An Application of the Confidante Method to Estimate Induced Abortion Incidence in Java, Indonesia

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CONTEXT: Induced abortion is legally restricted and highly stigmatized in Indonesia, and is thus extremely difficult to measure. Indirect methods leveraging women's social networks, such as the Confidante Method, have shown promise in estimating hidden behaviors, including abortion, in similar settings.

METHODS: A community-based survey was conducted among 8,696 women aged 15–49 in Java, Indonesia, in November 2018–January 2019. Data were collected via in-person interviews with respondents about their own abortions and those of up to three of their closest confidantes. One-year induced abortion incidence rates per 1,000 women were estimated using a direct-report approach and the Confidante Method.

RESULTS: The direct-report abortion rate was 3.4 per 1,000 women in 2018, compared with the Confidante Method rate of 11.3 per 1,000. Among the confidantes of women who reported an abortion in the past five years, the abortion rate was 42.0 per 1,000. Half of the women reported that they had no confidantes with whom they shared private information. Among women reporting an abortion and at least one confidante, 58% had disclosed their abortion to their confidante, indicating that substantial transmission bias was present.

CONCLUSIONS: The Confidante Method relies on several assumptions that did not hold in this study. Although the method performed better than the direct-report approach, it underestimated the incidence of abortion in Java. More research is needed to understand how abortion-related information is shared within social networks and to assess the appropriateness of applying the Confidante Method to estimate abortion in a given context.
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Understanding the extent to which abortions occur in a particular setting is critical for informing policymakers who develop abortion-related laws and regulations. Reliable estimates of the incidence of induced abortion are also useful for research on abortion safety and the consequences of unsafe abortion, as well as for other fertility- and pregnancy-related research that requires the use of data on all pregnancies. However, measuring the incidence of induced abortion is extremely difficult, particularly in settings where abortion is illegal, severely restricted or highly stigmatized.[1–3]

Direct methods for measuring abortion are suboptimal. Official health statistics and medical records are problematic because routine collection of abortion data is often nonexistent, incomplete or of poor quality in restrictive settings.[4] In addition, people tend not to admit to their abortions when asked directly in population-based surveys.[1,5] Although efforts have been made to improve direct reporting of abortion in surveys by using techniques aimed to increase confidentiality or to destigmatize abortion, underreporting remains high.[2,6–14]

The Abortion Incidence Complications Method (AICM) was developed as an indirect approach to estimate the incidence of induced abortion, thus addressing some of the issues inherent in direct methods.[2] The method utilizes health systems data to estimate the number of postabortion complications cases treated in health facilities, and then uses data gathered from individuals knowledgeable about abortion in that setting to adjust the estimate to account for additional induced abortions that resulted in either no complications or untreated ones. The AICM has been used in more than twenty countries and has been considered a strong estimation method especially for contexts where induced abortion is illegal or largely unsafe.[2] However, as medications to terminate pregnancies outside of the formal health system have become increasingly available,[15,16] abortions and abortion-related complications may have become less visible to knowledgeable informants, potentially making the AICM a less effective method for measuring abortion incidence.

Other indirect approaches for estimating abortion and other clandestine behaviors have been developed and tested, including some that utilize individuals' social networks. The Anonymous Third Party Reporting (ATPR) method entails asking survey respondents questions about all of their close female confidantes, including whether they have had an abortion;[2,17,18] the Best Friend Approach asks respondents whether the one female friend of reproductive age with whom they are closest has had an abortion;[19] and the Network Scale-Up Method asks respondents several questions aimed at accurately generating the size of their social network, and then asks how

many people in their network have had an abortion.[20-22] These methods have shown generally positive results in terms of reducing the social desirability bias present with direct reporting, and they lay the groundwork for further innovation and newer methodological approaches.

Another approach that has gained traction among researchers in the field of abortion measurement is the Confidante Method, which is a hybrid of the ATPR method and the Best Friend Approach.[23] For each woman interviewed, the Confidante Method collects information on up to three confidantes—defined as those with whom the respondent would share private information and who would also share such information with her—and, in doing so, can triple the sample size relative to the Best Friend Approach and self-reports. At the same time, the Confidante Method limits the network to a maximum of three confidantes, likely improving the precision of the data compared with the ATPR method, which requires respondents to know as much about the behaviors of their distant confidantes as they do about their closest. The Confidante Method mitigates the effects that stigma has on abortion self-reporting in a manner similar to the Best Friend Approach and ATPR method, while maintaining the ability to collect detailed information about confidantes' abortion experiences. This can include when abortions occurred, basic demographic and socioeconomic characteristics of those who have had abortions, and experiences with post-abortion complications and treatment—none of which can be determined using the Network Scale-up Method.

To produce robust abortion incidence estimates, the Confidante Method and most other social network–based methods rely on several hypotheses and presuppositions, which can be combined into two overarching assumptions: that the close social ties of a representative sample will constitute a surrogate sample that is also representative and that people are willing and able to accurately report their confidantes' abortions. Since 2018, the Confidante Method has been used to measure abortion incidence in Côte d'Ivoire, Ethiopia, Ghana, Nigeria and Uganda,[24-26] and the varying robustness of the estimates produced by this work suggests that several assumptions may have been violated in some contexts and not others, calling for further research to assess the reliability and validity of the method.

This article presents findings from a larger study designed to test multiple methodologies for measuring abortion incidence in Java, Indonesia. Java is the geographic and economic center of Indonesia, and home to approximately 60% of the population.[27] The current law only allows abortion in exceptional cases, such as when the pregnancy resulted from rape or poses a risk to the woman's health.[28] There is some evidence that menstrual regulation—a process by which a woman brings back a missed period—is available in the first trimester, but the extent to which this occurs is unknown. Abortion in this context is highly stigmatized,[29-31] and there are few data on its incidence or safety. Previous work that has attempted to assess abortion experiences in Indonesia consists mainly of small-scale, clinic-based, nonrepresentative studies or studies that are now outdated.[31-35] This study was conducted to address this large evidence gap.

