

A future without health? Health dimension in global scenario studies

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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; Indicateur état sanitaire; Facteurs épidémiologiques (*source: MeSH, INSERM*).

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

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Voir page 900 le résumé en français. En la página 900 figura un resumen en español.

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 socio-cultural, 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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Box 1. Scenarios

Scenarios are descriptions of journeys to possible futures that reflect different perspectives on past, present, and future developments; they are created with a view to anticipating the future. They are hypothetical, describing possible future pathways, and they consist of states, events, actions, and consequences that are linked causally. Scenarios include the depiction of an initial state, which usually lies in the present, or a final state at a fixed time horizon (or both).

Scenario analysis has evolved significantly over the past decades. In the early days, scenarios were used primarily as planning and forecasting tools to display a rather mechanistic and deterministic world view. Later, scenario analysis moved beyond merely fulfilling a decision-support function to supporting a more open form of exploration. Nowadays, scenarios have evolved into powerful exploratory tools: they do not predict the future, but rather they paint pictures of possible futures and explore the various outcomes that might result if certain basic assumptions are changed. Currently, therefore, scenarios often are used to broaden and deepen the mindset of stakeholders involved in a process of exploring possible futures.

Based on this, the relevant question that scenarios can address is not whether any particular development will happen in the future, but rather what might happen and how we act to encourage, discourage, prepare for, and respond to such an event or development. In this way, we can expand our thinking beyond the conventional paradigm to explore future possibilities that go beyond our conventional thinking and that may result in surprising and innovative insights.

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 behaviour, 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,

Table 1. Studies included in review of inclusion of health dimension in scenarios

Study	Time horizon	Scenarios	Description
Global Scenario Group (5)	2050	a. Conventional worlds	Gradual convergence in incomes and culture toward dominant market model
		b. Market forces	Market-driven globalization, trade liberalization, institutional modernization
		a. Policy reform	Strong policy focus on meeting social and environmental sustainability goals
		Barbarization	Social and environmental problems overwhelm market and policy response
		a. Breakdown	Unbridled conflict, institutional disintegration and economic collapse
		b. Fortress world	Authoritarian rule imposed by elites in “fortresses”, poverty and repression outside
		Great transitions	Fundamental changes in values, lifestyles and institutions
a. Ecocommunalism	Local focus and a bioregional perspective		
	b. New sustainability paradigm	New form of globalization that changes the character of industrial society	
Millennium Project (7)	2050	Cybertopia	Computers and communications make a better world (the age of communications) and globalization accelerates
		Rich get richer	Active intense competition leads to an extreme gap between the rich and poor, but eventually things change and the gap narrows
		Trading places	The developing countries flourish and the rich stagnate, which leads to shifts in global economic and political power
		Passive mean world	Downward spiral; growth slows and sustainability suffers
World Business Council on Sustainable Development Global Scenarios (9)	2050	First raise our growth (FROG)	People rely on market mechanism and technological solutions and ignore socioenvironmental problems
		GEOpolity	Problems reach a crisis point and people turn away from ineffective institutions of government and business to seek new models of governance that take into account the previously ignored religious and democratic values
		Jazz	People embody the growing environmental and social values within the economic “myth” and experiment within a transparent world

(Table 1, cont.)

Study	Time horizon	Scenarios	Description
Which World (8)	2050	Market world Fortress world Transformed world	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
Global Trends 2015 (6)	2015	Inclusive globalization Pernicious globalization Regional competition Post-polar world	Positive effects of globalization and widespread global cooperation Globalization's negative effects promote extensive dislocation and conflict Globalization's negative effects spur intensely competitive but not conflictual regionalism Globalization's negative effects spur regionalisms characterized by descent into regional military conflict
Special Report on Emission Scenarios (7)	2100	A1 A2 B1 B2	Rapid market-driven growth, with convergence in incomes and culture Self-reliance and preservation of local identities; fragmented economic and technological development Convergent world with rapid changes in economic structures and emphasis on global solutions to sustainability Local solutions to economic, social, and environmental sustainability
World Water Scenarios (2)	2025	Business as usual (BaU) Technology, economics, and private sector (TEC) Values and lifestyles (VAL)	Current water policies continue, high inequity Market-based mechanisms, better technology Less water-intensive activities, ecological preservation
Global Environmental Outlook-3 (4)	2032	Markets first Policy first Security first Sustainability first	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 A new development paradigm emerges in response to the challenge of sustainability, supported by new, more equitable values and institutions

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

Fig. 1. Inclusion of health dimension in selected scenarios (1, 2, 4–9)

