

## Population issues in development economics

Population level, population growth.

Why should we be focusing on population issues?

- 1) Do you have enough and will you have enough public goods such as security, roads, sanitation, clean water, health care, education,.....?
- 2) Do you have enough and will you have enough jobs for people?
- 3) Do you have enough and will you have enough food to feed people, and will you be able to improve nutrition?

Further issues:

Is there a link between poverty and family size such that population growth is high because poverty is high?

Will population growth become a problem in the context of current resource allocations – more people, fixed ‘pie’?

## Population description:

Currently around 8 billion on the US census clock and ticking!

<https://www.census.gov/programs-surveys/popest.html>

Projection of maximum of 11 billion by 2200.

Over 90% of this projected population will live in what are currently defined as the countries in the developing world – though who knows what their status will be then.

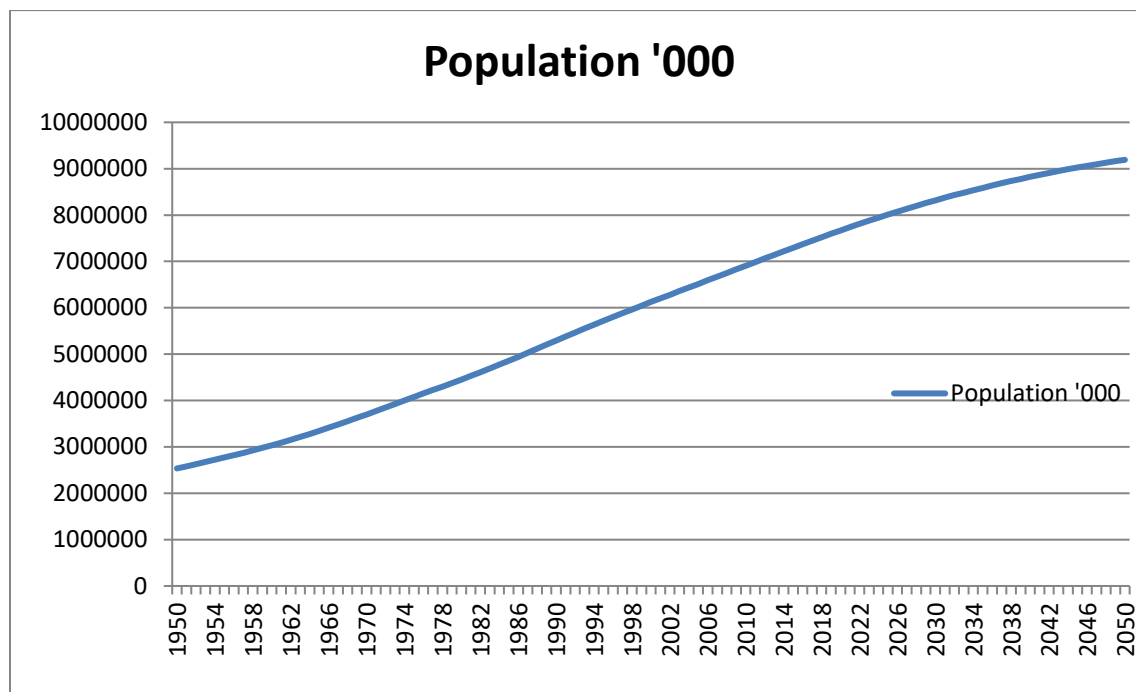
Rapid increase in world population from 1950 to current times.

2000 years ago, around 250m people.

1750, around 750 m.

1950-1980 rapid growth.

Still increasing.



Earthtrends / UN population and projections

Per year population growth estimates:

Up to 1650: 0.00002 (0.002%)

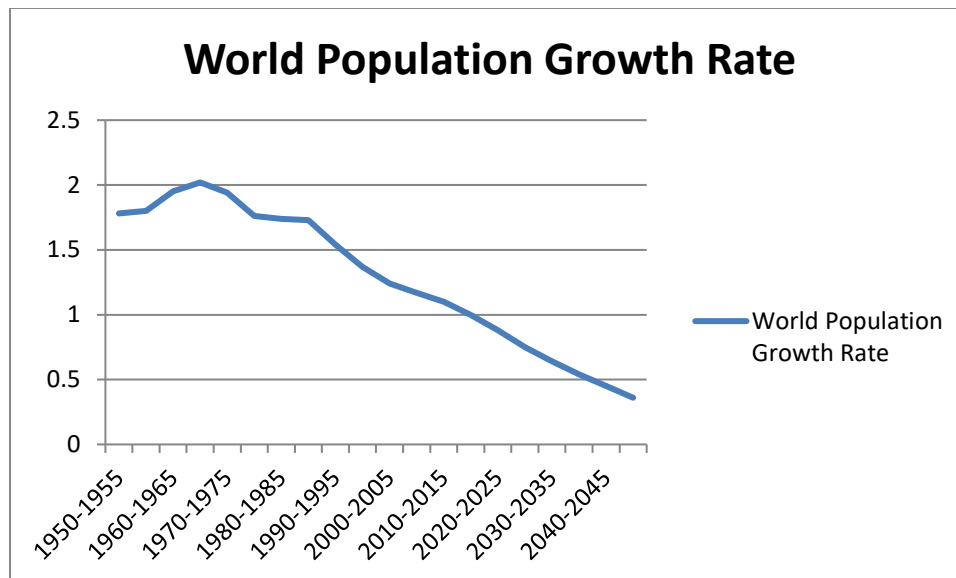
1650-1750: 0.003 (0.3%)

1850 -1900: 0.006 (0.6%)

1930-1950: 0.010 (1.0%)

1960-1980: 0.023 (2.3%)

Now down from high of 2.3% growth to around 1.3%



Earthtrends / UN observed and projections

Calculate a doubling time.  $2 * P = Pe^{rt}$

Ln (2)	Rate	Years to double
.693	0.002%	34,657
.693	1.0%	69
.693	2.3%	30

Slightly different from the numbers in the book, but close enough.

Rapid decrease in mortality rates is main driving force behind these growth patterns.

Data sources for population information:

<https://population.un.org/wpp/>

<https://www.un.org/development/desa/pd/data-landing-page>

Where are all these people!

Developing countries, as we have noted before. Projections indicate this will if anything increase over time.

Most of total world population currently is in developing countries.

How do we measure population change?

Rate of population growth for a given country. % yearly net change in population size due to natural change and net international migration.

Natural change: the difference between fertility and mortality.

