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National health surveys in India

This online first version has been peer-reviewed, accepted and edited,
but not formatted and finalized with corrections from authors and proofreaders.

A review of national health surveys in India

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(Submitted: 19 May 2015 – Revised version received: 28 December 2015 – Accepted: 5 January 2016 – Published online: 12 February 2016)

Abstract

Several rounds of national health surveys have generated a vast amount of data in India since 1992. We describe and compare the key health information gathered, assess the availability of health data in the public domain, and review publications resulting from the National Family Health Survey (NFHS), the District Level Household Survey (DLHS) and the Annual Health Survey (AHS). We highlight issues that need attention to improve the usefulness of the surveys in monitoring changing trends in India's disease burden: (i) inadequate coverage of noncommunicable diseases, injuries and some major communicable diseases; (ii) modest comparability between surveys on the key themes of child and maternal mortality and immunization to understand trends over time; (iii) short time intervals between the most recent survey rounds; and (iv) delays in making individual-level data available for analysis in the public domain. We identified 337 publications using NFHS data, in contrast only 48 and three publications were using data from DLHS and AHS respectively. As national surveys are resource-intensive, it would be prudent to maximize their benefits. We suggest that India plan for a single major national health survey at five-year intervals in consultation with key stakeholders. This could cover additional major causes of the disease burden and their risk factors, as well as causes of death and adult mortality rate estimation. If done in a standardized manner, such a survey would provide useable and timely data to inform health interventions and facilitate assessment of their impact on population health.

Introduction

Health information gathering is an important part of any health system, but is often weak in low-income countries, plagued by poor quality data that are inadequate for informing health policy.^{1–4}

Population-based surveys are an invaluable source of health information.⁵ A key aim of these surveys is to provide high-quality data for policy development and programme planning, monitoring and evaluation. Population-based surveys have been used extensively to gather

information on fertility, mortality, family planning, maternal and child health, and some other aspects of health, nutrition and health care in India.⁶

We have previously reported that the health information system in India has not kept up with the epidemiological transition.⁶ In this paper, we assess national health surveys conducted in India since 1992 that were designed to provide information on health indicators at subnational levels. We describe and compare the health information covered by these surveys over time, the availability of resulting data in the public domain and the use of these survey data in publications. Based on our findings, we highlight the issues that need consideration to improve the usefulness of these surveys. We believe they should be able to provide more effective, useable and timely data on the health status of the population, given the evolving disease burden in India.

Reviewing surveys

We selected large-scale, national, population-based household surveys that provided data on health indicators at the subnational levels in India from 1992 to 2015. These were the National Family Health Survey (NFHS), the District Level Household Survey (DLHS) and the Annual Health Survey (AHS; Box 1). The surveys are summarized in Table 1.

Themes

We reviewed the survey questionnaires to assess: survey period and sample sizes; types of respondent; key themes; timeframe for availability of data in the public domain; and analytical publications resulting from the data. A more detailed review of the number of children, reference period and age groups was undertaken to gauge the utility of the data for assessment of trends in child mortality, maternal mortality and immunization.

To determine how well the household, male and female survey questionnaires corresponded to disease burden in the country, we assessed the proportion of questions covering major themes: maternal and child health; reproductive health other than infections; reproductive tract infections; other adult infections; non-communicable diseases; and injuries. Data on anthropometric and biological markers were analysed in addition to the questionnaires.

We recorded the time between the completion of data collection for each survey round and the availability of individual-level data in the public domain. We conducted a PubMed

database search to identify peer-reviewed research papers from January 1993 to March 2015 that had used data from either or all of the first three rounds of NFHS and DLHS. For AHS, this search was done for research papers published between January 2011 and March 2015. The fourth rounds of NFHS and DLHS were not included in this search as the data collection for the former is not yet complete and the data for the latter have not yet been released in the public domain. The search terms used in PubMed to identify relevant publications were “National Family Health Survey” or “NFHS and India”, “District Level Household Survey” or “DLHS” and India” and “Annual Health Survey” or “AHS and India”. We screened the titles and abstracts of identified articles and reviewed the full texts of those that analysed data from the surveys. Review papers and the papers that merely made reference to survey data in background or discussion sections were excluded.

