Estimating the Incidence of Induced Abortion in Java, Indonesia, 2018

CONTEXT: *In Indonesia, maternal mortality is high and abortion is restricted. Reliable information on induced abortion is needed; however, the difficulty of measuring abortion in settings where it is legally restricted and highly stigmatized calls for innovation in approaches to measuring abortion incidence.*

METHODS: *The data were from three original surveys conducted in Java among health facilities, knowledgeable informants and women aged 15–49, fielded in April 2018–January 2019. Two methods were used to estimate the one-year induced abortion incidence rate in Java: the standard Abortion Incidence Complications Method (AICM) and a modified AICM. Each method was evaluated on the basis of data quality, and what is known about sexual and reproductive health indicators related to abortion rates, to determine which performed best in measuring abortion incidence in Java.*

RESULTS: *Estimates of complications resulting from induced abortion from knowledgeable informants and the women differed substantially. The modified AICM produced an estimate of 42.5 abortions per 1,000 women aged 15–49, while the standard AICM estimate was lower (25.8 per 1,000). A comparison of the distribution of abortion methods used revealed that knowledgeable informants believed abortion was less safe than indicated by women's reports of their own experiences. Therefore, the standard AICM likely underestimates abortion.*

CONCLUSIONS: *The modified AICM performed better than the standard AICM and indicates that abortion is common in Java. Increased access to contraceptives and high-quality postabortion care is needed. Future research should investigate the safety of abortion, especially with respect to self-managed abortion.*

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Unsafe abortion is a worldwide public health issue, especially affecting women in countries with restrictive abortion laws. Globally, an estimated seven million women were treated for complications from unsafe abortions in 2012, almost entirely in countries with highly restrictive abortion laws or those with poor implementation of more permissive policies.[1] Further, 45% of abortions occurring worldwide (approximately 25 million) during 2010–2014 were unsafe.[2] The Institute for Health Metrics and Evaluation has estimated that each year, approximately 11% of maternal deaths globally are attributable to unsafe abortion,[3] which the World Health Organization (WHO) defines as a procedure to terminate a pregnancy performed by an individual lacking the necessary skills, in an environment lacking minimal medical standards or both.[2]

The legal grounds for abortion in Indonesia are narrow: Current law allows abortion in medical emergencies, as well as in cases of severe fetal anomaly.[4] In 2009, the law was expanded to include cases of rape, but only up to six weeks' gestation.[4] Research has demonstrated that abortions are just as common in legally restrictive settings as they are in settings where abortion is broadly legal.[5] Given Indonesia's abortion context, it is likely that unsafe abortion is prevalent and contributes to the country's high maternal mortality rate, which is higher than that in other countries in Southeast Asia: WHO estimates a maternal mortality ratio of 177 maternal deaths per 100,000 live births in Indonesia, compared with 29 in Malaysia, 37 in Thailand and 152 for the Southeast Asia region as a whole.[6]

However, little is known about abortion incidence and safety in Indonesia. Although the most recent estimate of the annualized induced abortion rate for Southeast Asia (34 abortions per 1,000 women aged 15–44 for 2015–2019) provides a useful approximate indicator for all countries in the subregion,[7] each country's unique context will lead to country-specific rates that likely differ from the regional average. Only one study, conducted in 2000, has attempted to estimate the incidence of abortion in Indonesia;[8] it used snowball sampling to find abortion service delivery points and directly estimated abortion incidence by dividing abortion caseload by the size of the population served by those facilities. Although the study produced a rate of 37 abortions per 1,000 women aged 15–49, this estimate included both spontaneous and induced abortions, and was based on a nonrepresentative sample of health facilities in 10 major cities and six districts. Furthermore, it is likely that abortion rates have changed in the two decades since this study took place.

The current lack of evidence on abortion in Indonesia is likely because of the difficulty of measuring abortion in settings where it is legally restricted and stigmatized. Official

statistics and medical records of induced abortion in such settings are largely incomplete, poor in quality or may not exist. Further, asking women directly in surveys if they have had an abortion has generally proven ineffective, as many are reluctant to disclose this information.[9,10]

To address many of these concerns, researchers developed the Abortion Incidence Complications Method (AICM) in the 1990s as an indirect way to estimate abortion incidence.[11] In brief, the AICM uses a representative survey of health facilities to estimate the number of women treated for postabortion complications each year. Then, using estimates of the proportion of all abortions that likely end in treated complications, gathered from individuals knowledgeable about abortion in that setting, it adjusts the estimate to reflect additional induced abortions that either did not result in a complication or resulted in one that was not treated in a health facility. This approach has historically been one of the most rigorous methods for measuring abortion incidence and has been used in more than 20 countries, with modifications to the method made over time.[12] However, misoprostol—a drug that allows women to self-induce abortions outside of the formal health care system—has become increasingly available in restrictive settings, and knowledge of its use as an effective and safe abortifacient has increased as well.[13,14] In Indonesia, sales of misoprostol increased by 116% between 2002 and 2007,[14] and the drug is currently widely available online for abortion.[15] As a result, a greater proportion of abortions are "hidden," and key informants—on whose knowledge the AICM relies—may not be able to accurately estimate the proportion of induced abortions that result in complications requiring treatment in health facilities.

