A future without health? Health dimension in global scenario studies
Pim Martens & Maud Huynen

Abstract This paper reviews the health dimension and sociocultural, economic, and ecological determinants of health in existing global scenario studies. Not even half of the 31 scenarios reviewed gave a good description of future health developments and the different scenario studies did not handle health in a consistent way. Most of the global driving forces of health are addressed adequately in the selected scenarios, however, and it therefore would have been possible to describe the future developments in health as an outcome of these multiple driving forces. To provide examples on how future health can be incorporated in existing scenarios, we linked the sociocultural, economic, and environmental developments described in three sets of scenarios (special report on emission scenarios (SRES), global environmental outlook-3 (GEO3), and world water scenarios (WWS)) to three potential, but imaginary, health futures (“age of emerging infectious diseases”, “age of medical technology”, and “age of sustained health”). This paper provides useful insights into how to deal with future health in scenarios and shows that a comprehensive picture of future health evolves when all important driving forces and pressures are taken into account.

Keywords World health/trends; Forecasting; Communicable diseases, Emerging/epidemiology; Biomedical technology; Sustainability; Health status indicators; Epidemiologic factors (source: MeSH, NLM).

Mots clés Santé mondiale/orientations; Prévision; Maladies transmissibles émergentes/épidémiologie; Technologie biomédicale; Durabilité; Indicator état sanitaire; Facteurs épidoépidémiologiques (source: MeSH, INSERM).

Palabras clave Salud mundial/tendencias; Predicción; Enfermedades transmisibles emergentes/epidemiología; Tecnología biomédica; Sostenibilidad; Indicadores de salud; Factores epidemiológicos (fuente: DeCS, BIREME).

Health dimension in global scenarios
The value of scenarios to explore possible futures and provide sound, policy-relevant guidance for decision-makers is increasingly and widely recognized (Box 1). Scenarios have been generated about, for example, global climate change (1) and water utilization, availability, distribution, and quality (2), and an assessment of future ecosystem composition, structure, and function is in progress (3).

In today’s era of globalization, global environmental change and the subsequent increasing concern for our present and future health, the call for good global health governance is growing stronger. Scenarios are useful tools for exploring possible global health futures, gaining insights with regard to (the driving forces of) global health, and supporting the decision-making process. To date, however, a set of global integrated scenarios on future health development has not been generated. Even worse, as described below, in most of the global scenarios developed, the health dimension is lacking completely.

With the following three criteria “integration”, “long-range outlook”, and “global scope” in mind, we considered eight scenario studies (with a total of 31 scenarios) published since 1995 (Table 1). With regard to the health dimension in the selected scenarios, only 14 of the 31 scenarios gave a reasonable description of future developments in health (Fig. 1). Nine scenarios described only specific pressures or drivers with regard to human health or only certain aspects of health (for example, mortality and water-related diseases). Eight scenarios completely neglected the health dimension. Only four scenarios explicitly discussed several sociocultural, economic, and ecological developments as determinants of health. The main global drivers and pressures of health were described adequately in most of the selected scenarios, with the exception of “education”: only 14 scenarios described developments in “education”, one mentioned that literacy goals were set, and 16 did not mention “education” at all (Fig. 1). A mere 15% of the selected scenarios, therefore, describe health adequately and in an integrated way. Remarkable was the fact that of the six storylines developed by the Global Scenario Group, two described health specifically as an outcome of socio-economic and environmental changes, one gave a reasonable description of future health, but health was absent in three of the scenarios. This indicates that health is not handled consistently within the current sets of scenarios. When we looked at the major global determinants of health, however, these were addressed adequately in most scenarios. It would have been possible, therefore, to describe the future developments in health as an outcome of these multiple drivers and pressures.

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Health dimension in global scenario studies: review

Future health ages

What health future lies ahead? We linked the three most recently developed sets of scenarios (special report on emission scenarios (SRES), global environmental outlook-3 (GEO3), and world water scenarios (WWS)) to potential future health ages (Box 2):

- Age of emerging infectious diseases: in which the emergence of new infectious diseases or the re-emergence of "old" diseases will have a significant impact on health, influenced by travel and trade, microbiological resistance, human behavior, breakdowns in health systems, and increased pressure on the environment (11, 12).
- Age of medical technology: in which increased health risks caused by changes in lifestyle and the environment will be offset by increased economic growth and improvements in technology (13, 14).
- Age of sustained health: in which investments in social services will lead to a sharp reduction in lifestyle-related diseases, most environmentally related infectious diseases will be eradicated, and disparities in health between rich and poor countries eventually will disappear (15).

