safer motherhood • Referral funds • Cash incentive and free delivery services scaled up nationally as Aama program • GESI strategy • Community-Based Newborn Care Program • Nepal Health Sector Strategy II (2010–2015)	• Incentives for four antenatal care visits, free delivery, and institutional reimbursement • Misoprostol distribution through female community health volunteers • Extended the scheme to provide free delivery • Care at public and some private health facilities • Local recruitment of comprehensive obstetric and neonatal care teams • Implementation of newborn care at the community level
2013	• Nyano Jhola (Warm Bags) Program • Maternal and perinatal death surveillance and response guideline	• Distribution of warm bags to those who are delivered in HFs • Mandatory reporting of maternal deaths for formulation of a plan to save the lives of mothers and newborns
2015	• Free newborn care program • Nepal health insurance program • Emergency referral funds • Nepal Health Sector Strategy (2015–2020)	• Implementation of free newborn care • Design and implementation of health insurance program • Focus on quality of care and equity in health sector strategy
2016	• Reaching the unreached strategy (2016–2030) • Aama and free newborn care program • Nepal Health Sector Strategy III (2016–2022) • Nepal's Every Newborn Action Plan	• Integration of free newborn care program in maternity incentive program • Focus of health sector strategy on access, quality, equity, and multisectoral actions • Service delivery arrangements that expand maternal and newborn health services from the community to tertiary levels

Continued…

Table 1—*Continued*

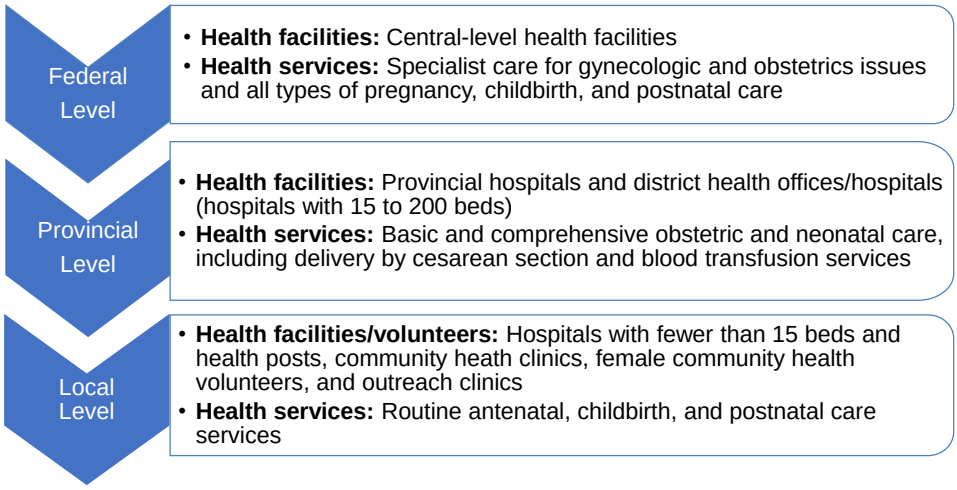
Year	Policies, programs, and strategies	Major provisions
2018	• Safe Motherhood and Reproductive Health Rights Act • GESI operational guideline	• Endorsement of the act for program implementation • Implementation of GESI strategy at different levels of governments
2019	• Nepal Safe Motherhood and Newborn Health Road Map 2030	• The road map for reducing neonatal mortality to less than 12 deaths per 1,000 live births by the provision of high quality, equitable maternal and newborn health services
2022	• Nepal Health Sector Strategic Plan 2023–2030	• Focus on equity, quality, accessibility, availability, and use of health services

GESI = gender equity and social inclusion; HF = health facility

Source: Prepared by authors collecting information from a variety of sources[34,38–43]

The Constitution of Nepal 2015 guarantees the right to equality, social justice, and freedom from social discrimination.[44] The fundamental rights of the constitution empower citizens with free basic health services. The country's health system governance provides a mandate and jurisdiction to all three levels of government (local, provincial, and federal).[45] Implementing health policies and programs is a concurrent power of all three levels of government, as is delivering health services, including maternal health services (Figure 2). For example, local-level health facilities provide basic health services while provincial and federal level health facilities deliver secondary and tertiary care. The constitution has included affirmative action for excluded populations, including women, poor individuals, and individuals from disadvantaged castes/ethnicities.

Figure 2 Health system and services for maternal and newborn health in Nepal



Source: Created by Khatri R and adapted from his research[41]

The National Health Policy 2019, aligned with constitutional mandates, envisions strengthening social health protection and ensuring access to and use of quality health services in Nepal.[46] However, many challenges persist in the provision and delivery of care, including inadequate provision of equitable health services, management of free and quality health services at service delivery outlets, and access to health services for populations in need.[47,48] The Government of Nepal is committed to improving access to and use of services and health outcomes, focusing on those left behind.

1.3 Study Rationale

Despite overall improvements in access to maternal health services and in the health status of mothers and newborns, disadvantaged groups and rural residents still face challenges using health services in Nepal. Earlier evidence suggests high equity gaps in the use of health services across different socioeconomic, demographic and geographical areas. Achieving universal health coverage is impossible without reaching out to those already left behind. It is vital to achieve universal coverage in proportionate strata of the population.

Access to free basic health services in HFs is the constitutional right of citizens.[44] Free basic health services are available in public HFs through public funding. In private HFs, people must pay for services, even basic ones. The readiness of public HFs facilities to provide MNH services remains suboptimal and inadequate compared with that of private HFs.[50] Routine health services, such as delivery, have increasingly been overmedicalized, especially in private HFs with better profits.[51] Overall, care seeking in private HFs is increasing with perceived higher quality of care.[49] However, health services in private HFs have also been reported to be poorly regulated in terms of accreditation, quality of care, and uniformity of care cost.[52]

Historically, in line with global health initiatives including the SDGs and universal health coverage, Nepal has formulated its policies and programs by taking a national-level average of health indicators using a blanket, one-size-fits-all approach. In the context of a federalized health system, opportunities exist for local governments to identify their needs and develop specific programs to meet those needs. Although the GESI strategy focuses on equitable policies and strategies, its implementation is limited, and some population groups have been left behind in accessing health services. Women and children are most affected, especially those from marginalized groups. Additionally, the MMR and NMR are high among socioeconomically disadvantaged groups and in remote and rural areas.[26,27,29,31] These groups either have poor access to health services or receive health services of suboptimal quality.

In this purview, it is imperative to investigate the extent of inequities in Nepal so that policies, programs, and strategies can be designed and revised in the context of the federalized health system to ensure equitable access to MNH services for the populations most in need. A detailed understanding of the trends in uptake of maternal health services and the determinants of uptake could inform decisionmakers in designing policies and implementing strategies to address gaps in equity.

1.4 Objectives

This study aimed to investigate equity gaps in the use of key maternal health services (institutional delivery, place of institutional delivery, delivery by cesarean section, and uptake of maternity incentives), considering socioeconomic and demographic factors in Nepal. Specific objectives were:

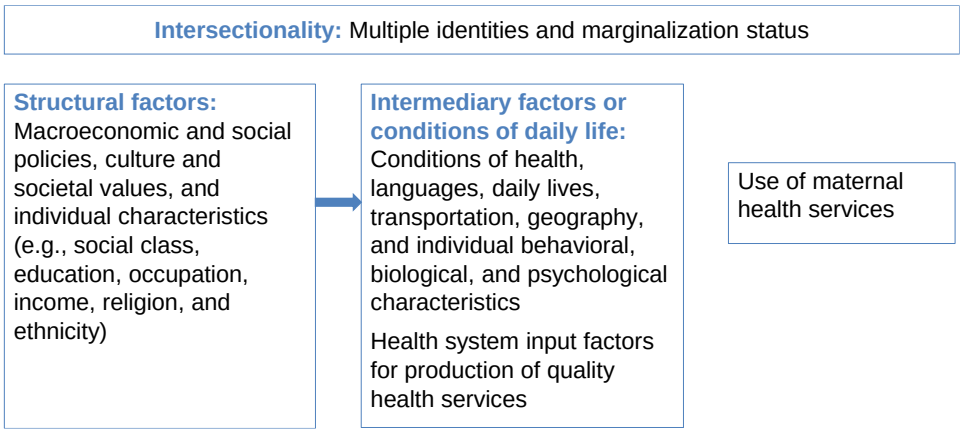
- To analyze overall trends in uptake of key maternal health services in three recent population-based surveys in Nepal: the 2011 Nepal Demographic and Health Survey (NDHS), the 2016 NDHS, and the 2022 NDHS
- To investigate determinants of uptake of key maternal health services in data from the 2022 NDHS

2 METHODS

2.1 Conceptual Framework

The conceptual framework used in this study, adapted and modified from Marmot and the World Health Organization (WHO) social determinants of health framework,[1,55] has been previously described.[54] According to this framework (Figure 3), structural factors (which depend on the social structure of the society and required political interventions) and intermediary factors (which are usually modifiable through multisectoral actions) are intricately linked. The factors overlap with an individual's multiple identities, thereby creating intersectional advantages and/or disadvantages (that is, marginalization status). Structural factors, intermediary factors, and intersectional disadvantages all influence access to and use of maternal health services.

Figure 3 Conceptual framework for analysis of maternal health services in Nepal



Source: Adapted from Marmot,[1,55] modified for previous research by Khatri et al.,[54] and used for this research

2.2 Data Sources

This study was an overall national trends analysis of uptake of key maternal health services using data from three recent surveys: the 2011 Nepal Demographic and Health Survey (NDHS), the 2016 NDHS, and the 2022 NDHS. The trend analysis included women age 15–49 who had live births in the 1 year prior to the 2011 NDHS (n = 1,057), the 2016 NDHS (n = 964), and the 2022 NDHS (n = 981). The study also identified determinants of key maternal health services, related specifically to childbirth, using data from the 2022 NDHS. Among the 981 women who had live births in the 1 year prior to the survey, 796 (weighted) had given birth at health facilities. This smaller sample (n = 796) was used to analyze the determinants. Detailed methods of the NDHS surveys are explained in the original final report for the 2022 NDHS.[29] Figure A1 provides an illustrative breakdown of these 981 women by maternal health service.

This study was a further analysis of publicly available NDHS data, which were obtained from The Demographic and Health Surveys (DHS) Program (www.dhsprogram.com). Before obtaining data access, The DHS Program approved the submitted registration form outlining the requested data and analysis plan. The DHS Program then authorized the research team to download and analyze data for this study.

2.3 Study Variables

The outcome variables for this study are shown in Box 1. The four outcome variables for the trend analysis were at least four antenatal care (ANC) visits, institutional delivery (that is, at a health facility), postnatal care (defined as at least one postnatal care visit within 48 hours of childbirth), and completion of all routine maternity care visits. Outcome variables for the analysis of determinants were institutional delivery (versus home delivery), place of institutional delivery (public versus private), delivery by cesarean section, and uptake of maternity incentives. Through the Aama Surakshya Karyakrum program, women receive incentives to cover their transportation costs if they complete at least four ANC visits and give birth at a health facility.

Box 1 Outcome variables and categorization

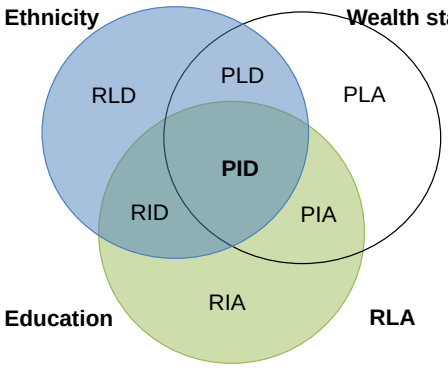
- **Trend analysis:** at least four antenatal care visits, institutional delivery, postnatal care, and completion of all routine visits
- **Place of delivery:** home/health facility
- **Place of health facility delivery:** public/private
- **Type of delivery:** vaginal/cesarean section
- **Type of health facility for cesarean section:** public/private
- **Maternity incentives for health facility deliveries:** yes/no, received maternity services in public versus private health facilities

Independent background variables were selected based on our conceptual framework. These variables comprised marginalization status and a variety of structural and intermediary factors: maternal age, religion, ethnicity, education, wealth quintile, province, place of residence, ecoregion, occupation, native language, birth order of the child, place of delivery, and uptake of at least four ANC visits. Detailed categorization of each independent variable can be found in the appendix (see Table A1).

Marginalization status was determined using the variables of education, wealth status, and ethnicity.[53,54] The Government of Nepal has categorized ethnicities into six broad categories: Dalits, disadvantaged Janajatis (indigenous), disadvantaged non-Dalit Terai caste groups, religious minorities (Muslims), relatively advantaged Janajatis, and Bramins/Chhetris. For this study, we merged these six categories into two groups: disadvantaged ethnicities (Dalits, Muslims, Terai caste, and disadvantaged Janajatis) and advantaged ethnicities (Brahmins/Chhetris and advantaged Janajatis). We also separated some ethnicities (for example, Brahmins and Chhetris) if the categories had enough cell values. Education was dichotomized into illiterate (those who cannot read and write) and literate (those who can read and write and have at least a primary education). The five wealth quintiles described in the 2022 NDHS were dichotomized into two groups, merging the lowest two quintiles (lower 40%) into "lower wealth status" and the highest three quintiles (upper 60%) into "upper wealth status." The three variables (two categories each) were then combined to create the new marginalization status variable. Eight original categories of marginalization status (Figure 4) were merged into four categories based on the number of disadvantages (multiple marginalizations) a woman could have: triple, double, single, and no disadvantages.

The short window of time for this study (1 year prior to each survey) was used to reduce the recall bias of childbirth-related information and identify the recent rate of institutional delivery. However, this resulted in small sample sizes in some categories for some variables (for example, marginalization status), which explains why some of them were merged.

Figure 4 Intersections of ethnicity, education, and wealth status to define multiple marginalization status



Variables:
Ethnicity: Advantaged and disadvantaged
Wealth status: Rich and poor
Education: No education (illiterate) and literate

Original categories of marginalization status:
PID: Poor, illiterate, and disadvantaged ethnicity
PIA: Poor, illiterate, and advantaged ethnicity
PLD: Poor, literate, and disadvantaged ethnicity
RID: Rich, illiterate, and disadvantaged ethnicity
PLA: Poor, literate, and advantaged ethnicity
RIA: Rich, illiterate, and advantaged ethnicity
RLD: Rich, literate, and disadvantaged ethnicity
RLA: Rich, literate, and advantaged ethnicity

Source: Created by Khatri R and adapted from his research[54]

2.4 Data Analyses

Univariate (descriptive), bivariate, and multivariate analyses were performed. As this study was a further analysis of secondary data, quality was ensured only at the analysis stage. We applied sampling weight, primary sampling unit, and strata adjustments for all analyses.

Proportions for each outcome variable were described, and trends were analyzed by marginalization status. We reported the national average indicators as well as results by number of disadvantages. Associations between outcome variables and all independent background variables were also examined. Differences in proportions were assessed using chi-square tests. Initial unadjusted and adjusted logistic regression analyses were performed to assess the determinants for each outcome variable. Separate multivariable regression models were used for each outcome variable.

Before running the final regression model, we checked for multicollinearity. Independent variables with variation inflation factors ≥5 were excluded. Education, wealth quintile, and ethnicity were multicollinear with marginalization status, so these three variables were excluded. Because ecoregion was highly correlated with province, it was also excluded in the final regression model. Additionally, for the purpose of interpretation, the reference category of some of the variables was changed in the multivariable analysis based on the outcome of interest. For example, if institutional delivery was low among teenage mothers (age 15–19), which is important for programs and policies, older women were considered as a reference category to estimate the odds of institutional delivery among adolescents. We reported adjusted odds ratios with 95% confidence intervals for all independent variables retaining a p value <.05. The level of statistical significance was set at $p < .05$ (two-tailed) to identify the determinants associated with each outcome variable. Findings were reported weighted estimates (unless otherwise indicated). All analyses were conducted using the "svy" command function and considering the clustering effect in Stata 17 (StataCorp, 2023).

The study included mothers who had live births in the 1 year prior to the survey. This short window of time was used to reduce the recall bias of childbirth-related information and identify recent uptake of institutional delivery (2020/2021). However, this resulted in small sample sizes in some of the categories of variables (for example, marginalization status), which we then merged.

3 RESULTS

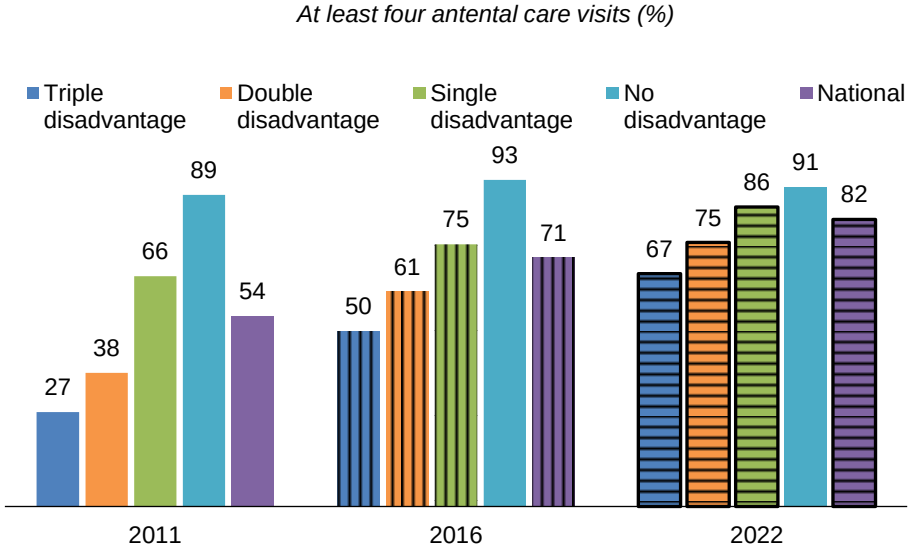
Following are the key findings of descriptive analyses and multivariate analyses. Results of more detailed descriptive analyses and of bivariable analyses can be found in the appendix.

