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COST ANALYSIS OF ADJUSTMENTS OF THE EPIDEMIOLOGICAL SURVEILLANCE SYSTEM TO MASS GATHERINGS

ANALIZA KOSZTÓW ADAPTACJI SYSTEMU NADZORU EPIDEMIOLOGICZNEGO DO MASOWYCH ZGROMADZEŃ

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STRESZCZENIE

W artykule omówiono problem analizy ekonomicznej działań w zakresie zdrowia publicznego na imprezach masowych. Po przedstawieniu podstawowych sposobów ekonomicznego podejścia do analizy kosztów autor stara się przeanalizować zastosowanie tych metod do planowania imprez masowych. Trudności w porównywalności różnych sytuacji i brak danych o efektach na etapie planowania, sprawia, że większość ekonomicznych metod nie nadaje się do zastosowania na tym etapie. Nawet zastosowanie analizy minimalizacji kosztów może być ograniczone do porównania przewidywanych kosztów przyjętych standardów nadzoru epidemiologicznego. Badanie efektywności wykonywane *ex post* po meczu, gdy koszty i uzyskane efekty są znane, może przynieść więcej informacji na przyszłość i ułatwić wybór najbardziej skutecznych procedur.

Słowa kluczowe: *masowe zgromadzenia, efektywność kosztów, minimalizacja kosztów*

ABSTRACT

The article deals with the problem of economical analysis of public health activities at mass gatherings. After presentation of elementary review of basic economical approaches to cost analysis author tries to analyze applicability of those methods to planning of mass gatherings. Difficulties in comparability of different events and lack of the outcome data at the stage of planning make most of the economic approaches unsuitable to application at the planning stage. Even applicability of cost minimization analysis may be limited to comparison of predicted costs of preconceived standards of epidemiological surveillance. Cost effectiveness performed *ex post* after the event when both costs and obtained effects are known, may bring more information for future selection of most effective procedures.

Key words: *mass gatherings, cost effectiveness, cost minimization*

INTRODUCTION

Economics of Public Health should be understood as a relatively narrow branch of large domain of the economics. It concerns decisions regarding the improvement of the population health. Economically oriented decision should weight expected incentives against the costs. The incentives for those decisions are expected positive public health consequences. Costs cover the use of resources and also implementation and operation efforts.

In optimal conditions calculations of costs and obtained outcomes would be expressed in this same monetary units as it is in cost benefit analysis. Problem is, that many valuable outcomes like elimination of human fear or suffering are completely imponderable. Other like reduced incidence are difficult to estimate and their resulting savings depend on many factors not easy to measure. This points to the role of cultural factors and humanitarian assessment of the expected risks and

expected outcomes also in the economic analysis of the planned activities in the field of public health.

It is advised to consider that any attempt to introduce economics to public health is fraught with the potential margin of error and any allocation of resources may lead to overspending or, on the contrary, may lead to shortages not allowing for the use of optimal methods of surveillance and implementation of sufficient preventive and control measures. For this reason, the economics of public health have to respect acceptable standards of surveillance, and especially their lower margins, below which descent must not be permitted. Freedom of choice and the economical analysis should occur above those minimum standards.

BASIC FORMS OF COST ANALYSIS

Public health economics provides different approaches to cost analysis giving the opportunity to select

one or more of its types which seem appropriate for the specific context of public health. Basis for the selection of methods for the analysis of the cost and result of public health measures may be available preliminary data and the risk assessment of the phenomena of interest. Previously performed assessments of the cost and effectiveness of public health measures at similar events may be of value if circumstances are comparable.

Depending on the purpose to which the analysis is to be made the following main types of cost analysis are often used (1):

- **Cost of illness analysis.** It consists of assessing the cost per case of specific disease or other health-related condition which includes:
 - Direct costs, which cover expenditures for:
 - prevention
 - detection
 - treatment
 - rehabilitation
 - research
 - education and training
 - capital investment in medical facilities

The direct costs in detailed calculation may be further itemized into purchases of goods such as medicines and bandages, expenditure on services like laboratory tests and diagnostic procedures etc. Some direct costs have medical character, but some, like transportation of patients or training of personnel, have not.

- Indirect costs (morbidity costs)
 - absence from employment
 - loss of leisure time
 - housekeeping services

As a separate position of imponderable losses frequently listed is suffering related to the disease.

Calculation of cost of illness brings numerous questions quite difficult to answer as lack of data allowing calculation of expenditures which are not paid for individual patients like costs of personnel education. Another problem emerges from different sources of payment of different components of the cost of illness and on calculation of discount related to the time factor. Major methodological and ethical problems are created by cost-assessment of mortality.

A cost of illness may be analyzed in many different ways depending on the perspective of researcher and on the purpose for which the analysis is conducted. But in any case it is a basic measure of expenditure and the profit resulting from a reduction in spending by prevention of illness.

In preparation of economical analysis of public health action at mass gatherings extensive analysis of the cost of illness would be itself less than economical. On the other hand any simplified version of it, if it is prepared ad hoc for particular event, could be loaded

with unacceptable error rate. Use cost of illness for economical analysis of public health activity at mass gatherings could be justifiable in the conditions of already existing reliable data regarding cost of illness in a country referred to (1).

- **Cost minimization analysis.** In public health economy this term describe procedures which may lead to selecting of the least costly intervention among those which lead to comparable outcomes. Another words it this the attempt to obtain desired effect with the minimal cost. The cost may be measured simply in terms of money planed to be spend, but it may include also effort of personnel (not always translated into their payment) and time spend for operation of the system to obtain the desired result. For example simple calculation of the cost of computer based disease reporting and analysis versus paper based reporting may lead to choice of paper based system as much less expensive, provided that time and effort of personnel was not included in the calculation. Also “comparable outcomes” should be assessed for its meaning. Paper based surveillance system may lead to satisfactory results, comparable with computerized system when incidence is low, but may fail to meet requirements with higher incidences (2).

