

# The global burden of unsafe abortion in the year 2000

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## 1. Introduction

The term “abortion” covers a variety of conditions arising during early pregnancy, from ectopic pregnancy and hydatidiform mole, through to spontaneous and induced abortion. There are important differences in the dimensions and nature of deaths and disabilities resulting from different kinds of abortion<sup>1</sup>.

Ectopic pregnancy is defined as the implantation of the fertilised ovum outside the uterine cavity, usually in the fallopian tubes. Risk factors associated with ectopic pregnancy are: pelvic inflammatory disease, sexually transmitted disease, history of ectopic pregnancy, *in vitro* fertilisation, and elderly parity. Epidemiological data on ectopic pregnancy are scarce, and the way the results are presented render the comparability of studies difficult (the denominator varies from live births, to pregnancies, or deliveries, or still and live births etc.).<sup>1</sup> However, some countries have reported an increased trend in the incidence of ectopic pregnancy (US, UK), which may not entirely be attributed to improved methods to diagnose early pregnancy.<sup>2,3</sup> Studies in Sweden have demonstrated that the epidemiology of ectopic pregnancy mirrors the epidemiological trends of pelvic inflammatory disease and of some sexually transmitted diseases.<sup>4,5</sup> Other small-scale studies also showed that women with ectopic pregnancy have evidence of previous or current genital *Chlamydia trachomatis* infection, underlining the importance of this microorganism in the development of the condition<sup>6</sup>. For the GBD 2000 the burden of ectopic pregnancy is partly captured under the heading of sexually transmitted disease where it is described as a sequela.

Hydatidiform mole is a gross malformation of the placenta, caused by a hydropic degeneration of all the chorionic villi with a more or less marked proliferation of trophoblasts.<sup>7</sup> In this situation, the fetus is deprived of oxygen and nutrition and will eventually die.<sup>1</sup> The condition may develop into choriocarcinoma, a malignant proliferation of atypical villus trophoblasts without villi formation. If left untreated, this can be fatal to the woman, through necrosis, haemorrhage, and distant metastases.<sup>7</sup> Given the paucity of data on the incidence of hydatidiform mole, no attempt has been made to calculate any estimates for hydatidiform mole for the GBD 2000.

During the first trimester, spontaneous abortion is caused by immunological factors, abnormalities of the ovum or a systemic disease in the woman. During the second trimester it is usually associated with cervical incompetence, abnormalities of the uterine body or infections (such as *Listeria monocytogenes*).<sup>1</sup> Spontaneous abortions seldom have severe complications and are rarely fatal.<sup>1</sup> No attempt has been made to quantify the burden of disability and deaths due to spontaneous abortion for the GBD 2000. When induced abortion is performed by qualified persons with correct techniques and sanitary standards are satisfied, abortion is a relatively safe surgical procedure.<sup>8</sup> The

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overwhelming majority of deaths and disabilities caused by pregnancies with abortive outcome arise from the complications of unsafe abortion.<sup>1</sup>

Unsafe abortion is defined as an abortion taking place outside of health facilities (or any other place recognized by law) and/or provided by an unskilled person.<sup>9</sup> In 1990, abortion was estimated to be the 48<sup>th</sup> cause of disability, with DALYs accounting for 0.4% of all GBD conditions and 17% of the burden of all maternal conditions. This draft paper summarizes data and methods used to estimate the global burden of abortion in the year 2000 for Version 2 estimates of the GBD 2000.<sup>10</sup> It draws heavily on an analysis of the available data and information on the incidence of unsafe abortion prepared by the Department of Reproductive Health and Research (RHR) in WHO.<sup>11</sup>

## 2. Case and sequelae definitions

The definitions used by GBD 2000 for unsafe abortion and its sequela are given in table 2.1.

**Table 2.1 GBD 2000 case and sequelae definitions for unsafe abortion**

Cause category	GBD 2000 Code	ICD 9 codes	ICD 10 codes
Abortion	U126	714	M05-M06
Cases/Sequelae	Definition/Case criteria		
Unsafe abortion	Termination of an unwanted pregnancy either by persons lacking the necessary skills or in an environment lacking the minimal medical standards or both		
Infertility	Failure to conceive again following an unsafe abortion		

## 3. Estimating unsafe abortion

Data for the estimated incidence of unsafe abortion come from the database maintained by the Department of Reproductive Health and Research (RHR) in WHO. This database consists of quantitative and qualitative information on the frequency of abortion and associated mortality. Reports included in the database are identified through a search of library databases and by tracing references. Not all articles identified can be traced and the compilation is based on sources available at the headquarters of the World Health Organization, in Swiss libraries and in other reference centres. In addition, data from WHO-supported country studies, studies supported by other United Nations agencies and NGOs, papers presented at meetings, unpublished reports as well as information provided by national authorities, other agencies and colleagues around the world are included.

