EXTENDED ABSTRACT: Comparing Five Approaches to Estimating Abortion Incidence in Ghana

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Introduction

In countries where abortion is legally restricted, reliable estimates of abortion incidence are often lacking. In Ghana, abortion laws are comparatively less restrictive than in many sub-Saharan African countries, but abortion is still highly stigmatized and many are unaware of the conditions under which it may be legally obtained. Thus, many abortions in Ghana are still being done clandestinely and illegally, and are not officially documented. The only abortion incidence estimate available is from a flawed 2007 study,[1] which yielded a rate of 15 per 1000, a gross underestimation since the modeled estimate for West Africa is 28 per 1000.[2] Accurately estimating abortion incidence is critical for bringing attention to this practice and shaping policy, as well as for estimating other outcomes such as contraceptive failure and unintended pregnancy rates.

Various promising methods to indirectly estimate abortion incidence have been proposed, but no study has systematically compared how they perform in a given setting. Moreover, methods may perform differently across settings, and multi-country studies can help elucidate most suitable approaches for different settings. We tested five methodologies for estimating abortion incidence in Ghana: (1) direct questioning of women about their abortions, (2) the Abortion Incidence Complications Method (AICM), (3) a modified AICM, (4) the List Experiment, and (5) the Confidante Method. The first two represent current standard practice in the field, while the last three are innovative approaches either newly developed by the authors (modified AICM, Confidante Method) or recently applied to abortion estimation (List Experiment). A complementary study is being conducted in Indonesia, for which an abstract has been submitted to the same session. To our knowledge, this is the first study comparing more than two indirect estimation methodologies in one setting. Data collection is complete, and data are being analyzed. We describe the methodology and planned comparative analyses.

Description of estimation approaches

Self-reports: A common approach to measuring abortion incidence involves asking women directly if they have had an abortion (ever and/or in a specific period of time). Respondents can report multiple abortions and the timing of each, and contextual information can be collected to estimate incidence by population subgroup or type of procedure. However, this approach underestimates abortion in most settings because many women are unwilling to admit to having had an abortion,[3] and willingness to report may be differential by women's characteristics, abortion experiences or outcomes*. Techniques aimed at enhancing anonymity (e.g. Sealed Envelope Method) have not consistently generated reliable estimates. [4]

AICM: In the early 1990s, an indirect approach called the Abortion Incidence Complications Method (AICM) was developed. In the AICM, the number of abortions is estimated as the number of women receiving post-abortion care (PAC) in a health facility (obtained from a nationally representative survey of health facilities or HFS), multiplied by the estimated number of abortions that do not lead to facility-based treatment for every woman who receives PAC (known as the multiplier, and obtained from a survey of knowledgeable informants).[5] In countries where abortion is legal under certain circumstances, the HFS also estimates the number of legal abortions provided in facilities. This is added to the total number of clandestine abortions derived from PAC cases (after removing PAC cases stemming from legal abortions, so as to not double-count legal abortions).

* For example, women are more likely to report a complicated abortion.

However, the AICM relies on several key assumptions pertaining to the construction of the multiplier and other aspects such as removal of PAC cases assumed to stem from spontaneous abortion.

Modified AICM: To address some limitations of the AICM, a modified version constructs the multiplier from women's self-reported abortions (instead of from knowledgeable informants). While this assumes that women's reports of their abortions are not biased by whether they ultimately received PAC, surveys of women in Burkina Faso[6] and Nigeria[7] suggested this approach may improve accuracy.

Double List Experiment: The List Experiment involves reading to respondents a list of three or four non-sensitive events (for example staying overnight in hospital) and asking *how many* of these events they have experienced, but not which ones. In half of the sample (the treatment group), abortion is added as an additional item on the list. The incidence of abortion is calculated as the difference between the mean number of events experienced by the treatment group and the control group. To increase statistical power, the "double list experiment"[8,9] includes two different lists, and each group is a treatment group for one list and a control group for the other list. The overall incidence of abortion is calculated as the mean of the estimates derived from each list.

Confidante Method: Each respondent is asked to think about up to three confidantes aged 15 to 49 who would share their secrets with her, and with whom she would also share her secrets. For each confidante, information is collected on her sociodemographic characteristics, contraceptive use, and whether she has had an abortion in the past year and past three years. This method can also collect information on the proportion of confidantes' abortions that had complications and received PAC, which can be used as the multiplier for the modified AICM (instead of respondents' self-reports).

Data collection

For the AICM, we conducted a nationally representative health facilities survey (HFS) and a knowledgeable informants survey (KIS). For the List Experiment, the confidante approach and the direct reporting, we conducted a nationally representative community-based survey (CBS) of women aged 15 to 49. The modified AICM draws from the HFS and the CBS. Survey weights adjust for the sampling designs of the HFS and CBS. Ghana has ten regions that can be grouped into three main zones: Northern, Middle and Coastal. Abortion incidence estimates from each methodology will be generated for each zone and nationally.