Although these stages are imaginary (even though some features already are recognizable in some countries) and are not delineated sharply, they could follow from ages in the health transition.
as we have seen in the past and are facing now (16) (Box 2). The projected picture of future health in a particular scenario evolved from our interpretation of the combination of the described future developments in the determinants of health.

The health futures of the SRES, GEO-3 and WWS scenarios are diverse, and we must keep in mind that the timeframes of these scenarios differ (10). Beneath the diversity of the studies in terms of the choice of scenario names and the narrative motivation for each storyline — including our enrichment related to human health — lies a common set of archetypal visions of the future:

- the world evolves gradually, driven by dominant driving forces;
- a strong policy push redirects development toward various environmental and social goals;
- global development succumbs to fragmentation, environmental collapse, and institutional failure; and
- a new form of development emerges from the challenges of globalization.

Looking at the health dimension we see that, on the one hand, in a future where a strong economic orientation prevails (WWS-BAU (Business-As-Usual) and WWS-TEC (Technology, Economics, and the Private Sector), and GEO3-MF (Markets First)), health developments in developing countries move towards the age of emerging infectious diseases, while the developed world manages to advance to the age of medical technology.

On the other hand, the scenarios that emphasize international cooperation with a strong focus on meeting social and environmental sustainability goals (SRES-B1, WWS-VAL (Values and Lifestyles), and GEO3-SuF (Sustainability First)), are characterized by the advancement of developing and developed countries to the age of sustained health.

In between these “extremes”, we see a spectrum of developments. For example, in the GEO3’s Policy First (PF) scenario, advances towards sustainability are slow. The developing countries are not likely to advance beyond the age of chronic diseases, and the developed countries are not able to complete the transition to sustained health. Something similar is the case in the future of the SRES-B2 scenario, but in this differentiated world, some developing countries might achieve some modest technological progress that sends them on the way towards the age of medical technology. SRES-A1 describes a future in which developing countries may experience improvements in health and increased life expectancy, but at the same time do not “trade” infectious

<table>
<thead>
<tr>
<th>Study</th>
<th>Time horizon</th>
<th>Scenarios</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which World (8)</td>
<td>2050</td>
<td>Market world</td>
<td>Free markets bring prosperity and human progress Inequity and environmental degradation bring conflict between rich and poor, social instability, and violence Fundamental social and political reform create a more peaceful, equitable, and environmentally sound world</td>
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<td></td>
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<td>Fortress world</td>
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<td></td>
<td>Transformed world</td>
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</tr>
<tr>
<td>Global Trends 2015 (6)</td>
<td>2015</td>
<td>Inclusive globalization</td>
<td>Positive effects of globalization and widespread global cooperation Globalization’s negative effects promote extensive dislocation and conflict</td>
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<td></td>
<td></td>
<td>Pernicious globalization</td>
<td>Globalization’s negative effects spur intensely competitive but not conflictual regionalism Globalization’s negative effects spur regionalisms characterized by descent into regional military conflict</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Regional competition</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Post-polar world</td>
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</tr>
<tr>
<td>Special Report on Emission Scenarios (7)</td>
<td>2100</td>
<td>A1</td>
<td>Rapid market-driven growth, with convergence in incomes and culture</td>
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<tr>
<td></td>
<td></td>
<td>A2</td>
<td>Self-reliance and preservation of local identities; fragmented economic and technological development</td>
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<td></td>
<td>B1</td>
<td>Convergent world with rapid changes in economic structures and emphasis on global solutions to sustainability</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B2</td>
<td>Local solutions to economic, social, and environmental sustainability</td>
</tr>
<tr>
<td>World Water Scenarios (2)</td>
<td>2025</td>
<td>Business as usual (BaU)</td>
<td>Current water policies continue, high inequity Market-based mechanisms, better technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Technology, economics, and the private sector (TEC)</td>
<td>Less water-intensive activities, ecological preservation</td>
</tr>
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<td></td>
<td></td>
<td>Values and lifestyles (VAL)</td>
<td></td>
</tr>
<tr>
<td>Global Environmental Outlook-3 (4)</td>
<td>2032</td>
<td>Markets first</td>
<td>A world in which market-driven developments converge on the values and expectations that prevail in industrial countries. Strong actions are undertaken by governments in an attempt to reach specific goals A world of great disparities, where inequality and conflict prevail, brought about by socioeconomic and environmental stresses</td>
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<td>Policy first</td>
<td>A new development paradigm emerges in response to the challenge of sustainability, supported by new, more equitable values and institutions</td>
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diseases for chronic diseases — the so-called “double burden” of disease — while the developed world reaches the age of medical technology. In the futures of the SRES-A2 scenario and the more “pessimistic” GEO3-SF (Security First), the developed world also is likely to experience this double burden of disease, while the developing countries shift into the age of emerging infectious diseases.