Because of this changing landscape, researchers are testing and applying new indirect methodologies to measure abortion incidence more robustly. One such approach is the Confidante Method, in which respondents are asked to report the abortions of their closest female confidantes.[16–19] The method is hypothesized to improve upon estimates based on direct reports because women may be more likely to report their close friends' abortions than their own. The Confidante Method has recently been applied in Côte d'Ivoire; Ethiopia; Ghana; Nigeria; Rajasthan, India; and Uganda; results from these studies suggest that the method may not, in fact, result in better abortion reporting in some cultural contexts.[20,21]

Another approach is a modified version of the AICM.[22] The standard and modified AICM both begin by estimating postabortion care (PAC) caseloads in the same way. However, instead of adjusting these caseload estimates on the basis of information gathered from knowledgeable informants, the modified AICM obtains the number of abortions that result in treated complications from women's self-reports. It is hypothesized that information supplied by women themselves, rather than by key informants, will provide a more accurate account of treated abortion complications, ultimately yielding a more accurate estimate of abortion incidence.[22] This is especially true in settings in which women are increasingly self-inducing abortions outside of the formal health care system. A recent study in Ghana was the first to test this hypothesis and found that the modified AICM performed better in estimating abortion incidence in that country than did the standard AICM.[23]

To address the clear need for a better understanding of induced abortion in Indonesia, and in consideration of the difficulty of measuring abortion incidence in restrictive settings, we designed and implemented a study to estimate abortion incidence in Java, Indonesia, that employed four methodologies: direct reports from women, the Confidante Method, the standard AICM and the modified AICM. We originally hypothesized that in the context of Indonesia, the direct-report method would be the least successful in estimating abortion incidence.[24,25] This has since been confirmed to be the case, as the direct-report abortion rate for this study was estimated at an implausibly low 3.7 per 1,000 women aged 15–49, reported in a concurrently published article by Stillman et al.[26] In addition, the Confidante Method also ultimately failed to produce a valid abortion incidence estimate in Java.[26]

In this article, we generate estimates for the rate of induced abortion in Java using the two remaining methods: the standard AICM and the modified AICM. We then evaluate the performance of each estimate on the basis of the quality of respondents' reports in our study surveys and in relation to indicators in Java that are strongly associated with abortion rates, such as the total fertility rate (TFR), the contraceptive prevalence rate, unmet need for modern contraception and the contraceptive method mix. Finally, we determine which method and corresponding incidence estimate yields the most plausible measurement of induced abortion incidence in Java.

METHODS

Study Setting

Indonesia is a nation comprising thousands of islands; Java is the most populous and home to almost 60% of the country's residents.[27] Compared with the rest of Indonesia, Java is wealthier and more developed, although there is great variation in levels of economic development across Java's six provinces (Jakarta Special Capitol Region, West Java, Central Java, Yogyakarta, East Java and Banten), and in general, women in Java have better access to health services.[28]

It is commonly accepted that most abortions in Indonesia take place outside the narrow bounds of the law. However, PAC is legal, and it is offered in many hospitals. Broadly, PAC describes a set of services for treating miscarriages as well as complications resulting from unsafe abortion. Indonesia's national health insurance program reimburses hospitals for providing PAC, and since 2008, the government has been offering *Pelayanan Obstetri Neonatus Essensial Dasar* (PONED) registration to public health centers as well, designating them to provide essential emergency obstetric and neonatal care services.

Data Sources and Sampling

For the standard and modified AICM estimates of abortion in Java, we used data from three quantitative surveys implemented by this study—the Health Facilities Survey (HFS), the Survey of Knowledgeable Informants (SKI) and a community-based survey (CBS) of women of reproductive age—fielded from April 2018 to January 2019. The HFS and SKI were adapted from previous AICM studies and made context-specific; the CBS was developed on the basis of the study team's knowledge and in consultation with experts. Data for all three surveys were collected in-person by trained enumerators using the mobile data collection application SurveyCTO on password-protected tablet computers and stored on a secure server accessible only to the research team. Parental consent was secured for respondents younger than 18, and all respondents provided verbal consent; HFS participants also provided written consent. Ethical approval for this study was provided by 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.

• *HFS.* The main purpose of the HFS was to gather data on the number of patients treated in health facilities for postabortion complications (of either induced or spontaneous abortions) in 2018.

The sampling frame consisted of all hospitals and public health facilities in Java theoretically capable of providing PAC. Hospitals were defined as "PAC capable" if they had an operating room, gynecology clinic or maternity ward; this definition captured both public hospitals and private maternity hospitals. The Indonesian Ministry of Health groups public hospitals into types A–D, with type A hospitals being the most advanced and type D hospitals providing only the most basic services (see footnote on Table 1 for further details). Public health centers with PONED registration were also considered "PAC capable." Private clinics were not included because no comprehensive list of such clinics exists.

We extracted lists of public and private hospitals in Java from the Ministry of Health Hospital Management Information System website in June 2017. No centralized lists of PONED health centers exist; therefore, we collected district-level lists of PONEDs by contacting each of the district-level Ministry of Health offices in Java in April 2018. These efforts resulted in a final sampling frame of 2,239 eligible facilities across Java's six provinces.

To obtain a sample that was representative of the entire island and each province, we stratified the sampling frame by province and facility type (type A, B, C and D hospitals; private maternity hospitals; and PONEDs). We selected 100% of type A hospitals (13 in total), 40% of each of the remaining hospital types and 20% of PONED health centers (Table 1). Overall, we sampled 717 (32%) of the full list of facilities, of which 657 completed HFS interviews—a response rate of 92%.

To assign weights, we first adjusted the universe size of each stratum to account for facility closure and misclassification found in the sample for that stratum. We then assigned sample weights equal to the inverse probability of selection within each stratum under the adjusted sample universe. Finally, we adjusted these base weights to account for nonresponse.

TABLE 1. Sample selection and response rates for the Health Facility Survey, by facility type, Java, Indonesia, 2018

Facility type	No. of PAC–capable facilities	Sampling fraction (%)	No. of facilities selected	No. of completed interviews	Response rate (%)
All	**2,239**	**32**	**717**	**657**	**92**
Hospital	**1,253**	**42**	**520**	**460**	**88**
Type A	13	100	13	11	85
Type B	205	40	84	73	87
Type C	446	40	192	171	89
Type D	356	40	134	123	92
Private maternity (RSIA/RSAB)	233	40	97	82	85
PONED health center	**986**	**20**	**197**	**197**	**100**

Notes: The Indonesian Ministry of Health groups public hospitals into four categories denoted by the letters A–D; Type A hospitals have the largest number of specialty wards, and Type D hospitals have no more than three specialty services. RSIA (Mother and Child Hospitals)/RSAB (Child and Maternity Hospitals) are privately owned maternity hospitals, often run by religious nonprofit organizations, that provide delivery, neonatal and pediatric services, along with general obstetric and gynecologic care. PONED health centers are public health centers registered to provide emergency obstetric and neonatal services. PAC=postabortion care. RSIA=*Rumah Sakit Ibu dan Anak*. RSAB=*Rumah Sakit Anak dan Bersalin*. PONED=*Pelayanan Obstetri Neonatus Essensial Dasar*.

