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## Article

### Beyond reproduction: Women's health in today's developing world

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## ► Abstract



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**Background** The concept of women's health is tethered strongly to reproductive health. At present, international attention and resources are focused on obstetric events and, recently, HIV/AIDS because of the significance of these problems in the least developed nations. This limited concept of women's health, however, is decreasingly relevant to the global community, and needs to be revisited in the light of decreasing fertility and increasing life expectancy in many countries where it was previously applicable. It should be expanded to embrace the full spectrum of health experienced by women, and preventive and remedial approaches to the major conditions that afflict women. Allocation of health service resources should be aligned with the epidemiological realities of these threats to women's health.

**Methods** Cause of death data for women aged 15–34 years and 35–44 years were examined for nine less developed countries. Deaths associated with pregnancy and child birth, and HIV were compared with deaths due to three chronic disease categories (cancer, cardiovascular disease, and diabetes). The women's health research literature for developing countries appearing in the *American Journal of Public Health* and *British Medical Journal* was also examined.

**Results** In seven out of the nine countries, among women aged 15–34 years, chronic diseases caused over 20% of deaths, while reproductive causes and HIV together accounted for ~10% of deaths, in all countries except in India. Among women aged 35–44 years, in all but India, chronic diseases accounted for over four times the deaths attributable to reproductive causes and HIV. The causes of death were not related to the level of development in these countries as measured by GNI PPP. Papers pertaining to women's health published in public health and medical research journals focused principally on **reproduction**.

**Conclusions** Extending the definition of women's health to include a concern for chronic diseases is critical if the needs of women in less developed nations are to be met. In less developed countries, chronic disease is the most important cause of female death even during childbearing years and for women with young families. Development agencies and private philanthropy must begin to fund the studies that will further refine our understanding of the role of chronic diseases in women's health in the developing world.

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**Keywords** Women's health, developing countries, resource allocation, chronic diseases, cardiovascular disease

The past two decades have witnessed tremendous progress in the health of all but the poorest countries, and this seems set to continue. There are 49 countries deemed least-developed by the United Nations (UN), where poverty remains a high hurdle. But in line with progress in the rest of the less developed world, *World Population Prospects: The 2002 Revision* predicts that 17 of these least developed countries will achieve at least several core health development goals by 2020.<sup>1</sup> At the global level, life expectancy

at birth is likely to rise from 65 years today to 74 years in 2045–50.<sup>2</sup> By 2050, life expectancies in the less developed nations will be within 10 years of those in the developed nations.<sup>2</sup> Between 1980 and 1998, maternal mortality declined in many less developed nations, for example by 42% in Mexico, 43% in Argentina, 58% in Chile, and 35% in China.<sup>3</sup> Although the estimated annual number of women worldwide whose deaths are due to causes related to pregnancy and child-bearing remains 585,000, 90% of these deaths are in the least-developed nations of Africa and Asia.<sup>4</sup>

Fertility rates in developed and less developed countries are converging. Births in developing countries have decreased from six children per woman in 1960 to around three today.<sup>5</sup> The prevalence of contraceptive use is 70–80% in many countries.<sup>6</sup> The UN estimates that by 2050, three out of every four countries in the less developed regions will be experiencing below-replacement fertility.<sup>1</sup> In fact, fertility is decreasing much faster than the United Nations Population Division had expected. This decline, when combined with the projected increase in the number of AIDS-related deaths, led the UN, in February 2003, to reduce its global population projection for the year 2100 by one billion people.<sup>2</sup>

These demographic trends of increased life expectancy coupled with decreased fertility have produced ageing populations in the developing countries. 'Ageing' does not imply 'aged': the coming two decades will see a rise in the proportion of developing country populations that are in the working ages before the proportion of older people rises substantially. Women between the ages of 25 and 64 represented just 30% of all women in the developing world in 1970. By 2030, they will comprise half the female population.<sup>2</sup> The concept of women's health needs to be revisited in the light of decreasing fertility and increasing life expectancy.

