Chapter 13
Population Issues and Solutions

Richard Grossman

Introduction

Our human species is pretty amazing. We have spread over most of the planet and changed much of Earth in order to support us. However, there are costs to our conquering the planet and to our technology. We are using up resources such as petroleum and metals. In addition, we are polluting with wastes such as the carbon dioxide produced from burning fossil fuels. Much of nature and many people are suffering because of human overconsumption. Our mark on the natural world is likely to become more and more severe as time goes on. Indeed, all the environmental indicators show this to be the case (see Chap. 4 by Washington in this volume). There is injustice in what we are doing to the planet—and injustice in what we are also doing to our fellow human beings. How can we make the world more just? Although there are many possible actions that can help, this chapter will concentrate on one—voluntary limitation of human fertility.

Why Should We Be Concerned About Human Population?

This chapter will touch on a number of questions about how humans fit into the natural environment. The questions are:

- What does human population have to do with social and ecological justice?
- How are populations of humans measured and what measures are helpful to understand?
- Are small families good?
- How can a woman avoid pregnancy until she plans to be a mother?

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- Can family planning help protect the environment?
- What are the best solutions to slowing population growth, and thus promoting social and ecological justice?

Washington (Chap. 4 in this volume) has already outlined the Ecological Footprint concept, including how it would take 1.7 Earths to support the way people are using resources (GFN 2018). I would like to stress one of the limitations of the Ecological Footprint (which Washington also mentions), which does not take into account resources for *nonhuman* species. Therefore, if we humans use more resources than the planet has to offer, there is injustice to all the other animals and plants we share this world with. Washington also cites two other measures of our impact, the Living Planet Index of WWF and the Planetary Boundaries concept. All these measures agree: humans have overwhelmed planet Earth.

There is another way of looking at the impact we have on the planet. We need to remember the equation: **I**mpact = **P**opulation × **A**ffluence × **T**echnology (Holdren and Ehrlich 1974). This means the environmental impact is determined by: the number of people times their consumption times the type of technology they use (which may increase or decrease impact). How can we reduce our impact? It is not fair for our current generation of people to use more than our share of the wealth of the planet. The I = PAT formula shows that both the number of people and the affluence (or consumption) of each person are important.

We are surrounded by advertisements that try to get us to consume more, not less. Therefore, trying to get people to reduce their consumption is difficult (Assadourian 2013). While it is important to reduce the **A** (affluence, or consumption) in the formula I = PAT, it is also essential that we reduce the **P**, population (as well as move to technology that reduces impact). Despite the declining Total Fertility Rates (TFRs), population momentum will cause global population to rise to 9.8 billion by 2050 and 11.2 billion by 2100 (UNDESA 2017). Awareness of this problem will allow us to decrease this projected growth. Given that we are already in 'overshoot' (i.e. beyond our ecologically sustainable population, Washington 2015a) with a world population approaching 7.6 billion, this predicted increase poses grave risks for nature conservation (Crist et al. 2017). However, effective, non-coercive strategies *can* stabilise, then reduce, world population. These are discussed at the end of this chapter.

How Human Overpopulation Decreases Social and Ecological Justice

I would argue that a just society (in purely human terms) is one in which every human has a just share of wealth, opportunities and privileges. This does not necessarily mean that every person has an equal share of these resources, but the share should be sufficient for a safe and healthy life. By analogy, I would argue that a 'just environment' is one which provides a just share to all organisms, of whatever

phylum. This share should be sufficient for every organism to exist and to reproduce relatively unmolested. Of course, the carnivores will prey on and eat the herbivores! However, in a just environment no one species will endanger the livelihood of all species with nuclear weapons or with polluting chemicals such as DDT. As argued in Chap. 1, social and ecological justice should be intertwined to a large extent, because we all share the limited resources of the planet. Furthermore, promoting justice for humans may interfere with justice for nonhuman species, and vice versa.

How Are Populations of Humans Measured and What Measures Are Helpful to Understand?

No other species of animal lives across such broad geography, nor is as mobile as we humans. Population estimates show a relatively small number of us until about a thousand years ago. There was slow growth up until the middle of the 18th century, than the rate of growth accelerated (Fig. 13.1). Many factors contributed to this increase in our numbers, including better hygiene, improved medical care and increased food production (Bongaarts and O'Neill 2018). Demographers study human populations, why they grow and why they move from place to place (McFalls 2007). More information about current and projected population, where growth is happening and many other demographic subjects can be found at the United Nations Population Fund website (UNFPA 2018).

