Trends in institutional delivery and Caesarean section rates: 2005-2015

Introduction

It has been well documented that institutional deliveries and timely caesarean section (CS) for women with well-defined obstetric problems, save infant lives and reduce maternal morbidity. In the second half of the last century, the major concern in most of the developing countries was the low institutional delivery rates, low CS rates and persistent high maternal and perinatal mortality rates.

In the last two decades there has been a steep increase in caesarean section rates in some developed and some developing countries[1]. Part of the increase in CS rates especially in developing countries was due to increased institutional deliveries enabling timely CS in women with obstetric problems. However, both in developed and developing countries, there has been an increase in CS without clear cut obstetric indication; oft cited reasons for such CS ranged from convenience and choice of the woman to the logistic and financial benefit of the obstetrician and hospital. Unwarranted CS is associated with higher maternal and perinatal morbidity and may have adverse implications for future pregnancies[2-5].

Over years, India had invested in providing access to antenatal care and institutional deliveries. These interventions led to a slow increase in institutional delivery rates, and improvement in maternal and perinatal outcomes[7,8,9]. Between 2005 and 2015 there was a steep increase in institutional deliveries, and a relatively small rise in CS rates[10-12]. The rise in CS rates in India could be partly due to rise in institutional deliveries which enabled women requiring CS to benefit from timely CS and partly due to unwarranted CS done without any obstetric indications[10-12].

The present study undertook analysis of raw data from National Family Health Survey (NFHS) 3, District Level Household Survey 4 (DLHS 4), Annual Health Survey (AHS) third round and NFHS 4:

- to assess trends in institutional delivery in government (govt) and private (pvt) institutions at national, regional and state levels
- to assess CS rates in govt and pvt institutions at national, regional and state levels
- to assess CS rates in relation to the profile of the woman
- to identify regions, states, type of institutions and segments of population having low and high CS rates and
- suggest interventions for attaining near-universal institutional delivery and optimal CS rates

Focussed intervention based on these data may enable the country to achieve near universal access to institutional delivery without undue increase in CS rate.

Material and methods

The schedules used for data collections for NFHS3-4, DLHS4 and AHS round three were compared. Schedules used in all the surveys had provision to collect information on place and mode of delivery. Deliveries took place at home, on the way to the hospital, sub centre, PHC, CHC, rural hospital, government dispensaries, maternity centres, AYUSH hospitals, private hospitals, maternity centres, nursing homes and trust hospitals. For the purpose of the present

analysis institutional deliveries were defined as deliveries in institutions with inpatient beds where women were admitted and a doctor and nursing staff were available to provide care during delivery; therefore, sub-centre deliveries were not included as government institutional deliveries. All hospitals providing delivery care may not have facilities to undertake CS. However, none of the surveys provided information whether CS was being undertaken in the institution where delivery occurred. Therefore, for computing CS rates in institutional deliveries (govt, pvt and all institutions) institutions where delivery occurred were used as denominator. In all surveys, information regarding type of delivery was available. NFHS reported only CS and non-CS deliveries while AHS and DLHS4 reported normal deliveries, assisted deliveries and CS.

Raw data from all these surveys were analysed to compute institutional delivery rates and CS rates in relation to place of residence (urban/rural) using the above uniform definitions (Table 1).

Table 1

Survey	Year of survey	Number of		
		Total deliveries	Institutional deliveries	CS
NFHS 3	2005-06	50562	22539	5394
NFHS 4	2015-16	255584	189401	35184
AHS 3rd round	2012-13	442840	271611	39681
DLHS 4	2012-13	114160	39681	21510

- Delivery rates in relation to place of delivery were computed at national (NFHS3 and 4), regional (AHS states and DLHS states) and at state level (NFHS3, 4 AHS and DLHS4).
- CS rates in relation to all deliveries were computed at national level from NFHS3 and 4, at regional level (AHS vs DLHS4 states) and at State level.
- CS rates in institutional deliveries (govt, pvt and all institutions) were computed at national level from NFHS3 and 4, at regional level (AHS and DLHS4) and at State level.

Data on CS rates (state wise in govt and private institutions) extracted from the Reports/Fact Sheets of NFHS3, 4, DLHS4 and AHS (third round), were tabulated and compared with the institutional delivery and CS rates obtained from the analysis of the raw data from the surveys.