The study's findings are covered in two complementary articles. The current article presents findings from women's* direct reporting of their own abortions and those of their confidantes, and provides a robust assessment of the Confidante Method, its assumptions and the adjustments made to correct for violations of its assumptions. A second article compares two indirect estimation methods—the AICM and a modified AICM.[36] Together, these articles aim to provide further evidence on the utility of various methods for measuring abortion incidence in a legally restrictive context where the practice is highly stigmatized.

METHODS
Sample and Data Collection
This study uses data from a 2018 community-based survey designed to be representative of women of reproductive age (15–49 years) in Java. An important objective of the survey was to provide insight into induced abortion in Java, including its prevalence, the characteristics of women who have abortions and the context in which induced abortions occur. Data were collected to permit the estimation of abortion incidence using several methods.

The survey sampling strategy relied on a multistage cluster design. The study team randomly selected 35 villages (administrative units) in each of Java's six provinces; the probability of selection was proportionate to the estimated population size of the village. Next, we randomly selected three neighborhoods—*Rukun Tetangga* (RTs) in Indonesian—per village. Within each selected RT, enumerators listed all households and obtained information about the age and gender of each household's occupants. Eligible households were those that housed at least one woman aged 15–49; from among those, we randomly selected approximately 13 households per RT. Within each selected household, we randomly selected up to two eligible women to participate in the survey. This process resulted in a total of 9,435 women selected from 7,800 households across Java. About 5% of this sample did not consent to participate or did not complete the full interview, resulting in a final sample of 8,969 female respondents and a response rate of 95%.

Data were collected in person by trained female fieldworkers using the mobile data collection application SurveyCTO on password-protected tablet computers and stored on a secure server accessible only to the research team. Consent was obtained from all adult women, and both parental or guardian consent and minor assent were

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*People of all genders are capable of becoming pregnant and having abortions. We did not include questions related to gender identity in the surveys due to concerns related to cultural sensitivity and appropriateness. For the purpose of this study, our eligibility criteria included being a woman aged 15–49, and the word "woman" was used in the consent form as well as the surveys. Therefore, we refer to study participants as "women" in this article.

obtained for women younger than 18. Potential participants were told that the study focused on experiences and preferences regarding pregnancy, pregnancy outcomes, childbearing, contraceptive use and other aspects of well-being. Abortion was not mentioned in the consent form. Each woman was interviewed in her home, in a private area of her choosing. Field-workers were instructed to pause the interview if something or someone interrupted them, or if privacy was violated. The survey took approximately 1.5 hours to complete, and women were offered a bar of soap as a small token of appreciation for their participation. Data collection occurred between November 2018 and January 2019, and interviews were conducted in Bahasa, Javanese or Sundanese. The Commission of Research Experts and Research Ethics of the University of Indonesia Faculty of Public Health and the institutional review board of the Guttmacher Institute approved the study.

Measures

• *Identification of confidantes.* We defined confidantes as women aged 15–49 who lived in Java, who would share personal or private information with respondents and with whom respondents would also share such information; this definition is similar to that used in the application of the ATPR method.[17] Because the Confidante Method relies on the representativeness of the sample of confidantes within the population, it was important to ensure that respondents were not primed earlier in the survey to think about abortion when selecting their confidantes. Therefore, we asked women to identify their confidantes prior to any mention of abortion. If women reported having more than three confidantes, we asked them to report on the three who would be first, second and third most likely to share personal information with them and vice versa. Respondents gave their confidantes a nickname to maintain anonymity and for ease of reference. Women identified a total sample of 7,458 confidantes.

• *Induced abortion among confidantes.* To estimate induced abortions among confidantes, we asked women a series of abortion-related questions about each of their confidantes, in order of closeness. Interviewers first read a short note intended to normalize abortion: "It is not uncommon for women to find that they are pregnant when they don't want to be, or when it would be difficult for them to have a child, and sometimes they decide to do something or take something in order to end their pregnancy." For each confidante identified, we asked respondents, "Has [confidante nickname] ever done anything that intentionally ended a pregnancy?" Response options were "no," "yes, I think so," "yes, I'm certain" and "don't know." Only confidantes for whom respondents answered "yes, I am certain" or "yes, I think so" were classified as having had an abortion. For each confidante abortion reported, we asked for the year the abortion had occurred. If the respondent was unsure, we asked if it had occurred within the past year, 1–3 years ago, 3–5 years ago or more than five years ago.

• *Induced abortion among respondents.* To obtain the data for the direct-report abortion rate estimation, we asked women about their own induced abortions in two distinct ways. The first approach was designed to capture the practice of menstrual regulation, and the second was designed to capture intentional and successful pregnancy terminations. Pilot data and discussions with research partners suggested that women may be particularly hesitant to discuss abortions in this setting and may choose to refer to their pregnancy terminations as menstrual regulations. Menstrual regulation—*induksi haid* or *disedot* in Indonesian—has been used to terminate pregnancies in the first trimester,[33] but there is a dearth of evidence on the extent to which it may currently occur. We did not collect information on menstrual regulation for confidantes out of concern that women may be unlikely to know if their confidante has used this procedure to end a pregnancy.

