

The world population explosion: causes, backgrounds and projections for the future

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Abstract

At the beginning of the nineteenth century, the total world population crossed the threshold of 1 billion people for the first time in the history of the homo sapiens sapiens. Since then, growth rates have been increasing exponentially, reaching staggeringly high peaks in the 20th century and slowing down a bit thereafter. Total world population reached 7 billion just after 2010 and is expected to count 9 billion by 2045. This paper first charts the differences in population growth between the world regions. Next, the mechanisms behind unprecedented population growth are explained and plausible scenarios for future developments are discussed. Crucial for the long term trend will be the rate of decline of the number of births per woman, called total fertility. Improvements in education, reproductive health and child survival will be needed to speed up the decline of total fertility, particularly in Africa. But in all scenarios, world population will continue to grow for some time due to population momentum. Finally, the paper outlines the debate about the consequences of the population explosion, involving poverty and food security, the impact on the natural environment, and migration flows.

Key words: Fertility, family planning, world population, population growth, demographic transition, urbanization, population momentum, population projections.

Introduction

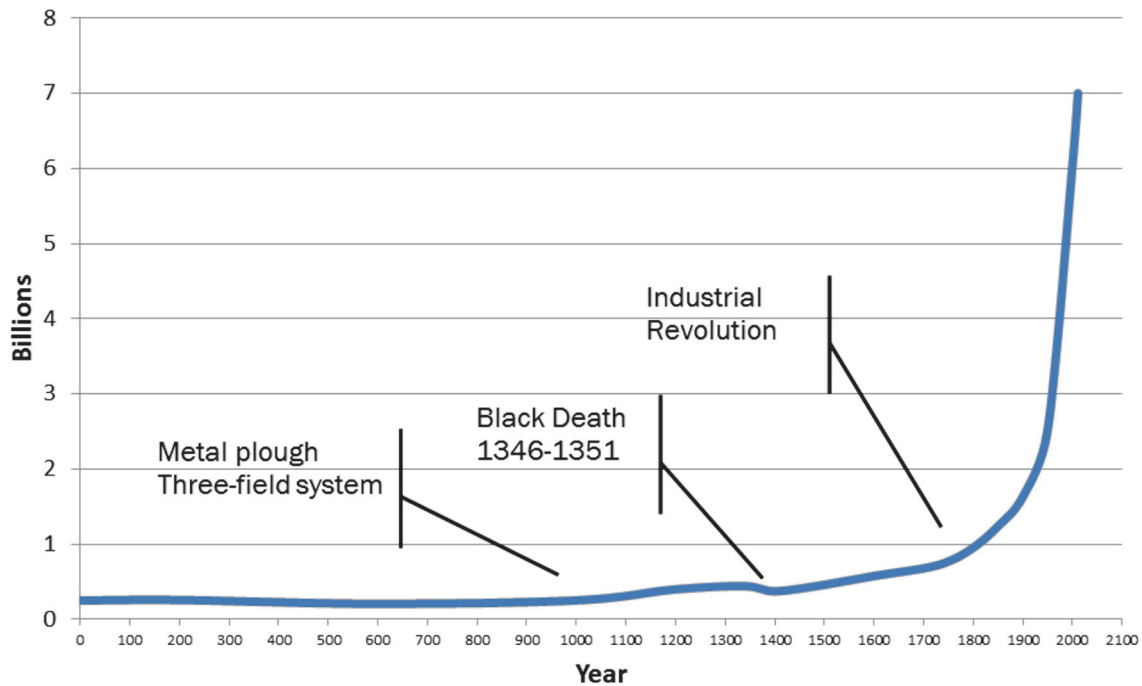
In the year 1900, Belgium and the Philippines had more or less the same population, around 7 million people. By the year 2000, the population of the Western European monarchy had grown to 10 million citizens, while the South East Asian republic at the turn of the century already counted 76 million citizens. The population of Belgium has since then exceeded 11 million citizens, but it is unlikely that this number will rise to 12 million by the year 2050. The population of the Philippines on the other hand will continue to grow to a staggering 127 million citizens by 2050, according to the demographic projections of the United Nations (UN 2013).

The demographic growth rate of the Philippines around the turn of the century (2% a year) has already created enormous challenges and is clearly unsustainable in the long term: such growth implies a doubling of the population every 35 years as a consequence of which there would be 152 million

people by 2035, 304 million by 2070, and so on. Nobody expects such a growth to actually occur. This contribution will discuss the more realistic scenarios for the future.

Even the rather modest Belgian demographic growth rate around the turn of this century (0.46%) is not sustainable in the long term. In any case, it exceeds by far the average growth rate of the human species (homo sapiens sapiens) that arose in Africa some 200.000 years ago. Today, earth is inhabited by some 7 billion people. To achieve this number in 200.000 years, the average yearly growth rate over this term should have been around 0.011% annually (so 11 extra human beings per 1.000 human beings already living on earth). The current Belgian growth rate would imply that our country would have grown to 7 billion in less than 1500 years.

The point of this story is that the current growth numbers are historically very exceptional and untenable in the long term. The demographic growth rates are indeed on the decline worldwide and this



Source: Livi-Bacci (2001, p. 27) and UN World Population data.

Fig. 1. — Historical growth of the world population since year 0

paper will attempt to explain some of the mechanisms behind that process. That doesn't change the fact, however, that the growth remains extraordinarily high and the decline in some regions very slow. This is especially the case in Sub Saharan Africa. In absolute numbers, the world population will continue to grow anyway for quite some time as a result of demographic inertia. This too will be further clarified in this paper.