Most countries have a census every few years. This is a way of keeping track of the number of people in a given part of the country. A census usually includes other information, such as the ages of people, the number of children they have, their ethnicity, their education. A census also tracks migration—where people lived before the census—to know how people are moving around.

Demographers refer to "rates"—for instance, the "birth rate" is the number of live births per 1000 people and the "mortality rate" is the number of deaths per 1000 people. Often these numbers are broken down to cover just a portion of the population. For instance, the "infant mortality rate" is the number of children who die at less than 1 year of age per 1000 live births. The "under 5 mortality rate" is the number of children who die before age 5 years per 1000 live births. It is important to pay attention not only to what is being measured (the numerator) but also to what that is being compared to (the denominator). For instance, the denominator is different in the mortality rate and the infant mortality rate. Also notice that all these measures assume a given geographic place, and that the time interval is a year.

Population pyramids are a quick way of visualizing the age structure of a group of people as Fig. 13.2 shows. Males are on one side and females on the other. Each horizontal bar represents an age range—usually 5 or 10 years. The number of people in each age range is shown by the length of the bar. You can see that the shapes of the three pyramids below (Figs. 13.2, 13.3 and 13.4) are very different. The Central African Republic (Fig. 13.3) has a large number of children, meaning that
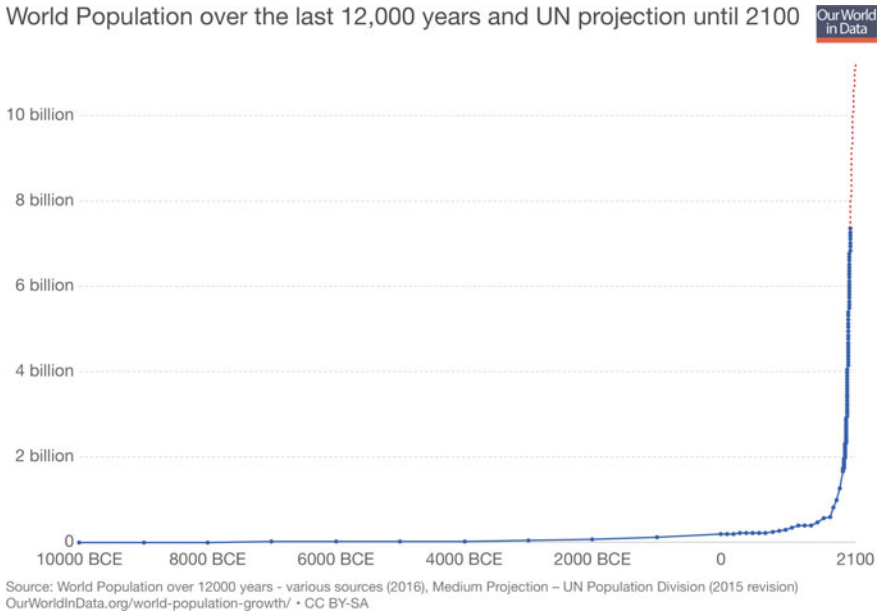
World Population over the last 12,000 years and UN projection until 2100

Source: World Population over 12000 years - various sources (2016), Medium Projection – UN Population Division (2015 revision)
OurWorldInData.org/world-population-growth/ • CC BY-SA

Fig. 13.1 World population growth. *Source* https://ourworldindata.org/world-population-growth

its population is growing rapidly. The pyramid for the whole world is narrower (Fig. 13.2), which is typical for a population that is growing slowly. Notice that the base of the Swiss pyramid (Fig. 13.4) is narrower than its middle; its population is growing slowly or perhaps even decreasing. The bar with the most people is the 50–54 age range—already out of the child-bearing years. As time goes on and those people age and some die, the bar for that age cohort will get shorter. In the world population pyramid, however, the longest bar (except for children) is the 25–29 year olds. These people are still in their reproductive years and so we can expect that they will have more children—and the world population will continue to grow.

There are two measures to get an idea of how rapidly a population is changing—the birth rate and the Total Fertility Rate (TFR) (McFalls 2007). The birth rate is the number of live births per 1000 people. The TFR is the average number of children a woman will have during her lifetime. I prefer the TFR because it is easy to compare with the number that is required to have a steady population (with no growth and no decrease). Of course, neither of these measures looks at the death rate, which also helps determine the rate of change.

