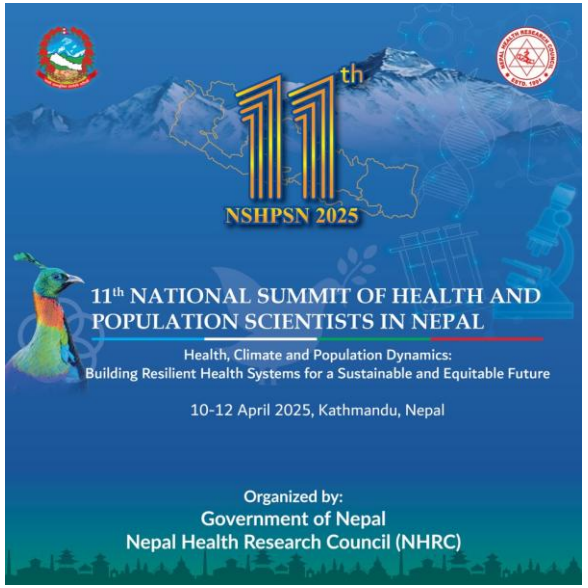
Equity Gaps in Determinants of Neonatal Mortality in Nepal: Insights from NDHS 2016 and 2022 Analysis



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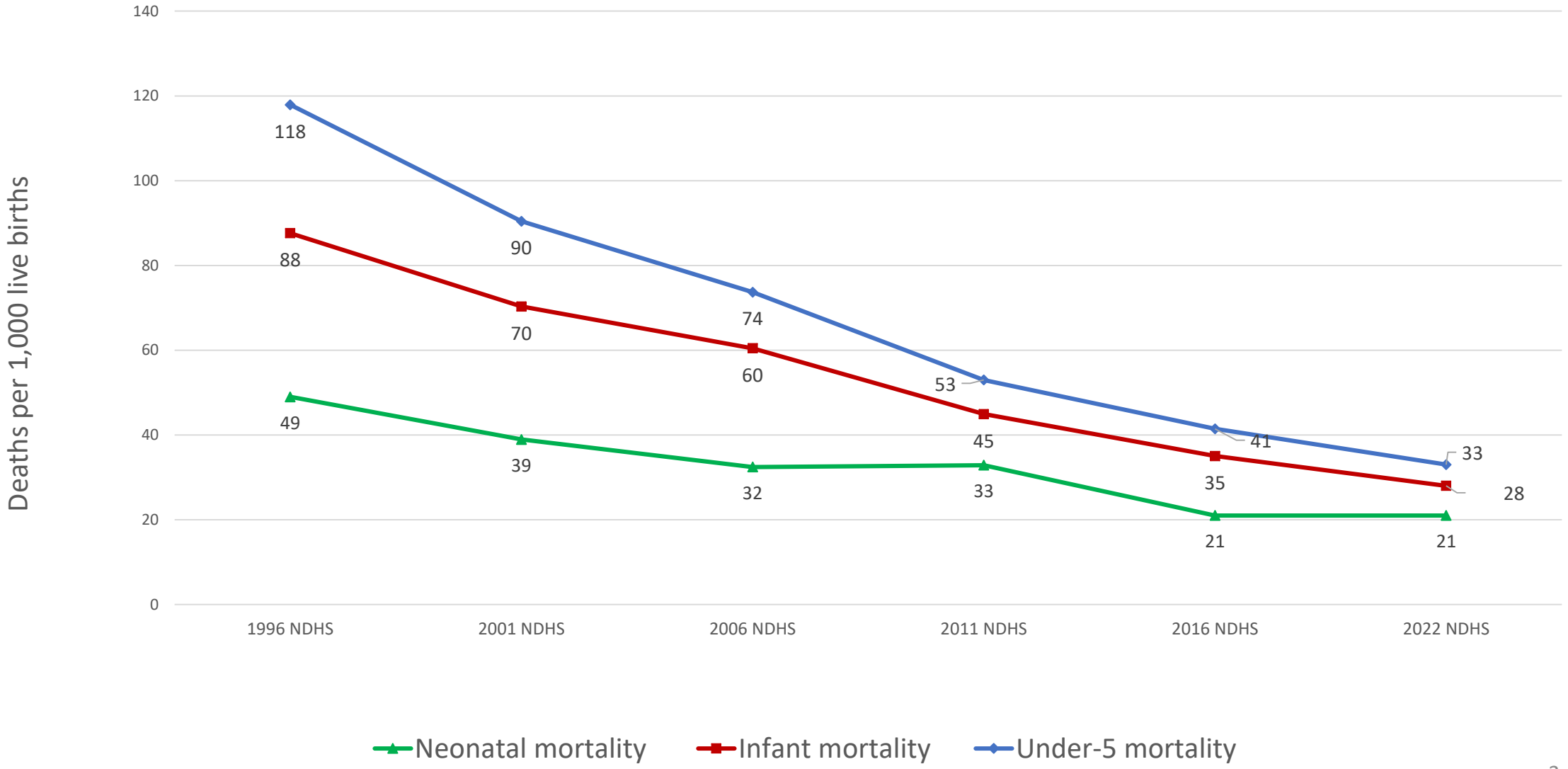
Background

