Estimating global abortion incidence from 1990 until 2015 using Bayesian methods and a framework of abortion determinants

Leontine Alkema, Anisa Assifi, Akinrinola Bankole, Bela Ganatra, Caitlin Gerdts, Heidi Johnston, Anna Popinchalk, Clementine Rossier, Susheela Singh, Ozge Tuncalp, Paul Van Look, Gilda Sedgh

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Abstract

Abortion incidence estimates are needed to monitor progress in achieving universal access to reproductive healthcare. To date, estimates abortion incidence worldwide have been made for 1995, 2003 and 2008. We propose a new approach to estimating abortion incidence and use this approach to estimate current abortion levels and past trends. The estimates are based on available data for all countries pertaining directly to abortion incidence, as well as information on factors indirectly related to abortion, such as contraceptive method mix and the unmet need for contraception. In the proposed model, abortion incidence is estimated on the basis of determinants of abortion using Bayesian methods. The final paper will present selected findings to illustrate the modelling approach.

Extended abstract

Introduction

Abortion incidence estimates are needed to monitor progress in achieving universal access to reproductive health but estimating abortion incidence is challenging because of issue of data quality and coverage. To date, estimates of abortion incidence worldwide have been made for 1995, 2003 and 2008 (Sedgh et al, 2012; WHO, 2011). In those undertakings, abortion incidence estimates were based on separate assessments of the incidence in countries with liberal abortion laws and incidence in countries with restrictive laws. The primary sources of information used to make the estimates were direct evidence of abortion incidence, such as official statistics of abortion done and published estimates of abortion incidence based on surveys and other studies. However, because abortion is illegal in many countries and sometimes stigmatized even where it is legal, direct evidence on abortion incidence is limited.

In this paper, we propose a new approach to estimating abortion that takes advantage of both direct information on abortion incidence and evidence on factors associated with abortion to estimate overall abortion rates worldwide and for all major regions and subregions of the world. We are currently exploring various specifications of the abortion incidence model. In this extended abstract, we discuss one candidate approach and provide illustrative results. In the final paper, a finalized model and selected findings (to illustrate the modelling approach) will be presented.

Data

The abortion incidence estimates will be based on all available data related to abortion incidence from official statistics and surveys of women for countries where abortion is legally permitted under broad criteria, and information on the quality of the estimates. Additionally, we are constructing a database populated with all available data identified in a systematic search of published literature on abortion from 1990-2014 with additional information on abortion incidence, such as the incidence of post-abortion complications treated at facilities. This information will be included in the estimation framework through appropriate models.

Candidate modelling approach

Abortion incidence is modelled through a simplified framework of abortion determinants. The explanation is as follows: women of reproductive age are divided into different groups according to marital status and contraceptive use and need; pregnancy rates are estimated for each group based on available information and hierarchical time series models. For example, consider estimating pregnancy rates among women who use modern methods. Suppose we have two countries A and B. Country A has information on the contraceptive method mix info for 2006 and 2012, while no information is available for country B. In this situation, we use the method mix information and associated failure rates for country A in 2006 and 2012 to inform the estimates for those country years. To obtain estimates for the other years in country A, a time series model is used. The estimates for country B are informed by the estimates for country A through a hierarchical model, whereby information on pregnancy rates is exchanged between countries on the basis of comparisons between countries on other factors with known values (geographical regions is the most straightforward approach to grouping countries but other groupings will be explored as well).

Based on estimates of pregnancy rates and numbers of women of reproductive age by marital status and contraceptive use group, pregnancies are obtained. To infer the number of miscarriages, births and in particular abortions, we will model the proportion of miscarriages and aborted pregnancies. The estimates for these unknown parameters will be informed by the abortion data as available in the country, as well as covariates and hierarchical models. We will also explore whether intention status of the pregnancy and unintended births can be included in this framework, similar to an approach that was used earlier based on individual data (Rossier et al, 2007).

