

Background to the IUSSP Debate:

"The population of humans that can be supported sustainably on the planet at a reasonable standard of living is below 4 billion." Yes or No

Joel E. Cohen

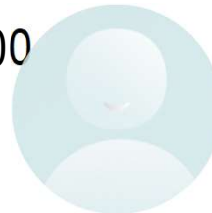
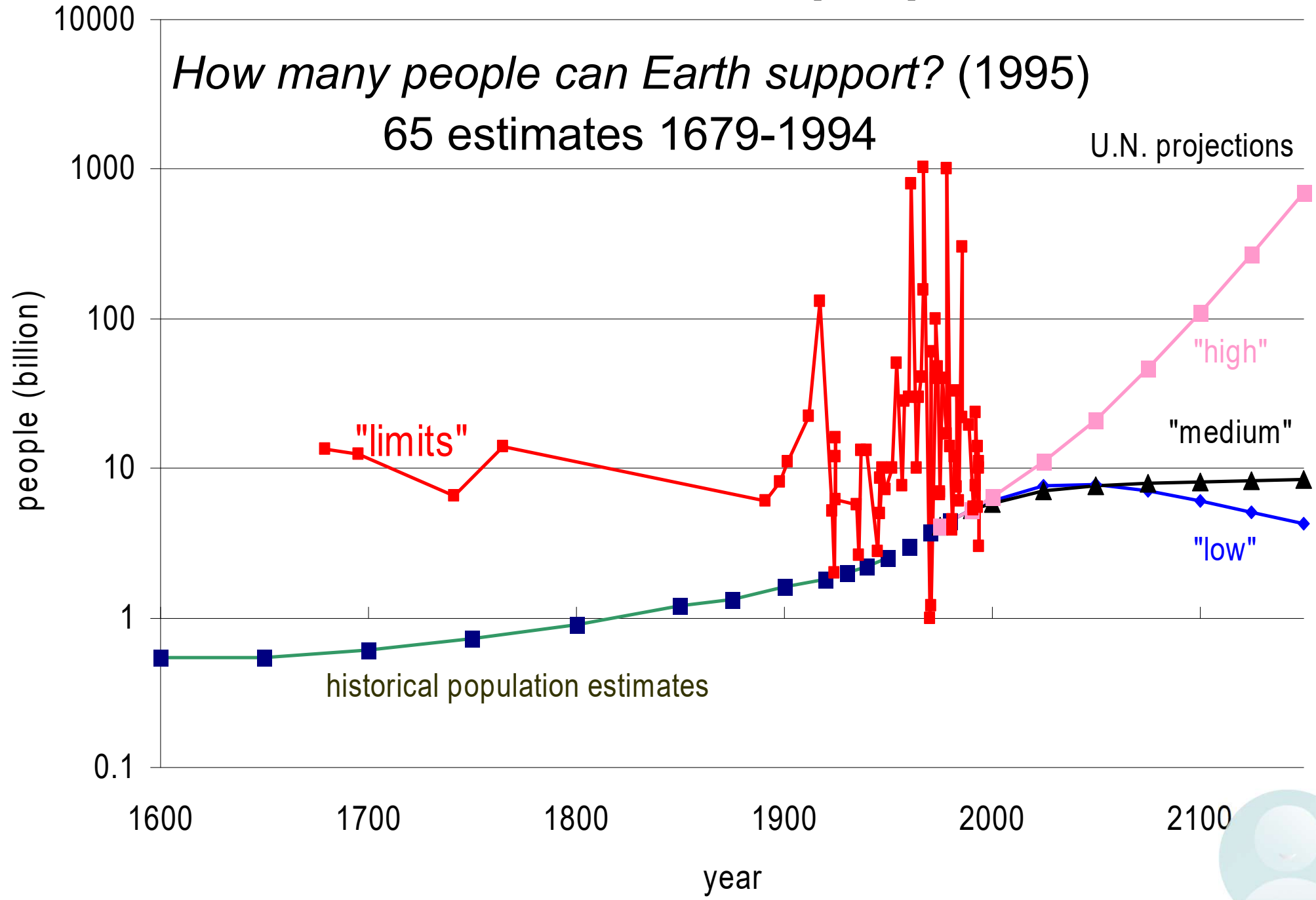
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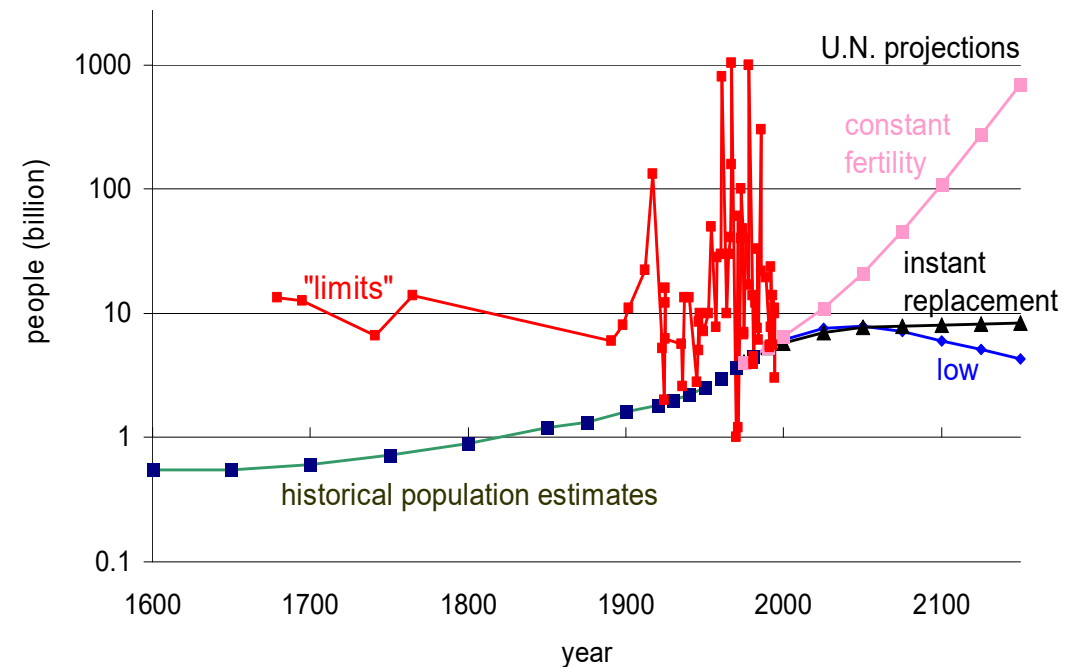
2023-10-18