3.1 Trends in Uptake of Maternal Health Services

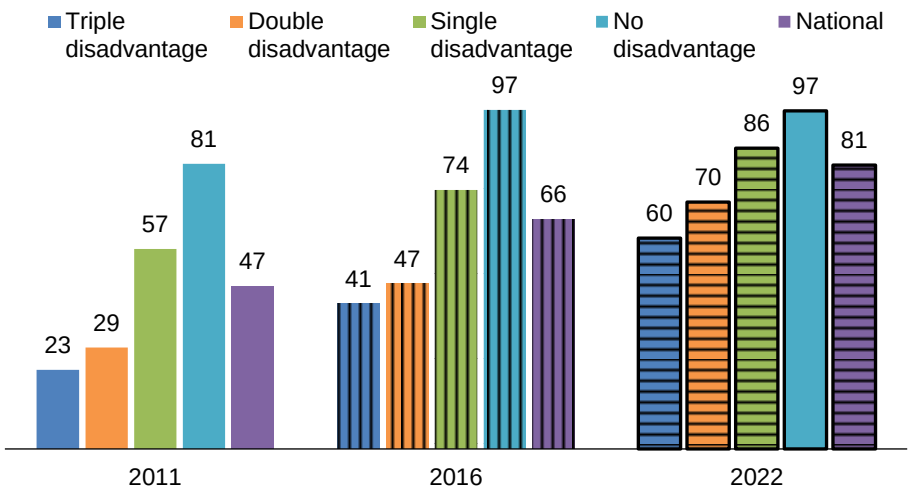
Figure 5 presents trends in uptake of at least four antenatal care (ANC) visits, institutional delivery, postnatal care (PNC), and completion of all routine maternity visits by marginalization status between the 2011 Nepal Demographic and Health Survey (NDHS) and the 2022 NDHS. At the national level, the trends were increasing for all routine maternity services. Uptake declined along the continuum of ANC through PNC, with a higher level of dropout between institutional delivery and PNC than between ANC and institutional delivery. Nearly one in three women (59%) completed all three routine maternity care visits in 2022. However, this was low compared with completion of individual routine care visits (82% for at least four ANC visits).

Uptake of routine maternal health services was highest among women with no disadvantages and lowest among women with triple disadvantages. The equity gap between all four categories of marginalization status declined over time, illustrated by converging trendlines. We found a statistically significant increase in uptake of at least four ANC visits from 2011 to 2022 for all women with at least one disadvantage. The proportion of women with at least one disadvantage who completed all routine maternity care visits also increased significantly from 2011 to 2022. The increases in institutional deliveries and PNC visits from 2011 to 2022 were statistically significant for all categories of marginalization status (Figure 5).

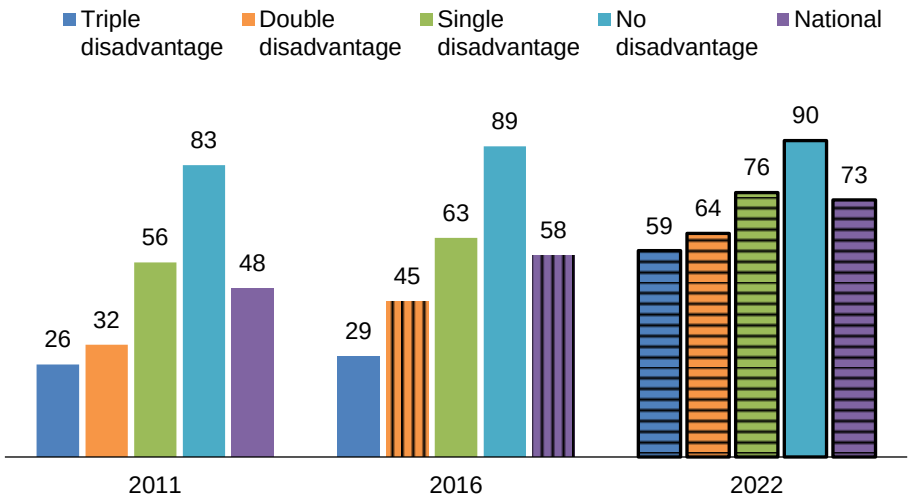
Figure 5 Trends in uptake of each routine maternal health service by marginalization status, 2011–2022 Nepal DHS surveys

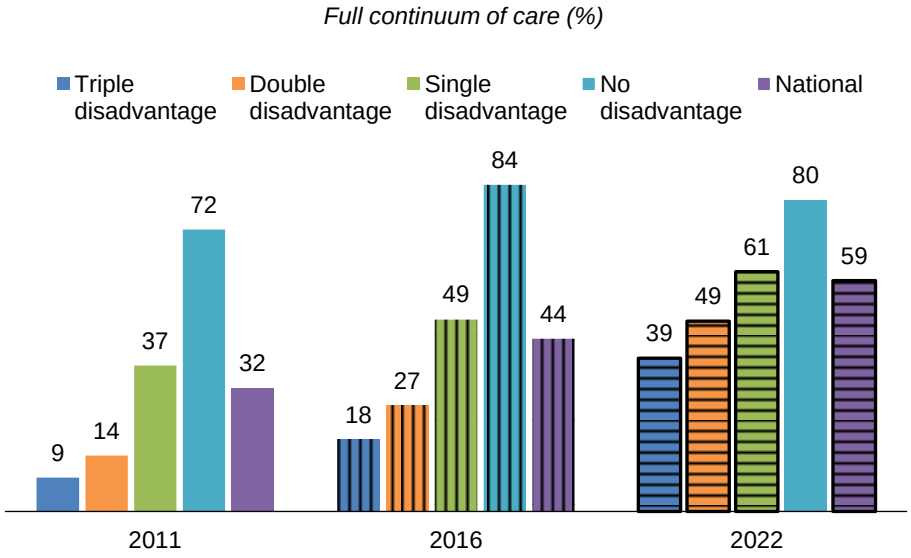


Institutional delivery (%)



Postnatal care (%)



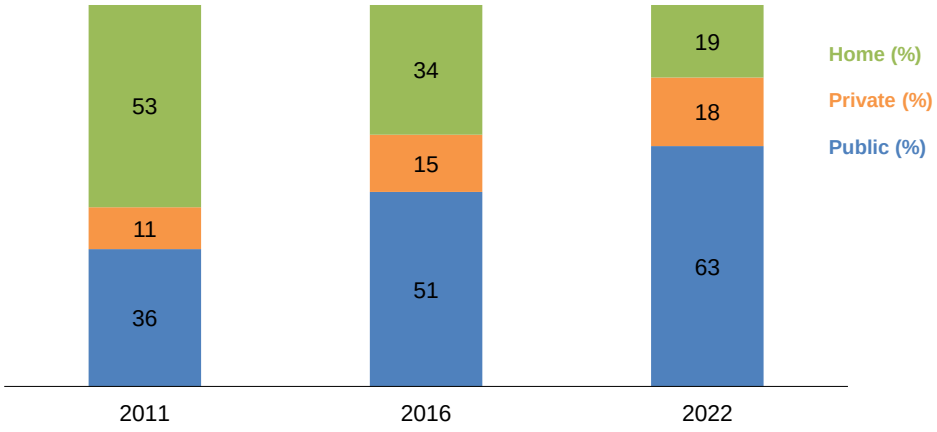


Note: Each bar with vertical lines indicates a statistically significant change from 2011 to 2016. Each bar with horizontal lines indicates a statistically significant change from 2016 to 2022. Each bar with a solid outline indicates a statistically significant change from 2011 to 2022.

3.1.1 Trends in place of delivery

Figure 6 shows overall trends in place of delivery over the three NDHS surveys. Delivery at public health facilities (HFs) increased from 36% in 2011 to 63% in 2022. Delivery at private HFs also increased, from 11% to 18% in the same period. Although home deliveries decreased over time, 19% of women still gave birth at home without assistance from skilled birth attendants in 2022.

Figure 6 Overall trends in place of delivery, 2011–2022 Nepal DHS surveys



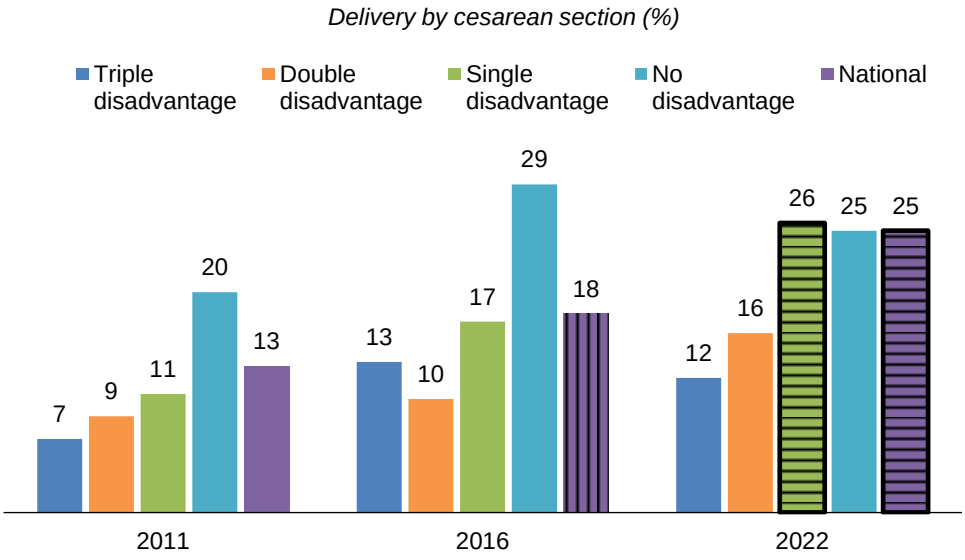
3.1.2 Trends in delivery by cesarean section and uptake of maternity incentives

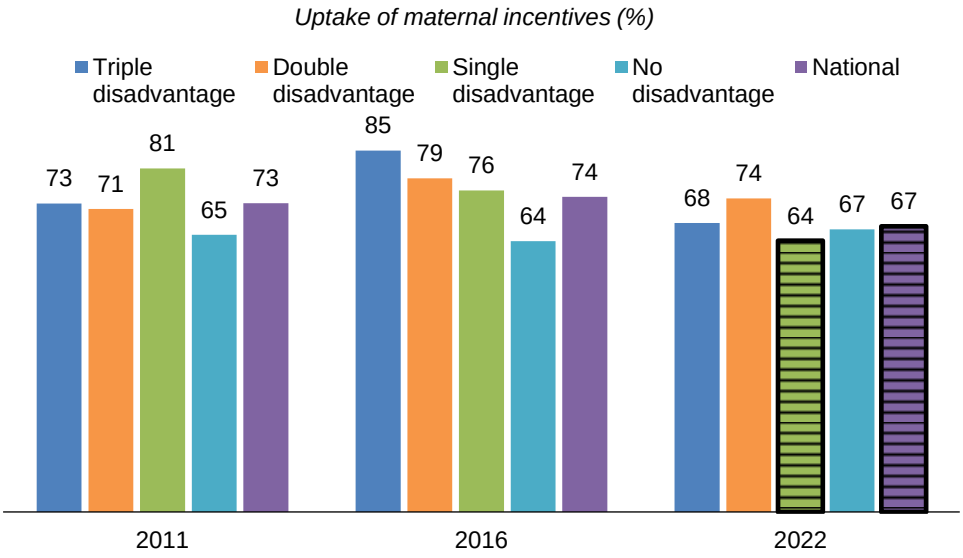
Figure 7 presents trends in delivery by cesarean section (CS) and uptake of maternity incentives among women who gave birth in HFs, by marginalization status. Nationally, delivery by CS increased over the three NDHS surveys. Among all institutional deliveries, the CS rate doubled from 13% in 2011 to 25% in

2022. Among the women who gave birth in HFs, the overall uptake in maternity incentives decreased from 73% in 2011 to 67% in 2022.

Delivery by CS was generally highest among women with no disadvantages or women with a single disadvantage. Between 2011 and 2022, the proportion of women with delivery by CS significantly increased among those with a single disadvantage, but it did not change significantly among those with other marginalization statuses. There was no notable change over time in the equity gap between marginalization statuses for women with CS deliveries. The uptake of maternity incentives decreased so significantly among women with a single disadvantage that this group went from having the highest uptake in 2011 to having the lowest uptake in 2022. There were no statistically significant changes in the uptake of maternity incentives among women with other marginalization statuses.

Figure 7 Trends in delivery by cesarean section and uptake of maternity incentives among women who gave birth in health facilities, by marginalization status, 2011–2022 Nepal DHS surveys



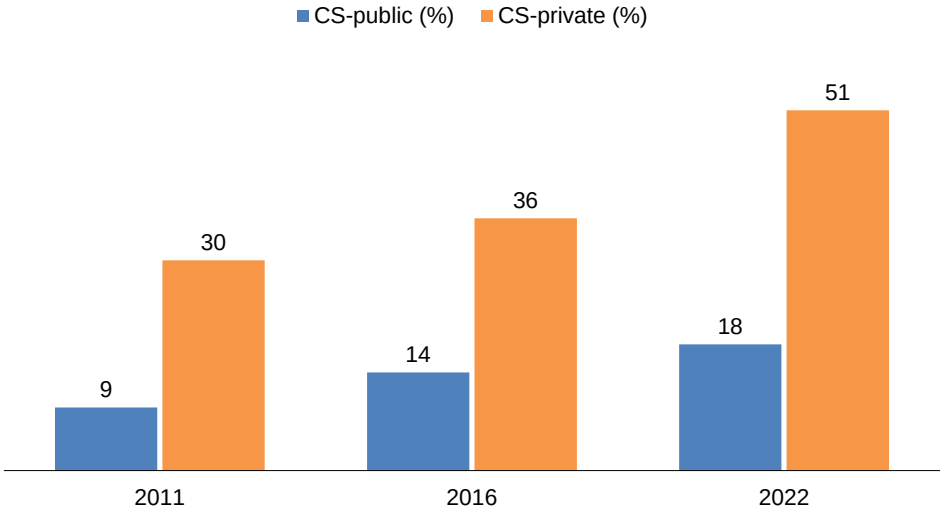


Note: Each bar with vertical lines indicates a statistically significant change from 2011 to 2016. Each bar with horizontal lines indicates a statistically significant change from 2016 to 2022. Each bar with a solid outline indicates a statistically significant change from 2011 to 2022.

3.1.3 Trends in delivery by cesarean section in health facilities

Figure 8 shows the increasing trend of delivery by CS in public and private HFs over the past three NDHS surveys. From 2011 to 2022, delivery by CS increased from 9% to 18% in public HFs and from 30% to 51% in private HFs.

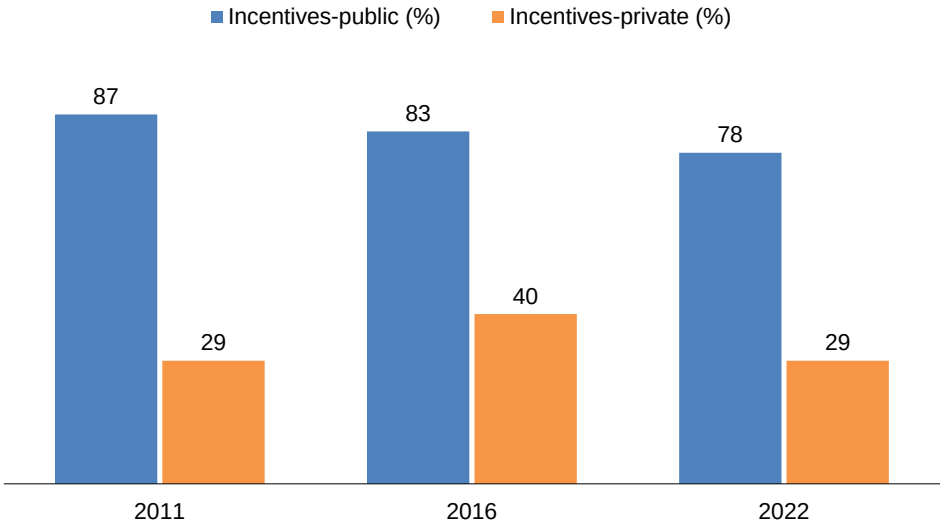
Figure 8 Trends in uptake of delivery by cesarean section among women who gave birth in health facilities, by facility type, 2011–2022 Nepal DHS surveys



3.1.4 Trends in uptake of maternity incentives in health facilities

Figure 9 presents the uptake of maternity incentives by delivery in public and private HFs in the three most recent NDHS surveys. Among women who gave birth in public HFs, uptake of maternity incentives declined over time. Nearly 9 in 10 women (87%) received maternity incentives in 2011, which declined to 78% in 2022. Among those who gave birth in private HFs, the proportion receiving maternity incentives remained low over time. Only about 3 in 10 mothers (29%) received maternity incentives in 2011; although this proportion increased to 40% in 2016, it declined back to 29% in 2022.