The TFR for a stable population size (neither growth nor shrinkage) is about 2.1 (McFalls 2007). This is true in a country with good health care. It takes one child to replace the mother and one child to replace the father. Unfortunately, some children will die before they reproduce; this accounts for the fraction in the stable population TFR figure. As a country's growth slows, the number of people will continue increasing for decades even after the TFR declines to 2.1, however. This
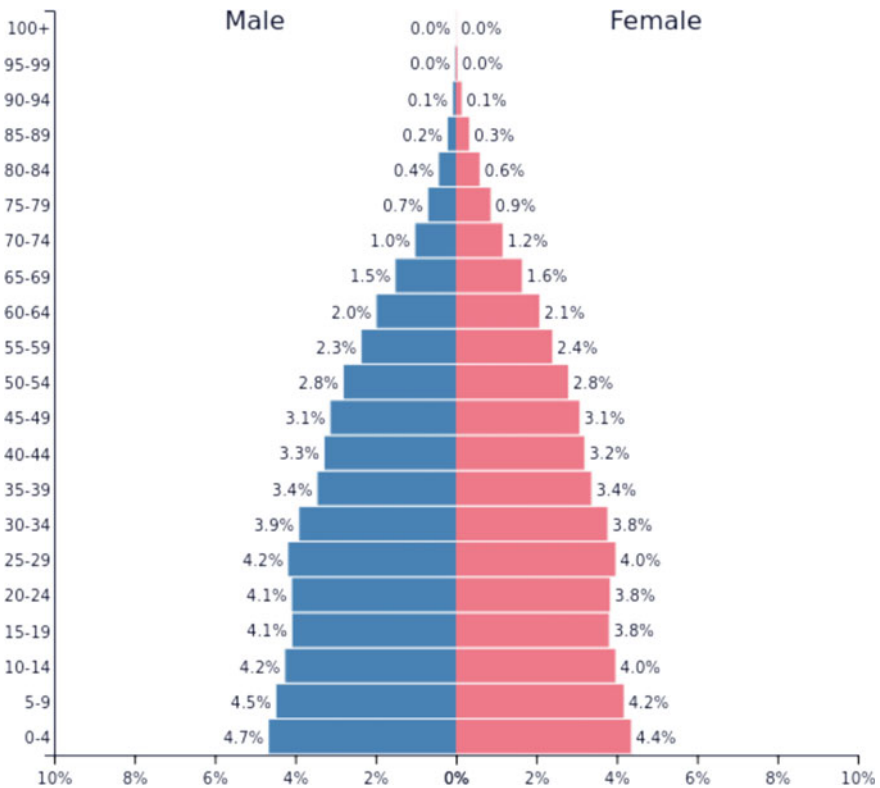
Fig. 13.2 World population pyramid. *Source* www.populationpyramid.net/ used with permission

is because there are already a large number of children who will become parents as time goes on. This is called "population momentum" (Ibid).

Many countries historically had a period of slow growth, then rapid growth and more recently slow growth again. The term "demographic transition" can help understand these changes. The slow increase is usually attributed to high death rates—especially of infants and children. Then, with better sanitation, improved agriculture and health care, the death rates fell—this is Stage 2 in Fig. 13.5 (McFalls 2007). Gradually, people realize that they don't need to have such large families, so they start to limit the number of children who are born—Stage 3 (Fig. 13.5). The population continues to increase, but more slowly. Then in Stage 4 the birth rate and the death rate are about the same and the population is steady—but much larger than previously (Fig. 13.5). Stage 5 of the demographic transition (Fig. 13.5) is already happening in some parts of the world. People are having smaller families (PRB 2018), and more women are choosing to not bear any children (Blackstone 2014).

