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Geographic Inequities in Coverage of Maternal and Child health Services in Haryana State of India

Shankar Prinja[1] · Deepak Balasubramanian[1] · Atul Sharma[1] · Rakesh Gupta[2] · Saroj Kumar Rana[1] · Rajesh Kumar[1]

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Abstract

Introduction India aims to achieve universal health coverage, with a focus on equitable delivery of services. There is significant evidence on extent of inequities by income status, gender and caste. In this paper, we report geographic inequities in coverage of reproductive, maternal and child health (MCH) services in Haryana state of India. *Methods* Cross-sectional data on utilization of maternal, child health and family planning services were collected from 12,191 women who had delivered a child in the last one year, 10314 women with 12–23 months old child, and 45864 eligible couples across all districts in Haryana state. Service coverage was assessed based on eight indicators − 6 for maternal health, one for child health and one for family planning. Inter- and intra-district inequalities were compared based on four and three indicators respectively. *Results* Difference in coverage of full ante-natal care, full immunization and contraceptive prevalence rate between districts performing best and worst was found to be 54%, 65% and 63% respectively. More than one-thirds of the sub-centres (SCs) in Panchkula, Ambala, Gurgaon and Mewat districts had their ante-natal care coverage less than 50% of the respective district average. Similarly, a significant proportion of SCs in Mewat, Panipat and Hisar districts had full immunization rate below 50% of the district average. *Conclusion* Widespread inter- and intra-district inequities in utilization of MCH services exist. A comprehensive geographical targeting to identify poor performing districts, community development blocks and SCs could result in significant equity gains, besides contributing to quick achievement of sustainable development goals.

Keywords Maternal and child health · Family planning · Healthcare services coverage · Geographic inequities · Inter-district inequities · Intra-district inequities

Significance

What is already known on this subject? There is significant evidence on the extent of inequities in utilization of healthcare services by income status, gender and caste in Haryana state, India. However, much less evidence is available in terms of geographic inequities. *What this study adds?* The study identifies wide intra-district inequities in coverage of reproductive, maternal, neonatal and child health (RMNCH) services in all districts of the state. Though inter-district variations were not observed to be as much, large differences were observed among performance of lowest and highest scoring districts. Major socio-political investments are required in public policies to reduce health inequities.

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✉ Shankar Prinja
shankarprinja@gmail.com

Deepak Balasubramanian
deep19882000@gmail.com

Atul Sharma
dr.atulsharma@hotmail.com

Rakesh Gupta
rguptaias@gmail.com

Saroj Kumar Rana
rana_saroj@rediffmail.com

Rajesh Kumar
dr.rajeshkumar@gmail.com

[1] School of Public Health, Post Graduate Institute of Medical Education and Research, Chandigarh, India

[2] Department of Health and Family Welfare, National Rural Health Mission, Haryana, Panchkula, India

Introduction

The sixty-seventh general assembly of the United Nations called upon all the member nations to provide its people with access to affordable and quality health-care services (Ministry of Statistics and Programme Implementation 2015). The 12th five-year plan of Government of India (GoI) gives recognition to this and has included universal health coverage (UHC) as a target (Prinja et al. 2015). At the heart of achieving universal coverage, is an aspiration for attainment of equity in both health service utilization and outcomes. India's flagship health program—National Rural Health Mission (NRHM) (now called National Health Mission (NHM)) has also been designed with this consideration: to increase the coverage of services and achieve UHC while maintaining focus on equity.

In order to quantify progress towards achieving UHC, there is a need to periodically monitor the performance of the health system, especially in terms of population coverage of health services (Ministry of Health & Family Welfare 2005). This can be achieved in two broad ways: relying on routine management information system (MIS), or using periodic surveys. While, on the one hand, the routine MIS is fraught with incompleteness and over reporting (Sharma et al. 2016), on the other hand the coverage evaluation surveys (CES) which exist, such as national family health surveys (NFHS) and CES, provide only state level coverage, while the programmatic need in a decentralized atmosphere is to have coverage at the district and sub-district level. Surveys like district level health survey (DLHS) which report district level findings, last conducted in 2012 in Haryana, suffer from numerous methodological issues, including but not limiting to large reference periods for eligible respondent selection and long gaps between successive surveys.

Another subject of dispute is the extent to which these sources analyse and report on inequities in coverage. While coverage by wealth groups, caste and other socio-demographic groups is still reported, very less evidence is available in terms of geographic inequities (International Institute of Population Sciences 2008; Kieny and Evans 2013; Ministry of Health & Family Welfare 2005; Prinja et al. 2012, 2016). The importance of documenting geographic inequities is that they can be easily ameliorated through targeted action. On the other hand, non-geographic inequities are relatively difficult to address programmatically, as the means necessary to identify the vulnerable are more difficult. For example, whether the efficiency of below poverty line list to identify 'real poor' is doubtful. Also, much of the action in terms of targeting under NHM has happened through geographic route.

In order to bridge this gap in evidence base for geographic inequalities in health care utilization, i.e. lack of district and sub-district level coverage data; as well as need to identify geographic inequities, we undertook this study to assess the same for reproductive, maternal and child health (MCH) services in Haryana state, India.