Figure 9 Trends in uptake of maternity incentives among women who gave birth in health facilities, by facility type, 2011–2022 Nepal DHS surveys



3.2 Variables Associated with Institutional Delivery

3.2.1 Background variables for women

This portion of the study included 981 women age 15–49 who had at least one live birth in the 1 year prior to the 2022 survey. Table 2 presents the background variables of these women. Large proportions of the women were age 20–24 (36.8%), were of Janajati ethnicity (31.9%), had secondary education (44.9%), were from Madhesh province (24.4%), had given birth to their first child (40.7%), and had at least one disadvantage (43.4%). Figure A1 shows a flowchart of the maternal continuum of care for all 981 women.

Table 2 Distribution of women age 15–49 who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	%	95% CI	N = 981
Structural factors			
Religion			
Hindu	83.7	79.8, 87.0	822
Other	16.3	13.0, 20.2	160
Ethnicity			
Brahmin	8.3	6.4, 10.8	81
Chhetri	18.7	15.6, 22.1	183
Madheshi	17.0	13.7, 21.0	167
Dalit	17.2	13.9, 21.1	169
Janajati	31.9	27.8, 36.3	313
Muslim	7.0	4.4, 10.9	68
Education			
No education	16.4	13.6, 19.7	161
Basic	33.4	30.2, 36.8	328
Secondary	44.9	40.8, 49.1	441
Higher	5.2	3,3, 8.1	51
Wealth quintile			
Lowest	20.4	17.4, 23.7	200
Second	21.6	18.6, 25.1	212
Middle	20.1	17.1, 23.5	197
Fourth	20.2	17.0, 23.7	198
Highest	17.7	14.4, 21.6	174
Occupation			
Not working	44.9	41.1, 48.7	440
Agriculture	40.6	36.6, 44.7	398
Manual labor	5.8	4.3, 7.9	57
Working paid	8.7	6.9, 11.0	86
Marginalization status			
Disadvantages			
Triple	8.3	6.5, 10.6	82
Double	29.8	26.3, 33.7	293
Single	43.4	39.5, 47.4	426
No	18.4	15.0, 22.4	180
Intermediary factors			
Province			
Koshi	19.2	16.3, 22.4	188
Madhesh	24.4	21.3, 27.7	239
Bagmati	16.3	13.2, 19.9	160
Gandaki	6.7	5,1, 8.7	66
Lumbini	15.9	13.8, 18.2	156
Karnali	7.1	6,1, 8.2	70
Sudurpaschim	10.4	9.0, 12.0	102
Place of residence			
Urban	66.0	62.8, 69.2	648
Rural	34.0	30.8, 37.2	333
Ecoregion			
Mountain	6.2	3,9, 9.5	60
Hill	34.9	30.0, 40.0	342
Terai	59.0	53.8, 64.0	579
Native language			
Nepali	48.5	43.9, 53.2	476
Maithili	18.8	14.5, 23.9	184
Bhojpuri	8.5	5.5, 12.8	83
Other	24.2	20.6, 28.2	237
Age			
<20	18.8	16.4, 21.6	185
20–24	36.8	33.8, 39.9	361
25–29	27.6	24.6, 30.9	271
30–34	12.7	10.2, 15.9	125
≥35	4.0	2,8, 5.6	39

Continued…

Table 2—*Continued*

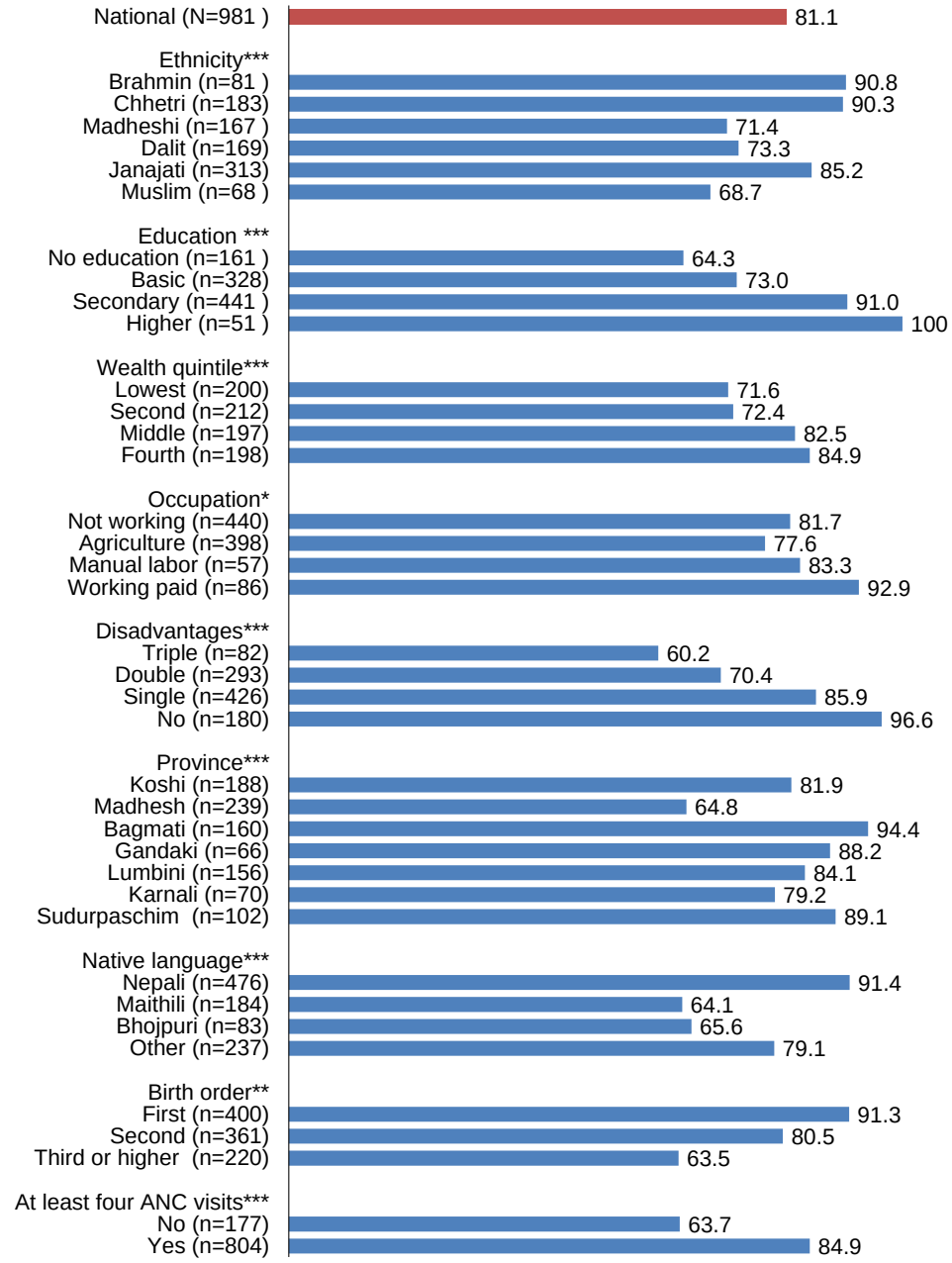
Variable	%	95% CI	N = 981
Birth order			
First	40.7	36.9, 44.6	400
Second	36.8	33.3, 40.5	361
Third or higher	22.4	19.5, 25.7	220
Place of delivery			
Public health facility	63.5	59.3, 67.6	623
Private health facility	17.6	14.3, 21.4	172
Home	18.9	16.0, 22.2	185

CI = confidence interval

3.2.2 Institutional delivery among all deliveries

Among the 981 women, 796 (81.1%) delivered their babies at HFs. Nine background variables were significantly associated with institutional delivery (Figure 10). Large equity gaps existed between Brahmins (90.8%) and Muslims (68.7%), between women with no education (64.3%) and those with higher education (100%), between women in the highest wealth quintile (96.7%) and those in the lowest (71.6%), between women with triple disadvantages (60.2%) and women with no disadvantages (96.6%), between women in Madhesh province (64.8%) and those in Bagmati province (94.4%), between Maithili speakers (64.1%) and Nepali speakers (91.4%), and between women with a third or higher birth order (63.5%) and those with a first birth order (91.3%). See Table A2 for findings on additional background variables.

Figure 10 Institutional delivery among women age 15–49 who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

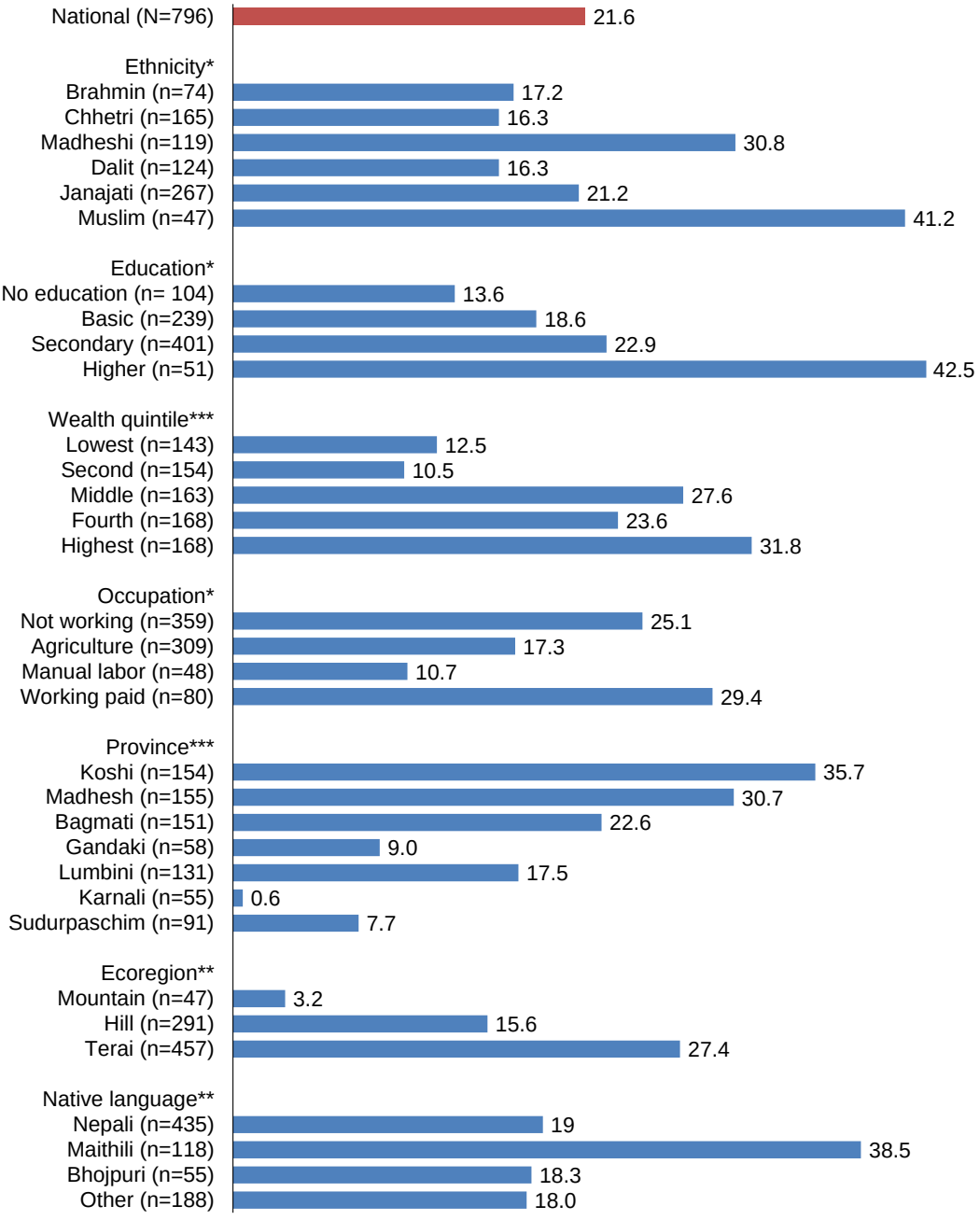


*** $p<.001$, ** $p<.01$, * $p<.05$

3.2.3 Delivery at private health facilities

Among the women with institutional deliveries (n = 796), 21.6% gave birth in private HFs (Figure 11). Compared with the national average and reference categories, delivery at private HFs was significantly higher if women were Muslim (41.2%) had higher education (42.5%), were in the highest wealth quintile (31.8%), were from Koshi province (35.7%), were from the Terai ecoregion (27.4%), had paid jobs (29.4%), and spoke Maithili (38.5%). See Table A3 for findings on additional background variables.

Figure 11 Delivery at private health facilities among women age 15–49 who had an institutional delivery, by background variables, 2022 Nepal DHS

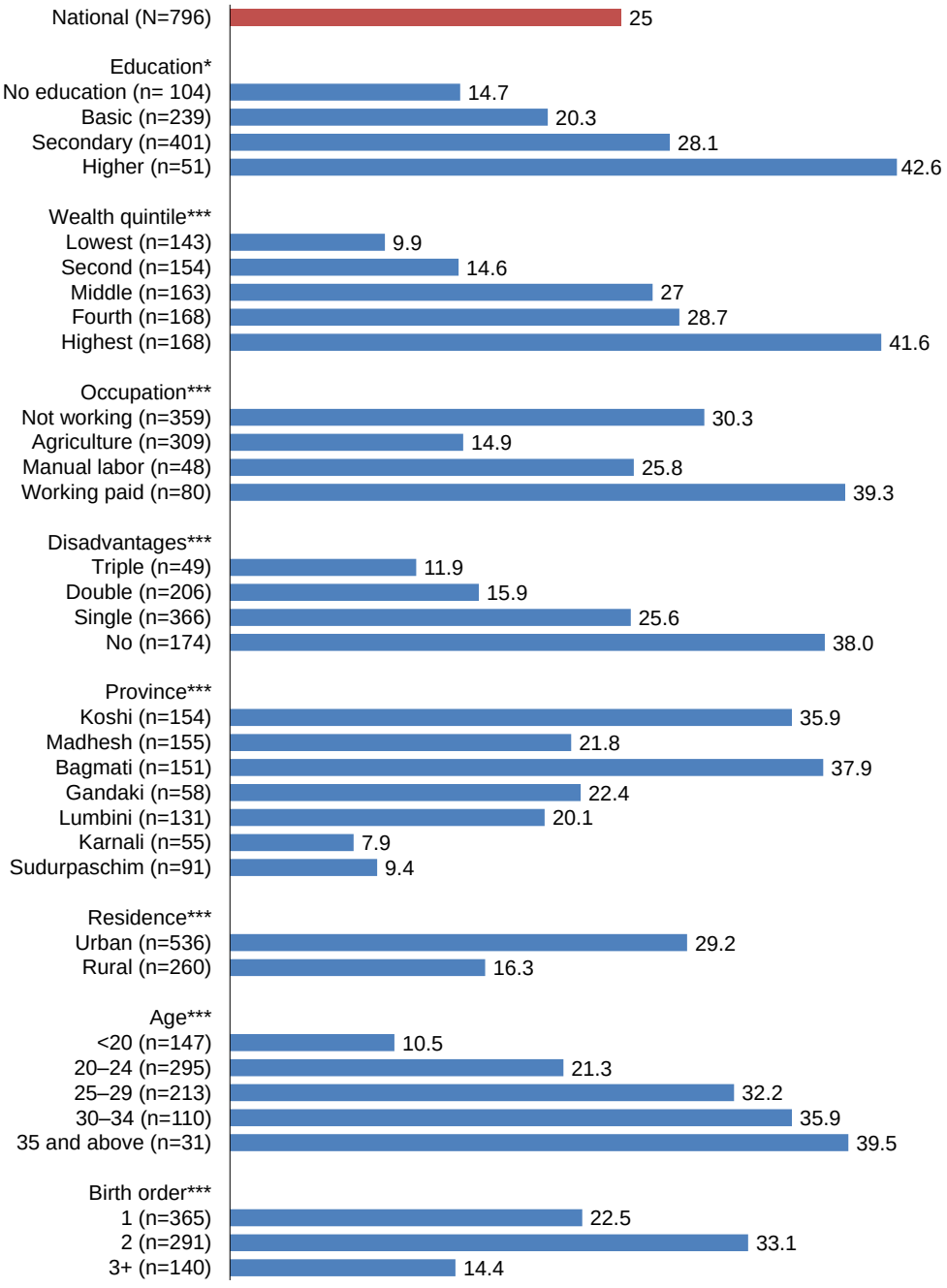


*** $p < .001$, ** $p < .01$, * $p < .05$

3.3 Variables Associated with Delivery by Cesarean Section

Among all institutional deliveries (n = 796), one in four women (25%) had delivery by CS (Figure 12). Compared with the national average and the other categories for each variable, delivery by CS was more common among women age 35 and older (39.5%), women with higher education (42.6%), women in the highest wealth quintile (41.6%), women with no disadvantages (38%), women in Bagmati province (37.9%), women with paid jobs (39.3%), and women with a second birth order (33.1%). See Table A4 for findings on additional background variables.