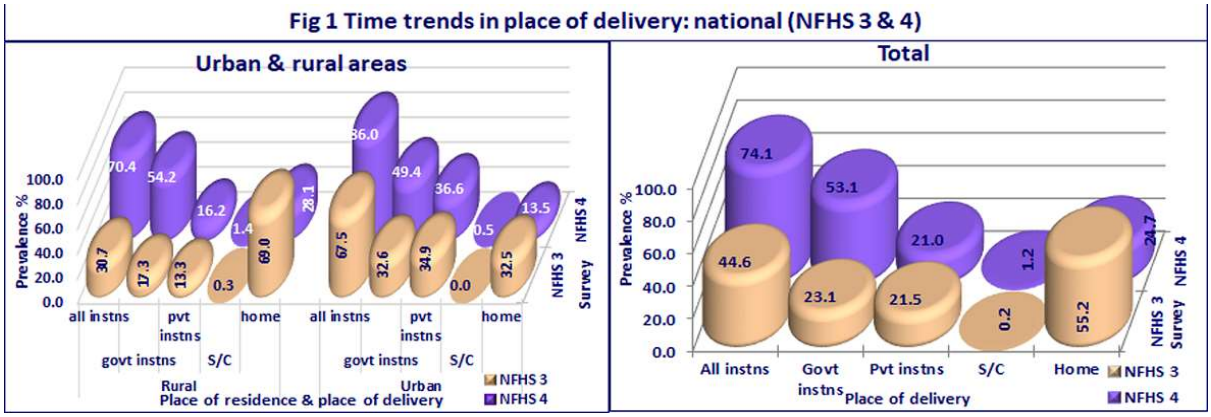
AHS third round and DLHS4 carried out in 2013 had very large sample size. Raw data from these two surveys were analysed to assess CS rates in relation to profile of the women (standard of living index, literacy, age and birth order).

Results

Time trends in institutional delivery rates

National At the national level between 2005 and 2015 there was a steep fall in home deliveries and rise institutional delivery rates both in urban and rural areas. Sub-centre deliveries were low both in 2005 and at 2015.The rise in institutional deliveries was mostly due to increase in deliveries in govt institution (rural 17.3 % to 54.2% and urban 32.6 to 49.4%); increase in private institutional deliveries was small. As compared to rural areas institutional deliveries

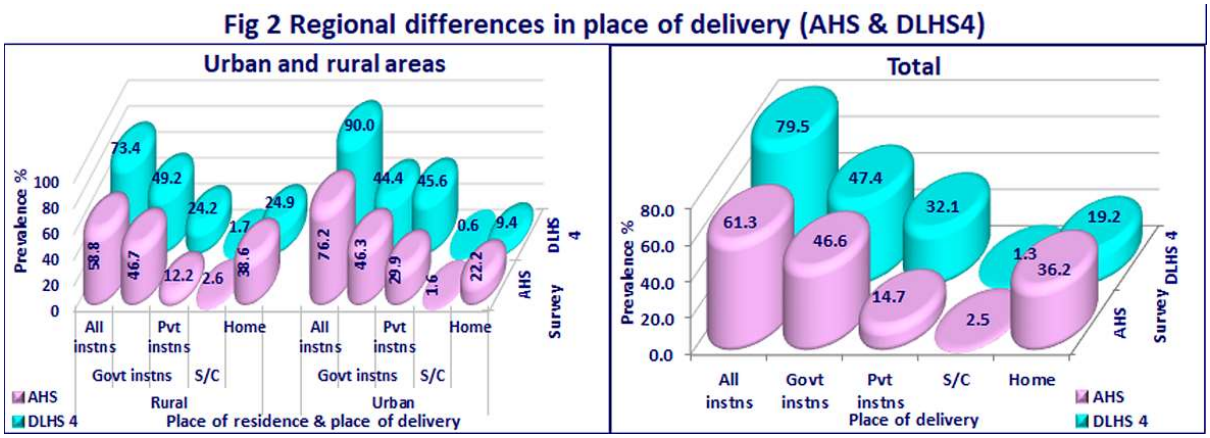
especially private institutional deliveries were higher and home deliveries were lower in urban areas (Fig 1).



Regional Comparison of data from AHS and DLHS4 states, on place of delivery showed that home delivery rates were higher and institutional delivery rates were lower in AHS states as compared to DLHS4 states. Sub-centre deliveries were not common either in AHS or DLHS4 states. Delivery rates in govt institutions was similar in AHS and DLHS4 states; but delivery rate in private hospitals in DLHS states (32.1%) was more than double that of AHS states (14.7%) (Fig 2). Both in AHS and DLHS4 states, institutional deliveries especially private institutional deliveries were higher and home deliveries were lower in urban areas as compared to rural areas. Home deliveries were lowest in urban area in DLHS states and highest in rural areas in AHS states. Institutional delivery rates in government institutions were similar both in AHS and DLHS4 states. Deliveries in private institutions were highest in urban areas in DLHS states and lowest in rural areas in AHS states (Fig 2).