The demographic transition is a model that helps to explain what was observed to happen with population over several centuries in England and some parts of Western Europe (McFalls 2007). It took about two centuries for this change to happen in
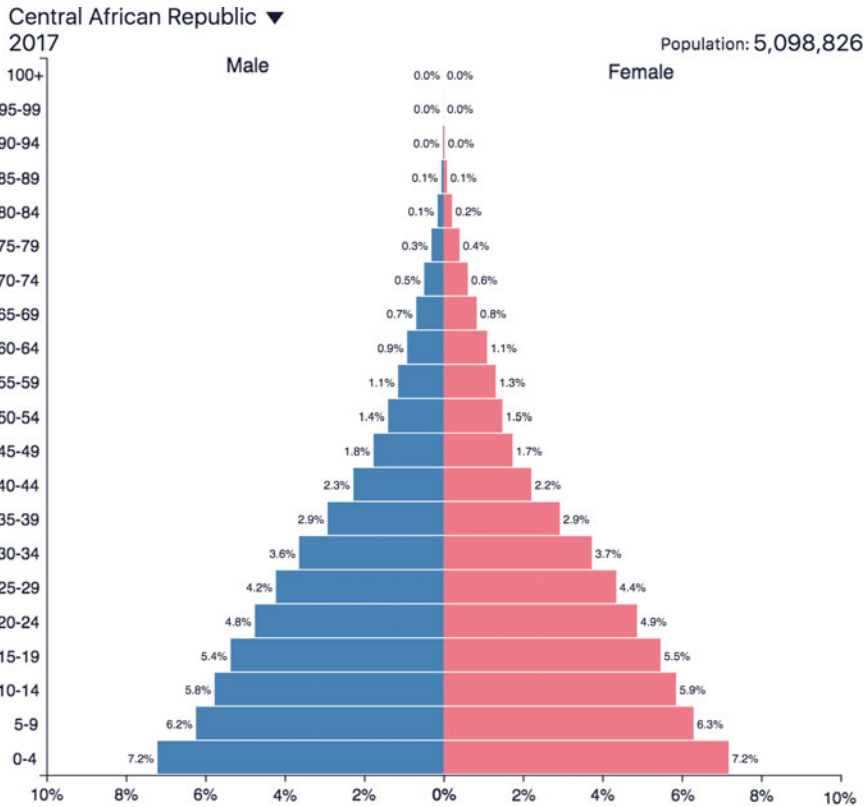
Fig. 13.3 Central African Republic population pyramid. *Source* www.populationpyramid.net/ used with permission

these areas, starting with the Industrial Revolution in the mid-1700 s (Ibid.). In other places the demographic transition occurred later, or is still happening. For instance, the Diné (Navajo) society in the USA started late, and progressed rapidly. Many Diné went through stages 1–4 in the 20th century; in some cases, in just one or two generations (McCloskey 1993).

Keeping track of large numbers of people is pretty difficult if they stay in one place, but people tend to be mobile. That is especially true now, when people move around for work or for safety or for recreation. This makes demographers' jobs more difficult, but it is important to keep track of the migrations of people. There is one relatively new type of migration that is worth noting. Climate change has caused people to leave their homes because of sea level rise and desertification. An example is people who live on islands in the Pacific Ocean, such as the Marshall Islands (Constable 2016). Even though the Marshallese have done very little to cause climate change (and thus the sea level to rise), they are unfairly affected by it.
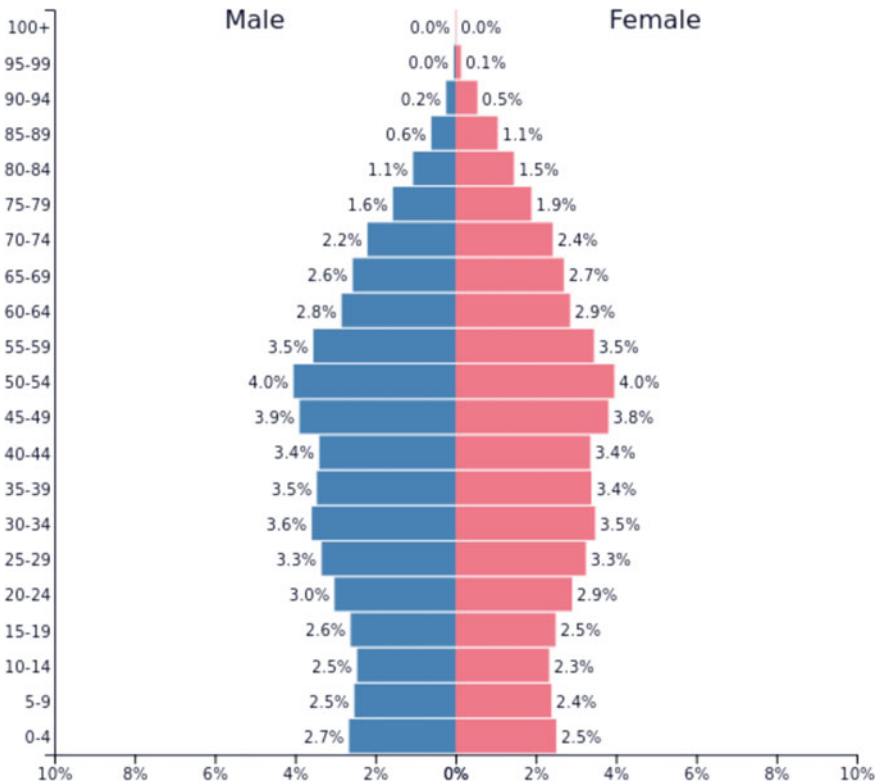
Fig. 13.4 Switzerland population pyramid. *Source* www.populationpyramid.net/ used with permission