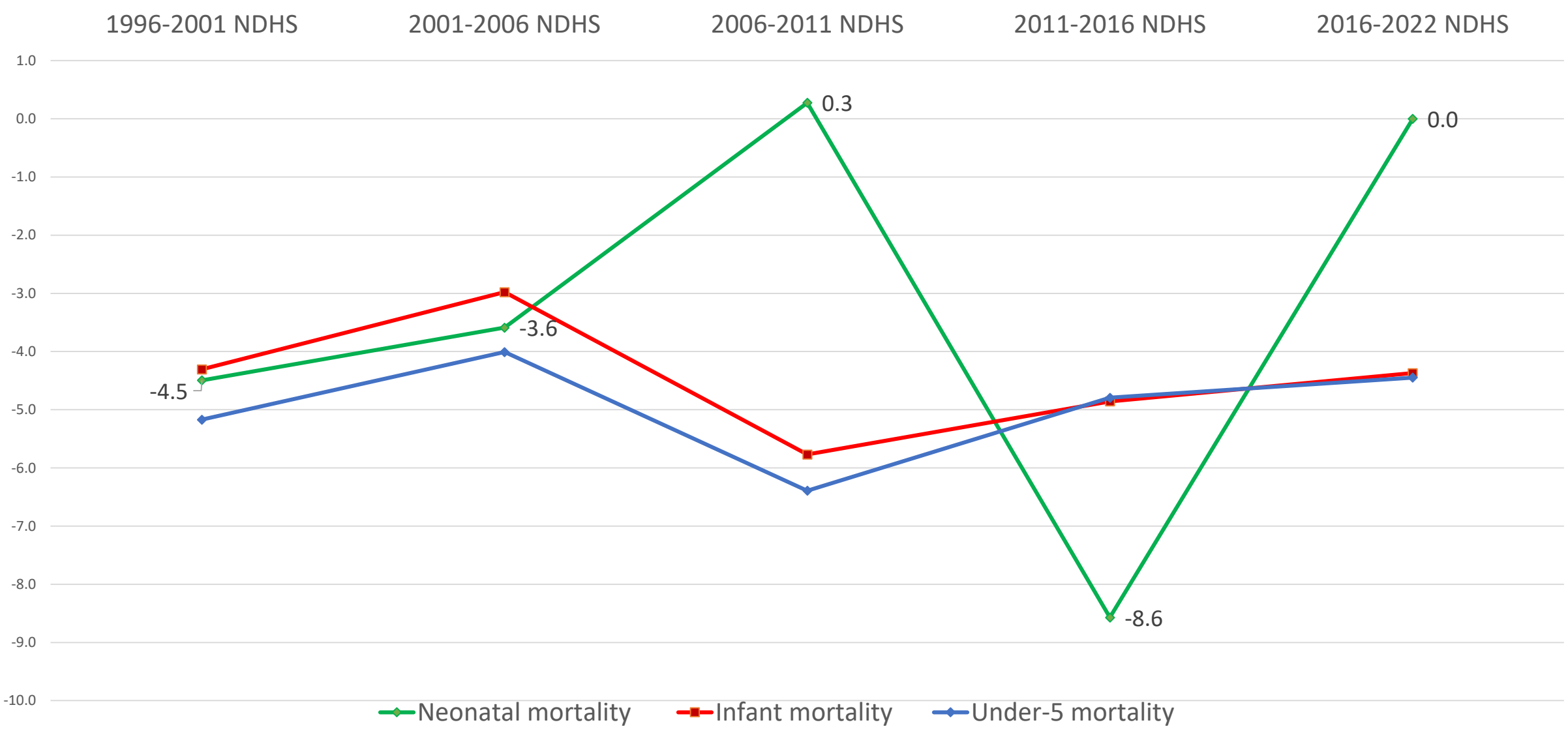
Neonatal mortality: Global Facts

- Neonatal deaths have fallen by more than a half from 5 million in 1990 to 2.4 million in 2020.
- Nearly half of under-5 deaths (47%) are contributed by neonatal deaths.
- The burden of global newborn deaths is mostly shared between sub-Saharan Africa (43%) and southern Asia (36%) (UN, IGME, 2021).
- In 2017, South Asia had the NMR at 26·9 (24·1 to 30·3) per thousand live births (Lucia et al., 2019).
- Neonatal disorders have ranked sixth as leading cause of all deaths since 2013 (Abbafati et al., 2020).

Trends of NMR, IMR and U5MR in Nepal



Average Annual Changes on NMR



Causes and Determinants of NMR

- Equity gap exists such as NMR is high in poorest wealth quintiles, rural residents, disadvantaged caste and ethnic groups, and mothers with no education. (Singh et al. , 2019)
- Poor maternal service utilization such as lack of four ANC visits, lack of PNC for newborn care, home delivery leads to higher NMR. (Singh et al., 2019 and Paudel et al., 2013)
- Most common underlying causes of neonatal deaths are: respiratory and cardiovascular disorders (31%) complications of pregnancy, Labor, and delivery (31%) (MoHP, 2017)
- Verbal Autopsy of causes of deaths have shown that more than half (56%) deaths occurred at home in 2016. (MoHP, 2017)

Nepal Government's Initiatives on Maternal and Newborn Health

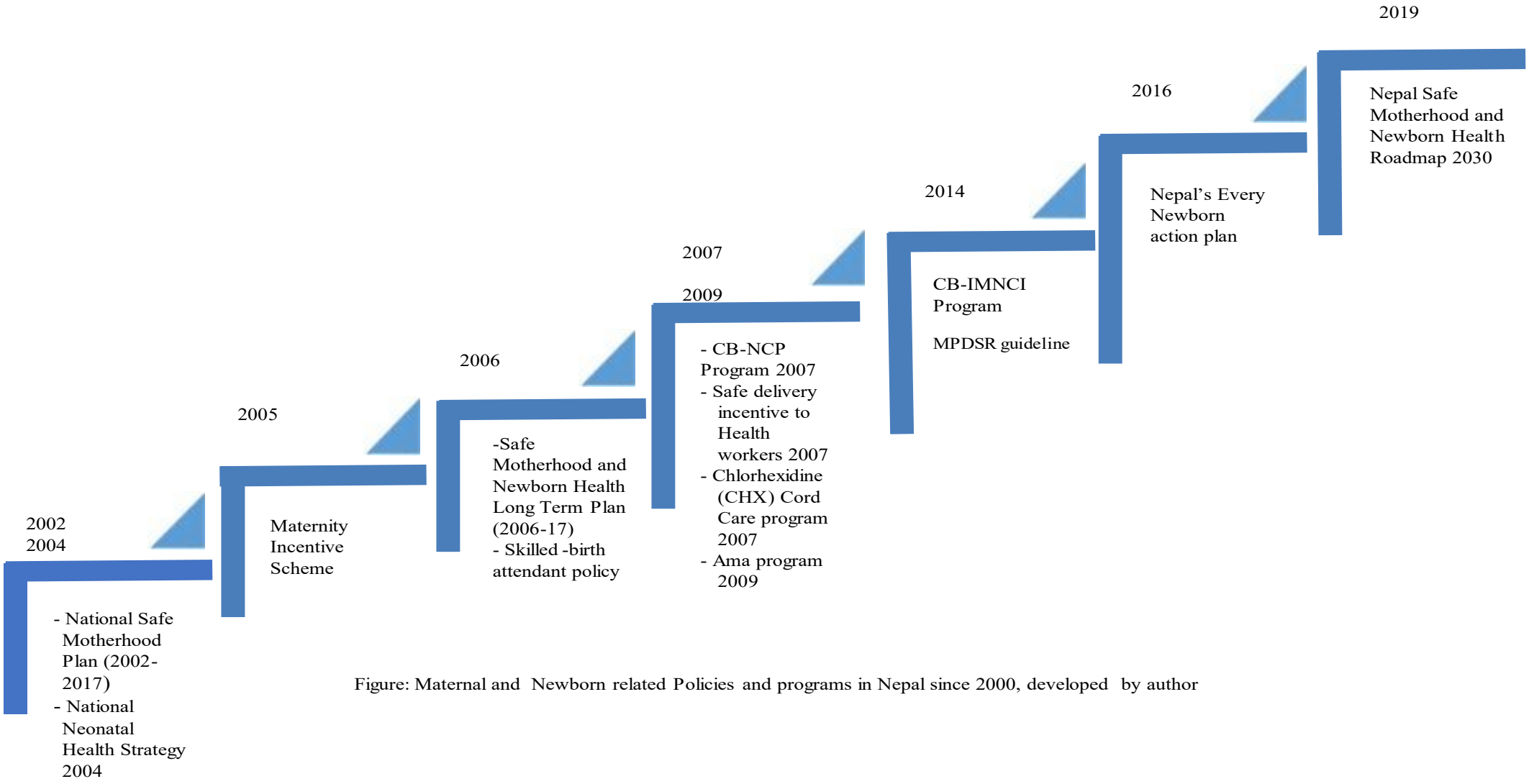
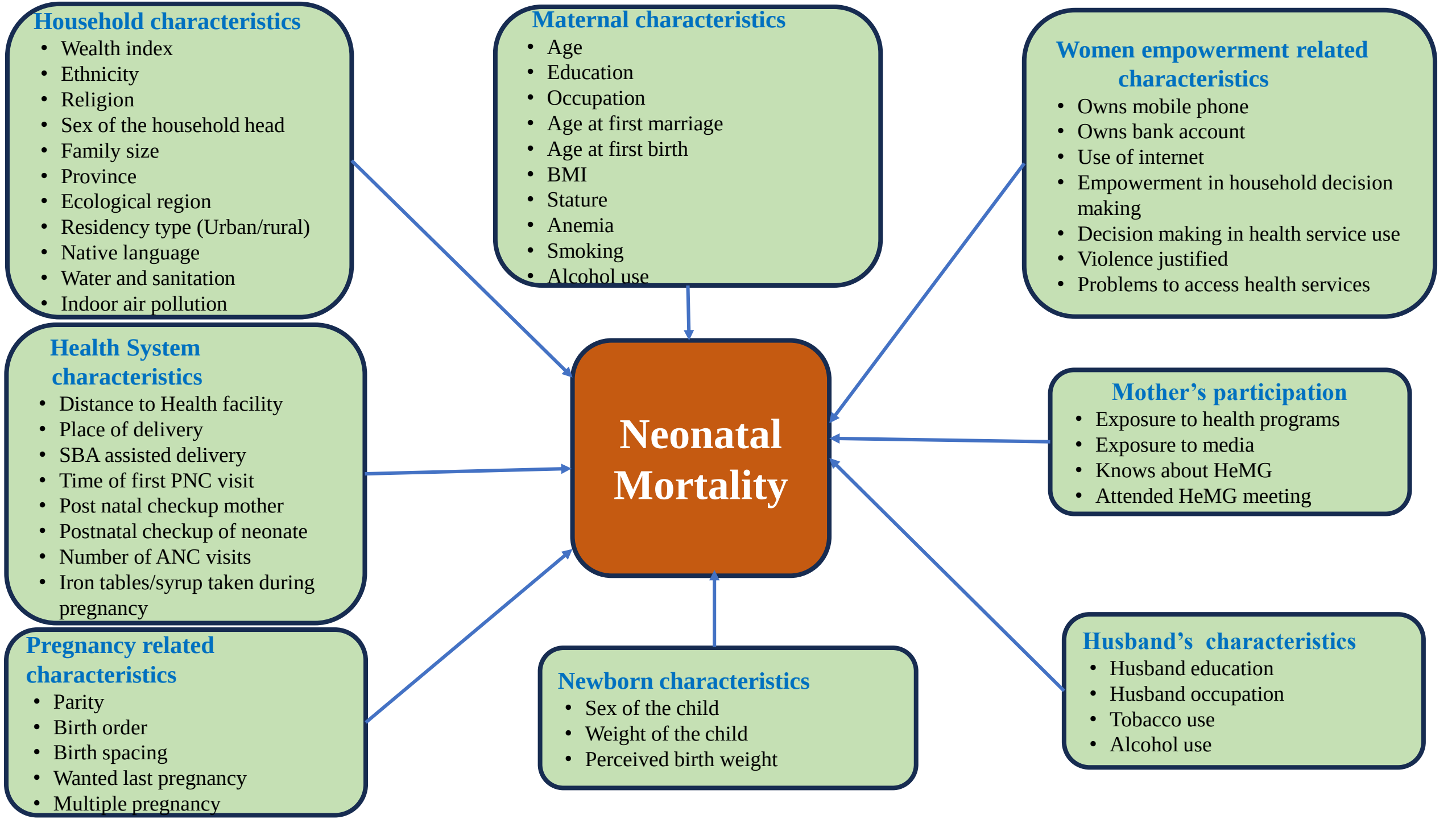


