# Progress in Reducing Inequalities in Reproductive, Maternal, Newborn and Child Health Services in Nepal

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## ABSTRACT

**Background:** Equity has emerged as a cross-cutting theme in the health sector, and countries across the world are striving to ensure that all people have access to the health services they need without undue financial hardship and educational, social, cultural and geographical barriers. In this context, this analysis has attempted to analyse Nepal's progress in reducing inequalities in reproductive, maternal, newborn and child health services based on economic status and place of residence.

**Methods:** In this analysis, we have used data available from the web version of the Health Equity Assessment Toolkit, a data visualisation tool developed by the World Health Organisation. We have analysed the inequalities in terms of a composite coverage index which combines eight reproductive, maternal, newborn and child health interventions along the continuum of care.

**Results:** Composite coverage of reproductive, maternal, newborn and child health services was 43% in 2001 which increased to 65% in 2016. The absolute difference in composite coverage of the services between the lowest and highest wealth quintiles decreased from 28-percentage points in 2001 to 8-percentage points in 2016. The difference in service coverage between the urban and rural settings reduced from 21-percentage points to six percentage points in the period. Among the eight various services, births attended by skilled birth attendants is the indicator with the highest scope for improvement.

**Conclusions:** Inequalities based on wealth quintiles and residence places have narrowed from 2001 to 2016. Additional efforts in expanding skilled birth attendants and antenatal care service coverage among the poorest quintile and rural residents could further improve the coverage of the indicators at the national level and narrow down the inequalities.

**Keywords:** Health services; inequality; maternal; Nepal; newborn and child health; reproductive health

## INTRODUCTION

Inequalities in health are unjust and avoidable differences in health intervention coverage or outcomes arising from some forms of discrimination or lack of access to resources. Addressing inequalities has not only become a moral imperative, but it also tends to offer benefits to society, enhancing the health of the population and improving economic outcomes.[1-3]

An equity-oriented approach to achieve Universal Health Coverage (UHC) stresses that accelerated and early gains have to be realised by disadvantaged population subgroups without financial hardship [4,5] and service utilisation should not be limited by educational, social, cultural and geographical barriers. This improves overall indicators of a country while also reducing inequalities. As equity has been the cross-cutting theme, measuring progress towards UHC is based on monitoring health inequalities in the country[6,7] which can be achieved through an equity analysis. [8] In this context, this paper analysed Nepal's progress in reducing inequalities in reproductive, maternal newborn and child health services based on economic status and place of residence.

## METHODS

Data for this study were taken from the web version

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of the Health Equity Assessment Toolkit (HEAT). It is an interactive data visualisation tool developed by the World Health Organization (WHO) that presents the inequalities in the composite coverage index (CCI) disaggregated by economic status, residence, and education level. HEAT involves re-analysis of Demographic and Health Survey (DHS), Multiple Indicator Cluster Survey (MICS) and Reproductive Health Survey (RHS) micro-data globally. The WHO Collaborating Centre calculates Health Equity Monitoring (International Centre for Equity in Health, Federal University of Pelotas, Brazil).[9,10] Featuring data about reproductive, maternal, new-born and child health (RMNCH) indicators, it is one of the largest repositories of disaggregated data comparable across countries and over time.[9]

To ensure uniformity in methodology, we extracted only the Nepal Demographic and Health Survey (NDHS) data from 2001 to 2016 in this article. In a few cases, there may be minor differences between the data reported here and in previous DHS reports due to minor differences in the definition and calculation of some indicators.[11] Detailed information about the criteria used to calculate the indicator numerator and denominator values used in these analyses is available in the WHO Indicator and Measurement Registry.[12]

CCI is a weighted score reflecting coverage of eight RMNCH interventions along the continuum of care: demand for family planning satisfied (modern methods); ANC visits (at least four visits); births attended by SBA; BCG immunisation coverage among one-year-olds; measles immunisation coverage among one-year-olds; DPT3 immunisation coverage among one-year-olds; children aged less than five years with diarrhea receiving oral rehydration therapy and continued feeding.

