To keep global warming below 1.5°C, a key strategy for the crucial next decade is to try convince women to wait and have their first child at age 30+

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Hueting (UNEP Global 500 Award) & De Boer (2019) [1] clarify that national statistical bureaus present Gross Domestic Product (GDP) as "national income" while a large part of GDP is no proper income, but depletion of resources that are necessary for the survival of future generations. Providing policy makers with additional information about emissions of CO_2 leaves ambiguity about the causal relation with GDP. Policy makers tend to think that "economic growth" is required to reduce pollution while it actually tends to increase it. Environmental sustainability assumes that people would at least want to give children, born this century, an environment without climate change and other such catastrophes. Standards for environmental sustainability – another result of the Hueting & De Boer book – allow to determine that there is overpopulation. The national statistical bureaus have stewardship, or a duty of care. This requires that the figure of GDP is presented alongside information about the distance to environmental sustainability, $e\Delta$ = GDP – eGDP. Hueting was appointed in 1969 at CBS Statistics Netherlands to create a new department on environmental statistics with the objective to correct the figure of GDP for environmental damage. Colignatus (2019a) (draft) [2] discusses the reception of this analysis. The following result derives from this context, and concerns a tentative finding about a factor in family planning and climate change.

This present memo: (i) reports upon this tentative finding, Colignatus (2019b), [3] (ii) suggests a policy strategy for the UN / UNFPA and national government agencies on health and education, and, since I am only an econometrician and no demographer, medical doctor or family planner, (iii) invites other researchers to check the tentative finding, for research itself, but also to allow a clearer view on the relevance and details of such a policy strategy.

This new tentative finding stands in stark contrast with an earlier far more conservative conclusion by Bradshaw & Brook (2014). [4] It supports Bongaarts & O'Neill (2018) [5] but highlights an unmentioned but crucial didactic point.

Policy strategy and new finding

The policy strategy is to try to convince young women to have their first child at age 30 or later. A delay in primiparity means that there is no infringement upon procreation and fertility rights themselves. The next decade is crucial for climate change and keeping the rise of global temperature below 1.5 degrees Celsius, see UNEP (2019). [6] Currently 2/3 of all births are with mothers with ages 15-29. If such births could be delayed then the next 15 years would see a direct reduction of world population by 0.8 billion compared to "business as usual" (BAU). When this delay is sustained in the future, then, when the later born babies grow up, they themselves will wait till they are 30+, which causes further reduction. The cumulative effect would be that world population can be reduced from 11 billion to 8 billion people by 2100. It would cut projected emissions by some 20-25%.
Colignatus (2019b) contains the rough estimate of the effect size. **Figure 1** shows the population sizes for BAU and two alternative scenario's to 2100: (i) just delay and (ii) delay with a learning effect of 20% lower fertility.
Figure 2 shows the dependency ratio's, with the active age group 15-64 in the denominator and the other age groups in the numerator. The ratio first drops to 40% and rises to 80% for a while. When the population reduction comes with improvements in income and health, then retirement might rise from age 65 to 70, reducing the number of dependents and increasing the denominator.