In countries where induced abortion is restricted and inaccessible, or even where abortion is legal but difficult to obtain, little information is available on abortion incidence and practices. Whether legal or illegal, induced abortion is generally stigmatized and frequently censured by religious teaching. Because of the difficulty of quantifying and classifying abortion in such circumstances, its occurrence tends to be unreported or under-reported. Surveys show that under-reporting occurs even where abortion is legal<sup>12,13,14</sup> and when taking place in clandestine circumstances it may not be reported at all or declared a spontaneous abortion (miscarriage).<sup>15,16</sup> The language used for induced abortion reflects this ambivalence: induced miscarriage (*fausse couche provoquée*),<sup>17</sup> menstrual regulation etc. Abortion statistics are therefore notoriously incomplete, and it is recognized that in countries where

induced abortion is restricted or illegal, its magnitude can only be estimated indirectly and with great difficulty.<sup>18</sup> Estimates will have to be adjusted for mis- and under-reporting, as data available from community studies and hospital data will only show the “tip of the iceberg”. The adjustments will largely depend on the methods used for abortion, and on assumptions of its relative incidence in rural and urban areas.

The current estimation process began with an in-depth review of close to 500 recent references yielding data or other pertinent information (abortion methods, abortion providers, access and legal developments), while over 1,400 data entries referring to 1980 or later were re-assessed to ascertain any important developments. Incidence data were identified for all major and most middle-sized countries to calculate country estimates using the methods described below. Whenever possible, country estimates were corroborated using multiple approaches.<sup>11</sup> UN birth estimates for the year 2000<sup>19</sup> and country-specific WHO maternal mortality ratios<sup>a</sup> for 1995<sup>20</sup> were used to calculate the number of unsafe abortions and maternal deaths due to unsafe abortion. The incidence of and mortality due to unsafe abortion is first estimated for countries with a population of 300,000 or more and then aggregated to arrive at sub-regional, regional and global estimates. The aim has been to arrive at reasonable country level estimates, with robust aggregate level estimates.

Estimates of the incidence of unsafe abortion and resulting maternal mortality have a degree of uncertainty. They should be considered only as best estimates relying on the information currently available, using the methodologies described below.

## 4. Unsafe abortion incidence

Because of good data availability the unsafe abortion ratio, that is, unsafe abortions to 100 live births, was chosen to calculate the unsafe abortion incidence. The ratio may be estimated indirectly from hospital or community studies as unsafe abortion data are not directly available. Occasionally reliable national estimates could be used.

The annual unsafe abortion ratio was estimated after adjustment for under-reporting. Adjustments took into account the existing abortion law (*de jure*) and its application (*de facto*)<sup>21,22,23</sup> information on the providers of unsafe abortions, prevalent abortion methods, and cultural and rural/urban differences. For every country the resulting estimates were finally assessed in the light of the total fertility rate (TFR);<sup>19</sup> reported contraceptive prevalence, as well as trends where available;<sup>24</sup> unmet need for family planning, where available. For the purpose of these calculations and to circumvent the problem of induced abortion being misreported as spontaneous, it has been considered more reliable to use the combined incidence of spontaneous and induced abortion, when available, correcting for the incidence of spontaneous abortion.<sup>25</sup> Calculations took into account that unsafe abortion ratios are lower in rural than in urban areas,<sup>26,27,28</sup> generally assuming that the incidence in rural areas is half of its incidence in urban areas. By extension, it was also assumed that sub-national data can be inferred to country level with appropriate adjustments.

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<sup>a</sup> The 1995 maternal mortality estimates have been used to calculate sub-regional proportions of maternal deaths in anticipation of the pending maternal mortality estimates for the year 2000. Number of maternal deaths due to abortion for 2000 by WHO regions have been calculated applying those proportions to the estimated number of deaths for 2000 as published in the WHR 2001. While the proportions are not expected to change substantially, once the new estimates are available the abortion mortality estimates will be recalculated.