Survey characteristics

Survey period

The first survey conducted was NFHS-1 in 1992–1993. The following three rounds of NFHS were done in 6–9 years intervals, which were longer than the DLHS interval of 4–5 years. The period of the first DLHS survey overlapped with NFHS-2 and the following survey rounds done with close proximity. AHS, which is complementary to DLHS-4, was initially done in 2010–11, with two further rounds between 2011 and 2013 (Table 1).

Types of respondents

There were some changes in the types of respondents across these surveys over time (Table 2). Ever-married women were surveyed in all rounds of NFHS and AHS. DLHS-1 and DLHS-2 surveyed only currently married women but DLHS-3 and DLHS-4 surveyed ever-married women. NFHS-3 and NFHS-4 and DLHS-3 also included never-married women.

The ever and/or currently married women interviewed in all surveys were of reproductive age; however, the age boundaries for inclusion varied both across surveys and between different rounds of the same survey. Women up to 49 years of age were selected as respondents in all rounds of NFHS; the lower age limit for NFHS-1 was 13 years, which was raised to 15 years during subsequent rounds. Women aged 15–44 years were surveyed during the first two rounds of DLHS and the upper age limit was raised to 49 years for ever-married women in DLHS-3 and

DLHS-4. The age group for never-married women was 15–24 years in DLHS-3. AHS surveyed women 15–49 years of age.

Male representation across surveys has been inconsistent. Only in four rounds have men been represented. Men aged 15–54 years were interviewed in NFHS-3 and NFHS-4. Men aged 20–54 years were interviewed in DLHS-1, whereas the husbands of eligible women, regardless of age, were interviewed in DLHS-2. AHS did not interview men.

Key survey themes

Interview

The key survey themes are shown in Table 2 (available at: <http://www.who.int/bulletin/volumes/94/###-###-#####>) and Table 3. The numbers of disease- or condition-specific questions increased in all surveys over time. From 246 to 868 questions in NFHS, from 200 to 339 questions in DLHS and from 137 to 207 questions in AHS. Of these questions, more than 90.5% of questions were about maternal and child health and reproductive health (range: 90.6–99.1%; Table 3). Adult infections other than those of the reproductive tract received very little attention in the surveys, constituting only 0.6–3.0% of the total disease- or condition-specific questions. The number of questions on noncommunicable diseases increased for each round in the NFHS and DLHS, from two to 41 and zero to 10, respectively.

NFHS-4, DLHS-4 and the AHS baseline had questions on tobacco and alcohol use, which are major risk factors for chronic diseases. However, these questions did not fully meet the criteria for STEPwise approach to surveillance, recommended by the World Health Organization (WHO) for monitoring risk factors over time.^{22,23} Only NFHS-3 and NFHS-4 had more than 3 questions related to injury (24 and 26 questions, respectively). However, all of these concerned intimate partner violence only (Table 3).

Questions on antenatal care, delivery and postnatal care, birth history and family planning were included in all surveys with the exception of postnatal care in NFHS-1. Key subthemes regarding child health were immunization, breastfeeding practices and common childhood morbidity symptoms (cough, fever and diarrhoea).

All rounds of NFHS included questions on women's employment status and fertility preferences. Rounds 2, 3 and 4 of NFHS included questions on quality of health services,

sexually transmitted infections (STIs), human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) and women's autonomy. Several common themes were identified in the separate questionnaires completed by both women and men during NFHS-3 and NFHS-4: reproductive history; marital and sexual relationships; co-habitation; family planning and fertility preferences; quality of health services; STIs and HIV/AIDS. Additional themes in the men's questionnaire were male involvement in health care and male attitudes towards women's autonomy and domestic violence (Table 2).

DLHS-1 and DLHS-2 included questions on the quality of public sector health services; however, these were dropped in subsequent rounds. Several new themes were added to DLHS-3, including sex education, age at marriage, infertility, obstetric fistula, knowledge about reproduction and public sector health programmes; these were all dropped in DLHS-4. Additional information on fertility preferences and menstruation was documented in DLHS-3 and DLHS-4. The husbands' questionnaire in DLHS-2 collected data on family planning and fertility preferences and on STIs and HIV/AIDS. In addition to the core themes of maternal and child health, birth registration was documented in AHS.