Beginning in the mid-1970s, women's health was defined largely in terms of **reproduction**. The objective of reproductive health—a term that was a direct antecedent to women's health—was population control and much of that tenor remained when the term 'reproductive health' was replaced by 'women's health'. Women's health programs conventionally address contraception, healthy pregnancy, safe delivery, and the prevention of sexually transmitted infections. More recently, HIV/AIDS has been added to the priority list of women's health issues as part of the prevention of sexually transmitted infections. This limitation of women's health to reproductive health has had, and continues to have, a profound influence on the allocation of resources for women's health in the developing world.

This limitation is obvious in both the public and philanthropic sectors. For example, within the US Agency for International Development, the combination of reproductive and maternal health, and HIV/AIDS represents over 50% of the health budget.<sup>7</sup> The Development Co-operation Directorate of the Organization for Economic Co-operation and Development reports that commitments and disbursements for population programs focused on maternal health had become more than double between 1999 and 2002, at which point all donors, bilateral and multilateral, were allocating nearly \$2 billion per year to population health efforts.<sup>8</sup> The Asian Development Bank boosted its allocations to population programmes from 2% of its work in 1978–91 to 20% in 1991–97.<sup>9</sup>

Private philanthropic flows of funds for women's health also reflect a reproductive health definition. Of all women's health grants from the Ford Foundation from 1999 through the first quarter of 2004, 1300

were for reproductive health, two for cancer (both for breast cancer awareness, totalling \$60,000), and none for diabetes or cardiovascular disease (CVD). Of all Health Equity grants made by the Rockefeller Foundation to developing country programmes from January 1, 2002 through December 31, 2003, 84% were for women's health, and 94% of over \$10 million in grants were allocated to reproductive and HIV programmes, the two categories usually being combined. Only three grants, totalling half a million dollars, were given for general women's health or chronic disease prevention in women—in this case, tobacco control.

Nanette Wenger at the Emory University terms this form of women's health, focused exclusively on **reproduction** and early child-rearing, the 'bikini approach' because it ignores the rest of the woman<sup>10</sup> and those health problems that are specific to women but not associated directly with **reproduction**, such as domestic violence. It also ignores health problems that women share with, but perhaps experience more frequently than, men.

In the US, it is only in the last 15 years that research has begun to recognize that gender is a central element in the incidence and prevalence of chronic diseases. As the background papers for the 2002 Harvard University conference on Defining Women's Health pointed out, *Index Medicus* added 'women's health' as a subject heading only in 1991, but as of 2002 it was still not possible to use the keyword 'gender' in Medline and obtain anything except that literature formerly categorized under the keyword 'sex'.<sup>11</sup>

The recent observation that women develop traditional chronic diseases well before menopause has been a startling development. Coronary artery disease, stroke, diabetes, and lung cancer are now recognized as growing threats to younger women in the US and OECD countries. However, as documented in *A Race Against Time*, chronic diseases are now playing an accelerating role in less developed economies.<sup>12</sup> Women are prey to the same epidemics of chronic disease as men, but at ages younger than realized in the past. Although much of the gender-specific literature in developed economies has focused on differential utilization of CVD resources, there is evidence that the diseases have a slightly different presentation in women that require heightened sensitivity on the part of clinicians.<sup>13–15</sup> The use of those facilities designed for prenatal, perinatal, reproductive, and infant care for chronic disease risk factor modification and monitoring offers an opportunity that is gaining in importance every year.

## ► **Methods**

The World Health Organization's mortality statistics database provides data on deaths by cause, gender, and age for many but not all countries, and these data are often weak.<sup>3</sup> For example, according to the data a country such as Slovenia would have two deaths in a year from child-bearing causes, which is unlikely. Hence, we focused our data analysis on nine less developed countries with more complete statistics. The choice of these countries was arbitrary apart from there being adequate data available. As in our previous studies on CVD mortality,<sup>12</sup> we accept that the data reported routinely through WHO differ from the data adjusted locally or for other purposes. We compared the two sets of data for causes of death as coded according to ICD

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- i. Deaths associated with pregnancy and child birth, namely: abortion O00–O07; haemorrhage during pregnancy and childbirth O20, O46, O67 and O72; toxæmia of pregnancy O13–O16, and O21; complications of the puerperium O85–O92, and A34; other direct obstetric causes O10–O12, O22–O75, and O95–O97, except O46, O67, and O72; indirect obstetric causes O98–O99. These deaths were added to deaths from HIV/AIDS B20–B24.
- ii. Deaths from three chronic disease categories: cancer C00–C97, CVD I00–I99, and diabetes E10–E14. These three chronic disease causes of death were combined because (a) as with diabetes and CVD, they are often concurrent, and (b) they may have shared common risk factors, such as hypertension or smoking, for years. These risk factors could have been amenable to detection and management through a more comprehensive approach to women's health.

