**Collecting better data on sexuality, relationships and violence:
empirical evidence from a school-based evaluation**

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Abstract

Background: Missing and inconsistent data are common problems when researching young people's sexual health. Complete and high-quality data are needed to inform effective programming. To inform improvements, we examine different techniques for collecting school-based data about young people's sexuality, relationships and partner violence.

Methods: We use empirical data from a school-based programme evaluation in Mexico City as a case study. The evaluation sought data on sexuality and relationships using self-administered questionnaires, observation, focus groups, and in-depth interviews. We explore the advantages and disadvantages of different data collection methods in practice, comparing data from questionnaires and interviews to examine data quality and identifying challenges to collecting and interpreting data from different methods and sources. We used descriptive statistics, reviewed field notes, and conducted thematic analysis, drawing on research team and participant perspectives.

Results: Data collection was influenced by earthquakes and extreme weather, social aspects of the data collection setting, and the sensitive nature of the data. There was variation in data quality by group, timepoint, gender, and topic. Women had a higher proportion of complete responses than men at most timepoints. Intervention group men were the only group to increase their proportion of complete responses from baseline to endline. Items about sexual activity had the lowest proportions of complete responses. Participants varied in their willingness to share personal information. Data from different sources and timepoints sometimes appeared contradictory, creating challenges with interpretation.

Conclusions: This analysis can inform methodological choice for school-based sexual health research. Our experience highlights the difficulties of anticipating – and correcting for – the many interacting real-world challenges threats to data quality and interpretation challenges that can arise. It is vital that results for all types of analysis are accompanied by a reflexive discussion of data collection conditions and challenges that might impact on data quality.

Key words

Mixed methods evaluation, school-based data collection, young people, sexual health, data quality, research disruptions

Background

Missing and inconsistent data are common problems when researching young people's sexual health (1). Complete and high-quality data are needed to inform effective programming. Barriers to collecting accurate and meaningful sexual health information from young people include the limitations of self-reporting on sensitive behaviors (2,3) and the challenges of collecting data in schools, where many health interventions for young people are implemented (4,5). Improvements are needed to ensure high quality data for the evaluation of programs addressing young people's sexual health and relationships. To inform improvements, we examine different techniques for collecting school-based data about young people's sexuality, relationships and partner violence, using empirical data from a school-based evaluation in Mexico.

Many adolescent sexual health studies are conducted in schools, which provide efficient access to a large population of young people and a relatively controlled data collection environment; school-based surveys typically have high response rates (6). However, schools are complex systems operating in dynamic contexts (7,8), bringing a range of data collection and recruitment challenges. Weather events, earthquakes, school closures, or changes in classroom allocation and school staffing, can hinder data collection (5,9–11). Parents or school staff may resist sexual health programming or research (12,13), making it difficult to recruit schools at all (4). Even once schools are enrolled in a study, data quality can be compromised by school dropout rates (14), absenteeism, scheduling issues, classroom management challenges (4,5), a lack of private spaces (15), and difficulties retaining participants (16). Researchers have also observed that students may be

uncomfortable answering sexual health questions in the presence of teachers (5) and may opt out of participating in such studies altogether (4,16).

Regardless of the setting, data collection about young people's relationships is influenced by the sensitive nature of adolescent sexuality (17). Young people may find questions about sex inappropriate or invasive (1). This may reflect social norms that stigmatize adolescent sexuality, especially for young women (18,19), and can influence participants' willingness to disclose their own sexual health experiences (20). Self-reported sexual health data can be unreliable for a range of reasons including lack of recall or the desire of participants to respond in socially acceptable ways (2,3,21). Different strategies have been used to correct for such threats to the quality of sexual health data. However, studies examining the effects of the mode of data collection, question wording, incentives, fieldworker training, and matching interviewers and interviewees by gender have been inconclusive or shown only marginal improvements (3,22,23).

Data collection using different methods over multiple timepoints can help address some of the challenges to collecting meaningful and accurate data about adolescent sexual health and relationships. Every data collection method has different strengths and weaknesses, and using multiple complementary methods can help mitigate some of the challenges to obtaining high quality data (24). Mixed methods studies draw on different types of data to consider various aspects of the same concept or experience (25), providing insight to different dimensions of lived experiences. Collecting data longitudinally can help understand shifting experiences with sexuality and relationships (26) – and how interventions influence these (27). This may be particularly useful when conducting research with adolescents, who are at an age characterized by rapid shifts in beliefs and experiences related to gender and sexuality (28,29). While longitudinal and mixed methods data

collection can help learn about multifaceted and evolving sexual health and relationship experiences, these approaches can also create challenges in interpretation by recording potential conflicts or inconsistencies between data points (25,30–32).