Wealth index was constructed based on asset owned and access to certain services, which was divided on five quintiles, each quintile accounting 20% of the population. Principal component analysis was used in constructing the wealth index. Wealth index was considered as proxy of the economic status of the household.[13]

The absolute concentration index (ACI) used in this analysis is weighted measure of inequality that indicates the extent of health indicators concentration on specific subsegment of population: advantaged or disadvantaged population. It indicates the extent to which a health indicator is concentrated among a specific population: advantaged or disadvantaged. The relative concentration

index (RCI) used in this study is the measure of inequality expressed on a relative scale with value ranging from -1 and +1 which was later concerted into a scale from -100 to +100 multiplying by 100. In the scale, zero indicates no inequality, a positive value and a negative value indicates concentration of indicators on advantaged and disadvantaged group respectively.[13]

The population attributable risk (PAR) indicates the room for improvement on health indicators at national level that can be achieved by raising indicators at population subgroups to the level of advantaged group and is a complex weighted measure of inequality. Larger value of PAR indicates higher level of inequality and thus larger room for improvement. If the PAR value is zero, no additional improvement can be achieved in indicators at national level by raising indicators in population subgroups to the level of advantaged group.[13]

The slope index of inequality (SII) measures the difference in health indicators between the most advantaged and most disadvantaged groups while taking into consideration all other population subgroups using a regression model. It is also a weighted measure of inequality where the value of zero indicates no inequality and a greater absolute value indicates a higher level of inequalities. Calculation method and additional details of these indicators are available in technical notes of the Health Equity Assessment Toolkit's web version inbuilt database edition.[14]

## RESULTS

The coverage of RMNCH services has improved over time. CCI for RMNCH services was 42.75% in 2001, 52.82% in 2006, 59.57% in 2011 and 64.68% in 2016. The inequalities in RMNCH services coverage seem to be narrowing down from 2001 to 2016, with an absolute difference between Q5 and Q1 falling from 28 percentage points to 8 percentage points (Figure 1).

Nepal has also reduced the inequalities in RMNCH services coverage based on place of residence between the years 2001 to 2016. The absolute difference in CCI between urban and rural residents was 21 percentage points (62% in urban and 41% in rural) in 2001, 12 percentage points (64% in urban and 52% in rural) in 2006, 14 percentage points (73% in urban and 58% in rural) in 2011 and 6 percentage points (68% in urban and 61% in rural) in 2016. Inequalities decreased sharply between 2011 to 2016 compared to previous years (Figure 2).
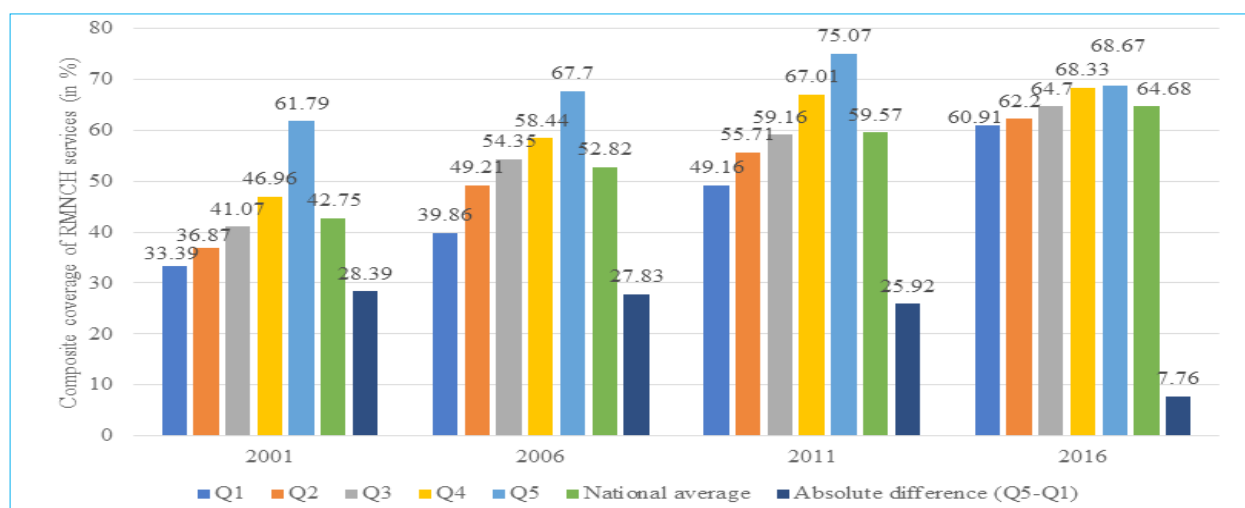
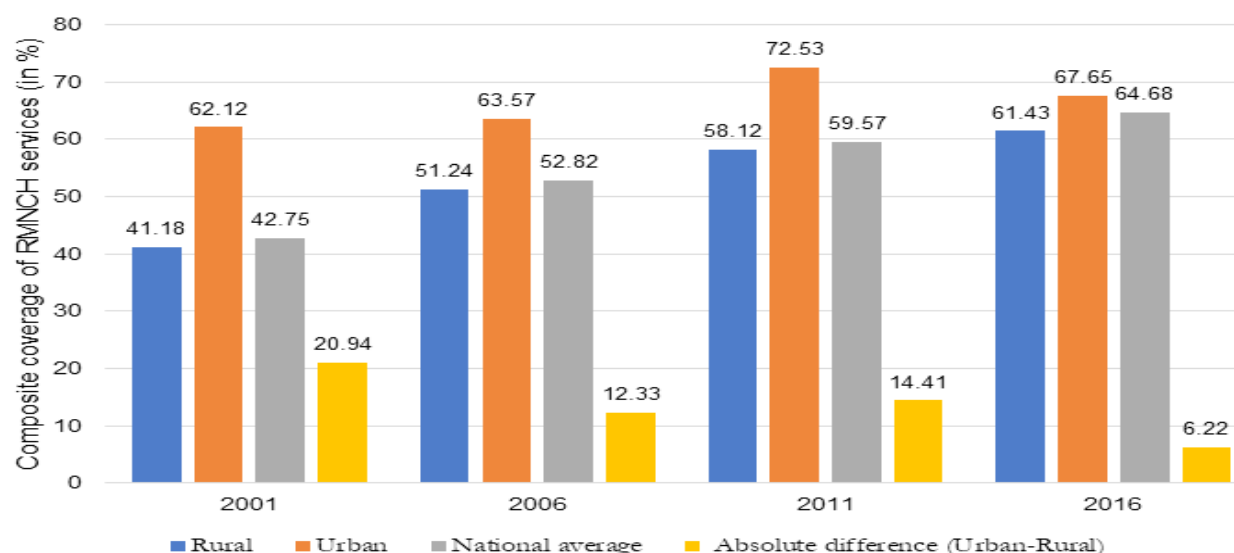Figure 1. Progress in reducing inequalities based on wealth quintile.



