# The changing profile of risks to health

**WORLD SCIENCE FORUM**
Budapest 2024

*The science and policy interface at the time of global transformations*

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# Future challenges:

Parameters

1. **Demography:** by 2100 will be 2.5–5.3bn more people (up from 8.2bn), but most parts of the world then in sharp population decline.

2. **Older:** median age now 29; by 2050 will be 41.

3. **Climate change:** By 2050 2C hotter than pre-industrial level, over 50% population in water-stressed areas. By 2100 2-4C hotter; large-scale climate-driven migration.

4. **More urban:** demographic growth, internal migration, relocation from flood areas could add 3.9bn to urban populations, need ~200 more cities with >20m people.

Key directions of change

1. **Increase efficiency** (food, energy, water, waste, transport etc.)

2. **Adjust to ageing** society (e.g. biomedical science, robotics)

3. **Transition to low-carbon** energy supplies.

4. **Find new solutions for urban living** (construction, work, transport etc.)

## Progress to date:

Life expectancy for a Roman Citizen in 100BC was ~20-25 years.

Over next 2,000 years (to 1900) life expectancy rose to 30 years.

Rate of gain: <1 extra day of life per year.

Life expectancy doubled between 1900 and 2000.

Rate of gain: 110 days of life per year.

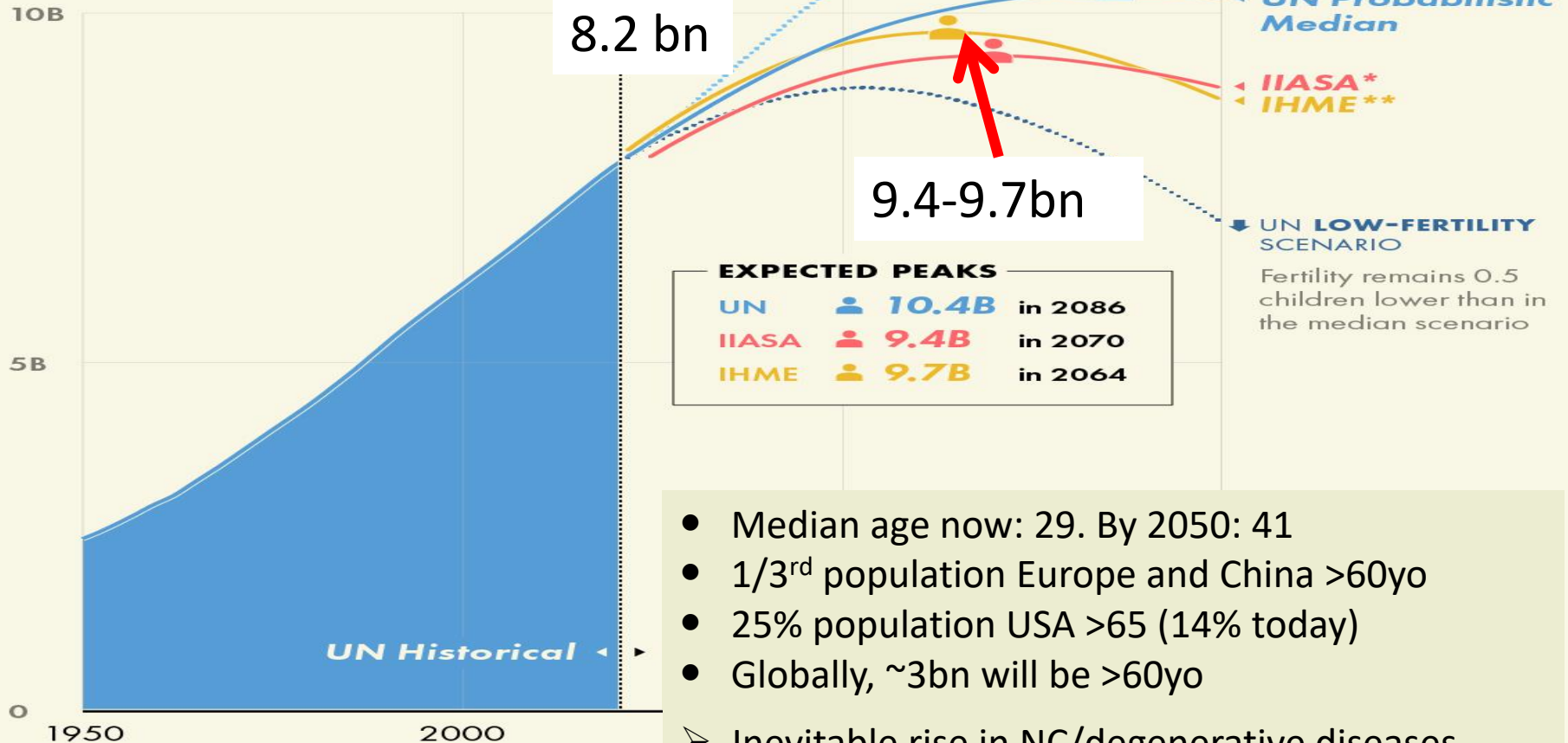So rate of gain increased: >100-fold.

