Assessing the Economic Value of Public Health Programs Based on Risk: The Case of the Cancer Plan in France

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ABSTRACT

Objectives: This article intends to understand how health risk is actually valued and managed in public health programs through the case study of the cancer plan in France.

Methods: A literature review has been carried out with a particular focus on major health risk characteristics from a multidisciplinary perspective. To assess the economic value of the cancer plan in France, the study uses secondary data on the costs of cancer that have been collected and published by the National Institute for Cancer for 2004.

Results: A model is designed to evaluate health risk components that can be classified into four main categories relating the level at which risk is analyzed (individual or population) to the main type of intervention needed (preventive or curative) to cope with it. The findings show that actions and interventions dealing with prevention, education, and research represent 3.54% of the total costs of the cancer plan in France while 96.46% relates to health care and economic losses.

Conclusions: The proposed classification of health risk components gives more insight and understanding of risks associated with diseases and illness and proposes an operational representation of actions and costs related to the risks. The methodology proposed might be of significant interest to those involved in making health-care financing decisions.

Keywords: cost analysis, economic evaluation, public health, risk factors.

Introduction

The economic evaluation of public health programs derives from methods based on their aggregate costs compared with their efficacy and future benefits [1]. They do not take explicitly into account the fundamental notion of health risk, which underpins the goals and missions of public health policies. Yet, if preventing illness and reducing diseases represent the major part of the public health agenda [2], comprehensive public health plans should focus mainly on health risk assessment and management [3].

Moreover, evaluating public health systems [1] according to their aggregate costs makes it difficult to manage and monitor ongoing public health programs [4] mainly because we must adopt the principle that health requires more than just health care [5]. Improvements in this sphere therefore require close attention to the relationship between preventive and curative measures and health-care policy intervention. In this context, risk-targeted [6,7] approaches to economic evaluation represent a promising avenue [8] through which to design, implement, and monitor public health programs more effectively.

This contribution seeks to improve understanding of the ways in which health risk is actually assessed and managed in public health programs through a case study of the cancer plan in France.

Methods

Multiparadigm Literature Review on Health Risk

A multidisciplinary review of the literature on risk was conducted to explore how health risk is defined, assessed, and managed, particularly regarding its psychosocial aspects. The academic EBSCO database (Business Source Premier, Cairn, Elsevier, Factiva, Springer, Wiley, Blackwell; University of Montpellier’s Library, France) was investigated first of all for the words “risk” and “health,” which yielded more than 15,000 results. A refined search on “risk assessment” and “risk management” yielded 164 articles published between 1973 and 2008. It was particularly noteworthy in this regard to observe the tremendous interest in the subject during the last years, because 87 of these academic articles were published after 2004. In terms of broad results, out of 164 articles, 16 concerned health risk assessment, 12 risk communication, 9 public health, 7 evaluation, 6 medical care, and 7 methodology. A specific search for “health risk” and “economic evaluation,” yielded five articles, out of which only one [9] dealt with psychosocial considerations in health evaluation. This search was completed by investigating books and reports on public health and risk from the World Health Organization (WHO) and the French Parliament.

The main objective of this literature review was to design a conceptual framework in which the overall costs of a determined public health program could be used to assess its value in terms of health risk management.

Assessing the Economic Value of the Cancer Plan in France

According to an accounting rationale, cancer plan costs can be considered as the resources [10] devoted to addressing the risk of cancer, either in terms of prevention or treatment. Then, to assess the economic value of a public health plan it is critical to translate costs into value. The question then is to determine on what grounds costs can be an appropriate proxy for value in this context? Costs represent the volume of resources spent to implement a health plan, while value is what population and individuals believe the plan is worth to them, i.e., the objectives of the plan translated into health outcomes and health risk reduction. In economic sectors where resource allocation is determined by market forces, the value of economic goods can readily be determined by market prices compared to their costs; thus, the decision-making process is based on the monetary profit
Economic Value of Public Health Programs

553

criterion. This approach can be adapted to decision-making in the public sector using cost-efficiency or cost-utility evaluation models based on anticipated costs and gains for the economy as a whole. Nevertheless, Johansson [11] shows that, as a particular public good [12,13], public health value cannot be simply derived from market monetary rules. In this sector, economic evaluation is dominated by cost-effectiveness analyses that include health-related, nonmonetary measure (Johansson, p. 12). Actually, in cost-effectiveness analyses, value and cost appear to be closely imbricated [14], the main distinction rests on the fact that monetary measure relates to costs and gains, while nonmonetary to health outcomes or value. Consequently, the decision criterion must be based on benchmarking, either in comparison to alternative interventions or to a threshold of costs per health effect. Moreover, costs and value are not observable at the same time; usually, costs are incurred before health outcomes are observed. The discount rate applied to monetary measures is an imperfect solution to this problem because of the nonmonetary elements. A better solution would be to observe costs in a “longitudinal cost analysis” that would avoid cost-effectiveness threshold biases. The value of health outcomes could then be assessed by observing the evolution of cost structure in a historical perspective, given the objectives assigned to the public health plan.