- **Cost-effectiveness analysis (CEA) and cost utility analysis** are comparative studies the costs of two or more different public health procedures or activities which are targeted for similar outcomes. The basic difference is that in cost-effectiveness outcome is measured in natural units like incidence or number of cases, while in cost utility measured outcome takes the form of specially defined “utilities” like QALY (quality adjusted years of life)

Certain modification of cost effectiveness is **cost-consequence analysis** in which no numerical comparative analysis is performed. It is simple calculations of the costs of different procedures leading to the different outcomes and the decision maker has to use his own judgment to evaluate the procedure (3,4).

Cost effectiveness ratio:

$$CER = \frac{Cost_a - Cost_b}{Effect_a - Effect_b}$$

- **Cost benefit** is a type of economical analysis in which outcome like cost is expressed in monetary units. It may be used like cost effectiveness for comparison of different procedures, but since comparison used the same units for cost and the

outcome, result may be expressed as rate or difference and may be used for characteristics of a single procedure. It should be noted that that estimation of the cost of illness is the key part of the cost-benefit analysis and the main obstacle for wider use of this type of approach (5).

It has to be noted that optimal solutions based on cost effectiveness analysis are not always feasible. In most cases financial resources have their limits and search for the most effective solutions has to remain below them. Also scope and time horizon of analysis may limit applicability of some economical calculations. Long term effectiveness may be different than the short term one, and remote effects may fall out of the observation field.

PROBLEM OF COST ANALYSIS AT MASS GATHERINGS

Applicability of cost analysis methodology to planning of public health measures at mass gatherings has serious limits mostly related to the problems with measurement of the outcomes but also with lack the frame of reference necessary in comparative studies. Even the simplest cost consequence analysis would encounter difficulties in assessing the consequences. For example expected outcome of effective hygienic supervision would be decreased number of foodborne infections. Problem is that the basic level from which observed number of infections should be subtracted, cannot be determined or even reasonably estimated.

Also effectiveness of epidemiological surveillance is entangled into sort of uncertainty rule related to simultaneous implementation of public health measures targeted on reduction of incidence and enhanced reporting which effectiveness is supposed to be measured by the cost of reported singular case. More general reservations emerge from prospective estimation of outcomes applied to cost effectiveness analysis performed before occurrence of those outcomes. Such analysis would be justified if outcome evaluation would be based on past experiences in situations really comparable with the current one. In other words the variance of outcome measures would be possible to estimate. This aim is rather unrealistic when it comes to mass gatherings. This is why economical approach to surveillance system can rarely go beyond cost minimization analysis.

As it was pointed above the prerequisite for cost minimization analysis is the possibility of calculating the costs of different investments on the condition that those investments lead to the comparable outcomes. With such definition caveat regarding the inability to predict health effects before they occur is still valid. In this situation we are forced to introduce some sim-

plifications. Difficult to predict surveillance attributes like sensitivity or fraction of confirmed cases among reported ones could be replaced in the cost minimization analysis by preconceived standards of surveillance such as number of medical posts and professionals obliged to report, desired timeliness, format of reporting and the scope of the required analysis.

Surveillance system at mass gatherings may be implemented from the scratch or, as happens more often, they may rely on enhancement of the existing routine one. In the first case comparative cost analysis would cover total implementation and operation costs of the new planned surveillance system with variants of technical solutions and costs these changes would entail. Within the second case, modifications to existing system would be placed on the outcome side and the subject of comparison would be incremental costs of those modifications.

The list of expected costs of personnel, materials, investments, external services and also operating costs should take the form of regular business plan with alternative solutions. Any cost minimization analysis should be tailored to the particular circumstances including: the existing routine surveillance system, size and character of mass gathering of interest, desired enhancement of the surveillance system, existing infrastructure and the existing human resources, fixed assets and available financial means (6,7).

Problems with estimation of future outcomes causes that the analysis of the effectiveness of public health activities, including epidemiological surveillance systems was rarely, if ever, performed at the planning stage of mass gatherings. But it should be noted that some of the problems with cost effectiveness analysis which occur at the planning stage do not occur after the event, when costs are already known and at least some of the effects can be measured. Calculation of costs versus quality of surveillance system may not provide satisfactory base for comparison of effectiveness between different events, but may provide footing for learned evaluation of expenditure, and may help to rationalize preparation of surveillance at mass gatherings in the future. It may also help in assessment of the effectiveness of particular procedures used, and in this way give the background for selection of activities in the future planning. But to evaluate the effectiveness of this approach it would be necessary to try it first in practice. For now, such studies never have been carried out at a sufficiently large scale.

REFERENCES

1. Drummond MF, O'Brien B, Stoddart GL, et al. *Methods for the Economic Evaluation of Health Care Programmes* (2nd ed). Oxford, Oxford University Press: 1997.

2. Robinson R. Cost-effectiveness analysis. *Br Med J* 1993; 307(6907): 793–795.
3. Robinson R. Costs and cost-minimization analysis. *Br Med J* 1993; 307(6906): 726–728.
4. Robinson R. Cost-utility analysis *Br Med J* 1993; 307(6908): 859–862.
5. Robinson R. Cost-benefit analysis. *Br Med J* 1993; 307(6909): 924–926.
6. Donaldson C, Hundley V, McIntosh E. Using economics alongside clinical trials: why we cannot choose the evaluation technique in advance [letter]. *Health Econ* 1996; 5(3): 267–269.
7. Briggs AH, O'Brien BJ. The death of cost minimization analysis? *Health Econ* 2001;10(2): 179-18

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