First, we asked women if they had ever done something to bring back a late menstrual period and, if so, the year of each occurrence. We asked additional questions about each occurrence in the past six years, beginning with the most recent one. For each occurrence, we asked if they had been pregnant at the time. Response options were "no," "yes, probably," "yes, definitely" and "don't know." Among those who stated that they were definitely or probably pregnant, we asked roughly how late their menses was each time. If they could not estimate the timing, they had the option to choose from "less than 10 days," "between 10 days and two weeks" or "more than two weeks." We classified a woman as having had a menstrual regulation abortion if she reported that she had done something to bring back a menstrual period, she was definitely or probably pregnant at the time and her period was at least 10 days late.

We then asked women if they had ever intentionally and successfully ended a pregnancy and, if so, the year of each occurrence in the past six years, starting with the most recent event. We instructed women who met the study definition of having a menstrual regulation abortion to exclude those instances when reporting their pregnancy terminations.

• *Investigating definite versus suspected abortions.* Among confidantes, we first calculated definite and suspected abortions separately to investigate respondents' uncertainty in reporting their confidantes' abortions. However, the proportion of confidantes who respondents only suspected to have had an abortion was negligible (<1%; not shown); we therefore combined the definite and probable abortions in our final confidante abortion estimates. If women reported that they did not know if their confidantes had had an abortion (2–4%; not shown), we conservatively assumed that these confidantes had not had an abortion.

For respondent direct reports, the proportion who said that they were probably pregnant when they brought back a late period was similar to the proportion who said that they were definitely pregnant. Moreover, women who said that they were probably pregnant at the time they brought

TABLE 1. Selected characteristics of women aged 15–49 who participated in a community-based survey, by whether they reported having any confidantes, Java, Indonesia, 2018

Characteristic	All (N=8,969)	No confidantes (N=4,374)	Any confidantes (N=4,595)
Province**			
Jakarta	6.9	4.9	9.1
West Java	34.2	36.8	31.4
Central Java	22.7	21.6	24.0
Yogyakarta	2.8	2.2	3.4
East Java	25.4	27.5	23.2
Banten	7.9	7.1	8.8
Residence**			
Urban	23.2	19.6	27.1
Rural	76.8	80.4	72.9
Age***			
15–19	14.7	8.8	21.1
20–29	26.2	21.0	31.7
30–39	30.2	32.7	27.6
40–49	28.9	37.6	19.6
Median age***	33.0	36.0	28.0
Union/marital status***			
Married/cohabiting	73.1	80.8	64.7
Not married/not cohabiting***	26.9	19.2	35.3
Never married	81.1	71.7	86.7
Formerly married	18.9	28.3	13.3
Parity***			
0	27.3	18.3	37.2
1–2	50.6	54.5	46.5
3–5	20.9	25.6	15.8
≥6	1.1	1.7	0.6
Mean no. of children***	1.6	1.9	1.3
Education***			
None/incomplete primary	11.4	15.6	6.9
Completed primary	18.5	23.7	12.9
Incomplete secondary	30.2	27.3	33.3
Completed secondary	29.7	25.2	34.6
>completed secondary	10.2	8.2	12.3
Wealth***			
Poorest	20.9	24.0	17.6
Poorer	20.5	21.4	19.4
Middle	21.3	20.1	22.6
Richer	18.7	18.4	19.0
Richest	18.6	16.2	21.3
Contraceptive use			
Any method***	48.1	53.6	42.1
Pill	9.1	9.7	8.5
Injectable***	24.0	28.7	19.0
Reported an abortion			
Past 1 year	0.3	0.2	0.4
Past 3 years*	0.7	0.4	0.9
Past 5 years**	0.9	0.5	1.3

*Difference between women with any confidantes and those with none significant at p<.05. **Difference between women with any confidantes and those with none significant at p<.01. ***Difference between women with any confidantes and those with none significant at p<.001. *Notes:* Confidantes were defined as women aged 15-49 who lived in Java, who would share personal or private information with respondents and with whom respondents would also share such information. Ns are unweighted, and distributions are weighted. Data for respondents were weighted to match the Indonesia Demographic Health Survey (Java-only data) using province, age, marital status, education and contraceptive use; weighting procedures are detailed in the Appendix.

back their period generally reported that their periods were later than those who said they were definitely pregnant, indicating that they had likely been pregnant. Given this, combined with evidence from elsewhere that women are generally able to correctly presume that they are pregnant,[37] both women who were certain and those who suspected pregnancy—as long as their period was at least 10 days late—were classified as having had a menstrual regulation abortion.

• *Social and demographic characteristics.* We also measured a number of additional social and demographic characteristics. Among respondents, we measured residence, age, marital status, cohabiting status, parity, educational attainment, wealth quintile and contraceptive use. We asked women to report on the social and demographic characteristics of their confidantes, namely residence, age, marital status, educational attainment and contraceptive use. We also asked, overall, how many people respondents knew who had experienced an abortion.

Analysis

• *Testing for violations of assumptions.* Because the Confidante Method relies on two main assumptions, the first step in our analysis plan was to test for violations of these assumptions to the extent possible.

Testing assumption 1—that the close social ties of a representative sample will constitute an equally representative surrogate sample—required several steps, starting with assessing the representativeness of the respondent sample. First, we calculated and applied individual-level sampling weights to the respondent data (see Appendix). Even though the community-based survey sample was drawn to be representative of Java, we compared our weighted sample to the sample from the Java-specific 2017 Indonesia Demographic and Health Survey (IDHS); the DHS is generally considered the gold standard for national- and provincial-level representativeness. We observed statistically significant differences between the two samples on key social and demographic characteristics using t tests for continuous variables and chi-square tests for categorical variables (Appendix Table 1). Therefore, we recalculated the community-based survey sample weights so that our sample would more closely match that of the IDHS. Details on the construction of the adjusted weights are outlined in the Appendix.