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“Limits” of human population



What do these estimates reveal?



1. Range in last 50 years: <1 billion to >1000 billion. They cannot all be right.
2. Variation of estimates increases with time. Numbers are more political than scientific.
3. Half of estimates lie in range 4-16 billion. Humans have entered a zone of concern.

Outline

2 interacting factors:

natural constraints, human choices

4 interacting factors:

population, economics,
environment, culture

11 factors define “sustainably ... at
a reasonable standard of living”

2 factors: constraints, choices

1. Constraints: We do not fully understand earth's biological, chemical, and physical responses to past and future perturbations from humans and from nature.
 2. Choices: We cannot foresee many future human choices.
- 1 x 2. Future choices may affect which constraints apply. Unanticipated constraints may affect which choices are possible.

4 factors

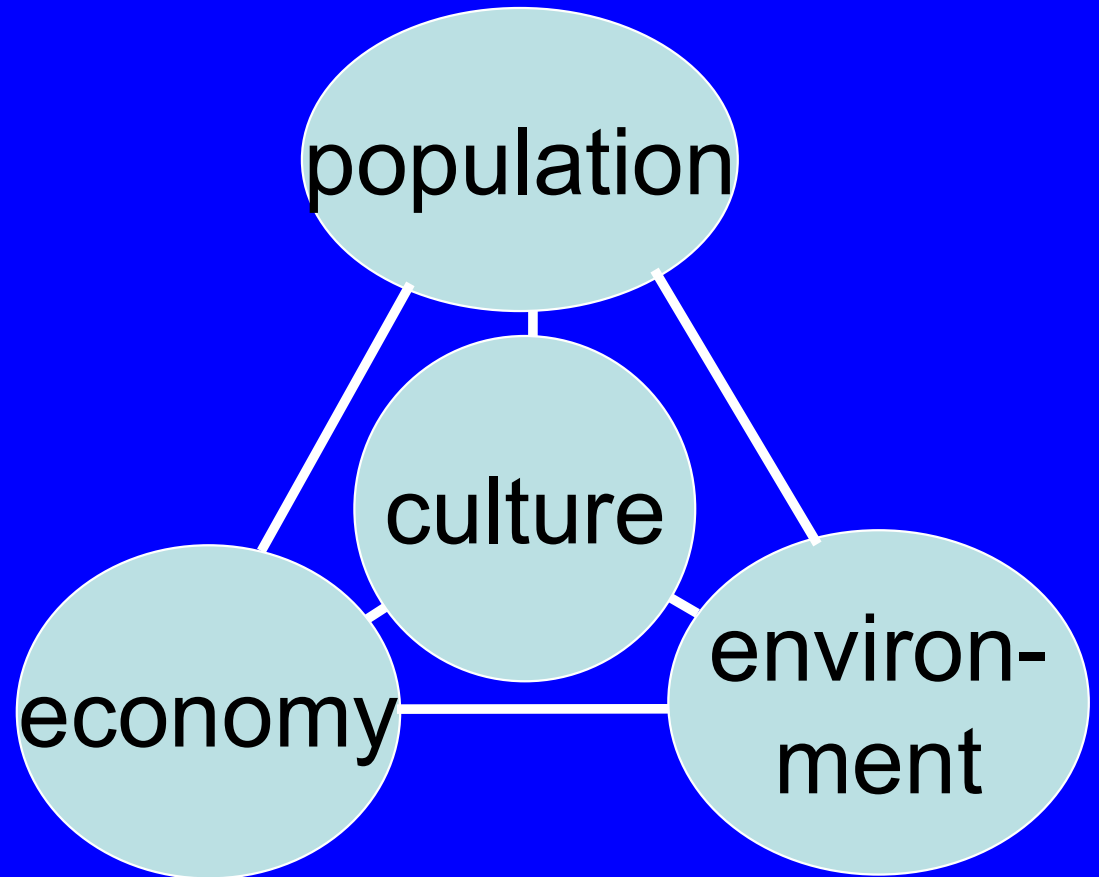
Population

Economy

Environment

Culture

interact pairwise, 3-ways, 4-ways.



How many people Earth can support depends on answers to at least 11 questions.

How many people Earth can support depends on:

1. Average level of material & cultural well being

(food, fiber, water, housing, industrial output, health, sanitation, energy, education, travel)

2. Distribution of material & cultural well being

(extent of inequalities in income, wealth, "happiness," health, other "goods," among nations and among individuals within nations, by varied statistical measures)

How many people Earth can support depends on

3. Technology



How many people Earth can support depends on

4. Domestic & international **political** arrangements

(means of resolving conflicts, individual freedoms, procedures for change)



How many people Earth can support depends on

5. Domestic & international **economic** arrangements

(incentives, production, trade or tariffs, regulation within & among nations)

6. Domestic & international **demographic** arrangements

(birth, death, migration, marriage, family, households, age structure, cities)