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Figure 1

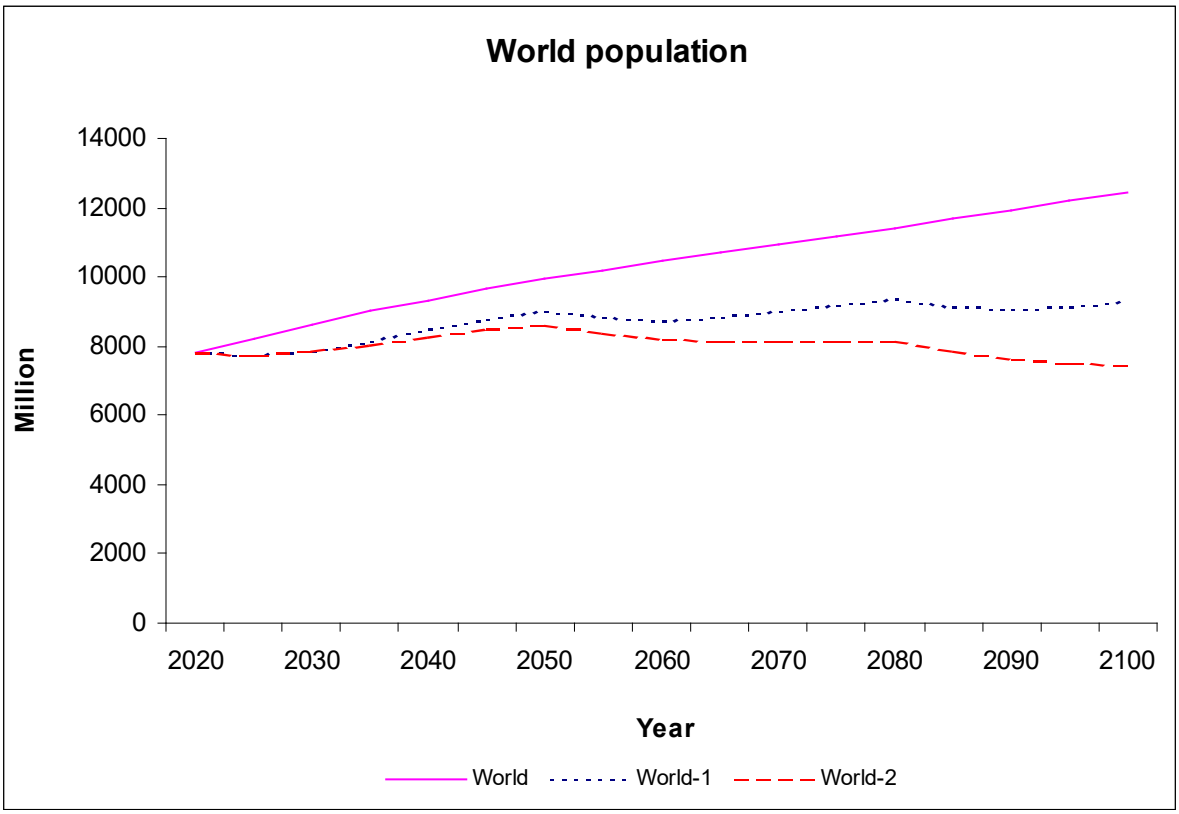
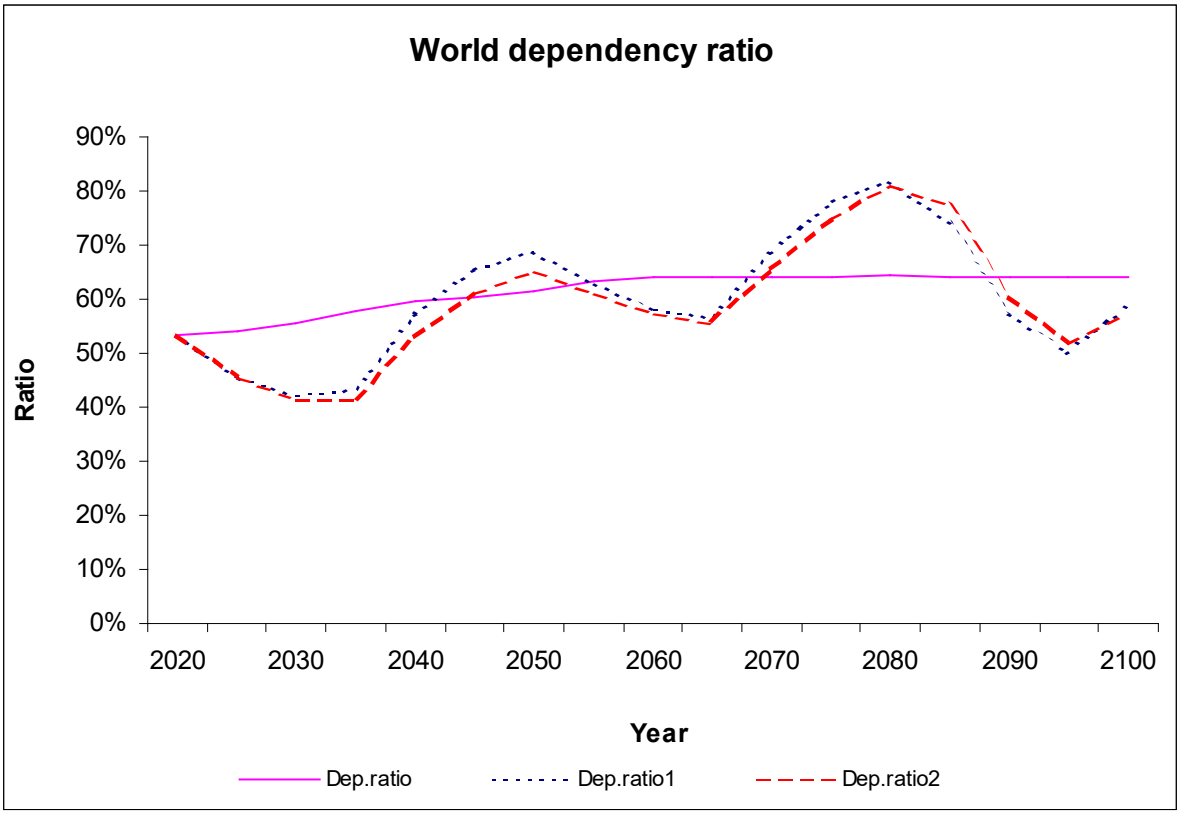


Figure 2



Contrast with Bradshaw & Brook 2014

This new finding starkly contrasts with Bradshaw & Brook (2014): "Humanity's large demographic momentum means that there are no easy policy levers to change the size of the human population substantially over coming decades, short of extreme and rapid reductions in female fertility; it will take centuries, and the long-term target remains unclear."

