

How interviewers affect responses to sensitive questions on the justification for wife beating and refusal to have conjugal sex, and domestic violence in India

Abstract

There is relatively little research on interviewer effects on responses to questions on women justifying a woman's refusal to have sex with her husband, women justifying wife beating, women's experience of physical and sexual violence, and whether the woman's father ever beat her mother. The National Family Health Surveys (NFHS) are the only source of these data in India that are routinely used by policymakers for formulating evidence-based policies and programmes. This study examines interviewer effects on these indicators that were collected in two large-scale NFHS surveys in India (2005-06 and 2015-16). We use cross-classified random intercept multilevel logit models to examine interviewer effects. In both surveys, we find large interviewer effects on questions about the justification of a woman refusing to have sex with her husband and the justification of wife beating. The interviewer effects were much larger in the 2015-16 survey, which had a sample size of 6,99,686 women age 15-49, than in the 2005-06 survey, which had a sample size of 1,24,385 women age 15-49. Such large interviewer effects should be considered when interpreting data on these topics. Understanding interviewer effects is important given the wide use of these surveys in policy formulation and monitoring in India.

Keywords: interviewer effects; National Family Health Survey; cross-classified random intercept multilevel logit models; justification of a woman's refusing to have sex with her husband; justification of wife beating; experience of physical and sexual violence; father ever beating mother; India

Introduction

Results from household sample surveys have become an important part of the policymaking process, especially in low- and middle-income countries (LMICs) like India. In the absence of regular and complete data from vital registration systems and other government-supported systems, sample surveys have become an essential source of data in the fields of population and health. The results obtained from sample surveys are frequently used for monitoring policies and programmes at the national and state levels. In India, the National Family Health Surveys (NFHS) and the District Level Household Surveys (DLHS) occupy a central place in policy discussions of maternal and child health programmes (MoHFW 2010). In addition, data from these surveys have been used extensively for monitoring the Millennium Development Goals (MDGs) and are an important data source for estimating progress on the Sustainable Development Goals (SDGs) (<https://www.un.org/millenniumgoals/>; <https://sdgs.un.org/goals>). The most recent round of NFHS (also known as NFHS-4), conducted in 2015-16, provided estimates of 27 SDG indicators, and the fifth round that is currently underway is expected to provide estimates of 34 SDG indicators.

A growing body of research documents varying levels of interviewer effects in national and sub-national surveys. Interviewer effects arise when interviewers knowingly or unknowingly introduce bias while collecting information from respondents. There is a general perception that, to avoid embarrassment, some interviewers might record the answers to particularly sensitive questions without actually asking the questions or without probing to obtain accurate responses. Sometimes there is also a tendency for respondents to give and for interviewers to record culturally accepted answers, which is known as social desirability bias (Davis et al. 2010; Ford and Norris 1997; Liu 2016; Wang et al. 2013; Yang and Yu 2008). There is also a possibility that interviewers might rush through an interview if they are pressured to finish

within a tight timeframe. Interviewer effects might also arise when interviewers do not read the questions verbatim, as intended, or when they add other information that may confuse or mislead the respondent (Kasprzyk 2005). Interviewer effects may be particularly pronounced when information on sensitive topics is collected in a survey (Bignami-Van Assche et al. 2003; Groves and Magilavy 1986; Mangione et al. 1992; West and Blom 2017). Survey questions seeking to collect information on sensitive topics such as abortion, HIV/AIDS, and domestic violence may be more prone to non-response or measurement errors than non-sensitive questions (Bignami-Van Assche et al. 2003; Leone et al. 2021; Tourangeau and Yan 2007).

Despite a general understanding that interviewers might cause measurement errors (Blom and Korbmacher 2013; Davis et al. 2010; Groves 2004; Groves et al. 2009; MacQuarrie et al. 2018; Tourangeau and Yan 2007), there is little research on interviewer effects in LMICs (Bignami-Van Assche et al. 2003). The research that exists has generally examined the effect of interviewers' socio-economic and demographic background in comparison with the respondent's characteristics on measurement errors (Biruk 2018; Mneimneh et al. 2020; Randall et al. 2013; Schaeffer et al. 2010). For example, two studies found an association between the age of the interviewer and measurement errors (Cleary et al. 1981; Ford and Norris 1997). While Hispanic women reported more sexual activity to younger interviewers in a study by Ford and Norris (1997), positive responses to psychological symptom scales increased with interviewer age in a study by Cleary et al. (1981). Race and ethnicity of the respondent and the interviewer were also found to be associated with measurement errors in a few studies from the United States and African countries. Those studies found that the quality of data is better in non-coethnic interviewer and respondent pairs (Adida et al. 2016; Davis et al. 2010; Liu 2016; Wang et al. 2013). More experienced interviewers were more likely to elicit information on personal issues in studies conducted in the United States and elsewhere (Cleary et al. 1981;

Olson and Bilgen 2011). Interviewers' beliefs (Himelein 2015), experience, and prior training (Olson and Smyth 2015), and expression of nonverbal signals (Holbrook et al. 2003) were also found to be associated with interviewer effects. A few studies have also reported the association of the interviewer effects with selection, training and supervision of interviewers, interviewer workload, and length of interview (Anglewicz et al. 2009; Bignami-Van Assche et al. 2003; Nix 2014). Weinreb and Sana (2009) used the 1998 Kenya Demographic and Health Survey (DHS) to analyse the effect of interviewer's translation of the questionnaire and showed a clear interviewer effect on questions related to HIV and pregnancy. Most of these studies have been limited to outcomes such as abortion, HIV/AIDS, racial discrimination, and substance use (Leone et al. 2021; Liu 2016; Wang et al. 2013; Weinreb and Sana 2009). Amos (2018) found negligible effects on non-response related to contraceptive use in the Philippines and Indonesia.