This analysis considers different approaches to gathering data about young people's sexuality and relationships. We draw on a case study experience of a school-based evaluation in Mexico in which we experienced challenges to data collection, including two earthquakes and extreme weather events. The aim of this analysis is to provide an illustrative example of the challenges to collecting sexual health data in practice, and explore how these challenges impacted on data collection, data quality, and interpretation of data.

Methods

We use empirical data from a program evaluation as a case study; the evaluation was a quasi-experimental longitudinal exploration of a school-based comprehensive sexuality education program with a focus on intimate partner violence (IPV) prevention. It was conducted in Mexico City in 2017 and 2018 and was collaboratively designed and implemented by International Planned Parenthood Federation/Western Hemisphere Region, Fundación Mexicana para la Planeación Familiar (Mexfam), and London School of Hygiene and Tropical Medicine (LSHTM).

We have described further details of the intervention and its evaluation elsewhere (33,34). The intervention was developed by Mexfam and took place in one secondary school (*preparatoria*) in the south of Mexico City with students between 14 and 17 years of age. It comprised 10 sessions of approximately two hours each and was facilitated by professional health educators. The course used participatory methods designed to generate reflection

about gendered social norms, and included sessions examining relationship dynamics and types of IPV as well as other sexual and reproductive health topics. We piloted the intervention from March to June 2017, then implemented the study from August to December 2017 with six classroom groups of young people – three intervention classes who received the course during the study and three comparison classes who received it after the evaluation ended.

Data collection methods for the evaluation in Mexico City comprised self-administered (pen-and-paper) baseline and endline questionnaires, observation of intervention sessions, focus group discussions with teachers, students, and health educators, and in-depth interviews with students (one-time and repeat). We selected this range of methods to generate evidence that would be useful and meaningful to practitioners, donors and policy makers. We included quantitative data collection methods (questionnaires) to complement the qualitative methods (interviews, observation, focus groups) that predominate in this study, in part because qualitative data alone are sometimes perceived as less rigorous by some audiences (35–37).

The work was conducted in Spanish. We held information sessions about the study with participants' parents and obtained parental consent and participant assent, then implemented the questionnaires and qualitative data collection methods. We observed intervention sessions and recorded field notes (38) describing our experiences using different data collection methods and approaches.

Participants in the interviews and focus groups, which took place outside of class time, were offered a gift card for use at a discount department store. Questionnaire respondents were not offered compensation as this took place during class. All study participants were offered free health services at Mexfam. The research team was versed in

local laws around disclosure of violence and followed ethical guidelines for research of this nature (39,40). All study participants gave informed consent to participate in the study, and we obtained parental consent. The study was approved by the *Centro de Investigación Clínica Acelerada*, Mexico, and the LSHTM Research Ethics Committee, UK. We use pseudonyms to protect participant confidentiality.

Data analysis

This analysis focuses on our experiences with two data collection methods in practice. First, baseline and endline pen-and-paper survey questionnaires, which we used to describe the sociodemographic information and self-reported experiences of the full sample. Second, in-depth interviews (repeat and one-off), which we conducted with a subset of participants to learn about their lived experiences, with a focus on their dating relationships, and to consider which parts of the intervention seem to influence participants' evolving experiences, understandings and beliefs. We selected these two data sources because they were prominent in our study, encompassing the vast majority of study participants.

We used an iterative, grounded approach to defining our analysis strategy to explore the advantages and disadvantages of different data collection methods. We analyzed data from questions about sensitive topics for which we anticipated challenges gathering accurate information – specifically, participants' experiences with relationships, sexuality and violence. Seven such questions were asked in both the interview guide and questionnaires (1-7 in Table 1); three additional questions were asked directly only in the questionnaires, but sometimes emerged as topics in the interviews (8-10 in Table 1).

Table 1: Questionnaire items about relationships, sexuality and violence

	Item	Response categories
1	Have you ever gone out with someone, as in a dating relationship? It could be with a boyfriend, girlfriend, friends with benefits, etc.	Yes No I would rather not say
2	Are you currently going out with someone, as in a dating relationship? It could be with a boyfriend, girlfriend, friends with benefits, etc.	Yes No I would rather not say
3	Have you ever had sexual contact? For example, touching or being touched on the genitals, anal sex, vaginal sex or oral sex?	Yes No I would rather not say
4	Have you ever experienced dating violence in your own relationship (past or present)?	Yes No I would rather not say
5	Do you think the majority of your female friends have already had sex?	Yes No I would rather not say
6	Do you think the majority of your male friends have already had sex?	Yes No I would rather not say
7	As far as you know, has there been any type of dating violence at your school? It could be among boyfriend/girlfriend, friends with benefits, etc.	Yes No I would rather not say