Next, we assessed whether the confidantes were similar enough to respondents to be considered a surrogate sample using chi-square tests to detect differences between respondents' characteristics and the characteristics of each of their confidantes (Appendix Table 1). We used the same tests to understand whether there were important differences in the groups of confidantes as they became less close to respondents (first confidante to second to third). As with the respondents, we calculated adjusted sample weights for the pooled confidantes to match the IDHS sample.

Next, we assessed whether "barrier effects" (i.e., the phenomenon that people have differential propensities to know people in different groups) may have biased the creation of the surrogate sample of confidantes.[38] We first

calculated the proportion of women who reported having zero confidantes, because proxies for this group of respondents are effectively excluded from the surrogate sample. To understand how the exclusion of "missing" confidantes may have biased the sample, we used chi-square tests to determine whether there were statistically significant differences in key social and demographic characteristics as well as self-reporting of abortions between women who reported zero confidantes and those who reported at least one (Table 1). We hypothesized that if there were major differences between the two groups of respondents, there would, in turn, likely be differences between the two groups of confidantes, making it more difficult to adjust for the problem of "missing" confidantes.

For assumption 2—women are willing and able to accurately report their confidantes' abortions—we first assessed whether women were more willing to report their confidantes' abortions than their own by comparing the confidante and self-reported abortion rates. However, given the sensitivity around abortion, even if women were willing to report on their confidantes' abortions, it is likely that they may not have had perfect knowledge about all abortions among their confidantes. This imperfect knowledge is also known as transmission bias. To better understand the degree to which transmission bias may have been present in our data, we asked women who reported an abortion and at least one confidante whether they had told each of their confidantes about their abortion(s). The lower the proportion of respondents who told their confidantes about their abortions, the more likely transmission bias was present. We calculated the proportion of women who disclosed their own abortions to their confidantes separately for first, second and third confidantes, because we assumed women would be more likely to share their experiences with those who are closest to them (first confidante) than with those more distant (second and third confidantes). The reciprocal nature of the relationship between respondents and confidantes (i.e., chosen on the basis of the mutual exchange of personal information) would suggest that the proportion of respondents who reported disclosing their own abortions to their confidantes would be similar to the proportion of confidantes who would have in turn disclosed their abortions to respondents. Therefore, to adjust for the presence of transmission bias, we calculated a visibility factor that is the inverse of the proportion of respondents who reported disclosing their own abortion(s) to each confidante. For example, if overall, 50% of women told their first confidante about their own abortions, the visibility factor for first confidantes would be 1/50 × 100 or 2.0. In other words, for every one abortion women reported for a first confidante, there would be one additional first confidante abortion of which they were not aware. We then applied this visibility factor to the confidante-specific abortion rates to adjust for women's imperfect knowledge of their confidantes' abortions.

• *Estimating abortion incidence.* We estimated one-year induced abortion incidence rates per 1,000 women of reproductive age for confidantes and respondents. For confidantes, we present unadjusted and adjusted rates. To calculate the adjusted rate for the pooled confidantes, we applied the visibility factor to each confidante separately, added up the total adjusted number of confidantes who had had an abortion, divided this number by the total number of pooled confidantes and multiplied the estimate by 1,000. Because the survey was conducted November 2018–January 2019, we define the past year as anytime in the 2018 calendar year. All respondent and confidante incidence estimates were weighted. All analyses were conducted using Stata 15.1; all proportions presented are weighted, and all Ns presented are unweighted.

RESULTS
Sample Characteristics
The majority of respondents lived in rural areas (77%), and 15% were younger than the age of 20 (Table 1); the median age of respondents was 33. Most of the women were married or cohabiting (73%) and had at least one child (73%). Fewer than half of the women had completed secondary school (40%), and 48% were currently using a contraceptive method. Half reported having zero confidantes (52%, n=4,374); 27% reported only one confidante, 14% reported two and 7% reported three or more (not shown). The average number of confidantes reported across the survey respondents was 0.89 (standard deviation, 1.18). Women who reported having at least one confidante were more likely than those who reported none to live in urban areas; to be younger, unmarried and nulliparous; and to be more highly educated; these differences were statistically significant.

The pooled confidantes' characteristics were similar to those of the respondents after weighting (Table 2). However, there were some differences in social and demographic characteristics among confidantes: As confidantes became "less close" to the respondent (first to second to third), larger proportions of them were reported to be younger, unmarried and more educated.

Abortion Reporting
Overall, self-reporting of abortions was low: Few women reported ever having had an abortion (2%; not shown), and only 0.3% of respondents—32 women—reported having had an abortion in the past year (Table 1). Reporting of pregnancy terminations was especially low: Only three women reported ending a pregnancy in the past year compared with 29 who reported bringing back a late period (not shown). Women who reported having at least one confidante were more likely than those who reported none to self-report an abortion in the past three years (0.9% vs. 0.4%) and past five years (1.3% vs. 0.5%).

The proportion of women reporting that their confidantes had ever had an abortion was somewhat higher

TABLE 2. Selected characteristics of women's confidantes, by order of closeness

Characteristic	All (N=7,458)	Confidante order		
		First (N=4,595)	Second (N=2,085)	Third (N=778)
Province**				
Jakarta	7.1	6.9	7.2	8.8
West Java	34.1	34.3	34.4	31.9
Central Java	22.9	21.6	25.2	25.1
Yogyakarta	2.9	2.6	3.2	4.2
East Java	25.3	26.5	23.1	23.8
Banten	7.6	8.2	6.9	6.1
Age***				
15–19	15.3	13.4	17.4	21.9
20–29	26.3	25.7	28.0	25.9
30–39	30.2	31.0	28.4	30.2
40–49	28.2	30.0	26.1	22.1
Median age**	32.0	33.0	30.0	30.0
Union/marital status***				
Married/cohabiting	71.9	75.1	67.8	61.5
Not married/not cohabiting	28.1	24.9	32.2	38.5
Education***				
None/incomplete primary	9.1	9.9	7.3	8.9
Completed primary	19.8	21.4	17.4	15.4
Incomplete secondary	30.0	30.6	30.4	24.3
Completed secondary	28.5	26.9	30.8	32.7
>completed secondary	12.6	11.2	14.1	18.7
Contraceptive use				
Any method	48.0	48.9	46.9	44.5
Pill*	7.3	8.2	5.7	6.2
Injectable	27.4	27.6	28.0	24.2
Had an abortion				
Past 1 year	0.5	0.6	0.5	0.1
Past 3 years	1.7	1.8	1.4	1.4
Past 5 years	2.3	2.2	2.2	3.7