The evolution of the world population in numbers

In order to be sustainable, the long term growth rate of the population should not differ much from 0%. That is because a growth rate exceeding 0% has exponential implications. In simple terms: if a combination of birth and growth figures only appears to cause a modest population growth initially, then this seems to imply an explosive growth in the longer term.

Thomas R. Malthus already acquired this point of view by the end of the 18th century. In his famous "Essay on the Principle of Population" (first edition in 1789), Malthus argues justly that in time the growth of the population will inevitably slow down, either by an increase of the death rate or by a decrease of the birth rate. On a local scale, migration also plays an important role.

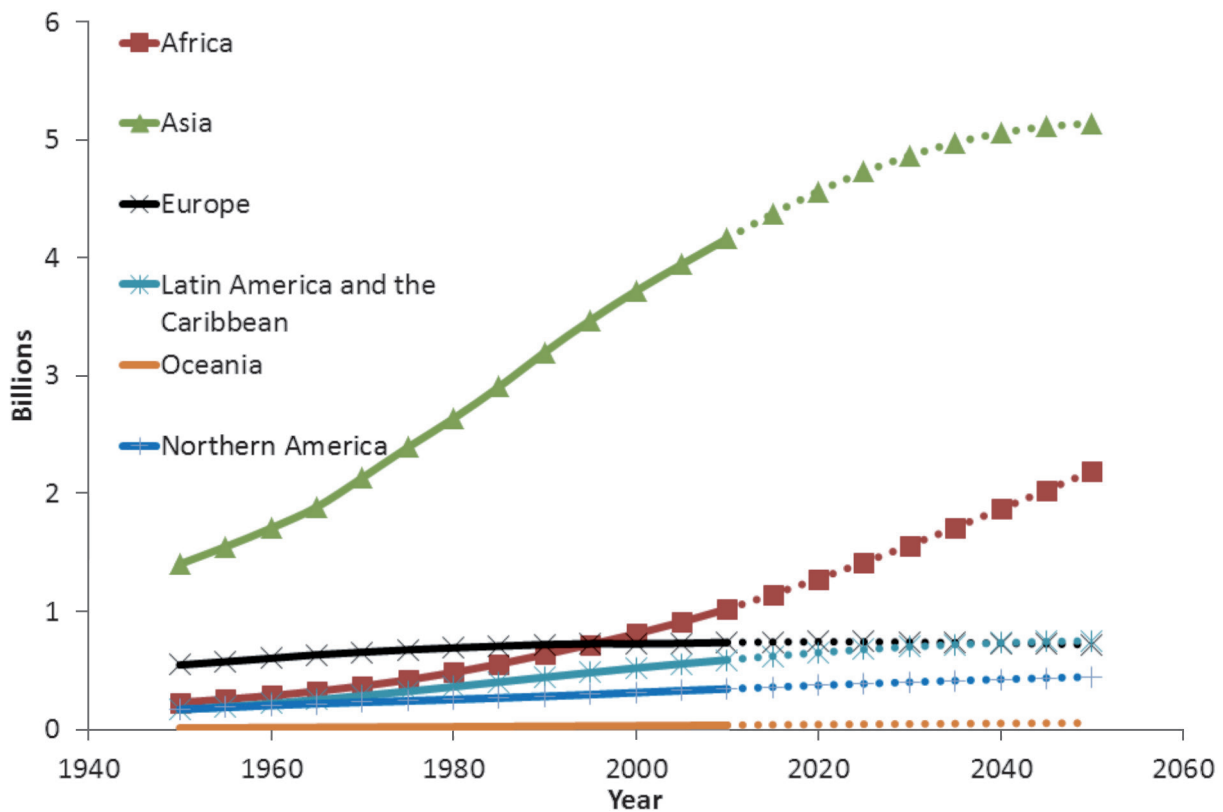
It is no coincidence that Malthus' essay appeared in England at the end of the 18th century. After all,

the population there had started to grow at a historically unseen rate. More specifically the proletariat had grown immensely and that worried the intellectuals and the elite. Year after year, new demographic growth records were recorded.

At the beginning of the 19th century, the number of 1 billion people was exceeded for the first time in history. Subsequently growth accelerated and the number of 2 billion people was already surpassed around 1920. By 1960, another billion had been added, in 40 instead of 120 years time. And it continued to go even faster: 4 billion by 1974, 5 billion by 1987, 6 billion by 1999 and 7 billion in 2011 (Fig. 1).

This will certainly not stop at the current 7 billion. According to the most recent projections by the United Nations, the number of 8 billion will probably be exceeded by 2025, and around 2045 there will be more than 9 billion people¹. The further

(1) Unless otherwise specified, all figures in this paragraph are based on the *United Nations World Population Prospects, the 2012 Revision*, <http://esa.un.org/wpp/>. Concerning projections for the future, I reported the results of the Medium Variant. Apart from this variant, there are also high and low variants (those relying on scenarios implying respectively an extremely high and extremely low growth of the population) and a variant in which the fertility rates are fixed at the current levels. It is expected that the actual number will be somewhere between the highest and lowest variant and will be closest to the medium variant. That's why I only report this latter value.



Source: UN World Population Prospects, the 2012 Revision; the data after 2010, with dotted line in the figure, are Median Variant projections.

Fig. 2. — Evolution of the population size by continent, 1950-2050*

one looks into the future, the more uncertain these figures become, and with demography on a world scale one must always take into account a margin of error of a couple of tens of millions. But according to all plausible scenarios, the number of 9 billion will be exceeded by 2050.