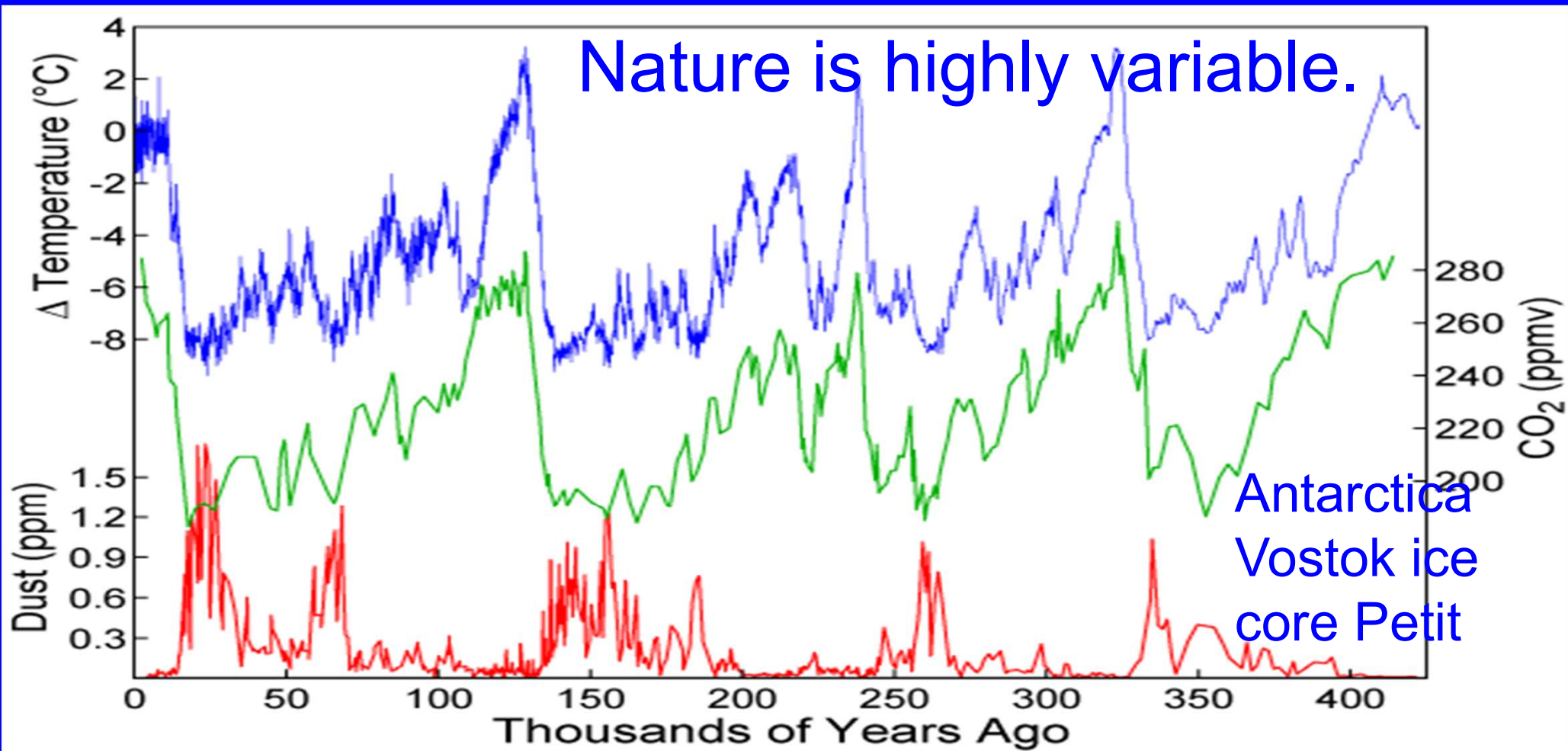
How many people Earth can support
depends on

7. Physical, chemical & biological environments



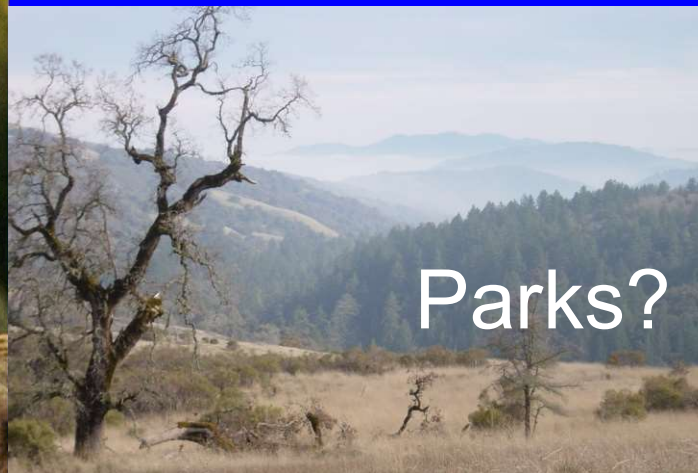
How many people Earth can support depends on

8. Desired variability or stability of population



How many people Earth can support depends on

- 9. Risk or robustness
- 10. Time horizon
- 11. Values, tastes & fashions



Proposed panaceas

Bigger pie

increase productivity of people & machines

Fewer forks

slow population growth through voluntary reductions in fertility

Better manners

reduce violence, corruption, inequities, barriers to efficiency

reduce unwanted material by-products of consumption & production



Cohen, *How Many People Can the Earth Support?* 1995

Thank you! Questions?

Najibullah Musafar / Aina Photo



Background to the IUSSP Debate, Joel E. Cohen, cohen@rockefeller.edu, 20231018:

"The population of humans that can be supported sustainably on the planet at a reasonable standard of living is below 4 billion." Yes or No

Slide 1

I thank Stan Becker for inviting me to provide background to this debate, and Paul Monet and the IUSSP for supporting the debate.

I propose some questions that must be answered to judge whether Earth can support sustainably 4 billion or any other number of people.