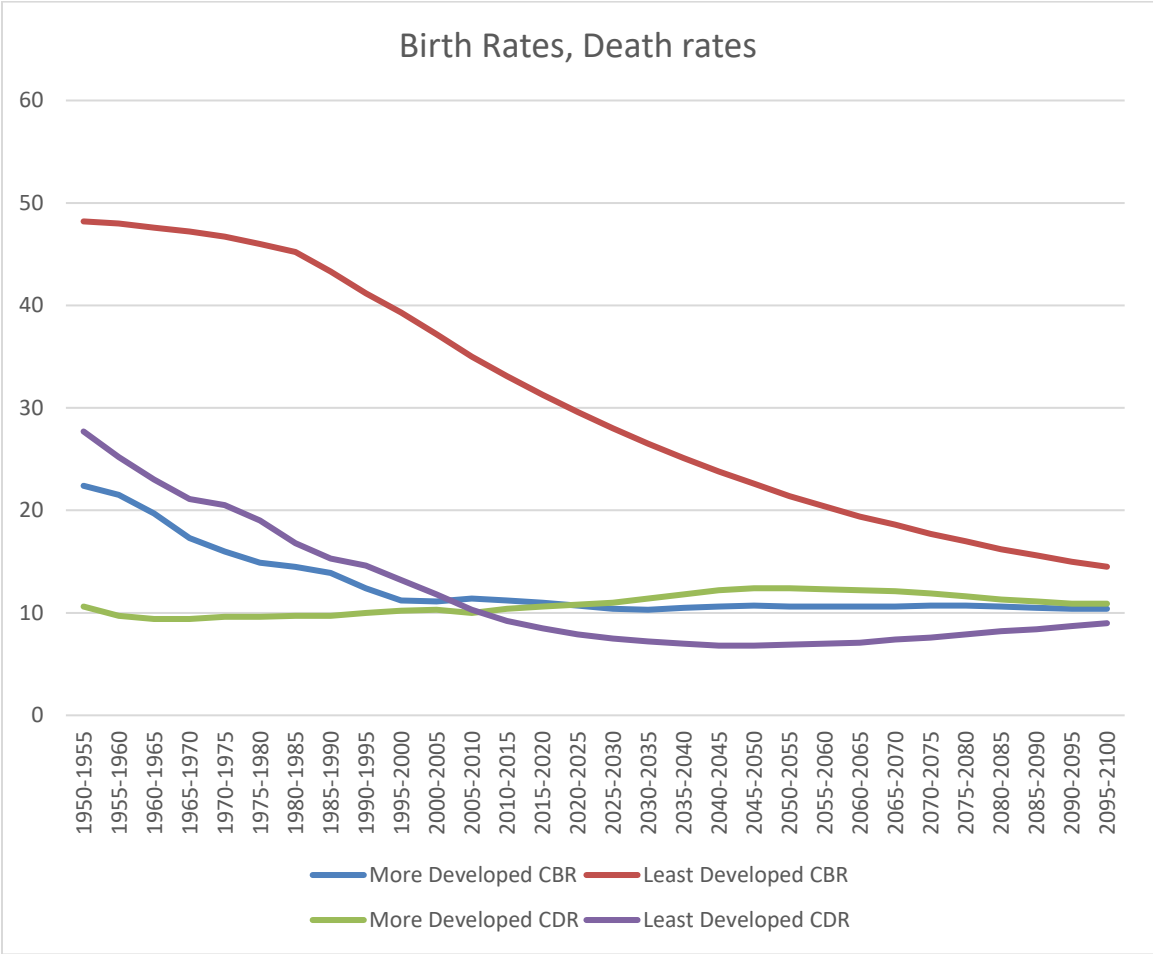
Question – are all countries in the world currently experiencing positive population growth?

Crude Birthrate (a measure of fertility). Number of births per year per 1000 individuals in the population.

What is the birthrate in developing countries?

Something like 20 to 40. In the developed countries it is more like 15.

Crude death rate. Number of deaths per year per thousand individuals in the population.



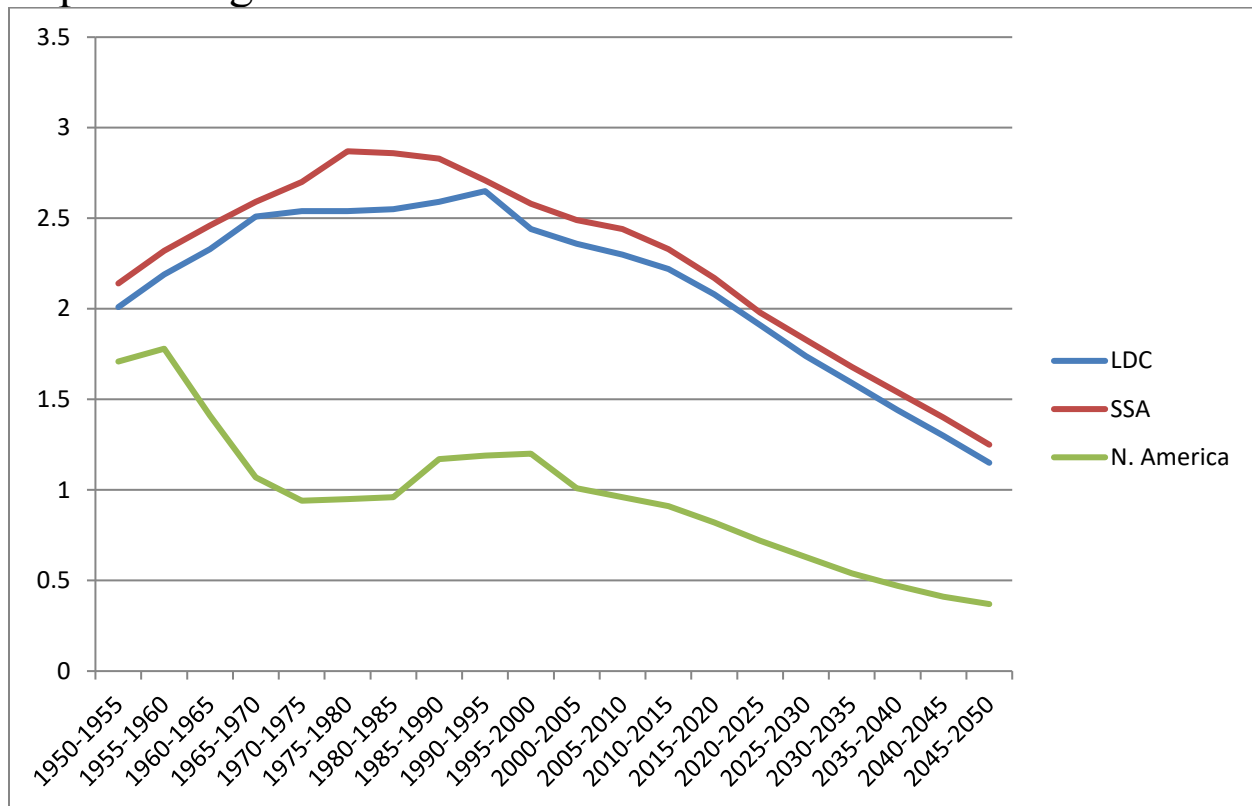
UN Data and projections (medium variant)

