Background and justification

Unsafe abortion is recognized as a global public health issue: some seven million women are treated for complications from unsafe abortions each year, and an untold additional number experience complications for which they do not receive needed treatment.[1] However, the clandestine and often illegal nature of induced abortion makes it difficult to accurately measure its incidence, as asking women to directly report their own abortions generally results in under-reporting. In response, the Abortion Incidence Complications Methods (AICM) was developed to indirectly estimate abortion incidence. The AICM uses estimates of facility post abortion care (PAC) caseloads in combination with a multiplier to estimate induced abortion incidence,[2] and it has been successfully implemented in over 25 countries.[3–16] However, the recent rise in the use of medication abortion, which often does not require any interactions with the medical system, has increasingly made traditional AICMs less desirable methods to estimate abortion incidence.

In light of the limitations associated with direct reports and the AICM, new methods are being developed and tested through community-based surveys, including the list experiment, the confidante method, and a modified approach to the AICM. It is it yet to be determined which of these five methods is most effective in estimating abortion incidence in a specific population. Further, it may be that some estimation methods perform better in certain cultural or geographic contexts than others.

The aim of this study is to estimate abortion incidence in Java, Indonesia's most populous island. While the number of women who have unsafe abortions in Indonesia is unknown, 11% of married women who wish to avoid pregnancy are not using a method of contraception, and therefore unintended pregnancies are likely common.[17] The most recent data on abortion incidence in Indonesia estimated the annual abortion rate in Indonesia to be 37 abortions per 1,000 women ages 15-49.[18] However, this estimate included both spontaneous and induced abortions and was derived from a limited, facility-based survey conducted nearly 20 years ago.

This study will provide needed evidence for the Indonesian government, health professionals, and NGOs to address abortion as part of a commitment to reduce the high rate of maternal mortality in the country. Further, the results of this study will add to the evidence base regarding which abortion estimation methods are most rigorous in the changing landscape of induced abortion around the world. While there is no gold standard with which to compare each incidence estimation generated by this study, sensitivity tests, comparisons of the estimates with each other, and comparisons to results from other countries will help determine which methods performed better than others and in which contexts.[i]

Methods

Sampling and data collection procedures

Data for this study are being collected through three cross-sectional instruments; a health facility survey (HFS), a survey of knowledgeable informants (SKI), and a community based survey of women (CBS).

HFS: Data collection occurred from May-June, 2018. A sampling frame of all facilities thought to offer PAC services in Java was created (N=2,256). Health facilities were categorized into 6 levels based on facility capacity and ownership type: Public Hospitals (types A-D), private hospitals (includes Child and Maternal/Women's Hospitals), and Puskesmas-PONEDs (public health centers with obstetric and

[i] Note to conference organizers: a similar study is currently being conducted in Ghana, and the investigators of that study are also submitting an abstract to PAA. The organizers might agree that these two papers will be complementary and will have synergistic value.

neonatal basic emergency services). In order to obtain a representative sample, we used stratified random sampling to select facilities (stratified by province and facility type). We selected approximately 32% of the full list of facilities (n=717), and interviews were completed with 667 facilities (93% response rate). The HFS respondents were the most qualified staff to answer questions about PAC caseloads (i.e. senior administrators, heads of OBGYN wards, head midwives, etc.)

SKI: Data collection will occur from November-December 2018. Participants who are knowledgeable about induced abortions and post-abortion care (i.e. medical doctors, midwives, policymakers, advocates, researchers, NGO staff, community health workers, traditional providers) will be purposely selected to participate. In order to make viable estimates for each province in Java, we will administer this survey to at least 35 people per province (total=210). Respondents will be selected to represent a variety of perspectives from both rural and urban areas.