Anthropometry and biomarkers

Height and weight were measured for children during all rounds of NFHS, though the age varied in the different rounds (Table 4). Height and weight were measured for men and women in NFHS-2, NFHS-3 and NFHS-4. DLHS-1 and DLHS-3 did not include any anthropometric measurements. DLHS-2 included weight measurement only for children younger than 6 years to calculate weight-for-age as an indicator of nutritional status. Height and weight were measured in DLHS-4 and in a subsample of households in AHS for children 1 month of age and older, as well as women and men.

The surveys evaluated various biomarkers, especially in the later rounds (Table 4). NFHS-2 included assessment of anaemia among children 6–35 months of age and ever-married women 15–49 years of age. Anaemia testing was also done for men in NFHS-3 and NFHS-4. Anaemia testing was done for children, girls and women in DLHS-2, but not in DLHS-3. DLHS-4 and AHS included anaemia testing for children 6 months or older as well as women and men. HIV testing was included in a subsample of men and women in NFHS-3 and NFHS-4. Blood

pressure measurement and blood testing for fasting plasma glucose were done in men and women in NFHS-4 and DLHS-4 and in a subsample of men and women in AHS.

Trend analyses

Estimating child mortality

The information collected on deaths and age at death among all children born to ever-married women 15–49 years of age in their lifetime is consistent across all rounds of NFHS, clarifying trends in child mortality over time using the lifetime data on births. In contrast, the data on birth histories varied in the different DLHS rounds, ranging from the preceding 3 years of the survey to lifetime data. The AHS baseline round collected birth history information for the preceding 3-year period, and the update rounds captured this information for the preceding year. On assessing the comparability of childhood mortality indicators across all rounds of NFHS, DLHS and AHS, analogous estimates can be generated only for 3 years preceding the surveys for currently married women aged 15–44 years (Table 5).

Estimating maternal mortality

Comparable estimates of maternal deaths in the 2 years preceding the survey among women aged 15–49 years are possible using NFHS-1, NFHS-2 and NFHS-4, but maternal death data were not collected in NFHS-3. In the various rounds of DLHS, the reference period for the collection of data on maternal deaths varies from 1 to 3 years preceding the survey. In the AHS, the reference period for maternal deaths ranges from 1 to 5 years preceding the last survey (Table 5).

Immunization

Assessment of immunization trends over time using all the NFHS, DLHS and AHS rounds is possible only for the last two surviving children born in the 3 years preceding the surveys, due to variation in the reference periods and in the number of births and living children for which immunization data were collected in the various rounds (Table 5).

Timeliness of data availability

Individual-level NFHS and DLHS data – without individual identifiers to maintain participants' confidentiality – have to be made available in the public domain for analytical use. Table 6 shows the time between completion of data collection and release of individual-level data in the public domain. The time for NFHS and DLHS to release their data varied between 9 and

22 months. Until recently, only summary data had been reported for the AHS rounds. The individual-level data for the three AHS rounds were made available in November 2015, following 29 months of data collection for the second update round.

Survey data publications

We identified 600, 95 and 73 publications resulting from the NFHS, DLHS and AHS respectively. Based on the review of the title and abstract, 337, 48 and three publications had used the NFHS, DLHS and AHS data, respectively; we reviewed the full text of these publications. Data from only NFHS-1 were used in 56 articles, data from NFHS-2 in 83 articles and data from NFHS-3 in 145 articles. The remaining 53 publications used data from two or more of the NFHS rounds. Only data from DLHS-2 and/or DLHS-3 were used in publications. No publication using DLHS-1 data was identified. One publication used AHS baseline survey data and two used the first update of the AHS survey data.

Discussion

The national population-based health surveys in India started a quarter of a century ago with a predominant focus on maternal and child health, as these were considered the most visible and prominent health problems at that time. Over this period, the disease burden has shifted significantly towards noncommunicable diseases. Data from the global burden of disease study suggest that in India in 1990, diseases among children younger than 15 years and maternal disorders accounted for 57% of the total disease burden (with about 60% of this in the first year of life). In 2013, this burden had decreased to 33% of total disease burden, while noncommunicable diseases made up 52% of the total disease burden.²⁴ However, in the latest national health surveys, questions on noncommunicable diseases constituted less than 5% of the total questions. Similarly, injuries are barely represented in national health surveys even though these contributed 13% of the total disease burden in 2013.²⁴