Study staff contacted each sampled facility and identified the staff person most qualified to answer questions about PAC caseloads and treatment, usually senior administrators, heads of the obstetrics-gynecology ward or head midwives; in-person interviews were scheduled for a later date. In eight large hospitals, multiple units treated PAC patients and no single individual was able to answer questions on behalf of all units, so a staff member in each unit was interviewed separately, and their answers about PAC caseloads were summed to obtain estimates for the facility as a whole.

• *SKI.* The main purpose of the SKI was to collect data to estimate the proportion of all abortions in Java that resulted in complications that were treated in health facilities. This information included the percentage distribution of women seeking abortion according to the method and provider/source of abortion, the likelihood that abortions result in complications, the likelihood that complications result in treatment, and differences in these outcomes by women's wealth status and place of residence.

The study population of the SKI consisted of individuals knowledgeable about conditions under which women obtain induced abortion in Java. We purposively selected 222 key informants across Java's six provinces. Our sample included medical doctors, midwives, nongovernmental organization staff, researchers, community health workers, informal sector or traditional providers, and community leaders—together representing a variety of perspectives from both rural and urban areas. Indonesian study staff were able to identify at least one individual in each of these categories in each province at the start of recruitment, and snowball sampling was used to identify the remaining

respondents. In total, 209 individuals completed interviews (response rate, 94%). The demographic characteristics of SKI respondents can be found in Appendix Table 1.

• *CBS.* The main purpose of the CBS was to collect data on women's experiences of induced abortion and postabortion complications (methods used, complications experienced and care for complications obtained in health facilities). Each respondent reported on their own experiences and those of her closest female confidantes.

The target population for the CBS were women aged 15–49 living in Java. The sample size for the CBS was calculated to estimate the proportion of women reporting an abortion that resulted in a treated complication in the past five years. On the basis of our knowledge of abortion reporting in other settings and proportions of treated complications from other studies, we assumed that the abortion incidence rate in Java was similar to the most recent regional estimate at the time of sample selection in 2018 (the 2014 estimated rate for Southeast Asia—36 per 1,000 women aged 15–49),[5] that 35% of women who had had an abortion would report it in the survey and that approximately 16% of abortions result in treated complications. To achieve a desired level of precision (+/−2%) for the outcome of interest, and after accounting for the potential design effect of the cluster sampling strategy, the calculations resulted in a target sample size of 8,100 women.

The sampling strategy employed a multistage cluster design. The study team randomly selected 35 villages (administrative units) in each of Java's six provinces, with the probability of selection proportionate to the estimated population size of the village; then, three neighborhoods (*Rukun Tetangaa* [RTs]) per village were randomly selected. 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, approximately 13 households were randomly selected per RT. Within households with one or two eligible women, all women were selected to participate in the survey; in households with three or more eligible women, two participants were randomly selected. This process resulted in a total of 9,435 women aged 15–49 being selected from 7,800 households across Java. Of these, 8,969 completed the survey, for a response rate of 95%; about 5% of the sample either did not consent to participate or did not complete the full interview.

• *Additional data sources.* For the abortion calculations, we used several Java and province-specific indicators from the 2017 Indonesia Demographic and Health Survey (IDHS); these included age-specific fertility rates and the proportions of women who delivered their last birth in a hospital or health center, are considered poor and live in rural areas.[28] In addition, we obtained data from Indonesia's National Statistics Agency on the number of women aged 15–49 by five-year age-groups in 2018, for Java as a whole and by province.[29]

Calculating Abortion Incidence Estimates

• *Standard AICM.* The first step in the AICM is to calculate the number of women who received PAC in the past year. The HFS asked respondents to estimate the number of PAC patients treated—both inpatient and outpatient—in a typical month and in the previous month. Respondents were not asked to differentiate between spontaneous and induced abortions because these cases often present with clinically indistinguishable symptoms. In addition, we wanted to minimize the risk of providers' reports being informed by fear of legal repercussions. We used the respondents' reports to obtain an estimate of the total number of PAC cases within each study facility for 2018 by averaging the last and average month figures and multiplying by 12.

To avoid double-counting PAC patients who had received treatment in one place and were then referred elsewhere for additional treatment, we subtracted referred cases from each facility's PAC caseload estimate. To do this, we asked respondents how many patients they referred to another facility or department (in hospitals in which multiple departments were surveyed) after having provided PAC. We then subtracted these referrals from each facility-specific caseload count. We applied sample weights to the caseload and referral estimates, and calculated totals with 95% confidence intervals by facility type in each province.

The next step in the AICM is to subtract miscarriages from the PAC count to obtain the number of PAC cases that can be attributed to induced abortions. This requires estimating the number of miscarriages that are treated in health facilities. We first estimated the total number of second-trimester miscarriages because these are the type of miscarriage most likely to require treatment in a health facility. Using data from a prospective study of pregnancy outcomes, we assumed second-trimester miscarriages will be 3.4% of all live births.[30] We estimated the number of live births by applying age-specific fertility rates from the 2017 IDHS to the number of women in each five-year age-group in each province, separately for urban and rural areas. We then applied the 3.4% estimate to the total number of births in each province to estimate the total number of second-trimester miscarriages.

Next, under the assumption that the proportion of second-trimester miscarriages treated in health facilities is similar to the proportion of women who deliver in these facilities (a standard assumption for the AICM), we multiplied the miscarriage estimates by the proportion of deliveries in each province that occurred in a public or private hospital, or in a public health center, according to 2017 IDHS data.* This yielded estimates of the number of second-trimester miscarriages treated in health facilities in each province. We then calculated the total number of PAC

*It is possible that this assumption led to an underestimate because some settings in which deliveries occurred—such as private midwives' offices and assisted home births—are unlikely sources of care for late miscarriages.[28] Unfortunately, there is no reliable evidence on the proportion of second-trimester miscarriages treated in health facilities in this setting.

cases due to induced abortion by subtracting our estimate of treated second-trimester miscarriages from the total number of PAC patients.