Demographic growth was and is not equally distributed around the globe. The population explosion first occurred on a small scale and with a relatively moderate intensity in Europe and America, more or less between 1750 and 1950. From 1950 on, a much more substantial and intensive population explosion started to take place in Asia, Latin America and Africa (Fig. 2). Asia already represented over 55% of the world population in 1950 with its 1.4 billion citizens and by the year 2010 this had increased to 4.2 billion people or 60%. Of those people, more than 1.3 billion live in China and 1.2 billion in India, together accounting for more than one third of the world population.

In the future, the proportion of Asia will come down and that of Africa will increase. Africa was populated by some 230 million people around 1950, or 9% of the world population. In 2010 there were already more than 1 billion Africans or 15% of the world population. According to UN projections, Africa will continue to grow at a spectacular rate up to

2.2 billion inhabitants in 2050 or 24% of the world population. The proportion of Europe, on the other hand, is evolving in the opposite direction: from 22% of the world population in 1950, over 11% in 2010 to an expected mere 8% in 2050. The population of Latin America has grown and is growing rapidly in absolute terms, but because of the strong growth in Asia and especially Africa, the relative proportion of the Latin American population is hardly increasing (at most from 6 to 8%). The proportion of the population in North America, finally, has decreased slightly from 7 to 5% of the world population.

What these figures mainly come down to in practice is that the population size in especially the poor countries is increasing at an unprecedented rate. At the moment, more than 5.7 billion people, or more than 80% of humanity, are living in what the UN categorise as a developing country. By 2050, that number would – according to the projections – have increased to 8 billion people or 86% of the world population. Within this group of developing countries, the group of least developed countries, the poorest countries so to speak, is growing strongly: from 830 million now, up to an expected 1.7 billion in 2050. This comprises very poor countries such as Somalia, Sudan, Liberia, Niger or Togo in Africa;

Afghanistan, Bangladesh or Myanmar in Asia; and Haiti in the Caribbean.

The growth of the world population goes hand in hand with global urbanisation: while around the year 1950 less than 30% of people lived in the cities, this proportion has increased to more than 50%. It is expected that this proportion will continue to grow to two thirds around 2050. Latin America is the most urbanised continent (84%), closely followed by North America (82%) and at a distance by Europe (73%). The population density has increased intensely especially in the poorest countries: from 9 people per square km in 1950 to 40 people per square km in 2010 (an increase by 330%) in the poorest countries, while this figure in the rich countries increased from 15 to 23 people per square km (a 50% growth). In Belgium, population density is 358 people per square km and in the Netherlands 400 people per square km; in Rwanda this number is 411, in the Palestinian regions 666 and in Bangladesh an astonishing 1050.

Although the world population will continue to grow in absolute figures for some time – a following paragraph will explain why – the growth rate in percentages in all large world regions is decreasing. In the richer countries, the yearly growth rate has already declined to below 0.3%. On a global scale, the yearly growth rate of more than 2% at the peak around 1965 decreased to around 1% now. A further decline to less than 0.5% by 2050 is expected. In the world's poorest countries, the demographic growth is still largest: at present around 2.2%. For these countries, a considerable decrease is expected, but the projected growth rate would not fall below 1.5% before 2050. This means, as mentioned above, a massive growth of the population in absolute figures in the world's poorest countries.

Causes of the explosion: the demographic transition

The cause of, first, the acceleration and, then, the deceleration in population growth is the modern demographic transition: an increasingly growing group of countries has experienced a transition from relatively high to low birth and death rates, or is still in the process of experiencing this. It is this transition that is causing the modern population explosion. Figure 3 is a schematic and strongly simplified representation of the modern demographic transition.

In Europe, the modern demographic transition started to take place in the middle of the 18th century. Until then, years of extremely high death rates were quite frequent. Extremely high crisis mortality could be the consequence of epidemic diseases or

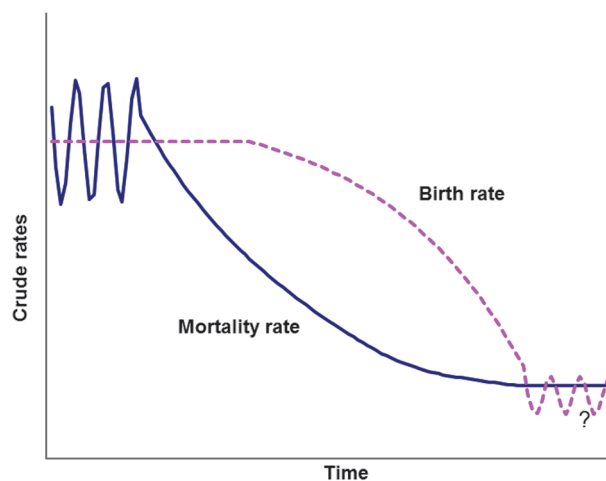


Fig. 3. — Schematic representation of the modern demographic transition.

failed harvests and famine, or a combination of both. As a consequence of better hygiene and a better transportation infrastructure (for one, the canals and roads constructed by Austria in the 18th century), amongst other reasons, crisis mortality became less and less frequent. Later on in the 19th century, child survival began to improve. Vaccination against smallpox for example led to an eradication of the disease, with the last European smallpox pandemic dating from 1871. This way, not only the years of crisis mortality became less frequent, but also the average death rate decreased, from an average 30 deaths per 1000 inhabitants in the beginning of the 19th century to around 15 deaths per 1000 citizens by the beginning of the 20th century. In the meantime, the birth rate however stayed at its previous, high level of 30-35 births per 1000 inhabitants.