Figure 12 Delivery by cesarean section among women age 15–49 who gave birth in health facilities, by background variables, 2022 Nepal DHS

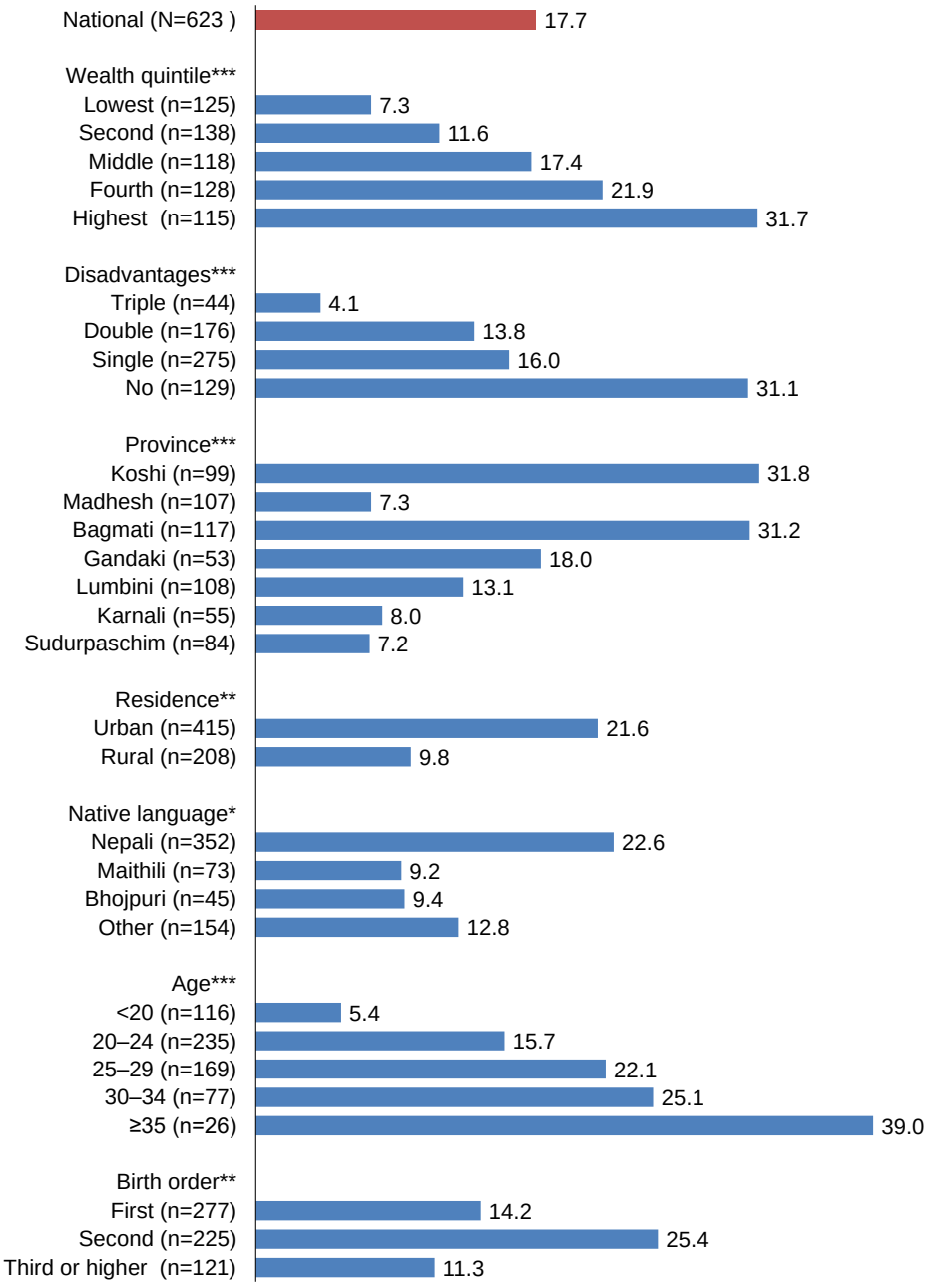


* $p < .05$, *** $p < .001$

3.3.1 Delivery by cesarean section in public health facilities

Figure 13 shows the background variables that were significantly associated with delivery by CS in public HFs. Among 623 women who gave birth in a public HF, 17.7% had delivery by CS. The proportion of women who had CS deliveries in public HFs was significantly higher if the women were age 35 or older (39%), from the highest wealth quintile (31.7%), had no disadvantages (31.1%), lived in Bagmati province (31.2%), lived in urban areas (21.6%), were native Nepali speakers (22.6%), and had a second birth order (25.4%). See Table A5 for findings on additional background variables.

Figure 13 Delivery by cesarean section among women age 15–49 who gave birth in public health facilities, by background variables, 2022 Nepal DHS

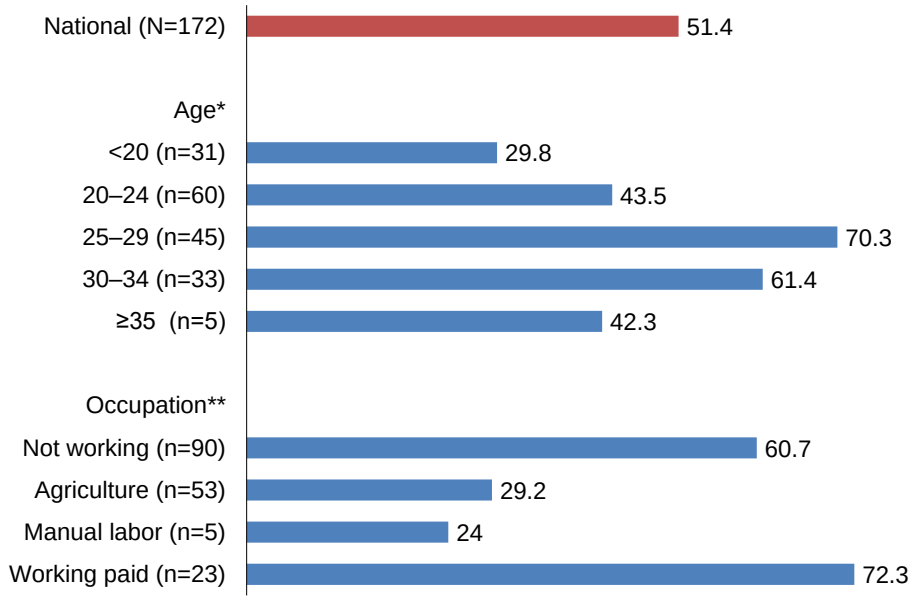


* $p < .05$, ** $p < .01$, *** $p < .001$

3.3.2 Delivery by cesarean section in private health facilities

Figure 14 shows the background variables associated with CS delivery in private HFs. Among all institutional deliveries, 172 mothers gave birth at private HFs. More than half of these women (51.4%) had delivery by CS. Delivery by CS in private HFs was significantly more common among women age 25–29 (70.3%) and women with paid jobs (72.3%) than among women in the respective reference categories. See Table A6 for findings on additional background variables.

Figure 14 Delivery by cesarean section among women age 15–49 who gave birth in private health facilities, by background variables, 2022 Nepal DHS

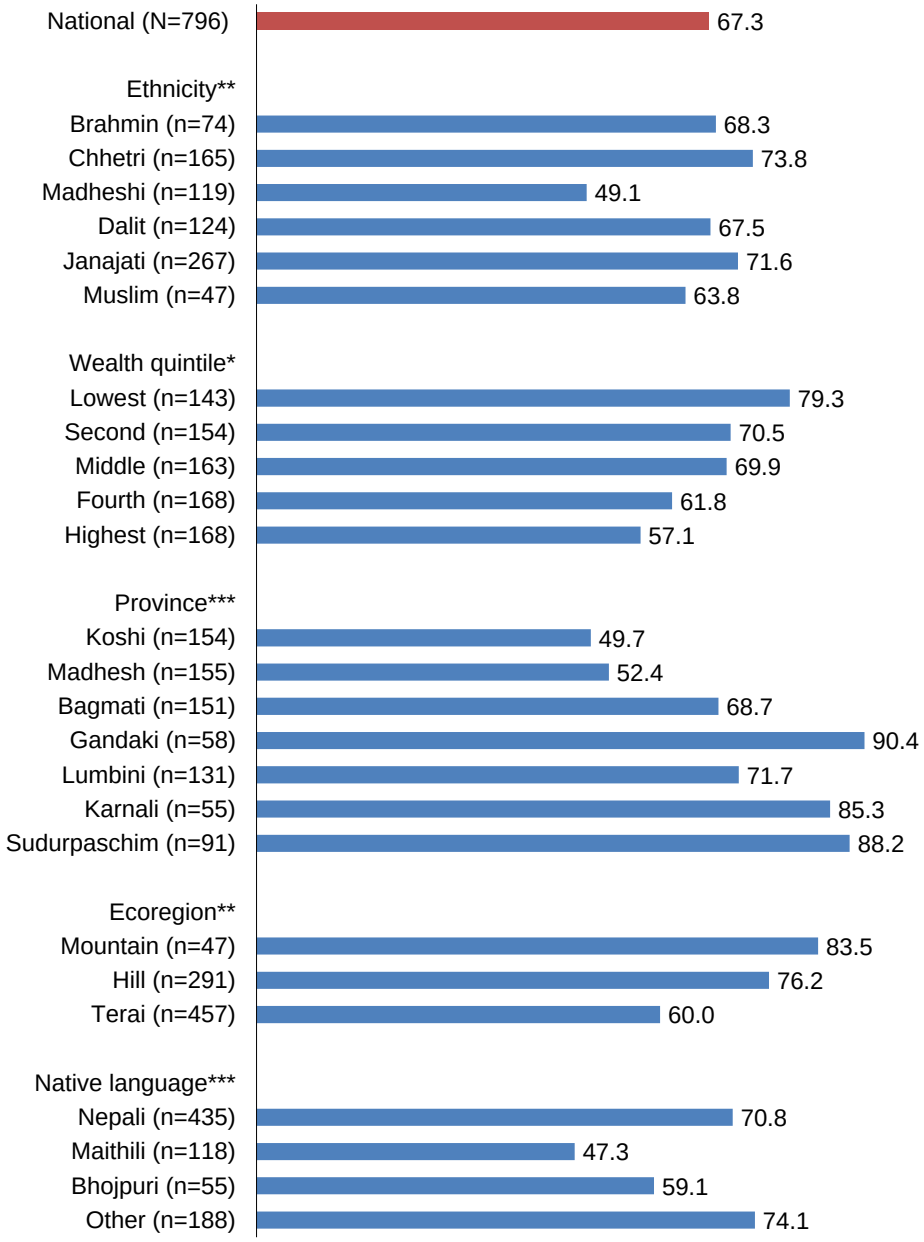


* $p<.05$, ** $p<.01$

3.4 Variables Associated with Uptake of Maternity Incentives

Figure 15 presents uptake of maternity incentives among the 796 women who gave birth in HFs. Of these women, two-thirds (67.3%) received maternity incentives. Compared with the national average and respective reference categories for each variable, uptake of maternal incentives was significantly higher if women were of Chhetri ethnicity (73.8%), were from the lowest wealth quintile (79.3%), were from Gandaki province (90.4%), were from the Mountain ecoregion (83.5%), or spoke other languages (74.1%). See Table A7 for findings on additional background variables.

Figure 15 Uptake of maternity incentives among women age 15–49 who gave birth in health facilities, by background variables, 2022 Nepal DHS

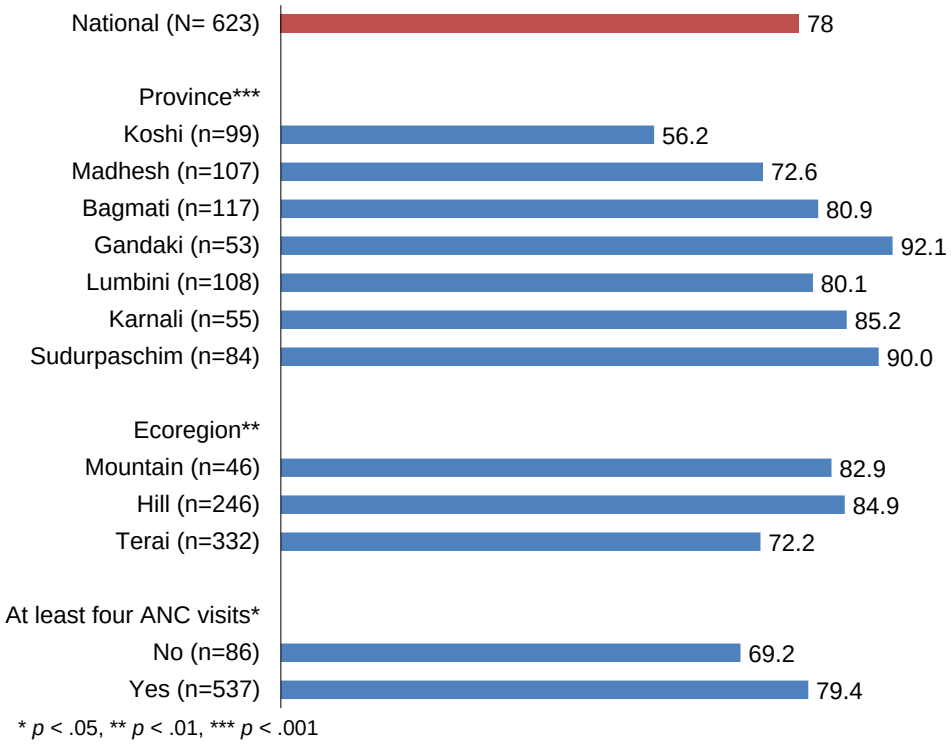


* $p < .05$, ** $p < .01$, *** $p < .001$

3.4.1 Uptake of maternity incentives in public health facilities

As shown in Figure 16, among the 623 women who gave birth at public HFs, about four in five (78%) received maternity incentives. Women who gave birth in public HFs had significantly higher uptake of maternity incentives if they were from Gandaki province (92.1%), were from the Hill ecoregion (84.9%), or had at least four ANC visits (79.4%), when compared with their respective reference groups. See Table A8 for findings on additional background variables.

Figure 16 Uptake of maternity incentives by women age 15–49 who gave birth in public health facilities, by background variables, 2022 Nepal DHS

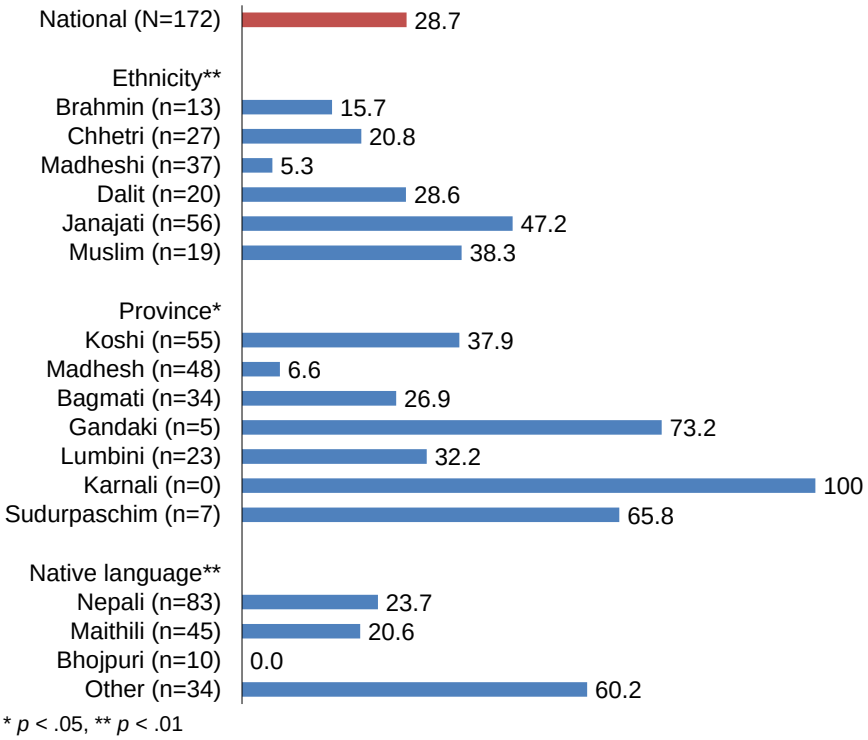


* $p < .05$, ** $p < .01$, *** $p < .001$

3.4.2 Uptake of maternity incentives in private health facilities

As shown in Figure 17, about four in five (29%) of the 172 women who gave birth at private HFs received maternity incentives. Compared with the national average and reference groups for each variable, uptake of maternity incentives in private HFs was significantly higher among women of Janajati ethnicity (47.2%), women from Gandaki province (73.2%), and women who spoke other languages (60.2%). See Table A9 for findings on additional background variables.