It appears that the latter study used a rather cautious scenario: "We also emulated a shift toward older primiparity by allocating 50% of the fertility in the youngest reproductive age class (15-24) evenly across the older breeding classes (25-49), following a linear change function from 2013 to 2100 (...)."

Since so much is unknown, the latter caution may be understood, but the current challenge – to keep global warming below 1.5°C – is such that humanity better looks at all options on the table, including a more ambitious delay in primiparity.

Other research

Bradshaw & Brook (2014) were criticised by O'Sullivan (2015) [7] on the relevance of regional differences, and we can support her statement now on the topic of primiparity: "Bradshaw and Brook's (...) 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." O'Sullivan (2016) [8] criticises the UN Population Division for being less creative in clarifying the policy options. The UN Division might function more as a statistical instead of indicative planning agency. We need supercomputers with integrated modeling, since it is science fiction to suppose that there can be 11 bn people without restraining feedbacks. O'Sullivan (2018) [9] is highly recommendable, e.g. on the causality of fertility and development, and current undermeasurement of population. Her chapter highlights the effect of population momentum for the long run, and unfortunately doesn't specify the importance of primiparity for the next decade.

O'Neill et al. (2012) [10] review the literature on population and emissions, but not yet quite on the effect discussed here. Remarkably, the Worldwatch Institute (2016) [11] looked at more than 900 papers and concludes (p1): "Peer-reviewed scientific research published since 2005 has rarely considered directly the hypothesis that family planning benefits environmental sustainability. Not surprisingly, given this relative lack of attention, no scientific consensus is apparent in the literature."

Gerlagh, Lupi & Galeotti (2018) [12] take the age group 15-45 as a single generation (unit), so that they cannot simulate this (intra-unit) effect. They consider taxing the external effects of births (a fertility tax) instead of ways to *avoid* the problem and such tax. They directly challenge procreation and fertility rights. However, their model seems to be adaptable to include the option of delay.

Communication and didactics

The UNFCCC tends to focus on keeping global warming below 1.5°C in 2020-2030. Such framing comes from failure of earlier targets so that mitigation and adaption seem a second-best solution. However, the current 1°C already has disastrous effects. It makes more sense to target both a population of 3 bn and removing the current surplus of CO_2.

Economist Hueting presented his findings in terms of national income, as eGDP = 70% GDP. It can be more didactic to infer that at least one in three persons is too many. An even larger reduction of population is needed to cut net emissions to zero.

Bongaarts & O'Neill (2018) are critical that UNFCCC neglects demographers and family planners. The 1994 Cairo population conference emphasized fertility rights, which caused 25

years of unchecked population growth. UNFCCC didn't want to be slowed down by this kind of discussion. Textbooks on demography state anyway that there are no effects in the medium run (the next decade 2020-2030), and that population momentum works like steering a supertanker. Thus UNFCCC and demographers are in a stalemate. This can be resolved by better didactics on delay in primiparity. Bongaarts & O'Neill (2018) know about its existence but did not specify it nor the presently indicated effect size. UNFCCC might be surprised that there is an approach that (i) doesn't infringe upon fertility rights (ii) with a direct effect in the next decade.

Conclusions

Paul Ehrlich in "The population bomb" of 1968 spoke about a "heat limit" rather than climate change. The book caused much discussion, and a bet with Julian Simon (1932-1998). Many people regret now that humanity hasn't listened more carefully. This new tentative finding on delay in primiparity has a similar urgency. Humanity has a real opportunity for the 2020-2030 decade – namely a delay that maintains fertility rights – and many will regret later when it would not be used to the fullest practical extent possible.

The indicated effect magnitude warrants the conclusion that more research on delaying births would be interesting. Not to establish whether this road might be taken, since education already is a human right, but to explore the details that can be communicated in education on family planning.

The indicated effect magnitude also identifies this approach as a suggestion for a high priority strategy by the United Nations / UNFPA and the national government agencies on health and education.

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