*Difference between any order of confidante significant at p<.05. **Difference between any order of confidante significant at p<.01. ***Difference between any order of confidante significant at p<.001. *Notes:* Ns are unweighted, and distributions are weighted. Data for confidantes were weighted to match the Indonesia Demographic Health Survey (Java-only data) using province, age, marital status, education and contraceptive use; weighting procedures are detailed in the Appendix.

than the proportion reporting their own (3%; not shown), but it was still low (Table 2). Although the reported proportion of confidantes who had had an abortion in the past year was similar for first and second confidantes (0.6% and 0.5%, respectively), this reporting dropped off dramatically for third confidantes (0.1%).

When asked about all of the women in their social network, but not specifically about their confidantes, approximately 16% of respondents aged 15–24 reported that they knew at least one person who had ever experienced an induced abortion; collectively, these respondents reported knowing of 2,257 such women (not shown). Respondents of all ages combined reported knowing 2,516 women who had had an abortion.

Transmission Bias

Transmission bias was calculated among the 67 respondents who reported having had an abortion and having at least one confidante (Table 3). Among these women, 58% reported telling at least one confidante about their last abortion; 55% had told their first confidante, 46% their second

and 33% their third. Given the high level of transmission bias between women and third confidantes, and the drop off in reporting of third confidantes' abortions, we determined that women's reporting of third confidantes' abortion experiences would not be reliable enough to include in our estimates. Thus, we removed this group of confidantes from the sample—resulting in a final analytic sample of 6,680 confidantes. Visibility factors of 1.8 and 2.2 were applied to the first and second confidantes, respectively.

Abortion Rates

After respondents' pregnancy terminations and menstrual regulation abortions were combined, the direct-report approach estimated a one-year induced abortion rate of 3.4 per 1,000 women aged 15–49 in 2018 (Table 4). The unadjusted one-year pooled confidante abortion rate was slightly higher than the respondent rate at 5.5 per 1,000 women, although this difference was not statistically significant. After adjusting for transmission bias, the pooled confidante abortion rate increased to 11.3 per 1,000 women. Adjusting these estimates to account for the likely imperfect knowledge that women have of their confidantes' abortions made the confidante-respondent differences statistically significant.

Confidante abortion rates varied dramatically depending on whether the corresponding respondents reported abortions of their own (Table 5). The annual abortion rate (based on the recent one-year period) among confidantes whose corresponding respondents did not self-report an abortion was 4.9 per 1,000 women. This rate increased by almost 10-fold among confidantes of respondents who reported having had an abortion themselves in the past five years (42.0 per 1,000), and this difference was statistically significant. However, given the very small sample size of confidantes whose respondents reported an abortion, the 95% confidence intervals were very wide; this rate is therefore difficult to interpret.

DISCUSSION

Results from this study provide important insights into the application of the Confidante Method in Java, Indonesia. While the direct-report approach resulted in an induced abortion rate of 3.4 per 1,000 women of reproductive age, the Confidante Method resulted in an estimated rate of 11.3 induced abortions per 1,000 women. However, in comparison, the modified AICM approach used in the larger study estimated the rate to be 42.5 per 1,000 women.[36] In addition, the most recent model-based estimate for the Southeast Asian subregion was 47 abortions per 1,000 women aged 15–44.[39] On the basis of this evidence, it appears that despite its slight improvement over direct reporting, the Confidante Method still produced an implausibly low estimate and was not successful in measuring abortion incidence in Java.

The Confidante Method has several potential strengths: It helps to mitigate the effect that stigma has on the direct reporting of abortion, allows for an analysis of the

characteristics of women who have abortions, can produce information on abortion methods and safety, and may provide larger sample sizes and more statistical power relative to direct reporting. However, as mentioned earlier, for the Confidante Method to reliably estimate abortion incidence, two main assumptions need to be met, which was not the case in the context of this study. Although we were able to adjust for some of the resulting biases in the data, the failure to meet the necessary assumptions ultimately resulted in the failure of the method.

First, we found flaws in the surrogate sample (assumption 1). To start, we observed systematic differences in social and demographic characteristics between the confidante and respondent sample. We attempted to adjust for these differences by reweighting the confidante data using social and demographic characteristics. However, it is likely that our confidante sample remained nonrepresentative because we could only adjust for known and measured characteristics.

In addition, half of women reported no confidantes. This may suggest that strong social ties, as defined by the mutual sharing of private information, are not as common among women in Java as we had anticipated. As a result, our confidante sample is missing a similar group of women for whom we had no data. This is problematic because women with no reported confidantes differed from women with these social ties on several social and demographic characteristics, as well as for self-reported abortions. This phenomenon has been documented in several other studies that employ the Confidante Method,[24,26] and the exclusion of a proxy for these women likely biases the resulting abortion incidence estimates either toward or away from the null. Other studies have attempted to address the nonrepresentativeness of the surrogate sample by constructing proxies for "missing confidantes" (i.e., confidantes that exist in the population but that were not identified by respondents) by using regression techniques to predict the likelihood of each missing confidante having had a recent abortion.[24,26] This approach requires making several assumptions about the characteristics of these missing confidantes, and although it may be useful to improve Confidante Method estimates in some scenarios, we could not defend its use to impute data for half of our confidante sample in this study.