While estimation of disease burden should not be the only criterion for inclusion in large-scale national health surveys, not having nationwide estimates for the conditions causing major disease burden is problematic. Reliable nationwide population-based data on major noncommunicable diseases, such as ischaemic heart disease, chronic obstructive pulmonary disease, stroke, low-back and neck pain and depression are scanty in India, as are similar data on injuries. Such data are also unavailable for tuberculosis and pneumonia.²⁵

Attempts to improve coverage of noncommunicable diseases in national health surveys are a move in the right direction, but more could be done. The surveys could be expanded to meet WHO's criteria for monitoring of noncommunicable diseases, the STEPwise approach to surveillance. This approach includes standardized data on four behavioural risk factors (tobacco use, alcohol use, low fruit and vegetable intake and physical inactivity) and four biological risk factors (body mass index, blood pressure, fasting blood glucose and blood cholesterol).²² Among the behavioural risk factors, tobacco and alcohol use are being assessed in national health surveys, but these do not fully meet the STEPS standardized data criteria. Low fruit and vegetable intake and physical inactivity are not yet being measured. Among the biological risk factors besides body mass index (which has been included in most surveys), blood pressure and fasting blood glucose have been added in the most recent rounds of the national surveys, but blood cholesterol is still not included. Recent national health surveys have only partly addressed these data gaps since our previous report, which preceded these surveys.²³

National health surveys have the potential to increase data on disease burden by including biomarker measurements and diagnostic tests. For example, inclusion of HIV testing in NFHS-3 enabled a more accurate estimation of HIV prevalence.^{26,27} Rapid diagnostic tests for tuberculosis^{25,28} and malaria²⁹ and assays for measuring blood lipids in the field³⁰ could also be included. While a detailed assessment of all major diseases is not feasible in a single national survey, opportunities exist for adding additional categories of information. Some countries use a range of clinical and biomarker tests in their surveys and some regularly rotate the health and/or disease topics between rounds to make each round more manageable and frequent.^{31–39}

Reliable cause-of-death data are important for informing decision-makers. India lacks an effective vital registration system that can provide such data across the country. To increase data on cause of death, automated algorithms could be used, which enable researchers to assign cause of death from large-scale verbal autopsy data. This is both more reliable and efficient than the resource-intensive physician-coding methods.^{40,41}

Comparability of measurements over time and across population groups is fundamental to optimal interpretation and use of survey data.^{2,42,43} Given the enormous amount of data collected in national surveys, we calculated the feasibility of trends assessment over time for child mortality, maternal mortality and immunization between and within these surveys. All

rounds of NFHS had documented birth history consistently, allowing for comparable estimates over time as all births were captured with no restriction on reference period. However, the DLHS and AHS rounds captured births and/or pregnancies only for specific reference periods, which varied within and between surveys, thereby limiting the potential for using all the collected data for this purpose. Similarly, the reference period for data on immunization coverage varied within and between the surveys.

A systematic review reports that among publications in PubMed concerning global demographic and health surveys, there were many using the Indian NFHS data.⁴⁴ We report 336 original research publications using NFHS data. On the other hand, the three DLHS rounds completed to date resulted in only 48 publications. This is puzzling, given that DLHS surveys were designed to provide district-level estimates, whereas the first three NFHS rounds, with smaller sample sizes, were designed only to provide state-level estimates. One of the reasons for the poorer use of DLHS could be that the data are made available in a format which is not user friendly. AHS has provided individual-level data in the public domain only very recently, so the low number of publications from these data is not surprising.

The time between completion of data collection and individual-level data availability for analysis by researchers decreased between the first and third rounds of NFHS and DLHS, but increased again for the last round of DLHS. Part of the reason for this delay could be the effort needed to synchronize the DLHS-4 data with the AHS data, as these two surveys are complementary, with each covering approximately half the country's population. In any case, such delays in use of a public good resource should be avoided. The recent availability of individual-level AHS data on request is a positive step towards increasing the effectiveness of the data.