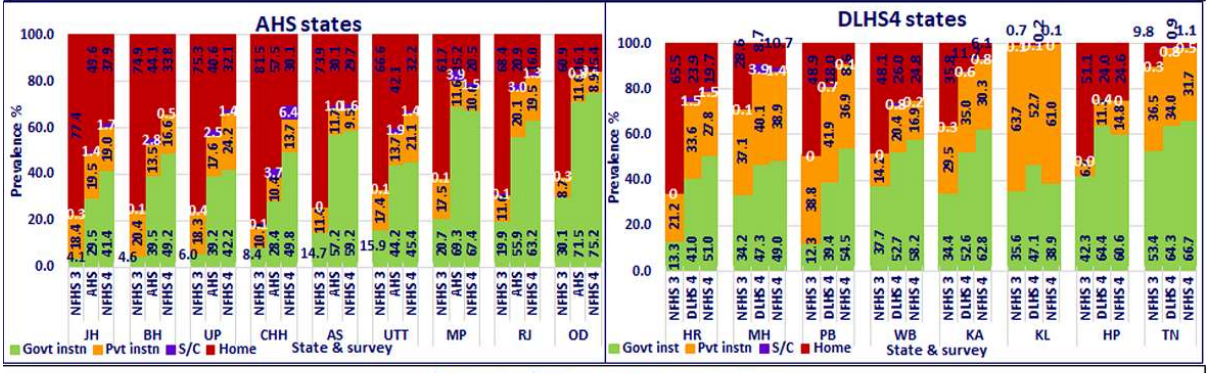
Inter-state differences Time trends in place of delivery between 2005 and 2015 in AHS states and in some major states among DLHS 4 states computed from the raw data of all four surveys (NFHS3, 4, AHS third round and DLHS4) is given in Fig 3. These were compared with the data from fact sheets/reports from these four surveys. By and large the data were comparable.

Over years, there has been an increase in institutional deliveries in all states (both AHS and DLHS4) but the magnitude of increase differed. Assam, MP and Rajasthan had low institutional deliveries in 2005 and showed a steep increase in institutional deliveries. At the other end of the spectrum was Kerala where over 90% women had institutional deliveries even



in 2005 and the increase in subsequent years was small (Fig 3). In 2015 over 80% of women had institutional delivery in MP, Rajasthan, Odisha, Maharashtra, Punjab, Karnataka, Kerala

Fig 3 Inter-state differences and time trends in place of delivery NFHS3, AHS, DLHS4 & NFHS4 (computed)



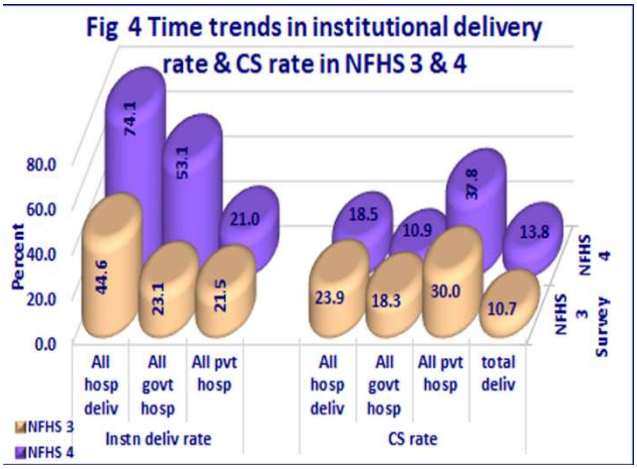
CI for Prevalence of institutional deliveries in states in surveys

95% CI	UTT	RJ	UP	BH	AS	JH	OD	CHH	MP	HP	PB	HR	WB	MH	KA	KL	TN
NFHS 3	30.6-35.9	29.4-33.5	23.3-25.3	23.2-26.8	23.9-28.3	20.5-24.6	36.5-41.1	16.6-20.4	36.4-39.9	45.8-52.1	48.4-53.8	31.9-37.1	49.9-53.9	69.7-73.0	61.9-65.9	98.7-99.8	88.5-91.3
AHS/DLHS4	57.3-58.5	75.6-76.5	56.6-57.2	52.7-53.4	68.5-69.4	48.6-49.6	82.7-83.5	38.3-39.4	80.5-81.2	73.6-77.6	80.5-82.1	73.8-75.4	72.2-74.1	86.9-87.9	87.2-88.2	99.6-99.9	98.0-98.5
NFHS 4	66.4-66.5	82.2-83.3	66.0-66.9	65.1-66.3	68.7-68.6	59.5-61.3	83.5-84.9	62.6-64.5	77.5-78.6	73.8-76.9	90.6-92.1	77.9-79.7	73.8-76.2	87.2-88.6	92.6-93.7	99.7-100.0	98.1-98.7

and Tamil Nadu.