Figure: Maternal and Newborn related Policies and programs in Nepal since 2000, developed by author

Rationale for the study

- Stagnation of neonatal mortality has been observed despite the basic routine **maternal and newborn care reaches high levels**
- Identifying the trend on NMR and understanding the protective and risk factors contributing NMR over the period of 2016 to 2022 give the picture of the progress made
- Nepal is committed to achieve SDG 3 target 2 to reduce NMR to 12/1000 live births by 2030
- Understanding determinants of NMR in the current context feeds into formulation of policy and programs to achieve the target

Conceptual Framework


Household characteristics
Wealth index
Ethnicity
Religion
Sex of the household head
Family size
Province
Ecological region
Residency type (Urban/rural)
Native language
Water and sanitation
Indoor air pollution
Maternal characteristics
Age
Education
Occupation
Age at first marriage
Age at first birth
BMI
Stature
Anemia
Smoking
Alcohol use
Women empowerment related characteristics
Owns mobile phone
Owns bank account
Use of internet
Empowerment in household decision making
Decision making in health service use
Violence justified
Problems to access health services
Health System characteristics
Distance to Health facility
Place of delivery
SBA assisted delivery
Time of first PNC visit
Post natal checkup mother
Postnatal checkup of neonate
Number of ANC visits
Iron tables/syrup taken during pregnancy
Neonatal Mortality
Mother's participation
Exposure to health programs
Exposure to media
Knows about HeMG
Attended HeMG meeting
Pregnancy related characteristics
Parity
Birth order
Birth spacing
Wanted last pregnancy
Multiple pregnancy
Newborn characteristics
Sex of the child
Weight of the child
Perceived birth weight
Husband's characteristics
Husband education
Husband occupation
Tobacco use
Alcohol use

Objectives

- Describe changes in NMRs for key population groups using 2022 and 2016 DHS data;

- Identify determinants of NMR in most recent period using NDHS 2022 data

Methods I

Further Analysis of NDHS 2016 and 2022 was done. Both Surveys are the cross-sectional surveys spanned over the period of around 6 months.

Year	Date of fieldwork	Reference period for 5-year neonatal mortality estimates	Reference date	Households interviewed (n)	Household response rate (%)	Women age 15-49 interviewed (n)	Eligible women response rates (%)	Number of live births[1] (n)	Number of early neonatal deaths[1] (n)	Number of late neonatal deaths[1] (n)	Number of neonatal deaths[1] (n)
2016	06/06/2016 to 31/01/2017	2001-2016	2013.5	11,040	98.5	12,862	98.3	5087	84	22	106
2022	05/01/2022 to 22/06/2022	2016-2021	2019.8	13,786	99.7	14,845	97.4	5192	85	20	105