The death rate went down but the birth rate still didn't: this caused a large growth in population. It was only near the end of the nineteenth century (a bit earlier in some countries, later in others) that married couples in large numbers started to reduce their number of children. By the middle of the 20th century, the middle class ideal of a two children household had gained enormous popularity and influence. The reaction by the Church, for example in the encyclical *Humanae Vitae* (1968), came much too late to bring this evolution to a halt.

As a consequence of widespread family planning – made even easier in the sixties by modern hormonal contraceptives – the birth rate started declining as well and the population tended back towards zero growth. Nowadays the end of this transition process has been more than achieved in all European countries, because the fertility has been below replacement level for several decades (the replacement level is the fertility level that would in the long

term lead to a birth rate identical to the death rate, if there would be no migration)².

That the population explosion in the developing countries since the second half of the 20th century was so much more intense and massive, is a consequence of the fact that in those countries, the process of demographic transition occurred to a much more extreme extent and on a much larger scale. On the one hand, mortality decreased faster than in Europe. After all, in Europe the decline in mortality was the result of a gradual understanding of the importance of hygiene and afterwards the development of new medical insights. These insights of course already existed at the start of the demographic transitions in Asian, Latin American and African regions, whereby the life expectancy in these regions could grow faster. On the other hand, the total fertility – the average number of children per woman – at the start of the transition was a lot higher in many poor regions than it initially was in Europe. For South Korea, Brasil and the Congo, for example, the total fertility rate shortly after the Second World War (at the start of their demographic transition) is estimated to be 6 children per woman. In Belgium this number was close to 4.5 children per woman by the middle of the nineteenth century. In some developing regions, the fertility and birth rate decreased moderately to very fast, but in other regions this decline took off at an exceptionally sluggish pace – this will be further explained later on. As a consequence of these combinations of factors, in most of these countries the population explosion was much larger than it had been in most European countries.

Scenarios for the future

Nonetheless, the process of demographic transition has reached its second phase in almost all countries in the world, namely the phase of declining fertility and birth rates. In a lot of Asian and Latin American countries, the entire transition has taken place and the fertility level is around or below the replacement level. South Korea for example is currently at 1.2 children per woman and is one of the countries with the lowest fertility levels in the world. In Iran and Brasil the fertility level is currently more or less equal to Belgium's, that is 1.8 to 1.9 children per woman.

Crucial to the future evolution of the population is the further evolution of the birth rate. Scenarios for the future evolution of the size and age of the population differ according to the hypotheses concerning the further evolution of the birth rate. The evolution of the birth rate is in turn dependent on two things: the further evolution of the total fertility

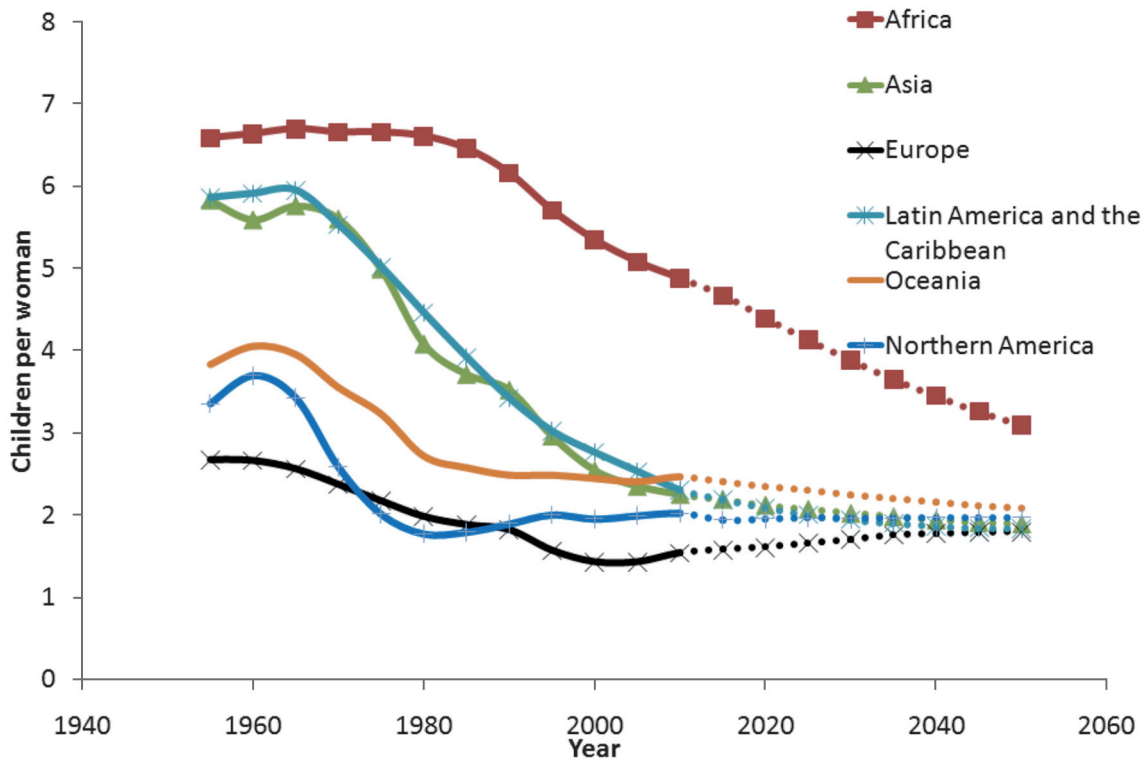
rate (the average number of children per woman) in the first place and population momentum in the second. The latter is a concept I will later on discuss in more detail. The role of the population momentum is usually overlooked in the popular debates, but is of utmost importance in understanding the further evolution of the world population. Population momentum is the reason why we are as good as certain that the world population will continue to grow for a while. The other factor, the evolution of the fertility rate, is much more uncertain but of critical importance in the long term. The rate at which the further growth of the world population can be slowed down is primarily dependent on the extent to which the fertility rates will continue to decline. I will further elaborate on this notion in the next paragraph. After that, I will clarify the notion of population momentum.