Annual growth rate: Crude birth rate minus crude death rate

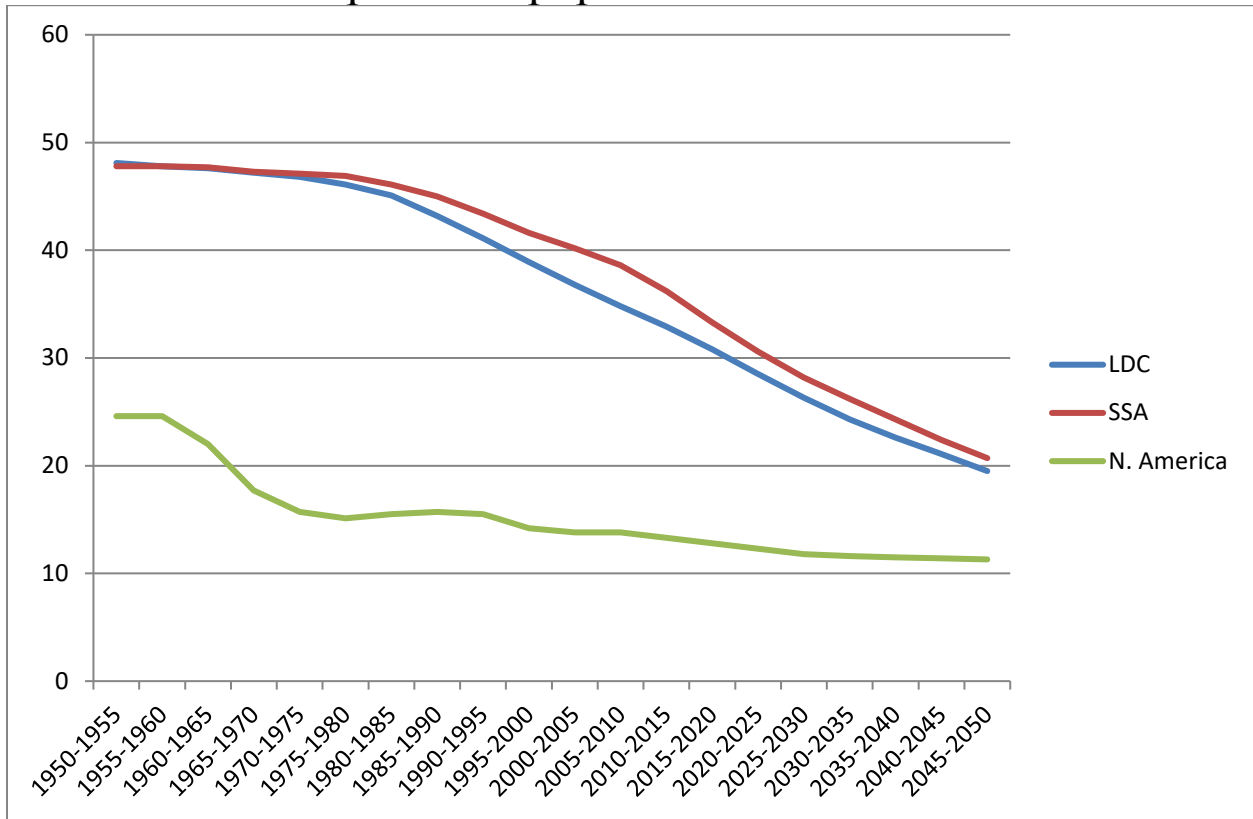
$((\#b-\#d)/1000)$

Expressed in percentage terms, 1.5% to 2.5% range for developing countries. 0.1% to 1.5% range for developed countries.