8	With whom would you say that you prefer to have a dating relationship? It could be serious, casual, friends with benefits, etc.	<p>With someone of the same sex as me</p> <p>With someone of the opposite sex as me</p> <p>With people of both sexes</p> <p>I don't know</p> <p>I would rather not say</p>
9	Have you ever felt agreed to have sexual contact with someone even though you didn't want to?	<p>Yes</p> <p>No</p> <p>I would rather not say</p>
10	Have you ever heard of, seen or experienced sexual harassment in your school? For example, whistles, sexual advances, inappropriate looks, unwanted touching, kissing, pressure to have sex through threats, etc.	<p>Yes</p> <p>No</p> <p>I would rather not say</p>

The analysis proceeded iteratively as we familiarized ourselves with data from all sources and reviewed field notes and email communications regarding data collection challenges. This helps us identify potential reasons for inconsistent, incomplete or inaccurate data. We also conducted a thematic analysis (41) of in-depth interview data from 19 participants to gather information about their experiences with the data collection process and perceptions of challenges to data quality.

We assessed the extent to which questionnaire responses were incomplete ('prefer not to say' or left blank) and complete (any response category other than 'prefer not to say') for ten questionnaire items about relationships, sexuality and violence (Table 1), drawing on 392 questionnaires (124 baseline intervention group, 116 baseline comparison group, 95 endline intervention group, and 57 endline comparison group). We used descriptive statistics to assess the proportion of complete questionnaire responses overall, then compared this between intervention and comparison groups at baseline and endline, men and women at baseline and endline, and between questionnaire items. We used a two-sample test of proportions in STATA 14.0 to assess if the proportion of complete responses was different between groups.

When interpreting the data, we took into consideration contextual information about implementation conditions and participant experiences with data collection. This helped assess whether inconsistencies or incomplete data might reflect problems with the method in practice – for example, poorly written questions or implementation challenges (25,30,42,43). We consider inconsistencies or conflicts in the data using a 'complementarity' approach to triangulation, in which findings from different data collection methods are 'not expected to be the same, but rather to make sense in relation to each other and to help create a fuller picture' (44). This approach acknowledges that conflicts between data points can reflect diverse aspects of the concepts being studied (30) or different moments in evolving life experiences, rather than assuming that there is one 'correct' answer (25,31).

Results

We first describe data collection challenges in this study, then and consider how these influence on data quality, and finally explore potential reasons why they occurred.

Challenges collecting high-quality data in practice

During the evaluation, we encountered a range of challenges to collecting high-quality data. These included: (1) delays to data collection; (2) interpersonal interactions during data collection; (3) participant concerns about privacy and confidentiality; and (4) variability in participants' willingness to participate in the study. We describe each of these below.

Delays to data collection

Data collection in the evaluation in Mexico was disrupted by two earthquakes and extreme weather events, leading to delays in research activities. In the first weeks of the study, the information sessions for parents and guardians were delayed or cancelled due to heavy rains, an earthquake drill, and a day of school closure for building inspections after the earthquake on September 7, 2017. As a result, baseline questionnaire implementation for two of the three comparison classrooms was delayed by a week. Recruitment for the repeat interviews was also delayed several weeks.

On September 19, 2017, the school closed again due to another significant earthquake. The school reopened more than three weeks later, after a building inspection ascertained its safety. As a result, baseline questionnaire implementation for the third comparison classroom was delayed further – by five weeks in total. The intervention resumed once the school reopened, in a slightly condensed format. Because of these delays, the final intervention session took place on the last week of the school year, one week later than anticipated. The endline questionnaire, to be implemented after the intervention was completed, was delayed to the examination period immediately before the Christmas holiday, when absenteeism was higher than usual. In-depth interviews planned for the end of the semester were delayed by two months, to the beginning of the following semester.

Interpersonal interactions during data collection

In all groups, we encountered challenges related to interpersonal interactions while the questionnaire was being implemented. We observed that students would stand outside the classroom window and gesture to those inside to come out, causing a distraction. We also saw many participants talking to each other as they responded to the questionnaire, sometimes answering questions together with a friend or looking at each other's responses. In some groups, unruly behavior disrupted the whole group while the questionnaire was being implemented.

The in-depth interviews were one-on-one, and therefore less susceptible to interruption from interpersonal interactions. Some participants asked to complete the interviews with a friend; we were unable to do so as it could have influenced the nature of the interview and what was disclosed.