Declining fertility

Fertility is going down everywhere in the world, but it's going down particularly slowly in Africa. A further decline remains uncertain there. Figure 4 shows the evolution per world region between 1950 and 2010, plus the projected evolution until 2050. The numbers before 2010 illustrate three things. First of all, on all continents there is a decline going on. Secondly, this decline is not equal everywhere. And thirdly: the differences between the continents remain large in some cases. Asia and Latin America have seen a similar decline in fertility: from 5.9 children per woman in 1950 to 2.5 at the start of the 21st century. Europe and North America had already gone through the largest part of their demographic transition by the 1950's. Their fertility level has been below replacement levels for years. Africa has indeed seen a global decrease of fertility, but the average number of children is still at an alarmingly high level: the fertility merely decreased from 6.7 to 5.1 children per woman.

These continental averages hide a huge underlying diversity in fertility paths. Figure 5 attempts to illustrate this for a number of countries. Firstly let us consider two African countries: the Congo and Niger. As was often the case in Europe in the 19th century, fertility was first on the rise before it started declining. In the Congo this decrease was more extensive, from around 6 children in 1980 to 4 children per woman today, and a further decline to

(2) In demography, the term « fertility » refers to the actual number of live births per women. By contrast, the term fecundity refers to reproductive capacity (irrespective of actual child-bearing), see Habbema et al. (2004).



Source: UN World Population Prospects, the 2012 Revision; the data after 2010, with dotted lines, are medium variant projections.

Fig. 4. — Evolution of the total fertility rate by world region: 1950-2050

just below three is expected in the next thirty years. Niger is the country where the fertility level remains highest: from 7 it first rose to an average of just below 8 children per woman in the middle of the 1980's, before decreasing to just above 6.5 today. For the next decades a decline to 4 children per woman is expected. But that is not at all certain: it is dependent on circumstances that will be further explained in a moment. The demographic transition is after all not a law of nature but the result of human actions and human institutions.

Around 1950, Pakistan and Iran had more or less the same fertility level as Niger, but both countries have seen a considerable decline in the meantime. In Pakistan the level decreased slowly to the current level of 3 children per woman. In Iran the fertility decreased more abruptly, faster and deeper to below the replacement level – Iran today has one of the lowest fertility levels in the world, and a further decline is expected. The Iranian Revolution of 1978 played a crucial role in the history of Iran (Abassi-Shavazi et al., 2009): it brought better education and health care, two essential ingredients for birth control.

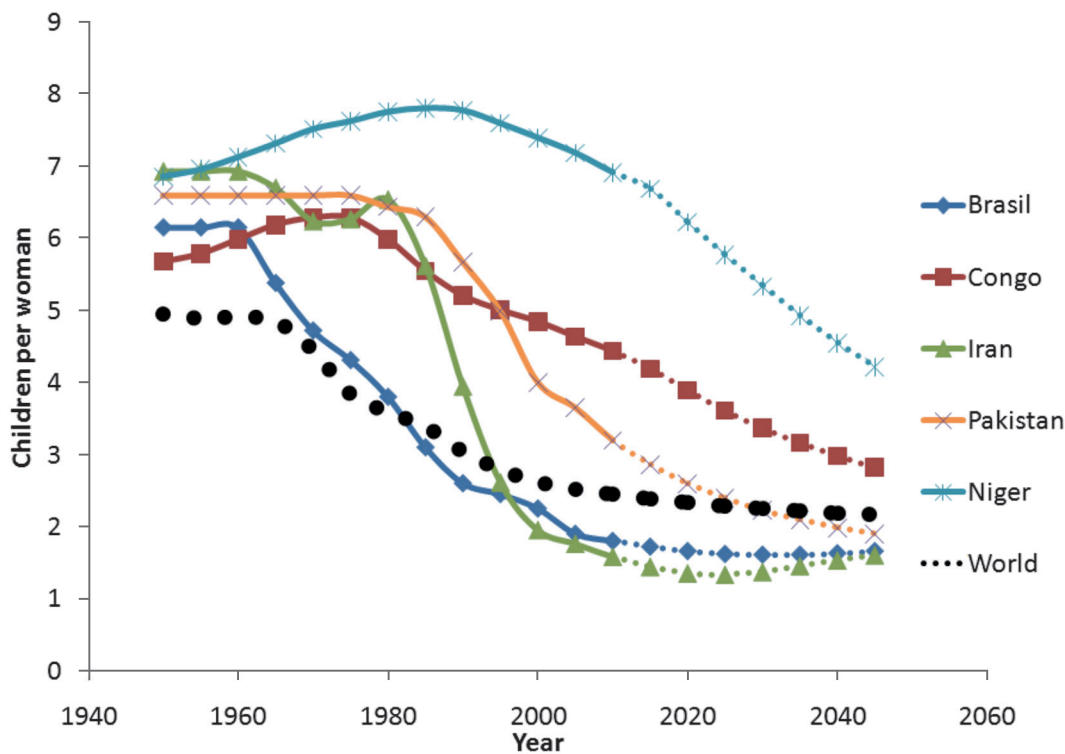
Brasil was also one of the countries with very high fertility in the 1950's – higher than the Congo, for example. The decrease started earlier than in Iran but happened more gradually. Today both

countries have the same total fertility, below the replacement level.