CBS: Data collection will occur from November, 2018-January, 2019. The target population for the CBS is women aged 15-49 living in Java. A multi-stage sampling strategy will be used to generate a representative sample of households in Java. First, we will randomly select 210 administrative villages (the lowest level of government administration) in Java, using probability proportionate to size. Second, within each village we will randomly sample approximately 3 community groups (rukun tetangga or RT). Third, we will randomly select approximately 13 households (HH) in each RT. In each household we will select all eligible women (in households with ≤ 4 eligible women), or randomly select up to four women (in households with > 4 eligible women). Assuming one woman per HH on average and 13 HH per RT, our sample will equal 8,190 women.

Across the three surveys, all study materials will be translated to Bahasa and back-translated into English. All participants will undergo informed consent and complete a face-to-face interview using SurveyCTO on Android tablets.

Data and Analysis

Direct reports: Women will be asked if they have ever done anything to successfully end a pregnancy, and if so, how many times they did something to end a pregnancy in the past 6 years. In addition, some women who induce abortions do not classify their actions as "doing something to end a pregnancy". Instead, before confirming the pregnancy, women may try to do something to "bring back their period", sometimes referred to in other settings as menstruation regulation (MR). We will classify an MR as a probable induced abortion as one where a women did something that successfully brought back a period when she suspected that she was pregnant. To calculate abortion incidence over the last 5 years, the numerator will consist of the number of women who self-reported inducing an abortion plus the number of women who reported a probable MR induced abortion in the last 5 years. The denominator for the incidence rate is the total number of women who respond to the survey. We will use sampling weights to adjust this rate to be representative for all of Java.

List experiment: Women will be read a list of four non-sensitive events (for example staying overnight in hospital, having malaria, using a female condom, having had a menstrual period) and asked them *how many* of these events they have experienced, but not which ones. In half of the sample (treatment group), abortion is added as an additional item on the list. To increase the power of the estimate, we will use the "double list experiment":[19,20] two different lists (A and B) will be included in the questionnaire, and each group will be a treatment group for one list and a control group for the other list. The numbers provided for each list will be summed across respondents and averaged by list. The averages for the control versions of List A and List B will then be subtracted from the treatment versions of List A and List B to

generate an estimate of the population proportion that had ever had an abortion. The annual abortion rate in the year before the survey from each list (A and B) will be calculated as:

[(mean # events in previous year in treatment group) - (mean # events in previous year in control group)] * 1000 / (number of women).

The estimated abortion rate will be the mean of the rates from lists A and B. We will calculate separate rates by province, urban/rural residence, and age group.

Confidante method: Women are asked to think about the women aged 15-49 who would share private and confidential information with her, and with whom she would also share such private and confidential information. Respondents are asked to report about *up to three* of these confidantes. For each confidante (A-C), we measure sociodemographic characteristics, contraception use, whether the confidante had an abortion in the last five years, whether she experienced complications from the abortion, and whether she was treated in a facility for those complications.

To calculate the abortion incidence among confidantes, we first compute the abortion incidence among Confidante A by dividing the number of Confidante A's who had an abortion in the last 5 years by the total number of Confidante A's identified in the survey. This same process is continued for Confidante B and Confidante C. The final Confidante abortion incidence rate will be the average of the three Confidante-specific abortion rates.

AICM: In the AICM method, we first estimate all PAC cases seen in health facilities and adjust this number to account for women who experience an induced abortion with no complications and women with induced abortion complications who do not receive care in a health facility. First, we estimate all PAC cases seen in sampled health facilities in the past year by averaging last and average month PAC caseloads for each facility and multiplying by 12. Second, to correct for instances where PAC patients receive care at one facility and are later referred to a higher-level facility for more advanced treatment, we will adjust each yearly caseload estimate by facility referral rates. Third, we calculate representative estimates of PAC caseloads by weighting the estimates in each province by the survey sampling fractions and response rates for facility types in that province. Fourth, we adjust these province-level estimates to account for PAC cases that were likely due to miscarriage by estimating the annual number of miscarriages in Java that both require and receive treatment in a health facility. We then subtract the weighted miscarriage numbers from the weighted total PAC caseloads to obtain the estimated number of complications due to induced abortions treated at health facilities.