We compared the frequency of deaths in these two disease groups for women:

- i. Women aged 15–34: the prime childbearing and family formation years.
- ii. Women aged 35–44: years in which some childbearing takes place but principally when family consolidation occurs.

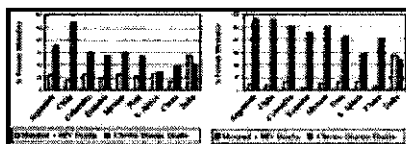
We limited the analysis to these age groups because these are the ones on which most of the conventional attention to women's health is concentrated.

In addition to the study of mortality, we examined the health research literature to determine the focus adopted by the academia in its research into women's health in developing countries. We searched the archives of the *American Journal of Public Health* between 1971 and 2004 for articles on CVD and women's health. Articles on women's health published in the *British Medical Journal* from 1998 to June 2004 were also examined using the Journal's online archive categorization system.

## ► Results

In the study age groups, chronic diseases significantly overshadowed **reproduction** and HIV as a cause of women's death in the nine countries. This is true even in the 15–34 year age group for seven of the nine countries studied, the exceptions being India (largely due to reproductive causes) and South Africa (largely due to rampant HIV/AIDS). In the 35–44 year age group, even in India we noted that chronic diseases rivals maternal conditions and HIV infection as a cause of female death. Between half and two-thirds of the chronic disease deaths in this group were due to cardiovascular conditions (Figure 1).

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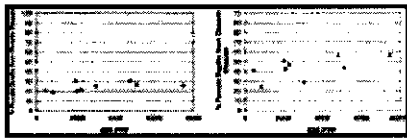
**Figure 1** Comparison of numbers of deaths among women, aged 15–34 (left panel) and 35–44 years (right panel), from maternal causes, HIV/AIDS, and chronic diseases as defined in nine countries. Source: WHO Mortality Database<sup>3</sup>

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Moreover, the causes of death were not related to the level of development in these countries, at least not as measured by *per capita* purchasing power parity corrected Gross National Income (GNI PPP). As illustrated in Figure 2, the proportion of deaths among women aged 15–34 years and 35–44 years attributable to chronic disease remained consistent irrespective of the national income within the band of less developed nations.



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**Figure 2** Comparison of percentage of deaths among women, aged 15–44 (left panel) and 35–44 years (right panel), attributable to chronic diseases in nine countries with national development levels as indicated by GNI PPP for those countries. Source: WHO Mortality Database<sup>3</sup> and World Development Indicators.<sup>21</sup>

We observed that the papers contained in the 187 journals on population and the 65 journals on family planning in the National Library of Medicine's PubMed database were concentrated on **reproduction**.<sup>16</sup> However, this emphasis was extended to the 63 public health journals as well. For example, since 1971, the *American Journal of Public Health* has published 52 articles that included papers on women's health principally in China, and 100 others in which China was included. Twenty-six were on reproductive health, child health, or HIV. Two dealt with CVD. In the same period, 10 articles on health in Peru included five on reproductive and child health, and none on CVD. For no developing country in over 30 years has the Journal published research on CVD (for men or women) more than once.

We found the same trend in the medical literature. An examination of the archives of the *British Medical Journal* from 1998 to June 2004 showed that the category 'women's health' contained the following distribution of articles: In the last category there were three papers on CVD and two on diabetes, one of which was concerned with women aged 70–81 years, and 13 were about cancer. The remainder were concerned with the medical aspects of **reproduction**. There were five times as many articles on women's incontinence as on CVD as a women's health issue.