Next, we calculated the multiplier, which represents, among all women who have had an induced abortion, the proportion who had had a treated complication. A detailed description of the steps for calculating the multiplier is provided elsewhere.[31] In brief, using data from the SKI, we multiplied the estimated proportion obtaining abortions from each provider type (medical doctors, midwives or nurses; licensed pharmacists; traditional providers; the woman herself) within each abortion method (surgical, medication, other†) by the respective probabilities of experiencing complications from each provider type within each abortion method; we next multiplied the sum of these products by the probabilities of receiving treatment for complications. We did this separately among urban poor, urban nonpoor, rural poor and rural nonpoor women; this yielded the estimated proportion of women with abortion complications who received treatment among these four population subgroups in each province. We then weighted these estimates by the population distribution of the four groups in each province using 2017 IDHS data, where "poor" was defined as living in a household in the bottom two wealth quintiles (i.e., the lowest 40%) in each province. These calculations generated estimates of the proportion of all abortions that resulted in PAC treatment in a facility in each province, and the multiplier for each province was the inverse of this proportion.

To obtain the total number of induced abortions, we multiplied the number of PAC cases due to induced abortion in each province by that province's multiplier. We summed the province estimates to calculate the estimated number of induced abortions for Java. We used this number to calculate the induced abortion rate per 1,000 women aged 15–49 in each province and for Java.

• *Modified AICM.* The modified AICM calculation begins in the same way as the standard AICM, by estimating the number of PAC cases treated in facilities, and removing referrals and second-trimester miscarriages. However, instead of estimating the multiplier using data collected from knowledgeable informants, the modified AICM uses data collected in the CBS on induced abortions and treatment rates. We initially planned to calculate the modified multiplier using only the respondent's self-reported abortion data; however, too few women (68 women in the past three years) directly reported an abortion in the CBS for us to rely solely on these data. Therefore, we also used data on abortions among "confidantes," who were defined as members of the respondent's social network with whom she shares personal, private information. Interviewers asked each respondent to think of up to three women aged 15–49 who fit this description, and the 8,969 respondents identified a total of 7,458 confidantes. Respondents were asked if each confidante had ever done something to intentionally end a pregnancy. If the respondent answered "yes" or "I think so," she was asked when this last happened. In addition, the respondent was asked whether each confidante abortion had resulted in a complication that was treated in a health facility. Overall, respondents reported that 138 confidantes had had an abortion in the past three years.

To create the modified multiplier, we calculated the proportion of confidantes and respondents who had had a complication from an induced abortion for which they received treatment at a health facility. Because the total number of abortions was small (206 combined in the past three years), we did not attempt to calculate province-specific multipliers; we calculated one multiplier for all of Java and applied it to all provinces. The inverse of the proportion for Java constitutes the modified AICM multiplier.

We applied the Java modified multiplier to the total number of PAC cases due to induced abortion (based on the HFS) for each province to calculate the number of abortions and abortion rate in each province and in Java. To evaluate the performance of the incidence estimates, we compare the distribution of reported abortion methods and complications between the SKI and CBS, and assess the final estimates in relation to other sexual and reproductive health indicators for Java.

All analyses were conducted in Stata 15.0. Some analyses, such as the AICM estimate, required the combination of results from multiple surveys with no variables or respondents in common. For these operations, we calculated the necessary figures in Stata and exported them into Excel tables, in which the final calculations were performed. All results presented are weighted.

RESULTS

Abortion Incidence: Standard AICM

Overall, we estimate that 245,295 PAC cases were treated in public health facilities and private hospitals in Java in 2018 (Table 2). Of these, 40,689 were treated for second-trimester miscarriages, resulting in 204,606 PAC cases due to induced abortions annually. This translates to a PAC provision rate for Java of 5.1 patients treated for complications of induced abortion per 1,000 women aged 15–49. The PAC provision rate varied by province, ranging from 3.7 per 1,000 women in East Java to 8.2 per 1,000 in Jakarta.

According to the average of the SKI responses, almost half (47%) of abortions were surgical, 28% were performed using medication and 26% used some other method (Table 3). SKI respondents indicated that a majority of abortions, 64%, were performed by a doctor, midwife or nurse, 4% by a pharmacist and 13% by a traditional practitioner, while 19% were self-managed.

Using the SKI responses, we estimate that 73% of women having induced abortions in Java did so without any complications, 20% had a complication that received

†In the SKI, interviewers told respondents that the "other" category includes *jamu*, traditional Javanese herbal medicines and supplements used for a variety of purposes, including menstrual regulation and abortion.

TABLE 2. Postabortion care caseload numbers and provision rates, for Java overall and by province

Indicator	All Java	Jakarta	West Java	Central Java	Yogyakarta	East Java	Banten
Total annual PAC caseload nos.							
PAC patients treated	246,932 (194,816–299,048)	29,700 (21,817–37,584)	79,229 (64,262–94,197)	59,037 (46,766–71,308)	7,289 (4,954–9,624)	48,769 (41,245–56,293)	22,908 (15,772–30,043)
Referral PAC patients treated at >1 location	1,637 (1,560–1,714)	192	197	364	8	329	548
Total no. of women receiving PAC care	245,295 (193,255–297,334)	29,508 (21,633–37,383)	79,033 (64,044–94,022)	58,673 (46,594–70,753)	7,281 (4,948–9,614)	48,440 (40,908–55,972)	22,360 (15,129–29,590)
Women receiving treatment for second-trimester miscarriages	40,689	4,836	10,429	10,314	1,543	10,250	3,318
Women treated for induced abortion complications in facilities (PAC cases – treated miscarriages)	204,606 (152,567–256,645)	24,672 (16,796–32,547)	68,604 (53,615–83,593)	48,360 (36,280–60,439)	5,738 (3,405–8,072)	38,190 (30,658–45,722)	19,042 (11,811–26,273)
PAC provision rate per 1,000 women aged 15–49							
Abortions + miscarriages	6.1 (4.8–7.4)	9.8 (7.2–12.4)	6.0 (4.9–7.2)	6.6 (5.3–8.0)	7.4 (5.0–9.8)	4.7 (3.9–5.4)	5.3 (4.2–8.3)
Induced abortions	5.1 (3.8–6.4)	8.2 (5.6–10.8)	5.2 (4.1–6.4)	5.5 (4.1–6.8)	5.8 (3.5–8.2)	3.7 (2.9–4.4)	4.4 (3.3–7.4)