Figure 2: Progress in reducing inequalities based on place of residence

When individual variables considered for calculation of composite RMNCH services are dealt with individually, differences seem to exist in the coverage of various indicators, as shown in table 1.

Vaccination coverage has a relatively low level of inequalities and less area of improvement. PAR for BCG and Measles was zero, indicating that improvement of indicator in other wealth quintiles to the level of Q5 does not improve the indicator in aggregate. A negative value of both the ACI and RCI for BCG and Measles means that the service is more concentrated in Q1 (better coverage in lowest wealth quintile). By eliminating wealth-related inequality in births attended by SBA and increasing coverage of all other wealth quintiles to the level of the Q5, Nepal can improve the overall coverage value by almost 28 percentage points, as shown by PAR value.

Among the eight RMNCH indicators, it is the indicator with the highest scope for improvement. Considering the SII, births attended by SBA are the most unequally distributed indicator based on wealth quintiles. SII for births attended by SBA increased from 40 in 2001 to 59 in 2016, indicating that inequalities have widened. Eliminating economic-related inequality in four ANC coverage and increasing coverage to the level of other wealth quintiles to that of Q5, the overall indicator value can be improved by 18 percentage points. Births attended by SBA and four ANC coverage are the two areas with the widest area of improvement considering PAR value. The SII for FP demands satisfied by modern methods was -3.12, which indicates that coverage is more concentrated in Q1 than Q5. Similarly, measles immunisation coverage has been concentrated in Q1 compared to Q5 (Table 1).