The next step is to calculate the "multiplier", which is the estimated number of "invisible" induced abortion cases represented by each PAC case; these are not counted in the HFS because women either did not experience a complication and/or did not get PAC treatment in a health facility. Expressed another way, the provincial multiplier (m_i) indicates, for every one woman treated for a complication in a health facility, the number of other women who have an induced abortion that either did not result in a complication or that resulted in a complication but did not receive treatment in a health facility.

Using SKI responses, we estimate the following measures for each of the six provinces in Java: among women who have an induced abortion, the distribution of abortion types[ii] and the distribution of provider types,[iii] the proportion of women who have a complication by abortion type and provider type, the proportion of women who would obtain treatment at a health facility if they experience a complication

[ii]Surgical (D&C/D&E/MVA/EVA), medication, other

[iii]Doctors, nurses/midwives, pharmacists/drug shop owners, traditional providers, the woman herself

from the induced abortion, and the proportion of all induced abortions with treated complications. For each of these four measures, we collect information and estimate the proportions separately for each four sub-groups: rural poor, rural non-poor, urban poor and urban non-poor women. Finally, to estimate the induced abortion incidence rate for Java, we multiply the estimated number of PAC cases due to induced abortions by the multiplier. This is done separately for the province-specific induced abortion PAC estimates and province-specific multipliers. These province-level estimates are then summed to obtain an estimate for the whole of Java.

Modified AICM: For this method, we estimate the number of induced abortions with complications treated in health facilities in the same way as the traditional AICM. However, the Modified AICM uses CBS data to calculate the multiplier. Women who report having an abortion in the CBS are asked whether they experienced complications and whether they received PAC in a facility. We then calculate the proportion of women who reported receiving PAC at a health facility, out of all women who report having an induced abortion in the past 5 years. The multiplier in the modified AICM is the inverse of the proportion of women who reported receiving PAC at a health facility, out of all women who report having an induced abortion in the past 5 years. The inverse of these weighted proportion is the multiplier in the modified AICM. Finally, as with the traditional AICM, we multiply the estimated number of induced abortions with complications treated in health facilities by the modified multiplier. As with the other abortion incidence estimation methods, we will calculate this estimate for each of the six provinces, as well as the whole of Java.

Results

We will present the abortion incidence estimates from all five methodologies for Java, Indonesia.

Discussion

In the absence of a gold standard measure of abortion incidence, we will employ several methods to assess how each abortion estimation method performs. For the direct report method, list experiment, and confidante method, the main potential source of bias is underreporting. Therefore, we will deem the highest estimated abortion incidence of these three to be the least biased. This method has been used previously to compare methodologies for measuring other sensitive behaviors prone to underreporting.[21]

We will also compare the reporting of uncomplicated abortion in the AICM (multiplier) with modified AICM (modified multiplier). Health professionals, which typically account for about 40% of the SKI respondents, may be more likely than women themselves to underreport induced abortions that do not have complications, as health professionals might be unaware of these abortions. While women may also underreport these self-induced abortions due to stigma, those that do report may still accurately report the complication rates associated with these abortions. Therefore, we will compare estimated complication rates from health professionals to complications rates directly reported by women. If the complication rate reported by women is much larger than that reported by health professionals, it is reasonable to assume that the women-reported rate is more accurate.

The CBS asks women to report about their confidantes' contraceptive use. Using the same methodology to calculate the incidence of abortion among confidantes, we can calculate the prevalence of contraceptive use in general and among specific methods for confidantes as well. We will compare these results with contraceptive prevalence estimates from the DHS to assess how accurately women can report on the sensitive behaviors of their confidantes. If we find that contraceptive use is either over- or underestimated using the confidante method, we may consider the abortion incidence estimate based on the confidante method to be similarly over or underestimated.

