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**Unrealistic demographic scenarios  
should not be published**

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## **Abstract**

*Background:* Demographers often wonder “what would happen if ...”, for instance, by forecasting the world population in 2100 under various scenarios. Some articles make predictions that have not any chance to be observed, because they are totally unrealistic from a biological viewpoint.

*Objective:* Some examples of unrealistic scenarios are provided. This article argues that such unrealistic scenarios are a source of confusion and should not be published.

## **1. Introduction**

Demographers often wonder “what would happen if ...”. For instance, they try to forecast the world population under various scenarios, as done by Basten et al. (2013) in a recent article in *Demographic Research*. Such forecasts are useful, provided they rely on realistic and relevant hypotheses. Basten et al. (2013) wondered what could happen if the global total fertility rate would vary in the 0.75-2.50 range, but they rightly did not consider 3, 3.50, or higher global fertility levels, because there is not any chance to observe such values during a long period.

However, from time to time, articles make predictions that have not any chance to be ever observed, simply because they are totally unrealistic from a biological viewpoint. While it could be understood that an unrealistic scenario is used as the extreme boundary of the forecast, i.e. the scenario that will never be observed, some demographers however do not state that point, leaving the reader with the unpleasant feeling that the authors do not discard extreme scenarios. The present article, written by a biogerontologist, is a plea for discarding unrealistic scenarios from demographic forecasts, because they are a source of confusion.

## **2. Some examples of unrealistic scenarios**

Bourgeois-Pichat (1988) made the hypothesis that, in the future, lifespan without incapacity could be 140 years and women could reproduce up to 100 years. Vallin and Caselli (1997) relied on this hypothesis and published a graph showing, in 2100, women with first and second children at modal ages of 35 and 70 years, the last births being observed beyond 80 years of age. For any biologist, making the hypothesis that most women could have a child at a modal age of 70 years and beyond has simply nothing to do with biology. Forecasting extreme lifespans also simply ignores basic knowledge in biology (for a criticism of extreme longevity forecasts, see Le Bourg, 2012).

Basten et al. (2013) made population projections up to 2300, under various total fertility rates (from 0.75 to 2.50) and life expectancy hypotheses (90, 100, 120 years: but this last hypothesis is irrelevant, see Le Bourg, 2012). In this article, the authors calculated the population size of sub-

saharian Africa in 2100 if the total fertility rate would remain around 5 in this region. It would be 12 billion, i.e. more than the usually expected total population in 2100 and the authors stressed that “the results are only presented to 2200 because they would quickly reach impossibly high levels”. My opinion is that even the 2100 level is highly improbable, to the very least, and that there is no ground for a scenario with such a high total fertility rate at a continent level.

Unrealistic forecasts of the global population size have been made in the past. Jacquard (1978) stressed that if the yearly growth rate of the population would remain 1.9%, as it was during the 1970s, the population would be 45 billion in 2100 and 150 billion in 2200. However, such forecasts simply ignore that taking into account the environment and its constraints is mandatory for species to thrive. Bacteria in petri dishes show an exponential growth only before reaching the walls of the dish. Flies can lay hundreds of eggs a week but the planet is not overwhelmed by flies because, on the whole, one fly is replaced by one fly in the next generation, no matter the number of eggs laid. Like bacteria and flies, the size of human populations does not evolve freely and stating that it could increase without limit is a mere ignorance of ecological constraints and of basic population biology.

### **3. Blatantly irrelevant hypotheses should be avoided**

In biology and demography, not all hypotheses are probable to the same extent. Some hypotheses are clearly so unrealistic that there is not any heuristic interest in studying them. For instance, human mean body size is increasing for decades and one could make the hypothesis that it could increase in a linear way with no limit, despite it is not actually the case (Komlos and Lauderdale, 2007). Then, one could wonder, for instance, what would be the consequences of 3-meters tall humans for real estate market, because buildings in the world could no longer be used. However, biological variables show asymptotic limits, as observed for world records in sports for which the progression rate is not linear but exponentially decaying (Berthelot et al., 2008), and there is thus not any ground to make the hypothesis that, one day, humans will be 3-meters tall.

The same could be said for demographic forecasts. There is no ground for forecasts of unlimited population size or lifespan, not to mention childbearing at 80 years of age and beyond. Thus, publishing such forecasts is simply a source of confusion for readers. In 2000, Leridon severely criticised “useless computations” of the United Nations forecasts on replacement migration as a solution to population ageing. For instance, Leridon (2000) emphasised that these computations showed that France should welcome 100 millions immigrants before 2050 to keep constant the 15-64/65+ ratio, i.e. nearly twice its current population. Regarding Korea, the UN report stated that “it would be necessary to have a total of 5.1 billion immigrants from 1995 through 2050” (UN, 2000)

to keep this ratio constant. One can agree with Leridon (2000): what is the interest of computations showing that ca half the world population should emigrate to Korea?

Mass-media often publish demographic forecasts, as emphasised by Leridon (2000), but biologists also rely on them, and these are two reasons for avoiding unrealistic forecasts in demography articles. These forecasts are not only useless and meaningless, but they are also harmful.

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