Recommendations

As national health surveys are resource-intensive, it would be wise to maximize the knowledge gained from them that could be used to improve population health in India. We propose that consultation – similar to the consultative development process underpinning the National Health Survey in Brazil⁴⁵ – could improve the design of national health surveys in India. We have several recommendations. First, instead of having multiple, frequent surveys with overlapping goals, India should have a single major national health survey at five-year intervals. This could

provide data on additional major causes of disease burden and their risk factors, along with cause-of-death data using automated verbal autopsy methods and include adult mortality rate estimation. The sample sizes should aim to provide state-level estimates for all indicators and district-level estimates for crucial indicators to capture the key features of health status heterogeneity across the country. Second, Data collection on the key variables should be standardized to meet monitoring standards and to provide comparable data over time. Third, effective partnerships with a larger range of relevant stakeholders, including the academic community, should be established to increase the relevance and usefulness of the data. Fourth, detailed methods should be published. Fifth, individual-level data from these surveys should be made publicly available as soon as possible so that it can be used in the urgent tasks of informing policy and developing a more effective health system. Sixth, linking household survey data with health service use and administrative data, preferably using geospatial coding methods could be considered. Over time, India could also consider a continuous design for its national health survey, with advantages for survey management and timely provision of findings.⁴⁶

Acknowledgements

We thank Arti Bhimjiyani and G. Anil Kumar. LD is also affiliated with the Institute for Health Metrics and Evaluation, University of Washington, Seattle, United States of America.

Funding:

The Indian Council of Medical Research, New Delhi, India. AP was supported by the Wellcome Trust Capacity Building Strategic Award.

Competing interests:

None declared.

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Box 1. Description of major surveys done in India between 1992 and 2016

The National Family Health Survey (NFHS) is the equivalent of demographic and health surveys done in many countries around the world.⁷ NFHS is overseen by the Ministry of Health and is coordinated by the International Institute for Population Sciences (IIPS), in Mumbai as the nodal agency, with support from ORC Macro and other agencies.⁸ The primary aim of NFHS has been to provide information on maternal and child health and reproductive health. Three rounds of NFHS were conducted in 1992–1993, 1998–1999 and 2005–2006, and the fourth round is currently underway.^{9–12} The first three rounds of NFHS were designed to provide state level data, but the fourth round, with a much larger sample size, will generate estimates of most indicators for all 640 districts in the country.¹²

The District Level Household Survey (DLHS) was launched in response to the need for district-level data on the Reproductive and Child Health programme.¹³ The DLHS are carried out by the International Institute for Population Sciences with oversight by the Ministry of Health. Four rounds of DLHS have been undertaken: 1998–1999, 2002–2004, 2007–2008 and 2012–2014.^{14–17} The fourth round was done in coordination with the Annual Health Survey (AHS), with the former not conducted in nine states covered by the latter. The AHS has been conducted in the less developed states of India (Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh, Uttarakhand, and Assam).¹⁸ The sample sizes at the district level in AHS are much larger than those in the DLHS and aim to generate more robust estimates at the district level, especially of infant mortality. The AHS is implemented by the Office of the Registrar General of India with funding from the Ministry of Health. The baseline round of AHS was undertaken in 2010–2011, while two subsequent rounds in 2011–2012 and 2012–2013 collected data on the same households as in the baseline.^{19–21} In contrast, the DLHS and NFHS have new cross-sectional samples for each round.

Table 1. **Survey and sample size for major health surveys in India, 1992 to 2016**

Survey	Survey years	No. of households in the sample
NFHS		
NFHS-1	1992–1993	88 562
NFHS-2	1998–1999	91 196
NFHS-3	2005–2006	109 041
NFHS-4 ^a	2015–2016	568 200
DLHS		
DLHS-1	1998–1999	529 817
DLHS-2	2002–2004	620 107
DLHS-3	2007–2008	720 320
DLHS-4 ^b	2012–2014	350 000
AHS^b		
AHS baseline	2010–2011	4 140 000
AHS 1st update	2011–2012	4 280 000
AHS 2nd update	2012–2013	4 320 000

AHS: annual health survey; DLHS: district-level household survey; NFHS: national family health survey.

^a Data collection is ongoing as of February 2016.

^b DLHS-4 covered 336 districts in 26 states and union territories of India. AHS covered 284 districts in the other nine states of India.