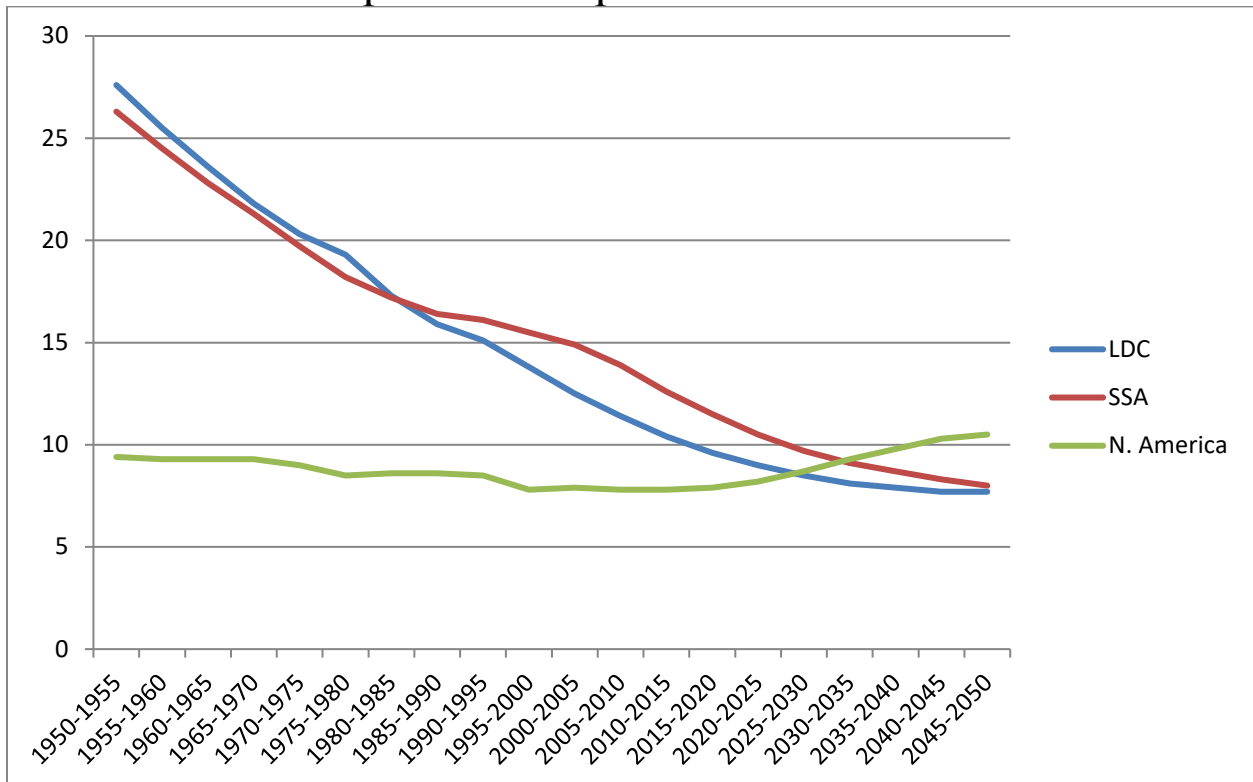
Population growth rate



## Crude Birth Rate per 1000 population

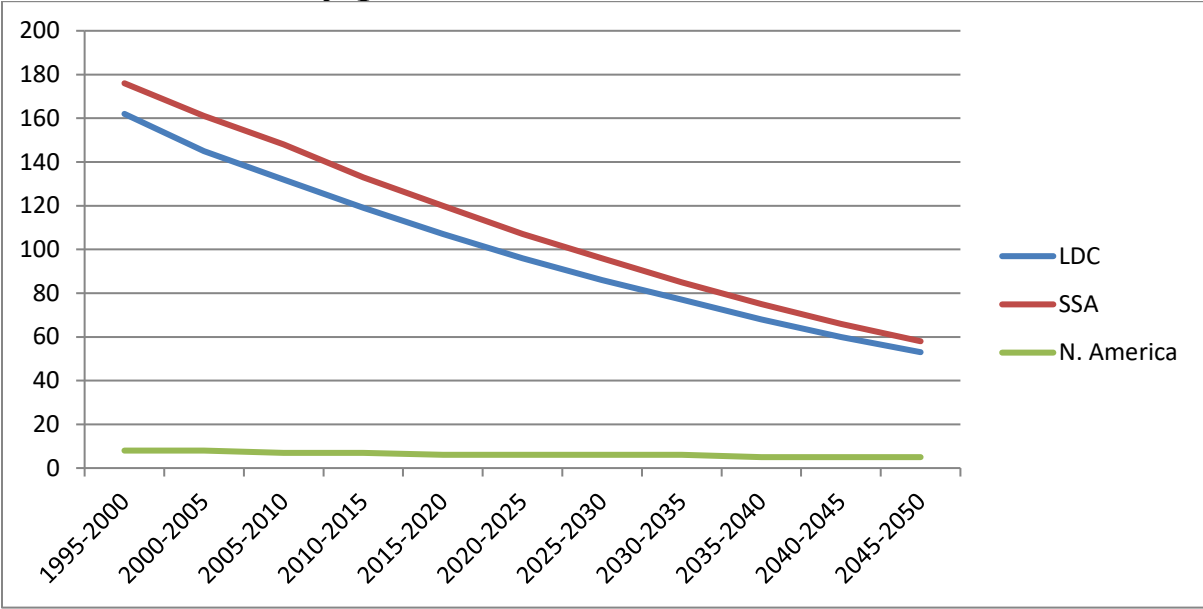


## Crude Death Rate per 1000 Population

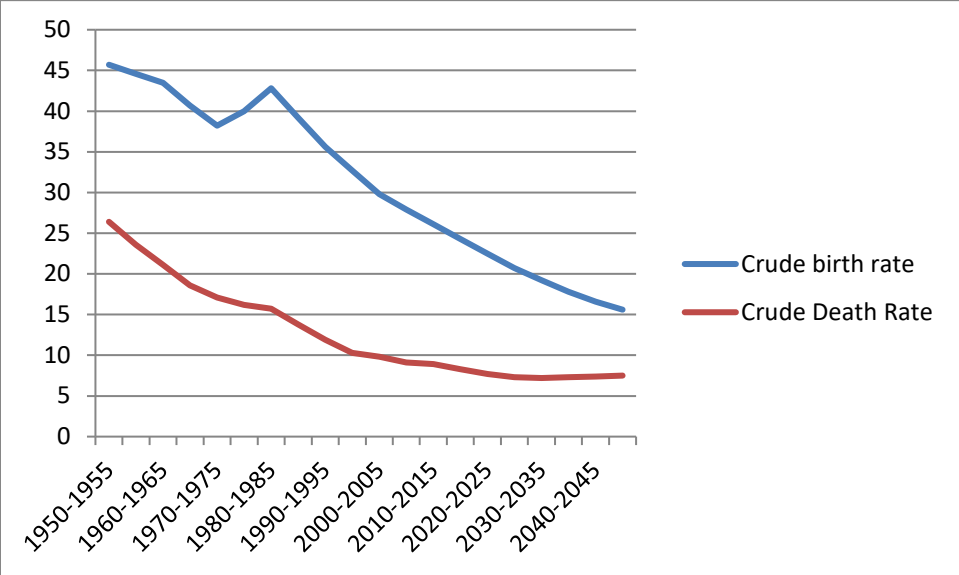


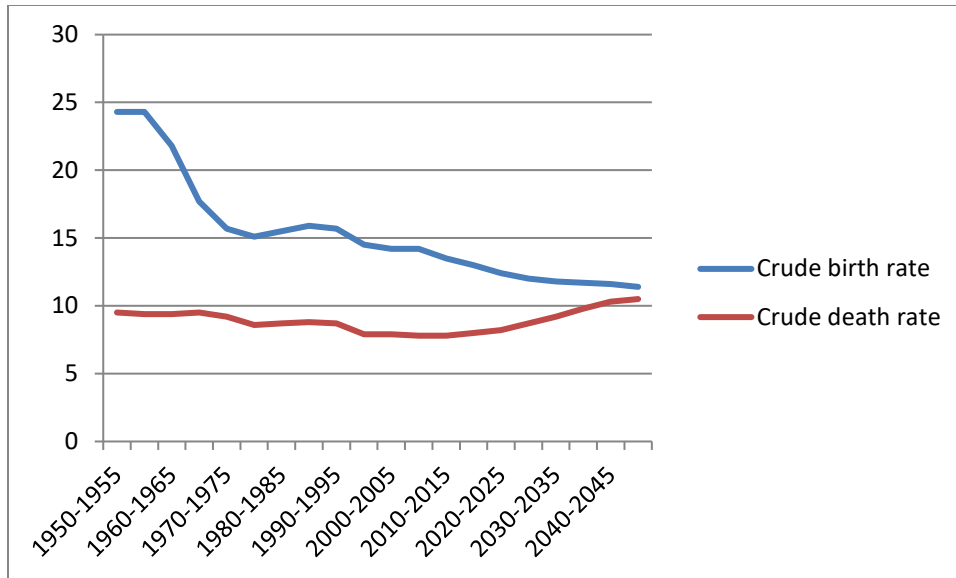


# Under 5 mortality per 1000 live births



# Haiti





USA

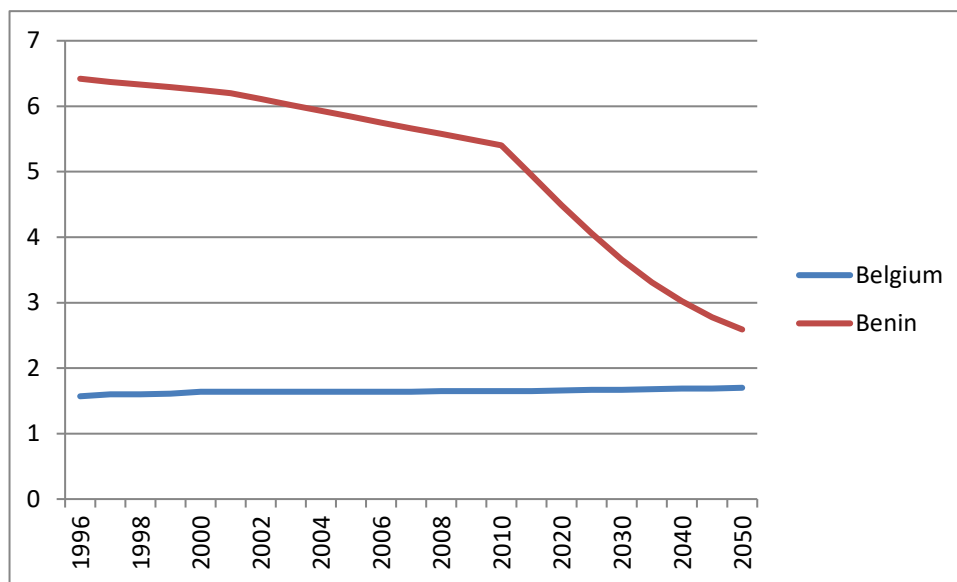
So for example for SSA

Country or area/ Year	Births per 1,000 population	Deaths per 1,000 population	Net number of migrants per 1,000 population	Rate of natural increase (percent)	Growth rate (percent)
SUB-SAHARAN AFRICA					
2000	40.9	15.7	-0.3	2.52	2.48
2010	37.2	13.5	-0.1	2.37	2.36
2020	32.9	11.5	-0.1	2.14	2.13
2030	29.4	9.9	-0.1	1.95	1.94
2040	26.4	8.7	-0.1	1.77	1.76
2050	23.6	7.8	-0.0	1.58	1.58

Total fertility rate: the average number of children a woman would have in her life assuming that current age-specific birthrates remain constant throughout her childbearing years – 15-49 years of age.

High in Africa: 5.2. Italy, Spain, Latvia 1.2.

Replacement rate is around 2.1 (mom, dad, and some mortality / infertility)



One other measure to consider is the life expectancy at birth. The number of years a person born today is expected to live. So not just birth, but how long each person born stays around.

Besides issue of population size and population growth, we also should note there are issues related to population structure.

Dependent children: Individuals under 15 years old

Dependent adults: People 65 or older

Dependency ratio: Ratio of dependent people to working age adults (15-65)

Child / Youth dependent ratio.

Adult dependent ratio.

The child dependent ratio in developing countries is around 40%, while in developed countries it is around 20%.