| Table 1: Inequalities based on economic status. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Indicator | Year | National average | Q1 | Q5 | Difference (D) | Absolute concentration index (ACI) | Relative concentration index (RCI) | Population attributable risk (PAR) | slope of inequality |
| Demand for FP satisfied by modern methods | 2001 | 52.75 | 39.12 | 70.48 | 31.37 | 6.21 | 11.77 | 17.74 | 37.93 |
| | 2006 | 60.93 | 46.67 | 67.22 | 20.55 | 3.42 | 5.61 | 6.3 | 21.17 |
| | 2011 | 54.32 | 46.68 | 58.12 | 11.44 | 1.97 | 3.63 | 3.8 | 12.27 |
| | 2016 | 56.05 | 54.95 | 53.23 | -1.72 | -0.51 | -0.9 | 0 | -3.12 |
| Antenatal care coverage (at least four visits) | 2001 | 14.32 | 4.7 | 43.98 | 39.28 | 6.32 | 44.16 | 29.66 | 41.79 |
| | 2006 | 29.45 | 10.53 | 60.31 | 49.78 | 9.08 | 30.85 | 30.86 | 54.65 |
| | 2011 | 50.09 | 28.26 | 83.69 | 55.43 | 10.44 | 20.84 | 33.6 | 61.12 |
| | 2016 | 69.37 | 56.67 | 87.43 | 30.76 | 5.32 | 7.67 | 18.06 | 32.85 |
| Births attended by SBA | 2001 | 12.85 | 3.6 | 45.13 | 44.61 | 6.58 | 46.66 | 34.72 | 41.19 |
| | 2006 | 18.71 | 4.8 | 57.8 | 55.29 | 8.88 | 43.9 | 40.28 | 53.29 |
| | 2011 | 36.05 | 10.7 | 81.54 | 74.18 | 13.2 | 32.56 | 46.04 | 72.16 |
| | 2016 | 58.04 | 33.91 | 88.73 | 51.84 | 9.39 | 14.97 | 27.59 | 58.83 |
| BCG immunization coverage among one-year-olds | 2001 | 84.48 | 74.88 | 92.56 | 17.68 | 3.76 | 4.45 | 8.08 | 24.3 |
| | 2006 | 93.37 | 84.74 | 97.04 | 12.31 | 2.46 | 2.64 | 3.67 | 16.83 |
| | 2011 | 96.52 | 94.15 | 100 | 5.85 | 0.95 | 0.98 | 3.48 | |
| | 2016 | 97.50 | 98.04 | 97.07 | -0.97 | 0.07 | 0.07 | 0 | 1.18 |
| DPT3 immunization coverage among one-year-olds | 2001 | 72.13 | 62.05 | 85.37 | 23.32 | 4.54 | 6.3 | 13.23 | 28.37 |
| | 2006 | 88.71 | 75.22 | 96.25 | 21.03 | 4.29 | 4.83 | 7.54 | 29.24 |
| | 2011 | 91.84 | 88.1 | 98.36 | 10.26 | 2.01 | 2.18 | 6.52 | 13.03 |
| | 2016 | 86.28 | 87.19 | 89.48 | 2.3 | 0.55 | 0.63 | 3.2 | 3.94 |
| Measles immunization coverage among one-year-olds | 2001 | 70.59 | 61.06 | 83.15 | 22.1 | 4.4 | 6.24 | 12.56 | 27.71 |
| | 2006 | 85.02 | 73.2 | 94.47 | 21.27 | 4.15 | 4.88 | 9.46 | 26.47 |
| | 2011 | 88.02 | 85.97 | 96.13 | 10.16 | 1.78 | 2.02 | 8.11 | 10.79 |
| | 2016 | 90.42 | 93.96 | 89.76 | -4.2 | -0.32 | -0.36 | 0 | -2.08 |
| Under 5 children with diarrhoea receiving oral rehydration therapy and continued feeding | 2001 | 42.56 | 37.77 | 58.04 | 20.27 | 3.17 | 7.44 | 15.48 | 19.79 |
| | 2006 | 36.80 | 25.32 | 56.76 | 31.44 | 5.42 | 14.74 | 19.97 | 32.69 |
| | 2011 | 46.66 | 46.47 | 54.1 | 7.64 | 1.45 | 3.12 | 7.44 | 9 |
| | 2016 | 61.38 | 59.39 | 75.98 | 16.58 | 3.05 | 4.97 | 14.6 | 18.96 |
| Under 5 children with pneumonia taken to HF | 2001 | | | | | | | | |
| | 2006 | 42.93 | 35.96 | 54.04 | 18.08 | 3.82 | 8.91 | 11.1 | 24.84 |
| | 2011 | 49.50 | 34.93 | 74.96 | 40.03 | 6.18 | 12.48 | 25.47 | 38.12 |
| | 2016 | 55.05 | 56.55 | NA (N<20) | | | | | |