Child mortality, education and family planning

Which factors cause the average number of children to go down? The literature concerning explanations for the decrease in fertility is vast and complex, but two factors emerge as crucial in this process: education and child survival.

Considering child survival first: countries combining intensive birth control with very high child mortality are simply non-existent. The statistical association between the level of child mortality and fertility is very tight and strong: in countries with high child mortality, fertility is high, and vice versa. This statistical correlation is very strong because the causal relation goes in both directions; with quick succession of children and therefore a lot of children to take care of, the chances of survival for the infants are lower than in those families with only a limited number of children to take care of – this is a fortiori the case where infrastructure for health care is lacking. A high fertility level thus contributes to a high child mortality. And in the other direction: where survival chances of children improve, the fertility will go down because even those households with a lower number of children



Source: UN World Population Prospects, the 2012 Revision; the data after 2010, with dotted lines, are medium variant projections.

Fig. 5. — Evolution of the total fertility rate in some countries between 1950 and 2010, and projected evolution until 2050

have increasing confidence in having descendants in the long term.

It is crucial to understand that the decline in child mortality in the demographic transition always precedes the decline in fertility. Men, women and families cannot be convinced of the benefits of birth control if they don't have confidence in the survival chances of their children. Better health care is therefore essential, and a lack of good health care is one of the reasons for a persistently high fertility in a country like Niger.

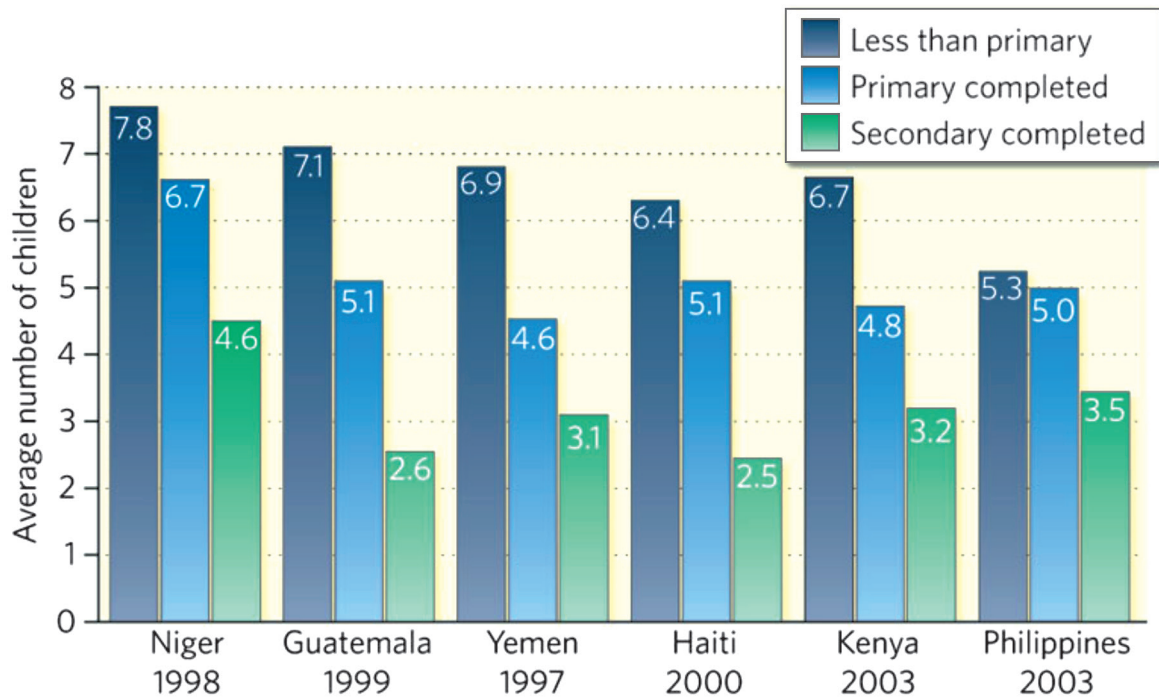
Education is another factor that can cause a decline in fertility. This is probably the most important factor, not just because education is an important humanitarian goal in itself (apart from the demographic effects), but also because with education one can kill two birds with one stone: education causes more birth control but also better child survival (recently clearly demonstrated by Smith-Greenaway (2013), which in its turn will lead to better birth control. The statistical correlation between level of education and level of fertility is therefore very strong.

Firstly, education enhances the motivation for birth control: if parents invest in the education of their children, they will have fewer children, as has been demonstrated. Secondly, education promotes a more forward-looking lifestyle: it will lead people to think on a somewhat longer term, to think about

tomorrow, next week and next month, instead of living for the day. This attitude is necessary for effective birth control. Thirdly, education also increases the potential for effective contraception, because birth control doesn't just happen, especially not when efficient family planning facilities are not or hardly accessible or when there are opposing cultural or family values.

The influence of education on birth control has been demonstrated in a vast number of studies (James et al., 2012). It starts with primary education, but an even larger effect can be attained by investment in secondary education (Cohen, 2008). In a country like Niger, for example, women who didn't finish primary school have on average 7.8 children. Women who did finish primary school have on average 6.7 children, while women who finished secondary school "only" have 4.6 children (Fig. 6). The fertility of Niger would be a lot lower if more women could benefit from education. The tragedy of that country is that too many people fall in the category of those without a degree of primary school, with all its demographic consequences.