Methods II

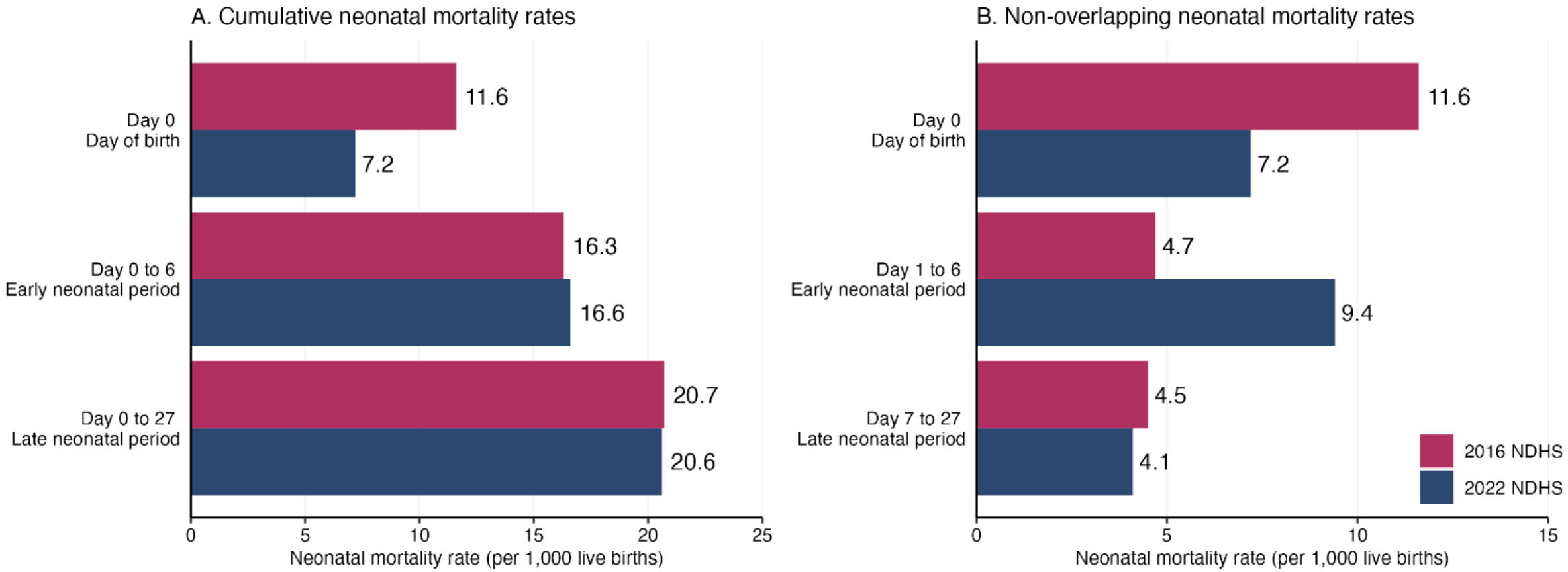
Data analyses

- Trends Analysis on NMR by characteristics covering provinces, resident types, maternal education, wealth index, and women empowerment
- Independent variables included household-level background characteristics, and factors related to maternal and paternal, pregnancy, maternal and newborn, women empowerment, and health system.
- The dependent variable NMRs of 2016 and 2022 were constructed based on all births in completed months in the range of 1 to 61.
- General linear model assessed the significant changes in NMR from 2016–2022 by various characteristics.
- NMR determinants were identified by conducting logit regression analyses.

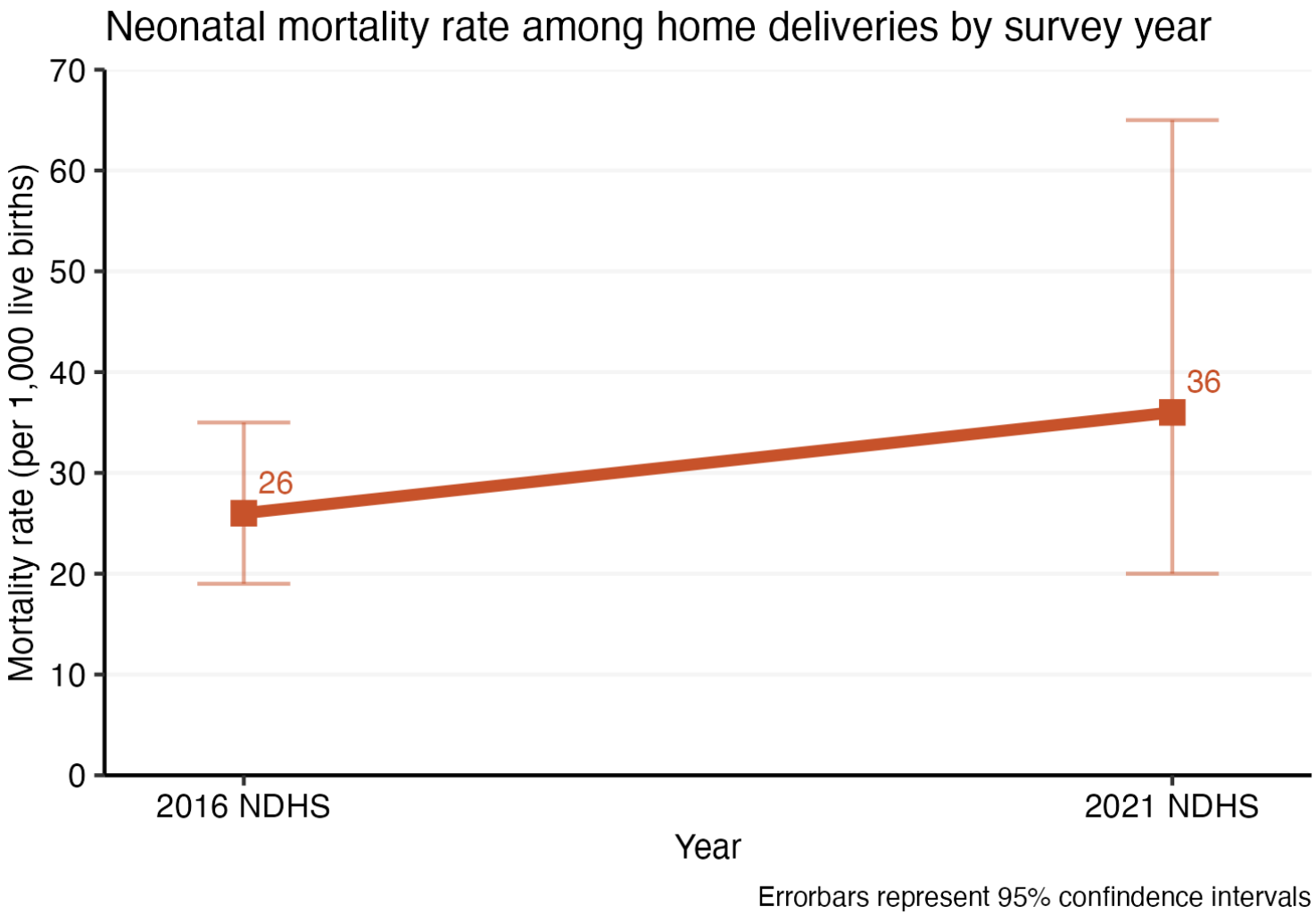
Ethical Consideration: The study received approval from ethical review board from ICF and NHRC