Second, we observed flaws in the reporting of confidante abortions (assumption 2). Although respondents were more willing to report their confidantes' abortions than their own, as evidenced by the higher abortion rate among confidantes compared with respondents, it appears that the underreporting of women's own abortions may have translated to an underreporting of their confidantes' abortions in this setting. The drastic increase in the reporting of confidantes' abortions among women who reported their own abortions could be explained by their willingness to report on sensitive behaviors on a survey in general, compared with those who would not be willing to report even if they had had an abortion. It could also be that women

TABLE 3. Transmission error and visibility factor for confidantes who had had an abortion

Confidante	Among respondents who reported an abortion, those who told their confidante about their abortion		
	N†	Transmission error	Visibility factor
Any	67	0.582	1.718
First	67	0.552	1.811
Second	37	0.459	2.176
Third	9	0.333	3.000

†Number of women who reported having had an abortion and having at least one confidante. *Note:* Ns, transmission errors and visibility factors are unweighted.

TABLE 4. Estimated one-year induced abortion rates per 1,000 women aged 15–49 (and 95% confidence intervals) for respondents and confidantes

Sample	No. of abortions	Abortion rate
Respondents (N=8,969)†	32	3.4 (2.2–5.4)
Confidantes (6,680)‡		
Unadjusted	39	5.5 (3.5–8.7)
Adjusted§	76	11.3 (7.2–17.9)***

***Difference from the respondent abortion rate significant at p<.001. †Respondents' abortions include reported pregnancy terminations and menstrual regulations. ‡Confidantes include first and second confidantes only; respondents were not asked about their confidantes' menstrual regulations, so this type of abortion is excluded from the confidante rate. §Adjusted for transmission error; the level of transmission error is based on the proportion of respondents who told each confidante about their abortion, of all respondents who had had an abortion and at least one confidante. *Note:* Ns are unweighted, and rates are weighted.

TABLE 5. Estimated one-year induced abortion rate (and 95% confidence intervals) among confidantes, by respondents' self-report of abortion in the past five years

Respondent self-report	No. of confidantes	Abortion rate
Had an abortion in past 5 years		
No	6,576	4.9 (3.0–8.1)
Yes	104	42.0 (12.7–130.1)*

*Difference between confidante one-year abortion rate by respondent abortion self-report significant at p<.05. *Note:* Ns are unweighted, and rates are weighted.

who were willing to report their abortions in the survey had a permissible attitude toward abortion in general and may have been more likely to know about their confidantes' abortions than those who did not report, given the research that states people share sensitive information with others who they think would be receptive to it.[40]

The severity of the stigma around abortion in Indonesia likely contributed to the underreporting of both respondents' and confidantes' abortions in the survey. Although stigma around unmarried sex and abortion may be of concern particularly to unmarried women in Indonesia,[41,42] there is evidence that married women also face challenges when seeking abortion; many women are willing to travel considerable distances to avoid being recognized by those who know them.[31] In this context, women may be more secretive and less likely to share their abortion experiences—either with their confidantes or with an interviewer—because of a perception that doing so could harm their reputation.

There is also evidence to suggest that women may be more likely to discuss their abortions with individuals who would not meet our study definition of a "confidante": for example, a husband or partner, or a midwife or another trusted source of health information, such as an online application or hotline.[43] Indeed, our results show that only about half of women who reported an abortion shared their abortion experiences with those they considered confidantes per the study definition. We attempted to adjust for this by applying a visibility factor to the results. Given the low level of respondent self-reporting and overall underreporting of confidante abortions, this adjustment was made to an already biased estimate, and the resulting confidante abortion rate must be interpreted cautiously. Although an adjustment must be made to account for transmission bias, more work is needed in future studies to understand the most appropriate way to do so.

Although few women overall reported ever having had an abortion (2%), and fewer than expected reported that their confidantes had ever had an abortion (3%), when asked about all of the women in their social network, 16% of respondents aged 15–24 collectively reported that they knew approximately 2,250 women who had ever experienced an induced abortion. Data from the 2017 IDHS adolescent report show that 23% of unmarried 15–24-year-old women in Indonesia reported knowing someone who had had an abortion.[43] Although this general finding cannot be considered an accurate measure of the proportion of women who have ever had an abortion, it does show that women may be more willing to report abortions in general when there is no chance for the abortion to be linked to a specific individual, especially when it comes to a close confidante that they would want to protect. In this case, an approach such as the Network Scale-up Method—which does not require women to report the abortions of their closest confidantes, but rather those among their wide social network—may be more effective in this setting.

Limitations

This study has several limitations worth noting. First, we did not ask women about their confidantes' menstrual regulation abortions, as we assumed a priori that they would not be able to accurately report on the measure. For this reason, the direct-report and confidante rates are not exactly comparable. When asked directly about their own abortions in the previous year, 29 women reported having brought back a late period, while only three reported having terminated a pregnancy. It is possible that women would have been similarly more willing to report on their confidantes' menstrual regulation abortions. If we had asked respondents to report confidante menstrual regulation abortions, and they had done so accurately, the direct-report and confidante measures would be more comparable, and the confidante rate would likely have been higher. However, future research is needed to understand whether asking respondents about confidantes' menstrual regulations is methodologically defensible.

In addition, the order of questions in the direct-report abortion module may have contributed to the lower number of reported pregnancy terminations compared with menstrual regulation abortions among respondents. We intentionally asked women about their experiences of bringing back a late period first, to ease into questions about abortion and to help mitigate problems with underreporting. However, this ordering may have inadvertently led to further underreporting of pregnancy terminations by priming women for questions related to abortions before being asked about them. Future studies should consider randomizing participants to be asked these questions in the opposite order to determine how the ordering may affect results.