Methods

Study Setting

Haryana is one of the northern states of India divided in 22 districts (21 at the time of study), with a total population of 25,353,081 (2.1% of Indian population) (Table 1). The state lies in the top quartile in terms of per capita gross domestic product (GDP) in India. The human development index (HDI) value of the state is 0.545 (Suryanarayana et al. 2011). However, it lags behind other states in many health and healthcare service indicators. The adult sex ratio of 877 of Haryana is among the lowest in the northern region and is far lower than national average of 940 (Office of the Registrar General and Census Commissioner 2012). In terms of the infant mortality rate (41 per 1000 live births), Haryana ranks 27 among 35 states and Union Territories in India, which is low considering the human and economic development in the state (Office of the Registrar General and Census Commissioner 2014).

The state has 40 district and sub-divisional hospitals, 109 Community Health Centres, 454 Primary Health Centres and 2542 Health sub-centres (SCs) for provision of health services.(National Rural Health Mission 2014) Public health expenditure in the state was INR 483 (USD 8.1) per capita in 2012–2013, of which State Government and Union Government spending was INR 403 (USD 6.7) and INR 80 (USD 1.3) per capita, respectively (Ministry of Health & Family Welfare 2009; Tandon and Cashin 2010). The district profile of all 21 districts has been provided in Table 1.

Data Collection

This analysis reported in this study is based on data collected as part of a larger household survey undertaken from September 2012 to March 2014 in the state of Haryana to measure the extent of UHC. As part of this survey, 30 graduate-level field investigators collected household-level information from a randomly selected sample of SCs in all 21 districts of the state. A multistage stratified random sampling design was used in selection of primary sampling units (PSUs: a sub-centre was the PSU in rural area, while list of polio posts was used for selecting PSUs in urban area), villages under PSUs, and households in each village. Households were selected from all villages under a PSU, based on probability proportional to size. In each PSU, three categories of individuals were interviewed to assess coverage of

Table 1 Demographic characteristics of population in Haryana and its districts, 2011

State/district	Growth rate (2001–2011)[1]	Sex ratio[2]	Sex ratio (0–6 years)[3]	Literacy rate (total)[4]	Literacy rate (males)[5]	Literacy rate (females)[6]	Sub-centres evaluated
Ambala	12.1	882	807	82.9	88.5	76.6	19
Bhiwani	14.3	884	831	76.7	87.4	64.8	19
Faridabad	31.7	871	842	83	89.9	75.2	39
Fatehabad	16.8	903	845	69.1	78.1	59.3	17
Gurgaon	73.9	853	826	84.4	90.3	77.6	31
Hisar	13.4	871	849	73.2	82.8	62.3	19
Jhajjar	8.7	861	774	80.8	89.4	71	34
Jind	12	870	835	72.7	82.5	61.6	20
Kaithal	13.4	880	821	70.6	79.3	60.7	20
Karnal	18.2	886	820	76.4	83.7	68.3	18
Kurukshetra	16.8	889	817	76.7	83.5	69.2	19
Mahendragarh	13.4	894	778	78.9	91.3	65.3	34
Mewat	37.9	906	903	56.1	73	37.6	34
Palwal	25.5	879	862	70.3	82.6	56.4	36
Panchkula	19.3	870	850	83.4	88.6	77.5	17
Panipat	24.3	861	833	77.5	85.4	68.2	28
Rewari	17.1	898	784	82.2	92.9	70.5	34
Rohtak	12.6	868	807	80.4	88.4	71.2	19
Sirsa	16	896	852	70.4	78.6	61.2	17
Sonipat	15.7	853	790	80.8	89.4	70.9	18
Yamunanagar	16.6	877	825	78.9	85.1	72	35
Haryana*	19.9	877	830	76.6	85.4	66.8	521

*Overall state figures

[1]Growth Rate: Percentage increase in the number of people living in a particular district between 2001 and 2011

[2]Sex Ratio: Number of females per 1000 males in the population

[3]Sex Ratio (0–6 years): Number of females per 1000 males in the age group of 0–6 years in the population

[4]Literacy Rate (Total): Percentage of literates in the age-group seven years and above

[5]Literacy Rate (Males): Percentage of literates among males in the age-group seven years and above

[6]Literacy Rate (Females): Percentage of literates among females in the age-group seven years and above

RMNCH services—women who had delivered a child within last 1 year of date of survey, women with a child between 12 and 23 months of age and eligible couples (15–45 years old married woman). These individuals were interviewed to collect information on utilization of services for maternal health, immunization and family planning respectively. Additionally, two categories of clients were interviewed for assessing coverage of curative care, however, details of this is beyond the scope of this paper. Further details on study design are available elsewhere (Prinja et al. 2015, 2016; Sharma et al. 2016).

The overall sample comprised 12,427 women who had delivered in the last one year, 10,549 women with a 12–23 months old child and 47,029 eligible couples. The women were interviewed using two schedules, one for capturing their socio-demographic characteristics and the other for information on relevant service utilization. Some women had data missing for one of these variables (Online Resource 1). The final data used for analysis thus comprised 12,191 women who had delivered in the last one year, 10,314 women with a 12–23 months old child and 45,864 eligible couples.