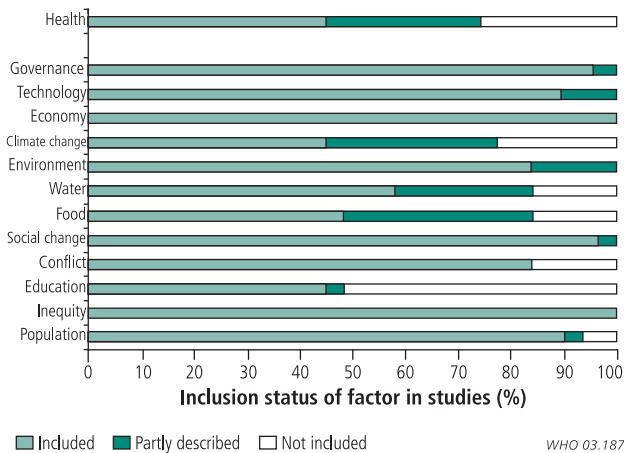
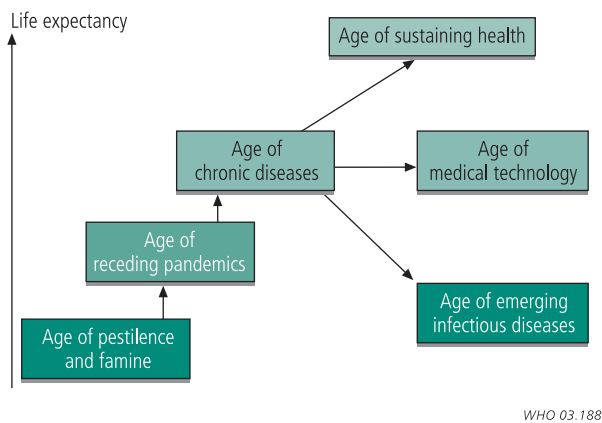


Fig. 2. Future stages in the health transition. It is possible for developing countries to skip the “age of chronic diseases” and move directly to the “age of sustained health”, “age of medical technology” or “age of emerging infectious diseases”



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

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 (11)), 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

socioculturels, économiques et environnementaux décrits dans trois groupes de scénarios (rapport spécial sur les scénarios d’émissions – SRES, l’avenir de l’environnement mondial 3 – GEO3, et scénarios mondiaux relatifs à l’eau – WWS) 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 las emisiones — SRES —, Perspectivas del medio ambiente mundial 3 — GEO3 — y Escenarios mundiales del agua — WWS —) con tres posibles futuros sanitarios imaginarios («la era de las enfermedades infecciosas emergentes», «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.

ملخص

مستقبل بدون الصحة؟ البُعد الصحي في دراسات حول السيناريو العالمي لمستقبل الصحة

فقد قمنا بربط التطورات الاجتماعية الثقافية والاقتصادية والبيئية، الموصوفة في ثلاث مجموعات من السيناريوهات (وهي سيناريوهات التقرير الخاص المعني بالانبعاثات من المخلفات الصناعية، وسيناريو التوقعات البيئية العالمية-الإصدار الثالث، والسيناريوهات العالمية للماء) في ثلاثة أوضاع محتملة الحدوث لمستقبل الصحة ولكنها تخيلية (وهي "عصر الأمراض المعدية المستجدة"، و"عصر التكنولوجيا الطبية"، و"عصر الصحة المستدامة أو المضمونة الاستمرار"). وتطرح هذه الورقة رؤى عميقة ومفيدة حول كيفية التعامل مع الصحة المستقبلية في السيناريوهات، وتبين أن من الممكن الحصول على صورة شاملة للصحة المستقبلية إذا أخذت جميع القوى المؤثرة والضغوط في الحسبان.

الملخص: تستعرض هذه الورقة البُعد الصحي والحدّات الاجتماعية الثقافية، والاقتصادية، والإيكولوجية للصحة في الدراسات الحالية حول السيناريو العالمي لمستقبل الصحة. والملاحظ أن أقل من نصف عدد السيناريوهات التي تمت مراجعتها، وعددها ٣١ سيناريو، قدّمت وصفاً جيداً للتطورات الصحية في المستقبل، كما أن دراسات السيناريو المختلفة لم تتناول موضوع الصحة بأسلوب متناسق. غير أن معظم القوى العالمية المؤثرة في الصحة تؤخذ في الحسبان بقدر كاف في السيناريوهات المنتقاة، ومن ثمّ كان من الممكن وصف التطورات المستقبلية في الصحة كنتيجة لهذه القوى المؤثرة المتعددة. ولكي نضرب أمثلة لكيفية دمج الصحة المستقبلية في السيناريوهات الحالية،

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