

Population stabilization potential and its benefits underestimated

Bradshaw and Brook's report "Human population reduction is not a quick fix for environmental problems" (1) argues that plausible efforts to reduce birth rates will make little difference to the course of human population this century. Although they emphasize that population reduction is highly desirable from an environmental perspective, and that greater support for voluntary fertility reduction is much needed, the authors argue that the benefits will be generations away.

However, apart from unfairly combining declines in fertility and mortality as if they are codependent, Bradshaw and Brook's (1) global scenarios ignore the important impact of country-to-country variability. Holding current age-specific fertility and mortality rates constant would lead to a rapid increase in high-fertility countries' share of the total population. Fertility reduction focused in these countries has a far greater impact on future population than the globally averaged course the authors project. This effect is evident in their own subregional projections. At the global level, Bradshaw and Brook's (1) "business-as-usual" scenario (Scenario 1) is almost the same as the "realistic" scenario (Scenario 2a), in which global fertility falls slowly to 2.0 by 2100 but mortality also halves. In 2100, the scenarios reach 10.42 and 10.35 billion, respectively. However, when the same scenarios are applied to subregions, Bradshaw and Brook find "the

final mean population densities [in 2100] were between 16% and 37% lower [for subregions in the 2a projection] ... than those predicted assuming constant vital rates" (1). Given constant land area, this finding clearly contradicts the global result and the paper's title. The sum of subregional populations, which can be calculated from tables S2 and S3 in ref. 1, are 14.5 billion for Scenario 1, and 9.8 billion for Scenario 2a, a difference of almost one-third. The difference would be even greater if the projections were done on national data rather than subregions: the United Nation's "constant fertility" projection reaches 28 billion by 2100 (2).

Bradshaw and Brook (1) claim that fertility reduction is a solution from which only "our great-great-great-grandchildren might ultimately benefit." This statement is belied by the enormous social and economic benefits that family-planning-adopting nations have experienced in one generation, compared with their nonadopting neighbors (3). Bradshaw and Brook (1) attribute the general lowering of fertility over past decades to rising affluence, education, and the empowerment of women. More accurately, "general" lowering is the result of rapid lowering in individual countries at different times as they adopted voluntary family-planning programs, averaged together with those who saw little decline because they did little. There can be little doubt that a renewed

commitment to such voluntary programs could achieve below-replacement fertility globally, much sooner than Bradshaw and Brook consider realistic, with enormous benefits this century.

Thus, Bradshaw and Brook's (1) paper seriously understates the hazard of our current population course, and underestimates the impact of fertility-reduction efforts. The authors clearly intend to reinforce the importance of population on total environmental impact, but the effect of this paper can only be perversely to diminish political will for family-planning efforts.

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1 Bradshaw CIA, Brook BW (2014) Human population reduction is not a quick fix for environmental problems. *Proc Natl Acad Sci USA* 111(46):16610–16615.

2 United Nations, Department of Economic and Social Affairs, Population Division (2013) *World Population Prospects: The 2012 Revision*. (United Nations, New York). Available at esa.un.org/unpd/wpp/index.htm. Accessed January 12, 2015.

3 O'Sullivan JN (2013) Revisiting demographic transition: Correlation and causation in the rate of development and fertility decline. *27th International Population Conference, IUSSP, Busan, South Korea*, August 26–31, 2013. Available at www.iussp.org/en/event/17/programme/paper/4775. Accessed January 12, 2015.

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