Data Analysis

Outcome Indicators

Overall eight performance indicators were computed, of which six were related to reproductive and maternal health while one each was related to child health and family planning. Among the maternal health indicators, two were related to prophylactic interventions during ante-natal care (ANC) (iron folic acid (IFA tablets) supplementation, tetanus toxoid (TT) injections), two were related to frequency and overall quality of ANC (> 3 ANC check-ups, full ANC), one was related to delivery (institutional delivery rate) and

one to post-natal care (PNC) (> 6 PNC visits by accredited social health activist (ASHA)). Full immunization rate and contraception prevalence rate were the two indicators studied under child health and family planning. Operational definitions of these indicators have been presented in Online Resource 2. The indicators were computed and compared for all districts; averages for the state were generated from available data. Both the state and district coverage was weighted average of coverage at respective levels. For the state and district level, coverage was weighted by the distribution of rural–urban, literacy levels and caste among sample and universe population of state and district.

Inter-district Inequities

The inter-district inequities were evaluated using four indicators: coverage of full ANC services, institutional delivery rate, full immunization rate and contraceptive prevalence rate. Each district was graded into poor performing, average performing and good performing on the basis of its performance for that indicator relative to the state average. Districts with results less than 50% of the state average were classified as poor performing, those between 50–80% as average performing while those higher than 80% of the state average as good performing.

Intra-district Inequities

The intra-district inequities were ascertained using three indicators: coverage of full ANC services, institutional delivery rate and full immunization rate. Average performance of the districts in terms of these indicators was computed from results for individual SCs in the district. Each SC in the district was then graded into poor performing, average performing and good performing on the basis of its performance for that indicator relative to the district average. SCs with results less than 50% of the district average were classified as poor performing, those between 50–80% as average performing while those higher than 80% of the district average as good performing. The percentage of SCs in each grade was then calculated to determine the intra-district inequities.

Ethical Approval

Ethical approval was obtained from the Institute Ethics Committee of the first author's institute. Written informed consent was sought from the respondents in all the households that were included in the survey. The administrative approval of the Health Department, Government of Haryana was also obtained.

Results

Sample Characteristics

A total of 521 primary sampling units were studied across Haryana, with the number for each district roughly proportional to its geographical area (Table 2). The sample was divided into rural: urban ratio of 4:1. Almost 80% of the respondents studied were Hindu, while around 70% were literate. The sample was uniformly distributed among scheduled caste/scheduled tribe (39.6%), Other backward classes (34.4%) and general category (26.1%). About 33.8% respondents belonged to poorest two categories of the wealth quintiles of the population (Table 2).

Coverage of RMNCH Services

The coverage of TT injections and institutional delivery rate were high (82.3% and 82.2% respectively) in the state, while coverage of full immunization rate, ≥ 3 antenatal check-ups and contraceptive prevalence rate were relatively moderate at 70.9%, 68.2% and 59.4% respectively (Table 3). Coverage of IFA supplementation, full ANC and six or more postnatal care visits by ASHA were observed to be poor at 36.4%, 26.2% and 12.4% respectively.

Inter-district Inequities

Inter-district inequities in the state were found to be < intra-district inequities, though the difference between highest and lowest performing districts was observed to be statistically significant for some indicators.

Full ANC

Mewat, Bhiwani, Palwal and Karnal districts were observed to be in poor performance category in the state (3.2%, 9.4%, 10.9% and 12.8% respectively) (Fig. 1a). Sirsa and Faridabad districts (with 13.9% and 17.8% full ANC rate respectively) were in the average performance category relative to the state average, while all other districts were observed to be in the good performance category. The lowest and highest performing districts differed by 54% points in terms of coverage of full ANC care.

Full Immunization Rate

Districts of the state performed even better in terms of full immunization rate. While only Mewat district (28.9% full immunization rate) and Gurgaon district (49.1% full immunization rate) appeared in the bottom two categories, all

Table 2 Socio-demographic characteristics of study sample

Characteristics	Women who delivered a child in last 1 year* N (%)	Women with 12–23 months old child* N (%)	Eligible couples* N (%)
Overall sample	12,191 (100)	10,314 (100)	45,864 (100)
Area			
Rural	9745 (79.9)	8498 (80.6)	37485 (79.7)
Urban	2446 (20.1)	2051 (19.4)	9544 (20.3)
Religion			
Hindu	9450 (80.9)	8245 (80.3)	37240 (81.5)
Muslim	1119 (9.6)	1082 (10.5)	4157 (9.1)
Christian	397 (3.4)	362 (3.5)	1634 (3.6)
Sikh	703 (6.0)	578 (5.6)	2655 (5.8)
Caste			
SC	4548 (39.2)	4101 (40.3)	17281 (38.2)
ST	43 (0.4)	52 (0.5)	178 (0.4)
OBC	3988 (34.4)	3408 (33.5)	15220 (33.6)
General/others	3024 (26.1)	2617 (25.7)	12589 (27.8)
Occupation			
Self employed	7680 (65.8)	6804 (66.6)	30873 (67.9)
Wage employee and others	646 (5.5)	560 (5.5)	2252 (5)
Unemployed	1249 (10.7)	1486 (14.5)	6340 (14)
Salaried employee	2103 (18.0)	1364 (13.4)	5975 (13.1)
Education			
Illiterate	3464 (29.6)	3568 (33.9)	15094 (32.2)
Literate	8242 (70.4)	6951 (66.1)	31842 (67.8)
Wealth quintile			
Poorest	1786 (15.2)	2318 (22.5)	9762 (21.3)
Poor	2178 (18.6)	2057 (19.9)	9299 (20.3)
Moderate	2372 (20.2)	2042 (19.8)	8961 (19.5)
Rich	2597 (22.2)	1977 (19.2)	9039 (19.7)
Richest	2788 (23.8)	1920 (18.6)	8803 (19.2)