One achieves with education therefore a plural beneficial demographic effect on top of the important objective of human emancipation in itself. All this is of course not always true but depends on which form of "education"; I assume that we're talking about education that teaches people the



E. Murphy & D. Carr *Powerful Partners: Adolescent Girls' Education and Delayed Childbearing* (Population Reference Bureau, 2007)

Source: Cohen 2008.

Fig. 6. — Association between level of education and total fertility rate in some poor countries

knowledge and skills to better take control of their own destiny.

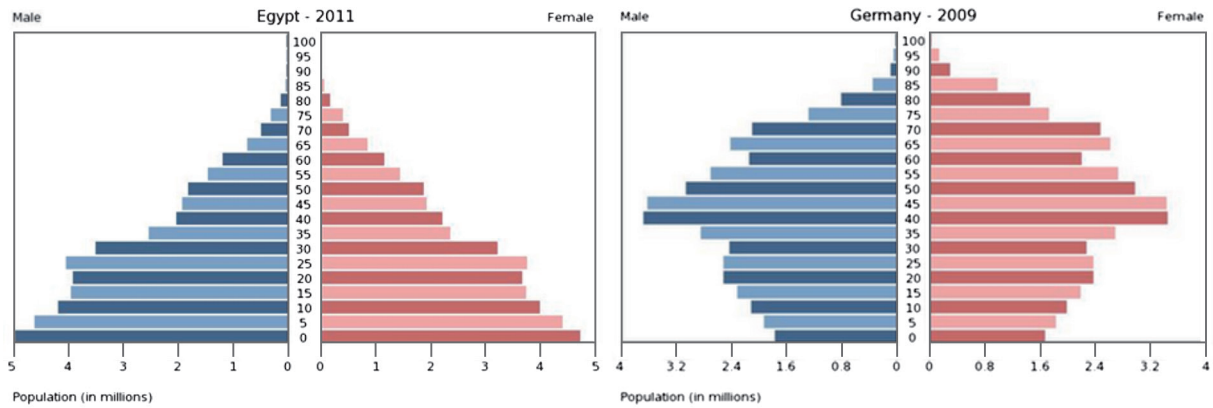
It is one thing to get people motivated to practice birth control but obtaining actual effective contraception is quite another matter. Information concerning the efficient use of contraceptives and increasing the accessibility and affordability of contraceptives can therefore play an important role. There are an estimated 215 million women who would want to have contraception but don't have the means (UNFPA, 2011). Investments in services to help with family planning are absolutely necessary and could already have great results in this group of women. But it's no use to put the cart before the horse: if there is no intention to practice birth control, propaganda for and accessibility of contraception will hardly have any effect, as was demonstrated in the past. In Europe the lion's share of the decline in fertility was realized with traditional methods, before the introduction of hormonal contraception in the sixties. There is often a problem of lack of motivation for birth control on the one hand, as a result of high child mortality and low schooling rates, and a lack of power in women who may be motivated to limit fertility but are confronted with male resistance on the other (Blanc, 2011; Do and Kurimoto, 2012). Empowerment of women

is therefore essential, and education can play an important role in that process as well.

Population momentum

Even if all the people would suddenly practice birth control much more than is currently considered possible, the world population would still continue to grow for a while. This is the consequence of population momentum, a notion that refers to the phenomenon of demographic inertia, comparable to the phenomenon of momentum and inertia in the field of physics. Demographic growth is like a moving train: even when you turn off the engine, the movement will continue for a little while.

The power and direction of population momentum is dependent on the age structure of the population. Compare the population pyramids of Egypt and Germany (Fig. 7). The one for Egypt has a pyramidal shape indeed, but the one for Germany looks more like an onion. As a consequence of high birth rates in the previous decades, the largest groups of Egyptians are to be found below the age of forty; the younger, the more voluminous the generation. Even if the current and future generations of Egyptians would limit their fertility strongly (as is indeed the case), the birth rate in Egypt would still continue to



Source: US Census Bureau, international database.

Fig. 7. — Population pyramids of Egypt (left) and Germany (right)

rise for quite some time, just because year after year more and more potential mothers and fathers reach the fertile ages. Egypt therefore clearly has a growth momentum.

Germany on the other hand has a negative or shrinking momentum: even if the younger generations of Germans would have a larger number of children than the generation of their own parents, the birth rate in Germany would still continue to decrease because fewer and fewer potential mothers and fathers reach the fertile ages.

The population momentum on a global scale is positive: even if fertility would decrease overnight to the replacement level, the world population would continue to grow with 40% (from 7 billion to 9.8 billion). Only the rich countries have a shrinking momentum, that is -3%. For Europe the momentum is -7%. The population momentum for the poorest countries in the world is +44%, that of Sub Saharan Africa +46% (Espenshade et al., 2011).

Consequences of the population explosion

The concerns about the consequences of population explosion started in the sixties. Milestone publications were the 1968 book *The Population bomb* by biologist Paul Ehrlich, the report of the Club of Rome from 1972 (*The Limits to Growth*) and the first *World Population Plan of Action* of the UN in 1974 among others.

In the world population debate, the general concerns involve mainly three interconnected consequences of the population explosion: 1) the growing poverty in the world and famine; 2) the exhaustion and pollution of natural resources essential to human survival; and 3) the migration pressure from the poor South to the rich North (Van Bavel, 2004).

Poverty and famine

The Malthusian line of thought continues to leave an important mark on the debate regarding the association between population growth and poverty: Malthus saw an excessive population growth as an important cause of poverty and famine. Rightfully this Malthusian vision has been criticized a lot. One must after all take the reverse causal relation into account as well: poverty and the related social circumstances (like a lack of education and good health care for children) contribute to high population growth as well.