Four Asian countries (South Korea, Singapore, Hong Kong and Taiwan) went through the demographic transition starting in the latter half of the 20th century. They did this rapidly and arguably enjoyed an economic benefit that is partly due to the change in demography (Bloom and Finlay 2009). These countries are sometimes called the "Asian Tigers" because of their strong economies. Although there are many factors that helped their rapid economic growth, one reason is that they concentrated on education. This has had the additional benefit of empowering people to limit family size (Lam and Duryea 1999). These four countries also had the advantage of a high proportion of people in the economically productive age range. The "Asian Tigers" are examples of the beneficial effect of what has been called the "demographic dividend". Other countries have also benefitted from decreasing population growth rates, although to a lesser extent (UNFPA 2018).
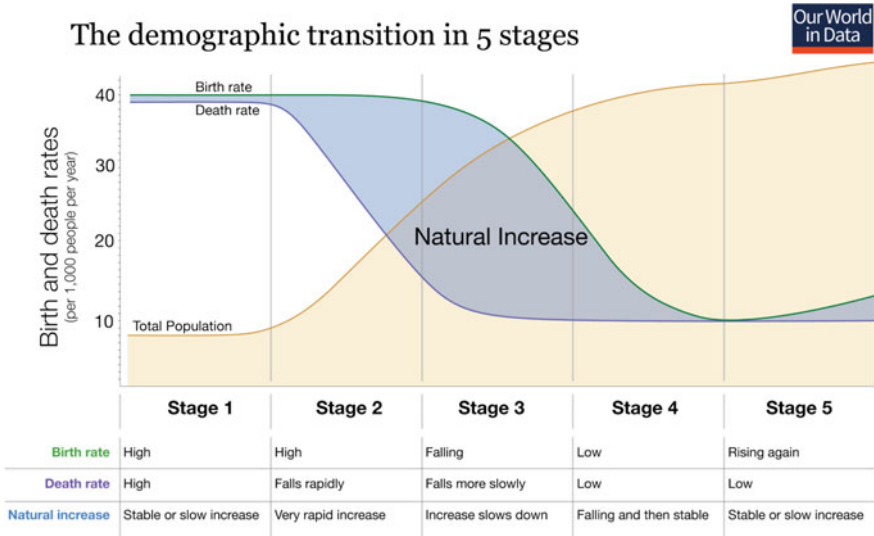
Fig. 13.5 The 5 stages of demographic transition. *Source* https://ourworldindata.org/world-population-growth (see above)

Are Small Families Good?

In the past, many children died, so it was necessary to give birth to many babies just so just a few might survive to adulthood. In addition, children were important to help with farming and housework—but that need has changed. There are now over 100 nations with the TFR at or less than replacement (2.1 children per woman) (CIA 2017). Mexico is a good example, 50 years ago women had an average of about 7 children, (UNDESA 2009) but now the average is 2.2—barely above replacement (PRB 2018).

A small family is good all around—it is better for the parents and for the child or children—and especially for the planet (McKibben 1998; Grossman 2012). The long-term benefits of family size have been worked out for climate change, however these findings might arguably be generalized for other environmental issues. This was well demonstrated by Travis Rieder (2016) who examines the ethics of having children in the era of climate change. It is based on calculations that the "carbon legacy" of an individual is much greater than the carbon that a person emits during their lifetime (Murtaugh and Schlax 2009). This is because most children grow up to have their own children, and so on, all emitting while parents are still alive and after. Indeed Murtaugh and Schlax (2009) estimate that a women's carbon legacy under current conditions in the US is 5.7 times her lifetime emissions. Were she to have fewer children, then her carbon legacy would drop.