Notes: For PAC patients treated, referral PAC patients treated at >1 location and total number of women receiving PAC care, the figures in parentheses are 95% confidence intervals; for other indicators, figures in parentheses are uncertainty intervals. PAC=postabortion care.

TABLE 3. Percentage distribution of abortion methods and providers/sources of abortion reported, and complication rates by method, according to survey

Procedure details	%		Complication rate	
	SKI*	CBS†	SKI*	CBS†
Abortion method				
Surgical	47	6	20	0
Medication	28	16	38	14
Jamu‡	na	40	na	8
Other§	26	39	59	12
Provider/source of abortion				
Doctor/midwife/nurse	64	21	na	na
Licensed pharmacist	4	4	na	na
Traditional practitioner	13	1	na	na
Woman herself	19	73	na	na
Total	100	100	na	na

*Distribution in the SKI is the mean of estimates from 202 knowledgeable informants who provided responses to these questions. †Distribution in the CBS is calculated from the responses of 56 respondents who reported having had abortions and shared information about the method and provider type. ‡Jamu refers to traditional Javanese herbal medicines, some of which are used for menstrual regulation or abortion. In the SKI, jamu was included in "other" types of abortions. In the CBS, women were not given a predetermined list of methods. §In the SKI, "other" methods included oral or vaginal introduction of substances, solutions or other materials, such as jamu, other local herbs or teas, traditional wine, black beer, specific fruits or vegetables, enema, pharmaceuticals (aspirin, chloroquine etc.), sticks or other objects. *Notes:* Percentages may not add to 100 because of rounding. SKI=Survey of Knowledgeable Informants. CBS=community-based survey. na=not applicable.

treatment and 7% had untreated complications (Figure 1). The inverse of the proportion of abortions resulting in complications that received treatment constitutes the multiplier in each province; thus, for every PAC case, 5.0 times as many abortions occurred in Jakarta, 5.3 times as many in West Java, 4.3 times as many in Central Java, 3.0 times as many in Yogyakarta, and 5.6 times as many in both East Java and Banten (not shown).

After applying the standard AICM provincial multipliers to the number of treated induced abortion complications, the estimated total number of abortions in Java in 2018 was 1,031,573 (Table 4). Therefore, the standard AICM abortion rate in Java in 2018 was 25.8 induced abortions per 1,000 women of reproductive age. The abortion incidence rate varied by province, ranging from 17.6 per 1,000 women in Yogyakarta to 40.6 per 1,000 in Jakarta.

Abortion Incidence: Modified AICM

CBS respondents reported different distributions of abortion methods and providers than the SKI respondents (Table 3). Six percent of women said they ended their pregnancy using a surgical method, 16% using medication, 40% using jamu and 39% some other method. The majority of CBS respondents (73%) reported self-managing their abortions, while 21% reported obtaining an abortion from a doctor, midwife or nurse, 4% from a pharmacist and 1% from a traditional practitioner.

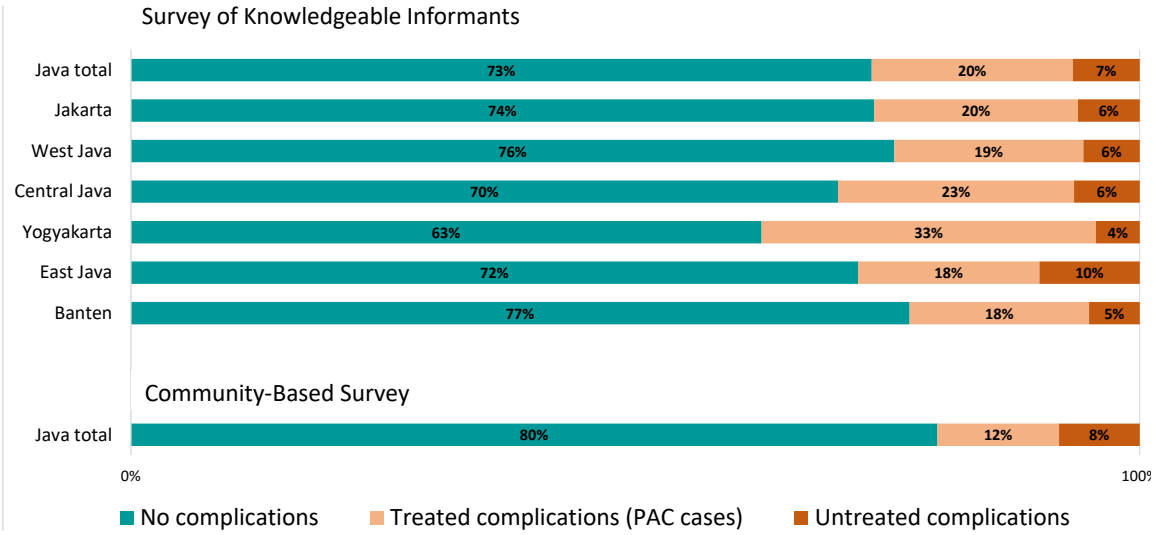
Among respondents and their confidantes who had had an abortion in the past three years, an estimated 80% had experienced no complications as a result of their induced abortion, 12% had had a complication that was treated in a health facility and 8% had had untreated complications (Figure 1). The inverse of the treated complications proportion results in a multiplier of 8.3, meaning that, for each PAC case in Java, there were 8.3 times as many induced abortions (not shown).