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## ► Conclusions

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While the origins of many chronic diseases are deeply embedded in society, surveys of proximate risk factors in Asia and the Pacific show that they are not limited to the affluent Western societies.<sup>17</sup> In women in the 15–34 year age group, these risk factors might be detected and treated by alert, comprehensive women's health services, thus ameliorating the risk of death in the 35–44 year age group. **Beyond CVD**, similar alertness may pay dividends. At present, for example, in India in 1991, most women of the reproductive age who attended a cancer detection programme presented late and had either unusual vaginal bleeding or a lump in the breast.<sup>18</sup> The extraordinary dominance of chronic diseases as a cause of death in the 35–44 year age group suggests that extending the definition of women's health to include the relatively easy detection and treatment of risk factors and early clinical features of chronic diseases is critical not just in the 35–44 year age group, but also in the 15–34 year age group, which is the prime child bearing age group.

In its 'New Agenda for Women's Health', the World Bank has restricted concerns about chronic diseases, especially CVD, to women over the age of 45.<sup>19</sup> However, as the data we have presented show, CVD, cancer, and diabetes are the important causes of female death even during childbearing years and for women with young families in developing countries.

The definition of women's health has been narrow, and that narrowness has driven the allocation of women's health resources to an equally narrow set of health interventions for a limited set of diseases and disorders, policies, and programmes. This has failed the women of the developing world.

There are four clear conclusions to be drawn.

First, while a narrow definition of women's health and a focus on reproductive safety may still be appropriate today in the world's least-developed countries, with low life expectancies, high infant mortality, and high rates of infectious diseases, this does not serve the needs of women living in less developed nations. In the vast majority of developing countries, a narrow definition is now inadequate because it does not reflect prevailing mortality patterns, and is driving research and policy in decreasingly relevant directions. As these countries continue to develop, as they age, as they urbanize further and faster, as life becomes more sedentary, the chronic disease risk factors will coalesce with greater force. Delay in redefining women's health will only permit the momentum of the problem to increase. To keep in pace with development, the definition must be widened now to include CVD, cancer, and diabetes for women of all ages.

Women's health programmes and resources flowing to the developing world should manifest greater fidelity to women's health needs. Chronic disease risk factors are present at early ages in women in the developing countries and they are cutting a swathe through the ranks of women, and their young families, in their early middle ages.

Second, the importance of expanding the definition of women's health is not because of the disease profiles of wealthy women. As we have demonstrated, women in nations with different average per capita

incomes experience similar problems of chronic diseases, even in their childbearing years.

Third, however, it is critical to acknowledge that there is much we do not know. Those who fund and carry out health research on women's issues have not invested in documenting and understanding the totality of women's epidemiology and death patterns in the developing nations. Development agencies and private philanthropy should begin to fund the studies that will further refine our understanding of the role of chronic diseases in women's health in the developing world.

Fourth, we can confront chronic diseases; it is not a cause for passivity and resignation. Chronic diseases, because of their close association with one's lifestyle, is judged by some to be the individual's fault: they should not smoke, get fat, or take too little exercise. Yet individual behaviour is largely determined by social settings and economic freedom. Others say that we should not confront chronic diseases with limited global health resources. In the past 30 years, however, we have learned much about the risk factors for CVD, many kinds of cancer, and diabetes. We have a clearer understanding on which are the important, better, and simpler ways to identify them, and the effective management tools for tracking and reducing them. The progress of CVD can be curtailed by risk reduction including affordable pharmacological interventions at every stage.<sup>20</sup>

With the renewal of primary care infrastructure in the face of HIV, itself increasingly a chronic condition, developing nations have the resources to use to confront chronic diseases for men and for women.

The importance of chronic disease to the health of women in the developing world is clear. The imperative to know and understand more about the dimensions of the problem is also clear. There is every reason to believe that a commitment to a broader definition of, and approach to, women's health in the developing world will bring important social, economic, and health rewards for women and their young families.

## ► Acknowledgments

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## ► References

<sup>1</sup> United Nations. *Population Prospects: The 2002 Revision*. Geneva: United Nations Population Division, 2003. Available at <http://esa.un.org/unpp> (Accessed July 1, 2004).