The hidden momentum of population growth. Population growth will continue even if the fertility rate declines substantially.

The policy implemented has achieved a fertility rate of 2 for the youth generation as they pass from youth status in generation 1 to reproductive status in generation 2.

The fertility rates for the reproductive group and the post reproductive group reflect the fertility rate that characterized the cohort in question during their childbearing years.

The starting size of the population is equal in all scenarios, but how they got there (past fertility rates) differs. All stabilize population level by generation three, but will stabilize at different levels.

	Gen 1	Gen 2	Gen 3	Gen 4
youth fr=2	20	20	20	20
reproductive fr=2	20	20	20	20
post reprod. fr=2	20	20	20	20
Total population	120	120	120	120

	Gen 1	Gen 2	Gen 3	Gen 4
youth fr=2	30	30	30	30
reproductive fr=3	20	30	30	30
post reprod. fr=4	10	20	30	30
Total population	120	160	180	180

	Gen 1	Gen 2	Gen 3	Gen 4
youth fr=2	40	40	40	40
reproductive fr=5.3	15	40	40	40
post reprod. fr=6	5	15	40	40
Total population	120	190	240	240

Start with this one: The five post reproductive had 6 kids each during their time so 30 total, 15 were female and these females (current reproductive) had a fertility rate of 5.3 so 80 kids total (79.5 rounded up), half female, so 40 youth.

For identical fertility rates in the youth cohort, the country with a larger cohort of future reproductive females will experience higher population growth.

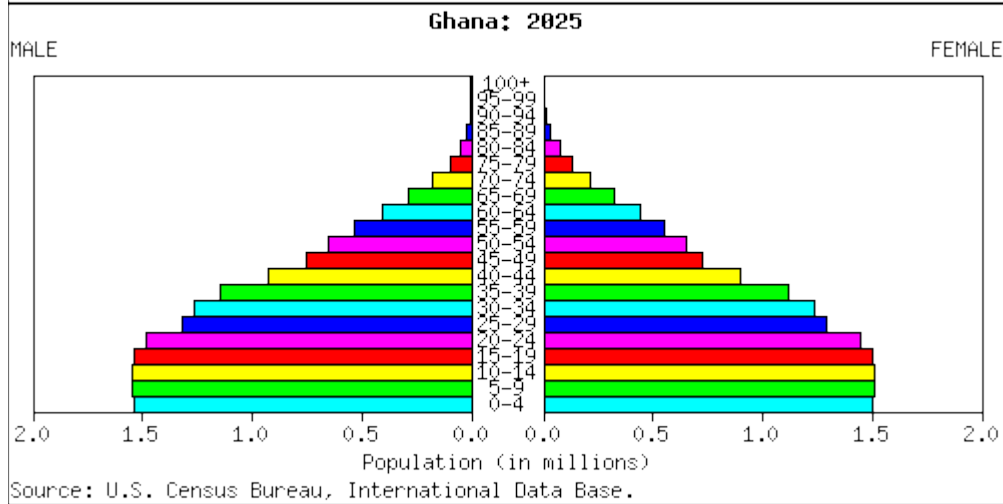
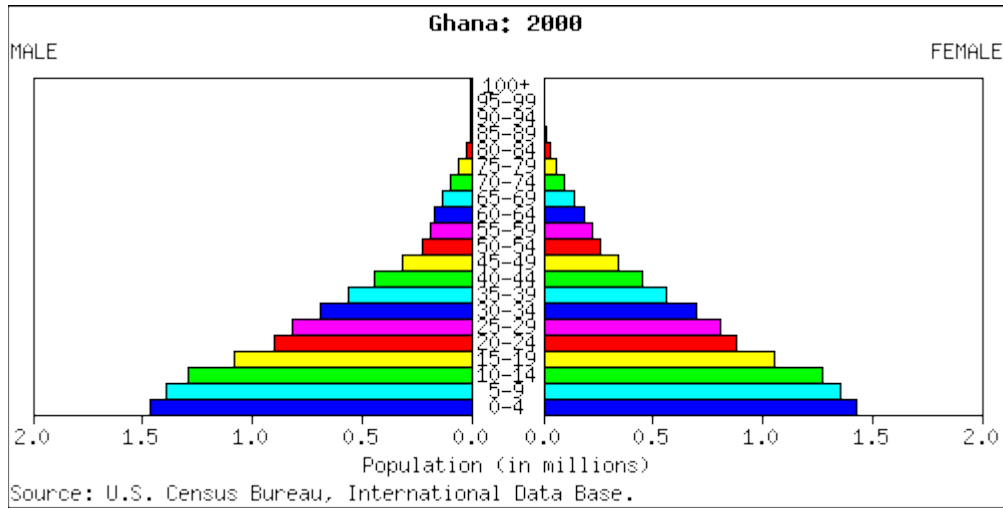
Given a bottom heavy age structure, the number of parents is expected to increase as time goes by, so even if they give birth to children at a replacement rate of around 2, the population will still increase.

Time lag until demographic “bulge” passes through reproductive years. Population structure indicates there is built in growth to the total population even if policies lead total fertility rates to replacement rates for the future reproductive cohort– stability is a generation off.

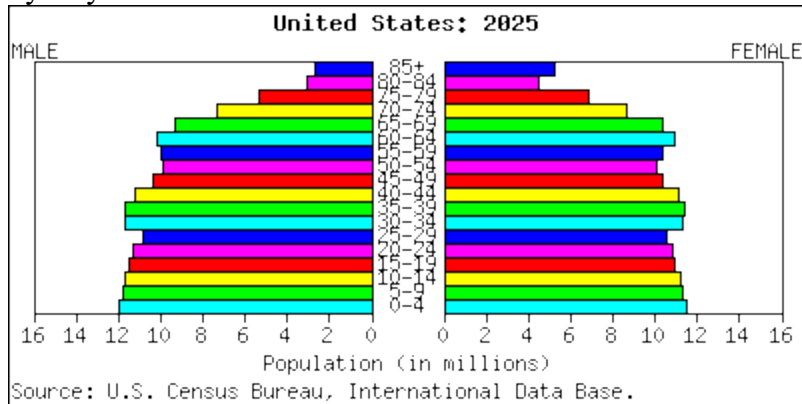
Can be either population numbers per cohort or % of total population in the cohort on the x-axis. Y axis is age cohort. Left and right is male or female.



# Population Pyramid Summary for Ghana



By way of contrast:



## The Demographic transition.

Three stages in the book, but seems like four to me:

- I. High birth rate, high death rate. Stable or slowly growing population.
- II. High birth rate, declining death rate. Slowly leads to rapid growth in population.
- III. Declining birth rate, low death rate. Rapid leads to slowly growing population.
- IV. Low birth rate, low death rate. Stable or slowly growing population.

Show graph.

Can you get caught in stage II?

A race between income growth and population growth. Per capita income reflects the outcome of this race. If population growth is too rapid, it can outstrip the increase in total income, and growth in income is the underlying variable in the demographic transition.

X-axis in demographic transition is time, but also income per capita implicitly.

A variant is that rapid population growth outstripping income leads to environmental damage that undermines the potential for future income growth. Eat into natural capital. More on this in environment development section.

Malthus- fixed factor is land. Diminishing marginal returns. Eventually geometrically growing population outstrips arithmetically growing output. Any surplus we have above subsistence we use up having more kids, eventually leading to long run subsistence trap.