The importance of family size choices to climate change was pointed out by Wynes and Nicholas (2017). They found that the most frequent recommendations of

individual lifestyle choices to reduce carbon emissions were actions such as recycling and changing lightbulbs. Unfortunately, these actions are relatively ineffective (Ibid). Wynes and Nicholas (2017) found that three actions are significantly more effective, although less frequently recommended. These three are: (1) living car-free; (2) avoiding long-haul airplane travel; and (3) eating a plant-based diet. Furthermore, the *highest* impact action an individual can take is almost never recommended, even though it is more than ten times as effective as the three 'more effective' actions combined. The highest impact action they note is to have *one fewer child* (Ibid).

In most parts of the world couples are choosing to have fewer children (PRB 2018). There are many different answers as to why, depending on what culture is asked. In the past people raised much of their own food and kids helped with the work—both inside and outside the home. Children were much more likely to die before adulthood. Birth control was mainly used by the elite, and was not very reliable, but now effective contraception is available to all in many parts of the world. Children are expensive: estimates of the cost of raising a child in the USA to age 18 are about $250,000 (USDA 2018). Children in large families with limited finances often have to do without certain resources, while a child in a smaller family can often take advantage of more. Some parents have recognized the struggle of finding time and money for each child, and have chosen to have fewer children (Miller 2018). These are reasons for the decrease in family size—and there are others, too.

Some people have environmental concerns when they consider raising a child. There are two sorts of concerns—the first is that the child would be affected by the contaminants in the environment (Steingraber 2003). The second is that increasing the human population will also increase greenhouse gas emissions and contribute to climate change (Rieder 2016). Although there is strong social pressure in most societies for women to become mothers, that is changing. More women are ending their reproductive careers without having a child than previously (USCB 2018). There is also a trend for women to wait until their 30 s or later to start a family (McFalls 2007). Now that it is possible to have sex without pregnancy, some couples are making a conscious choice to be child-free. There is some evidence that child-free people are actually happier than those who parent (Glass et al. 2016).

There are advantages of small family size for the child/children. For years it was assumed that large families were good for children. People thought that by growing up with brothers and sisters would make a child better equipped to deal with life in the real world, and that single children suffered from the lack of interaction with siblings. In his book 'Maybe One' Bill McKibben (1998) looked at the value of large families. His conclusion was that single children are actually more likely to succeed in the world. He finds that single kids are not spoiled, weird, selfish, or asocial, but do well in society. McKibben also traces myths about single children to a psychologist who liked large families and injected his prejudices into the ethos of the United States (Ibid). Single children and children from small families, are more likely to get the attention they crave, while growing up including health care and education (Ibid). Arguably, this is especially true in cultures that have very limited resources such as developing countries, and poor neighborhoods in rich countries such as the USA.

How Can a Woman Avoid Pregnancy Until She Plans to Be a Mother?

One of the greatest public health advances of the 20th century was the development of effective contraception (CDC 1999). The availability of reliable contraception has led to huge changes in society, and especially to improving the lives of women (USAID 2017). Reliable contraception has allowed people to have much better control over their fertility, and to have sexual intercourse with less fear of an unwanted pregnancy. There are many good sources of information about family planning; one of the best is Planned Parenthood (www.plannedparenthood.org). Personal knowledge of birth control methods is important to prevent unplanned pregnancies. Especially important is knowledge of Emergency Contraception (EC) (which can be used after unprotected intercourse, such as in case of rape) and Long Acting Reversible Contraception (LARC). However, neither EC nor LARCs provide protection against reproductive infections, including HIV. Both male and female condoms provide some protection against these infections.

There are several types of EC, both hormonal and IUDs. Most common is a tablet of 'levonorgestrel', which is reported to be so safe that it is usually available without a prescription (WHO 2018). It is about 90% effective, but works best if taken within 12 h of unprotected intercourse (Ibid). An IUD containing copper is the most effective EC, but has the disadvantage that it requires a visit to a health care provider. Its effectiveness lasts for up to 5 days after unprotected sex. Another advantage of the IUD is that it can give many years of excellent protection against pregnancy (Curtis and Peipert 2017; WHO 2018).

Long Acting Reversible Contraceptives (LARCs) are in two categories: IUDs and implants. IUDs fit inside a woman's uterus and can last 3–10 years or longer. Implants are small, flexible plastic rods that are filled with a hormone that are inserted under the skin of a woman's arm. The hormone lasts for 3 years or longer.