The HFS sampling frame included all health facilities that could, in theory, provide PAC or abortion services[†]. We conducted a census of teaching and regional hospitals. For the remaining facility types, we used a two-stage stratified cluster sampling design, first selecting 121 of 216 districts, then selecting 608 facilities within these. Interviewers used a tablet-based questionnaire to interview face-to-face senior staff member(s) knowledgeable about the facility's provision of PAC and abortion services.

For the KIS, we compiled a purposive list of key informants distributed throughout the 10 regions, who are knowledgeable about conditions of abortion provision and PAC, making efforts to ensure balanced representation of experts with knowledge of rural and urban areas. Around 125 interviews were conducted face-to-face by researchers familiar with abortion and PAC in Ghana.

For the CBS, we used a two-stage stratified cluster design with probability proportional to size sampling. First, 100 enumeration areas (EAs) were selected, stratified by urban/rural location and region. In each EA, all

[†]Except Community-Based Health Planning and Services (CHPS) facilities because of the over 5,000 such facilities, the vast majority do not offer PAC or abortion services, and are expected to contribute less than 3% to caseloads.

households were mapped, 42 households were randomly selected, and household surveys were conducted to gather socio-economic information and identify eligible female respondents (15 to 49 years). Trained interviewers administered a smartphone-based questionnaire to CBS respondents face-to-face. Interviewers were resident enumerators who lived in the local area and were familiar with the language and culture.

Fieldwork was conducted from June to September 2018 by the Kwame Nkrumah University of Science and Technology (KNUST), with technical support from the Guttmacher Institute and Performance Monitoring and Accountability 2020 (PMA2020).

Calculating abortion incidence

AICM: Using standard AICM analysis approaches,[10] we will compute the number of abortions, abortion rates (per 1,000 women aged 15-49) and ratios (per 100 births) nationally and for each zone, for the year 2017.

Modified AICM: We will conduct the same computations as for the standard AICM, but the multiplier will be calculated using women's reports of proportions of abortions (their own and their confidantes') that receive treatment. We will compare multipliers and incidence rates across these methodologies (Table 1).

Table 1. Multiplier and abortion incidence using different data sources

Source of multiplier	Multiplier[1]	Incidence rate (AICM)
Knowledgeable informant survey		
Direct self-reports		
Confidantes		

[1]For each abortion complication treated in a facility, number of abortions that do not receive treatment in a facility (either due to no complication being experienced, or a complication being experienced but treatment not being accessed).

Double List Experiment: We will calculate the abortion rate in the past year from each list (A and B) as: [(mean # events in past year in treatment group) - (mean # events in past 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 sub-region, urban/rural residence, and age group.

Direct reporting: The abortion rate will be calculated as:
Past year: [# of abortions reported by women in past year * 1000] / [total women in CBS]
Annualized (3 years): [# abortions reported by women in last 3 years * 1000] / [total women in CBS *3]
We will also calculate the lifetime incidence of abortion, and annual rates for the two previous years based on reported timing of abortions. This will help assess whether reporting decreases with time.

Confidante method: We will compute the abortion rate as:
Past year: [# of confidantes who had abortion in past year * 1000] / [#confidantes]
Annualized (3 years): [# confidantes who had abortion in previous 3 years*1000] / [#confidantes *3]
We will also compute the annual abortion rate separately for the two preceding years, to see if there is attrition in reporting over time. If the respondent does not know whether a confidante has had an abortion, this confidante will be excluded from the numerator and denominator. We will compare the abortion rate based on the first confidante with the rate based on the third confidante, to assess if there is attrition in knowledge or reporting of abortions after the first confidante.

Determining the most valid estimate of abortion incidence

Abortion incidence rates will be compared across the five methodologies, and several strategies will be employed to assess the validity and accuracy of the various estimates.

Comparing underreporting across methods: The main source of bias in the list experiment, confidante method and direct questioning is underreporting. As has been done previously when comparing methodologies for measuring a sensitive practice prone to underreporting,[11] it would be reasonable to deem the highest estimated abortion rate from these approaches to be the least biased estimate. We can compare estimates for demographic subgroups, to assess if the methods rank differently for different subgroups. With respect to assessing which multiplier performs best (Table 1), a key concern with the AICM is that health professionals may be less aware of uncomplicated or untreated abortions. Women might also be less likely to report uncomplicated abortions than complicated abortions. Thus, the approach that yields the higher multiplier could be deemed the more valid estimate.

Validating components of estimates against an objective measure: With data from the HFS as a gold standard for the incidence of abortions treated in a facility, HFS estimates of this measure (after subtracting miscarriages) can be compared with estimates based on the confidante method and self-reporting.