Participant concerns about privacy and confidentiality

The research team observed that students – particularly the young women – appeared concerned about privacy and confidentiality during the questionnaire implementation. For example, while completing the questionnaire some participants asked if we were really going to keep their data safe. In two of the comparison groups, a teacher was in the room while the students were completing the questionnaire. Students appeared uncomfortable and may have thought their teacher would have access to their responses. One teacher told students they had to complete the questionnaire before receiving their final examination scores. Although the research team immediately clarified that participation was strictly voluntary, students may have felt coerced.

In addition, our field notes record challenges maintaining privacy when conducting in-depth interviews. The space initially provided for the interviews had several glass

windows. School staff could see into interview room, and interviewees appeared uncomfortable sharing private information in this context. In addition, first aid supplies were stored in this space, and on several occasions the school nurse entered unexpectedly to use the space, prompting an early end to the interview. Based on these experiences, we requested a private space for interviews, far away from classrooms and staff offices. Once we relocated there were fewer disruptions, though cleaning staff occasionally entered the room, leading the interviewer to pause the conversation briefly.

Recruitment and participation

Despite the delays, disruptions, and privacy challenges described above, the vast majority of students agreed to complete the questionnaire. Nevertheless, in one classroom a group of participants refused to complete the baseline questionnaire. Our fieldnotes record that one young man had initially refused to participate, with half of his fellow students following suit.

There were lower response rates to questionnaires at endline compared to baseline in both the intervention and comparison groups. More than three-quarters of the intervention group completed the endline questionnaire (77% response rate; 95 of 116 participants), while under half of the comparison group completed the endline questionnaire (49% response rate; 57 of 116 participants). The intervention group completed their endline questionnaires during the final intervention session, with most of the students present. Students in the intervention group were familiar with the research team that implemented the questionnaires, as we had been observing intervention sessions over the semester. Conversely, we did not have regular sessions with the comparison group throughout the semester, so they did not recognize us. We had to ask their teachers for permission to enter the comparison classrooms during the examination period at the end of

the semester. We encountered various challenges – many students were absent, some left the room when we arrived, and many did not remember having completed the baseline questionnaire.

We were able to conduct the planned number of endline in-depth interviews at the beginning of the following semester, instead of at the end of the intervention. However, recruiting for and scheduling these interviews was challenging, in part because some students had changed their phone numbers or moved to a different school during the semester break.

Assessing data quality

The diverse challenges we encountered influenced the questionnaire data quality. In this section, we describe the extent of missing and incomplete data in the questionnaire and consider any differences by timepoint (baseline and endline), group (intervention and comparison), gender (women and men), and question topic. We limited the analysis of complete versus missing and incomplete responses to the ten questionnaire items about participants' experiences with relationships, sexuality and violence. Because of the semi-structured nature of the in-depth interview guide, we do not attempt to quantify data quality for the interviews; we will consider the nature and quality of the qualitative data in subsequent sections.

Extent of complete data in questionnaire responses

Of the 3,920 questionnaire responses in the analysis (10 items from 392 questionnaires), 86% of questionnaire responses were complete, 12% were 'prefer not to say,' and 2% were left blank [not shown]. There were differences in the proportion of complete responses by group, timepoint, gender, and topic, described below.

In the intervention group, there was a higher proportion of complete responses at endline than baseline (93% vs. 87%; $p<.001$). The comparison group, in contrast, shows no evidence of a difference in the proportion of complete responses between baseline and endline (79% vs. 79%) [not shown]. In the intervention group, for 9 of the 10 questions there was an increase in the proportion of complete responses between baseline and endline. This reflects an increase in the proportion of complete responses among male respondents in the intervention group from 84% at baseline to 93% at endline ($p<.001$), while complete responses among women stayed nearly constant (92% vs 93%; no evidence of a difference in proportions). [Figure 1].

Figure 1: Proportion of complete responses to questionnaire items about sensitive topics, by group, timepoint and gender

Women provided complete responses more frequently than men in three of the four groups and timepoints [Table 2]. Specifically, women had a significantly higher proportion of

complete responses than men in the comparison group at baseline (84% vs 73%; $p<.001$), in the comparison group at endline (87% vs 70%; $p<.001$), and in the intervention group at baseline (92% vs 84%; $p<.001$). It was only in the intervention group at endline that there was no difference in the proportion of complete responses between men and by women [Table 2].