All survey showed that, delivery in private institutions were higher in DLHS 4 states as compared to AHS states (Fig 3). Delivery rates in private institutions were high in Maharashtra, Punjab, Kerala, Karnataka and Tamil Nadu. In Kerala over 60% of deliveries were in private institutions, but in all other states proportion of deliveries in government institutions were higher than deliveries in private institutions. The increase in institutional deliveries in AHS states were predominantly due to increase in deliveries in government institutions.

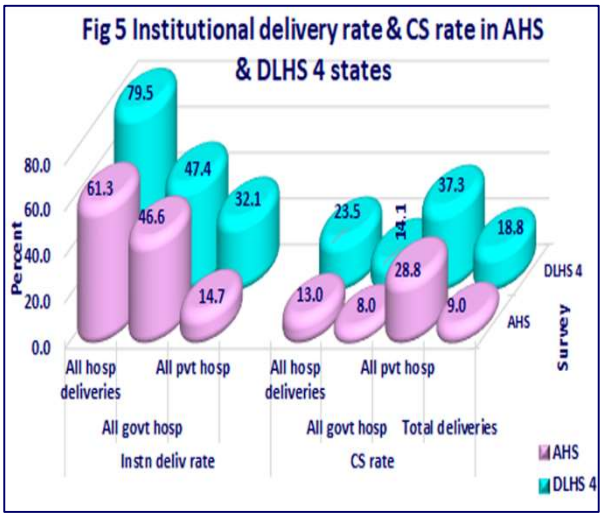
Fig 4 Time trends in institutional delivery rate & CS rate in NFHS 3 & 4



Time trends in Caesarean section rates for all deliveries

National: Time trends in CS rates for all deliveries at the national level was 10.7 % in NFHS3 and 13.8% in NFHS 4. CS rates in govt hospitals had shown a decline between NFHS3 and NFHS 4, but CS rates in private hospitals has shown an increase. Because majority of women deliver in govt hospitals the CS rate in all institutional deliveries has shown a decline between NFHS3 and 4 (Fig 4).

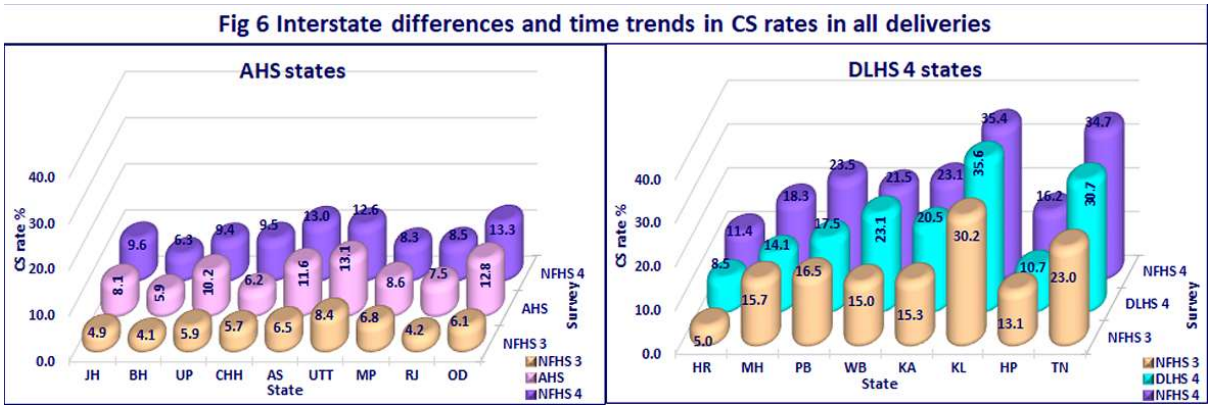
Fig 5 Institutional delivery rate & CS rate in AHS & DLHS 4 states



Regional: CS rates in AHS state was 9% as compared to CS rate of 18% in DLHS 4 states. CS rates in govt institutions, private

institutions and all institutional in DLHS 4 states was higher as compared to the corresponding rates in AHS states (Fig 5).