Studies have shown that children who come from unplanned, unwanted pregnancies do not succeed as well in life as if they were wanted (David 1988, 1992). If an abortion was requested but denied, the children who resulted from unplanned pregnancies did not do well in school, were more disruptive and were more likely to have criminal records than a matched control group (Ibid). When they were in their 20 s these people were less happy with their lives than people in the control group. These studies point out the importance of effective family planning programs and the injustice of forcing people to become parents against their will (Ibid).

Can Family Planning Help Protect the Environment?

The natural world will benefit from reduced human population growth via family planning—at least this is one of the goals of Population, Health and Environmental (PHE) programs (Engelman et al. 2016). PHE programs are located where there are

high concentrations of biodiversity and also high concentrations of people (Ibid). Blue Ventures (2018) is a not-for-profit organization that carries out PHE programs. In a coastal community in southwest Madagascar, fishermen and Blue Ventures staff both observed that the octopus catch had decreased markedly. Blue Ventures suggested that a closure of the fishery might restore the catch, and the fisher community were willing to try. A seven month closure was very successful in increasing the catch (Oliver et al. 2015). Following the lead, surrounding communities have started periodic closures.

Blue Ventures (2018) expanded their horizons by meeting the need for primary health care with clinical services. They also provide public health services, including family planning. In all of Madagascar only a third of women use a modern method of contraception, but in 2007 just one in ten women was using reliable contraception where Blue Ventures worked. Many more women are using contraception now and the program: "…between August 2007 and July 2013 is estimated to have averted a total of 804 unintended pregnancies among a population of approximately 15,000 people" (Robson and Rakotozafy 2015: 10).

Can PHE programs actually help protect nature? A project of the Worldwatch Institute is evaluating their effectiveness (Engelman et al. 2016). Their primary research question is: "Does evidence support the claim that the practice of voluntary family planning promotes environmental benefits and helps lead to an environmentally sustainable world that meets human needs?" (Ibid: 1). The report concludes they cannot absolutely confirm the hypothesis. However, Engelman et al. (2016: 1) argue: "The preponderance of evidence from the papers reviewed nonetheless supports it, with little refutation". There are thus some grounds to argue that family planning is effective not only in promoting ecological justice, but also in promoting social justice.

What Are the Best Solutions to Slowing Population Growth, and Thus Promoting Social and Ecological Justice?

Engelman (2016) has suggested nine strategies to slow population growth). Importantly, these are all humane, non-coercive and voluntary. I have added material in support of these points. After Engelman's nine, I have added three more of my own—making an even dozen solutions:

1. **Assure access to contraceptives and family planning**. Although most women in developed countries have access to reliable contraception, it is estimated that over 200 million women worldwide lack this access (Guttmacher Institute 2018). Family Planning 2020 (FP2020 2018: 1) argues for: "…a global partnership that supports the rights of women and girls to decide, freely, and for themselves, whether, when, and how many children they want to have". Its hope is to reach 120 million women and girls with voluntary family planning in 69 of the world's poorest countries.

2. **Guarantee education through secondary school for all (with particular focus on girls)**. If a girl is in school she is less likely to be married, thus delaying her sexual debut. When she leaves school she is more likely to be able to take care of her children, so they will be healthier and less like to die (see point 11 below). Perhaps most important is that education increases women's autonomy. Women who feel empowered are more likely to recognize the advantages of smaller families and also be better able to access contraception (Lam and Duryea 1999).

3. **Offer age-appropriate sexuality education for all**. In many societies children and adolescents are not taught about sexuality, and are less able to protect themselves against abuse, disease and pregnancy. Some states in the USA don't allow sexuality education that teaches contraception, but only teach young people to abstain from sex until marriage (Breuner and Mattson 2016). Unfortunately, 'abstinence only' education is not successful, and the pregnancy and sexually transmitted infection rates in these areas may be high (Ibid). Sexuality education curricula that are more inclusive have been shown to reduce the risks of adolescent pregnancy, HIV and infections for children and adolescents (Ibid).

4. **Eradicate gender bias from laws, economic opportunity, health and culture**. Bias in favor of males is common throughout the world. Starting with the fetus, abortion for sex selection is not uncommon in countries such as India and China. Femicide starts with selective abortion and progresses to the killing of newborn girls (and of women) because of their gender (Garcia-Moreno et al. 2012). Events in several countries have shown that it is possible to decrease gender bias; South Korea is an example (Kim 1994). Another example is Rwanda, where 61% of seats in the National Parliament are held by women—the highest percentage in the world (World Bank 2018). This country has a strong, effective family planning program. (RoR 2012).

