

Biography of John Bongaarts

John Bongaarts, demographer and vice president of the Policy Research Division at the Population Council, an organization based in New York, was elected to the National Academy of Sciences in 2002. Throughout his career, he has examined the multitude of factors that affect fertility, mortality, and other human life statistics.

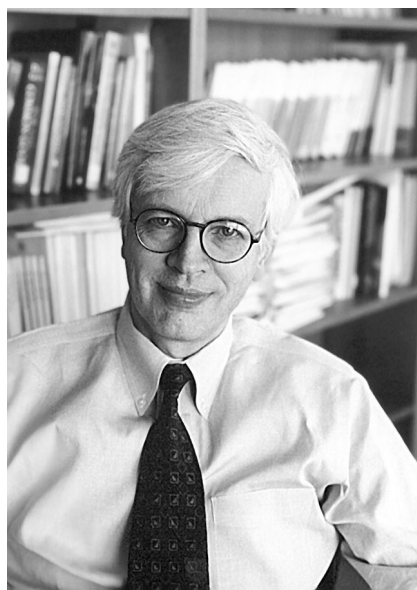
Bongaarts' statistical analyses have helped scientists and policymakers come to a better understanding of the relationships between population and the environment, including the effects of population growth on global warming (1) and global food production (2, 3). His studies on AIDS in the late 1980s and early 1990s tracked the spread of the epidemic and its effects on worldwide mortality (4, 5). His research on fertility issues, a prevailing interest throughout his 30-year career, has helped developing countries construct population policy options (6, 7). Bongaarts' Inaugural Article, titled "Estimating mean lifetime," is featured in this issue of PNAS (8).

An Unorthodox Route

In undergraduate work at Eindhoven University of Technology in the Netherlands, Bongaarts studied systems engineering, a form of electrical engineering that examines how electrical feedback systems interact and operate. However, when he entered a master's program at Eindhoven, Bongaarts chose to apply his interest to living systems.

"I got a little bored with plain engineering, and I wanted to apply this to what I thought were more interesting things in biology and medicine," he said. Consequently, for his master's thesis, titled "Probabilistic characterization of R-R intervals," (9) Bongaarts used statistical methods to characterize irregularities in heart function seen in electrocardiograms.

Upon receiving his master's degree in 1968, Bongaarts continued his study of the life sciences through a Ph.D. program in physiology and biomedical engineering at the University of Illinois, Chicago. His dissertation, titled "A cybernetic model of the demographic transition," (10) examined the properties that make population numbers self-regulating. A year-long postdoctoral fellowship under the mentorship of Zenas Sykes at Johns Hopkins University allowed Bongaarts to study the biological and theoretical underpinnings of fertility models.



John Bongaarts, photograph taken in 2001.

Where Policy and Science Intersect

Bongaarts became interested in population issues during his doctoral studies after reading Paul Erlich's popular 1968 book, *The Population Bomb* (11), and the 1972 Club of Rome report, *The Limits to Growth* (12). Both publications argued that human population growth is damaging the earth's ability to sustain life.

"Consumption and population growth appeared to be outstripping resources available. I decided I wanted to do research in this area—it seemed a very interesting and exciting and important thing to do," said Bongaarts. "In particular, I didn't want to be just an academic. I wanted to be at the intersection between science and policy."

Bongaarts' policy leanings led him to a summer internship, and later a full-time job, at the Population Council headquarters in New York City, where he has remained. The Council, an international nonprofit organization established by John D. Rockefeller in 1952, examines global problems related to reproductive health and population growth.

Bongaarts' work at the council over the past 30 years has given him an opportunity to study a variety of human population issues. His statistical analyses have shown how such diverse factors as malnutrition (13, 14), the availability of birth control (15), the duration of breastfeeding (16), and the accessibility of abortion (17) have affected global

and local birth patterns. This research has laid the foundation for effective population forecasts that have galvanized population policy in several countries, including China and developing nations in sub-Saharan Africa (18, 19).

Throughout the course of his career, Bongaarts has worked with collaborators whose work complements his own. Previous collaborators include Susan Greenhalgh of the University of California at Irvine, Susan Watkins of the University of Pennsylvania, Robert Potter of Brown University, and Griffith Feeney of the University of Hawaii. "I tackle a new issue, and I find someone else who has worked in it. Together, we can produce something interesting," said Bongaarts.