**Causes:**

- Improvements in water and sanitation
- Improvements in agriculture and food storage
- Increases in productivity (could support larger population)
- In recent years- advances in medicine (immunization, antibiotics)

Greatest impact: decreased infant mortality

# THE WORLD IN 2100

## PREDICTING GLOBAL POPULATION

Although the UN's projections are the most widely used, alternative models are predicting both a lower and earlier peak.

15bn → UN **HIGH-FERTILITY** SCENARIO

Fertility remains 0.5 children higher than in the median scenario

10.4bn

◄ **UN Probabilistic Median**

8.2 bn

◄ **IIASA***
◄ **IHME****

9.4-9.7bn

▼ UN **LOW-FERTILITY** SCENARIO

Fertility remains 0.5 children lower than in the median scenario

**EXPECTED PEAKS**

| | | | |
|---|---|---|---|
| UN | 👤 | 10.4B | in 2086 |
| IIASA | 👤 | 9.4B | in 2070 |
| IHME | 👤 | 9.7B | in 2064 |

**UN Historical**

- Median age now: 29. By 2050: 41
- 1/3rd population Europe and China >60yo
- 25% population USA >65 (14% today)
- Globally, ~3bn will be >60yo

➢ Inevitable rise in NC/degenerative diseases

UN projections as of 2022. IHME projections as of 2020. IIASA projections as of 2014.
Source: UN, IHME, IIASA

*International Institute for Applied Systems Analysis
**Institute for Health Metrics and Evaluation

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Today, NCDs cause ~74% of all deaths globally = 41m deaths/year.

Projected to rise to 86% of all deaths by 2050

Today, over 80% from four groups of diseases:
- Cardiovascular diseases = 17.9m/year
- Cancers = 9.0m/year
- Respiratory diseases = 3.9m
- Diabetes = 1.6m

NCD treatment is long-term, high-cost.

Average health spending in rich countries: 9% GDP; 17.9% in USA.

Over 80% of all NCD deaths in low/middle-income countries.

**Source: WHO, The Economist, P. Clayton**

Risk factors
1) Population: ageing

2) Behavioral risk factors
Unhealthy lifestyles, bad diets, physical inactivity, tobacco, alcohol.
- Tobacco: 7.2 million deaths/year
- Excess sodium: 4.1 million deaths/year
- Alcohol: total 3.3m, about half due to NCDs (mainly cancer)
- Lack of exercise: 1.6 million deaths/year

3) Metabolic risk factors
- Raised blood pressure
- Overweight/obesity
- Hyperglycemia (high blood glucose levels)
- Hyperlipidemia (high levels of fat in the blood)

4) Socioeconomic impact.
- Cost of treatment reduces people with insufficient resources to poverty.
- But greater urban concentration could reduce per unit cost delivery: ~55% of population now urban; 68% by 2050.

# Prevention

**Smoking**
UK banned smoking in public places and workplaces in July 2007.
Result: >20% decline in cardiovascular diseases in first 10 years.
"Greatest UK public health achievement of the 21st century".

**Sodium**
Finland mandated salt reduction esp. in processed foods, starting 1970. By 2009, average sodium intake down by 40%, significant reduction in average blood pressure levels (>10 mm Hg reduction in diastolic blood pressure) and 80% drop in deaths due to stroke.

# Technology

Long term: Genome editing to target and correct e.g. some forms of cancer by modifying T cells to prevent them from being switched off by tumours.

Medium term: AI/robotics

Examples:
Google Health algorithm now as good as medical professionals at screening mammograms and identifying breast cancer, better at avoiding false positives.

3-D printer: coats hydrogel 'scaffolding' with stem cells, grow replacement organs.

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