*Stratum totals do not add up to overall total due to missing data

Table 3 Coverage of RMNCH Services in Haryana, India, 2012–2014

Indicators	Mean coverage	95% confidence interval	
		LL	UL
Maternal health			
IFA supplementation (≥ 100)	36.4	35.6	37.2
TT injections (2)	82.3	81.7	83.0
Antenatal check-ups (≥ 3)	68.2	67.4	69.1
Full ANC	26.2	25.5	27.0
Institutional delivery	82.2	81.5	82.8
Postnatal care (6 visits by ASHA)	12.4	11.9	13.0
Child health			
Full immunization	70.9	70.1	71.7
Family planning			
Contraceptive prevalence rate	58.1	57.7	58.5

other districts' results were higher than 80% of the state average (Fig. 1b). A difference of 65% was observed between worst and best districts.

Institutional Delivery Rate

Though institutional delivery rate ranged from 52% in Mewat district to 98% in Rewari district (a difference of 46%), 19 of the 21 districts appeared in the good performance category (Fig. 1c). While none of the districts performed less than 50% of the state average, only Mewat and Palwal (52% and 57% respectively) districts were found to be average performing.

Contraception Prevalence Rate

Similar to other indicators, majority of the districts were observed to be in good performance category with

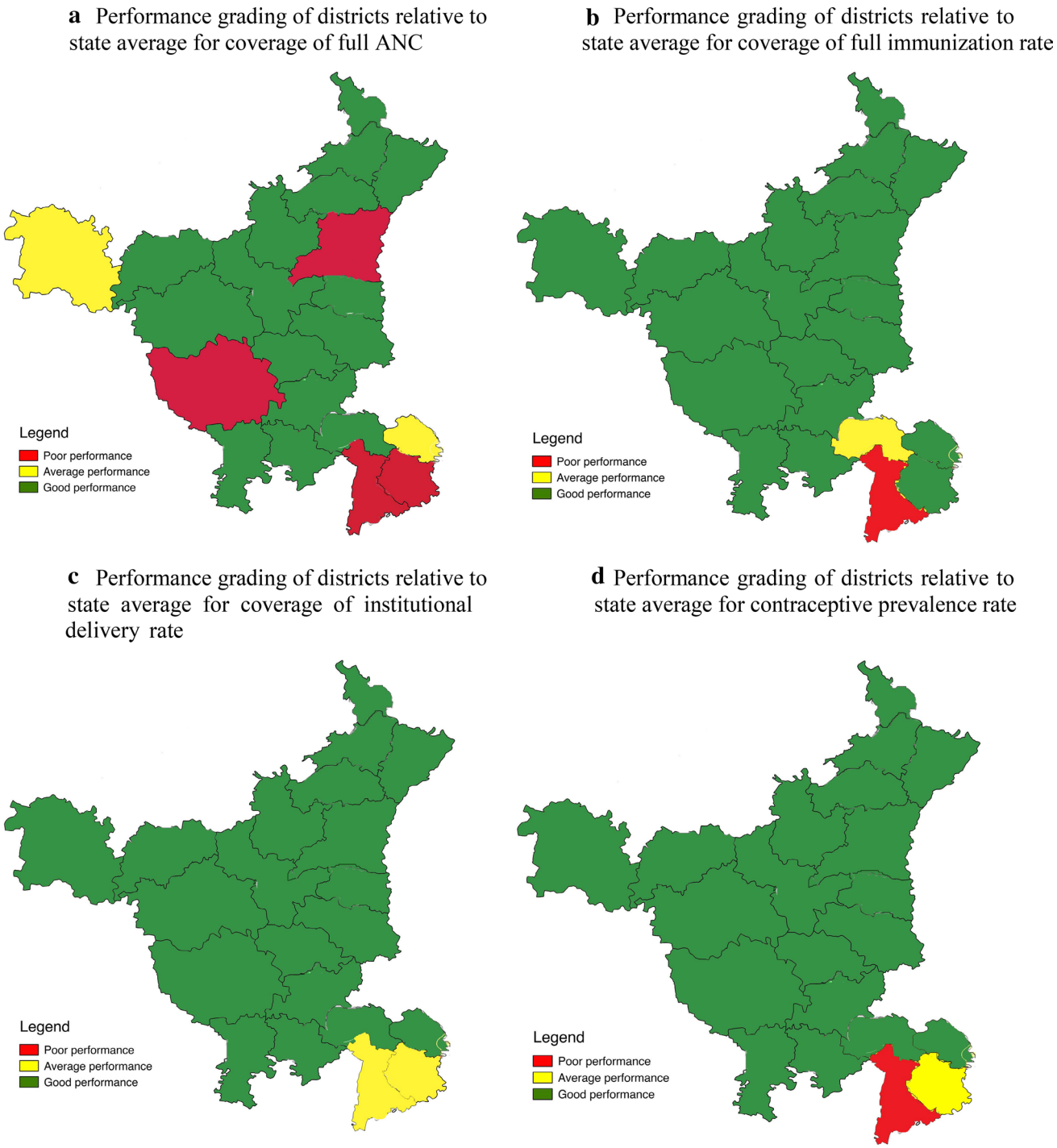


Fig. 1 Extent of inter-district inequities in coverage of key RMNCH services in various districts of Haryana. **a** Performance grading of districts relative to state average for coverage of full ANC. **b** Performance grading of districts relative to state average for coverage of full immunization rate. **c** Performance grading of districts relative to state average for coverage of institutional delivery rate. **d** Performance grading of districts relative to state average for contraceptive prevalence rate