Underestimates role of technological progress. Recall Solow estimation results for TFP.

Note Boserup's hypothesis that population pressure leads to technological innovation.

Also, assumption that income and population growth rate are positively correlated not well supported by the data.

Demand for children models.

A utility maximizing individual.

Maximize utility of consumption subject to constraints.

Children are a consumption good that give you happiness (no, you don't really eat them).

Demand for children who survive to adulthood.

Demand for an additional child for an individual (or a household) can be expressed as:

Demand ( household income, net cost of raising a child reflecting the opportunity cost of raising children rather than other activities weighed against the expected future benefits of the child, prices of other goods, tastes for other goods relative to children, probability existing children will survive to adulthood)

Predictions:

Higher household income, more children. Children are a normal good.

(research on the question: are children an inferior good or a normal good – one study finds children are an inferior good when the wife has lower education, and a normal good when the wife has higher education Willis JPE 1973).

**Table 3.** Poisson model of fertility determinants (standard errors in parentheses)

Variable	Jordan	Oman	Yemen	West Bank and Gaza
Age 20–24	0.4895835* (0.0951946)	0.9599325* (0.0161098)	0.4013652* (0.031324)	0.5161059* (0.0351593)
Age 25–29	0.8104637* (0.0944554)	1.415004* (0.0166321)	0.7908809* (0.0301714)	0.9353404* (0.0354984)
Age 30–34	1.004201* (0.0967993)	1.652053* (0.018014)	1.070635* (0.0299969)	1.183882* (0.0374353)
Age 35–44	1.083397* (0.102909)	1.750422* (0.0206047)	1.267232* (0.0297534)	1.33225* (0.0416908)
Age 45–54	0.9849592* (0.1139867)	1.582924* (0.025639)	1.264845* (0.0299244)	1.194097* (0.0505794)
Age at marriage	–0.0126329* (0.0025422)	–0.017094* (0.0008285)	–	–0.0290473* (0.0016106)
Marriage duration	0.0214508* (0.0022566)	0.0069011* (0.0006677)	–	0.0191844* (0.0012444)
Education	–0.0143408* (0.0014397)	–0.0308182* (0.000937)	–0.0320565* (0.0019176)	–0.0116752* (0.0073359)
Son preference	0.0356945* (0.0048505)	0.0617187* (0.001273)	0.0512862* (0.0021645)	0.050082** (0.0041624)
Moslem=1	0.289392* (0.079012)	–	–	0.3854342* (0.0743107)
Ed* religion	0.007831 (0.008651)	–	–	0.001042 (0.0073123)
Ed* son preference	0.006645* (0.003215)	0.0212892* (0.0000785)	0.0089958* (0.0015905)	0.0034682* (0.0006568)
Dead child=1	0.183194* (0.0118836)	0.2128097* (0.003577)	0.3337513* (0.0048735)	0.1995913* (0.0085401)
Urban=1	–	–0.0039201* (0.0005892)	–0.022778* (0.0076912)	–0.007335* (0.0051066)
Own home=1	0.032471* (0.013658)	–	0.0252498* (0.0093484)	0.0715402* (0.0106825)
TV=1	0.0595536* (0.0232275)	0.0181032* (0.0062087)	–	0.0049467 (0.0129905)
VCR=1	0.0280512** (0.0177661)	0.0078608* (0.0039583)	–	0.0372743* (0.0109484)
Oven=1	0.0399306 (0.0283233)	0.0034831 (0.005719)	–	0.0100973* (0.0082546)
Refrigerator=1	0.0150615 (0.017583)	0.0140824* (0.0044883)	–	0.0366751* (0.0115086)
Freezer=1	0.054315* (0.0330467)	0.0242791* (0.0035837)	–	–
Washer=1	0.0493317* (0.0193946)	0.0641006* (0.0049344)	–	0.0420607* (0.0096652)
Phone=1	0.01414073 (0.014291)	0.0244945* (0.0038359)	–	0.0520346* (0.0105756)
Car=1	0.0320032* (0.0137377)	0.0368075* (0.0035265)	–	0.0101438* (0.0089409)
Charcoal=1	–	–	–0.0186649* (0.0058895)	–
Kerosene=1	–	–	–0.0299876* (0.0056257)	–
Women's wage	–0.0009524 (0.000351)	–	–	–

Al Qudsi table from the Journal of Population Economics

Higher net cost, less likely to have another child. This includes opportunity cost recall.

Higher future benefits, more likely to have another child.

Higher prices other things, more likely to have another child.

Higher tastes for other goods, less likely to have another child.

Higher probability children will survive to adulthood, less likely to have another child.

Although we might think of such a perspective as whacky given the reality of fertility decisions, it turns out to be a pretty good model.

Evidence from empirical studies suggests:

High female employment opportunities,

Greater female school attendance,

Lower child mortality rates (higher probability of child survival)

Formal social support systems for the elderly, lower fertility rates.

Note that income and opportunity cost are pulling in opposite directions as income increases if income is a function of time devoted to non-child raising activities.

Increase job opportunities, education, and health care for women as a way to reduce population growth.

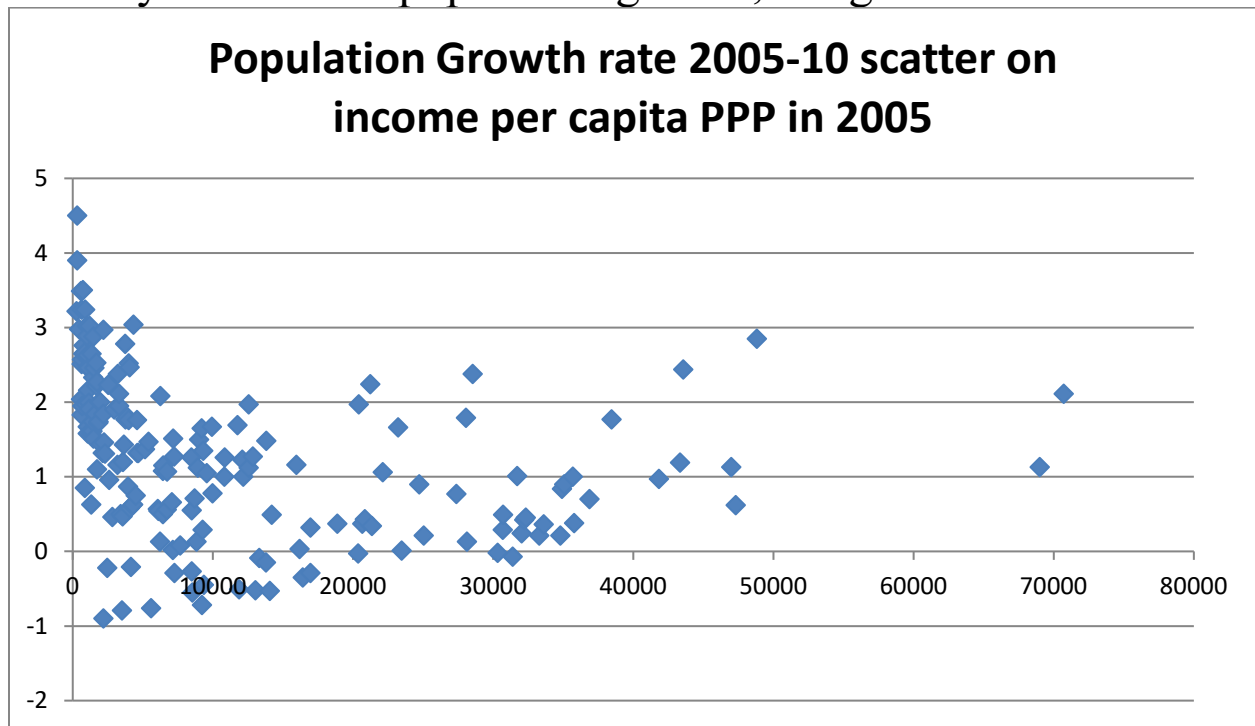
Note that while this seems somewhat nice and rather obvious, it is important as a response to the argument that such efforts will be self defeating, as households trapped in a set of values that places numbers of children above all other priorities will only use the improved social services to have more children.