Another limitation is in our understanding of how participants interpreted who qualified as a confidante. Half of women reported having no confidantes. Although this may reflect the true state of social ties in Java, it may also indicate that our definition of a confidante was either misinterpreted, unclear or too narrowly defined in the local languages. We attempted to explain it clearly, ensured that field-workers using different languages were trained on this definition to the same extent and used a definition consistent with several other studies that used the Confidante Method; however, individual respondents may have understood the idea of a confidante differently.

Finally, it is possible that our conceptualization of information sharing within social networks in Indonesia is flawed. For example, women may prefer to share information about abortion with women to whom they are less closely connected in their network. Although not included in this study because of budgetary reasons, formative qualitative research prior to questionnaire design would have been greatly beneficial for confidante definition and exploring how sensitive information is shared within networks. The results of this study along with other recently published research using the Confidante Method[24–26] make clear that future studies must include formative research to assess the method's appropriateness and design in the specific cultural context. Such formative research should seek to understand, for example, in whom women confide and how they discuss their abortions, if at all. This work could also shed more light on the hypothesis that women cannot accurately report on their confidantes' menstrual regulation abortions. In settings where abortion is stigmatized and people do not readily discuss such topics, it is important to know how information is transmitted and to assess the feasibility of respondents accurately reporting on their confidantes' abortions.

CONCLUSIONS

The problem of underreporting in surveys will likely not be eliminated, but the degree to which it is a problem may be reduced if the survey's definition of a confidante, and the language used to describe or ask about abortion, is adapted to each setting on the basis of formative research. Although the Confidante Method may be an appropriate

estimation technique and has produced plausible results in some countries, more evidence from varying contexts is needed. This study demonstrates that further methodological innovations are crucial to accurately capture women's experiences with abortion, especially in restrictive settings.

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RESUMEN

Contexto: *El aborto inducido está restringido legalmente y sumamente estigmatizado en Indonesia y, por lo tanto, es extremadamente difícil de medir. Los métodos indirectos que aprovechan las redes sociales de mujeres, como el método basado en confidentes, han demostrado ser promisorios para estimar comportamientos que se ocultan, incluido el aborto, en entornos similares.*

Métodos: *Entre noviembre de 2018 y enero de 2019, se llevó a cabo una encuesta basada en la comunidad entre 8,696 mujeres en edades de 15 a 49 años en Java, Indonesia. Se recolectaron datos a través de entrevistas presenciales con personas sobre sus propios abortos y los de hasta tres de sus confidentes más cercanas. Se estimaron tasas anuales de incidencia de aborto inducido por 1,000 mujeres mediante el uso del enfoque de informe directo y del método basado en confidentes.*

Resultados: *La tasa de aborto por informe directo fue de 3.4 por 1,000 mujeres en 2018, en comparación con la tasa del método basado en confidentes de 11.3 por 1,000. Entre las personas confidentes de mujeres que reportaron haber tenido un aborto en los últimos cinco años, la tasa de aborto fue de 42.0 por 1,000. La mitad de las mujeres reportaron que no tenían confidentes con quienes compartir su información privada. Entre las mujeres que reportaron haber tenido un aborto y tener al menos una persona confidente, el 58% habían revelado su aborto a su confidente, lo que indica que hubo un importante sesgo de transmisión.*

Conclusiones: *El método basado en confidentes depende de varias suposiciones que no fueron aplicables en este estudio. Aunque el método funcionó mejor que el enfoque de informe directo, subestimó la incidencia del aborto en Java. Es necesario realizar más investigación para comprender la forma en que la información relacionada con el aborto se comparte dentro de las redes sociales, así como para determinar qué tan apropiado es aplicar el método basado en confidentes para estimar la incidencia del aborto en un contexto determinado.*

RÉSUMÉ

Contexte: *L'avortement provoqué est limité par la loi et fait l'objet d'une forte stigmatisation en Indonésie. Il est par conséquent extrêmement difficile d'en mesurer l'incidence. Les méthodes indirectes tirant parti des réseaux sociaux des femmes, comme celle de la « confidente », se sont révélées prometteuses dans l'estimation de comportements cachés, notamment l'avortement, dans des contextes comparables.*

Méthodes: *Une enquête communautaire a été menée auprès de 8 696 femmes âgées de 15 à 49 ans à Java (Indonésie) entre novembre 2018 et janvier 2019. Les données ont été collectées dans le cadre d'entretiens personnels avec les répondantes, concernant leurs propres avortements et ceux d'un maximum de trois de leurs confidentes les plus proches. Les taux d'incidence de l'avortement provoqué d'une année pour 1 000 femmes ont été estimés selon une approche de déclaration directe et par la méthode de la confidente.*

Résultats: *Le taux d'avortement estimé par déclaration directe s'est avéré de 3,4 pour 1 000 femmes en 2018, par rapport à 11,3 pour 1 000 selon la méthode de la confidente. Parmi les confidentes des femmes ayant déclaré un avortement durant les cinq dernières années, le taux s'élevait à 42,0 pour 1 000. La moitié des femmes ont déclaré ne pas avoir de confidentes avec lesquelles elles partageaient une information privée. Parmi les femmes déclarant un avortement et au moins une confidente, 58% avaient divulgué leur avortement à leur confidente, indiquant un biais de transmission considérable.*

Conclusions: *La méthode de la confidente repose sur plusieurs hypothèses non confirmées dans cette étude. Bien qu'ayant produit de meilleurs résultats que l'approche par déclaration directe, elle sous-estime l'incidence de l'avortement à Java. Il convient d'approfondir la recherche pour comprendre les modalités du partage de l'information relative à l'avortement au sein des réseaux sociaux et pour évaluer la pertinence du recours à la méthode de la confidente pour estimer l'incidence de l'avortement dans un contexte donné.*