Figure 17 Uptake of maternity incentives by women age 15–49 who gave birth in private health facilities, by background variables, 2022 Nepal DHS



* $p < .05$, ** $p < .01$

3.5 Determinants of Use of Maternal Health Services

3.5.1 Determinants of institutional delivery

Table 3 presents adjusted odds ratios (AORs) and 95% confidence intervals (CIs) for various background variables associated with institutional delivery among women age 15–49 who had a live birth in the 1 year prior to the 2022 NDHS. Results of regression analysis found that the odds of institutional delivery were significantly lower among women younger than 20 than among those age 20–24 (AOR = 0.50; 95% CI [0.28, 0.88]) and among women from Karnali province than those from Sudurpaschim province (AOR = 0.34; 95% CI [0.15, 0.76]). Similarly, odds of institutional delivery were significantly lower among women with triple (AOR = 0.29; 95% CI [0.09, 0.9]) or double (AOR = 0.29; 95% CI [0.11, 0.79]) disadvantages than among women with no disadvantages. Institutional delivery was also significantly lower among women working in the agricultural sector (AOR = 0.61; 95% CI [0.39, 0.97]) than among women who were not working. Furthermore, institutional delivery was significantly lower among native Maithili speakers (AOR = 0.38; 95% CI [0.16, 0.91]), native Bhojpuri speakers (AOR = 0.35; 95% CI [0.13, 0.92]) and native

speakers other languages (AOR = 0.41; 95% CI [0.22, 0.77]) when compared with native Nepali speakers. Women with a second birth order (AOR = 0.24; 95% CI [0.13, 0.43]) or a third or higher birth order (AOR = 0.16; 95% CI [0.08, 0.30]) were significantly more likely to have an institutional delivery than women with a first birth order. Odds of institutional delivery were also significantly higher if women had completed at least four ANC visits than if they had not (AOR = 1.78; 95% CI [1.18, 2.68]) (Table 3). (See Table A10 for results of bivariable logistic regression analyses of institutional delivery.)

Table 3 Determinants of institutional delivery, 2022 Nepal DHS

Variable	Categories	AOR	95% CI
Occupation	Not working	1	
	Agriculture	0.61*	0.39, 0.97
	Manual labor	0.82	0.32, 2.08
	Working paid	1.11	0.39, 3.20
Religion	Hindu	1	
	Other	1.04	0.59, 1.84
Province	Koshi	0.66	0.32, 1.38
	Madhesh	0.42	0.16, 1.10
	Bagmati	1.11	0.41, 3.01
	Gandaki	0.63	0.25, 1.59
	Lumbini	0.65	0.27, 1.54
	Karnali	0.34**	0.15, 0.76
	Sudurpaschim	1	
Disadvantages	Triple	0.29*	0.09, 0.90
	Double	0.29*	0.11, 0.79
	Single	0.51	0.18, 1.40
	No	1	
Place of residence	Urban	1	
	Rural	0.92	0.61, 1.40
Native language	Nepali	1	
	Maithili	0.38*	0.16, 0.91
	Bhojpuri	0.35*	0.13, 0.92
	Other	0.41**	0.22, 0.77
Age	<20	0.50*	0.28, 0.88
	20–24	1	
	25–29	0.98	0.60, 1.60
	30–34	1.47	0.71, 3.04
	≥35	1.26	0.52, 3.02
Birth order	First	1	
	Second	0.24***	0.13, 0.43
	Third or higher	-0.16***	0.08, 0.30
At least four ANC visits	No	1	
	Yes	1.78**	1.18, 2.68

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; AOR = adjusted odds ratio; CI = confidence interval

3.5.2 Determinants of institutional delivery in private health facilities

Table 4 presents the AORs for background variables associated with delivery in private HFs in the 1 year prior to the 2022 NDHS. The regression analysis revealed significantly higher odds of delivery in private HFs if women were from Koshi (AOR = 6.53; 95% CI [2.71, 15.74]), Madhesh (AOR = 4.69; 95% CI [1.6, 13.75]), Bagmati (AOR = 2.71; 95% CI [1.02, 7.19]), or Lumbini (AOR = 2.69; 95% CI [1.13, 6.4]) provinces than if they were from Sudurpaschim province. Similarly, women with single (AOR = 3.68; 95% CI [1.4, 9.63]) or no (AOR = 3.7; 95% CI [1.18, 11.6]) disadvantages had significantly higher odds of delivery in private HFs than women with triple disadvantages. The odds of delivery in private HFs were

significantly lower among women from Karnali province than those from Sudurpaschim province (AOR = 0.08; 95% CI [0.01, 0.63]), lower among women working in manual labor than those not working (AOR = 0.35; 95% CI [0.13, 0.94]), and lower among women with a third or higher birth order than those with a first birth order (AOR = 0.43; 95% CI [0.19, 0.95]). (See Table A11 for results of bivariable logistic regression analyses of institutional delivery in private HFs.)

Table 4 Determinants of institutional delivery in private health facilities, 2022 Nepal DHS

Variable	Categories	AOR	95% CI
Occupation	Not working	1	
	Agriculture	0.95	0.58, 1.55
	Manual labor	0.35*	0.13, 0.94
	Working paid	1.23	0.55, 2.76
Religion	Hindu	1	
	Other	0.99	0.56, 1.75
Disadvantages	Triple	1	
	Double	1.76	0.64, 4.88
	Single	3.68**	1.40, 9.63
	No	3.70*	1.18, 11.6
Province	Koshi	6.53***	2.71, 15.74
	Madhesh	4.69**	1.60, 13.75
	Bagmati	2.71*	1.02, 7.19
	Gandaki	0.91	0.28, 2.97
	Lumbini	2.69*	1.13, 6.40
	Karnali	0.08*	0.01, 0.63
	Sudurpaschim	1	
Place of residence	Urban	1	
	Rural	0.97	0.59, 1.59
Native language	Nepali	1	
	Maithili	2.10	0.83, 5.34
	Bhojpuri	0.78	0.25, 2.44
	Other	0.87	0.49, 1.54
Age	<20	1	
	20–24	0.82	0.43, 1.58
	25–29	1.15	0.54, 2.47
	30–34	2.12	0.82, 5.50
	≥35	0.76	0.21, 2.75
Birth order	First	1	
	Second	0.69	0.40, 1.19
	Third or higher	0.43*	0.19, 0.95
At least four ANC visits	No	1	
	Yes	0.98	0.52, 1.88

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; AOR = adjusted odds ratio; CI = confidence interval

3.5.3 Determinants of delivery by cesarean section

Table 5 presents the AORs for background variables associated with delivery by CS among women who gave birth in HFs. Regression analysis found significantly higher odds of delivery by CS among women age 25–29 (AOR = 4.42; 95% CI [2.05, 9.54]), age 30–34 (AOR = 4.57; 95% CI [1.84, 11.31]), and age 35 and older (AOR = 5.67; 95% CI [1.7, 18.94]) than among teenage mothers. Similarly, the odds of delivery by CS were significantly higher among women from Koshi (AOR = 4.53; 95% CI [2.26, 9.11]), Madhesh (AOR = 2.76; 95% CI [1.17, 6.5]), Bagmati (AOR = 3.45; 95% CI [1.59, 7.52]), or Lumbini (AOR = 2.49; 95% CI [1.19, 5.22]) province than among women from Sudurpaschim province. The odds of delivery by CS were also significantly higher among native Nepali speakers (AOR = 1.91; 95% CI [1.04, 3.5]) and native Maithili speakers (AOR = 2.13; 95% CI [1.05, 4.32]) than among native speakers of other languages. Odds of delivery by CS were significantly lower among women working in the agricultural sector than among nonworking women (AOR = 0.48; 95% CI [0.3, 0.79]) and lower among women with a third or higher birth order than among those with a first birth order (AOR = 0.4; 95% CI [0.19, 0.84]) (Table 5). (See Table A12 for results of bivariable logistic regression analyses of delivery by CS.)

Table 5 Determinants of delivery by cesarean section among women who gave birth in health facilities, 2022 Nepal DHS

Variable	Categories	AOR	95% CI
Occupation	Not working	1	
	Agriculture	0.48**	0.30, 0.79
	Manual labor	0.64	0.24, 1.75
	Working paid	0.87	0.43, 1.78
Religion	Hindu	1	
	Other	0.96	0.50, 1.84
Disadvantages	Triple	1	
	Double	1.62	0.54, 4.87
	Single	2.14	0.77, 5.91
	No	1.83	0.64, 5.20
Province	Koshi	4.53***	2.26, 9.11
	Madhesh	2.76*	1.17, 6.50
	Bagmati	3.45**	1.59, 7.52
	Gandaki	1.88	0.76, 4.66
	Lumbini	2.49*	1.19, 5.22
	Karnali	0.91	0.33, 2.51
	Sudurpaschim	1	
Place of residence	Urban	1	
	Rural	0.71	0.46, 1.10
Native language	Nepali	1.91*	1.04, 3.50
	Maithili	2.13*	1.05, 4.32
	Bhojpuri	0.82	0.24, 2.87
	Other	1	
Age	<20	1	
	20–24	1.99	0.99, 3.99
	25–29	4.42***	2.05, 9.54
	30–34	4.57**	1.84, 11.31
	≥35	5.67**	1.70, 18.94
Birth order	First	1	
	Second	1.04	0.64, 1.69
	Third or higher	0.40*	0.19, 0.84
At least four ANC visits	No	1	
	Yes	1.11	0.55, 2.26

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; AOR = adjusted odds ratio; CI = confidence interval

3.5.4 Determinants of uptake of maternity incentives

Table 6 presents determinants of uptake of maternity incentives among women who gave birth in HFs. Regression analysis found significantly lower odds of uptake of maternity incentives among women from Koshi (AOR = 0.11, 95% CI [0.05, 0.25]), Madhesh (AOR = 0.18, 95% CI [0.13, 0.7]), Bagmati (AOR = 0.3, 95% CI [0.13, 0.7]), or Lumbini (AOR = 0.33, 95% CI [0.16, 0.71]) province than among those from Sudurpaschim province. (See Table A13 for results of bivariable logistic regression analyses of maternity incentives.)

Table 6 Determinants of uptake of maternity incentives among women who gave birth in health facilities, 2022 Nepal DHS

Variable	Categories	AOR	95% CI
Occupation	Not working	1	
	Agriculture	1.08	0.71, 1.64
	Manual labor	1.65	0.75, 3.63
	Working paid	0.80	0.45, 1.42
Religion	Hindu	1	
	Other	1.75	0.94, 3.26
Disadvantages	Triple	1	
	Double	1.03	0.45, 2.35
	Single	0.58	0.26, 1.31
	No	0.74	0.29, 1.91
Province	Koshi	0.11***	0.05, 0.25
	Madhesh	0.18***	0.07, 0.45
	Bagmati	0.30**	0.13, 0.70
	Gandaki	1.54	0.49, 4.82
	Lumbini	0.33**	0.16, 0.71
	Karnali	0.86	0.40, 1.86
	Sudurpaschim	1	
Place of residence	Urban	1	
	Rural	1.09	0.71, 1.66
Native language	Nepali	0.75	0.44, 1.28
	Maithili	0.51	0.24, 1.06
	Bhojpuri	0.65	0.24, 1.73
	Other	1	
Age	<20	1	
	20–24	1.20	0.71, 2.04
	25–29	1.22	0.65, 2.3
	30–34	0.69	0.29, 1.66
	≥35	1.05	0.36, 3.05
Birth order of child	First	1	
	Second	1.46	0.91, 2.34
	Third or higher	1.61	0.84, 3.09
At least four ANC visits	No	1	
	Yes	1.37	0.81, 2.29

** $p < .01$, *** $p < .001$

ANC = antenatal care; AOR = adjusted odds ratio; CI = confidence interval

4 DISCUSSION

4.1 Low Continuum of Care and Wide Equity Gaps Among Intersectional Groups

This study found high rates of catchup but low rates of maintenance of maternity care visits along the maternal care continuum. Although uptake of all routine maternity care visits increased between the 2011 Nepal Demographic and Health Survey (NDHS) and the 2022 NDHS, it was still low (59%) in 2022. The uptake of routine visits was high in the early gestational months and dropped significantly in later gestational weeks. Discontinuation was especially common between the time of delivery and the first prenatal care (PNC) visit.

Possible reasons behind these findings include difficulty in reaching health facilities (HFs) due to lack of transportation facilities and poor availability of uninterrupted delivery and PNC services.[56] Importantly, high uptake of institutional delivery and low uptake of PNC indicate that not even all mothers who gave birth in HFs received a PNC checkup. These findings were consistent with results of the further analysis of the 2016 NDHS[57] and similar studies conducted in other low- and middle-income countries, such as Zambia[58] and Pakistan.[59] Health posts in Nepal are in the center of municipalities, which might be inaccessible for some communities under their catchment. Adequate transportation facilities could improve access to HFs during the gestational weeks around childbirth.[60,61] Evidence suggests that maternity waiting homes could be another strategy for increasing childbirth in HFs and improving perinatal health outcomes.[62] The mandatory PNC checkup is vital before discharge from HFs. Adherence to guidelines for quality of care is vital for ensuring continuity of care from the antenatal period through the postnatal period.[57]

Recommendations: The Ministry of Health and Population could implement multiple long-term operational and strategic approaches to improve uptake of routine maternity care visits.[63]

- **Policy level:** Maternity incentive programs could be linked to continuity of care indicators at the policy level.[64] To achieve this, the completion of all maternity care visits could be incorporated into the current health management information system to be monitored. The current system, form number 3.6—Maternal and Newborn Health Service Register—records all routine care visits individually but lacks a composite indicator for the continuity of all visits. Including this composite indicator in the Maternal and Newborn Health Service Register and reporting it into the district health information software would improve the government's ability to monitor the continuity of care. Also, transportation incentives and maternity incentives need to include the uptake of at least one PNC visit within 24 hours of childbirth so that women with multiple disadvantages who complete all routine maternity care visits can receive the incentives. Finally, because dropout rates were high for HF deliveries and PNC visits, the antenatal care (ANC) to PNC continuum of care guidelines need to be revisited and linked with the maternity incentive program.[63] The first health care providers or HFs established in strategic locations should have prior communication and referral mechanisms in place. The Government of Nepal aims to establish 5–15 bedded local hospitals in each municipality. Previously, birthing centers were established at the ward level; however, those birthing centers were bypassed and underutilized with perceived poor quality of care.[65] Women sought care in higher-level hospitals for childbirth services to get better quality of care. Therefore, the current policy approach of one local hospital per municipality

could fragment resources and result in the underutilization of HFs, especially for childbirth in rural areas.[66] Such hospitals should be established in strategic locations in the catchment that covers more than one municipality.

- **Implementation level:** Health care providers need to adhere to the policy of compulsory PNC checkups for women delivering in HFs. During ANC visits, pregnant women are required to be informed and counseled on the importance of completing all maternity care visits from the antenatal period through the postnatal period.

4.2 Low Institutional Delivery Among Socioeconomically and Geographically Disadvantaged Groups

We identified increasing trends for institutional delivery, but the odds of institutional delivery were low among women with multiple disadvantages, women from remote provinces such as Karnali, and women with a high birth order. Women with multiple disadvantages face structural inequities, have difficult living conditions,[67] and may face several barriers to accessing HFs.[68] Lack of proper transportation facilities and inappropriate location of HFs also contribute to the inaccessibility of HFs for institutional delivery.

Native Maithili and Bhojpuri speakers had low levels of institutional delivery. These women reside in the Terai ecoregion, especially in Madhesh province. Cultural upbringings and belief systems also influence care-seeking practices and how reproductive and maternal health issues are shared. Many women in Madhesh province have different cultural beliefs and values than Nepali-speaking health workers; many also cannot speak Nepali and face linguistic barriers while receiving care. Women should have the opportunity to address their maternity health issues with care providers who have similar ethnic, cultural, and linguistic backgrounds.[69]

ANC visits were associated with the uptake of institutional delivery. ANC visits are an opportunity to provide health information and counsel pregnant women on the danger signs of pregnancy, childbirth, and newborn health as well as the benefits and risks of vaginal and cesarean section (CS) deliveries. So, health system efforts should focus on increasing the proportion of women with at least four ANC visits, especially targeting the most disadvantaged women, women in rural areas, and pregnant women with higher birth orders who prefer to give birth at home.

Recommendations: Improving institutional delivery is vital for maternal and newborn survival. Multiple context-specific strategies can be implemented.

- **Policy level:** Madhesh and Lumbini provinces, where most Maithili- and Bhojpuri-speaking people reside, are already left behind in access to quality maternal health services. Recruitment of local health workers, such as native Maithili or Bhojpuri speakers and skilled birth attendants in local HFs, could improve institutional delivery in HFs in those provinces.[70] Similarly, in Karnali province, women have barriers to accessing HFs and health systems due to difficult terrain and lack of appropriate transportation systems.[71] Improving transportation facilities through local development and the bridging of communities and HFs would increase childbirth in HFs in Karnali province.
- **Implementation level:** Providing uninterrupted availability of quality childbirth services in HFs could improve trust in government facilities. Health care providers recruited at the local level could identify women with multiple disadvantages and understand the local context, which could be useful in developing contextual strategies for service delivery. Coordination with local governments and

stakeholders, as well as technical support from the provincial government, is also fundamental in microplanning and in developing strategies to identify and provide maternity services to disadvantaged groups.