Results

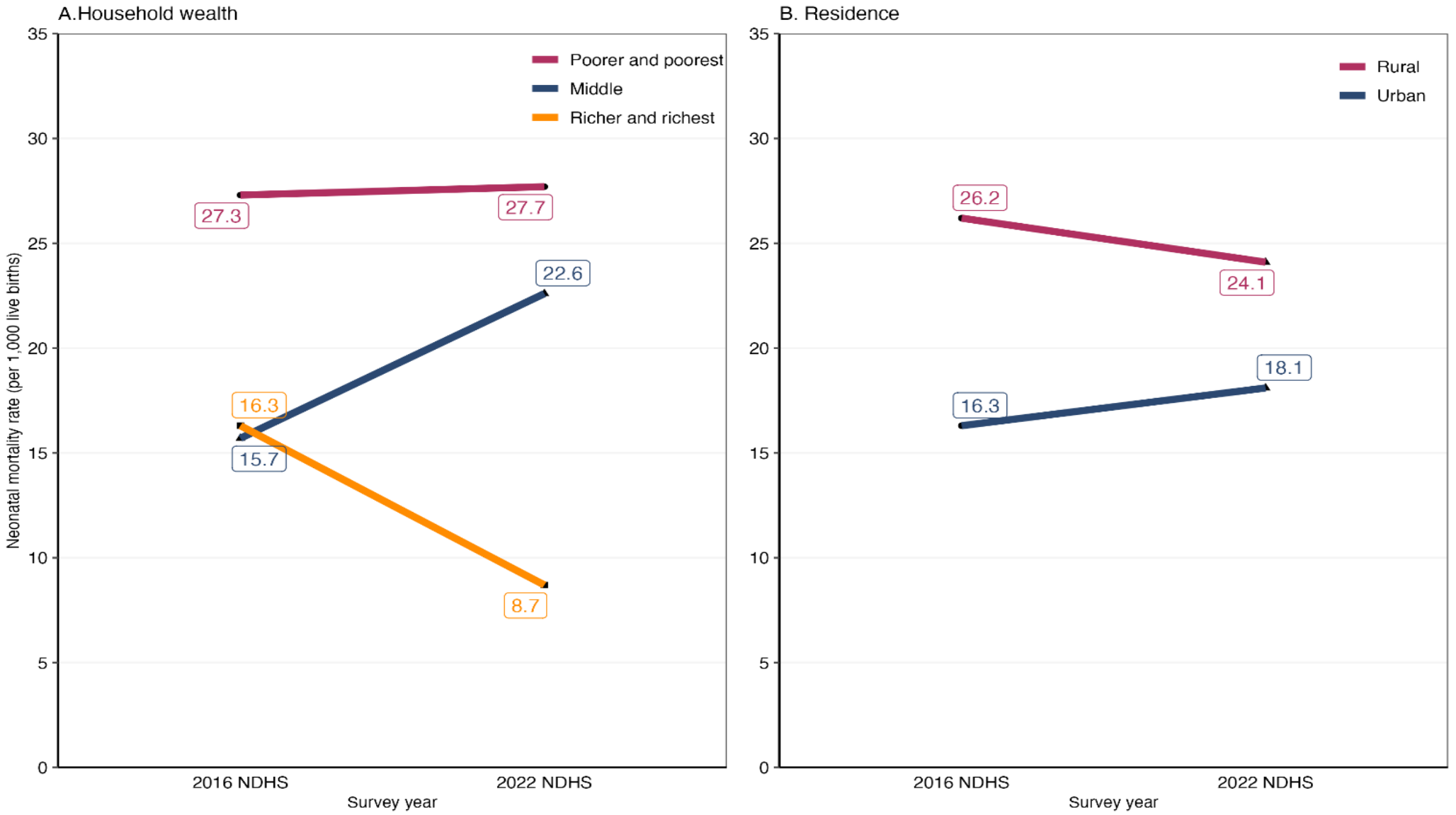
Neonatal mortality rate by day of death from the birth in NDHS 2016 and 2022