Surprisingly, we found only one study that examined the interviewer effects on abortion-related questions. Leone et al. (2021) found negligible interviewer effects on different questions related to abortion in India. Interestingly, that study used the 1998-99 round of NFHS (NFHS-2) for statistical analysis despite the availability of two more recent rounds of NFHS. It is important to note here that the sample size in NFHS-4 increased almost six-fold over the NFHS-2 sample size. Such a tremendous increase in sample size could potentially have serious implications for recruiting many more interviewers, organizing and managing multiple training courses for interviewers, supervising and managing the fieldwork, and other aspects of survey implementation. Moreover, understanding interviewer effects in other sensitive questions in recent NFHS surveys may help analysts and policymakers carefully choose key variables, since the presence of such effects could make it difficult to accurately identify analytical relationships. In addition, such an analysis may help analysts in cautiously comparing relationships across countries or over different survey rounds in India. Researching interviewer

effects in India is particularly important because of the huge cultural and social diversity that exists in India. There are diverse religions and caste and tribe groups; literacy and wealth levels vary substantially across the states and union territories; and cultural norms and practices and the acceptability of those norms and practices vary considerably across India (Dyson and Moore 1983; IIPS and ICF 2017).

Because of the limitations of the existing research in India and the utility of the National Family Health Survey, our study seeks to examine interviewer effects, net of community effects, in women justifying a woman's refusal to have sex with her husband, women justifying wife beating, the experience of physical and sexual violence, and whether the woman's father ever beat her mother in the 2005-06 and 2015-16 NFHS surveys. We have included community effects in the statistical analysis to ensure that the interviewer effect does not simply capture the community effects. Since interviewers in NFHS surveys conduct interviews in preselected communities located in given geographical areas, if we included only interviewer effects, the analysis could pick up community effects. In addition, community effects in NFHS surveys may vary considerably due to geographic differences in underreporting and the true prevalence of the selected outcomes. Moreover, there is a clear lack of evidence on community effects in the selected outcomes in India in general and sensitive outcomes in particular. Community effects are also important particularly in patriarchal societies like India because these reflect the clustering of traditionally held customs and norms regarding the status of women and men, sexual behaviour, spousal violence, etc.

Data and methods

Data

We used data from the 2005-06 NFHS-3 and the 2015-16 NFHS-4 in India. The key objectives of NFHS surveys are to provide estimates of fertility, mortality, family planning, maternal and child health, nutrition, non-communicable diseases, domestic violence, HIV/AIDS, and numerous other topics at the national and state levels. For the first time in the NFHS series, NFHS-4 also provided estimates of most indicators for each of India's 640 districts at the time of the 2011 Census. NFHS-3 covered all 29 states and 6 union territories of India. Both surveys used a two-stage sample design in urban and rural areas. Census Enumeration Blocks (CEBs) or villages, also known as primary sampling units (PSUs), were selected in the first stage using probability proportional to size (PPS) sampling. A fixed number of households were selected in the second stage from the selected CEBs or villages using systematic sampling. Both surveys covered over 99% of the India's population (IIPS and Macro International 2007; IIPS and ICF 2017).

In total, 1,24,385 women age 15-49 were interviewed in NFHS-3. In comparison, 6,99,686 women age 15-49 were interviewed in NFHS-4. This large increase in the number of interviewed women in NFHS-4 is due to the addition of districts as a reporting domain for providing estimates of selected indicators (IIPS and ICF 2017). The response rates for eligible women were 95% and 97% in NFHS-3 and NFHS-4, respectively (IIPS and Macro International 2007; IIPS and ICF 2017).

Ethics Statement

This research is based on secondary data from publicly available datasets, which are available from the DHS Program website (<https://dhsprogram.com/>). The datasets do not contain

information that may be used to identify the respondents. Hence, our study is exempt from ethical approval requirements.

Identifying interviewers in NFHS-3 and NFHS-4

The field interviewers in every state were grouped into teams. The standard interviewing team was comprised of one team supervisor, one field editor, three female interviewers, one male interviewer, and two health investigators. There was no field editor on the teams in NFHS-4 since that was the first NFHS survey that used computer assisted personal interviewing (CAPI). A number of primary sampling units (PSUs) were assigned to each team of interviewers. In each PSU, all of the women's interviews were conducted by female interviewers in the team assigned to that PSU. The NFHS-3 and NFHS-4 data include an interviewer number for each interview conducted, which allows the interviewing teams and interviewers to be identified. This information makes it possible to determine how many interviews each member of the teams conducted during the survey. Overall, 632 and 2,596 female interviewers conducted the fieldwork in NFHS-3 and NFHS-4, respectively.