Concerning famine: the production of food has grown faster since 1960 than the world population has, so nowadays the amount of food produced per person exceeds that which existed before the population explosion (Lam, 2011). The problem of famine isn't as much an insufficient food production as it is a lack of fair distribution (and a lack of sustainable production, but that's another issue). Often regions with famine have ecological conditions permitting sufficient production of food, provided the necessary investments in human resources and technology are made. The most important cause of famine is therefore not the population explosion. Famine is primarily a consequence of unequal distribution of food, which in turn is caused by social-economic inequality, lack of democracy and (civil) war.

Poverty and famine usually have mainly political and institutional causes, not demographic ones. The Malthusian vision, that sees the population explosion as the root of all evil, therefore has to be corrected (Fig. 8). Rapid population growth can indeed hinder economical development and can thus pave the way for poverty. But this is only part of the



Fig. 8. — Connections between social factors, poverty and population growth.

story. As mentioned, poverty is also an underlying cause of rapid population growth. Social factors are at the base of both poverty and population growth. It's those social factors that require our intervention: via investments in education and (reproductive) health care.

Impact on the environment

The impact of the population explosion on the environment is unquestionably high, but the size of the population represents only one aspect of this. In this regard it can be useful to keep in mind the simple I=PAT scheme: the ecological footprint or impact on the environment (I) can be regarded as the product of the size of the population (P), the prosperity or consumption level (A for affluence) and the technology used (T). The relationship between each of these factors is more complex than the I=PAT scheme suggests, but in any case the footprint I of a population of 1000 people is for example dependent on how many of those people drive a car instead of a bike, and of the emission per car of the vehicle fleet concerned.

The ecological footprint of the world population has increased tremendously the past decades and the growth of the world population has obviously played an important role in this. The other factors in the I=PAT scheme have however played a relatively bigger role than the demographic factor P. The considerable increase in the Chinese ecological footprint of the past decades for example, is more a consequence of the increased consumption of meat than of population growth (Peters et al., 2007; Liu et al., 2008). The carbon dioxide emission of China grew by 82% between 1990 and 2003, while the population only increased by 11% in that same period. A similar story exists for India: the population grew by less than 23% between 1990 and 2003, while the emission of carbon dioxide increased by more than 83% (Chakravarty et al., 2009). The consumption of water and meat in the world is increasing more rapidly than the population³. The consumption of water per person is for example threefold higher in the US than in China (Hoekstra and Chapagain, 2007). The African continent has at present the same number of inhabitants as Europe

and North America together, over 1 billion. But the total ecological footprint of Europeans and Americans is many times higher than that of Africans (Ewing et al., 2010). Less than 18% of the world population is responsible for over 50% of the global carbon dioxide emission (Chakravarty et al., 2009).

If we are therefore concerned about the impact of the world population on the environment, we can do something about it immediately by tackling our own overconsumption: it's something we can control and it has an immediate effect. In contrast, we know of the population growth that it will continue for some time anyhow, even if people in poor countries would practice much more birth control than we consider possible at present.

Migration

The population explosion has created an increasing migration pressure from the South to the North – and there is also important migration within and between countries in the South. But here as well the message is: the main responsibility doesn't lie with the population growth but with economic inequality. The primary motive for migration was and is economic disparity: people migrate from regions with no or badly paid labour and a low standard of living to other regions, where one hopes to find work and a higher standard of living (Massey et al., 1993; Hooghe et al., 2008; IMO, 2013). Given the permanent population growth and economical inequality, a further increasing migration pressure is to be expected, irrespective of the national policies adopted.

It is sometimes expected that economic growth and increasing incomes in the South will slow down the migration pressure, but that remains to be seen. After all, it isn't usually the poorest citizens in developing countries that migrate to rich countries. It is rather the affluent middle class in poor countries that have the means to send their sons and daughters to the North – an investment that can raise a lot of money via remittances to the families in the country of origin (IMO, 2013). There is after all a considerable cost attached to migration, in terms of money and human capital. Not everyone can bear those costs: to migrate you need brains, guts and money. With growing economic development in poor countries, an initial increase in migration pressure from those countries would be expected; the association between social-economic development

(3) See <http://www.unwater.org/water-cooperation-2013/water-cooperation/facts-and-figures/>

and emigration is not linearly negative but follows the shape of a J turned upside down: more emigration at the start of economic development and a decline in emigration only with further development (De Haas, 2007).

7 Billion and counting... What is to be done?

A world population that needed some millennia before reaching the number of 1 billion people, but then added some billions more after 1920 in less than a century: the social, cultural, economic and ecological consequences of such an evolution are so complex that they can lead to fear and indifference at the same time. What kind of constructive reaction is possible and productive in view of such an enormous issue?

First of all: we need to invest in education and health care in Africa and elsewhere, not just as a humanitarian target per se but also because it will encourage the spread of birth control. Secondly, we need to encourage and support the empowerment of women, not just via education but also via services for reproductive health. This has triple desirable results for demographics: it will lead to more and more effective birth control, which in itself has a positive effect on the survival of children, which in turn again facilitates birth control.

Thirdly: because of the positive population momentum, the world population will certainly continue to grow in absolute figures, even though the yearly growth rate in percentages is already on the decline for several years. The biggest contribution we could make therefore, with an immediate favourable impact for ourselves and the rest of the world, is to change our consumption pattern and deal with the structural overconsumption of the world's richest countries.

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