References

1. Singh, S. Hospital admissions resulting from unsafe abortion: estimates from 13 developing countries. *The Lancet* **368,** 1887–1892 (2006).
2. Singh, S., Remez, L. & Tartaglione, A. *Methodologies for estimating abortion incidence and abortion-related morbidity a review*. (Alan Guttmacher Institute : International Union for the Scientific Study of Population, 2010).
3. Henshaw, S. *et al.* The Incidence of Induced Abortion in Nigeria. *Int. Fam. Plan. Perspect.* **24,** 156 (1998).
4. Bankole, A. *et al.* The Incidence of Abortion in Nigeria. *Int. Perspect. Sex. Reprod. Health* **41,** 170–181 (2015).
5. Singh, S., Prada, E., Mirembe, F. & Kiggundu, C. The Incidence of Induced Abortion in Uganda. *Int. Fam. Plan. Perspect.* **31,** 183–191 (2005).
6. Prada, E. *et al.* Incidence of Induced Abortion in Uganda, 2013: New Estimates Since 2003. *PLOS ONE* **11,** e0165812 (2016).
7. Levandowski, B. *et al.* The incidence of induced abortion in Malawi. *Int. Perspect. Sex. Reprod. Health* **39,** 88–96 (2013).
8. Polis, C. *et al.* Incidence of induced abortion in Malawi, 2015. *PLOS ONE* **12,** e0173639 (2017).
9. Moore, A. *et al.* The Estimated Incidence of Induced Abortion in Ethiopia, 2014: Changes in the Provision of Services Since 2008. *Int. Perspect. Sex. Reprod. Health* **42,** 111–120 (2016).
10. Singh, S. *et al.* The estimated incidence of induced abortion in Ethiopia, 2008. *Int. Perspect. Sex. Reprod. Health* **36,** 16–25 (2010).
11. Sedgh, G., Rossier, C., Kaboré, I., Bankole, A. & Mikulich, M. Estimating abortion incidence in Burkina Faso using two methodologies. *Stud. Fam. Plann.* **42,** 147–154 (2011).
12. Basinga, P. *et al.* Abortion incidence and postabortion care in Rwanda. *Stud. Fam. Plann.* **43,** 11–20 (2012).
13. Sedgh, G., Sylla, A., Philbin, J., Keogh, S. & Ndiaye, S. Estimates of the incidence of induced abortion and consequences of unsafe abortion in Senegal. *Int. Perspect. Sex. Reprod. Health* **41,** 11–19 (2015).
14. Keogh, S. *et al.* Incidence of Induced Abortion and Post-Abortion Care in Tanzania. *PLOS ONE* **10,** e0133933 (2015).
15. Chae, S., Kayembe, P., Philbin, J., Mabika, C. & Bankole, A. The incidence of induced abortion in Kinshasa, Democratic Republic of Congo, 2016. *PLOS ONE* **12,** e0184389 (2017).
16. Mohamed, S. *et al.* The estimated incidence of induced abortion in Kenya: a cross-sectional study. *BMC Pregnancy Childbirth* **15,** 185 (2015).
17. Statistics Indonesia (Badan Pusat Statistik -- BPS), National Populaiton and Family Planning Board (BKKBN), Kementerian Kesehatan (Kemenkes -- MOH) & ICF International. *Indonesia Demographic and Health Survey 2012.* 1–544 (BPS, BKKBN, Kemenkes, and ICF International, 2013).
18. Utomo, B., Habsjah, A. & Hakim, V. *Incidence and social-psychological aspects of abortion in Indonesia: a community-based survey in 10 major cities and 6 districts, year 2000.* (University of Indonesia, Center for Health Research, 2001).
19. Glynn, A. N. What Can We Learn with Statistical Truth Serum? Design and Analysis of the List Experiment. *Public Opin. Q.* **77,** 159–172 (2013).
20. Moseson, H. *et al.* Reducing under-reporting of stigmatized health events using the List Experiment: results from a randomized, population-based study of abortion in Liberia. *Int. J. Epidemiol.* **44,** 1951–1958 (2015).
21. Rosenfeld, B., Imai, K. & Shapiro, J. N. An Empirical Validation Study of Popular Survey Methodologies for Sensitive Questions: Validation of Survey Methodologies for Sensitive Questions. *Am. J. Polit. Sci.* **60,** 783–802 (2016).