Table 2: Difference in proportion of complete responses by gender, group and timepoint

	Proportion of complete responses	p-value*
Comparison Baseline Men (53 questionnaires*10 items=530 responses)	73%	<.001
Comparison Baseline Women (63 questionnaires*10 items=630 responses)	84%	
Comparison Endline Men (26 questionnaires*10 items =260 responses)	70%	<.001
Comparison Endline Women (31 questionnaires*10 items=310 responses)	87%	
Intervention Baseline Men (68 questionnaires*10 items=680 responses)	84%	<.001
Intervention Baseline Women (56 questionnaires*10 items =560 responses)	92%	
Intervention Endline Men (52 questionnaires*10 items=520 responses)	93%	0.9554
Intervention Endline Women (43 questionnaires*10 items=430 responses)	93%	

*Calculated using two sample test of proportions

Questions related to sexuality and sexual activity had fewer complete responses than those about other topics. The questions with the lowest proportion of complete responses asked

about ever having sexual contact (75% complete), whether female friends were having sex (80% complete), sexual orientation (83%), whether male friends were having sex (84% complete), or if they ever had unwanted sexual contact (85% complete). For every item, women had higher proportions of complete responses than men. [Figure 2]

Figure 2: Proportion of complete responses to questionnaire items about sensitive topics, by question and gender

Participant observations about data quality

We asked a subset of participants about the data collection process and how they thought their classmates responded. Overall, participants described mixed views in terms of whether their classmates answered questionnaire items honestly. Of the 19 participants

who discussed this, four (Vicente, Elena, Israel, Beatriz) said they thought their classmates were generally honest in their responses, and four (Cecilia, Alejandro, Mauricio, Judith) that their classmates were not honest. Others had more nuanced responses. Gloria said she thought participants might be honest about some questions, but not about intimate topics such as sexual contact. Gerardo said he was more honest when responding to the endline than the baseline questionnaire, and thought his classmates may have answered similarly. Seven of the 19 respondents (Marco, Miguel, Julián, Gabriel, Jazmin, Victor, Karina) observed that while some classmates probably answered honestly, others seemed to treat the questionnaire as a joke.

Participants described a range of possible reasons for incomplete or inaccurate responses to the questionnaire. Two participants (Julián and Elena) said that they or others wanted to answer items quickly in order to leave and socialize. Five of the young women (Karina, Cecilia, Jazmin, Gloria and Judith) said that participants might feel embarrassed, fear being judged, or worry about lack of confidentiality – particularly in relation to questions about being sexually active. As Jazmin said, ‘maybe [they didn’t answer accurately] because it made them embarrassed or they doubted that the information would be confidential.’ Five of the young men (Miguel, Vicente, Alejandro, Gerardo, Alberto) talked about finding the survey boring, not paying attention, or using it to joke around. Alberto said that his classmates ‘didn’t like that it seems like a school test. [...] I think they got bored. [...] They just did it randomly’ (Alberto).

Some participants, however, described reasons to answer the questionnaire accurately and completely. They said that students may have been motivated to respond accurately to demonstrate their knowledge, show off that they were in a relationship, or because it was an important topic. As Israel said, ‘this is a topic that can personally help them, they know

they can take care of themselves or benefit. I think they were sincere.’ Eight participants (Julián, Marco, Jazmin, Beatriz, Israel, Victor, Alejandro, Lizbeth) also described the questionnaire as a tool to help build knowledge, for example reaffirming what they learned or helping them see their progress. Victor said, ‘At first it [the baseline questionnaire] is to see what you know, right? To see the information that you have about these topics. And at the end, it is so you can see how much your knowledge improved.’

Comparison of data gathered from different sources

In this section, we compare self-reported data from three data sources: baseline questionnaires, endline questionnaires, and in-depth interviews. The questionnaires were designed to describe the entire group of participants and help assess whether there were shifts in how participants reported their experiences and definitions of key concepts over time. The in-depth interviews were designed to provide insight to the evolving lived experiences of participants, and how the intervention might influence on their understandings and experiences. For participants who responded to both in-depth interviews and questionnaires, a comparison allowed us to consider data quality and interpretation challenges that can occur when integrating quantitative and qualitative data about sexual health.

Exploring differences in the nature of data collected in interviews and questionnaires

Willingness to share information appeared to vary by data collection method, timing and participant. Gerardo, a repeat interview participant who was recruited at the beginning of the semester, appeared willing to share personal information through both interviews and questionnaires from the beginning of the study. Gerardo self-reported that he was bisexual in both the baseline and endline questionnaires, and he also disclosed his sexual orientation voluntarily in an in-depth interview without being asked: ‘... I’m going to tell you

this, I'm bisexual'. In contrast, Alberto did not share personal information in the baseline and endline questionnaires, responding 'prefer not to say', but shared detailed information about his relationship in an in-depth interview that took place two months after the semester ended.