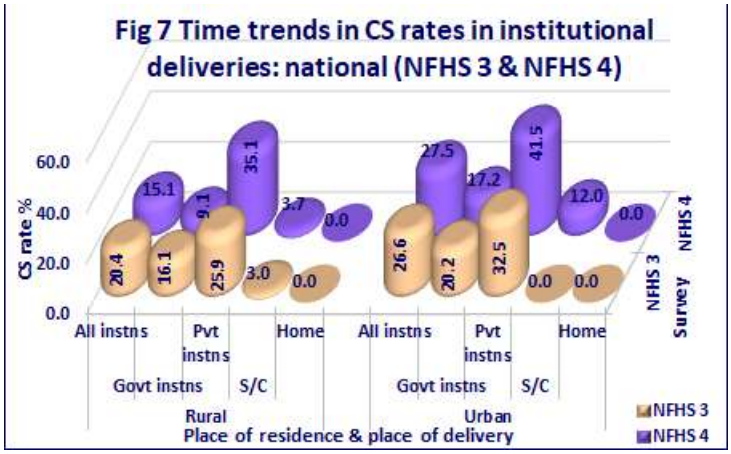
Inter-state differences: Interstate differences and time trends in computed state wise CS rates for all deliveries in AHS and DLHS4 states are shown in Fig 6. All the states (AHS and DLHS4 states) showed an increase in CS rates between 2005 and 2015. At all-time points, CS rates in AHS states were lower than most DLHS4 states. Tamil Nadu and Kerala had the highest CS rates in the country while Bihar UP, MP and Rajasthan had the lowest CS rates.



Time trends in CS rates in institutional deliveries

National: CS rates in institutional deliveries ***at national level*** is shown in Fig 7. Between NFHS3 and 4 institutional deliveries have nearly doubled. There was a decline in the CS rates in govt institutions (both urban and rural) but CS rates private institutions (both urban and rural) showed an increase. CS rates in all institutional deliveries remained essentially unaltered. CS rates in urban areas were higher as compared to rural areas both in NFHS 3 and 4. Both NFHS 3 and 4 data has showed that CS was done in sub-centre both in urban and rural areas.

Regional Institutional delivery rates and CS rates in institutional deliveries in AHS and DLHS4 states is shown in Fig.8. In AHS states both institutional delivery and CS rates were lower as compared to DLHS4 states in govt institutions, private institutions and all institutions. In AHS states CS rates in private institutions are several fold higher as compared to CS rates in govt institutions. CS rates were lowest in government hospitals in rural areas in AHS states. CS rates were higher in:

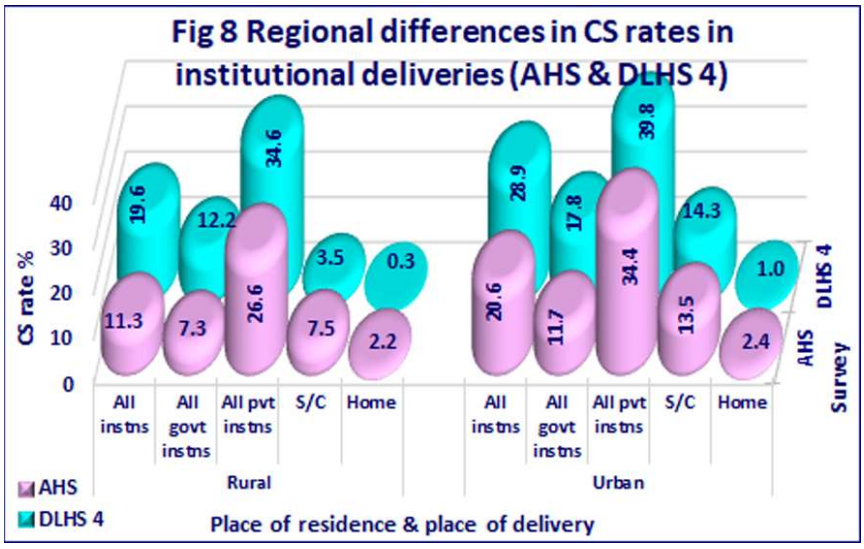


- DLHS4 states as compared to AHS states,
- urban areas as compared to rural areas in both the surveys and private institution in both surveys both in urban and rural areas.