5. **End all policies that reward parents financially based on their number of children**. It is unclear that rewarding parents for having children has actually increased birth rates significantly (Engelman 2016). However, it makes sense to eliminate these policies as they send precisely the wrong message.

6. **Integrate teaching about population, environment and development into all school curricula**. Although schools are teaching some about environmental issues, few curricula mention the most important issue—our growing human population (Wynes and Nicholas 2017). Fortunately, there are curricula already available for schools and colleges to use (Population Education 2018).

7. **Put full pricing on environment costs and impacts**. Most products and services have externalities that are not considered in determining their price. Air pollution from burning coal to generate electricity is an example (Haswell and Washington 2014). The risk of respiratory disease is known to be increased by this pollution, but the price of the electricity does not reflect the cost of healthcare for those who suffer from the pollution (Ibid; Gies 2017).

8. **Adjust to population aging, rather than trying to delay it through government programs aimed at boosting birth rates**. Some countries have tried to deal with population aging by encouraging immigration of workers. Unfortunately, more babies and more working-age immigrants only offer short-term solutions,

since these people will eventually age, requiring a new supply of babies and immigrants. Taking advantage of the fact that people are living longer and can work later in life is a better way of dealing with aging (Sanderson and Scherbov 2010). Norway is an example of a country that is changing its retirement policy to reward workers who work later in life (Farrell 2016)

9. **Convince leaders to commit to ending population growth through the exercise of human rights and human development**. For example, the official policy of the USA includes this wording: "The goal of U.S. international population policy is to promote healthy and educated populations by supporting reproductive health and rights, voluntary family planning, women's empowerment, development, and efforts to combat HIV/AIDS. The U.S. does not endorse population 'stabilization' or 'control'. The 'ideal' family size should be determined by the desires of couples, not governments. The U.S. strongly opposes coercive population programs" (USDS n.d.). Unfortunately this policy does not recognize the fact that the world is *already overpopulated.*

My three extra points are:

10. **Promote breastfeeding**. Breastfeeding is best for the infant, for the mother and for the planet. There is no nutrition as good for a baby as her mother's milk, which also helps the baby fight respiratory, ear and gastrointestinal infections (diarrhea) (ACOG 2016). Nursing helps to avoid childhood obesity and Sudden Infant Death Syndrome (SIDS). The mother benefits from breastfeeding by helping her lose weight and it aids in bonding with her new child. When a new mother breastfeeds her baby she is relatively infertile. This is not entirely foolproof—as the child grows older and starts to eat food the mother may start ovulating. Infertility while breastfeeding is reliable enough that it has been called the Lactational Amenorrhea Method (LAM) of birth control (PP n.d.). It requires three conditions: the baby must nurse almost exclusively, s/he must be no older than 6 months of age and the mother cannot have started to menstruate yet. If these conditions are met, LAM is a very effective method of child spacing.

11. **Promote child survival**. It may seem paradoxical, but decreasing the under-five death rate can decrease birthrates (Lloyd and Ivanov 1988). In many societies children are "insurance" for their parents. Many developing countries do not have any retirement or social security system, so children are the only means of support in old age or in case of incapacitation.

12. **If you live in a democracy, vote!** This is the best way to achieve many of the strategies above. To quote Dr. Martin Luther King, Jr.: "It is my belief that one of the most important steps that members of a minority community may take is that short walk to the voting booth. It is the responsibility of every good citizen to register and vote" (King 1962). Vote for candidates who support family planning that promotes both social and ecological justice.

These 12 strategies arguably help *both* social justice and ecological justice. When society has passed ecological limits (as we have, see Chap. 4 by Washington in this volume) 'more' people is neither good for society nor for the nature that supports society. Overpopulation beyond ecological limits remains a key driver of unsustainability and a key problem for conservation (Washington 2015b).

Conclusion

Although social and ecological justice may often be in conflict, stabilizing and reducing the human population by voluntary family planning can assist both, and reduce the pressures on the natural world. This chapter included some basic demography and information about advantages of small families. Access to safe, effective contraception helps women achieve goals of health, education and empowerment. In addition to helping people reach their goals, this will reduce pressure on the rest of life on Earth, a major aid to moving towards ecological justice. The stabilization and reduction of human population is thus a key strategy for effective conservation. Indeed, long-term conservation of nonhuman nature is unlikely without stabilization and reduction of human population. This chapter ends with suggestions for people to help solve overpopulation and thus improve both ecological and social justice.

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