*Missing data in any cells mean that indicator has not been computed because of insufficient data.*

The study found that the urban-rural differences have been narrowing down for all eight RMNCH indicators from the year 2001 to 2016. Similar to differences based on wealth quintile, births attended by SBA has the highest scope for improvement with a PAR value of 10 in 2016 indicating that if the coverage in rural areas is improved to the level of urban areas, the overall indicator value can be improved by almost 10 percentage points. The second greatest scope for improvement was seen on the proportion of under 5 children with Pneumonia taken to HF with a PAR value of 9 in 2016. ANC coverage (at least four visits) in aggregate can be approved by 6 percentage points if the coverage in the rural area is raised to the level of urban. The urban-rural absolute difference in coverage of DPT3 immunisation was found negative (-7 percentage points) (Table 2).

Table 2: Inequalities in coverage of RMNCH indicators based on place of residence.

| | Year | Rural | Urban | Difference (D) | Ratio (R) | Population attributable risk PAR) |
|---|---|---|---|---|---|---|
| Demand for FP satisfied by modern methods | 2001 | 50.34 | 72.18 | 21.84 | 1.43 | 19.43 |
| | 2006 | 59.57 | 67.9 | 8.34 | 1.14 | 6.98 |
| | 2011 | 53.38 | 60.32 | 6.93 | 1.13 | 6.00 |
| | 2016 | 54.46 | 57.02 | 2.55 | 1.05 | 0.97 |
| ANC coverage (at least four visits) | 2001 | 11.76 | 48.36 | 36.59 | 4.11 | 34.04 |
| | 2006 | 26.05 | 51.86 | 25.81 | 1.99 | 22.41 |
| | 2011 | 47.66 | 71.77 | 24.11 | 1.51 | 21.68 |
| | 2016 | 61.75 | 75.46 | 13.71 | 1.22 | 6.09 |
| Births attended by SBA | 2001 | 10.22 | 51.12 | 40.9 | 5 | 38.27 |
| | 2006 | 14.28 | 50.56 | 36.27 | 3.54 | 31.85 |
| | 2011 | 32.27 | 72.71 | 40.44 | 2.25 | 36.67 |
| | 2016 | 46.77 | 67.66 | 20.89 | 1.45 | 9.62 |
| BCG immunization coverage among one-year-olds | 2001 | 84.2 | 88.35 | 4.15 | 1.05 | 3.88 |
| | 2006 | 93.06 | 95.63 | 2.58 | 1.03 | 2.26 |
| | 2011 | 96.36 | 97.98 | 1.62 | 1.02 | 1.46 |
| | 2016 | 96.81 | 98.07 | 1.26 | 1.01 | 0.57 |
| DTP3 immunization coverage among one-year-olds | 2001 | 71.71 | 78.15 | -4.1 | 0.94 | 5.41 |
| | 2006 | 88.13 | 92.89 | -1.92 | 0.98 | 3.55 |
| | 2011 | 91.51 | 94.93 | -1.51 | 0.98 | 2.63 |
| | 2016 | 86.6 | 86.02 | -6.52 | 0.92 | -2.29 |
| Measles immunization coverage among one-year-olds | 2001 | 69.89 | 80.6 | 10.71 | 1.15 | 10 |
| | 2006 | 84.47 | 88.88 | 4.41 | 1.05 | 3.86 |
| | 2011 | 87.62 | 91.76 | 4.13 | 1.05 | 3.73 |
| | 2016 | 89.5 | 91.18 | 1.68 | 1.02 | 0.76 |
| Under 5 children with diarrhoea receiving oral rehydration therapy and continued feeding | 2001 | 41.86 | 54.75 | 12.89 | 1.31 | 12.19 |
| | 2006 | 36.55 | 38.59 | 2.04 | 1.06 | 1.79 |
| | 2011 | 45.91 | 54.14 | 8.23 | 1.18 | 7.48 |
| | 2016 | 60.82 | 61.83 | 1.01 | 1.02 | 0.45 |
| Under 5 children with Pneumonia taken to HF | 2001 | | | | | |
| | 2006 | 41.5 | 53.7 | 12.2 | 1.29 | 10.77 |
| | 2011 | 47.34 | 69.04 | 21.7 | 1.46 | 19.54 |
| | 2016 | 47.48 | 63.7 | 16.22 | 1.34 | 8.65 |