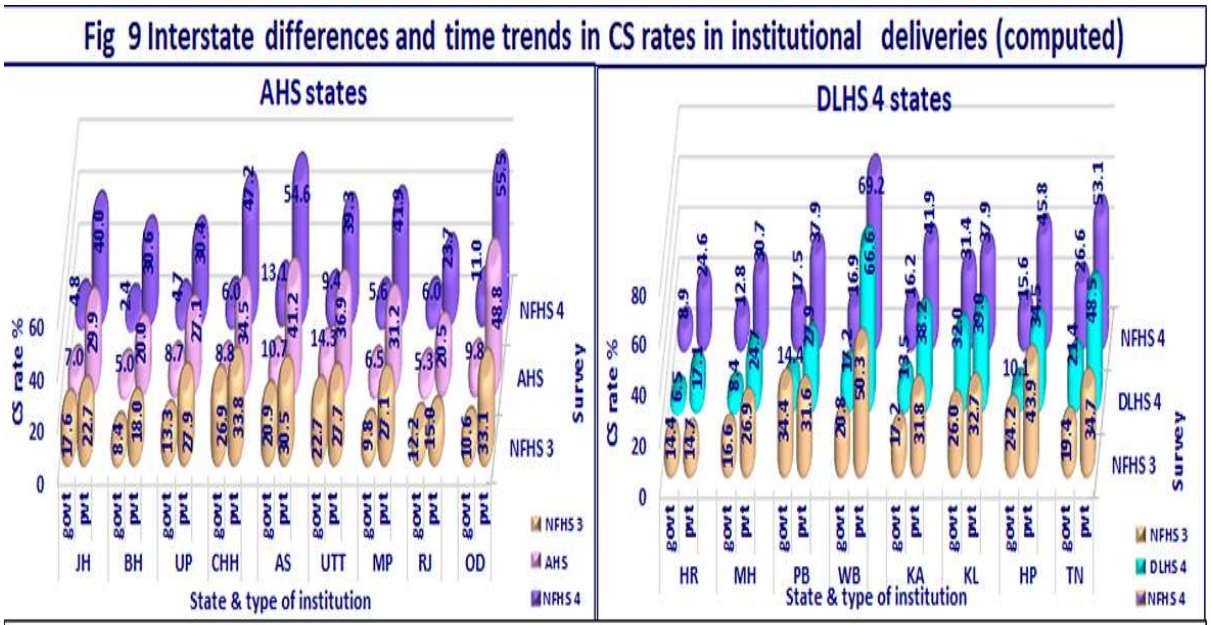
Both in AHS and DLHS states data indicated that CS were done in home and sub-centre deliveries both in urban and rural areas.

Interstate differences

Time trends in CS rates in govt and private institutions in AHS states and selected DLHS4 states computed from the raw data of NFHS 3, 4, AHS third round and DLHS 4 are shown in Fig 9. In the NFHS 3 survey CS rates in govt institutions in AHS and DLHS 4 states ranged between 8.4 (Bihar) to 26% in Kerala. CS rates in Govt institutions were higher than 20% in Chhatisgarh, Assam, Uttarakhand, Punjab, West Bengal, Kerala and Himachal Pradesh. CS rates in private institutions in NFHS3 ranged between 18% (Bihar) to 50.3% in West Bengal. CS rate in private institutions were ≥30 Chhatisgarh, Assam, Punjab, West Bengal, Karnataka, Kerala and Himachal Pradesh.



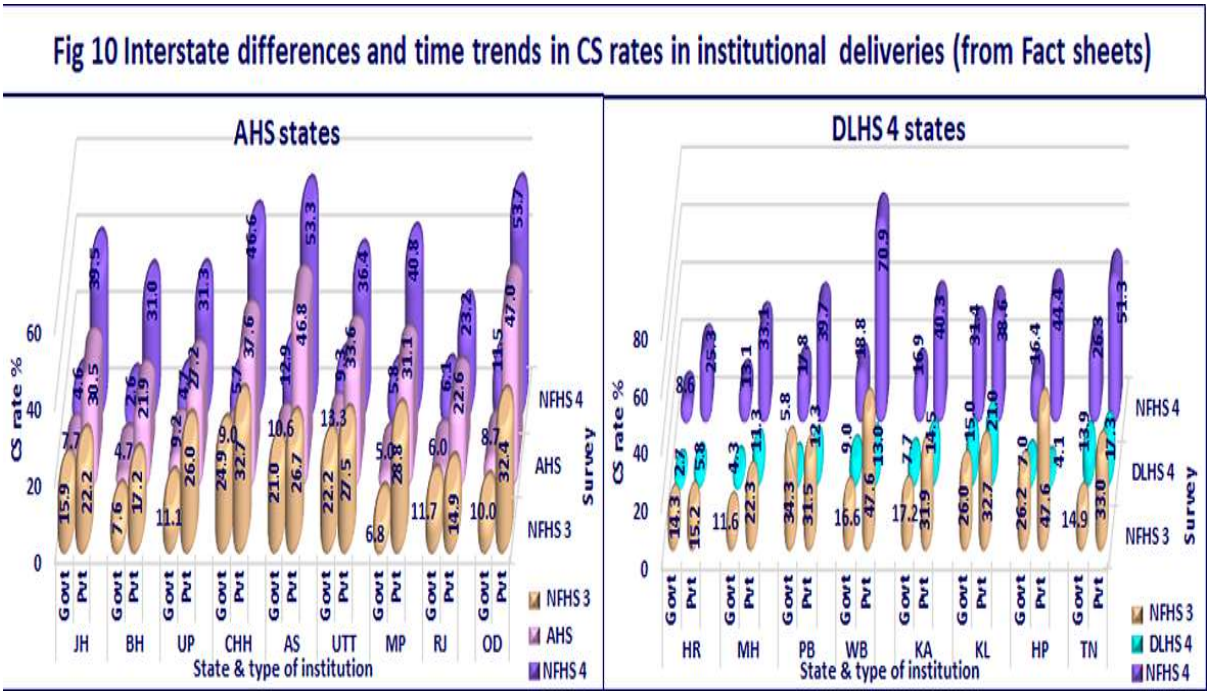
Compared to the CS rates in NFHS3 there was decline in the CS rates in Govt institutions in majority of states in AHS/DLHS and NFHS4. However the CS rates in private institutions continued to show an increase between NFHS3 and AHS/DLHS4 and NFHS4.