Table 2. **Types of respondents and key themes identified in major health surveys, India, 1992 to 2015**

Survey	Household		Women		Men	
	Respondent	Key survey themes	Respondent	Key survey themes	Respondent	Key survey themes
NFHS						
NFHS-1	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity - Mortality (all ages) 	Ever-married women 13–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Child mortality - Family planning and fertility preferences - Woman and husband's background characteristics - Women's employment status 	Not included in survey	N/A
NFHS-2	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity and risk factors - Health care use - Mortality (all ages) 	Ever-married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Child mortality - Family planning and fertility preferences - Woman and husband's background characteristics - Women's employment status - Women's autonomy and domestic violence - Quality of health services - STIs and HIV/AIDS 	Not included in survey	N/A
NFHS-3	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Child labour - Morbidity - Health care use 	Ever-married women 15–49 years of age and never-married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Child mortality - Family planning and fertility preferences - Woman and husband's background characteristics - Women's employment status - Women's autonomy and domestic violence - Quality of health services - STIs and HIV/AIDS - NCDs and behavioural risk factors - Use of ICDS - Marital and sexual relationships and living arrangements 	Men 15–54 years of age	<ul style="list-style-type: none"> - Reproductive history - Marital and sexual relationships, and living arrangements - Family planning and fertility preferences - Male involvement in health care - Quality of health services - NCDs and behavioural risk factors - Attitude towards women's autonomy and domestic violence - STIs and HIV/AIDS
NFHS-4	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics 	Ever-married women 15–49 years of age and	<ul style="list-style-type: none"> - Birth history - Maternal and child health 	Men 15–54 years of age	<ul style="list-style-type: none"> - Reproductive history - Marital and sexual

Survey	Household		Women		Men		
	Respondent	Key survey themes	Respondent	Key survey themes	Respondent	Key survey themes	
DLHS		<ul style="list-style-type: none">- Household amenities- Morbidity and risk factors- Health care use- Mortality (biological parents of children 0–17 years of age)	<ul style="list-style-type: none">never-married women15–49 years of age	<ul style="list-style-type: none">- Child mortality- Family planning and fertility preferences- Women’s and husbands’ background characteristics- Women’s employment status- Women’s autonomy and domestic violence- Marital and sexual relationships and living arrangements- Quality of health services- STIs and HIV/AIDS- NCDs and behavioural risk factors- Use of ICDS services		<ul style="list-style-type: none">relationship, and living arrangements- Family planning and fertility preferences- Male involvement in health care- Quality of health services- NCDs and behavioural risk factors- Attitudes towards women’s autonomy and domestic violence- STIs and HIV/AIDS	
	DLHS-1	Household head	<ul style="list-style-type: none">- Sociodemographic characteristics- Household amenities- Morbidity- Health care use- Child mortality- Maternal mortality	<ul style="list-style-type: none">Currently-married women 15–44 years of age	<ul style="list-style-type: none">- Birth history- Maternal and child health- Family planning- Quality of health services- STIs and HIV/AIDS	<ul style="list-style-type: none">Men 20–54 years of age	<ul style="list-style-type: none">- STIs and HIV/AIDS- Family planning
	DLHS-2	Household head	<ul style="list-style-type: none">- Sociodemographic characteristics- Household amenities- Morbidity- Mortality (all ages)	<ul style="list-style-type: none">Currently-married women 15–44 years of age	<ul style="list-style-type: none">- Birth history- Maternal and child health- Child mortality- Family planning- Quality of health services- STIs and HIV/AIDS	<ul style="list-style-type: none">Husbands of eligible women	<ul style="list-style-type: none">- STIs and HIV/AIDS- Family planning and fertility preferences
	DLHS-3	Household head	<ul style="list-style-type: none">- Sociodemographic characteristics- Household amenities- Health care use- Government health programmes- Mortality (all ages)	<ul style="list-style-type: none">Ever-married women 15–49 years of age	<ul style="list-style-type: none">- Birth history- Maternal and child health- Child mortality- Family planning and fertility preferences- Reproductive health- STIs and HIV/AIDS- Use of government health programmes	<ul style="list-style-type: none">Not included in survey	<ul style="list-style-type: none">N/A
				<ul style="list-style-type: none">Never-married women 15–24 years of age	<ul style="list-style-type: none">- Sex education and age at marriage- Reproductive health- STIs and HIV/AIDS		