A detailed, densely documented investigation was carried out by the National Institute for Cancer (INCA) [15] to collect all of the costs incurred in France in relation to the fight against cancer in 2004. This survey covers the costs borne by the government and the National Health Insurance system, along with those borne by society, such as welfare and utility losses. This aspect relating to lost production because of cancer had never previously been explored in France.

The overall costs of cancer are classified according to broad topics: hospital and ambulatory care, production losses due to cancer, public policy costs relating to prevention, screening, and medical research. Health care costs were calculated from PMSI (Programme de Médicalisation des Systèmes d’Information) data (French medical database on the activity of public and private hospitals, inspired by American DRGs [16]). Broader economic and public databases, such as the national health account and the government’s budget were used by the INCA to calculate other costs. Total expenditure reached €1.192 billion, out of which €10.886 billion was devoted to health care alone, €670 million to medical research, €247.9 million to screening, and €120 million to prevention campaigns. Prevention covers essentially the fight against tobacco and alcohol abuse, representing €109 million. In addition to these accounting costs, opportunity costs for economic losses corresponding to lost production and revenue were estimated at nearly €17.5 billion based on net present value of production losses and cost of sick leave.

Results

Literature Review: Modeling Health Risk

As a multidisciplinary field of study, Health Economics draws on welfare and microeconomics, biostatistics, epidemiology, and many other disciplines [17]; thus, health risk assessment should encompass all of these aspects. The literature review carried out shows that the risk conceptualization proposed by economists [18] may help articulate an epistemological approach to risk based on different paradigms, because it distinguishes uncertainty that cannot be anticipated or controlled from risk that can be modeled and predicted [19]. In this way, risk modeling may be seen as an attempt to control the unknown by applying knowledge to uncertainty: Each discipline can apply its own particular form of knowledge [20] to chance, to convert it into a risk proposition. It follows that the concept of risk is multifaceted [21] and requires investigation from a multidisciplinary [22,23] perspective.

Science and medicine understand and define risk as an objective reality that can be measured, controlled, and managed [24]. Risk is an impending epidemic or disease, an environmental disaster or a safety catastrophe, that can be harnessed by applying our knowledge to uncover the facts and putting remedial action or anticipatory measures into place. Social sciences stress the subjective nature of risk vis-à-vis the objective scientific view [25]. Psychology is preoccupied with determining the discrepancy between expert and every-day risk perception [26]; it assesses the reasons for being risk-averse, risk-indifferent, or a risk-taker [27], and aspects of motivation and cognition that characterize risk behavior. Sociology argues that the dominant scientific paradigm is breaking down, creating an opportunity for politics to determine the definition and treatment of risk. In reality, the sociological literature on risk is an eclectic patchwork [28], in which the sociocultural perspective constitutes an attempt to marry anthropology, society, and governmental action, to produce a synthesis through which to understand risk as a societal phenomenon [29]. Risk and society are intertwined and we must turn to people and the societies in which they live to understand risk. Some research [30] has shown that the way people respond to illness and its risks depends on their education, their age and their profession.

Among these approaches, the philosophical viewpoint [31] appears to be the more comprehensive, because it provides an epistemological approach to viewpoints on risk proposed by other disciplines. The philosophical approach [13] identifies five different types of risks:

1. “subjective risk: the mental state of an individual who experiences uncertainty or doubt or worry as to the outcome of a given event;
2. objective risk: the variation that occurs when actual losses differ from expected losses;
3. real risk: the combination of probability and negative consequences that exists in the real world;
4. observed risk: the measurement of that combination obtained by constructing a model of the real world; and
5. perceived risk: the rough estimate of real risk made by an untrained member of the general public.” (p. 568)

These definitions can be classified according to two rationales, the first of which distinguishes individual (subjective, objective, perceived) from collective (real, observed) characteristics of risk; while the second differentiates risk defined as a reality that exists in its own right (objective, observed) from risk defined as a reality by virtue of a judgment (subjective, perceived, real). On the basis of these two rationales, two dimensions for analyzing risk components may be identified.

When applied to health risk, this conceptual scheme allows for the classification of the different interventions and actions which constitute a public health program (Fig. 1). The first axis represents individual and population approaches to health risk. It distinguishes preventive and curative care at the individual level from public health actions and economic consequences of illness at the population level. The second axis differentiates between interventions designed to prevent diseases and those undertaken when diseases have occurred. These two axes delineate four quartiles corresponding to the categories of actions and interventions for each component of health risk, as shown in Figure 1.