Unsafe abortion is estimated from hospital data as suggested by Singh and Wulf<sup>25</sup> by adjusting the abortion/birth ratio for the expected fraction (0.034) of spontaneous abortions at 13 to 22 weeks that are assumed to require hospital treatment as women in developing countries having earlier miscarriages rarely turn to hospitals. Inter-country differences in the propensity to use hospitals for pregnancy-related conditions were taken into account to the extent that they apply equally to treatment of abortion complications and deliveries. This hospital unsafe abortion ratio, the “tip of the iceberg”, was further adjusted on the assumption that half or more of the induced abortions are accomplished without complications requiring hospitalisation (generally the higher the factor the “safer” the abortions provided) using a multiplier of between 1.5 and 5.<sup>25,29</sup> If not based on national level data, the unsafe abortion/birth ratio was finally corrected for a lower abortion ratio in rural areas weighted by the United Nations' estimate of urban and rural populations.<sup>30</sup>

Community studies relate abortion to births, or may report the proportion of women of reproductive age who ever had an induced unsafe abortion or who had one in the past year. Rates of women ever aborting were converted into annual rates.<sup>11</sup> The corresponding abortion ratio was calculated using UN estimates of women of reproductive age and live births for the time of the survey, corrected for under-reporting and adjusted for spontaneous abortions, if included.

For a few countries a national estimate of unsafe abortion incidence or number of unsafe abortions was available from a dependable source and used to calculate the abortion ratio. A small number of countries, for which no information was available, were assumed to have the same ratio as other countries in the region, or as other countries having similar abortion laws, fertility and contraceptive use.

The estimated number of unsafe abortions was finally calculated applying the adjusted unsafe abortion ratios by country to the birth estimates of the United Nations<sup>19</sup> and then aggregated to arrive at regional and global estimates. Nineteen million unsafe abortions are estimated to have taken place worldwide in the year 2000, 98% of which are estimated to occur in countries in development.

## 5. Determinants and time trends in unsafe abortion

Time trends in unsafe abortion are difficult to assess. Because of difficulties in getting reliable information, indirect methods are used to estimate its incidence and each attempt may have used different methodology, which may not be readily comparable.

A change in law (*de jure* and *de facto*) to allow abortion will lead to a shift from clandestine to legal abortion as the infrastructure becomes available. Raising contraceptive prevalence and effectiveness will lead to reducing the incidence of abortion.<sup>31</sup> Using data from developed countries Marston and Cleland<sup>32</sup> recently demonstrated the validity of these assumptions. These authors also show that a simultaneous rise in abortion and in contraceptive use might be apparent, when overall fertility is falling simultaneously, as contraceptive use alone is unable to meet the growing demand for fertility regulation. Similar observations of unsafe abortion incidence and contraceptive use are apparent from developing countries.<sup>33</sup> Hence, it is not surprising that some women in developing countries who want to limit or space childbearing but are unable to access contraceptives or use it ineffectively, rely on abortion.

## 6. Mortality and case fatality

Abortion-related mortality will occur mainly or exclusively as a result of unsafe abortion, as spontaneous abortion is only rarely a cause of death. Unsafe abortion-related mortality is rather likely

to be under-reported because of stigma attached to the procedure. The number of maternal deaths due to unsafe abortions was usually estimated from community reports or hospital data of abortion deaths as a percentage of all maternal deaths. For some countries national reproductive age mortality surveys and/or official reporting has provided data.

It is assumed that the proportion abortion to maternal deaths in hospital data roughly reflects the health care seeking behaviour and mortality risk for unsafe abortion complications. However, unsafe abortion-related deaths are expected to occupy a relatively higher share of maternal deaths in hospitals than its national proportion of maternal deaths. It is assumed that the national proportion of abortion related maternal mortality is 0.9 of the contribution of abortion to maternal deaths in a selection of national hospitals.

Sub-national data can be inferred to country level by extending the reasoning applied to national hospitals. For these calculations it is assumed that the proportion of deaths in urban areas is 0.9 of urban hospital abortion-related mortality, while in rural areas the proportion is 0.6 of that found in urban hospitals.<sup>34</sup> The rural proportion is expected to be lower than the urban one and the incidence of abortion is expected to be lower (usually half, see above in section “Abortion incidence”). The risk of death, however, may be higher because of poorer access to health care facilities in rural areas.