Survey	Household		Women		Men	
	Respondent	Key survey themes	Respondent	Key survey themes	Respondent	Key survey themes
DLHS-4	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity and behavioural risk factors - Health care use - Mortality (all ages) 	Ever-married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Family planning and fertility preferences - Woman's background characteristics - STIs and HIV/AIDS - Reproductive health - NCDs and behavioural risk factors 	Not included in survey	N/A
AHS AHS baseline	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity and behavioural risk factors - Health care use - Mortality (all ages) 	Ever-married women 15–49 years of age Currently married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Birth registration - Family planning and fertility preferences - STIs and HIV/AIDS - Awareness of childhood illness 	Not included in survey	N/A
AHS 1st update	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity - Health care use - Mortality (all ages) 	Ever-married women 15–49 years of age Currently married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Birth registration - Family planning and fertility preferences - STIs and HIV/AIDS - Awareness of childhood illness and danger signs in newborns 	Not included in survey	N/A
AHS 2nd update	Household head	<ul style="list-style-type: none"> - Sociodemographic characteristics - Household amenities - Morbidity - Health care use - Mortality (all ages) 	Ever-married women 15–49 years of age Currently married women 15–49 years of age	<ul style="list-style-type: none"> - Birth history - Maternal and child health - Birth registration - Family planning and fertility preferences - STIs and HIV/AIDS - Awareness of childhood illness and danger signs in newborns 	Not included in survey	N/A

AHS: annual health survey; AIDS: acquired immunodeficiency syndrome; DLHS: district-level household survey; HIV: human immunodeficiency virus; ICDS: integrated child development services; N/A: not applicable; NCD: noncommunicable disease; NFHS: national family health survey; STI: sexually transmitted infection.

Table 3. **Disease burden categories in major health surveys in India, 1992 to 2016**

Survey	No. of questions ^{a,b}	No. (%)					
		Maternal and child health	Reproductive health issues other than infection ^c	Reproductive tract infection ^d	Other adult infections	NCDs	Injury
NFHS							
NFHS-1	246	123 (50.0)	118 (48.0)	0 (0.0)	3 (1.2)	2 (0.8)	0 (0.0)
NFHS-2	294	157 (53.4)	110 (37.4)	15 (5.1)	4 (1.4)	5 (1.7)	3 (1.0)
NFHS-3	694	254 (36.6)	313 (45.1)	71 (10.2)	10 (1.4)	22 (3.2)	24 (3.5)
NFHS-4	868	278 (32.0)	307 (35.4)	204 (23.5)	12 (1.4)	41 (4.7)	26 (3.0)
DLHS							
DLHS-1	200	105 (52.5)	57 (28.5)	32 (16.0)	6 (3.0)	0 (0.0)	0 (0.0)
DLHS-2	315	167 (53.0)	84 (26.7)	61 (19.4)	2 (0.6)	1 (0.3)	0 (0.0)
DLHS-3	385	165 (42.9)	153 (39.7)	57 (14.8)	9 (2.3)	1 (0.3)	0 (0.0)
DLHS-4	339	186 (54.9)	103 (30.4)	37 (10.9)	2 (0.6)	10 (2.9)	1 (0.3)
AHS							
AHS baseline	137	70 (51.1)	52 (38.0)	2 (1.5)	2 (1.5)	10 (7.3)	1 (0.7)
AHS 1st update	207	131 (63.3)	63 (30.4)	3 (1.4)	2 (1.0)	7 (3.4)	1 (0.5)
AHS 2nd update	207	131 (63.3)	63 (30.4)	3 (1.4)	2 (1.0)	7 (3.4)	1 (0.5)

AHS: annual health survey; DLHS: district-level household survey; NCD: noncommunicable disease; NFHS: national family health survey.

^a Includes only questions on disease- or condition-specific and excludes questions on background and sociodemographic characteristics, general health and health care.

^b Based on household, separate questionnaires for women and men.

^c Includes questions on family life education, family planning, fertility and reproductive preferences, and gender status and relations.

^d Includes questions on non-sexually and sexually transmitted infections including HIV/AIDS.

Table 4. **Anthropometry and biomarker measurements in three major health surveys in India, 1992 to 2015**