4.3 Increasing Institutional Delivery in Private Health Facilities in Selected Provinces and Urban Areas

We found an increasing trend in delivery in private HFs, with higher odds of a HF delivery in provinces with higher socioeconomic development indicators (Koshi and Bagmati), in provinces in the Terai ecoregion (Madhesh and Lumbini), and among relatively privileged women (women with single or no disadvantages). In principle, private health services are complementary toward universal health coverage. The role of the private health sector is vital, as the public health system cannot provide health services to the entire population. However, in the context of the poorly regulated private health sector and the lack of a health insurance program, private health services can financially burden people and push them toward further marginalization. Earlier evidence from Nepal suggested that bypassing local HFs to go to big hospitals and public hospitals in nearby cities can cause overcrowding that further compromises the quality of maternity care; as a result, people seek private care to receive better quality of care, despite having to pay for those services.[65,72] In Nepal, basic health services are constitutionally mandated, fundamental rights of all citizens. The Government of Nepal has implemented the Aama program in all public HFs, where vaginal deliveries, management of delivery complications, and CS deliveries are free; however, very few private HFs have implemented this program.[73] Nonetheless, care seeking for childbirth in private HFs is increasing even though women must pay for services that are freely available in public HFs.[74] Additionally, the Aama program could address some financial barriers in accessing maternity care services in private HFs if more private HFs could implement this program.

Recommendations: Private HFs can play a complementary role in achieving universal health coverage and quality maternal health services.

- **Policy level:** To improve the regulation of the private sector, strict implementation of private health care guidelines (for example, allocation of 10% of beds to marginalized people) and standardization of care costs in private HFs are vital. Additionally, the Government of Nepal should encourage private HFs to create a favorable environment by implementing the Aama program.
- **Implementation level:** Care-seeking patterns in private HFs provide evidence of bypassing of public facilities, which may be due to reasons such as poor trust, perceived poor quality of care, long waiting times, interrupted service availability, and inadequate health workforces in public facilities. It is therefore vital to strengthen the quality of care in public HFs by focusing on adequate, timely, and skilled continuity of care, especially in remote areas and in Madhesh province. Implementation of the Aama program needs to be operationalized, especially in private HFs.

4.4 High and Increasing Delivery by Cesarean Section

Our analysis found high and increasing rates of delivery by CS in private HFs. Delivery by CS was highest among pregnant women of older ages; women in Koshi, Bagmati, Lumbini, or Madhesh province; and native Maithili speakers.

The World Health Organization (WHO) suggests that no more than 10%–15% of births should require delivery by CS.[75] However, the percentage of women who deliver by CS in Nepal is higher in general and three times higher among women who give birth in private HFs.[76] Additionally, in public HFs, the Aama program incentivizes CS deliveries since they bring in more money. More than half of all deliveries at private HFs are by CS. Among women who had multiple disadvantages, more than two-thirds (72%) who delivered babies in private HFs did so by CS. Women from Koshi, Bagmati, Lumbini, and Madhesh provinces had the highest odds of delivery by CS in private HFs. Maithili-speaking women also had high rates of delivery by CS in private HFs. Madhesh province, where most Maithili-speaking women live, has lower socioeconomic indicators, including female literacy, and distinct linguistic and cultural diversity that influence the ability of residents to reach HFs for services, especially for pregnancy and childbirth.[77]

Nepal has mixed health care delivery systems. Basic health services are available free of cost from public HFs, and private HFs offer a fee-for-service model.[78] Health insurance systems are in the early stage of implementation and are limited to public HFs. Higher CS rates in private HFs may be linked with commercialization of routine services rather than with medical recommendations for CS deliveries. Medicalization and commercialization of routine care services can have high cost implications for socioeconomically disadvantaged populations.

Recommendations: The increasing trend in delivery by CS, especially in the private sector, needs to be addressed.

- **Policy level:** It is unclear whether the CS deliveries were medically indicated or were conducted on maternal request. Exploration of this issue could be added to the future research agenda.
- **Implementation level:** Health information should be implemented through proper client education. Information on the benefits and risks of vaginal and CS deliveries is important for educating prospective mothers.

4.5 Low and Decreasing Uptake of Maternity Incentives

Overall, we found a decreasing trend in the uptake of maternity incentives. Less than half (only about one-third) of all women who gave birth in HFs received maternity incentives at the national level. The proportion who received maternity incentives was higher among those with multiple forms of marginalization than among their privileged counterparts. In contrast, nearly four in five women received incentives if they delivered in public HFs.

The reason behind these findings could be that all public HFs have implemented the Aama program while most private HFs do not offer maternity incentives. However, our analysis of the uptake of maternity incentives in private HFs should be interpreted carefully since the denominator included all private HFs, regardless of whether they were implementing the maternity incentive scheme. In 2020, more than 64 private HFs were found accredited by the Aama program.[79] Provinces with high rates of delivery in private HFs (Koshi, Bagmati, Madhesh, and Lumbini) and high rates of delivery by CS had lower rates of uptake of maternity incentives. Families still make out-of-pocket expenditures for institutional deliveries, with a large proportion attributed to hospital care, even though they receive maternity incentives in public hospitals.[80] In the context of low coverage of maternity incentives, concerns about quality of care, high rates of delivery in the private sector, and high care costs for delivery by CS, the maternity incentives

program needs to be revisited to target women with multiple disadvantages and to increase incentive amounts.

Recommendations: Rates of delivery by CS in private HFs were much higher than WHO-recommended levels. Only medically indicated and complicated deliveries require CS.

- **Policy and implementation levels:** The Aama program should be revised and focused on targeting the most disadvantaged women (that is, women with multiple forms of marginalization). The Aama program needs to be rolled out in private HFs but should be provided only to people with multiple forms of marginalization.

Health inequities, including inequities in maternal health, manifest a complex interlay of structural inequities created by sociostructural factors that are rooted in social gradients, governance systems, and the economic and social policies of a country. The current framing of health inequity as a health sector problem further complicates the understanding of this issue. Policy and program approaches that focus on point of service delivery outlets (HFs or health workers) are insufficient in addressing equity gaps. Nevertheless, policies and strategies for health systems should be designed and implemented to target health services to the most disadvantaged groups—those with structural and intersectional disadvantages—and to help modify the conditions in which these groups are born, live, and grow (for example, reduce distances to HFs and communities). They should also be designed and implemented in collaboration with other multisectoral actions to ensure the provision and delivery of equitable high quality health services.

5 CONCLUSION

5.1 Key Findings

- Completion of care was low and discontinuation of care was high along the maternity care continuum. Wide equity gaps were identified between women with triple forms of disadvantages and women with no disadvantages.
- An increasing trend in institutional delivery was found, but with lower rates of institutional delivery among women in Karnali and Madhesh provinces, women with multiple disadvantages, native speakers of Maithili and Bhojpuri, and women with a high birth order. Rates of institutional delivery were also higher among women who completed at least four antenatal care visits than among those who did not.
- An increasing trend was found for delivery in private health facilities (HFs). Women from Koshi, Bagmati, Madhesh, and Lumbini provinces, and women with single or no disadvantages, had significantly higher rates of delivery in private facilities than their reference populations. Those who worked in manual labor and those with a high birth order had significantly lower rates.
- High and increasing trends in delivery by cesarean section (CS) in private HFs were also identified. Pregnant women of older ages; women living in Koshi, Bagmati, Lumbini, or Madhesh province; and native Maithili speakers had significantly lower rates of delivery by CS in private HFs than their respective counterparts.
- We found a decreasing trend in uptake of maternity incentives in private HFs. Uptake was lower in provinces with high rates of delivery in private HFs and high rates of delivery by CS.

5.1 Key Recommendations

Universal access to quality maternal health services is fundamental for achieving the Sustainable Development Goal target of a maternal mortality ratio <70 deaths per 100,000 live births. To improve uptake of maternal health services to reach this target:

- Monitor the completion of all routine maternity care visits through the health management information system. The Maternal and Newborn Health Service Register records all three routine maternity care visits, but reporting of completion of care is missing in the reporting form. Care providers at the service delivery level should review, analyze, and use routine data to ensure continuity of care. The completion of all maternity care visits needs to be incorporated into the Aama program, especially for women with multiple disadvantages. Local health systems (municipalities) can consider completion of these visits as an indicator of program performance.
- Increase institutional delivery in remote and marginalized communities by addressing supply-side barriers of health service delivery, including uninterrupted supply of quality health services. Recruit local health workers who can understand local culture and speak local languages for improved health care delivery.
- Women bypass public and local HFs for better quality of care. Health systems should focus on improving quality of care and building trust in public HFs and systems. At the same time, the maternity incentives program needs to be implemented in all public and private HFs and be revised to target only women with multiple disadvantages.

- The increasing trend in CS deliveries in private HFs is alarming and of major concern. Audit CS deliveries in all public and private HFs to identify whether they are medically indicated or are by maternal/family request. Along with auditing and quantitative studies, qualitative studies are recommended to explore the pathways of delivery by CS (including by maternal demand). Additionally, an analysis of the economic impacts of the uptake of routine maternal services in private HFs, particularly delivery by CS, is needed to quantify families' financial burden.
- Compared with other services, the Aama program is equitable if women go to public HFs for childbirth services. However, in the context of increasing trends in childbirth in private HFs, unavailability of free essential medicines, and increased indirect costs of childbirth services in public HFs, families might experience financial burdens due to childbirth. Current maternity incentives are not sufficient to address the financial barriers, especially for disadvantaged populations. Thus, the maternity incentives program must be revised to include only the most disadvantaged, to increase the incentives for selected groups, and to ensure that health care meets quality standards.

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APPENDIX

Table A1 Operational definitions and categories of the independent variables

Variable	Categories	Definition
Age	15–19, 20–24, 25–29, 30–34, ≥35	Age of mothers at the time of interview
Religion	Hindu, Other	Other: Buddha, Islam, Kirat, Christian, etc.
Ethnicity	Brahmin, Chhetri, Madheshi, Dalit, Janajati, Muslim	Categorized into seven ethnicities, others were merged into the Madheshi caste
Education	No education, Basic, Secondary, Higher	No education, meaning illiterate, classes 1–8 are in basic, and those from class nine and higher are in secondary and higher categories
Wealth quintile	Lowest, Second, Middle, Fourth, Highest	Five quintiles
Disadvantages	Triple (illiterate, poor, and disadvantaged ethnicity), Double (any two of illiterate, poor, and disadvantaged ethnicity), Single (any one of illiterate, poor, and disadvantaged ethnicity), No (rich, literate, and advantaged ethnicity)	An intersectional variable created using wealth status (rich and poor), ethnicity (disadvantaged and privileged groups), and education (no education and with education)
Province	Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, Sudurpaschim	Seven provinces
Place of residence	Urban, Rural	Whether respondents lived in rural or urban areas at the time of the survey
Ecoregion	Mountain, Hill, Terai	Three regions, horizonal division
Sex of child	Male, Female	Sex of the index child
Occupation	Not working, Agriculture, Manual labor (skilled and unskilled), Working paid (service and business)	Those working categorized into three groups
Native language	Nepali, Bhojpuri, Maithili, Other	Categorization of individual respondents currently speaking their native languages, four groups
Birth order	First, second, third or higher	Birth order of the most recent child

Table A2 Institutional delivery among women age 15–49 who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	%	95% CI	Number	*p* value
National average	81.1	77.8, 84.0	981	
Occupation				.030
Not working	81.7	76.8, 85.7	440	
Agriculture	77.6	73.0, 81.6	398	
Manual labor	83.3	68.7, 91.8	57	
Working paid	92.9	83.6, 97.1	86	
Religion				.494
Hindu	81.5	78.0, 84.6	822	
Other	78.8	70.0, 85.5	160	
Ethnicity				<.001
Brahmin	90.8	81.8, 95.6	81	
Chhetri	90.3	86.1, 93.3	183	
Madhesi	71.4	62.6, 78.9	167	
Dalit	73.3	62.5, 81.9	169	
Janajati	85.2	79.6, 89.5	313	
Muslim	68.7	49.7, 83.0	68	
Education				<.001
No education	64.3	54.3, 73.1	161	
Basic	73.0	66.8, 78.5	328	
Secondary	91.0	87.6, 93.6	441	
Higher	100.0		51	
Wealth quintile				<.001
Lowest	71.6	65.5, 77.0	200	
Second	72.4	64.8, 78.9	212	
Middle	82.5	75.7, 87.7	197	
Fourth	84.9	77.4, 90.2	198	
Highest	96.7	92.0, 98.7	174	
Disadvantages				<.001
Triple	60.2	47.2, 72.0	82	
Double	70.4	64.1, 76.1	293	
Single	85.9	81.7, 89.2	426	
No	96.6	91.6, 98.6	180	
Province				<.001
Koshi	81.9	74.1, 87.7	188	
Madhesh	64.8	56.9, 71.9	239	
Bagmati	94.4	88.8, 97.3	160	
Gandaki	88.2	80.0, 93.3	66	
Lumbini	84.1	72.8, 91.3	156	
Karnali	79.2	69.5, 86.4	70	
Sudurpaschim	89.1	83.4, 92.9	102	
Place of residence				.143
Urban	82.7	78.2, 86.4	648	
Rural	78.1	73.2, 82.3	333	
Ecoregion				.143
Mountain	78.4	63.9, 88.1	60	
Hill	85.1	80.5, 88.7	342	
Terai	79.0	74.0, 83.3	579	
Age				.345
<20	79.4	72.3, 85.1	185	
20–24	81.7	76.8, 85.8	361	
25–29	78.6	72.2, 83.9	271	
30–34	87.7	79.9, 92.7	125	
≥35	79.2	62.6, 89.6	39	

Continued…

Table A2—*Continued*

Variable	%	95% CI	Number	*p* value
Native language				<.001
Nepali	91.4	88.1, 93.8	476	
Maithili	64.1	54.6, 72.6	184	
Bhojpuri	65.6	54.2, 75.4	83	
Other	79.1	72.1, 84.8	237	
Birth order				<.001
First	91.3	87.5, 94.0	400	
Second	80.5	75.4, 84.8	361	
Third or higher	63.5	56.1, 70.4	220	
At least four ANC visits				<.001
No	63.7	55.6, 71.1	177	
Yes	84.9	81.7, 87.7	804	

ANC = antenatal care; CI = confidence interval

Table A3 Delivery in public and private health facilities among women age 15–49 who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Public HFs (%)	Public HFs (95% CI)	Private HFs (%)	Private HFs (95% CI)	Number	*p* value
National average	78.4	73.8, 82.3	21.6	17.7, 26.2	796	
Age						.421
<20	79.2	70.5, 85.8	20.8	14.2, 29.5	147	
20–24	79.8	73.6, 84.8	20.2	15.2, 26.4	295	
25–29	79.0	71.6, 84.9	21.0	15.1, 28.4	213	
30–34	70.2	55.4, 81.7	29.8	18.3, 44.6	110	
≥35	84.9	66.6, 94.1	15.1	5.9, 33.4	31	
Religion						.555
Hindu	78.9	74.1, 82.9	21.1	17.1, 25.9	670	
Other	75.7	63.7, 84.7	24.3	15.3, 36.3	126	
Ethnicity						.025
Brahmin	82.8	68.3, 91.5	17.2	8.5, 31.7	74	
Chhetri	83.7	72.8, 90.8	16.3	9.2, 27.2	165	
Madheshi	69.2	58.3, 78.2	30.8	21.8, 41.7	119	
Dalit	83.7	74.8, 89.9	16.3	10.1, 25.2	124	
Janajati	78.8	70.9, 85.1	21.2	14.9, 29.1	267	
Muslim	58.8	41.8, 74.0	41.2	26.0, 58.2	47	
Education						.026
No education	86.4	78.2, 91.8	13.6	8.2, 21.8	104	
Basic	81.4	74.1, 87.1	18.6	12.9, 25.9	239	
Secondary	77.1	71.6, 81.8	22.9	18.2, 28.4	401	
Higher	57.5	33.2, 78.7	42.5	21.3, 66.8	51	
Wealth quintile						
Lowest	87.5	80.6, 92.2	12.5	7.8, 19.4	143	
Second	89.5	83.5, 93.4	10.5	6.6, 16.5	154	
Middle	72.4	63.5, 79.7	27.6	20.3, 36.5	163	
Fourth	76.4	66.9, 83.8	23.6	16.2, 33.1	168	
Highest	68.2	56.0, 78.4	31.8	21.6, 44.0	168	
Disadvantages						.055
Triple	88.4	76.4, 94.7	11.6	5.3, 23.6	49	
Double	85.1	78.9, 89.7	14.9	10.3, 21.1	206	
Single	75.3	69.1, 80.5	24.7	19.5, 30.9	366	
No	74.0	61.5, 83.6	26.0	16.4, 38.5	174	
Province						<.001
Koshi	64.3	52.1, 75.0	35.7	25.0, 47.9	154	
Madhesh	69.3	59.1, 77.9	30.7	22.1, 40.9	155	
Bagmati	77.4	61.3, 88.1	22.6	11.9, 38.7	151	
Gandaki	91.0	80.4, 96.1	9.0	3.9, 19.6	58	
Lumbini	82.5	74.2, 88.5	17.5	11.5, 25.8	131	
Karnali	99.4	95.6, 99.9	0.6	0,1, 4.4	55	
Sudurpaschim	92.3	86.2, 95.8	7.7	4.2, 13.8	91	
Place of residence						.536
Urban	77.5	71.4, 82.7	22.5	17.3, 28.6	536	
Rural	80.1	73.6, 85.3	19.9	14.7, 26.4	260	
Ecoregion						.002
Mountain	96.8	86.4, 99.3	3.2	0.7, 13.6	47	
Hill	84.4	75.8, 90.4	15.6	9.6, 24.2	291	
Terai	72.6	66.6, 77.8	27.4	22.2, 33.4	457	
Occupation						.027
Not working	74.9	68.2, 80.6	25.1	19.4, 31.8	359	
Agriculture	82.7	77.1, 87.1	17.3	12.9, 22.9	309	
Manual labor	89.3	75.5, 95.7	10.7	4.3, 24.5	48	
Working paid	70.6	56.7, 81.5	29.4	18.5, 43.3	80	
Native language						.002
Nepali	81.0	74.6, 86.0	19.0	14.0, 25.4	435	
Maithili	61.5	50.1, 71.8	38.5	28.2, 49.9	118	
Bhojpuri	81.7	67.7, 90.5	18.3	9.5, 32.3	55	
Other	82.0	74.4, 87.7	18.0	12.3, 25.6	188	