After applying the modified AICM multiplier to the number of treated induced abortion complications, the total number of abortions in Java in 2018 was 1,698,230 (Table 4). The modified AICM estimate of the abortion incidence rate was 42.5 induced abortions per 1,000 women of reproductive age. Similar to the standard AICM, the abortion rate was highest in Jakarta (68.0), although it was lowest in East Java (30.4).

DISCUSSION

The goals of this study were to produce a final abortion incidence estimate for Java in 2018 and, in so doing, evaluate the performance of two abortion incidence estimation

FIGURE 1. Percentage distribution of induced abortions reported by respondents, by complication status, according to survey



Notes: Induced abortions reported by community-based survey respondents include those experienced by the women themselves or their confidantes. PAC=postabortion care.

methods. After comparing the distribution of methods, providers and outcomes as reported in the SKI and the CBS, and assessing the resulting incidence estimates in relation to other well-documented sexual and reproductive health indicators for Indonesia, we conclude that the modified AICM produced the more accurate estimate, with a rate of 42.5 abortions per 1,000 women aged 15–49, for an annual total of 1,698,230 abortions.

Assessing the Multipliers

As previously discussed, the modified AICM was designed to improve the estimation of abortion incidence over the standard method.[22] This is because we expect that women's reporting of the circumstances of their own abortions provides a more solid basis for estimating the multiplier than estimates provided by key informants, who are more distant from women's actual experiences. Further, key informants' estimates reflect their own cumulative experience and not recent changes in how women access abortions, while women who are reporting on recent abortions (their own or their confidantes') will more closely reflect current conditions.

Differences between reports of abortions from women and those from knowledgeable informants suggest that conditions in Java may have, in fact, changed toward increased use of medication abortion, and knowledgeable informants may have overestimated the frequency of abortion complications. Although only one in five women who reported an abortion indicated that it was performed by a doctor or midwife, and few reported having a surgical procedure, SKI respondents' reports of abortion were much more medicalized (64% performed by a doctor or midwife; 47% surgical). Further, the proportion of women who reported self-managing abortions was almost four times as great as the estimates from the key informants. Respondents also reported widespread use of jamu to end their pregnancy. Unfortunately, SKI respondents were not asked separately about the frequency of use of or complications due to jamu. Because of this, we do not have a direct comparison of women's and key informants' reports on jamu. However, it is clear that key informants estimate that the use of jamu is less common than the women's reports would suggest, given that the entire "other" category accounted only for approximately one-quarter of SKI–estimated abortion methods.

Despite the limited information on medication abortion and jamu, reported levels of complications in the CBS are low (<15%), suggesting that these two common methods

TABLE 4. Estimated total number of induced abortions among women aged 15–49 and one-year abortion incidence rate, for Java overall and by province, according to estimation method

Country/province	Standard AICM	Modified AICM
Java		
No. of induced abortions	1,031,573 (771,422–1,291,725)	1,698,230 (1,266,305–2,130,156)
Abortion rate	25.8 (19.3–32.4)	42.5 (31.7–53.4)
Jakarta		
No. of induced abortions	122,156 (83,162–161,149)	204,775 (139,409–270,142)
Abortion rate	40.6 (27.6–53.5)	68.0 (46.3–89.7)
West Java		
No. of induced abortions	366,162 (286,162–446,162)	569,414 (445,007–693,821)
Abortion rate	27.9 (21.8–34.0)	43.4 (33.9–52.9)
Central Java		
No. of induced abortions	206,652 (155,033–258,270)	401,385 (301,125–501,645)
Abortion rate	23.4 (17.6–29.2)	45.4 (34.1–56.8)
Yogyakarta		
No. of induced abortions	17,311 (10,273–24,350)	47,629 (28,264–66,995)
Abortion rate	17.6 (10.4–24.7)	48.4 (28.7–68.1)
East Java		
No. of induced abortions	212,272 (170,409–254,135)	316,977 (254,465–379,490)
Abortion rate	20.4 (16.4–24.4)	30.4 (24.4–36.4)
Banten		
No. of induced abortions	107,021 (66,383–147,659)	158,049 (98,035–218,063)
Abortion rate	30.1 (18.6–41.5)	44.4 (27.5–61.3)

Notes: Figures in parentheses are uncertainty intervals. Abortion rate is number of induced abortions per 1,000 women in the past 12 months. AICM=Abortion Incidence Complication Method.

for terminating pregnancy in Java are relatively safe. A recent study in Indonesia triangulates these reported self-managed medication abortion complication rates—only 9% of women who had used misoprostol to terminate a pregnancy in the second trimester reported complications that required medical treatment.[32] Other research in similar settings on the use of misoprostol as an abortifacient suggests that the complication rates for all pregnancies (first and second trimester) are even lower.[33,34] Conversely, key informants reported a complication rate for medication abortion that was much higher than the CBS respondents, suggesting a discrepancy between the key informants' knowledge and women's actual experiences.

Although many women who reported using medication were unable to provide the name of the abortifacient pill, it is likely that some proportion of these were misoprostol because the women were able to successfully end their pregnancy through their use, and misoprostol (marketed as Cytotec) is widely available for sale online in Indonesia.[15] Although no published evidence exists on the contents or effectiveness of jamu formulations, the low frequency of complications among those who reported using it suggests a possibility that effective herbal abortifacients may exist in Java. Further, the term jamu may also be used colloquially to refer to a formulation of multiple drugs, in which misoprostol may be used with herbal medicines. A mystery client study in which researchers searched for and purchased abortion drugs online in Indonesia found that many sellers advertised using terms such as "drugs to bring back late period" and that misoprostol was sold as one medication in a packet of drugs to induce abortion, which often also contained at least one form of jamu.[15] In either case, it is clear that more research on the contents, effectiveness and safety of jamu as an abortifacient in Indonesia is needed.