In some cases, data collected through different methods and at different timepoints seemed contradictory, creating challenging interpreting data – especially about concepts that the program intervened on. In the baseline and ending questionnaires, Angélica reported that she had not observed IPV at school, whereas in the interview she described observing a situation of IPV and her reaction to it. 'I saw it, yes [...]. We were in class and they were fighting, and she told him she didn't want [to be with him] anymore, and he yanked her.' Similarly, in the baseline questionnaire, Angélica self-reported no past experiences of IPV, while at endline she responded that she had experienced it. In the interview, two months after the endline questionnaire, she shared detailed information about her experience of IPV before the intervention, in a past relationship.

'I had a boyfriend [in secondary school] who forbade me, forbade me from dressing like I wanted and from talking to people... well, from boys. [...] He told me that without me he couldn't live, and so... and that he was going to kill himself [if I left him].'

The differences in Angélica's responses are difficult to interpret because the intervention aimed to shift participant understandings of the types of behaviors that comprise IPV, and the questions about IPV were worded so that the participant would define 'partner violence' based on their own understanding of the concept at the time. We do not know if her definition of IPV had shifted as a result of the intervention, which might have influenced the change in her responses over time, or if there are other reasons for the discrepancy in

her responses. For example, she may have become comfortable reporting on sensitive behaviors in the endline survey because she had grown to trust the implementation and research team over the course of the semester.

For some students, responses to questions about their own experiences varied at different timepoints of data collection, which might reflect that participants' dating and relationship experiences were developing rapidly throughout the intervention. In the baseline questionnaire, Beatriz reported that she did not have a boyfriend, while in the endline questionnaire she reported that she did. In the interview that took place two months after the endline questionnaire, she said 'Yes, yes I have a boyfriend, right now I do have a boyfriend', and described that her relationship status had changed multiple times over the research period. Data collected through in-depth interviews allowed us to move beyond the limitations of close-ended responses to learn about the shifting and evolving experiences of participants, but also created challenges in interpreting differences between data points.

Interview responses were often quite detailed and provided contextual information as well as illuminating the ways in which the intervention seemed to influence participants – which the questionnaires were not designed to do. For example, Erika described how the course led her to reflect on her own relationship and whether she was experiencing violence

'Yes, yes it [the course] made me think a lot about the relationship [...]. I don't want to get to the point of blows. [...] Because when he, when he stops studying and I stay here at school, he starts to be insecure, and actually [...] he bit me and left my lip very, very swollen.'

Overview of reasons for missing, incomplete and inconsistent data

Data collection appeared to be influenced by diverse factors: the dynamic study environment, social setting in which questionnaire completed, timing of data collection, evolving nature of the concepts being measured, focus on sensitive topics, variation in individual interest or motivation to participate, and instrument design or mode of data collection. In Table 3, we summarize how each of these manifested in the evaluation in Mexico.

Table 3: Potential reasons for missing, incomplete and inconsistent data observed in this study

Dynamic study environment	<ul style="list-style-type: none"> • Natural hazards (earthquakes, flooding) caused school closures and schedule changes for data collection
Social setting in which questionnaire completed	<ul style="list-style-type: none"> • Participants interacted, i.e., completing questionnaire in consultation with friend(s) • Distractions during questionnaire implementation • Mass refusal to participate or opting out with classmates • Teacher in the room made participants uncomfortable • Coercion by teacher to complete questionnaire • Insufficient privacy in crowded room
Timing of data collection	<ul style="list-style-type: none"> • By endline, comparison group didn't remember research team or having completed baseline questionnaire • Seasonality of absenteeism (before holidays, examination period)

Evolving nature of concepts being measured	<ul style="list-style-type: none"> • Relationship experiences and life experiences shift over time, so data collection at different time points may elicit different responses • How participants understood and defined violence-related concepts shifted as they went through the intervention, which may have influenced how they responded to the questions over time
Sensitive topics	<ul style="list-style-type: none"> • Confidentiality concerns and fear of responses being leaked to teachers or parents – especially among women • Embarrassment or discomfort responding to sensitive questions
Variation in individual interest or motivation to participate	<ul style="list-style-type: none"> • Variability in interest to participate in the study and answer honestly; some participants took the questionnaire as a joke, others appeared to take it seriously • Women seemed more willing to respond than men, and had more complete responses • Some participants appeared particularly willing to share personal information from the beginning of study • As the intervention proceeded, intervention group participants may have become more interested in study topics, more comfortable talking about them, or more willing to complete the questionnaire
Instrument design and mode of data collection	<ul style="list-style-type: none"> • Some questionnaire items were not asked directly in interviews • Challenging to interpret ‘prefer not to say’ responses