We recognize that many factors are likely to be associated with the incidence of abortion. Such factors could include the strength of motivation to avoid having a child; consistency of contraceptive use and use-effectiveness among those using a method; and the level of sexual activity in the population. For most of these factors, information is available for just a limited number of countries and years. We will explore whether the limited information on these factors can inform our estimates.

Preliminary results

Preliminary results, based on the framework described above, are given in Figure 1 for Australia. The results are based on a set of estimates of contraceptive use (Alkema et al 2013, UNPD 2014), birth rates (UNPD 2013), abortion data (Sedgh et al 2012) as well as data on the proportion of unplanned births (Singh and Darroch 2012). The results suggest that the proportion of unintended pregnancies ending in abortion in Australia has decreased since the 1990s, the birth rate has remained constant, abortion incidence has decreased and the proportion of unplanned births has increased (but not significantly).

These results are for illustrative purposes only; further model development and the inclusion of additional data may change the estimates. In the final paper, estimates will be presented for sub-regions and/or illustrative countries.

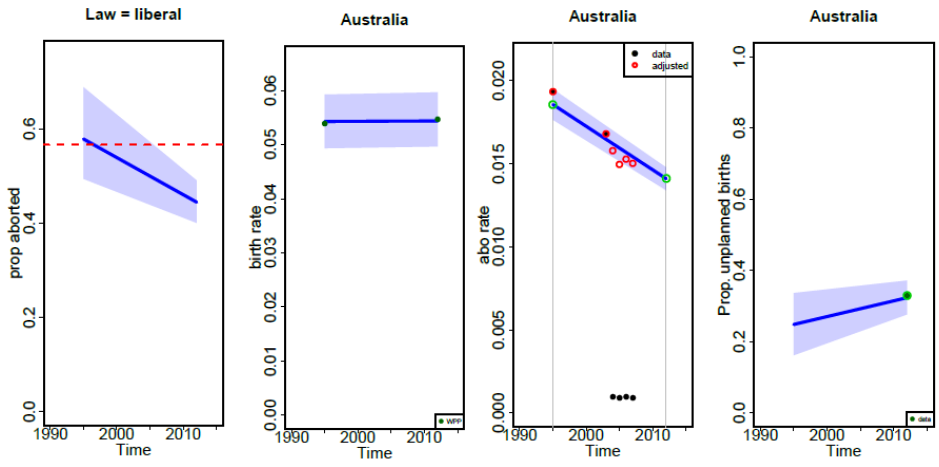

Figure 1: Illustrative results of model-based estimates for Australia for the proportion of unintended pregnancies which are aborted, the birth and abortion rates and the proportion of unplanned births.

References

L. Alkema, V. Kantorova, C. Menozzi, A. Biddlecom (2013). National, regional and global rates and trends in contraceptive prevalence and unmet need for family planning between 1990 and 2015: a systematic and comprehensive analysis. The Lancet, 381: 1642–1652.

C. Rossier, F. Michelot, N. Bajos (2007). Modeling the process leading to abortion: an application to French survey data. Studies in family planning 38.3: 163-172.

G. Sedgh, S. Singh, I.H. Shah, E. Åhman, S.K. Henshaw, E. Ahman, A. Bankole (2012). Induced abortion: incidence and trends worldwide from 1995 to 2008. Lancet, 379(9816), 625–32. doi:10.1016/S0140-6736(11)61786-8

S. Singh, J.E. Darroch (2012). Adding It Up : Costs and Benefits of Contraceptive Services Estimates for 2012.

United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision. Available: http://esa.un.org/unpd/wpp.

United Nations, Department of Economic and Social Affairs, Population Division (2014). Estimates and Projections of Family Planning Indicators: 2014 Revision.

World Health Organization (2011). Unsafe abortion: Global and regional estimates of the incidence of unsafe abortion and associated mortality in 2008. Sixth edition. Geneva, World Health Organization.