respect to contraception prevalence rate. While Mewat (24%) and Palwal district (46%) were the only districts in poor and average performing categories, Kaithal and Ambala districts were the top scorers, with 75.5% and 87.2% coverage respectively (Fig. 1d). There was a difference of 63% between the worst and the best performance district in the state.

Intra-district Inequities

Full ANC

More than 50% of SCs were found to be in the good performance category with respect to 'Full ANC' indicator in Haryana, with the highest proportion in Rohtak (76%), Jhajjar (75%), Fatehabad (71%) and Palwal (71%) districts (Fig. 2a). While Rohtak and Gurgaon districts had no SCs in the moderate performance category, nearly one-fourth of the same were in moderate grade in Rewari (26%), Jhajjar (25%), Hisar (23%) and Kurukshetra (22%) districts. More than one-thirds of the total SCs in Panchkula (50%), Ambala (37%), Gurgaon (37%) and Mewat (36%) districts were in low performance category.

Full Immunization Rate

Most of the districts in Haryana, except Kurukshetra and Rohtak had moderate to low performing SCs in providing full immunization to infants (Fig. 2b). Mewat (35%), Panipat (23%), Hisar (21%), Palwal (14%), Fatehabad (11%), Kaithal (10%) and Gurgaon (10%) districts had a high proportion of SCs with full immunization rate below 50% of the state average. The districts with a larger number of moderately performing SCs were Hisar (32%), Sonipat (38%), Jhajjar (19%), Karnal (19%), Rewari (17%) and Sirsa (18%).

Institutional Delivery Rate

Nearly 18 districts had more than 80% of their SCs in good performance category, with all SCs of Jhajjar and Palwal districts performing more than 80% of the state average in coverage of institutional delivery (Fig. 2c). Four districts, Jhajjar, Jind, Kaithal and Palwal, had no SCs in the moderate performance category. Thirteen of the total districts were found to have no SCs in the low performance grade, with Mahendragarh (15%), Mewat (8%), Panchkula (7%), Faridabad (6%), Kaithal (6%), Jind (5%), Yamunanagar (3%) and Bhiwani (3%) having a small proportion of low performing SCs.

Discussion

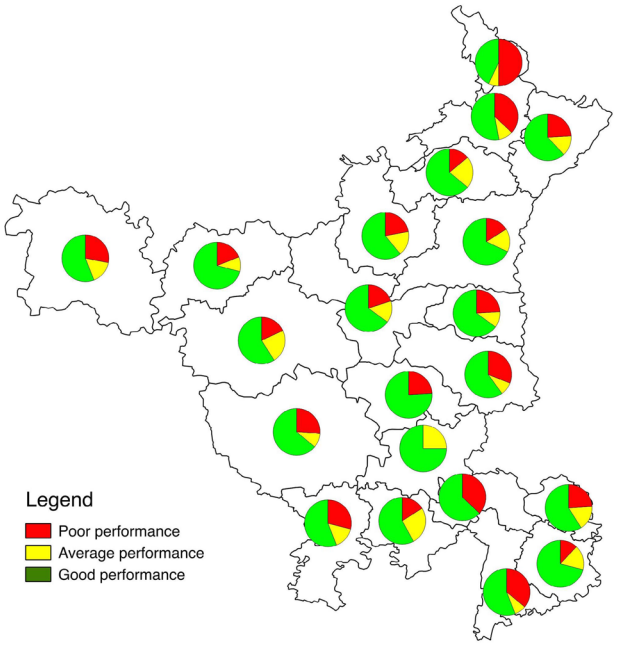
Our study showed that whereas coverage of TT injection during ANC and institutional delivery were good in the state, coverage of full immunization, ≥ 3 antenatal check-ups and contraceptive prevalence rate were average. The coverage of iron-folic acid supplementation, full ANC and postnatal care were poor and needed much improvement. There were wide intra-district inequalities in coverage of RMNCH services in all districts. Though inter-district variations were not observed to be as much, with majority of districts performing well relative to the state average, the difference between performance of lowest and highest scoring districts was uniformly high for all indictors and a cause of significant concern. Similarly, significant intra-district inequalities in service coverage were also observed which calls for a targeting of services in these low-performing areas.

Comparison of study results with findings of NFHS 3, CES and DLHS 4 revealed an increase in coverage of IFA tablet consumption, ≥ 3 antenatal check-ups, institutional delivery and full immunization rate (Table 4). On the other hand, a decline in coverage of full ANC and contraceptive prevalence rate was observed. The difference in coverage when compared with DLHS survey results could be a result of different definitions employed for full ANC in the two surveys. While DLHS considered at-least 3 antenatal check-ups, one TT injection and 100 IFA tablet consumption for full ANC, the present study considered at-least three ANC, two TT injections and at-least 90 IFA tablets for defining the same. However, results of our study should be more reliable considering the larger reference period for eligible respondent selection criteria used by DLHS which may result in recall bias. The DLHS sample interviewed women who had delivered as long as 5 years ago to interview for receipt of services during pregnancy and child-birth. Moreover, the present study covered 110,427 households, interviewing 12,427 women for collecting ante- and post-natal care information.