Continued…

Table A3—*Continued*

Variable	Public HFs (%)	Public HFs (95% CI)	Private HFs (%)	Private HFs (95% CI)	Number	*p* value
Birth order						.110
First	76.1	70.1, 81.1	23.9	18.9, 29.9	365	
Second	77.2	69.2, 83.6	22.8	16.4, 30.8	291	
Third or higher	86.7	77.9, 92.4	13.3	7.6, 22.1	140	
At least four ANC visits						.642
No	76.3	64.7, 84.9	23.7	15.1, 35.3	113	
Yes	78.7	73.9, 82.8	21.3	17.2, 26.1	683	

ANC = antenatal care; CI = confidence interval; HF = health facility

Table A4 Delivery by cesarean section among women age 15–49 who had a live birth in health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Delivery by CS (%)	95% CI	Number	*p* value
National average	25.0	21.4, 28.9	796	
Age				<.001
<20	10.5	6.4, 16.9	147	
20–24	21.3	16.4, 27.2	295	
25–29	32.2	24.9, 40.6	213	
30–34	35.9	25.7, 47.6	110	
≥35	39.5	23.3, 58.3	31	
Religion				.600
Hindu	24.5	20.5, 29.0	670	
Other	27.4	18.8, 38.1	126	
Ethnicity				
Brahmin	32.2	21.3, 45.5	74	
Chhetri	24.1	15.9, 34.7	165	
Madheshi	24.1	16.5, 33.9	119	
Dalit	17.7	11.6, 26.1	124	
Janajati	27.3	21.7, 33.7	267	
Muslim	24.6	13.8, 39.9	47	
Education				.040
No education	14.7	8.7, 23.7	104	
Basic	20.3	15.2, 26.7	239	
Secondary	28.1	23.2, 33.7	401	
Higher	42.6	20.1, 68.5	51	
Wealth quintile				<.001
Lowest	9.9	6.1, 15.5	143	
Second	14.6	9.8, 21.2	154	
Middle	27.0	19.9, 35.5	163	
Fourth	28.7	21.2, 37.5	168	
Highest	41.6	31.2, 52.7	168	
Disadvantages				<.001
Triple	11.9	5.4, 24.3	49	
Double	15.9	11.4, 21.7	206	
One	25.6	20.4, 31.7	366	
No	38.0	28.3, 48.8	174	
Province				<.001
Koshi	35.9	29.0, 43.4	154	
Madhesh	21.8	14.5, 31.5	155	
Bagmati	37.9	26.6, 50.6	151	
Gandaki	22.4	12.7, 36.4	58	
Lumbini	20.1	13.8, 28.2	131	
Karnali	7.9	3.8, 15.6	55	
Sudurpaschim	9.4	5.6, 15.3	91	
Place of residence				<.001
Urban	29.2	24.4, 34.5	536	
Rural	16.3	12.7, 20.8	260	
Ecoregion				.318
Mountain	16.7	6.0, 38.5	47	
Hill	22.2	16.3, 29.4	291	
Terai	27.6	22.9, 32.8	457	
Occupation				<.001
Not working	30.3	24.8, 36.5	359	
Agriculture	14.9	11.0, 19.8	309	
Manual labor	25.8	12.5, 45.9	48	
Working paid	39.3	26.7, 53.6	80	
Native language				.083
Nepali	28.7	23.4, 34.8	435	
Maithili	25.8	18.7, 34.5	118	
Bhojpuri	14.1	5.3, 32.2	55	
Other	18.9	13.2, 26.2	188	

Continued…

Table A4—*Continued*

Variable	Delivery by CS (%)	95% CI	Number	*p* value
Birth order				<.001
First	22.5	26.4, 40.6	365	
Second	33.1	8.9, 22.6	291	
Third or higher	14.4	8.9, 22.6	140	
At least four ANC visits				.338
No	20.5	13.1, 30.7	113	
Yes	25.7	21.7, 30.1	683	

ANC = antenatal care; CI = confidence interval; CS = cesarean section

Table A5 Delivery by cesarean section among women age 15–49 who had a live birth at public health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	CS in public HFs (%)	95% CI	Number	*p* value
National average	17.7	14.5, 21.3	623	
Age				<.001
<20	5.4	2.5, 11.4	116	
20–24	15.7	11.1, 21.7	235	
25–29	22.1	15.2, 31.0	169	
30–34	25.1	15.2, 38.5	77	
≥35	39.0	20.6, 61.1	26	
Religion				.861
Hindu	17.5	14.0, 21.7	528	
Other	18.4	10.8, 29.7	95	
Ethnicity				.179
Brahmin	29.1	18.2, 43.0	61	
Chhetri	18.2	10.8, 29.1	138	
Madheshi	12.1	5.9, 23.2	82	
Dalit	13.5	7.7, 22.6	104	
Janajati	19.6	14.3, 26.3	210	
Muslim	6.7	1.0, 32.8	28	
Education				.090
No education	9.1	4.3, 18.2	89	
Basic	14.9	10.0, 21.7	195	
Secondary	21.7	16.9, 27.4	309	
Higher	19.2	7.0, 43.1	30	
Wealth quintile				<.001
Lowest	7.3	4.1, 12.7	125	
Second	11.6	7.1, 18.4	138	
Middle	17.4	10.8, 26.9	118	
Fourth	21.9	13.9, 32.7	128	
Highest	31.7	21.5, 44.0	115	
Disadvantages				<.001
Triple	4.1	1.0, 15.4	44	
Double	13.8	9.4, 19.7	176	
Single	16.0	11.3, 22.1	275	
No	31.1	22.0, 42.0	129	
Province				<.001
Koshi	31.8	23.4, 41.7	99	
Madhesh	7.3	3.3, 15.6	107	
Bagmati	31.2	21.4, 43.0	117	
Gandaki	18.0	9.6, 31.1	53	
Lumbini	13.1	8.0, 20.9	108	
Karnali	8.0	3.9, 15.7	55	
Sudurpaschim	7.2	3.8, 13.2	84	
Place of residence				<.001
Urban	21.6	17.3, 26.6	415	
Rural	9.8	6.7, 14.3	208	
Ecoregion				
Mountain	15.1	4.7, 39.2	46	
Hill	16.8	12.5, 22.1	246	
Terai	18.7	14.1, 24.3	332	
Occupation				.071
Not working	20.1	14.9, 26.6	269	
Agriculture	11.9	8.2, 17.0	255	
Manual labor	26.1	12.5, 46.6	43	
Working paid	25.6	13.9, 42.3	56	
Native language				.021
Nepali	22.6	17.9, 28.0	352	
Maithili	9.2	4.0, 19.9	73	
Bhojpuri	9.4	3.1, 25.0	45	
Other	12.8	7.5, 21.1	154	

Continued…

Table A5—*Continued*

Variable	CS in public HFs (%)	95% CI	Number	*p* value
Birth order				.007
First	14.2	10.4, 19.1	277	
Second	25.4	18.6, 33.8	225	
Third or more	11.3	6.1, 19.9	121	
At least four ANC visits				.534
No	14.8	7.9, 25.9	86	
Yes	18.1	14.6, 22.3	537	

ANC = antenatal care; CI = confidence interval; CS = cesarean section; HF = health facility

Table A6 Delivery by cesarean section among women age 15–49 who had a live birth at private health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	CS in private HFs (%)	95% CI	Number	*p* value
National average	51.4	42.1, 60.6	172	
Age				.018
<20	29.8	14.8, 50.8	31	
20–24	43.5	30.0, 58.0	60	
25–29	70.3	53.8, 82.8	45	
30–34	61.4	41.6, 78.1	33	
≥35	42.3	9.0, 84.5	5	
Religion				.693
Hindu	50.6	39.7, 61.4	142	
Other	55.2	36.2, 72.7	31	
Ethnicity				.895
Brahmin	47.4	16.7, 80.2	13	
Chhetri	54.0	27.9, 78.1	27	
Madheshi	51.2	34.3, 67.8	37	
Dalit	39.1	18.3, 64.7	20	
Janajati	56.0	41.7, 69.4	56	
Muslim	50.2	30.4, 70.0	19	
Education				.39
No education	50.3	22.9, 77.5	14	
Basic	44.0	28.5, 60.8	44	
Secondary	49.7	38.4, 61.1	92	
Higher	74.1	35.0, 93.8	22	
Wealth quintile				.216
Lowest	27.8	11.4, 53.7	18	
Second	39.8	19.1, 64.9	16	
Middle	52.1	35.8, 67.9	45	
Fourth	50.7	33.9, 67.4	40	
Highest	62.7	43.4, 78.7	53	
Disadvantages				.126
Triple	71.6	30.6, 93.5	6	
Double	27.9	13.9, 48.2	31	
Single	55.0	42.3, 67.0	91	
No	57.7	35.2, 77.4	45	
Province				.661
Koshi	43.3	31.6, 55.8	55	
Madhesh	54.7	37.8, 70.5	48	
Bagmati	60.6	33.2, 82.6	34	
Gandaki	66.5	22.6, 93.1	5	
Lumbini	52.6	30.3, 73.9	23	
Karnali	0	0	0	
Sudurpaschim	35.4	14.3, 64.2	7	
Place of residence				.158
Urban	55.2	43.4, 66.5	120	
Rural	42.5	30.1, 55.8	52	
Ecoregion				.945
Mountain	63.2	9.6, 96.5	2	
Hill	51.6	29.5, 73.1	45	
Terai	51.2	41.6, 60.7	125	
Occupation				.003
Not working	60.7	47.7, 72.4	90	
Agriculture	29.2	17.5, 44.5	53	
Manual labor	24.0	3.2, 75.2	5	
Working paid	72.3	48.3, 87.9	23	
Native language				.705
Nepali	54.9	40.1, 68.9	83	
Maithili	52.4	36.4, 67.9	45	
Bhojpuri	35.1	10.9, 70.4	10	
Other	46.3	30.0, 63.4	34	

Continued…

Table A6—*Continued*

Variable	CS in private HFs (%)	95% CI	Number	*p* value
Birth order				.134
First	48.9	38.1, 59.8	87	
Second	59.3	45.3, 71.9	66	
Third or higher	35.1	17.1, 58.6	19	
At least four ANC visits				.287
No	39.0	18.8, 63.7	27	
Yes	53.7	43.5, 63.6	145	

ANC = antenatal care; CI = confidence interval; CS = cesarean section; HF = health facility

Table A7 Uptake of maternity incentives among women age 15–49 who had a live birth at health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Incentives (%)	95% CI	Number	*p* value
National average	67.3	62.4, 71.9	796	
Age				.717
<20	65.4	57.1, 72.9	147	
20–24	66.5	59.5, 72.8	295	
25–29	71.8	63.4, 78.9	213	
30–34	63.3	46.8, 77.2	110	
≥35	67.0	47.3, 82.1	31	
Religion				.419
Hindu	66.6	61.5, 71.3	670	
Other	71.2	59.6, 80.5	126	
Ethnicity				.008
Brahmin	68.3	54.7, 79.5	74	
Chhetri	73.8	63.5, 82.0	165	
Madheshi	49.1	39.0, 59.4	119	
Dalit	67.5	56.6, 76.7	124	
Janajati	71.6	63.3, 78.6	267	
Muslim	63.8	46.9, 77.9	47	
Education				.122
No education	75.4	65.4, 83.2	104	
Basic	66.9	59.2, 73.9	239	
Secondary	67.8	62.0, 73.0	401	
Higher	48.9	26.3, 72.0	51	
Wealth quintile				.012
Lowest	79.3	72.2, 85.0	143	
Second	70.5	61.2, 78.4	154	
Middle	69.9	61.4, 77.2	163	
Fourth	61.8	51.9, 70.8	168	
Highest	57.1	44.3, 69.0	168	
Disadvantages				.274
Triple	68.0	52.5, 80.4	49	
Double	73.8	66.5, 80.0	206	
Single	63.9	57.3, 70.0	366	
No	66.6	54.5, 76.8	174	
Province				<.001
Koshi	49.7	37.7, 61.7	154	
Madhesh	52.4	42.3, 62.3	155	
Bagmati	68.7	52.5, 81.3	151	
Gandaki	90.4	78.2, 96.1	58	
Lumbini	71.7	61.4, 80.2	131	
Karnali	85.3	78.5, 90.3	55	
Sudurpaschim	88.2	81.0, 92.9	91	
Place of residence				.490
Urban	66.3	59.6, 72.4	536	
Rural	69.3	63.3, 74.8	260	
Ecoregion				<.001
Mountain	83.5	73.5, 90.2	47	
Hill	76.2	67.4, 83.2	291	
Terai	60.0	53.5, 66.1	457	
Occupation				.103
Not working	62.7	55.8, 69.2	359	
Agriculture	72.7	66.7, 78.0	309	
Manual labor	73.1	54.7, 85.9	48	
Working paid	63.5	49.4, 75.6	80	
Native language				<.001
Nepali	70.8	63.7, 77.1	435	
Maithili	47.3	36.7, 58.1	118	
Bhojpuri	59.1	41.9, 74.3	55	
Other	74.1	66.3, 80.6	188	

Continued…

Table A7—*Continued*

Variable	Incentives (%)	95% CI	Number	*p* value
Birth order				.258
First	63.9	57.8, 69.6	365	
Second	68.9	60.2, 76.4	291	
Third or higher	72.9	63.1, 80.8	140	
At least four ANC visits				.069
No	58.8	47.5, 69.3	113	
Yes	68.7	63.6, 73.3	683	

ANC = antenatal care; CI = confidence interval

Table A8 Uptake of maternity incentives among women aged 15–49 who had a live birth at public health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Incentives at public HFs (%)	95% CI	Number	*p* value
National average	78.0	73.0, 82.2	623	
Age				.996
<20	77.1	68.5, 83.9	116	
20–24	77.4	70.2, 83.3	235	
25–29	78.8	69.3, 85.9	169	
30–34	78.9	65.3, 88.1	77	
≥35	78.9	54.7, 92.0	26	
Religion				.459
Hindu	77.3	72.2, 81.7	528	
Other	81.6	69.0, 89.8	95	
Ethnicity				.335
Brahmin	79.3	64.2, 89.1	61	
Chhetri	84.1	76.0, 89.8	138	
Madheshi	68.7	55.3, 79.6	82	
Dalit	75.0	63.9, 83.6	104	
Janajati	78.2	69.1, 85.1	210	
Muslim	81.7	60.4, 92.9	28	
Education				.179
No education	84.1	74.7, 90.5	89	
Basic	77.2	69.0, 83.8	195	
Secondary	78.1	72.3, 83.0	309	
Higher	62.4	38.6, 81.5	30	
Wealth quintile				.058
Lowest	83.7	77.1, 88.7	125	
Second	77.8	67.3, 85.7	138	
Middle	84.7	76.5, 90.4	118	
Fourth	75.0	63.4, 83.8	128	
Highest	68.3	56.6, 78.1	115	
Disadvantages				.386
Triple	75.0	57.8, 86.8	44	
Double	82.2	74.7, 87.9	176	
One	75.0	68.0, 80.8	275	
No	79.5	69.8, 86.7	129	
Province				<.001
Koshi	56.2	38.9, 72.2	99	
Madhesh	72.6	60.3, 82.3	107	
Bagmati	80.9	68.8, 89.0	117	
Gandaki	92.1	80.4, 97.0	53	
Lumbini	80.1	69.0, 88.0	108	
Karnali	85.2	78.4, 90.2	55	
Sudurpaschim	90.0	84.0, 93.9	84	
Place of residence				.961
Urban	77.9	71.1, 83.5	415	
Rural	78.1	71.5, 83.5	208	
Ecoregion				.005
Mountain	82.9	72.8, 89.8	46	
Hill	84.9	78.7, 89.5	246	
Terai	72.2	64.2, 78.9	332	
Occupation				.4
Not working	75.9	68.7, 81.8	269	
Agriculture	81.1	74.5, 86.3	255	
Manual labor	81.8	63.8, 92.0	43	
Working paid	70.9	53.9, 83.5	56	
Native language				.069
Nepali	81.9	75.6, 86.9	352	
Maithili	64.0	48.6, 77.0	73	
Bhojpuri	72.3	50.8, 86.8	45	
Other	77.1	68.1, 84.2	154	