Note also that family planning programs that do not address these underlying conditions will be limited in their impact.

Is population growth really a problem?

Some arguments for no, it is not.

Address development needs, and population growth will reduce as a result. The population growth problem is really the context of poverty, poor health, poor education, and lack of social security that lead to population growth, not growth itself.





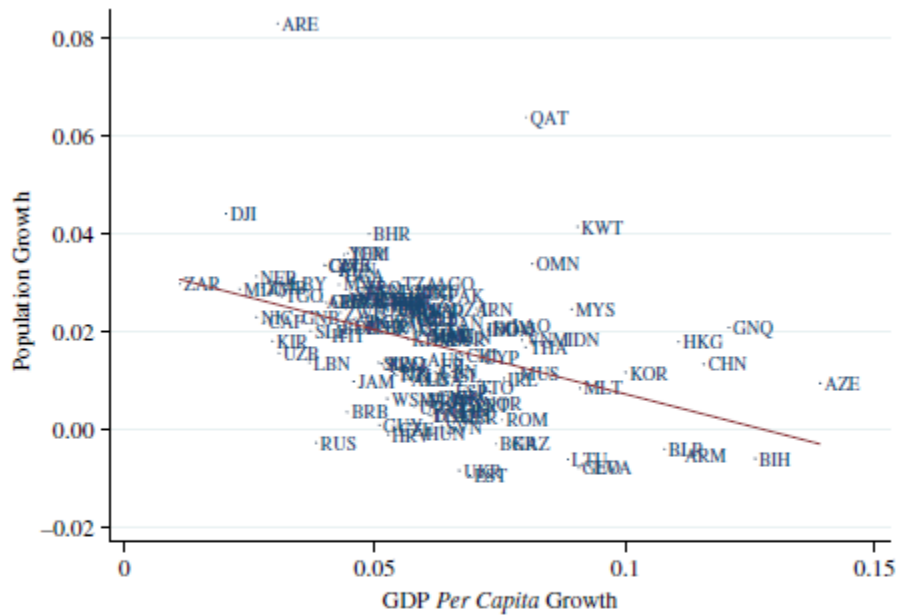
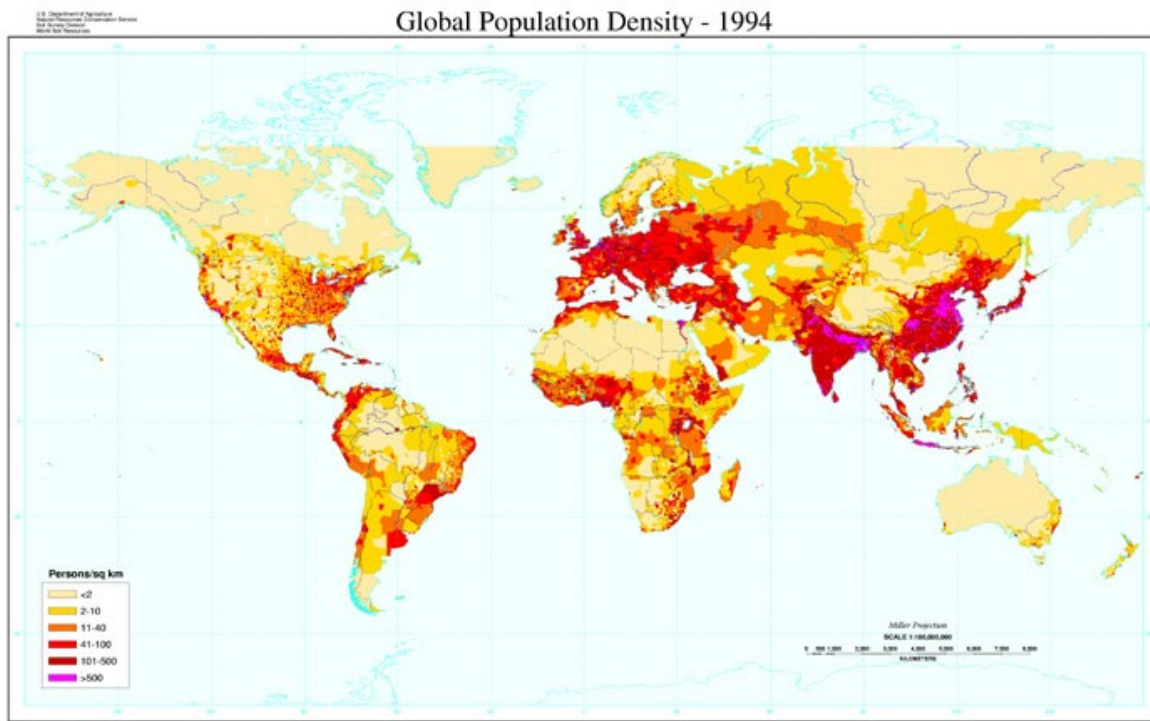


Fig. 1. *GDP Per Capita Growth and Population Growth in the Cross-section of Countries*  
 Note. Average annual population growth is plotted against average annual GDP *per capita* growth for 139 countries between 1950 and 2010.

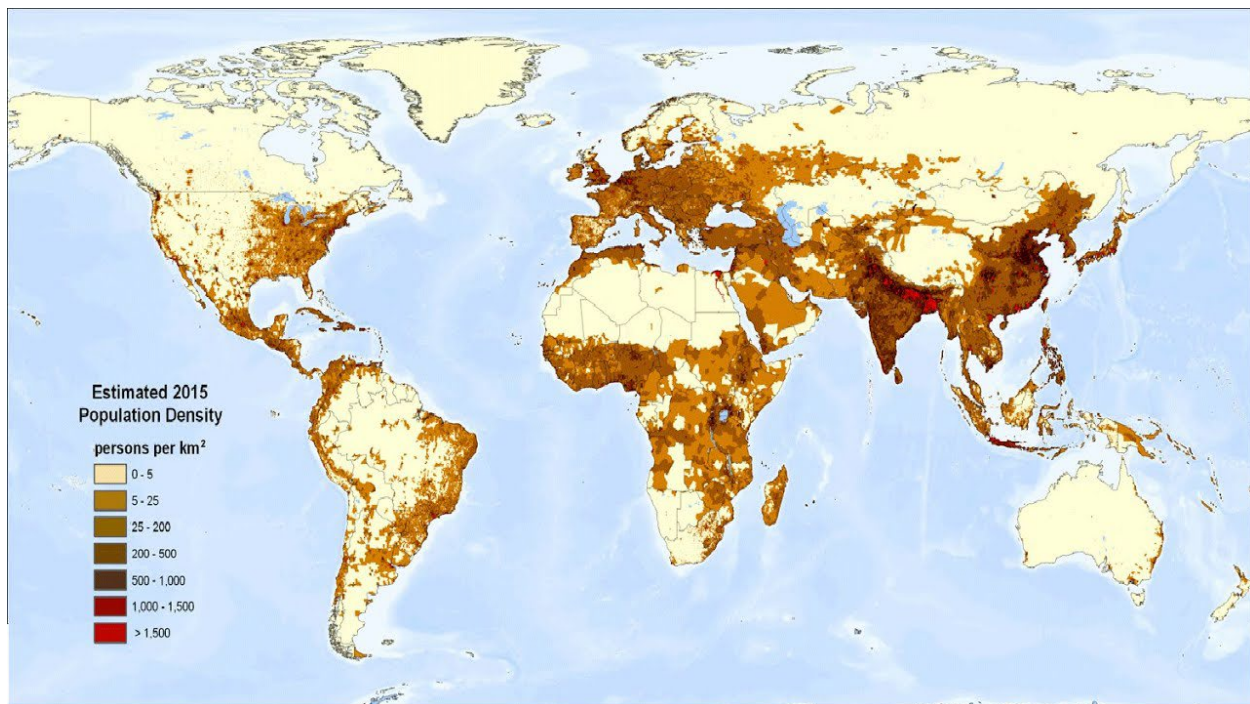
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Bruckner and Schwandt, *Economic Journal* 2014