## DISCUSSION

Coverage of RMNCH services in Nepal was 65% in 2016 by CCI values. Globally, almost one-quarter of LMICs have CCI values of 80% or more, with substantial variance across countries ranging from 37% in Ethiopia to 90% in Costa Rica. The gap in RMNCH service coverage seems to be narrowing down in Nepal based on both wealth quintiles and place of residence. Nepal has had a substantial increase in CCI for RMNCH services (increasing by 22 percentage points over 15 years), similar to most other LMICs.[15] The absolute difference in coverage of RMNCH services in Nepal between Q1 and Q5 was eight percentage points in 2016. The absolute difference between Q1 and Q5 wealth quintile varied globally, ranging from three percentage points in Jordan to 61 percentage points in Nigeria, among developing countries. The difference in RMNCH services coverage is 19 percentage points in Bangladesh, 21 percentage points in India, 22 percentage points in Timor-Leste and 26 percentage points in Myanmar.[13] Almost one-quarter of LMICs have a difference between Q1 and Q5 wealth quintile as large 30 percentage points or higher.[15] However, it should be noted that the reduction of gaps

between two extreme wealth quintiles could be the usual outcome of higher service coverage and may not be necessarily linked to the targeted equity-focused interventions.

Within RMNCH services in Nepal, gaps based on wealth quintiles seem to be widening up for births attended by SBA and four ANC services. Despite the aggressive efforts from government of Nepal (GoN) in reducing financial barriers and expanding health services, differences based on wealth quintile seem to be the highest in maternal health services, such as births attended by SBA and four ANC visits. In Nepal, the difference in coverage between Q1 and Q5 for births attended by SBA was found to be 52 percentage points in 2016, with coverage in Q1 falling below the national average by 25 percentage points. Not only do Q1 and Q5 have the highest absolute differences in coverage of births attended by SBA services compared to other RMNCH services, but the gap is also widening, increasing with the difference between richest and poorest wealth quintile from 45 percentage points in 2001 to 52 percentage points in 2016. PAR for births attended by SBA indicates even more room for improvement. Globally, almost 17 percentage points improvement can be achieved in births attended by SBA by eliminating inequalities based on wealth quintiles[15] which is 28 percentage points in Nepal.

For immunisation services, particularly BCG, measles and DPT3, differences based on wealth quintiles and place of residence have narrowed substantially. Comparison of the pace of improvement in indicators shows that there has been a faster improvement in disadvantaged groups like populations in Q1 and those residing in rural areas, thereby reducing coverage gaps. [15]

Similar to the findings in our study, evidence suggests that CCI for RMNCH services tends to have higher values in urban compared to rural areas. The difference is seven percentage points in Nepal, eight percentage points in India, nine percentage points in Bangladesh, ten percentage points in Timor-Leste and 16 percentage points in Myanmar.[13] In almost half of the countries globally, the difference between urban and rural areas was less than ten percentage points. In Bosnia and Herzegovina, the Dominican Republic, Jordan, Republic of Moldova and Uzbekistan, this difference was less than two percentage points.[15] However, due to the varying definition of urban and rural setting, the findings may not be exactly comparable from one country to other. For example, in 2011, there were 58 municipalities with 17.1% of population residing in urban area.[16] However, after 2015, the number of municipalities increased to 217 which increased the urban population to 42%.[17]

This administrative reorganization of the municipalities led to merging of rural areas, which lack the urban infrastructures to urban areas.[18] These changes should be taken into consideration while comparing the service coverage in rural urban setting across different time period and across different countries. The narrowing of the coverage gaps in urban rural setting in Nepalese context could partly because of these administrative changes in recent years.