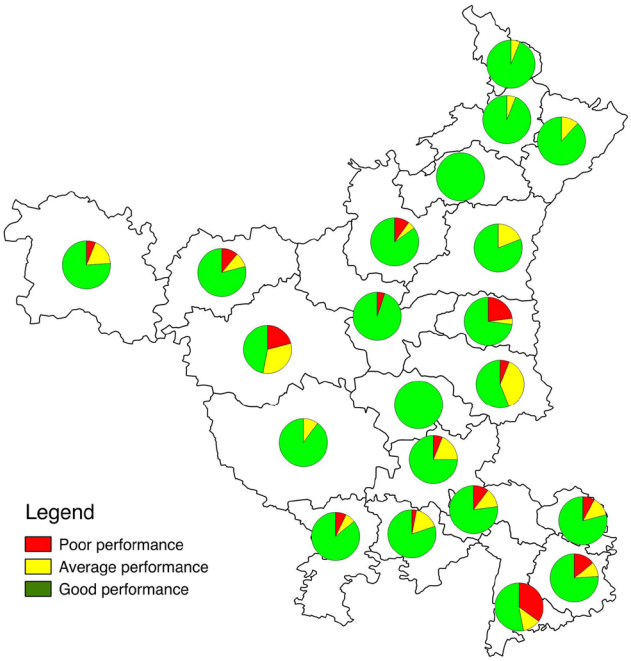
The impact of implementation of NRHM on healthcare indicators can be observed by comparing the coverage results in the present study with those reported in NFHS three. While most of the indicators showed modest improvement, there is not much change in the coverage of TT injection, while there is a decrease in the contraceptive prevalence rate. It may again be noted that the reference period in NFHS three for ANC related information was any birth in the last 5 years preceding the date of survey, whereas the present study considered women who delivered in the past 1 year.

The observed inter- and intra-district geographical inequalities in MCH care coverage of Haryana were similar to results reported by a number of previous studies from different areas of India. Differences in social determinants of health, especially demand-side factors, could be one of the reasons for these geographic variations in coverage of MCH care. Gupta et al. in 2008 reported that inequalities in coverage of MCH care in Chandigarh were attributable to place of respondents' residence, which led to differences in living conditions and environment (Gupta et al. 2008). Wealth related inequities in coverage of safe delivery and contraception use have also been previously reported in Bihar, Haryana, Himachal Pradesh, Punjab, Uttar Pradesh and other northern states. A study conducted in Haryana, Punjab and

a Performance grading of SCs relative to district average for coverage of full ANC



b Performance grading of SCs relative to district average for coverage of full immunization rate



c Performance grading of SCs relative to district average for coverage of institutional delivery rate

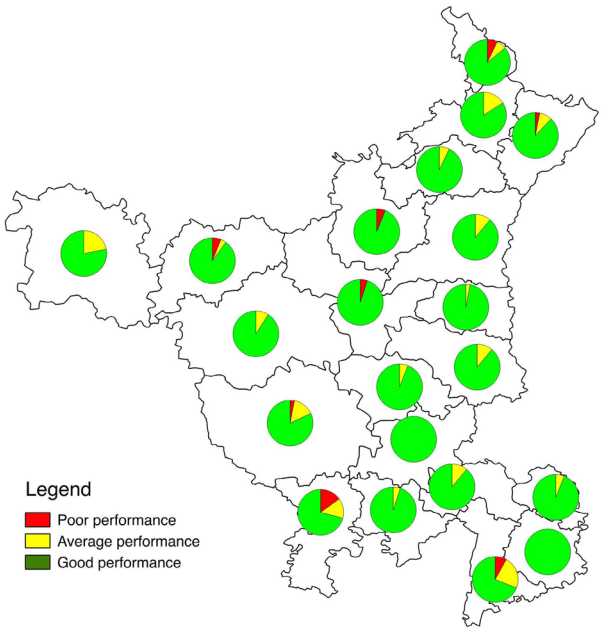


Fig. 2 Extent of intra-district inequities in coverage of key RMNCH services in various districts of Haryana. **a** Performance grading of SCs relative to district average for coverage of full ANC. **b** Performance grading of SCs relative to district average for coverage of full immunization rate. **c** Performance grading of SCs relative to district average for coverage of institutional delivery rate

Table 4 Comparison of indicators of present study with results from NFHS-3, CES and DLHS 4

Indicator	NFHS 3 (2005–2006	CES (2009)	DLHS 4 (2012–2013	Present study (2011–2014
Iron folic acid (IFA) tablets (≥ 90)	27.0[a]	49.1[b]	20.9[c]	36.4[b]
Tetanus toxoid (TT) injection (= 2)	83.4[a]	88.9[b]	66.2[d,c]	83.0[b]
≥ 3 Antenatal checkups (ANC)	59.0[a]	68.6[b]	44.8[c]	68.2[b]
Full ANC	NA	42.9[b]	15.0[c]	26.2[b]
Institutional delivery (ID)	36.0[a]	63.3[b]	77.0[c]	82.2[b]
Full immunization	65.0	71.7	52.1	70.9
Contraception prevalence rate (CPR)	63.0[a]	NA	51.6[c]	58.5[b]