Outcome variables

We included 11 variables in the analysis across the five broad domains (women justifying a woman's refusing to have sex with her husband, women justifying wife beating, women's experience of physical violence, women's experience of sexual violence, and woman's father ever having beaten her mother).

We included two variables under the domain of women justifying a woman's refusing to have sex with her husband—a wife being justified in refusing to have sex with her husband when she knows he has a sexually transmitted disease and a wife being justified in refusing to have

sex with her husband when she knows her husband has sex with other women. Both variables are binary; '1' representing a wife being justified in refusing to have sex with her husband and '0' otherwise. Likewise, we included two variables under the domain of women justifying wife beating—women justifying wife beating if the wife refuses sex and women justifying wife beating if the husband suspects that his wife is unfaithful. Both the variables are binary; '1' representing a woman justifying wife beating and '0' otherwise.

We included four variables under the domain experience of physical violence—the woman's husband ever punched her with his fist or with something that could hurt her; the husband ever kicked, dragged, or beat up his wife; the husband ever tried to choke or burn his wife on purpose; and the husband ever threatened or attacked his wife with a knife, gun or any other weapon. All four variables are binary; '1' representing that the woman experienced that form of physical violence and '0' otherwise. Likewise, we included two variables under the domain of experience of sexual violence—the husband ever physically forced his wife to have sexual intercourse with him even when she did not want to and the husband ever forced his wife to perform any sexual acts she did not want to. Both the variables are binary; '1' representing a woman who experienced that form of sexual violence and '0' otherwise.

Finally, we included one variable to capture whether a woman's father ever beat her mother. This variable is also binary; '1' representing that the father ever beat the mother and '0' otherwise.

We also included two variables (completed years of schooling for women and women's ages ending with the digit 0 or 5) for conducting a sensitivity analysis. The purpose of the sensitivity analysis is to examine whether the interviewer effects for non-sensitive questions are similar

to those obtained for sensitive questions. The question on the completed years of schooling is used to estimate the average years of schooling for women. The questions on age at their last birthday and their date of birth were used to compute the percentage of women who reported ages ending with 0 or 5 years.

Methods

Our analytical approach involved estimation of four-level random intercept multivariable binary logit regressions to model the selected outcomes, an approach similar to that adopted by Leone et al. (2021). We modelled the outcome of interest for the i^{th} respondent interviewed by the j^{th} interviewer in the k^{th} PSU in the l^{th} state. Our random intercept models are cross-classified at the interviewer level and the PSU level (or the interviewing team level as one PSU was assigned to only one interviewing team). We used a cross-classified random intercept model at the interviewer and PSU levels because interviewers are not nested within the PSUs. In addition, this approach allows us to account for the fact that some interviewers might be assigned to PSUs in which respondents may have a different propensity to report an outcome. Using this approach, we can partition the total variation in the outcome into variations because of the interviewers, PSUs, and state.

$$\text{Logit}(\Pr(y_{ijkl}=1|\theta_i, \zeta_j, \zeta_k, \zeta_l)) = \beta_0 + \lambda\theta_i + \zeta_j + \zeta_k + \zeta_l$$

where y is the outcome of interest for the i^{th} respondent interviewed by the j^{th} interviewer in the k^{th} PSU in the l^{th} state. θ is a vector of individual-level socio-economic, demographic, and residence-related characteristics. While ζ_j and ζ_k represent the cross-classified interviewer and PSU-level random intercepts, ζ_l represents the state-level random intercept.

We adjusted our models for relevant socio-economic, demographic, and residence-related characteristics of the respondents. By adjusting for respondent characteristics, we are able to control for the fact that interviewers may be differentially assigned to interview respondents who may have a differential propensity to report an outcome.

We also included state as a level in our regressions for two reasons. First, we wanted to account for the fact that different field agencies were contracted to carry out fieldwork in different states in NFHS surveys. Eighteen organizations—13 private sector organizations and 5 population research centres (PRCs) established by the Ministry of Health and Family Welfare, Government of India, in different states—carried out the fieldwork in NFHS-3 (IIPS and Macro International 2007). In comparison, NFHS-4 fieldwork was conducted by 14 field agencies, including 11 private sector organizations and 3 PRCs (IIPS and ICF 2017). Field agencies are important given that most major tasks related to fieldwork rest with them. For example, it is the responsibility of the field agency to conduct the training of field interviewers, organise field practice for the interviewers, ensure adherence to survey protocols, supervise the fieldwork, and pay adequate salaries and daily allowances to the field interviewers on a timely basis. Therefore, the quality of data, including the interviewer effects, might depend to a great extent on the field agencies, as proper implementation of many of the afore-mentioned tasks might vary from agency to agency. Due to the complex bidding process adopted to hire the field agencies in NFHS (IIPS 2014), the cost of the survey per household quoted by the field agencies varied substantially. Although field agencies had to strictly follow the survey protocols, it is possible that there may have been instances in which field agencies reduced salaries and other allowances of field interviewers to increase their profits. Second, there are natural variations in the outcomes across the different states of India. Sometimes these variations can be clearly identified as a north-south or an east-west divide (Dyson and Moore

1983). Moreover, socio-economic development varies considerably across the states of India (IIPS and ICF 2017).