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APPENDIX: CONSTRUCTION OF UNADJUSTED AND ADJUSTED SAMPLING WEIGHTS

Unadjusted Sampling Weights

Per the sampling strategy, we selected villages from provinces with probabilities proportional to their population sizes and then randomly sampled *Rukun Tetangga* (RTs) in each selected village, households in each selected RT and women in selected households. To construct individual sample weights, we first calculated the probability of selecting each village by multiplying the village population by the number of villages selected in each province and dividing by the total population in the province. Then, we individually calculated the probability of selection for RTs in selected villages, households in selected RTs and women in selected households, by dividing the number of selected units by the number of eligible units. Finally, we multiplied these four probabilities, the inverse of which resulted in individual sampling weights for respondents.

Adjusted Sampling Weights

After applying individual-level sampling weights to the community-based survey (CBS) respondent data, we compared the weighted CBS sample with the 2017 Indonesia Demographic and Health Survey (IDHS) weighted sample from Java (Appendix Table 1). There were statistically significant differences between the two samples on key social and demographic characteristics. The IDHS sample for Java was larger than that of the CBS (16,422 vs. 8,969), and likely reflected more accurate social and demographic distributions than the CBS; in addition, across countries, the DHS is generally considered to be the gold standard for national and regional representativeness. To account for differences between the two samples, we adjusted our weights to ensure that the CBS sample would more closely match the IDHS on five characteristics: province, 10-year age categories, marital status, educational attainment and contraceptive use. To do this, we created two 5 x 5 matrices (one with IDHS weighted data and one with our unweighted respondent data). Cells contained the proportions of each unique variable combination for the two samples. After creating these matrices, there were 18 combinations of respondent data (from 65 respondents) that did not match any possible combinations of IDHS data. We matched these respondents to the IDHS data on four variables instead of five: province, 10-year age categories, marital status and educational attainment. After matching on four variables, three combinations of respondent data (from 23 respondents) remained unmatched to any possible combinations in the IDHS data. We matched these remaining respondents to the IDHS data on three variables instead of four: province, 10-year age categories and educational attainment. To create the adjusted weights for each respondent, we matched the respondent cell proportions to the weighted IDHS proportions and calculated the weights by dividing the IDHS proportions by the respondent proportions.

We followed the same procedures outlined above to match our pooled sample of confidantes with the IDHS sample to construct adjusted confidante-specific weights. In the case of missing data for confidantes' age (0.03%; n=2) and educational attainment (0.8%; n=60), we assigned their corresponding respondents' value for those variables, under the assumption that confidantes' backgrounds are similar to that of their respondents. These imputed values, however, were only used for the purpose of calculating the weights.

APPENDIX TABLE 1. Selected characteristics of all women of reproductive age, community-based survey respondents and their confidantes, Java, Indonesia, 2018

Characteristic	Weighted 2017 IDHS** (N=16,422)	Weighted CBS respondents†† (N=8,969)	Unweighted CBS respondents (N=8,969)	Unweighted confidantes (N=7,458)	Confidante order‡‡		
					First	Second	Third
Province							
Jakarta	6.9	4.3	15.0	17.6†	17.3†	17.3†,‡	19.9†,‡
West Java	34.3	31.3	16.8	15.7	16.2	15.4	13.4
Central Java	22.5	32.3	17.3	19.4	18.8	20.2	20.3
Yogyakarta	2.7	2.4	17.2	19.0	17.5	20.7	23.4
East Java	25.7	23.6	16.5	13.0	13.6	12.2	11.4
Banten	7.9	6.1	17.2	15.4	16.6	14.1	11.6
Age							
15–19	14.6	12.5*	12.6	18.5†	17.5†	19.4†,‡	21.9†,‡
20–29	26.3	26.7	26.0	31.2	30.4	32.8	31.9
30–39	30.2	32.7	32.8	31.5	32.6	29.9	29.2
40–49	28.9	28.0	28.6	18.9	19.6	17.9	17.1
Median age	33.0	33.0*	33.0	30.0†	30.0†	29.0†,‡	28.0†,‡
Union/marital status							
Married/cohabiting	73.0	82.7*	81.9	71.6†	73.7†	69.5†,‡	65.2†,‡,§
Not married/not cohabiting	27.0	17.3	18.1	28.4	26.3	30.5	34.8
Education							
None/incomplete primary	7.5	11.1*	10.5	3.9†	4.3†	3.3†,‡	3.4†,‡
Completed primary	22.4	20.5	17.3	10.1	11.4	8.0	8.2
Incomplete secondary	30.4	27.4	26.6	27.9	28.7	27.7	23.5
Completed secondary	25.7	31.7	33.0	40.2	38.9	42.3	42.6
>completed secondary	14.1	9.3	12.6	17.9	16.7	18.7	22.4
Contraceptive use							
Any method	48.0	47.0	43.8	47.3†	48.2†	46.2†	45.0
Pill	9.2	9.0	7.6	6.3†	6.8	5.6†	5.4†
Injectable	22.3	23.7	20.5	24.8†	25.0†	24.8†	23.8†

*Differs from IDHS respondents at p<.05. †Differs from CBS respondents at p<.05. ‡Differs from first confidante at p<.05. §Differs from second confidante at p<.05. **Limited to women aged 15–49 in Java only; distribution weighted using DHS weights. ††Distribution weighted using the CBS sample weights. ‡‡Distribution unweighted. *Notes:* Ns are unweighted. CBS=community-based survey. IDHS=Indonesia Demographic and Health Survey.