Slide 2

My book, *How Many People Can The Earth Support?*, reviews 65 published estimates, plotted in red here. The horizontal axis is the year of publication. The vertical axis is the total population size on a logarithmic scale. The earliest estimate was by Antoni van Leeuwenhoek, inventor of the microscope, in 1679. He estimated the world could support 13.4 billion people.

Slide 3

Estimates in the last half of the 20th century ranged from less than 1 billion to more than 1000 billion. They cannot all be right.

The variation of the estimates increased with time instead of converging to a single best estimate. The numbers are more political than scientific. The high estimates are intended to persuade you that there is no problem with continued population growth. The low estimates are intended to persuade you that the earth already has more people than it can support.

Half of the estimates lie between 4 billion and 16 billion. Our present population is around 8 billion. This debate is timely.

Slide 4

I propose some questions at 3 levels of detail, summarized at the highest level by 2 words (constraints and choices), then 4 words (population, economics, environment, culture), then 11 broad questions.

Slide 5

Constraints: We do not fully understand earth's biological, chemical, and physical responses to past and future perturbations from humans and from nature.

Choices: We cannot foresee many future human choices.

Future choices may affect which constraints apply. Unanticipated constraints may affect which choices are possible.

Slide 6

Earth's capacity to support people depends on population, economics, the environment, and culture.

These factors interact in all pairs, all triplets, and all four at once. For example, how culture, economics, and population interact depends in part on the environment.

Slide 7

How many people Earth can support depends on answers to at least 11 questions.

Slide 8

1. What will be the **Average** level of material & cultural well being? How much food, fiber, water, housing, industrial output, health, sanitation, energy, education, and travel, as examples?
2. What will be the **Distribution** of material & cultural well being? What inequalities will we choose or accept in income, wealth, "happiness," health, and other "goods," among nations and among individuals within nations, by various statistical measures?

Slide 9

3. What **technology** will we use to produce goods and services?

Slide 10

4. What will be our Domestic & international **political** arrangements? Will we resolve conflicts violently or diplomatically? What will be our individual freedoms and our peaceful or violent procedures for political change?

Slide 11

5. What will be our Domestic & international **economic** arrangements? What will be our incentives, modes of production, trade agreements or tariffs, and regulation within & among nations?
6. What will be our Domestic & international **demographic** arrangements regarding, for example, birth, death, migration, marriage, family, households, age structure, and cities?

Slide 12

7. What will be our Physical, chemical & biological **environments**, including our future climate?

Slide 13

8. What will be our Desired **variability or stability** of population size? In this graph, on the horizontal axis, the present is on the left at year 0, and the past back to 400,000 years ago is on the right. The blue curve at the top shows global average temperature. Up is warm. Down is cold.

Now, and for the last 12,000 years, we have been in a warm interval between ice ages, called an interglacial. The previous interglacial occurred around 135,000 years ago, so biologically modern humans experienced the most recent ice age.

Let us pretend that the earth can support at most 1 billion people during an Ice Age. Do we want a total population size that remains steady at 1 billion people or do we want a total population size that surges up to 8 billion or more during a warm interglacial and subsides to 1 billion during ice ages? How much variability or stability do we want?

Slide 14

9. Do we prefer **Risk or robustness**? For example, are we willing to build cities in a floodplain or active earthquake zone, or do we limit settlements to safe areas?

10. What is our **Time horizon**? For the next five years we will have plenty of oil and the weather is likely to be mostly tolerable though frequently destructive. Over the next 50 or 500 years, the world will differ.

11. What will be our **Values, tastes & fashions**? Will we value Jaguars with four legs or Jaguars with four wheels? parks or parking lots? Will our fashions favor cotton, which is extremely water intensive to grow, or synthetics produced from agricultural and industrial byproducts? To settle our differences, will we choose violence or talk?

Slide 15

3 **panaceas** have been proposed: bigger pie, fewer forks, and better manners. The advocates of a **bigger pie** recommend increasing the productivity of people and machines. The advocates of **fewer forks** recommend slowing population growth through voluntary reductions in fertility. The advocates of **better manners** recommend reducing violence, corruption, inequalities, barriers to economic and technological efficiency, and unwanted material byproducts of consumption and production.

Many advocates favor one of these panaceas to the exclusion of the other two. I believe we need all three.

Slide 16

Thank you! I welcome questions if time permits.