Previous cross-country analysis has revealed that countries often prioritise improving overall population health first before attaining fairness in financing. Countries that already have a relatively high gross domestic product (GDP) and life expectancy and are less likely to have further improvements in overall health indicators are more likely to prioritise equality and fairness in goals. By contrast, policymakers in countries with lower life expectancy and GDP may prioritise improving health and health care ahead of equality and fairness.[19] Though the system does not systematically discriminate among people, the differential uptake of health services, medical technologies and prevention strategies may prevail among advantaged and disadvantaged groups, which results in inequalities in health. Theory on the diffusion of innovations suggest that the more advantaged segment of the population is often the early adopter of innovations that improve health, thereby widening socio-economic inequalities.[19]

Countries like Nepal, where health indicators still have enough room for improvement in even relatively advantaged groups of the population, should emphasise the importance of simultaneously addressing overall improvements in health and inequity as these goals are not mutually exclusive. Health policies and programmes that target improvement in health governance and responsiveness generally bring improvement in overall health and reduce inequalities.

Reducing inequalities in births attended by SBA, and four ANC visits seem to be the topmost priority in our context. Having an in-depth understanding of the nature of inequality and its drivers is a fundamental step towards solving it. Very often, the effectiveness of interventions to address inequalities based on economic status and place of residence are undermined by weak monitoring and evaluation mechanisms of existing interventions or programmes, inadequate financing for planned interventions, lack of cooperation/collaboration between various stakeholders in health, and poor health system governance, including inadequate/inappropriate accountability mechanisms.[20] Such issues need to be explored and addressed.

To improve coverage, effectively deliver health services and reduce inequalities, health systems must become more robust, with stronger leadership, management, financing, community engagement, and other critical elements, such as ensuring availability and quality of medicines, human resources and infrastructure.[21] Nepal, which has locally elected governments directly responsible for delivering primary health care, can also harness the opportunity to develop locally tailored innovative strategies to reduce inequalities. Nepal also offers financial incentives to women delivering in HF and having four ANC coverage. However, despite this scheme, deliveries attended by SBA and four ANC coverage show the widest differences between the poorest and richest wealth quintiles. Further qualitative studies could be helpful in identifying the reasons behind these differences.

The social health insurance scheme, which aims to ensure cent-percent coverage of the population not able to afford enrolment, could potentially help narrow the differences based on wealth quintiles. Currently, GoN is working on schemes for formal identification of the poor, which will further facilitate the development of strategies for specific situations where poor populations are clustered.

Reproductive, maternal, newborn and child health services has been a priority area for the GoN which is reflected in a series of policy initiatives such as maternity incentive schemes, skilled birth attendant policy, birth preparedness package, and expansion of FP services; all of which could be responsible for the reduction of inequalities in specific services. Similarly, the national immunization programme and integrated management of newborn and childhood illnesses have also been the area of priority of the government of Nepal. Reduction of the inequalities in the RMNCH services could be the result of such initiatives from government of Nepal.

Dealing with inequalities requires both interventions on the demand and supply side. To reduce inequalities in the long run, however, interventions also need to go beyond the health sector, such as development of human capital, and investment in female education in rural areas and the poor.[22]

This study has some limitations. The wealth index in DHS measures the household's economic status based on availability of assets and services. However, belonging to richer wealth quintiles does not necessarily mean that the income is readily available to individuals. Social norms and cultural practices could prevent individuals from seeking services which have not been covered in the analysis. The greater gains in earlier years does not necessarily mean that programmes were more effective in the earlier stages, but which lost their effectiveness in later stages. As the coverage of services increases, proportionate additional gains could be difficult because easy to reach population are already covered and hard to reach require slightly different strategies. The analysis was not intended to evaluate the effectiveness of specific interventions. Caution is needed while linking research results to specific interventions and comparing relatively new programme with programmes that have been running for relatively longer period.

## CONCLUSIONS

There has been progress in reducing inequalities based on wealth quintile and place of residence for most of the RMNCH indicators between the years 2001 and 2016. Among various indicators, there is greater scope for improvement on deliveries attended by SBA and four ANC service coverage services which are lagging compared to other indicators to narrow the inequalities. Services such as FP satisfied by modern methods and measles immunisation seem to be concentrated on the poorest wealth quintiles indicating that poor people have better coverage. On the other hand, particularly for maternal health services, additional efforts in expanding service coverage among the poorest quintile and rural residents could further improve the coverage indicators at the national level and could narrow down the inequalities.

## ACKNOWLEDGEMENTS

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