Finally, we estimated the intra-class correlation coefficient (ICC) that indicates the percent variance in the outcome that is explained by variation due to interviewers, variation due to PSUs, and variation due to states. The ICC allows us to compare the interviewer effects (or the interviewers' random intercept variance) across the outcomes and the two surveys considered in our study.

The socio-economic, demographic, and residence-related characteristics of the respondents included in the models are age 5 or more years of schooling, belonging to scheduled castes or scheduled tribes, belonging to Hindu households, belonging to households in the poorest wealth quintile, urban-rural residence, whether the respondent is working, exposure to media, parity, experience of child loss, having a living son, marital duration, age difference between the spouses, and whether the husband drinks alcohol. Wealth quintiles are already estimated and are included in the NFHS-3 and NFHS-4 datasets.

Finally, we conducted a sensitivity analysis where we estimated four-level random intercept multivariable regressions to model the two non-sensitive outcome variables. Neither NFHS-3 nor NFHS-4 collected information on interviewers' characteristics. Hence, we could not include interviewers' characteristics in the regressions.

All the statistical computations were done in STATA 16.0.

Results

Comparative statistics of NFHS-3 and NFHS-4

Table 1 shows selected comparative statistics of NFHS-3 and NFHS-4. Over 1,24,000 women age 15-49 in representative households were interviewed in NFHS-3. In comparison, over 6,99,000 women age 15-49 were interviewed in representative households in NFHS-4. Interviews were conducted in 3,850 PSUs in NFHS-3 and in 28,521 PSUs in NFHS-4. The number of interviewing teams was much larger in NFHS-4 than in NFHS-3. Likewise, the number of interviewers in NFHS-4 was three times that of NFHS-3. The average number of interviews per interviewer in NFHS-4 was almost twice that of NFHS-3. While the average survey duration in a state was 7.8 months in NFHS-4, it was only 4.6 months in NFHS-3.

Prevalence of the selected outcomes in NFHS-3 and NFHS-4

The prevalence of selected outcomes in NFHS-3 and NFHS-4 is shown in **Table 2**. The prevalence varied considerably by outcomes in both NFHS-3 and NFHS-4. The inter-survey differences in the prevalence of 11 outcomes were largely marginal. For example, 15% and 14% of women in NFHS-3 and NFHS-4, respectively, justified wife beating when a wife refuses sex to her husband. Likewise, 26% and 24% of women in NFHS-3 and NFHS-4 justified wife beating when a man suspects his wife of being unfaithful. Seven percent and 5% of women in NFHS-3 and NFHS-4, respectively, experienced forced sex. Likewise, 3% and 2% of women in NFHS-3 and NFHS-4 said that their husbands ever forced them to perform any sexual acts they did not want to. While the inter-survey differences were marginal for the outcomes associated with the woman's father ever beating her mother, the inter-survey differences were negligible for the outcomes associated with the experience of physical violence.

Inter-survey differences on the order of 4-5 percentage points were found only in the case of two outcomes related to women justifying a woman's refusing to have sex with her husband. For example, 85% and 80% women in NFHS-3 and NFHS-4, respectively, said that a wife is justified in refusing to have sex with her husband when she knows her husband has a sexually transmitted disease. Likewise, 84% and 80% of women in NFHS-3 and NFHS-4, respectively, said that a wife is justified in refusing to have sex with her husband when she knows her husband has sex with other women.

Intra-class correlation coefficient results

Intra-class correlation coefficients estimated using the cross-classified random intercept logit models for the selected outcomes are shown in **Table 3**. The interviewer effects varied considerably by the outcomes in NFHS-4. The estimated interviewer effects were highest for women justifying a woman's refusing to have sex with her husband when she knows that her husband has a sexually transmitted disease (46%) or her husband has sex with other women (45%). About a third of the total variation in the outcomes related to women justifying a woman refusing to have sex with her husband was due to the interviewers. Interestingly, the estimated interviewer effects varied by the severity of outcomes related to the experience of physical violence. For example, the estimated interviewer effects accounted for 17% of the total variation on whether her husband ever punched her with his fist or with something that could hurt her. In comparison, estimated interviewer effects accounted for 41% of the total variation on whether her husband ever threatened or attacked her with a knife, gun, or any other weapon. When it comes to outcomes related to sexual violence, 28-30% of the total variation was due to the interviewers. In the case of whether the woman's father ever beat her mother, 24% of the total variation was due to the interviewers. Note that the interviewer effects were larger

than the PSU effects for all the outcomes. Interestingly, there were also substantial state effects. Moreover, the state effects were larger than or equal to the PSU effects for 7 of the 11 outcomes.

In NFHS-3, the interviewer effects also varied considerably by the outcomes. As in NFHS-4, the estimated interviewer effects were highest for outcomes related to women justifying a woman's refusing to have sex with her husband when she knows that her husband has a sexually transmitted disease (32%) or her husband has sex with other women (33%). The estimated interviewer effects were also high for the two outcomes related to women justifying wife beating (27-28%). The estimated interviewer effects were also high for the two outcomes related to sexual violence. Note that the interviewer effects were higher than the PSU effects for all the outcomes. There were also substantial state effects. The state effects were larger than or equal to the PSU effects for 6 of the 11 outcomes.