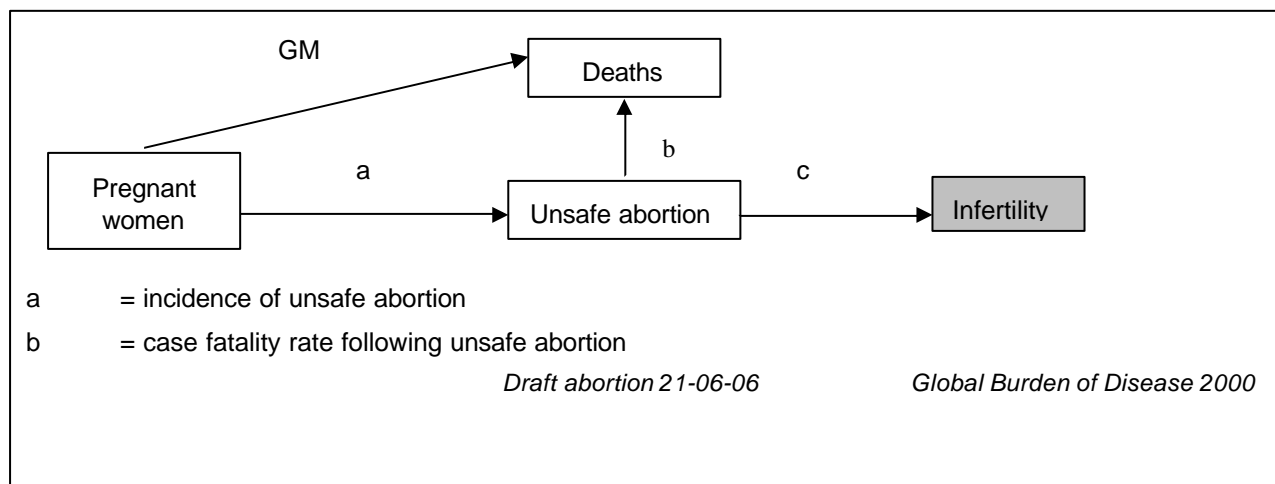
National community studies or reporting have been assumed to provide the best estimate available and are used without adjustments. Countries, for which no information was available, were assumed to have the same percentage of abortion-related maternal mortality as other countries in the region or as other countries having similar abortion laws, total fertility rate (TFR), unsafe abortion incidence, and percentage hospital deliveries.

The estimated number of maternal deaths due to unsafe abortions were finally calculated for countries applying the estimated proportion of maternal mortality caused by abortion-related complications to the WHO estimates of maternal deaths for the year 1995<sup>a</sup> and aggregated to arrive at regional and world totals. For the year 2000 it is estimated that there were approximately 60,000 maternal deaths due to unsafe abortion, almost all taking place in developing regions of the world.

## 7. Disease model and health state description for unsafe abortion

The disease model used for estimating the burden of unsafe abortion is shown in figure 7.1. The same assumptions as in the GBD 1990 were used for the proportion of cases with unsafe abortion leading to infertility.

**Figure 7.1. Disease model for unsafe abortion.**



- c = incidence of infertility following unsafe abortion  
 GM = general mortality

***YLDs to be calculated for boxes in grey***

Permanent disability can be the immediate consequence of unsafe abortion as a hysterectomy may be necessary to save a woman's life in cases of severe uterine damage or fulminating septic abortion. Unsafe abortion may also lead to haemorrhage, infection and death, particularly in settings where there is poor access to hospital and medical care. When infection spreads upwards through the genital tract, causing damage to the Fallopian tubes and ovaries, pelvic inflammatory disease may develop. This condition causes pain and discomfort, and if left untreated, can result in chronic pelvic pain, bilateral tubal occlusion (due to adhesions and scars formed around the uterus), and secondary infertility.<sup>35</sup> Secondary infertility is defined as failure to conceive again after an established pregnancy. In the GBD 1990 it was estimated that between 20-30 per cent of unsafe abortion procedures result in reproductive tract infections. The upper range was used in regions with high incidence of unsafe abortion, and with poor availability of hospital and medical care. A lower figure of 15% was used in regions where abortions were performed in "safer" circumstances, and where abortion seekers may receive skilled care in case of infection. It was also estimated that between 20 to 40 % of reproductive tract infections following unsafe abortion would result in secondary infertility<sup>1</sup>. The major sequela for unsafe abortion was considered to be secondary infertility, as a result of pelvic inflammatory disease with bilateral tubal occlusion. The same assumptions as in GBD 1990 were used to estimate the proportion of unsafe abortion which will develop infertility (table 7.1)<sup>1</sup>.