Real health risk relates to illness as a social process affecting social structure and organization. It refers more specifically to
health risks engendered by life style and culture. In this context, it is essential to identify health risk factors to put in place the main actions that are required within society with regard to education and prevention. The notion of risk factor in the socio-economic approach emphasizes that risk-taker decisions result from a complex system of interactions, which must be investigated through longitudinal studies [32]. For instance, the correlation between a risky decision and the satisfaction expected by the risk taker depends on the measurement system: correlation is positive when risk is evaluated according to its potential gains and negative according to its potential losses. Public health programs must therefore include research and survey data, information campaigns, and health promotion measures.

Observed health risk encompasses the economic consequences of illness, such as production losses borne by society through the working days lost and their impact on the functioning of public and private organizations that will have to compensate for such losses through corrective actions. Even though this implicit dimension of the costs of illness is very often underestimated, it is a real burden from the economic and social viewpoint.

Subjective/perceived health risk points to the way an individual reacts to illness, as far as identity construction [18] is concerned. This risk depends on individual behaviors when confronted with illness. Actions to cope with this risk focus mainly on prevention at the individual level, such as screening, counseling, disease detection, disease management.

Objective health risk relates to the effects of illness on the physical and mental health that must be treated by the healthcare system, namely primary care, hospital outpatient care, and clinical care.

**Assessing the Economic Value of the Cancer Plan in France**

The model outlined in Figure 1 has been applied to the cancer plan, drawing data from the study carried out by the INCA on the costs of cancer in France (Table 1).

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**Figure 1** Public health actions/interventions according to health risk components.

**Table 1** The costs of cancer in France (2004) (Source: INCA, 2007)

<table>
<thead>
<tr>
<th>Cost items</th>
<th>Valuation (€ except item 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Impact of illness on life years</td>
<td>About 2,300,000</td>
</tr>
<tr>
<td>Potential life-years lost</td>
<td>10,886,190</td>
</tr>
<tr>
<td>2. Health-care costs</td>
<td>7,184,885</td>
</tr>
<tr>
<td>Clinical care</td>
<td>3,701,305</td>
</tr>
<tr>
<td>Ambulatory care</td>
<td>527,811</td>
</tr>
<tr>
<td>3. Production losses</td>
<td>16,921,070</td>
</tr>
<tr>
<td>Productivity losses due to sick leaves, evaluated by the “friction cost” method</td>
<td>17,448,881</td>
</tr>
<tr>
<td>Potential production losses due to mortality, evaluated by the “discounted wages” method (or human capital)</td>
<td>16,921,070</td>
</tr>
<tr>
<td>4. Primary care prevention (information campaigns)</td>
<td>120,000</td>
</tr>
<tr>
<td>Tobacco</td>
<td>46,000</td>
</tr>
<tr>
<td>Alcohol</td>
<td>63,000</td>
</tr>
<tr>
<td>Food/physical training</td>
<td>11,000</td>
</tr>
<tr>
<td>5. Screening and disease detection</td>
<td>247,900</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>194,200</td>
</tr>
<tr>
<td>Colon cancer</td>
<td>53,700</td>
</tr>
<tr>
<td>6. Public funded research</td>
<td>670,000</td>
</tr>
<tr>
<td>Government funding to research bodies and universities</td>
<td>324,000</td>
</tr>
<tr>
<td>National Health Insurance funding to hospitals</td>
<td>302,000</td>
</tr>
<tr>
<td>Public funding to research contracts on cancer</td>
<td>44,000</td>
</tr>
</tbody>
</table>

Value in italic indicate category totals.
health policies centered on prevention and education, where emphasis is placed, not on containing and controlling costs, but on avoiding production and value losses borne by the economic system because of illness.

**Discussion**

The model proposed makes it possible to go beyond an “aggregate costs” logic in the evaluation of public health programs. Implementation of the model is based on the fact that in the case of public health programs, value is derived from cost structure. Indeed, it is the cost-mix obtained from the risk components that reflects the value of a public health plan. As a corollary, the value of a public health plan can be assessed through the risk-component-mix. To go beyond the operational aspect of the model proposed, further research should try to formalize the relationship between these two variables.

In the case of the French cancer plan, the model makes it possible to split the total cost of €29.373 billion. The evaluation of cancer risk through the model of health risk components confirms that the national health system is directed toward the management of the objective risk, i.e., curative care at the individual level. This explains why the political debate on health-care financing generally underestimates organizational and institutional settings that are essential for a comprehensive management of health risk. This approach is crucial for chronic diseases that need to be studied and managed adopting a life-course model.