A comparison of the interviewer effects between NFHS-3 and NFHS-4 suggests an increase by 5 or more percentage points for 10 of the 11 outcomes. The interviewer effects also increased by 4 percentage points for whether the husband ever forced his wife to perform any sexual acts she did not want to. The PSU effects increased by 5 or more percentage points for only 1 outcome and declined by 5 or more percentage points for only 3 outcomes. The state effects increased by 5 or more percentage points for only 1 outcome and declined by 5 or more percentage points for only 2 outcomes.

The full cross-classified random intercept regression tables are shown in the Appendix.

Sensitivity analysis

We estimated cross-classified random intercept models to examine whether the interviewer effects for two non-sensitive outcomes (age of women ending with 0 or 5 and completed years of schooling) are similar to those obtained for the sensitive outcomes. The results are shown in **Table 4**. The interviewer effects for the two non-sensitive outcomes were negligible. While the PSU and state effects were negligible for age of women ending with 0 and 5, the PSU and state effects were substantial for completed years of schooling (which is likely given variations in completed years of schooling across PSUs and states). A comparison of the PSU effects for completed years of schooling in the two surveys suggests a considerable decline from NFHS-3 to NFHS-4. No decline in state effects was observed in completed years of schooling between NFHS-3 and NFHS-4.

Discussion and conclusion

Our study is the first study that has examined interviewer effects in NFHS-3 and NFHS-4 surveys in India in a comprehensive way. It is also the first study to compare the interviewer effects across the two most recent rounds of NFHS (NFHS-3 and NFHS-4). The trends across rounds are significant because of the fact that the sample size in NFHS-4 was more than 6 times that of NFHS-3, making it one of the largest household surveys on population and health in the world. Moreover, this is the first study in India in which multiple indicators with different levels of sensitivity were analyzed to examine the interviewer effects on sensitive outcomes. Prior to our study, Leone et al. (2021) examined the interviewer effects in questions related to abortion in India using the NFHS-2 survey (conducted in 1998-99). Our analysis finds considerable interviewer effects in the selected outcomes. The interviewer effects increased by 5 or more percentage points from NFHS-3 to NFHS-4 for 10 out of 11 outcomes considered in the cross-classified random intercept logit analysis. A potential reason for the considerable

interviewer effects on sensitive outcomes could be that the sensitive questions introduce more opportunities for the interviewers to intervene and assist the respondent (Billiet and Loosveldt 1988; Groves and Magilavy 1986; Schnell and Kreuter 2005). Interestingly, the interviewer effects on the two least sensitive outcomes (ages of women ending with 0 or 5 and completed years of schooling) were negligible, and they remained unchanged between NFHS-3 and NFHS-4. These findings are consistent with the findings of various studies primarily conducted in developed countries (Bignami-Van Assche et al. 2003; Groves and Magilavy 1986; Mangione et al. 1992; West and Blom 2017). These findings are of importance given that researchers and policymakers tend to compare the results from various rounds of NFHS without considering the fact that measurement errors, such as interviewer effects, might have changed across survey rounds. It is particularly important to pay attention to these findings when comparisons are made on potentially sensitive questions.

While the increase in interviewer effects from NFHS-3 to NFHS-4 could be due to various factors, we believe that the almost six-fold increase in sample size could be one of the most important reasons for such a large increase. The increase in the sample size led to an increase in the workload of the field interviewers (measured in terms of the average number of interviews conducted by an interviewer) and the average duration that the fieldworkers had to engage continuously in the fieldwork in a given state. Table 1 shows a considerable increase in these two indicators over the two surveys. In addition, the larger sample size, which considerably increased the duration of the fieldwork in NFHS-4, could also have led to higher fatigue among the NFHS-4 field interviewers and implementers, resulting in compromised monitoring and supervision of the fieldwork.

A valuable contribution of our study is the finding related to the interviewer variance being larger than the PSU variance. This means that variations in the selected outcomes were larger across the interviewers than across the communities. These findings are consistent with the existing literature, especially so for sensitive items (Leone et al. 2021; Schnell and Kreuter 2005). These findings clearly indicate that the reporting of selected outcomes in NFHS is more related to survey implementation than to actual differences in selected outcomes. Moreover, it is reassuring that the quality issues with survey reporting of the selected outcomes are less affected by factors beyond the survey's control, such as community level traditions, norms, and stigma associated with reporting.

The large state effects could be the result of natural variations in the outcomes across the 29 states of India or variations due to the hiring of different field agencies to conduct the survey in different states based on a complicated tendering process that takes account of technical expertise and, to a lesser extent, the financial bid that was submitted. We argue that a larger part of the state effects could be due to the field agencies rather than natural variations in the outcomes across states for the primary reason that we adjusted the cross-classified random intercept logit models for a number of important socio-economic, demographic, and residence-related characteristics based on the available literature in India and abroad.