**Table 7.1. Assumptions for the proportion of unsafe abortion cases that will develop secondary infertility**

WHO region	Proportion unsafe abortion cases with secondary infertility (%)
AFRO D, AFRO E, SEARO D	12
WPRO B+SEARO B	8
EMRO B+D	5
AMRO A, EURO A, WPRO A, EURO B and C. AMRO B and D	3

Table 7.2 compares the assumptions used here with those of the GBD 1990. Using the methods outlined above and this disease model, we estimated the incidence of unsafe abortion per 100 live births, the mortality for unsafe abortion and the incidence and prevalence of infertility resulting from unsafe abortion (Table 7.3).

**Table 7.2. Comparison between GBD 1990 and GBD 2000 disease models**

	GBD 1990	GBD 2000
Stages/Sequelae	Unsafe abortion – episodes Infertility	Unsafe abortion – episodes Infertility
Incidence rates	0 to 40 per 100 live births (15.5% globally)	0 to 34 per 100 live births (14.3% globally)
Duration of infertility	Up to the age of 44 years	Up to the age of 44 years
Case fatality rate	0.1-0.7 % (0.3% globally)	0.1-0.9% (0.3% globally)

Disability weight for infertility 0.180 (treated and untreated cases)

0.180 (treated and untreated cases)

**Table 7.3 Estimated incidence and mortality rates for unsafe abortion and prevalence of infertility due to unsafe abortion, by region**

WHO region	Incidence per 100 live births	infertility prevalence per 1000 women 15-49	Mortality per 100000 women 15-49
AFRO D	12.5	3.96	13.7
AFRO E	14.7	4.73	15.9
AMRO A	0.0	0.00	0.1
AMRO B	34.0	0.22	1.1
AMRO D	24.5	1.36	6.8
EMRO B	17.3	1.50	1.8
EMRO D	16.2	1.53	8.0
EURO A	2.1	0.02	0.0
EURO B1	6.8	0.20	0.2
EURO B2	6.8	0.32	0.3
EURO C	14.7	0.24	0.4
SEARO B	28.6	2.82	5.7
SEARO D	18.7	3.67	8.9
WPRO A	0.0	0.00	0.0
WPRO B1	0.0	0.00	0.4
WPRO B2	3.0	0.29	1.9
WPRO B3	3.0	0.46	5.8
Total	14.3	1.41	3.9

## 8. Global burden of unsafe abortion in 2000

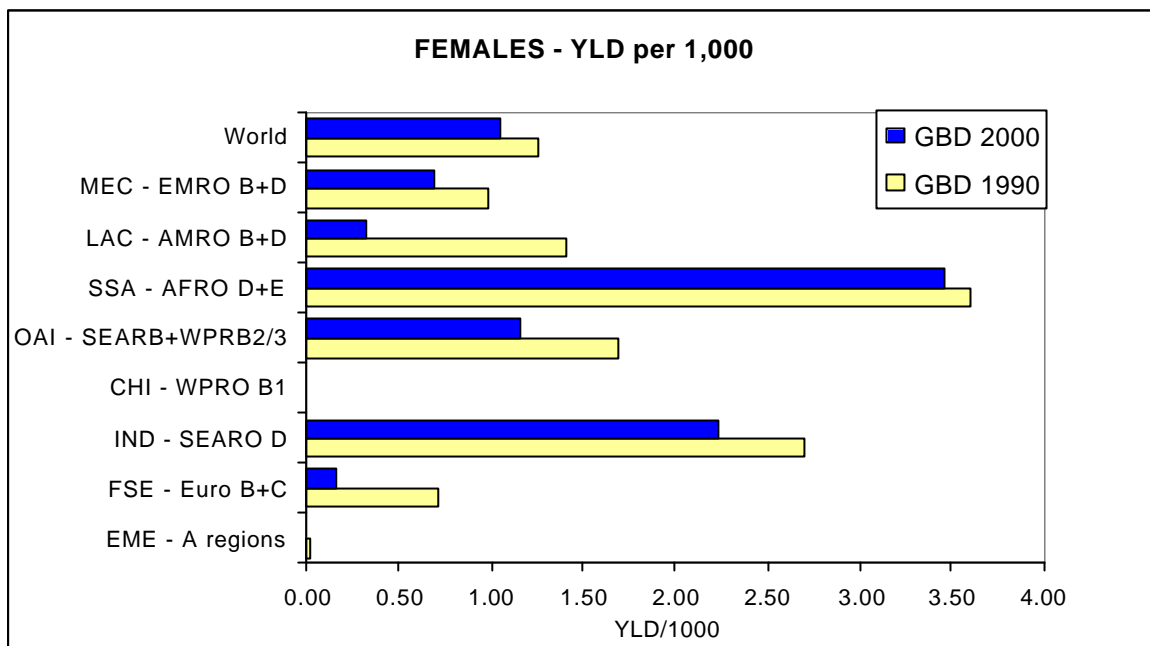
General methods used for the estimation of the global burden of disease are given elsewhere.<sup>36</sup> The tables and graphs below summarize the global burden of unsafe abortion estimates for the GBD 2000 and compare them with the unsafe abortion estimates from the GBD 1990.<sup>37</sup>