Discussion

Reflexive contextualization of findings based on data collection conditions and challenges is crucial to assess the utility and accuracy of data; without this, programmatic decision-making may be based on misleading or meaningless results. Our case study evaluation in Mexico illustrates the myriad challenges to collecting high quality data about relationships and sexuality from young people in schools. Instrument design and data analyses aim, with varied success, to account for a range of data quality challenges. However, it is difficult to design away all of the barriers to high quality data, and papers presenting study findings rarely detail these types of crucial conditions that might compromise data quality (45). Reflexivity, which involves ‘continual evaluation of [...] the research process’ (46), is a strategy commonly used by qualitative researchers engage with the unpredictability and ‘messiness’ of fieldwork and data analysis (9,47,48) – but the concept is not usually associated with quantitative studies (49). This may contribute to a lack of reflexive reporting of data collection conditions and challenges when authors present quantitative results. Regardless of the type of study, data collection challenges and conditions should be reported on systematically alongside results, necessitating “a cultural change [...] in which the open and honest reporting of such issues is seen as an indicator of study strength and researcher integrity” (45). This transparency about data quality issues can inform sensemaking and interpretation – particularly when studies address sensitive topics such as sexual health or are operating in challenging data collection environments such as schools.

Despite the challenges we encountered, we were able to adjust our research plans and complete the study. In-depth interviews were adaptable, as they were individually

negotiated with participants and conducted out of classroom hours. Interviews also created opportunities to ask participants about the influence of the earthquakes on their intervention experiences, providing important context to inform our interpretation of data. In contrast, the process of adjusting questionnaire data collection proved far more challenging, as we had to negotiate for time to implement the questionnaire within a school schedule abbreviated by school closures. Ultimately, we were able to implement the endline questionnaire, but it was done concurrently with school examinations and immediately before a two-months school holiday – negatively influencing data quality and participation rates. The data collection challenges in our study compromised the data quality of the questionnaires, leading us to exclude most of the quantitative data from analysis – thereby raising the relative importance of the qualitative data. Statistical and experimental methods and metrics are often prioritized for demonstrating program results and success in the fields of international development (50) and global health (51). Because the strength of evidence of stand-alone qualitative findings is still sometimes questioned (35–37), the exclusion of our quantitative results may negatively influence perceptions of the rigor of our findings – depending on the audience.

While school closures influenced all the types of data collected in this study, we found variability in data quality by group, gender, timepoint, and topic that may not be fully explained by the earthquake-related delays. For example, the intervention group had more complete data and higher response rates to the questionnaire than the comparison group, particularly at endline. There are several possible explanations. First, the intervention group had experience discussing sensitive sexual health topics during the comprehensive sexuality education course (33) – which the comparison group did not have at the time of the study. Second, the intervention group's reportedly positive experience with the program

implementers over the semester likely increased their willingness to complete the endline questionnaire – perhaps to show appreciation for the intervention. Third, the intervention group may have found the study topics to be relevant because of their recent experience with the program. In line with our findings, others too have found that control group participants may respond to surveys differently, perhaps because they feel resentment for not receiving a service (52). Control groups may have lower response rates than intervention groups, especially as a study progresses (53). In studies where the comparison group receives no intervention at all, it is important to consider the possibility of divergence over time between intervention and comparison groups in terms of their levels of motivation to participate in a study, respond honestly, or complete the questions.

Men in this study seemed more likely than women to respond to questionnaire items at random, leave incomplete responses, or take the questionnaire as a joke. Men in the intervention group, however, were the only group of participants that significantly increased the proportion of complete responses to the questionnaire between baseline and endline – bringing the men and women in the intervention group to equal levels of complete questionnaire responses at endline. Something about male participants' experience in the intervention seems to have increased their interest or willingness to participate in the study, a difference we did not observe among women.

Women tended to describe discomfort responding to personal questions and express concerns about confidentiality for both the interviews and questionnaires – concerns which were rarely brought up by men in this study. This suggests that women may have been considering whether to respond honestly to questions about relationships, sexuality and violence in light of perceived risks. Other studies have similarly found that female participants are more likely to participate in research than their male counterparts

(16,23). This raises questions about how to account for gendered differences in data quality and response rates, and how this phenomenon might influence data quality and study conclusions.

The differences we observed in the level of complete data and in motivation to participate between groups and by gender highlight some of the challenges of using analyses that average quantitative data across participants. Averages can conceal differences in how an intervention influences different subgroups (54) as well as variability in data quality – for example, how seriously different participants responded to the questions and whether they intended to answer honestly. Variability in data quality, influenced by the honesty of responses and willingness to participate, means that grouped quantitative analyses combine accurate data with purposefully inaccurate or random responses – potentially obscuring meaningful responses with meaningless ones. As such, interpretation of group-level data frequencies may have limitations without contextual information about data quality and its variability.