Continued…

Table A8—*Continued*

Variable	Incentives at public HFs (%)	95% CI	Number	*p* value
Birth order				.257
First	75.1	68.7, 80.5	277	
Second	79.5	72.6, 85.0	225	
Third or higher	81.8	72.9, 88.2	121	
At least four ANC visits				.034
No	69.2	56.7, 79.4	86	
Yes	79.4	74.7, 83.4	537	

ANC = antenatal care; CI = confidence interval; HF = health facility

Table A9 Uptake of maternity incentives among women age 15–49 who had a live birth at private health facilities in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Incentives at private HFs (%)	95% CI	Number	*p* value
National average	28.7	19.6, 39.8	172	
Age				.204
<20	21.0	8.3, 44.1	31	
20–24	23.2	13.7, 36.4	60	
25–29	45.6	28.5, 63.8	45	
30–34	26.6	8.2, 59.7	33	
≥35	0	--	5	
Religion				.287
Hindu	26.5	16.8, 39.1	142	
Other	38.8	20.5, 60.8	31	
Ethnicity				.006
Brahmin	15.7	4.0, 45.1	13	
Chhetri	20.8	8.4, 43.0	27	
Madheshi	5.3	1.3, 19.1	37	
Dalit	28.6	12.4, 53.2	20	
Janajati	47.2	28.1, 67.2	56	
Muslim	38.3	16.4, 66.3	19	
Education				.665
No education	20.0	7.5, 43.8	14	
Basic	21.7	10.1, 40.6	44	
Secondary	32.9	20.9, 47.6	92	
Higher	30.7	8.0, 69.3	22	
Wealth quintile				.209
Lowest	48.5	25.8, 71.9	18	
Second	8.7	2.2, 28.5	16	
Middle	30.9	16.2, 50.9	45	
Fourth	19.3	7.8, 40.3	40	
Highest	33.1	15.6, 56.9	53	
Disadvantages				.87
Triple	14.8	1.9, 60.8	6	
Double	25.7	12.8, 45.1	31	
Single	30.1	19.4, 43.5	91	
No	29.5	11.7, 57.1	45	
Province				.026
Koshi	37.9	21.1, 58.1	55	
Madhesh	6.6	2.0, 19.7	48	
Bagmati	26.9	7.5, 62.6	34	
Gandaki	73.2	30.0, 94.6	5	
Lumbini	32.2	13.1, 59.8	23	
Karnali	--	--	0	
Sudurpaschim	65.8	33.6, 88.0	7	
Residence				.42
Urban	26.3	15.3, 41.4	120	
Rural	34.1	22.2, 48.3	52	
Ecoregion				.329
Mountain	100.0	--	2	
Hill	29.0	11.9, 55.2	45	
Terai	27.6	17.8, 40.2	125	
Occupation				.144
Not working	23.5	14.0, 36.7	90	
Agriculture	32.6	19.9, 48.5	53	
Manual labor	0	--	5	
Working paid	45.7	22.1, 71.3	23	
Native language				.003
Nepali	23.7	13.3, 38.5	83	
Maithili	20.6	8.7, 41.3	45	
Bhojpuri	0	--	10	
Others	60.2	38.9, 78.3	34	

Continued…

Table A9—*Continued*

Variable	Incentives at private HFs (%)	95% CI	Number	*p* value
Birth order				.407
First	28.3	16.4, 44.3	87	
Second	33.0	18.5, 51.5	66	
Third or higher	14.7	5.9, 32.2	19	
At least four ANC visits				.756
No	25.5	9.8, 51.8	27	
Yes	29.2	19.7, 41.1	145	

ANC = antenatal care; CI = confidence interval; HF = health facility

Table A10 Bivariable logistic regression analysis of institutional delivery among women who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Categories	Crude odds ratio	95% CI
Ethnicity	Brahmin	1	
	Chhetri	0.94	0.40, 2.24
	Madheshi	0.25**	0.10, 0.61
	Dalit	0.28**	0.11, 0.72
	Janajati	0.58	0.24, 1.41
	Muslim	0.22**	0.07, 0.68
Age	<20	1	
	20–24	1.16	0.72, 1.85
	25–29	0.95	0.59, 1.54
	30–34	1.84	0.91, 3.71
	≥35	0.99	0.40, 2.41
Religion	Hindu	1	
	Other	0.84	0.51, 1.38
Education	No education	1	
	Basic	1.51	0.92, 2.48
	Secondary	5.66***	3.20, 9.99
	Higher	0	0
Wealth quintile	Lowest	1	
	Second	1.04	0.68, 1.59
	Middle	1.87*	1.13, 3.08
	Fourth	2.23**	1.28, 3.88
	Highest	11.73***	4.38, 31.4
Disadvantages	Triple	1	
	Double	1.57	0.87, 2.84
	Single	4.01***	2.20, 7.32
	No	18.50***	6.18, 55.41
Province	Koshi	1	
	Madhesh	0.41**	0.23, 0.72
	Bagmati	3.71**	1.54, 8.96
	Gandaki	1.66	0.76, 3.59
	Lumbini	1.17	0.52, 2.67
	Karnali	0.84	0.42, 1.67
	Sudurpaschim	1.80	0.93, 3.49
Place of residence	Urban	1	
	Rural	0.75	0.51, 1.10
Ecoregion	Mountain	1	
	Hill	1.58	0.71, 3.47
	Terai	1.04	0.48, 2.25
Occupation	Not working	1	
	Agriculture	0.78	0.55, 1.11
	Manual labor	1.12	0.47, 2.67
	Working paid	2.94*	1.09, 7.93
Native language	Nepali	1	
	Maithili	0.17***	0.1, 0.29
	Bhojpuri	0.18***	0.1, 0.33
	Other	0.36***	0.21, 0.6
Birth order	First	1	
	Second	0.40***	0.24, 0.66
	Third or higher	0.17***	0.10, 0.27
At least four ANC visits	No	1	
	Yes	3.20***	2.17, 4.72

* p <.05, ** p <.01, *** p <.001

ANC = antenatal care; CI = confidence interval

Table A11 Bivariable logistic regression analysis of institutional delivery in private health facilities among women who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Categories	Crude odds ratio	95% CI
Age	<20	1	
	20–24	0.96	0.56, 1.65
	25–29	1.01	0.56, 1.83
	30–34	1.61	0.74, 3.49
	≥35	0.67	0.22, 2.10
Religion	Hindu	1	
	Other	1.20	0.66, 2.19
Ethnicity	Brahmin	1	
	Chhetri	0.94	0.41, 2.12
	Madheshi	2.15	0.83, 5.53
	Dalit	0.94	0.35, 2.48
	Janajati	1.29	0.53, 3.16
	Muslim	3.37*	1.16, 9.82
Education	No education	1	
	Basic	1.44	0.8, 2.61
	Secondary	1.88*	1.00, 3.52
	Higher	4.69**	1.50, 14.66
Wealth quintile	Lowest	1	
	Second	0.82	0.42, 1.63
	Middle	2.67**	1.47, 4.84
	Fourth	2.16*	1.06, 4.39
	Highest	3.26**	1.56, 6.77
Disadvantages	Triple	1	
	Double	1.34	0.53, 3.36
	Single	2.51*	1.05, 5.99
	No	2.67	0.95, 7.49
Province	Koshi	1	
	Madhesh	0.8	0.41, 1.57
	Bagmati	0.53	0.21, 1.33
	Gandaki	0.18**	0.06, 0.50
	Lumbini	0.38**	0.19, 0.78
	Karnali	0.01***	0.0, 0.09
	Sudurpaschim	0.15***	0.07, 0.34
Place of residence	Urban	1	
	Rural	0.86	0.53, 1.4
Ecoregion	Mountain	1	
	Hill	5.51*	1.07, 28.31
	Terai	11.29**	2.32, 54.83
Occupation	Not working	1	
	Agriculture	0.62*	0.41, 0.96
	Manual labor	0.36*	0.13, 0.97
	Working paid	1.24	0.65, 2.36
Native language	Nepali	1	
	Maithili	2.66**	1.47, 4.82
	Bhojpuri	0.95	0.41, 2.21
	Other	0.94	0.54, 1.61
Birth order	First	1	
	Second	0.94	0.58, 1.50
	Third or higher	0.49*	0.25, 0.94
At least four ANC visits	No	1	
	Yes	0.87	0.48, 1.57

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; CI = confidence interval

Table A12 Bivariable logistic regression analysis of delivery by cesarean section among women who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Categories	Crude odds ratio	95% CI
Ethnicity (ref: Brahmin)	Chhetri	0.67	0.34, 1.30
	Madheshi	0.67	0.31, 1.42
	Dalit	0.45*	0.21, 0.96
	Janajati	0.79	0.4, 1.56
	Muslim	0.69	0.28, 1.70
Education (ref: No education)	Basic	1.48	0.74, 2.97
	Secondary	2.27*	1.20, 4.32
	Higher	4.31*	1.27, 14.58
Wealth quintile (ref: Lowest)	Second	1.56	0.77, 3.17
	Middle	3.37***	1.76, 6.45
	Fourth	3.67***	1.94, 6.94
	Highest	6.48***	3.26, 12.91
Disadvantages (ref: Triple)	Double	1.39	0.54, 3.63
	Single	2.55*	1.02, 6.34
	No	4.53**	1.73, 11.83
Province (ref: Koshi)	Madhesh	0.50*	0.28, 0.90
	Bagmati	1.09	0.59, 1.99
	Gandaki	0.51	0.24, 1.10
	Lumbini	0.45**	0.26, 0.78
	Karnali	0.15***	0.07, 0.35
	Sudurpaschim	0.18***	0.10, 0.35
Place of residence (ref: Urban)	Rural	0.47***	0.32, 0.70
Ecoregion (ref: Mountain)	Hill	1.43	0.42, 4.85
	Terai	1.91	0.59, 6.15
Occupation (ref: Not working)	Agriculture	0.40***	0.26, 0.63
	Manual labor	0.80	0.32, 2.01
	Working paid	1.49	0.78, 2.84
Native language (ref: Nepali)	Maithili	0.86	0.52, 1.42
	Bhojpuri	0.41	0.14, 1.22
	Other	0.58*	0.34, 0.99
Birth order (ref: First)	Second	1.71**	1.14, 2.57
	Third or higher	0.58	0.32, 1.05
At least four ANC visits (ref: No)	Yes	1.34	0.73, 2.45

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; CI = confidence interval

Table A13 Bivariable logistic regression analysis of uptake of maternity incentives among women who had a live birth in the 1 year prior to the survey, by background variables, 2022 Nepal DHS

Variable	Categories	Crude odds ratio	95% CI
Ethnicity (ref: Brahmin)	Chhetri	1.30	0.69, 2.47
	Madheshi	0.45*	0.22, 0.91
	Dalit	0.96	0.46, 2.01
	Janajati	1.17	0.60, 2.27
	Muslim	0.82	0.33, 2.02
Education (ref: No education)	Basic	0.66	0.38, 1.16
	Secondary	0.69	0.41, 1.16
	Higher	0.31*	0.10, 0.94
Wealth quintile (ref: Lowest)	Second	0.62	0.37, 1.07
	Middle	0.60	0.35, 1.04
	Fourth	0.42**	0.24, 0.74
	Highest	0.35**	0.18, 0.66
Disadvantages (ref: Triple)	Double	1.32	0.66, 2.65
	Single	0.83	0.42, 1.66
	No	0.93	0.41, 2.13
Province (ref: Koshi)	Madhesh	1.11	0.59, 2.11
	Bagmati	2.22	0.96, 5.17
	Gandaki	9.49***	3.24, 27.85
	Lumbini	2.57**	1.31, 5.06
	Karnali	5.89***	3.00, 11.56
	Sudurpaschim	7.54***	3.59, 15.84
Place of residence (ref: Urban)	Rural	1.15	0.77, 1.71
Ecoregion (ref: Mountain)	Hill	0.63	0.30, 1.34
	Terai	0.30***	0.15, 0.57
Occupation (ref: Not working)	Agriculture	1.58*	1.08, 2.31
	Manual labor	1.61	0.73, 3.57
	Working paid	1.03	0.57, 1.87
Native language (ref: Nepali)	Maithili	0.37***	0.22, 0.63
	Bhojpuri	0.59	0.28, 1.28
	Other	1.18	0.73, 1.89
Birth order (ref: First)	Second	1.25	0.81, 1.93
	Third or higher	1.52	0.92, 2.50
At least four ANC visits (ref: No)	Yes	1.54	0.96, 2.44

* $p < .05$, ** $p < .01$, *** $p < .001$

ANC = antenatal care; CI = confidence interval
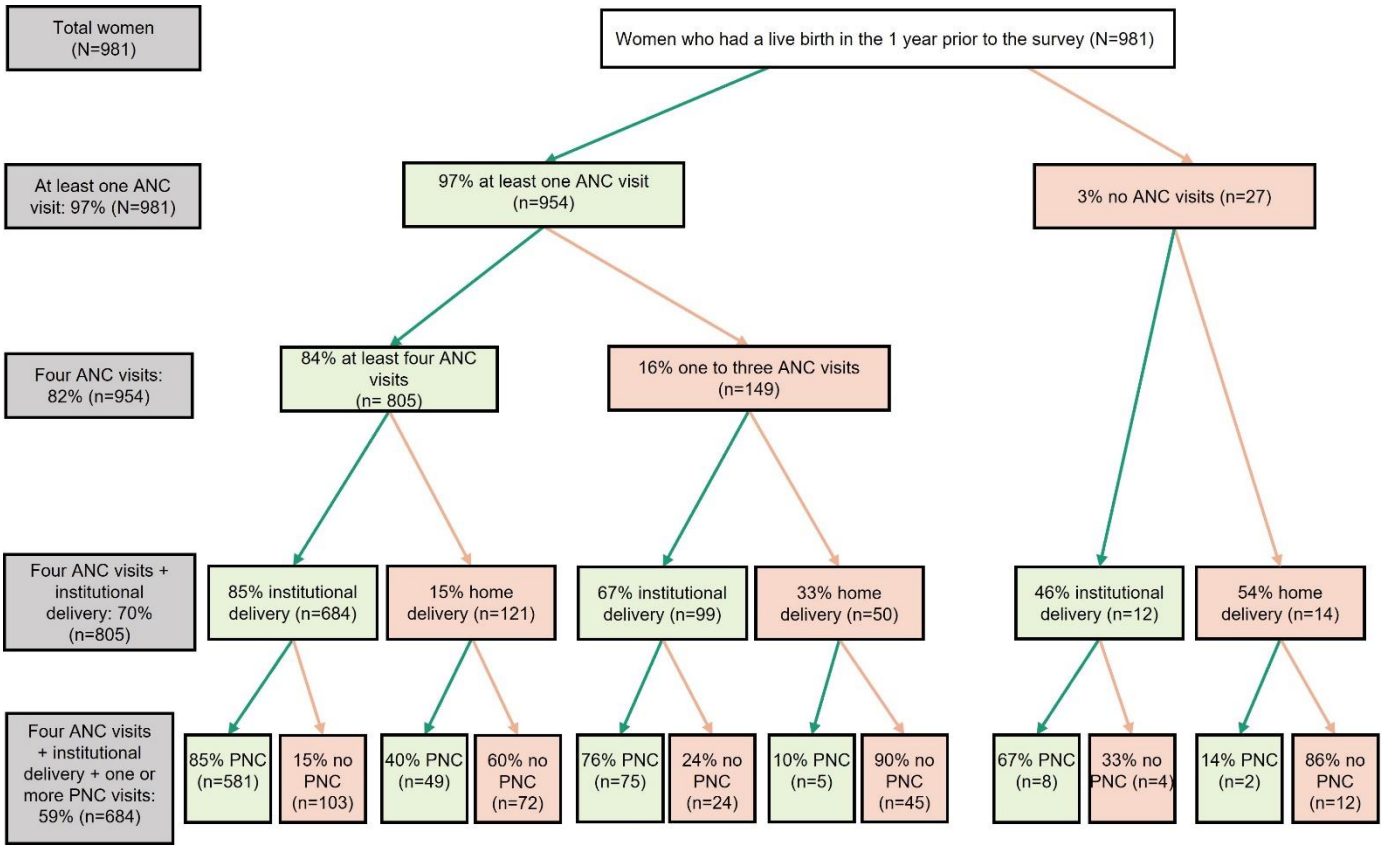
Figure A1 Maternal health continuum of care, 2022 Nepal DHS