Testing the validity of estimates of other reproductive health behaviors: For example, the confidante method can estimate contraceptive use in confidantes, which can be compared to DHS estimates. In the Double List Experiment (LE), we will test the validity of estimates of other events in the list that have a known population prevalence, to determine whether the LE is yielding accurate estimates of events.

Testing other assumptions of the methodologies: To determine whether the sample of confidantes is representative of the general female population, we will compare the distribution of sociodemographic characteristics among confidantes with those of CBS respondents and DHS respondents in that area. If women who have abortions have particular characteristics, this comparison can also help assess whether a woman's probability of being named as a confidante is independent of the probability that she had an abortion. To ensure these probabilities were independent, we phrased the initial confidante-generating question in such a way that the respondent did not suspect the interviewer would be asking about abortions, and we placed the question before any direct questions about abortion in the questionnaire.

Sensitivity analyses: We plan to conduct a number of sensitivity analyses across the estimation methods, to help determine the influence of certain components of the calculations on the overall incidence estimates.

If certain methodologies do not pass validity tests such as those outlined above, these methodologies will be deemed less accurate. For those methodologies that do perform well in the validity tests, we will identify the method with the least underreporting and deem this to be the most accurate.

Discussion points

In assessing these estimation methods, a central criterion is the validity of the measure of abortion incidence. However, other factors merit consideration in determining the best way to use limited resources to study abortion, such as whether the method accurately records timing of abortions; whether it can be employed across a range of settings (and thus allow for comparison of estimates across settings); the level of anonymity for women who report abortions; the cost required to achieve comparable levels of precision across methods; and contextual information on abortion. These considerations will be addressed in the discussion.

REFERENCES

[1] Ghana Statistical Service (2009). *Ghana Maternal Health Survey 2007*. Accra, Ghana: GSS, GHS, Macro International

[2] Sedgh G, Bearak J, Singh S, Bankole A, Popinchalk A, Ganatra B, et al. (2016). Abortion incidence between 1990 and 2014: global, regional, and subregional levels and trends. *Lancet 2016 Jul 16; 388(10041)*: 258–267

[3] Rossier, C. (2003). Estimating induced abortion rates: A review. *Studies in Family Planning*, *34*(2), 87–102.doi:10.1111/j.1728-4465.2003.00087.x

[4] Singh, S., Remez, L., & Tartaglione A. eds. (2010) *Methodologies for Estimating Abortion Incidence and Abortion-Related Morbidity: A Review*. New York: Guttmacher Institute; and Paris: International Union for the Scientific Study of Population.

[5] Singh, S., Prada, E., & Juarez, F. (2010) The Abortion Incidence Complications Method: A Quantitative Technique. in *Methodologies for Estimating Abortion Incidence and Abortion-Related Morbidity: A Review.* Singh, S., Remez, L., and Tartaglione, A., eds. New York and Paris: Guttmacher Institute and International Union for the Scientific Study of Population, 71–98.

[6] Sedgh, G., Rossier, C., Kaboré, I., Bankole, A., & Mikulich, M. (2011). Estimating abortion incidence in Burkina Faso using Two methodologies. *Studies in Family Planning*, *42*(3), 147–154. doi:10.1111/j.1728-4465.2011.00275.x

[7] Special tabulations from Sedgh, G., Bankole, A., Oye-Adeniran, B., Adewole, I. F., Singh, S., & Hussain, R. (2006). Unwanted pregnancy and associated factors among Nigerian women. *International Family Planning Perspectives*, *32*(04), 175–184. doi:10.1363/3217506.

[8] Glynn, A. N. (2013). What can we learn with statistical truth serum? Design and analysis of the list experiment. *Public Opinion Quarterly*, *77*(S1), 159–172. doi:10.1093/poq/nfs070

[9] Moseson, H., Massaquoi, M., Dehlendorf, C., Bawo, L., Dahn, B., Zolia, Y., Gerdts, C. (2015). Reducing under-reporting of stigmatized health events using the list experiment: Results from a randomized, population-based study of abortion in Liberia. *International Journal of Epidemiology*, *44*(6), 1951–1958. doi:10.1093/ije/dyv174

[10] Singh, S., Prada, E., & Juarez, F. (2010) The Abortion Incidence Complications Method: A Quantitative Technique. in *Methodologies for Estimating Abortion Incidence and Abortion-Related Morbidity: A Review.* Singh, S., Remez, L., and Tartaglione, A., eds. New York and Paris: Guttmacher Institute and International Union for the Scientific Study of Population, 71–98.

[11] Rosenfeld, B., Imai, K., & Shapiro, J. N. (2015). An empirical validation study of popular survey methodologies for sensitive questions. *American Journal of Political Science*, *60*(3), 783–802. doi:10.1111/ajps.12205