CI for CS rates in institutional deliveries in states in surveys

95% CI	UTT	RJ	UP	BH	AS	JH	OD	CHH	MP	HP	PB	HR	WB	MH	KA	KL	TN
NFHS 3	21.1-29.5	10.6-15.8	22.3-26.3	13.3-19.3	20.8-29.3	17.6-26.0	12.9-18.4	25.3-35.9	15.5-19.9	22.9-30.8	28.7-35.8	11.2-17.9	26.4-31.4	20.2-23.7	21.7-26.2	27.5-33.1	23.4-27.8
AHS/DLHS4	19.0-20.3	8.9-9.6	14.1-14.7	8.6-9.1	15.5-16.3	15.6-16.7	14.8-15.7	15.0-16.3	9.7-10.3	11.9-15.6	20.5-22.3	10.6-11.9	29.8-32.2	15.3-16.5	22.7-24.0	33.9-37.5	29.9-31.6
NFHS 4	17.7-20.2	9.7-10.7	13.7-14.5	9.1-9.9	17.9-19.8	15.0-16.7	15.0-16.4	14.0-15.8	10.1-11.0	19.8-23.2	24.5-27.0	13.6-15.3	27.2-30.0	19.8-21.6	23.5-25.5	33.5-37.3	34.1-36.2

Lowest CS rates in govt hospitals in NFHS4 was 2.4% in Bihar and highest in Kerala (31.4%). In all the AHS states except Odisha CS rates in govt institutions was below 10%. In all DLHS4 states the CS rate in govt institutions was below 20% except in Kerala and TN.

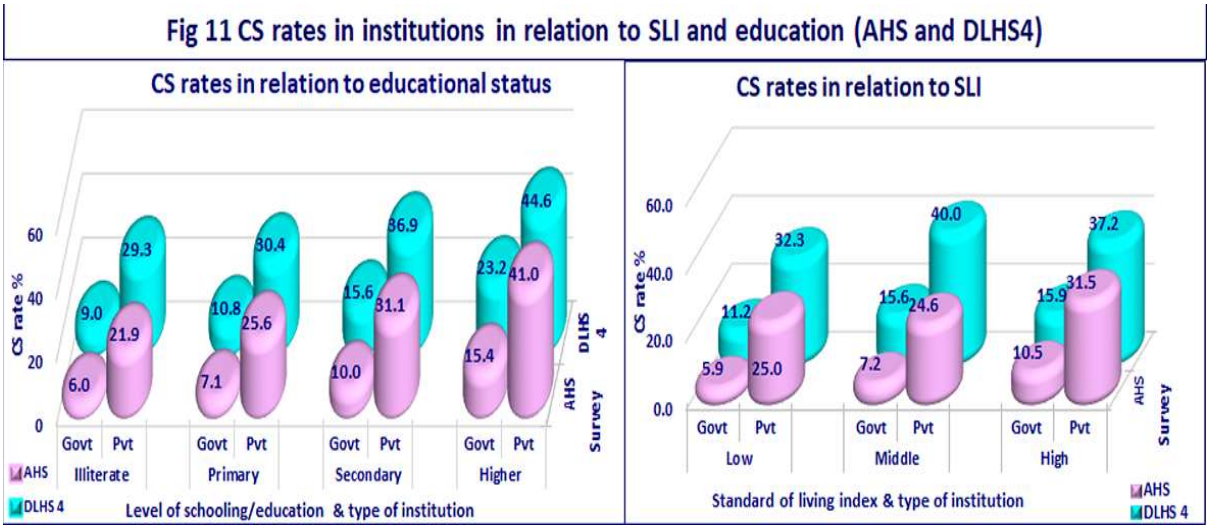


Comparison of CS rates reported in with the DLSH4 fact sheets

Comparison of the computed data on CS rates in govt and private institutions from the raw data from four surveys (Fig 9) with the reported CS rates from fact sheets of these four surveys (Fig 10) showed that by and large they were comparable in NFHS3, 4 and AHS third round. Comparison of the computed (Fig 9) and reported CS rates inDLHS4 fact sheets (Fig 10) showed that the reported CS rates in fact sheets in both govt and in private institutions across states were far lower as compared to the computed CS rates.