[a]% of last births in the past 5 years

[b]% of women who delivered in the past 1 year

[c]% of women who has last birth since Jan 2008

[d]Atleast one TT injection

Chandigarh, the richest states of India (highest per capita GDP) showed pro-rich distribution in utilization of health services, suggesting poverty as a factor for inequality (Prinja et al. 2012). Sanneving et al. observed that the quality of ANC care differs according to the socio-economic status of the women and for receiving the same quality of service as the rich, the poor have to spend a major part of their income (Sanneving et al. 2013). Mathew JL grouped the inequities in vaccination into individual (age, gender, birth order), family (area of residence, wealth, parental education, level of women autonomy), demography (religion and caste), and community (access to health care and community literacy level) factors (Mathew 2012). Thus, in the background of a vast number of social determinants of health, it is important to look beyond a single determinant as a cause for inequity or inequality.

Another important reason for these regional and sub-regional disparities could be differences in supply side structural and functional mechanisms, such as state health policies, programme implementation, health manpower/infrastructure or governance/administrative control. For example, significant geographic variations have been reported in literature among northern and southern states in utilization of services (Kumar and Mohanty 2011), where southern states like Kerala, Tamil Nadu, Andhra Pradesh and Karnataka have been reported to be better performing than the northern states in delivery of quality ANC services (Mathew 2012; Rani et al. 2008). Even among southern states, utilization patterns have been found to be non-uniform, being higher in Kerala and Tamil Nadu states than Andhra Pradesh and Karnataka states (Navaneetham and Dharmalingam 2002). Similarly, inter- and intra-district variations have been reported from north-eastern state of Assam, where coverage of safe delivery ranged from 16% in Dhubari to 62% in Kamrupmetru, while that for PNC ranged from 17% in Dhubari to 62% in Dibrugarh (Mathew 2012). Identification of factors responsible for these inequities requires in-depth analysis of their root causes through both quantitative and qualitative means at both state and district level. Finding the causes of causes and intervening at the root level can only help reduce inequities and inequalities (Sanneving et al. 2013).

Towards reduction of inequalities in utilization of services, the Government of India launched NRHM in 2005. Based on the poor health and demographic indicators, NRHM identified 18 empowered action group (EAG) states with 264 high focus districts for targeted action. These EAG states are getting higher allocation based on their needs as compared to other better-off states. Innovative initiatives like fair financing for greater equity, increasing the access of women to health services, decentralized planning through state and district action plans and flexibility to propose interventions for addressing their local needs and priorities have also been introduced. More recently, high-focus districts have been identified even in non-EAG states, so as to enhance implementation of services in these districts. Strengthening of physical infrastructure and staffing norms under NHM in low-performing districts and sub-districts will be important to address geographic equity (Prasad et al. 2013). There is a need to strengthen existing and develop newer initiatives to reach the unreachable as measure for reducing the inequity (Garg and Nath 2007). Continuous monitoring of geographic inequities will be the key so as to target action, as well as measuring impact of such strategies. A targeted action through such a targeted approach would be useful not only to improve equity, but also make quick gains in overall coverage so as to ensure achievement of sustainable development goals. Moreover, such as strategy of 'progressive universalism' by focusing action in poor-performing areas could ultimately pave the way for UHC (Thomsen et al. 2011).

Health of the people is not the sole responsibility of the health department, but should be a concern of policy makers in each and every sector (Marmot 2005). Every aspect of the

government and economy has the potential to affect health and health equity like finance, housing, employment, transport and health. Policy coherence is crucial, which promotes inter-sectoral coordination and wider social policy towards establishment of linkage between social development and health care planning (Purohit 2004). The prevailing inequalities in access to education, physical infrastructure and social safety should be reduced (Sikander and Shah 2010).

Limitations

We acknowledge that study was limited by non-availability of information on supply side factors. Data on availability of health facilities and delivery of healthcare services, and their accessibility, acceptability and affordability were not collected. This additional data could have been useful to explain these inequalities. Also, social determinants of health play an important role in influencing the healthcare utilization and health outcomes. As the purpose of this article was to demonstrate the inter- and intra-districts variation in inequities in MCH services utilization only, the associations with social determinants were not presented here. However, a number of articles from the results of this study have been published earlier, that have explored the role of these determinants.

The grading of district performance reported under the study was made in reference to the state average, which can be misleading and may give false assurance in case the state average for an indicator is low compared to the region or nation. To overcome this, the cut off may be taken from the level of expected performance determined by international agencies.

Recommendations

The observed inter- and intra-district health inequities in this study necessitate Haryana, one of the richest state of the country, to make major socio-political investments to reduce inequalities. These interventions and investments should, apart from health, focus on finance, education, housing, employment, transport and other sectors as well. This can be achieved by wider social policy and importance given to social determinants at each public policy. Besides identifying and strengthening EAG states of India, NHM should attempt to identify poorly performing districts, community development blocks and SCs and accord priority to these areas.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

References

Garg, S., & Nath, A. (2007). Current status of national rural health mission. *Indian Journal of Community Medicine, 32*(3), 171–172.