A comparison of the results for outcomes related to women justifying a woman's refusing to have sex with her husband, women justifying wife beating, and women's actual experience of physical and sexual violence shows that the questions on the experience of physical and sexual violence, though sensitive in nature, may be easier to ask and easier to answer accurately than questions on justifying a woman's refusing to have sex with her husband and a woman justifying wife beating. Perhaps women in a typical Indian set up are more likely to share their

experience of marital physical and sexual violence with the interviewers (who are from outside the community) than with someone who is from the community as they may see a greater risk in sharing their experience with their neighbors or someone else from the community. The authors' own experience in collecting data on physical and sexual violence in patriarchal societies such as India, where women typically live with their marital kin and have less contact with their natal kin, suggests that the survey affords women with their first opportunity to safely share their experience of physical and sexual violence with someone outside of their community. On the other hand, questions on justifying a woman's refusing to have sex with her husband and a woman justifying wife beating are not only sensitive in nature but are also difficult for interviewers to administer and difficult for female respondents to understand.

Limitations of our study may also be noted. We could not estimate the magnitude of the interviewer effects in absolute terms, nor could we estimate what the prevalence of the selected outcomes would be in the absence of the interviewer effects. We could not include interviewers' characteristics in our models due to the unavailability of that information in the two surveys. The inclusion of a Fieldworker Questionnaire containing detailed information related to interviewers' characteristics and experience is a relatively recent addition to the Demographic and Health Surveys (DHS), and the DHS Fieldworker Questionnaire has been included in the fifth round of NFHS, which is currently underway. Therefore, future research on NFHS-5 data and data from subsequent surveys will be able to include interviewers' characteristics when examining the interviewer effects. Such an analysis will help differentiate between the effect of interviewers' characteristics and the effect of interviewers' skills and experience. We cannot fully attribute the state-specific effects to the field agencies. Nevertheless, our study has found large interviewer effects on potentially sensitive outcomes, but only a very small or negligible effect on non-sensitive outcomes. Since only a small number

of questions in NFHS-3 and NFHS-4 are considered sensitive, it is encouraging that probable interviewer effects are restricted only to those few questions. Our findings also call for caution when analysing and interpreting the levels and patterns in the responses to sensitive questions in NFHS-3 and NFHS-4, especially since the interviewer effects might have changed between the two surveys.

Our study opens up a number of areas for future investigations. Future research may examine the interviewer effects across the states in India. Such research would help in understanding regional variations in interviewer effects in a large and diverse country like India. Such research would also help researchers and policymakers to better interpret the comparison of sensitive outcomes across states. In addition, knowing that states might that have large interviewer effects will be helpful for future similar studies and bring the point home that selection of appropriate survey organizations is essential. Another potential area for investigation would be to compare the interviewer effects across various countries. Future research may also study and develop simpler approaches or tests for examining whether the changes in interviewer effects from one round to another are statistically significant. Although we found an increase in the interviewer effects from NFHS-3 to NFHS-4, we could not empirically test whether the increase is statistically significant or due to chance.

Our findings have important implications for designing and implementing large-scale household surveys in LMICs like India. Since data on potentially sensitive topics are typically not available from other sources, there is a growing tendency to include more and more potentially sensitive questions in large-scale household surveys. DHS surveys face growing pressures to add new questions (Kishor 2015). Our analysis and other studies reveal that large-scale household surveys may not be the best vehicle for collecting data on sensitive topics.

Inclusion of potentially sensitive questions in such surveys requires rigorous interviewer training, supervision, and monitoring, as well as controls on the workload of interviewers (Kasprzyk 2005). Although these strategies were implemented in NFHS-3 and NFHS-4, additional emphasis on collecting reliable information on sensitive topics is needed. Both NFHS-3 and NFHS-4 incorporated stringent quality controls on survey implementation, but additional innovative approaches may need to be developed for collecting sensitive information in large-scale household surveys. A possible innovative option for sensitive questions is audio computer-assisted self-interviewing (ACASI), which may be more reliable in reporting confidential information (Chauchard 2014; Lindberg and Scott 2018; Rossier 2003; Sedgh and Koegh 2019; Sedgh et al. 2012). While ACASI might make women more comfortable in answering questions on selected outcomes, thereby lowering the chances of underreporting or inaccurate reporting (Langhaug et al. 2010), ACASI is less suitable for women with no schooling or lower levels of schooling (Potdar and Koenig 2005). The use of ACASI and C-ACASI (Color-coded ACASI) has shown promise for collecting confidential information from poorly educated men and women in a semi-rural area of South India (Bhatnagar et al. 2013).

Furthermore, due to the shift to providing district-level estimates in household surveys in India in addition to national and state estimates, the sample size of recent household surveys conducted has increased manifold. The increase in sample sizes complicates efforts to maintain high-quality data in these surveys. Our analysis indicates a considerable increase in the interviewer effects for sensitive questions from NFHS-3 to NFHS-4. Given these results, future household surveys in LMICs should seriously consider these effects when determining sample sizes and making decisions about the inclusion of very sensitive topics in those surveys. Finally, there is a need for qualitative research on how to reduce the potential interviewer and field agency effects in large-scale household surveys.