**Table 8.1. Unsafe abortion: global total deaths, YLD, YLL and DALY estimates, 1990 and 2000.**

	GBD 1990	GBD 2000
Deaths ('000)	61	58.9
YLD('000)	3,305	3,165
YLL('000)	1,794	1,775
DALY('000)	5,099	4,940

**Table 8.2. Abortion: YLD, YLL and DALY estimates for WHO epidemiological subregions, 2000.**

	YLD/100,000	YLL/100,000	Total YLD ('000)	Total YLL ('000)	Total DALYs ('000)
AFRO D	319.6	215.1	536	361	897
AFRO E	371.5	352.2	631	598	1,229
AMRO A	0.0	0.7	0	1	1
AMRO B	23.5	16.2	53	36	89
AMRO D	94.0	39.9	34	14	48
EMRO B	67.7	9.5	46	6	52
EMRO D	72.3	33.6	49	23	72
EURO A	1.1	0.3	2	1	3
EURO B1	13.5	8.6	11	7	19
EURO B2	22.0	6.2	6	2	7
EURO B3	16.9	5.2	22	7	29
SEARO B	152.6	49.0	301	97	397
SEARO D	223.6	107.3	1,461	701	2,162
WPRO A	0.0	0.1	0	0	0
WPRO B1	0.0	4.1	0	27	27
WPRO B2	18.9	28.3	14	20	34
WPRO B3	27.1	56.7	1	2	3
<i>Total</i>	<i>105.5</i>	<i>63.4</i>	<i>3,165</i>	<i>1,903</i>	<i>5,069</i>



**Figure 8.1. Unsafe abortion YLD rates, by sex, broad regions, 1990 and 2000.**

## 9. Conclusions

As mentioned above, one of the main limitations in getting accurate estimates of unsafe abortion is not only the lack of data in countries where abortion is illegal, but also the under-reporting and miscoding of cases, even in countries with liberal abortion policies.

These are Version 2 estimates for the GBD 2000. Apart from the uncertainty analysis, updating estimates to reflect revisions of mortality estimates and any new or revised epidemiological data or evidence, it is not intended to undertake any major addition revision of these estimates.

We welcome comments and criticisms of these draft estimates, and information on additional sources of data and evidence. Please contact Carmen Dolea ([doleac@who.int](mailto:doleac@who.int)), Elisabeth Åhman ([aahmane@who.int](mailto:aahmane@who.int)), Iqbal Shah ([shahi@who.int](mailto:shahi@who.int)) or Claudia Stein ([steinc@who.int](mailto:steinc@who.int)) for further clarifications

## Acknowledgements

We particularly wish to thank collaborators and people who assisted.

The authors also thank the colleagues from Reproductive Health and Research Department (RHR), in particular Carla AbouZahr, who provided useful comments and suggestions on the assumptions and data sources. We are grateful to Christina Bernard and Susan Piccolo for excellent administrative support. We also thank the many staff of the Global Programme on Evidence for Health Policy who contributed to the development of life tables and cause of death analysis. In particular, we thank Omar Ahmad, Brodie Ferguson, Mie Inoue, Alan Lopez, Rafael Lozano, Doris Ma Fat, Colin Mathers, Christopher Murray and Chalapati Rao. This study has been supported by a grant from the National Institute on Aging, USA.

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