The distribution of the existing population is the issue, not the overall number. People are clumped up in a few places that are clearly overstressed (mega cities for example), but there are vast underpopulated areas that could accommodate these people given correct policy and incentives.



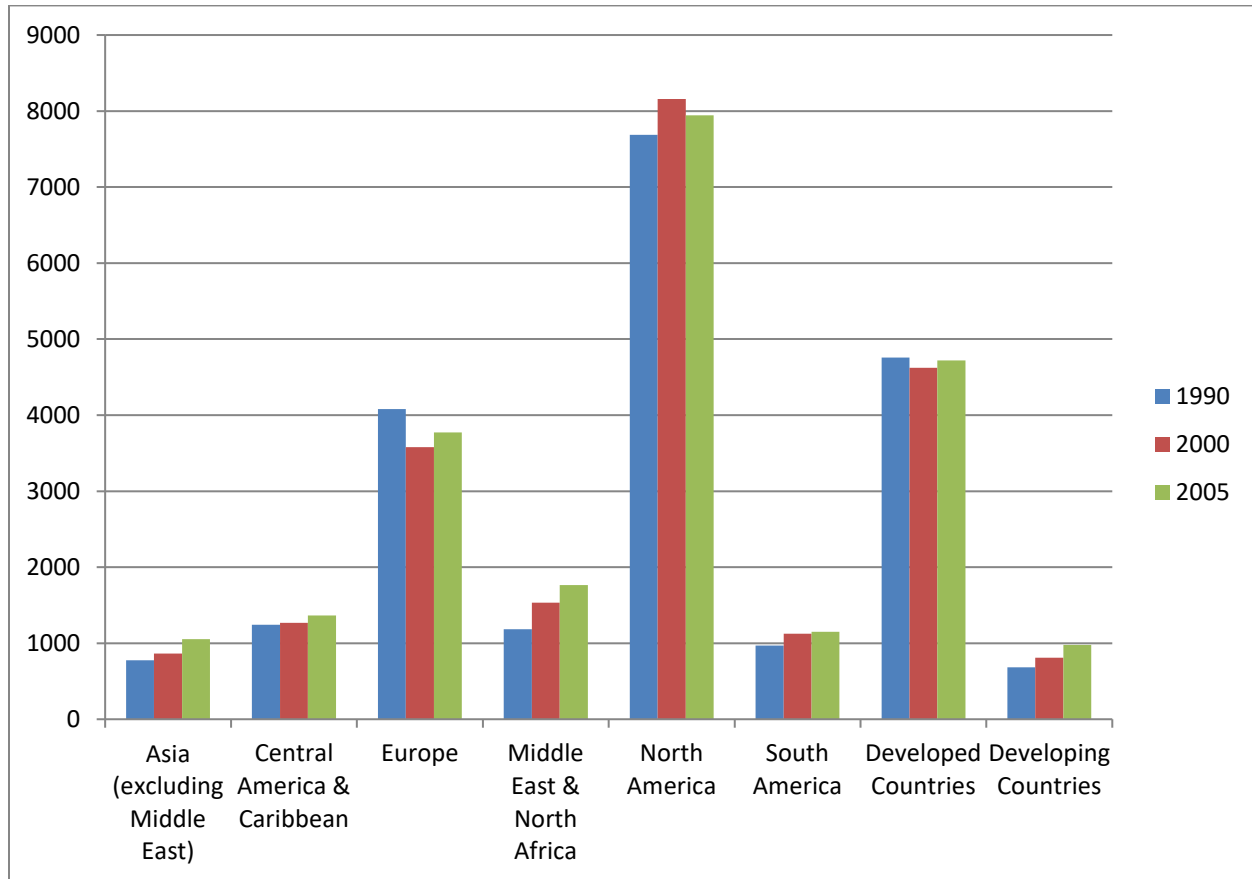
- **Source:** Tobler, W., V. Deichmann, J. Gottsegen, and K. Maloy. 1995. The global demography project. Technical Report TR-95-6. National Center for Geographic Information analysis. Univ. Santa Barbara, CA. 75 pp.



2015

The problem is the status of women, not the growth in population. Focus on improving the status of women and population will sort itself out.

### Energy consumption in kilograms of oil equivalents per capita



The population level in the developing world is only a problem given that the developed countries consume resources in a proportion far greater than their population share.

In turn, the poverty in the developing world provides conditions for rapid population growth.

If the developed countries would reduce their overconsumption, there would be more available to reduce poverty, thus addressing the conditions that lead to rapid population growth.

A deliberately contrived false issue. Developed countries focus on population control since they realize that growing populations in the developing countries will eventually demand the unequal allocation of wealth and resources currently existing be redressed.

Racist dimension possible.

Could argue that population growth has benefits, not just costs.

It creates consumers, laborers, and growth.

Population pressure leads to innovation.

Many areas of the world are currently underpopulated and underexploited. There is evidence that past populations were in fact higher for some areas in Africa. Slavery, diseases, warfare, governments.

Some arguments for yes, population growth is a problem.

Per capita is GNP divided by population. If the numerator grows slower than the denominator, then well being declines.

World food catastrophes and ecological disaster. “Full House”. “After decades of steady growth, the world’s food supply is no longer keep up with population increases”

Unprecedented growth and population size.

Population –poverty cycles. Population growth that is too rapid exacerbates the problems of less developed countries. Too many people in too short a time overwhelms the existing infrastructure. Not enough water, schools, health centers, ...

The consequence is declining living standards, leading to increases in population as family becomes the only means of security,...

International migration as an outcome with concerns raised about this issue in the recipient countries.

You need both development and family planning programs. This is in some ways a means of filling the gap on social services directly to at least allow control over unwanted pregnancies.

Some kind of consensus.

- 1) Population growth is not the primary cause of poor quality of life in developing countries. It is the failure of other aspects of domestic and international development policy.
- 2) Population and poverty has to be put in the context of the global distribution of resources.
- 3) Rapid population growth does intensify problems and make development harder (and more urgent).



Developing country policy options:

Persuasion

Establish family planning programs

Economic incentives and disincentives for having more children (limit maternity leave, money in bank for non-pregnant periods, tax breaks).

Coercion. Forced sterilization.

Raise the social and economic status of women.