<sup>2</sup> Foreign Aid in the National Interest. Washington, DC: US Agency for International Development, 2002.

<sup>3</sup> WHO Mortality Database. Available at <http://www3.who.int/whosis/menu.cfm?path=whosis.mort&language=english> (Accessed July 1, 2004).

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<sup>4</sup> Brands A, Yach D. *Women and the rapid rise of noncommunicable diseases*. NMH Reader, World Health Organization, 2002. Available at [http://whqlibdoc.who.int/hq/2002/WHO\\_NMH\\_02.01.pdf](http://whqlibdoc.who.int/hq/2002/WHO_NMH_02.01.pdf) (Accessed July 1, 2004).

<sup>5</sup> United Nations Population Fund. *State of world population*. Geneva: UNFPA, 2003. Available at [http://www.unfpa.org/swp/2003/pdf/english/swp2003\\_eng.pdf](http://www.unfpa.org/swp/2003/pdf/english/swp2003_eng.pdf) (Accessed August 18, 2004).

<sup>6</sup> United Nations. *The future of fertility in intermediate fertility countries*. New York: Department of Economic and Social Affairs, Population Division, United Nations, 2002.

<sup>7</sup> **Raymond S.** *Improving people's health background paper: foreign aid in the national interest*. Washington, DC: US Agency for International Development, 2002.

<sup>8</sup> Organization for Economic Cooperation and Development Development Co-operation Directorate. Available at [http://www.oecd.org/statisticsdata/0,2643,en\\_2649\\_33721\\_1\\_119656\\_1\\_1\\_1,00.html](http://www.oecd.org/statisticsdata/0,2643,en_2649_33721_1_119656_1_1_1,00.html) (Accessed July 1, 2004).

<sup>9</sup> Asian Development Bank Policy for the Health Sector, 1999. Available at <http://www.adb.org/Documents/Policies/Health/health401.asp> (Accessed July 1, 2004).

<sup>10</sup> Wenger NK. You've come a long way, baby: cardiovascular disease in women, problems and prospects. *Circulation* 2004;**109**:558–60.[[Free Full Text](#)]

<sup>11</sup> *Defining women's health: an interdisciplinary dialogue*. Harvard University Background Paper, April 15, 2002.

<sup>12</sup> Leeder S, **Raymond S**, Greenberg M *et al.* *A race against time: the challenge of cardiovascular disease in developing economies*. New York: Columbia University, 2004.

<sup>13</sup> Milner KA, Funk M, Richards S *et al.* Gender differences in symptom presentation associated with coronary heart disease. *Am J Cardiol* 1999;**84**: 396–97.[[CrossRef](#)][[Web of Science](#)][[Medline](#)]

<sup>14</sup> Wenger NK. Coronary heart disease: the female heart is vulnerable. *Prog Cardiovasc Dis* 2003;**46**:199–229.[[CrossRef](#)][[Web of Science](#)][[Medline](#)]

<sup>15</sup> Barrett-Connor E, Giardina E-G, Gitt S-K *et al.* Women and heart disease: the role of diabetes and hyperglycemia. *Arch Int Med* 2004;**164**:934–42.[[Abstract/Free Full Text](#)]

<sup>16</sup> PubMed National Library of Medicine. Available at <http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=PubMed> (Accessed July 1, 2004).




<sup>17</sup> Lawes CM, Roders A, Bennett DA *et al.* Asia Pacific cohort studies collaboration: blood pressure and cardiovascular disease in the Asia Pacific region. *J Hypertens* 2003;**21**:707–16.[[CrossRef](#)][[Web of Science](#)][[Medline](#)]

<sup>18</sup> *Women of South-East Asia: a health profile*. Regional Publications SEARO No. 34, September 2000.

<sup>19</sup> *A new agenda for women's health and nutrition*. Washington, DC: The World Bank, 1997.

<sup>20</sup> Magnus P, Beaglehole R. The real contribution of the major risk factors to the coronary epidemics: time to end the "only-50%" myth. *Arth Intern Med* 2001;**161**:2657–60.

<sup>21</sup> World Development Indicators. World Bank, 2003. Available at <http://www.worldbank.org/data/> (Accessed August 19, 2004).

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