Gupta, M., Thakur, J. S., & Kumar, R. (2008). Reproductive and child health inequities in Chandigarh union territory of India. *Journal of Urban Health, 85*(2), 291–299. https://doi.org/10.1007/s11524-007-9250-y.

International Institute of Population Sciences. (2008). *National Family Health Survey (NFHS-3), India, 2005-06: Haryana*. Retrieved from Mumbai.

Kieny, M. P., & Evans, D. B. (2013). Universal health coverage. *Eastern Mediterranean Health Journal, 19*(4), 305–306.

Kumar, A., & Mohanty, S. K. (2011). Intra-urban differentials in the utilization of reproductive healthcare in India, 1992–2006. *Journal of Urban Health, 88*(2), 311–328. https://doi.org/10.1007/s11524-010-9532-7.

Marmot, M. (2005). Social determinants of health inequalities. *Lancet, 365*(9464), 1099–1104. https://doi.org/10.1016/s0140-6736(05)71146-6.

Mathew, J. L. (2012). Inequity in childhood immunization in India: A systematic review. *Indian Pediatrics, 49*(3), 203–223.

Ministry of Health & Family Welfare. (2005). *Report of the national commission on macroeconomics and health*. New Delhi: MoHFW, Government of India.

Ministry of Health & Family Welfare. (2009). *National health accounts India 2004–05*. New Delhi: National Health Accounts Cell, Ministry of Health and Family Welfare, Government of India.

Ministry of Statistics and Programme Implementation. (2015). Per Capita National Income [Press release]. Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=123563.

National Rural Health Mission. (2014). *Report on rural health statistics upto 31st March, 2014*. Panchkula: NRHM

Navaneetham, K., & Dharmalingam, A. (2002). Utilization of maternal health care services in Southern India. *Social Science & Medicine, 55*(10), 1849–1869.

Office of the Registrar General and Census Commissioner. (2012). *Census of India 2011*. New Delhi: Ministry of Home Affairs. Government of India.

Office of the Registrar General and Census Commissioner. (2014). *SRS bulletin* (vol *49*(1)). New Delhi: Ministry of Home Affairs, Government of India.

Prasad, A. M., Chakraborty, G., Yadav, S. S., & Bhatia, S. (2013). Addressing the social determinants of health through health system strengthening and inter-sectoral convergence: The case of the Indian National rural health mission. *Global Health Action. 6*, 20135. https://doi.org/10.3402/gha.v6i0.20135.

Prinja, S., Bahuguna, P., Gupta, R., Sharma, A., Rana, S. K., & Kumar, R. (2015). Coverage and financial risk protection for institutional delivery: How universal is provision of maternal health care in India? *PLoS ONE. 10*(9), e0137315. https://doi.org/10.1371/journal.pone.0137315.

Prinja, S., Bahuguna, P., Pinto, A. D., Sharma, A., Bharaj, G., Kumar, V., et al. (2012). The cost of universal health care in India: A

model based estimate. *PLoS ONE. 7*(1), e30362. https://doi.org/10.1371/journal.pone.0030362.

Prinja, S., Gupta, R., Bahuguna, P., Sharma, A., Aggarwal, A. K., Phogat, A., & Kumar, R. (2016). A composite indicator to measure universal health care coverage in India: Way forward for post-2015 health system performance monitoring framework. *Health Policy Planning*. https://doi.org/10.1093/heapol/czw097.

Prinja, S., Kanavos, P., & Kumar, R. (2012). Health care inequities in north India: Role of public sector in universalizing health care. *The Indian Journal of Medical Research, 136*(3), 421–431.

Purohit, B. C. (2004). Inter-state disparities in health care and financial burden on the poor in India. *Journal of Health & Social Policy, 18*(3), 37–60. https://doi.org/10.1300/J045v18n03_03.

Rani, M., Bonu, S., & Harvey, S. (2008). Differentials in the quality of antenatal care in India. *International Journal for Quality in Health Care, 20*(1), 62–71.

Sanneving, L., Trygg, N., Saxena, D., Mavalankar, D., & Thomsen, S. (2013). Inequity in India: The case of maternal and reproductive health. *Global Health Action, 6*, 19145. https://doi.org/10.3402/gha.v6i0.19145.

Sharma, A., Rana, S. K., Prinja, S., & Kumar, R. (2016). Quality evaluation of health management information system for maternal & child health care in Haryana state, India. *PLoS ONE.* 11(2), e0148449. https://doi.org/10.1371/journal.pone.0148449.

Sikander, M. U., & Shah, S. A. A. (2010). Inter-district inequalities in social service delivery: A rationalised approach towards funds disbursement. *Pakistan Development Review, 49*, 881–899.

Suryanarayana, M. H., Agrawal, A., & Prabhu, K. S. (2011). *Inequality adjusted human development index for India's States*. New Delhi: United Nations Development Programme.

Tandon, A., & Cashin, C. (2010). Assessing public expenditure on health from a fiscal space perspective. *Health, nutrition and population (HNP)*. Washington, DC: The International Bank for Reconstruction and Development/The World Bank.

Thomsen, S., Hoa, D. T., Malqvist, M., Sanneving, L., Saxena, D., Tana, S., et al. (2011). Promoting equity to achieve maternal and child health. *Reproductive Health Matters, 19*(38), 176–182. https://doi.org/10.1016/s0968-8080(11)38586-2.