Survey	Height and weight	Blood pressure	Blood test for:		
			Anaemia	HIV	Fasting plasma glucose
NFHS					
NFHS-1	- Children younger than 4 years	Not done	Not done	Not done	Not done
NFHS-2 ^a	- Children younger than 3 years - Ever-married women 15–49 years of age	Not done	- Children 6–35 months of age - Ever-married women 15–49 years of age	Not done	Not done
NFHS-3	- Children younger than 5 years - Women 15–49 years of age - Men 15–54 years of age	Not done	- Children 6–59 months of age - Women 15–49 years of age - Men 15–54 years of age	- Women 15–49 years of age in a subsample of households - Men15–54 years of age in a subsample of households	Not done
NFHS-4 ^a	- Children younger than 6 years - Women 15–49 years of age - Men 15–54 years of age in the subsample of households	- Women15–49 years of age - Men15–54 years of age in a subsample of households	- Children 6–71 months of age - Women 15–49 years of age - Men 15–54 years of age in a subsample of households	- Subsample of women 15–49 years of age in a subsample of households - Men 15–54 years of age in a subsample of households	- Women15–49 years of age - Men15–54 years of age in a subsample of households
DLHS					
DLHS-1	Not done	Not done	Not done	Not done	Not done
DLHS-2 ^b	- Children younger than 6 years (weight only)	Not done	- Children younger than 6 years of age - Girls 10–19 years of age - Currently married pregnant women 15–44 years of age	Not done	Not done
DLHS-3	Not done	Not done	Not done	Not done	Not done
DLHS-4 ^a	- Women, men and children 1 month or older	- Women and men 18 years or older	- Women, men and children 6 or older	Not done	- Women and men 18 years or more of age
AHS					
All AHS ^a	- Women, men and children 1 month or older in a subsample of households	- Women and men 18 years or more of age in a subsample of households	- Women, men and children 6 months or older in a subsample of households	Not done	- Women and men 18 years or more of age in a subsample of households

AHS: annual health survey; DLHS: district-level household survey; HIV: human immunodeficiency virus; NFHS: national family health survey.

^a Testing of salt for iodine content was done for all households.^b Testing of salt for iodine content was done in households that had maternal death.

Table 5. **Birth history data for child mortality, maternal mortality and immunization across the three major health surveys in India, 1992 to 2015**

Survey	Birth history for child mortality ^a	Maternal mortality	Immunization
NFHS			
NFHS-1	All births	Women 13–49 years of age in the preceding 2 years	Last three live births in the preceding 4 years
NFHS-2	All births	Women 15–49 years of age in the preceding 2 years	Last two births in the preceding 3 years
NFHS-3	All births	Not available	All births in the preceding 5 years
NFHS-4	All births	Women 12 years of age in the preceding 2 years	All births in the preceding 5 years
DLHS			
DLHS-1	All births in the preceding 3 years	All women in the preceding 3 years	Last two surviving children born in the preceding 3 years
DLHS-2	All births	Women 15–44 years of age in the preceding 1 year	Last two surviving children born in the preceding 3 years
DLHS-3	All pregnancies in the preceding 3 years	Women 15–49 years of age in the preceding 3 years	Last two surviving children born in the preceding 3 years
DLHS-4	All pregnancies in the preceding 5–6 years	Women 15–49 years of age in the preceding 4 years	Last two surviving children born in the preceding 5–6 years
AHS			
AHS baseline	All pregnancies in the preceding 3 years	Women 15–49 years in the preceding 3 years	Last two surviving children born in the preceding 3 years
AHS update rounds	All pregnancies in the preceding year	Women 15–49 years in the preceding 1 year	Last two surviving children born in the preceding year

AHS: annual health survey; DLHS: district-level household survey; NFHS: national family health survey.

^a Birth includes only live births; pregnancy includes spontaneous abortions, induced abortions, live births and still births.

Table 6. Time lag for public availability of individual-level data from three major health surveys in India, 1992 to 2015

Survey	Data collection phase	Publicly available individual-level data	No. of months between data collection completion and publicly available individual-level data
NFHS			
NFHS-1	April 1992 to September 1993	August 1995	22
NFHS-2	November 1998 to December 1999	October 2000	9
NFHS-3	November 2005 to August 2006	September 2007	12
NFHS-4	March 2015 onwards	Data being collected as of February 2016	N/A
DLHS			
DLHS-1	May 1998 to October 1999	August 2001	21
DLHS-2	March 2002 to June 2005	August 2006	13
DLHS-3	December 2007 to December 2008	April 2010	15
DLHS-4	August 2012 to February 2014	December 2015	21
AHS			
AHS baseline	July 2010 to March 2011	November 2015	55
AHS 1st update	October 2011 to April 2012	November 2015	42
AHS 2nd update	November 2012 to May 2013	November 2015	29

AHS: annual health survey; DLHS: district-level household survey; N/A: not applicable; NFHS: national family health survey.