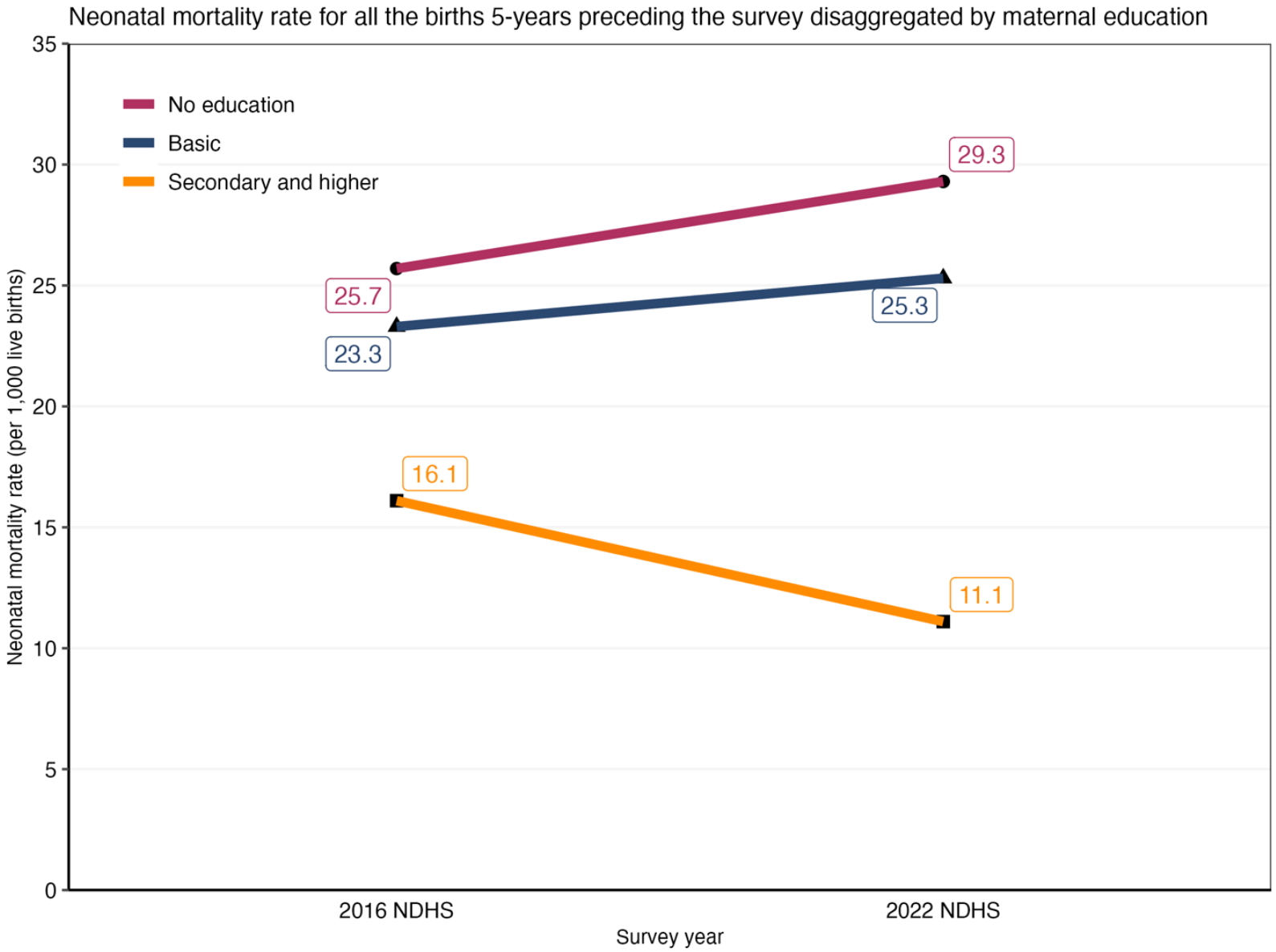
Trend on NMR by Home delivery



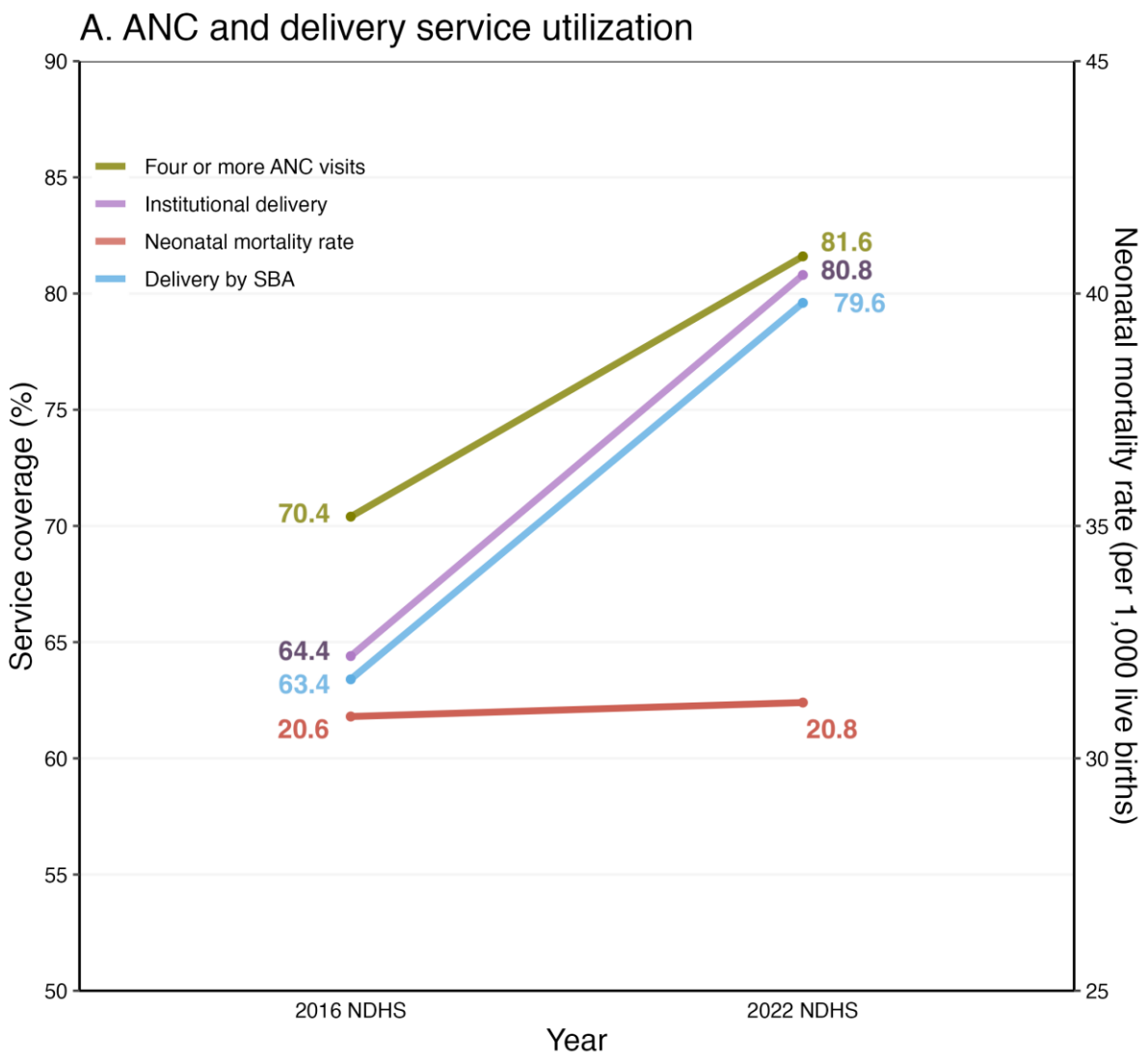
Neonatal Nortality by Residence and Wealth Index between 2016 NDHS and 2022 NDHS