### The way forward

The previous exercise shows that a comprehensive picture of future health can evolve from current global scenarios studies, and several reasons exist for integrating health in upcoming global scenario exercises (in, for example, the new scenarios that are being developed as part of the Millennium Ecosystem Assessment (3, 17)). Firstly, health can be seen as an important high-level integrating index that reflects the state — and, in the long term, sustainability — of our natural and socioeconomic environment. Population health, therefore, is central to the formulation of humankind’s “sustainable development” trajectory (18). Secondly, global scenarios can provide narratively rich (although, in general, quantitatively coarse) descriptors across a range of

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**Box 2. Three potential future health stages**

The shifts that have taken place in the patterns and causes of death in many countries can be described and explained within a conceptual framework known as the health transition.

The first stage of the health transition (the age of pestilence and famine) is characterized by the kind of mortality that has prevailed through most of human history. Most developing countries are now in (or moving towards) the second stage: the age of receding pandemics. This involves a reduction in the prevalence of infectious diseases and a fall in mortality rates. In the third stage (the age of chronic diseases), the elimination of infectious diseases makes way for chronic diseases among the elderly. Most developed countries are in this stage (16). Despite its limitations (19), the health transition is a useful tool for understanding current health trends and exploring future developments. Fig. 2 outlines three possible health futures. These stages are imaginary (although some features already are recognizable in some countries) and are not sharply delineated — there is always a continuum. There is also always the possibility that economic, political, social, or environmental crises will cause the process of transition to stagnate or reverse. Each country follows its own route to the “ages” in question.

### Age of emerging infectious diseases

In this stage (see (17)), the emergence of new infectious diseases or the re-emergence of “old” diseases will have a significant impact on health. A number of factors will influence this development: travel and trade, microbiological resistance, human behaviour, breakdowns in health systems, and increased pressure on the environment (12). Social, political, and economic factors that cause the movement of people will increase contact between people and microbes, and environmental changes caused by human activity (for example, dam and road building, deforestation, irrigation, and, at the global level, climate change) all will contribute to the spread of disease. The overuse of antibiotics and insecticides, combined with inadequate or deteriorating public health infrastructures, will hamper or delay responses to increasing disease threats.

As a result, the prevalence of infectious diseases will increase drastically, and life expectancy will fall (as is the case in many developing countries because of AIDS). Ill-health will lead to lower levels of economic activity, and countries will be caught in a downward spiral of environmental degradation, depressed incomes, and bad health. Control of infectious diseases will be hampered by political and financial obstacles, and by an inability to use existing technologies.

### The age of medical technology

To a large extent, increased health risks caused by changes in lifestyle and environmental changes will be offset by increased economic growth and technology improvements in the “age of medical technology”. To some extent, this might be comparable with other views on a fourth stage — the “hybristic” stage, described by Rogers & Hackenberg (13), and the “age of delayed degenerative diseases” (14). If no long-term, sustainable economic development occurs, increased environmental pressure and social imbalance may propel poor societies into the age of emerging infectious diseases. On the other hand, if environmental and social resources are balanced with economic growth, sustained health may be achieved.

