

A Systems Analysis Approach to Health and Wellbeing in the Urban Environment:

Summary report of an ICSU workshop¹ in collaboration with the International Institute for Applied Systems Analysis (IIASA)

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Introduction

Following introductory presentations on by IIASA Director **Leen Hordijk**, ICSU deputy Director **Carthage Smith**, and ICSU workshop chairs **Pierre Ritchie** and **Dov Jaron**, ICSU Committee on Science Policy and Review (CSPR) Chair **Khotso Mokhele** drew attention to some of the key contextual factors surrounding the workshop.

One was that, in elaborating its 2005 Strategic Plan, ICSU had identified the need to better integrate the social and natural sciences as a priority. The second was that human health had been identified as a major gap in ICSU's activities over the years. The third was that, in accepting the work of the Scoping Group on health, ICSU's CSPR had given its blessing to the formation of a Planning Committee to develop research activities in the area of urban health, with a particular methodological focus on systems analysis.

The workshop proper started with two presentations: one by **Landis MacKellar** on systems analysis in general and the second an example of systems type approach as applied to complex health problem, namely linkages between climate change policy and health, by London School of Hygiene and Tropical Medicine Director **Andrew Haines**.

MacKellar began by expressing the view that "systems analysis" was an ill-defined term and destined to remain so, but generally involves the representation of a problem or *problématique* as a logically connected set of agents and processes. He made a distinction between systems analysis and systematic analysis (to which all good work should aspire) and between systems analysis of health and the analysis of health systems (which can be done from any of a range of perspectives). A systems analysis is likely to involve change over a long period of time and will typically involve many interacting variables. Whether a system is complex or merely complicated is an empirical question, but it is not unlikely that a systems analysis of health will involve non-linearities and non-deterministic relationships.

Haines placed climate change at the intersection of health, urban environment, and energy. Given the pace at which the world is urbanizing, problems across a broad range will increasingly be urban problems. Among the main problems he identified were indoor air pollution caused by use of solid fuels, CO₂ emissions tied to power generation, and urban air pollution tied to the rise of the automobile and other forms of motorized transport. The full cost of transport systems would take into account factors such as impact on greenhouse gas emissions (GHG), impacts on exercise and obesity, and motor vehicle accidents. Given the scale of GHG emission reductions now called for by scientists, the entire energy and transport complex will need to be re-engineered over the next half century. In view of this, a crucial element of the health research programme must be an assessment of the impacts of different approaches to the climate change issue on human health.

General discussion revolved around the need to look at the entire picture; for example, the relationship between meat consumption, climate change, and health; or between provision of public transport, health, and climate change. The ethical dimension of public health was cited, as was the limited choice set of poor people and the importance of involving industry and the retail sector.

Session 2

Antony Capron described how urban sprawl, to which increased use of the automobile has been the response, has been associated with reduced levels of exercise and associated health impacts. It has also contributed to social isolation, as neighborhood institutions such as corner shops have weakened. Long hours spent commuting in automobiles contribute to stress and have a negative impact on family and community life, with spillover effects on health. Yet informed manipulation of the built environment, sustainable infrastructure and above all the provision of mass transport can alleviate these health problems while reducing substantially the environmental impact of urban growth.

Ania Grobicki spoke of links between urbanization, natural catastrophes, and health. She began with a comprehensive typology of disasters, of which meteorological disaster, particularly floods and hurricanes, and geological disasters, especially earthquakes, cause the greatest damage. Exposure to natural disaster risk is a function both of the hazard itself and of vulnerability / resilience. The brunt of natural catastrophes is borne by the world's poor, who are ill-equipped to prevent or mitigate losses and, after disaster occurs, experience difficulty in recovering. The general trend over the last decades has been to an increased number of (mostly weather-related) disasters, and increase in the number of persons affected, but a reduction in the number of human fatalities. Among the aspects impinging on urban vulnerability to disasters are unsustainable settlement patterns bringing populations into harm's way, inadequate urban drainage systems, and the absence of effective planning practices and building standards. A systems approach would take into account the multiplicity of hazards, different levels of population vulnerability, and the need for an integrated, inter-sectoral policy approach.

Most of the panel discussion and ensuing general discussion closing Session 2 focused on the policy processes. **Linda Bourque** and **Stan Morain** stressed that disasters are as much, indeed often more, a function of inadequate policy responses than they are functions of natural conditions. High-level packaging of data, especially to the extent that problems can be visualized for consideration by decision makers, can go far towards improving policy making. **Markus Amann**, based on his work in the area of air pollution, also discussed the need to communicate information to policy makers. Connections and synergies between different sectors – for example, classic urban air pollution and climate change – are often missed because of insufficient communication between experts from different sectors and the failure to pitch messages at a high-enough level of the policy making establishment.

Session 3

Suzanne Bennett Johnson spoke on the various components of morbidity and mortality, using Disability-adjusted Life Years (i.e., years of healthy life lost to various conditions) as a metric. She pointed out that the DALY approach reveals a surprisingly large role for unipolar depression, other mental illnesses, and conditions such as hearing loss. In addition, the DALY approach throws into relief the fact that life-style, not life-context, is the main causal factor in about half of all DALYs. Among life-style factors are nutrition, physical activity, substance usage, and sexual risk taking. She addressed the issue of how to measure wellbeing. The WHO Quality of Life measure includes an environmental

domain. Other quality of life measures tend to be very health-oriented. Life satisfaction measures incorporate multiple indices, but are very culture-specific.