Comparing the two surveys reveals large differences between SKI respondents' perceptions and the actual experiences reported by women. Given these differences, the fact that misoprostol is a relatively new method of abortion in Java and that self-managed abortion seems to be much more common than the SKI respondents realize, the modified multiplier, which is based on women's own reports, is more likely than the standard AICM multiplier to capture current conditions.

Assessing the Modified AICM Estimate Against Other SRH Indicators

Recent data on reproductive health indicators support the modified AICM estimate and suggest that abortion is likely to be an important reproductive strategy used by women in Java to supplement contraceptive use as they seek to achieve their desired timing and number of children. The TFR in 2017 was low, at replacement level or slightly higher (2.1–2.4 across Java's six provinces);[28] the wanted TFR was somewhat lower than the actual rate in each province by 0.2–0.4 child per woman. In addition, approximately 15% of births in the past five years in Java were either mistimed or not wanted at all. At 60% among married women, the level of modern contraceptive method use in Java is discordant with the low TFRs and low proportions of all births that are unintended, which strongly suggests that abortion plays an important role in limiting fertility. Furthermore, the injectable and the pill account for approximately two-thirds of all modern method use, while long-acting and permanent methods such as sterilization, IUDs and implants account for only 25%.[28] This method mix leaves room for a substantial level of discontinuation and method failure—and, therefore, unintended pregnancy.

Finally, we can compare the modified AICM estimate with those generated using other indirect methods for estimating abortion incidence in the region. First, an approximate estimate of abortion incidence can be predicted on the basis of earlier work by Bongaarts and Westoff that looks at the relationship between the TFR, wanted TFR, contraceptive prevalence, contraceptive method mix, and time spent married or cohabiting.[35] In Java, where the TFR is approximately 2.2 children per woman and 65% of married women use any contraceptive method (including traditional methods), the Bongaarts and Westoff model would predict a total abortion rate of about 1.8 abortions per woman in her lifetime, which translates to an annual abortion rate of roughly 51 per 1,000 women aged 15–49.[36] Second, recent work that used Bayesian statistical methods estimated the annual abortion incidence rate for Southeast Asia to be 34 per 1,000 women aged 15–49 for 2015–2019.[7] Although both of these methods are imprecise proxies for the true abortion rate in Indonesia, the modified AICM rate of 42.5 per 1,000 falls between these rates, while the standard AICM is much lower than both.

Limitations

The modified AICM estimate of abortion incidence is likely still an underestimate for several reasons. First, the count of women treated for postabortion complications is underestimated: The sample of facilities for the HFS excluded private clinics because of the lack of a list of such facilities from which a sample could be drawn. Exploratory interviews with a purposively selected sample of 40 private clinics throughout Java found that 25 of these facilities provided PAC, treating a total of 1,169 PAC patients in 2018. Although including PAC caseloads from private clinics would increase our modified AICM abortion incidence estimate, it is likely that this increase would be minimal.

Another limitation is the lack of data for miscarriage in Indonesia (on both probabilities of miscarriage and on facility-based treatment for complications related to miscarriage), which necessitated an overly broad assumption about care seeking for early pregnancy loss and the use of proxy measures. Sedgh and Keogh argued that using women's own reports of experiencing miscarriages would provide a better estimate of miscarriage rates.[22] We initially planned to use CBS respondent data to estimate miscarriages, and we also planned to only use respondent data (as opposed to respondents and confidantes combined) to calculate the modified multiplier. However, reporting in

the CBS was so low across multiple reproductive health indicators—abortions and miscarriages included—that we were unable to execute this original analysis plan. Ideally, prospective clinical studies of pregnancy loss would provide a more robust measure of pregnancy loss by gestation. Data on treatment in facilities for complications from miscarriages are also extremely scarce. More research is needed on this topic.

Another source of bias in our study is the underreporting of abortions in the CBS. Women who reported their abortions likely differed in meaningful ways from those who chose to not disclose their abortion experiences. If these differences are also associated with the likelihood of a woman experiencing complications or seeking PAC, then our multiplier may be unduly biased. However, the impact that this association could have on the multiplier is difficult to determine because little is known about the nature of these differences. If abortions that end in complications are more commonly reported, the resulting modified AICM estimate will represent an underestimate and vice versa. This bias may be particularly problematic among unmarried women. Indonesia's family planning program prohibits unmarried women from receiving contraceptive methods and services. This policy, along with conservative social norms and stigma around premarital sex, means it is likely that unmarried women face increased risk of unintended pregnancy and abortion. Although the 2017 IDHS attempted to measure sexual activity among unmarried women, reported levels were extremely low, likely because of the high level of social stigma surrounding such activity.[28] Further, unmarried women may be less likely to seek care for postabortion complications. Therefore, the results of this study are unlikely to capture abortions in this highly vulnerable group.

A similar problem exists for the reporting of confidante abortions, although speculations of the direction of the resulting bias are more easily made: Respondents may be more aware of confidante abortions that resulted in a complication, as these abortions tend to be more visible. If this is the case, including confidante abortions may have resulted in a smaller multiplier and thus an underestimated abortion incidence rate.

Finally, the results of this analysis may not be generalizable to all of Indonesia. In Java, 60% of married women use a modern method and 13% have unmet need for a modern method, compared with 54% and 16% in the rest of Indonesia, respectively.[28] It is likely that important determinants of abortion incidence and safety vary widely by region.

Despite these limitations, the modified AICM produced more reliable estimates than those produced by direct reporting and the Confidante Method.[26] In comparison to the most recent model-based estimates for the Southeast Asian subregion,[7] the directly reported abortion rate of 3.7 per 1,000 is implausibly low.[26] This is not unexpected; high levels of abortion underreporting is a common pattern, particularly where abortion is legally restricted and highly stigmatized.[23] However, we expected the Confidante Method to perform more robustly than it did. At a rate of 11.3 per 1,000 (adjusted for transmission bias), this estimate is also likely an underestimate.[26] It appears that social network–based approaches to measuring abortion incidence may not be appropriate in the cultural context of Indonesia. In contexts in which social network–based methods perform poorly, the modified AICM is an important tool for understanding abortion incidence.