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Table 1: Selected comparative statistics of NFHS-3 and NFHS-4, India

S. No.	Items	Survey Round	
		2005-06	2015-16
1	Sample size (number of interviewed women)	1,24,385	6,99,686
2	Number of PSUs in which interviews were conducted	3,850	28,521
3	Number of interviewing teams	264	875
4	Number of interviewers	916	2,734
5	Average number of interviews conducted by an interviewer	136	256
6	Average duration of survey in a state (in months)	4.6	7.8

Table 2: Prevalence of selected outcomes in NFHS-3 and NFHS-4, India

<i>Outcome</i>	NFHS 3: 2005-06		NFHS 4: 2015-16	
	Percentage	N	Percentage	N
<i>Woman justifying women's refusing to have sex with her husband</i>				
when she knows that her husband has a sexually transmitted disease	85.1	1,13,719	80.1	1,17,276
when she knows her husband has sex with other women	83.8	1,17,716	79.6	1,17,777
<i>Woman justifying wife beating</i>				
if a wife refuses sex	14.7	1,19,101	13.6	1,18,692
if a husband suspects that his wife is unfaithful	25.8	1,21,204	23.6	1,19,578
<i>Experience of physical violence</i>				
husband ever punched with fist or something harmful	6.3	72,733	6.3	66,834
husband ever kicked or dragged	6.6	72,733	6.5	66,834
husband ever tried to strangle or burn	1.2	72,733	1.2	66,834
husband ever threatened or attacked with knife/gun or other weapon	0.7	72,733	0.6	66,834
<i>Experience of sexual violence</i>				
husband ever physically forced wife to have sexual intercourse with him even when she did not want to	6.6	72,733	4.5	66,834
husband ever forced wife to perform any sexual acts she did not want to	3.3	72,733	2.3	66,834
<i>Father ever beat mother</i>				
Father ever beat mother	18.9	84,273	21.3	79,137

Table 3: Intraclass correlation coefficients estimated using four-level random intercept logit regressions, NFHS-3 and NFHS-4, India

Outcome	NFHS 3: 2005-06							NFHS 4: 2015-16						
	Variance				Intraclass correlation coefficient (ICC)			Variance				Intraclass correlation coefficient (ICC)		
	State	PSU	Interviewer	Residual	State	PSU	Interviewer	State	PSU	Interviewer	Residual	State	PSU	Interviewer
<i>Woman justifying woman's refusing to have sex with her husband</i>														
when she knows that her husband has a sexually transmitted disease	0.27	0.72	2.04	3.29	4%	11%	32%	0.57	0.51	3.77	3.29	7%	6%	46%
when she knows her husband has sex with other women	0.39	0.78	2.18	3.29	6%	12%	33%	0.78	0.57	3.79	3.29	9%	7%	45%
<i>Woman justifying wife beating</i>														
if wife refuses sex	0.45	0.63	1.62	3.29	8%	10%	27%	0.58	0.60	2.16	3.29	9%	9%	33%
if the husband suspects that his wife is unfaithful	0.83	0.57	1.82	3.29	13%	9%	28%	0.84	0.71	2.45	3.29	12%	10%	34%
<i>Experience of physical violence</i>														
husband ever punched with fist or something harmful	0.26	0.26	0.50	3.29	6%	6%	12%	0.45	0.51	0.88	3.29	9%	10%	17%
husband ever kicked or dragged	0.15	0.34	0.52	3.29	3%	8%	12%	0.57	0.50	0.94	3.29	11%	9%	18%
husband ever tried to strangle or burn	0.13	0.13	0.48	3.29	3%	3%	12%	0.16	0.67	1.63	3.29	3%	12%	28%

husband ever threatened or attacked with knife/gun or other weapon	0.19	0.53	0.75	3.29	4%	11%	16%	0.25	0.12	2.59	3.29	4%	2%	41%
<i>Experience of sexual violence</i>														
husband ever physically forced wife to have sexual intercourse with him even when she did not want to	0.65	0.44	1.08	3.29	12%	8%	20%	0.26	0.55	1.58	3.29	5%	10%	28%
husband ever forced wife to perform any sexual acts she did not want to	0.55	0.48	1.51	3.29	9%	8%	26%	0.26	0.69	1.85	3.29	4%	11%	30%
<i>Father ever beat mother</i>														
Father ever beat mother	0.58	0.30	0.54	3.29	12%	6%	12%	0.76	0.39	1.42	3.29	13%	7%	24%

Table 4: Intra-class correlation coefficients for two non-sensitive outcomes estimated using four-level random intercept regressions, NFHS-3 and NFHS-4, India

Outcome	NFHS 3: 2005-06							NFHS 4: 2015-16						
	Variance				<i>Intraclass correlation coefficient (ICC)</i>			Variance				<i>Intraclass correlation coefficient (ICC)</i>		
	State	PSU	Interviewer	Residual	<i>State</i>	<i>PSU</i>	<i>Interviewer</i>	State	PSU	Interviewer	Residual	<i>State</i>	<i>PSU</i>	<i>Interviewer</i>
Age of women ending with 0 or 5	0.03	0.03	0.02	3.29	1%	1%	1%	0.02	0.02	0.02	3.29	1%	1%	1%
Completed years of schooling	2.57	8.22	0.03	17.01	9%	30%	0%	2.33	5.00	0.06	20.28	8%	18%	0%

Appendix Table A1: Coefficients estimated using four-level random intercept multilevel logit regressions, NFHS-3, India