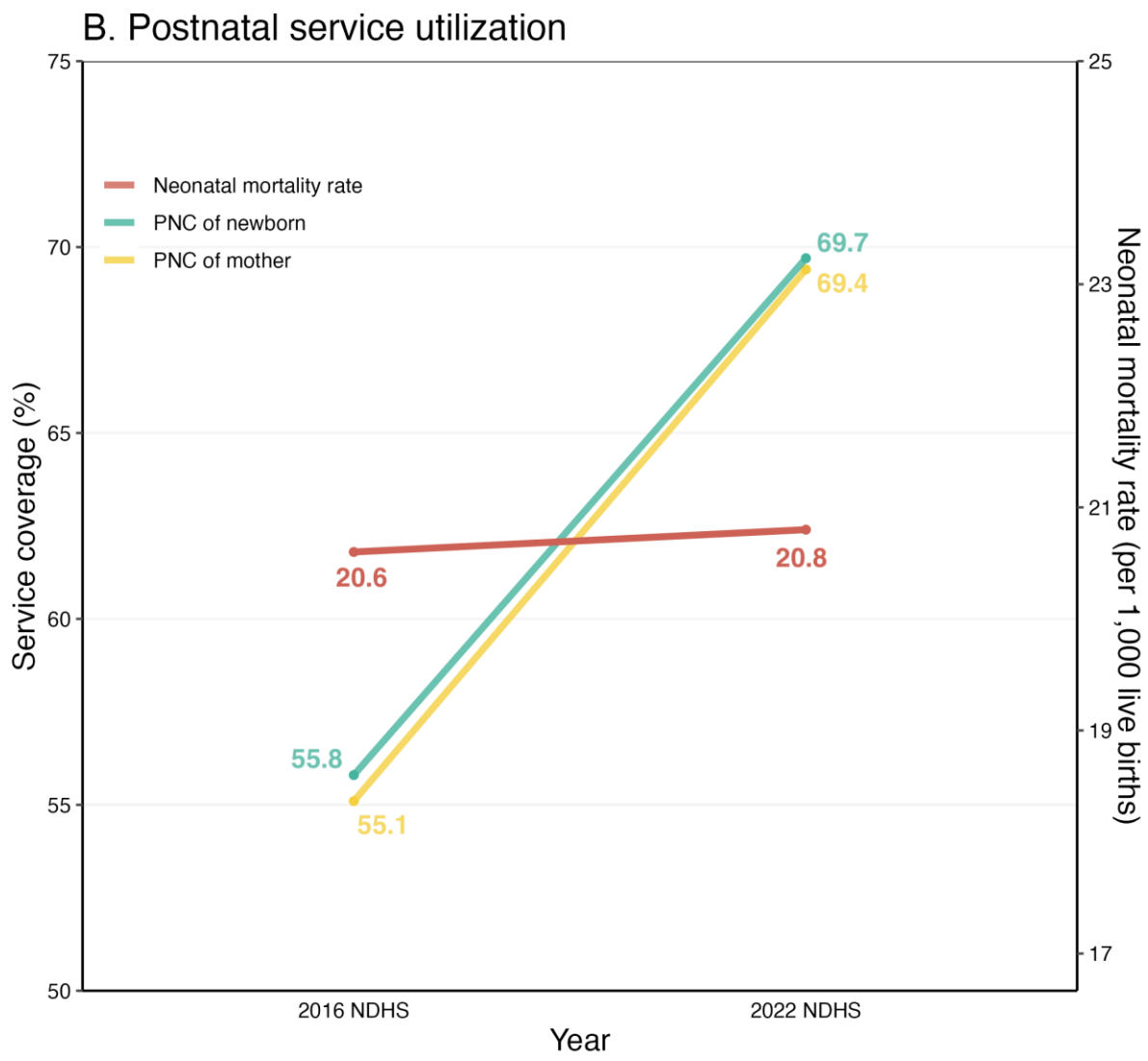


Neonatal mortality Rates among Diverse Education Groups

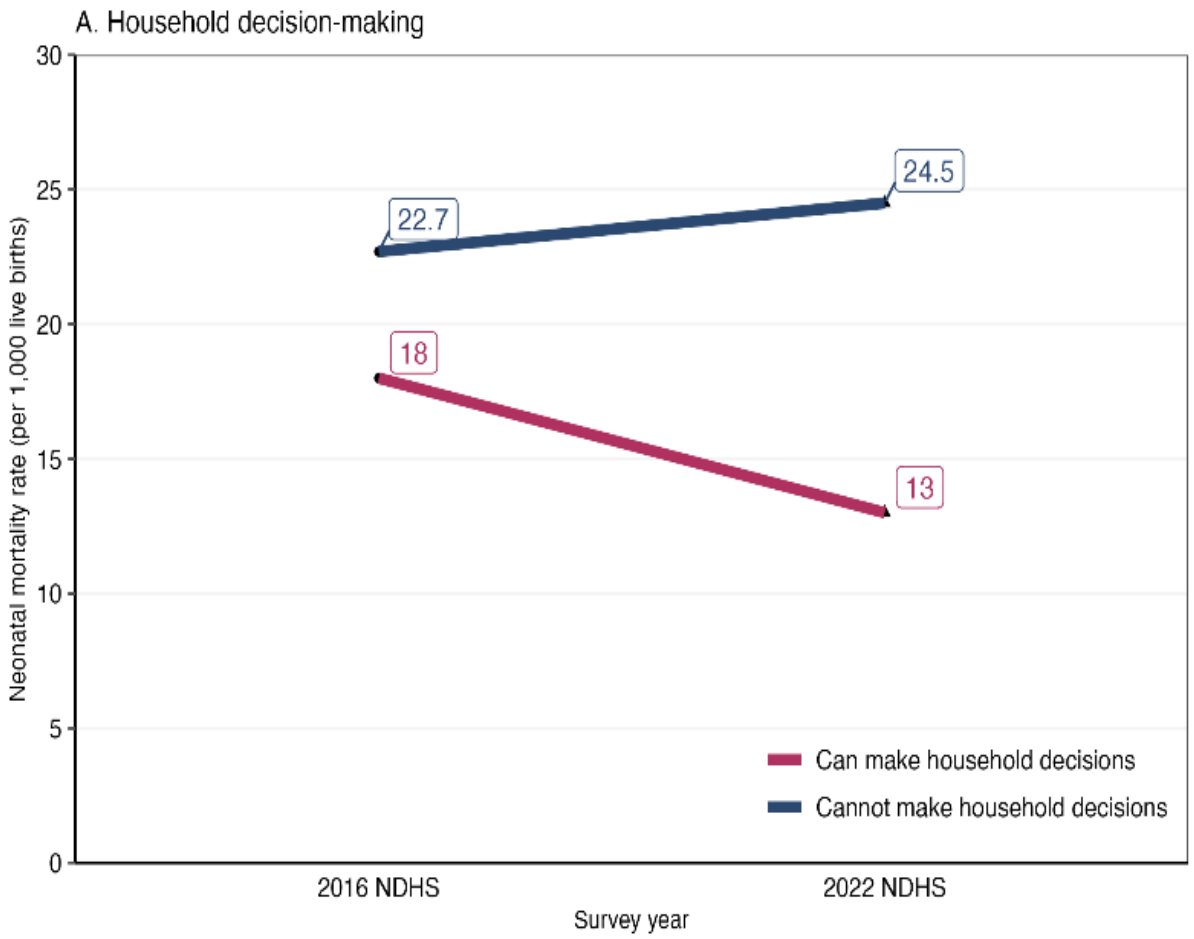


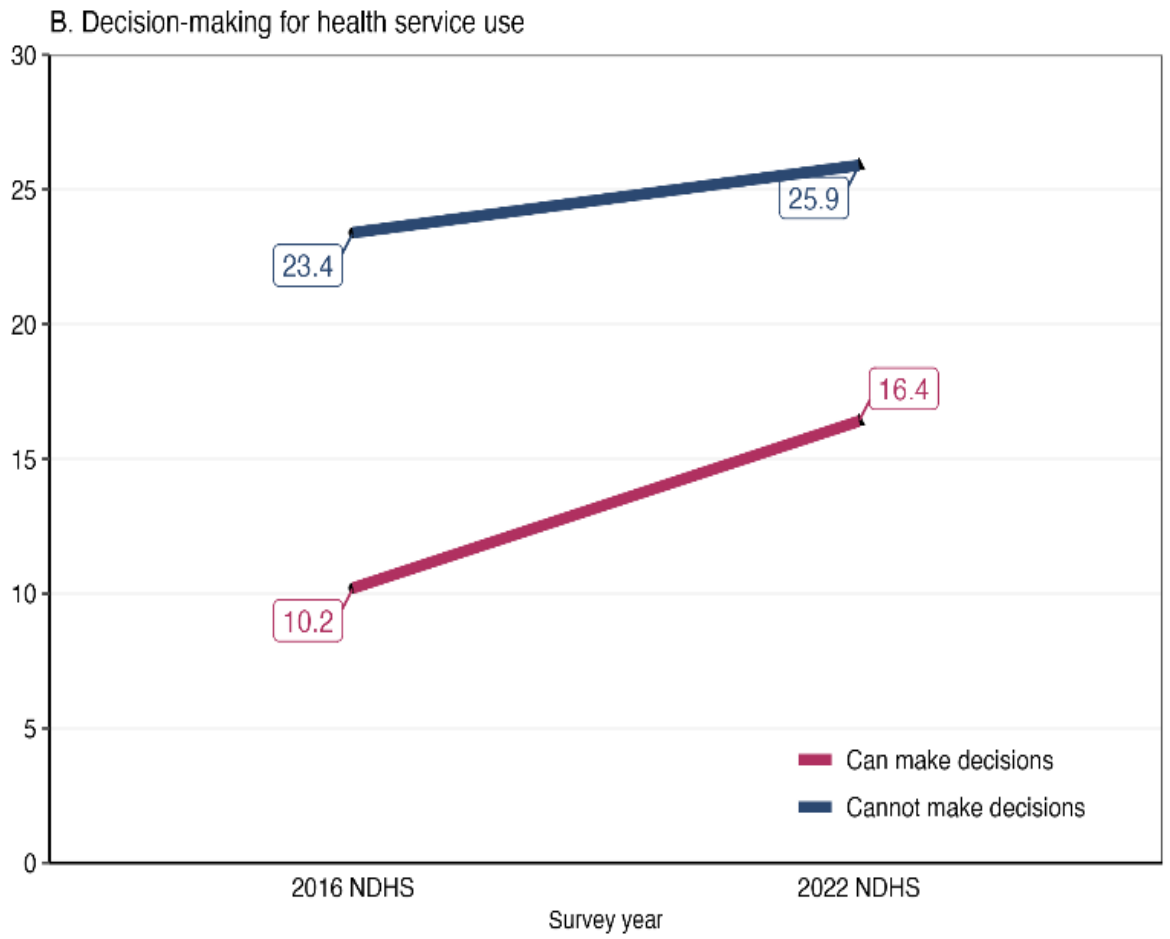
NMR and Service Utilization Trend in 2016 and 2022





Trend: Women Empowerment and NMR





Determinants of NMR

NMR for covariates, with p-values and symbols for the level of significance for the NDHS 2022 survey.