Mortality's Doppler Effect

Although he has conducted research on a wide range of topics, Bongaarts has consistently returned to issues related to fertility. His earlier fertility research gave him an important insight into mortality issues. As Bongaarts explains in his Inaugural Article (8), yearly estimates of both fertility and mortality are distorted by an effect similar to the Doppler effect in physics.

In the Doppler effect, the frequency of light or a sound appears to inflate as the source moves toward an observer and appears to deflate as the source moves away. Similarly, when women delay childbearing to later in life, the number of births observed in a particular year is distorted downward. Conversely, when women bear children at a younger age, births pile up, distorting fertility statistics upward. An apparent inflation of birth numbers was observed during the baby boom of the 1950s in the United States.

This phenomenon has been well documented by demographers, who must eliminate this bias when examining fertility trends. However, "the insight that comes in [my Inaugural] article is that this particular distortion also affects death rates, and that's what makes it new," said Bongaarts. "My colleagues who have been studying mortality have a hard time believing this, because it means that the very fundamental rates that they have relied on for a long time have a distortion in them."

This is a Biography of a recently elected member of the National Academy of Sciences to accompany the member's Inaugural Article on page 13127.

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The Future of Aging

Bongaarts sees his future research shifting away from fertility and mortality. His next project, he said, will be to look at what he considers the main demographic problem of the next century: population aging. As birthrates continue to decrease in developed and developing countries, the number of young workers also is decreasing. However, longer life spans also have increased the number of people in their 70s, 80s, and 90s. This disparity between the number of young workers and retirees can cause problems in public support systems, such

as pensions and health care, explained Bongaarts.

"In the past, there were many workers who paid taxes to support retired individuals, sometimes five or more workers per retiree. In the future, in some countries there will only be one person in the labor force for every one person retired," said Bongaarts. "That becomes an unsustainable situation, which requires higher taxes, lower benefits, or other adjustments."

Other projects Bongaarts would like to pursue involve studying the plateauing of the fertility decline in some devel-

oping countries, such as Bangladesh and Egypt, and examining how long the human life span could extend in light of future medical advances. Problems like these will always ensure the future growth of demographics, said Bongaarts.

"There are so many important social and economic policy issues, and the skills of the demographer can be applied to them," said Bongaarts. "I am constantly reminded that there's a real world out there, and by my work, I'm trying to make a difference."

Christen Brownlee, *Science Writer*

1. Bongaarts, J. (1992) *Popul. Dev. Rev.* **18**, 299–319.
2. Bongaarts, J. (1994) *Sci. Am.* **270** (3), 18–24.
3. Bongaarts, J. (1996) *Popul. Dev. Rev.* **22**, 483–503.
4. Bongaarts, J. (1996) *Popul. Dev. Rev.* **22**, 21–45.
5. Bongaarts, J. (1989) *Stat. Med.* **8**, 103–120.
6. Bongaarts, J. (1994) *Science* **263**, 771–776.
7. Greenhalgh, S. & Bongaarts, J. (1987) *Science* **235**, 1167–1172.
8. Bongaarts, J. & Feeney, G. (2003) *Proc. Natl. Acad. Sci. USA* **100**, 13127–13133.
9. ten Hoopen, M. & Bongaarts, J. P. (1969) *Cardiovasc. Res.* **3**, 218–226.
10. Bongaarts, J. (1972) Ph.D. thesis (University of Illinois, Chicago).
11. Ehrlich, P. R. (1968) *The Population Bomb* (Bantam Books, New York).
12. Meadows, D. L. (1972) *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind* (Universe Books, New York).
13. Bongaarts, J. (1980) *Stud. Fam. Plann.* **11**, 401–406.
14. Bongaarts, J. (1980) *Science* **208**, 564–569.
15. Bongaarts, J. (1991) *Popul. Dev. Rev.* **17**, 293–313.
16. Jain, A. K. & Bongaarts, J. (1981) *Stud. Fam. Plann.* **12**, 79–99.
17. Tietze, C. & Bongaarts, J. (1982) *Stud. Fam. Plann.* **13**, 373–379.
18. Bongaarts, J. & Greenhalgh, S. (1985) *Popul. Dev. Rev.* **11**, 585–617.
19. Frank, O. & Bongaarts, J. (1991) *Stat. Med.* **10**, 161–175.