Implications for the management of risk and uncertainty in health and illness are twofold. First, actions and interventions can be classified according to the level at which health risk is analyzed, i.e., individual or population level on the one hand, and the type of action/intervention needed to cope with each particular aspect of risk on the other hand. When real and subjective/perceived risks are undervalued in favor of objective and observed risks, the value of the plan is low as far as risk management is concerned. Second, each action/intervention can be linked to the whole set of measures making up the program. In this way, it becomes possible to measure the relationships between the different aspects of public health policies and their future outcomes.

Much of the available data on health care is reported according to separate “silos” of care provision: ambulatory care versus hospital inpatient care, consumption of pharmaceuticals versus other medical goods. This makes the comparative analysis of health care for the chronically ill particularly challenging, because these patients tend to use multiple health-care resources for the treatment of their conditions. Opportunities to link these data domains are usually limited. Taking a piecemeal approach to performance measurement is likely to be suboptimal.

Given the fact that most public health programs today are dedicated to remedying the damage preceded by earlier deprivation, an important and logical question to ask would be: What interventions can be instituted to slow down the progression of earlier adverse effects and reverse any potential damage? By systematically pursuing a life-course paradigm, we could potentially reduce the heavy human and economic costs precipitated by health inequities. The knowledge gained from life-course studies could then be resolutely applied to health and other programs in different age, racial/ethnic, socioeconomic, and gender groups to relieve suffering and offer hope of living healthy and fulfilling lives [33]. Engaging in such studies requires cohesive national planning, vast amounts of resources, and substantial commitments to thoughtfully analyzing and disseminating collected data that can be facilitated by the proposed conceptual model of health risk. Therefore, the model represents a powerful tool for the coordination of public health actions in a longitudinal approach.

From the public health policy perspective, plan evaluation through the model of health risk components will provide an answer to questions such as what strong primary care systems entail and what consequences strong primary care systems have on the performance of overall health-care systems. According to the WHO [34], health systems have three fundamental objectives: first, to achieve an improvement in the health status of the population; second, to respond to people’s expectations about their health; third, to provide financial protection against the

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**Figure 2** Value of the different components of cancer risk in France (Data source: INCA 2007, France).

<table>
<thead>
<tr>
<th>Level of analysis</th>
<th>Type of intervention</th>
<th>REAL HEALTH RISK</th>
<th>OBSERVED HEALTH RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION</td>
<td>PREVENTION</td>
<td>Information campaigns and public funded research: 790 000 K•</td>
<td>Production losses: 17 448 881 K•</td>
</tr>
<tr>
<td></td>
<td>CURATIVE CARE</td>
<td>Production losses: 17 448 881 K•</td>
<td></td>
</tr>
<tr>
<td>INDIVIDUAL</td>
<td></td>
<td>2.70%</td>
<td>59.40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SUBJECTIVE/PERCEIVED HEALTH RISK</td>
<td>OBJECTIVE HEALTH RISK</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Screening and disease detection: 247 900 K•</td>
<td>Health care: 10 886 190 K•</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.84%</td>
<td>37.06%</td>
</tr>
</tbody>
</table>
costs of ill-health. To implement health systems responding to such objectives, it is necessary to highlight the determinants of the relationship between outcomes and costs through the concept of risk management.

Primary care physician supply is regularly associated with improved health outcomes for conditions like cancer, heart disease, stroke, infant mortality, low birth weight, life expectancy, and self-rated care [35]. An orientation in favor of primary care reduces costs of ill-health, socio-demographic and socioeconomic disparities. When adults have recourse to primary care, they have access to preventive screenings [36], and management of frequent chronic conditions results in fewer complications, leading to fewer avoidable hospitalizations [37].

Although health-care expenditure continues to rise (up to 11% of gross domestic products in some EU countries), the needs of patient groups such as the elderly and chronically ill are still not adequately met. The increasing complexity of health care needs in specific patient groups, such as the elderly and the chronically ill, challenges the provision of adequate, population-based health-care services. We still lack definite answers to fundamental questions: What are the determinants of better performance? How does the relationship operate between higher quality aspects of health care and its impact on costs? What is the potential risk associated with the less expensive health-care models?

From the corporate perspective, the primary goal is to protect the employer against financial loss due to illness, disability, and reduced productivity among the workforce. Implementation of a program to meet this objective consists of a four-step process: 1) identify the health risks of the employee population; 2) assess the level of risk of each health factor for each employee as well as the entire employee group; 3) determine the financial impact of the risk; and 4) develop a risk-reduction strategy consisting of programs and interventions that will realize quantifiable net savings.

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