Characteristics	P-value		Pseudo-R^2
Household characteristics			
Language of the respondent	<0.001	***	0.038
Ethnicity (two categories)	0.002	**	0.010
Wealth index in terciles	0.003	**	0.030
Wealth index (Poorest & Second, Middle, Fourth & Highest)	0.001	**	0.064
Province	0.213	NS	0.032
Ecological region	0.034	*	0.009
Religion	0.087	NS	0.013
Type of residence	0.196	NS	0.008
Size of household	0.361	NS	0.004
Sex of household head	0.211	NS	0.008
Indoor air pollution	0.002	**	0.055
Improved water and sanitation	0.636	NS	0.005
Maternal characteristics			
Maternal education	0.002	**	0.031
Maternal age (5 categories)	0.023	*	0.063
Maternal use of tobacco	0.607	NS	0.001
Maternal stature	0.115	NS	0.007
Maternal anaemia	0.765	NS	<0.001
Mother ever drinks alcohol	0.809	NS	0.005
Empowerment related characteristics			

Determinants of NMR 2022 NDHS

Owns mobile phone	0.153	NS	0.004
Bank account	<0.001	***	0.039
Internet use	0.001	***	0.016
Empowerment: household decisions	0.007	**	0.015
Mother's experience of violence	0.876	NS	<0.001
Empowerment: health care /FP decisions	0.021	*	0.014
Newspaper / magazine	<0.001	***	0.026
Radio / TV	<0.001	***	0.023
Mothers' exposure to health programs			
Knows about Health Mother's Group	0.972	NS	<0.001
Husband's characteristics			
Husband's education	0.009	**	0.015
Husband's occupation 4 cats	0.015	*	0.022
Birth characteristics			
Birth weight taken	<0.001	***	0.078
Sex of child	0.096	NS	0.010
Birth weight	0.001	***	0.146
Twin birth	0.535	NS	<0.001
Perceived birth weight	0.017	*	0.025
Pregnancy related characteristics			
Birth order	0.124	NS	0.025
Mother's parity	0.053	NS	0.031
Preceding birth interval	0.001	***	0.054
Wanted last birth	0.219	NS	0.011
Health system related factors			
Time to health facility	0.205	NS	0.009
Birth attendants	0.010	**	0.033
Place of delivery	0.052	NS	0.052
C-section delivery	0.106	NS	0.008
ANC visits at least four or more	0.068	NS	0.030
Days iron tablets taken	0.117	NS	0.037
Newborn PNC within 2 days	0.002	**	0.068
Mother PNC within 2 days	0.126	NS	0.016

Determinants of NMR Below NMR of 15 per 1000 Live Births

Table 3.3: Categories of the significant (p<.05) covariates in Table 3.1 for which the NMR is estimated to be 15 or less in the NDHS 2016, and 2022 surveys.

Characteristics	Categories	NMR NDHS 2016	NMR NDHS 2022	Difference	P-value for difference	
Household and sociodemographic characteristics						
Language of the respondent	Nepali	17.4	10.3	-7.0	<0.001	***
Ethnicity (two categories)	Advantaged	18.3	10.7	-7.6	0.002	**
Wealth index (Poorest & Second, Middle, Fourth & Highest)	Richer and richest	16.4	8.7	-7.7	0.001	**
Ecological region	Hill	16.4	13.2	-3.1	0.034	*
Indoor air pollution	No	17.4	11.3	-6.1	0.002	**
Maternal characteristics						
Maternal education	Secondary and above (≥grade 9)	16.1	11.2	-4.9	0.002	**
Maternal age 5 categories	30-34 years	15.0	6.8	-8.2	0.023	*
Empowerment related characteristics						
Bank account	Yes	17.2	9.6	-7.6	<0.001	***
Internet use	Used at some time	13.7	14.6	0.9	0.001	***
Empowerment: household decisions	Yes, can make decision	18.0	13.0	-5.0	0.007	**
Newspaper / magazine	At least once a week	19.4	11.9	-7.6	<0.001	***
Radio / TV	At least once a week	19.5	12.2	-7.3	<0.001	***
Husband's characteristics						
Husband's education	Secondary and above (≥grade 9)	18.2	14.1	-4.1	0.009	**
Husband's occupation 4 categories	Agriculture	30.6	12.5	-18.1	0.015	*
Birth weight taken	Yes, taken	12.5	12.3	-0.3	<0.001	***
Birth related characteristics						
Birth weight	Large (≥3500 g)	11.0	6.9	-4.1	0.001	***
Birth weight	Normal (2500-3500 g)	9.8	12.4	2.6	0.001	***
Perceived birth weight	Larger than average	32.2	11.2	-21.0	0.017	*
Perceived birth weight	Smaller than average	34.9	12.5	-22.4	0.017	*
Preceding birth interval	>2 years	14.6	11.5	-3.2	0.001	***
Birth attendants	Delivery with SBA	16.9	14.3	-2.5	0.010	**

Conclusion: Key Take Home Messages

- Modest and uneven reduction of NMR since 2000
- Reduced NMR on the **first day of birth in 2022** NDHS compared to 2016
- **Widened equity gaps** in NMR across household, ethnicity and wealth index in 2022
- The paradox of **stagnant NMR** but **increased service utilization** over the period of 2016 to 2021
- Higher neonatal deaths in mothers with low/or no **education** and those experiencing **early marriage**
- Positive association of **women's decision-making** with lower NMR
- Positive association of **SBA-assisted delivery and PNC newborn** with lower NMR

Recommendations

- Equity gap on MNH services need to be addressed by targeting poorest/poorer households, mothers with low/low education background, and disadvantaged ethnicity/caste groups.

- To promote PNC check-ups, maternity incentive programs should be expanded covering continuum of care indicators for quality essential newborn care

- Newborn deaths has increased in home delivery, institutional and SBA-assisted delivery should be promoted targeting both service and demand sides

- Additional newborn focused studies are warranted to explore its determinants, service access and availability

Thank You

Brief Bio

Dr. Khem Pokhrel, PhD (Global Health), is a distinguished public health researcher in Nepal. He has authored over 25 research papers in internationally indexed journals. His research interests include big data analysis, systematic reviews and meta-analyses, randomized controlled trials, longitudinal studies, and health system strengthening. He firmly believes that research should have policy implications and be applied to improving people's health.