CS rates in relation to socio-demographic profile

CS rates in relation to standard of living index (SLI) tertiles is shown in Fig 11. There was



gradient in the CS rates in relation to SLI tertiles both in govt and private hospitals. CS rates

were lowest for women belonging to low SLI families, delivering in government hospitals, in rural areas, in AHS states. CS rates were highest in women belonging to mid and high SLI families, delivering in urban areas, in private hospitals, in DLHS 4 states.CS rates showed an increase with increasing literacy in both AHS and DLHS4 states, in government and private institutions. The highest CS rates were reported in women who had college education who accessed private institutions for delivery care (Fig11).

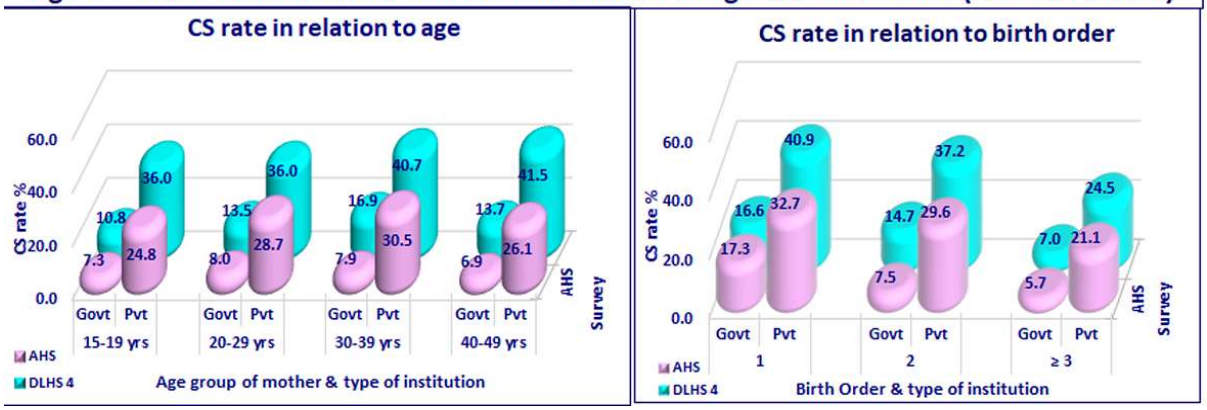
Majority of women who delivered were in the 15-29 year age group both in AHS and DLHS 4 states. Proportion of women who were beyond 40 years at delivery was very low. CS rates in relation to age of the woman at delivery is shown in Fig 12. CS rates were higher in

- DLHS 4 states as compared to AHS states
- Private institutions as compared to govt institutions both in AHS and DLHS4 states.

CS rates did not show substantial differences in relation to age either in the government or in private institutions in AHS or DLHS states. CS rates in relation to birth order of the woman at delivery is shown in Fig 12. CS rate were higher in:

- first births as compared to those delivering their second and subsequent children in both the surveys;
- in private as compared to govt institutions in all birth order groups; and
- in govt and private institutions in all parity groups in DLSH4 states, as compared to AHS states.

Fig 12 CS rates in institutional deliveries in relation to age and birth order (AHS and DLHS4)



Policy and programme implications of the findings

Analysis of data from national surveys provided useful information on trends in institutional delivery and leads on how to reach the goal of universal institutional deliveries within the next decade. The AHS states face the dual task of trying to achieve near-universal institutional delivery rates and improving quality care; they need substantial additional inputs to strengthen primary health care institutions. Improvement in cleanliness, people friendliness and convenience in govt institutions across states, and awareness generation among the families about the higher cost of delivery care in private institutions may help improving delivery rates in govt institutions. Data from national surveys provided important leads on CS rates at national, regional and state level, type of institution and in segments of population. All surveys have shown that the national average CS rate are within acceptable levels. However, there are many states with low CS rates perhaps because women with obstetric problems are not getting the needed CS. There is an urgent need to strengthen infrastructure in these states. At the other

end are states with high CS (perhaps unwarranted) rates both in govt and private sector institutions. Interventions measures to reduce unwarranted CS rates will include:

- institutional audit on CS as a routine in all hospitals and periodic review of these; and
- awareness generation among all segments of population on health consequences of unwarranted CS.

These interventions may enable the country to achieve universal institutional delivery and optimal CS rates within a decade.