Questionnaire items about sexual contact yielded the lowest overall response rates in the study, likely reflecting local social norms that stigmatize premarital sex among young people (19) and celebrate virginity and purity among women (55). The research team observed that participants were more likely to respond completely and in detail to questions about sensitive topics during in-depth interviews – perhaps because these were carried out individually, in a space that ensured privacy, allowed time to build trust, and were less prone to disruption. This suggests that qualitative research has an important role to play in gathering meaningful data to inform evaluation research about sensitive topics.

We used complementary methods of data collection, and gathered information at multiple points over time, to mitigate some of the challenges of collecting data about

sensitive sexual health topics. These diverse data sources and timepoints, however, also led to apparent contradictions between data sources. Apparent inconsistencies can provide insight to multifaceted and evolving lived experiences over time, and do not necessarily indicate poor quality data; they do, however, create challenges when interpreting data (25,30). Because beliefs, intentions and experiences evolve and shift over time, responses to questions about these may vary depending on when they are asked (26,56,57). Creating further measurement challenges, interventions often shift participants' beliefs and understandings of key concepts (58), potentially influencing their interpretation of the questions being asked, interest in responding, or perceptions about socially desirable responses. When conducting research with young people, data collection and interpretation should account for the rapidly evolving lived experiences, including short-duration relationships (59). Interpretation of data about adolescent sexuality and relationships should also take into account that what a participant reports at any given moment might provide meaningful information about their beliefs or experiences at that timepoint, but reflects one moment in a non-linear trajectory of rapidly evolving perceptions, understandings and experiences.

This study had a number of limitations. First, the design of the survey exacerbated some of the challenges with interpretation of data. The intervention was designed to influence participants' definitions or understanding of IPV, and we designed the questions to reflect a participant's own definition of concepts such as IPV. As such, a change in their responses around IPV might reflect shifting definitions because of the intervention, or might be explained by actual changes in their lived experiences, such as new experiences of violence. Second, we asked questions at different points in time, increasing the likelihood that responses would differ due to changing circumstances in participants' lives. Third, we

considered but lacked the resources to use digital or computer-assisted data collection tools, which reduce inconsistencies and missing data in sexual health research in some low- and middle-income country contexts (60,61). However, digital data collection would not have remedied most of the problems we identified, such as earthquake-related school closures and the complex social context of data collection – and so the extent to which this could have improved data quality is unclear. Fourth, differences between the comparison and intervention groups in this study may compromise comparability. We used a coin toss to select between two programs in the same school – one in the morning and another in the evening. According to school management, while the sociodemographic characteristics of students were similar, the afternoon (comparison group) has lower entrance examination scores, higher rates of absenteeism, and teachers may have less control over the classroom than in the morning program. In addition, the earthquake-related school closures resulted in delays to data collection that particularly affected the comparison group. These factors may have exacerbated differences in data quality between the two groups. Fifth, we do not know the extent to which data collection conditions and challenges ultimately impacted on data quality. Finally, given the described challenges with data collection, the questionnaire data may not be of sufficient quality to merit any analysis at all. For our purposes, however, the flaws are useful because these types of errors and limitations exemplify the potential weakness of school-based data collection in practice.

Conclusion

This analysis can inform methodological choice when considering the use of different data collection methods for school-based sexual health research. Our experience highlights

the difficulties of anticipating – and correcting for – the many interacting real-world challenges threats to data quality and interpretation challenges that can arise. Factors that influence data quality include a dynamic study environment, interpersonal interactions during data collection, the evolving and sensitive nature of the concepts being measured, and variation in individual interest or motivation to respond to questions honestly and completely. Data quality will vary across individuals, often based on a range of factors including gender, group and question topic. Collecting complementary sources of data at various timepoints can help mitigate the weaknesses or challenges of each method, and paints a more complete picture of evolving experiences and beliefs. However, this approach also generates challenges with interpretation of data. It is vital that results for all types of studies – whether quantitative, qualitative, or mixed methods – are accompanied by a reflexive discussion of data collection conditions and challenges that might impact on data quality. This allows for an assessment of data quality and the suitability of the methodological approach to the particular research environment before using potentially meaningless results to inform decision-making.

Acknowledgements

We acknowledge Rosa Icela Zavala, Jimena Valades, Marissa Billlowitz, and Mariana Cruz for their contributions to the conceptualization of the study, and Mark Petticrew for comments on prior drafts. We thank the secondary school in Tlalpan for allowing us to carry out this project on their campus, and all of the students, teachers and Mexfam health educators who agreed to participate in the study.

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