		<i>Woman justifying woman's refusing to have sex with her husband</i>		<i>Woman justifying wife beating</i>	<i>Experience of physical violence</i>				<i>Experience of sexual violence</i>		<i>Father ever beat mother</i>	
		when she knows that her husband has an STD	when she knows her husband has sex with other women	if wife refuses sex	if the husband suspects that his wife is unfaithful	husband ever punched with fist or something harmful	husband ever kicked or dragged	husband ever tried to strangle or burn	husband ever threatened with knife/gun or other weapon	husband ever physically forced wife to have sexual intercourse with him even when she did not want to	husband ever forced wife to perform any sexual acts she did not want to	Father ever beat mother
Caste	Scheduled castes											
	Scheduled tribes	-0.04	-0.15*	-0.11*	-0.02	-0.28*	-0.39*	-0.4*	0.01	-0.37*	-0.43*	-0.08*
	Other backward class	0.03	0.01	-0.12*	-0.04	-0.16*	-0.19*	-0.25*	-0.22	-0.21*	-0.26*	-0.23*
	Other castes	0.05	<0.01	-0.25*	-0.14*	-0.18*	-0.25*	-0.04	-0.34*	-0.08	-0.14*	-0.46*
Religion	Hindu											
	Muslim	-0.06	-0.14*	0.38*	0.29*	0.58*	0.57*	0.72*	0.52*	0.46*	0.68*	0.14*
	Christian	0.02	0.01	-0.14*	-0.1*	0.22*	0.09	0.08	0	-0.02	-0.07	0.05
	Other religion	-0.02	<0.01	-0.09	-0.08*	0.01	0.06	-0.06	0.05	-0.08	0.08	0.03
Wealth quintile	Poorest											
	Poor	0.07*	0.10*	-0.11*	-0.07*	-0.09	-0.06	-0.17	-0.10	<0.01	0.06	-0.06*
	Middle	0.15*	0.16*	-0.2*	-0.24*	-0.27*	-0.25*	-0.24*	-0.33*	-0.11*	-0.05	-0.17*
	Rich	0.19*	0.30*	-0.31*	-0.34*	-0.57*	-0.65*	-0.62*	-0.77*	-0.32*	-0.24*	-0.44*
	Richest	0.26*	0.40*	-0.66*	-0.63*	-1.28*	-1.39*	-1.2*	-1.46*	-0.79*	-0.85*	-1.01*
Place of residence	Rural											
	Urban	0.11*	0.08*	-0.42*	-0.35*	0.3*	0.29*	0.2*	0.44*	-0.01	-0.02	0.18*
Age in years		0.01*	<0.01	<0.01*	<0.01	-0.02*	-0.04*	-0.07*	-0.06*	-0.04*	-0.05*	
Schooling completed	No education											
	Primary	0.05	0.11*	-0.19*	-0.19*	0.05	0.10*	0.08	0.22*	0.09*	0.15*	
	Secondary	0.26*	0.31*	-0.61*	-0.49*	-0.32*	-0.23*	-0.33*	-0.18	-0.12*	0.01	
	Higher secondary and above	0.53*	0.56*	-1.49*	-1.23*	-1.05*	-1.12*	-0.61*	-0.75	-0.57*	-0.35*	

Media exposure	No											
	Yes	0.11*	0.06	-0.07	-0.09*	-0.19*	-0.21*	-0.17	-0.09	-0.12	-0.06	
Parity				0.03*	0.03*	0.06*	0.05*	-0.02	0.02	0.04*	0.01	
Number of living sons				-0.03*	0.01	0.01	0.02	0.04	-0.05	0.01	0.01	
Currently working	No											
	yes			0.01	0.01	0.25*	0.25*	0.2*	0.47*	0.14*	0.15*	
Years husband older than wife						<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Husband drinks alcohol	No											
	Yes					1.3*	1.35*	1.56*	1.45*	0.95*	0.96*	
Marital duration						<0.01	0.02*	0.06*	0.06*	0.01	0.02*	
Constant		1.7*	1.85*	-1.81*	-0.64*	-3.18*	-2.82*	-3.93*	-5.17*	-2.59*	-3.63*	-1.57*

*p<0.05

Media exposure	Yes	-0.03	-0.01	<0.01	-0.14*	0.23*	0.17	0.62*	0.72*	0.47*	0.39*	
Parity				0.03*	0.02*	0.08*	0.05*	0.01	<0.01	0.03*	0.05	
Number of living sons				0.01	0.02*	<0.01	0.01	-0.01	-0.01	0.04	0.02	
Currently working	No Yes			0.07*	0.03	0.20*	0.24*	0.29*	0.15	0.25*	0.27*	
Years husband older than wife						<0.01	-0.01*	-0.01	-0.03*	0.01	<0.01	
Husband drinks alcohol	No Yes					1.41*	1.5*	1.68*	1.55*	1.35*	1.32*	
Marital duration							0.01*	0.02*	0.04*	0.04*	<0.01	0.01
Constant		0.94*	0.63*	-2.57*	-1.42*	-3.49*	-3.09*	-4.93*	-5.89*	-3.89*	-4.58*	-1.49*

*p<0.05