### The age of sustained health

In the “age of sustained health”, investments in social services will lead to a sharp reduction in lifestyle-related diseases, and most environmentally-related infectious diseases will be eradicated. Health policies will be designed to improve the health status of a population in such a way that the health of future generations is not compromised by, for example, the depletion of resources needed by future generations. Although the chance that infections will emerge is only minimal, improved worldwide surveillance and monitoring systems will mean that any outbreak is dealt with properly. Despite the ageing of the world population, health systems will be well adjusted to an older population. Furthermore, disparities in health between rich and poor countries will eventually disappear.
possible global futures. These scenarios thus can provide good coverage of the initial array of “drivers and pressures” needed to assess health changes.

As good health is regarded by many as one of the most important assets of human life, why has so little effort been made to explicitly address human health in the past decade of scenario development? From the point of view of the global scenario community, projection of the potential health impacts of global changes poses a difficult challenge, in part because the sensitivity and adaptive capacity of exposed populations varies considerably depending on various factors, such as population density, level of economic and technological development, local environmental conditions, pre-existing health status, and the quality and availability of health care and public health infrastructure.

From a public health point of view, exploration of these global, long-term, and complex risks to human health seems far removed from the tidy examples that abound in textbooks of epidemiology and public health research. Health is only beginning to play a role in global scenario assessments, because of the above-mentioned complexities that beset research into human health impacts, compounded by an apparent diffidence on the part of most epidemiologists and other population health scientists to engage in this unfamiliar domain.

However, in order to connect current scenarios to a more robust analysis of changes in health will need further analysis. Ideally, new scenarios in which health is a key issue from the start of the process should be sketched; this would result in comprehensive and integrated descriptions of future health that are based on possible developments in the sociocultural, economic, and ecological drivers and pressures described in consistent storylines.

The integration of the health dimension into global scenario development has the potential to be instructive and exciting. International agreements and conventions regarding environment, energy, and many other issues need to be informed by the most comprehensive information about model estimates and scenario projections for the future — and health should be an integral part of this information.

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Résumé
La santé a-t-elle un avenir ? La dimension sanitaire dans les études de scénarios mondiaux
Le présent article examine dans les études de scénarios mondiaux existants la dimension sanitaire ainsi que les déterminants socioculturels, économiques et écologiques de la santé. Sur les 31 scénarios étudiés, moins de la moitié décrivaient de façon satisfaisante les futurs événements sanitaires et tous les scénarios n’abordaient pas la santé de manière systématique. Toutefois, dans le domaine de la santé les forces motrices étaient en général suffisamment traitées: il aurait donc été possible que les futurs événements sanitaires en soient décrits comme un résultat. Pour montrer comment intégrer une dimension sanitaire dans les scénarios existants, nous avons relié les événements sanitaires dans les études de scénarios mondiaux à trois situations sanitaires possibles mais imaginaires (l’ère des maladies infectieuses émergentes, l’ère de la technologie médicale et l’ère de la santé durable). Le présent article permet de mieux comprendre la façon de traiter les futures situations sanitaires dans les scénarios et montre que le tableau complet des problèmes de santé évolue lorsque l’on tient compte de toutes les forces motrices et pressions importantes.

Resumen
¿Un futuro sin la salud? Dimensiones sanitarias en los estudios de escenarios mundiales
En este estudio se analizan las dimensiones sanitarias y los determinantes socioculturales, económicos y ecológicos de la salud en los estudios de escenarios mundiales ya existentes. Ni siquiera la mitad de los 31 escenarios analizados proporcionaba una buena descripción de la evolución futura de la salud, y los diferentes estudios de escenarios no trataron la salud de forma homogénea. No obstante, en los escenarios seleccionados se abordaban de forma adecuada la mayoría de las fuerzas impulsoras mundiales de la salud, por lo que hubiera sido posible describir la evolución futura de la salud como un resultado de esas múltiples fuerzas impulsoras. Para aportar ejemplos de cómo se puede incorporar el futuro de la salud a los escenarios existentes, relacionamos las evoluciones sociocultural, económica y ambiental descritas en tres grupos de escenarios (el informe especial sobre los escenarios de emisiones — SRES —, la era de la tecnología médica y la era de la salud sostenida). El presente artículo permite comprender mejor cómo tratar la situación sanitaria futura en los estudios de escenarios y muestra que se puede obtener una visión global del futuro de la salud cuando se toman en consideración todas las fuerzas impulsoras y presiones importantes.
References