CONCLUSIONS

The results of this study provide support for the use of the modified AICM over the standard AICM to measure abortion incidence in restrictive settings. Although the use of social network–based methods to measure abortion incidence has shown great promise and has gained in popularity in recent years, these methods may not be appropriate in all cultural contexts. This appears to be the case in Indonesia, where the Confidante Method failed to produce a valid incidence estimate. Future research should continue to refine and improve the modified AICM so that it can be applied in settings where the necessary assumptions for the success of social network–based methods cannot be met.

Further, the study results indicate that, despite Indonesia's restrictive abortion context, a significant number of women have abortions. It is clear that there is a need for better access to contraceptive services, particularly for unmarried women, as well as access to safe abortion services and to high-quality PAC for complications resulting from unsafe abortions. Future research is needed to better understand the safety of abortion in Java, including the methods women use. This is especially true with respect to self-managed medication abortion and the use of jamu, about which almost nothing regarding safety or efficacy is known. In addition, evidence is needed on the severity of complications from unsafe abortion in Indonesia and the barriers to accessing PAC among women who have untreated complications. Understanding abortion safety and complications, and access to PAC, would provide the necessary evidence for policymakers to develop guidelines and programs aimed at reducing maternal mortality in Indonesia.

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RESUMEN

Contexto: *La mortalidad materna en Indonesia es alta y el aborto está restringido. Se necesita información confiable sobre el aborto inducido; sin embargo, la dificultad de medir el aborto en entornos donde está restringido legalmente y es fuertemente estigmatizado, requiere esfuerzos de innovación en los enfoques para medir la incidencia del aborto.*

Métodos: *Los datos se obtuvieron de tres encuestas originales realizadas en Java entre instituciones de salud, informantes conocedores del tema y mujeres en edades de 15 a 49 años y que fueron aplicadas entre abril de 2018 y enero de 2019. Se usaron dos métodos para estimar la tasa de incidencia de aborto inducido en un año en Java: el método estándar de estimación de aborto por complicaciones (AICM, por sus siglas en inglés) y el AICM modificado. Cada método se evaluó con base en la calidad de los datos y en lo que se sabe sobre indicadores de salud sexual y reproductiva relacionados con las tasas de aborto, para determinar cuál método se desempeñó mejor en la medición de la incidencia de aborto en Java.*

Resultados: *Las estimaciones de complicaciones derivadas del aborto inducido según informantes conocedores del tema y según las mujeres, difirieron sustancialmente. El AICM modificado produjo una estimación de 42.5 abortos por 1,000 mujeres en edades de 15 a 49 años, mientras que la estimación del AICM estándar fue más baja (25.8 por 1,000). Una comparación de la distribución de los métodos de aborto usados reveló que los informantes conocedores creían que el aborto era menos seguro que lo indicado en los informes de las mujeres basados en sus propias experiencias. Por lo tanto, es probable que el método AICM estándar subestime la incidencia del aborto.*

Conclusiones: *El método AICM modificado funcionó mejor que el AICM estándar e indica que el aborto es una práctica común en Java. Son necesarios un mayor acceso a los anticonceptivos y a una atención postaborto de alta calidad. Las futuras investigaciones deben investigar la seguridad del aborto, especialmente en relación con el aborto autoadministrado.*

RÉSUMÉ

Contexte: *En Indonésie, la mortalité maternelle est élevée et l'avortement est limité par la loi. Il existe un besoin d'information fiable concernant l'avortement provoqué. La difficulté de mesurer l'avortement dans les contextes où il est strictement limité et fortement stigmatisé demande cependant des approches innovantes.*

Méthodes: *Les données proviennent de trois enquêtes initiales menées à Java auprès de structures de santé, de sources bien informées et de femmes âgées de 15 à 49 ans, entre avril 2018 et janvier 2019. Le taux d'incidence de l'avortement provoqué à l'échelle d'une année à Java a été estimé selon deux méthodes: la méthode AICM standard d'évaluation de l'incidence de l'avortement en fonction des complications traitées et une méthode AICM modifiée. Chaque méthode a été évaluée en fonction de la qualité des données et de l'information connue sur les indicateurs de santé sexuelle et reproductive relatifs aux taux d'avortement, afin de déterminer celle qui avait le mieux mesuré l'incidence de l'avortement à Java.*

Résultats: *Les estimations des complications résultant de l'avortement provoqué obtenues des sources informées et des femmes consultées se sont avérées nettement différentes. La méthode AICM modifiée a produit une estimation de 42,5 avortements pour 1 000 femmes âgées de 15 à 49 ans, tandis que la méthode AICM standard produisait une estimation inférieure (25,8 pour 1 000). En comparant la distribution des méthodes d'avortement pratiquées, on a constaté que les sources informées estimaient l'avortement moins sûr que ne l'indiquaient les déclarations des femmes concernant leur propre expérience. Il est dès lors probable que la méthode AICM standard sous-estime l'avortement.*

Conclusions: *La méthode AICM modifiée, plus efficace que la méthode standard, fait état d'une pratique courante de l'avortement à Java. Un meilleur accès à la contraception et à des soins après avortement de qualité est nécessaire. La recherche future devrait se pencher sur la sécurité de l'avortement, en ce qui concerne en particulier les interventions autogérées.*

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APPENDIX TABLE 1. Percentage distribution of respondents to the Survey of Knowledgeable Informants, by selected characteristics, Java, Indonesia, 2018

Characteristic	% (N=209)
Gender	
Male	18
Female	82
Age	
18–35	28
36–54	54
55–70	14
≥71	4
Profession	
Clinician	66
Community health worker	9
Nonmedical	25
Education	
<secondary school	8
Secondary school	2
University degree	47
Postgraduate degree	43
Province	
Jakarta	13
West Java	17
Central Java	17
Yogyakarta	19
East Java	17
Banten	17
Work sector	
Public	52
Private	33
Nongovernmental organization	6
Other	9
Experience working or living in rural area	
<5 years	69
≥5 years	31
Total	100