Gérard Salem drew on his years of experience in Africa to discuss the urban health landscape. The process of urbanization, he stressed, is completely different in developed countries and in the developing world. In Ougadougou, he identified three distinct zones, the “legal” zone of regulated construction and two “illegal” zones of urban sprawl, one characterized by very dense settlement and the other sparsely inhabited. Infectious disease epidemiology in urban areas is influenced by three characteristics: population density, spatial and social heterogeneity, and the inter-connectivity of space, both within and between urban centers and between urban and rural zones. Population heterogeneity is everywhere and approaches based on average measures are likely to be of little use. Heterogeneity is also observable in health services, e.g. between traditional and modern providers and, within the latter category, between public, private, and religious providers.

In the panel discussion and general discussion that ensued, issues of Third World urban health took precedence. In Africa, families lose traditional rural support systems when they move into an urban environment; they also become prone to “diseases of affluence,” largely dietary in origin. In India, there is a tradeoff between traditional biomass fuels, which have severe health impacts via indoor air pollution and clean modern fuels, which eliminate indoor air pollution but at the expense of GHG emissions. These panel interventions gave rise to a general discussion of health inequities and the fact that, in many policy interventions related to health, there are winners and losers. The need for behavior modifications is accepted, but only a sub-set of past behavior modification efforts, such as those dealing with seatbelts and tobacco, have worked. Many chronic conditions are related to age, not other risk factors; for example, while high cholesterol may raise risks of cardiovascular problems in persons aged in their fifties or sixties, by the time they are into their seventies or eighties, it ceases to be a significant risk factor.

Session 4

William McGreevey also began his presentation by pointing out that rapid current urbanization in the Third World is very different than the gradual process of urbanization that occurred in today’s developed countries. He described a positive feedback loop which started with the fact that agglomeration economies and the advantages of concentration attracted economic resources, both labour and capital, to cities. Formerly, urbanization was limited by the fact that increases in income gave rise to only limited improvements in health and propinquity (population density) was, in fact, dangerous because of infectious disease. But with the advent of the germ theory of disease and the sanitary revolution, higher incomes in cities improved health, which raised economic growth rates yet further. Urbanization, therefore, may be a vital link between growth in income and improvements in health.

Landis MacKellar presented a broad ranging review of social factors affecting health. He described the importance of policy responses, in the form of decisions in such areas as health care financing, education, and focused interventions dealing with areas such as smoking, depression, and so on. Admitting that not everyone in the room would agree, he questioned the view from social epidemiology that there is a causal relationship

between income distribution and population-wide health. Re-distributing income from rich people to poor people will result in improved aggregate average measures of population health because the health of the poor will improve more than the health of the rich will deteriorate. But it is changes in income that are the causal basis for this effect, not changes in income distribution as is often claimed.

In panel discussion, the role of inequality as a source of stress having negative impacts on health was defended, with attention to labour market informality, violence, and unsustainable forms of development. Other speakers added that the process of decision making, whether it was exclusionary or not, was an important factor. Institutions such as social security, as well as sectoral policies in education and health, can improve the health of poor people, but the current policy environment in many countries is not necessarily conducive to such interventions.

Session 5

Clinton Andrews spoke on links between infrastructure and health, particularly the role of urban planning in ensuring that decisions made are health-promoting, not health-damaging. Planners sit at the intersection of the market, political forces, and administrative decision making bodies. There are multiple styles of planning across the world, from unitary (e.g., the Netherlands and UK) to highly federalized (e.g., Germany and Russia). Yet all are a response to the inter-dependence of decisions made, the indivisibilities associated with infrastructure, the need to anticipate the future better than markets alone are able to do, and the need to make the normative basis for decisions transparent to those affected by them.

Brian Ratcliffe discussed nutrition as a determinant of health. He described the tremendous challenges in assembling reliable data when self-reported data are systematically biased. Using a range of data from developing countries, he showed that development is associated with a reduction in daily energy expenditure, a smaller share of household income spent on food, a move towards foods with higher energy density, often imported, rising alcohol consumption; etc. Citing the energy expenditure required, he cast doubts on the often-made claim that the secret to avoiding obesity is more exercise. He also described the great power of fundamental evolutionary forces, for example, the hunter-gatherer's urge to eat a wide variety of foods in small quantities at high frequency – in a word, to eat snacks.

In panel discussion and general discussion, the general focus was the Third World and the need to promote participatory planning processes. Good governance is a central element in whether the planning process works, yet the definition of good governance itself is contested and may be context-specific.

Synthesis and overview sessions

In this synthesis and overview sessions, attention was focused on how to define and address the problems we are dealing with. Not only human population data are of importance; indicators of environmental degradation, data relating to proxy non-human diseases and species diversity, etc. also need to be integrated. Allowance needs to be

made for surprises. The needed research is interdisciplinary rather than multi-disciplinary and will call for the representation of wide range of approaches. Not only human behaviours, but the planning process, need to be taken into account. The reasons behind planning failures and successes need to be identified keeping in mind the linkages between the drivers of poor urban health. Comparative studies may be an appropriate tool.

The contribution of a systems approach was discussed. Such an approach avoids the error of reductionism in an area where individual deterministic relationships are often known but the system as a whole is more complex than the linear combination of its parts. The problem of hierarchies was raised; i.e. that effects arise at the level of the individual, the family, the community, the city, the country, and the world, and each level interacts with the others.

For ICSU, this urban health initiative will mean forming alliances with new partners, for example, urban planners. The organizers closed the conference with a reminder that given the current challenge of rapid urbanization; - there is an urgent need to move beyond a “symptom-treatment mode” of urban towards a systems analysis and above all approach of health. The participants were thanked for their contribution to the process.