The economic impact of quarantine: SARS in Toronto as a case study

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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The widespread implementation of quarantine to control the outbreak of severe acute respiratory syndrome (SARS) was examined. < Virus diseases; Other organisational issues of health care.

Type of intervention
Primary prevention.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised the general population of individuals who could potentially get infected with SARS.

Setting
The setting was the community. The economic study was carried out in Canada.

Dates to which data relate
The effectiveness data were derived from studies published from 2001 to 2004. The resource use and costs came from studies published from 2002 to 2004. The price year was unclear.

Source of effectiveness data
The effectiveness evidence was derived from a synthesis of published studies and authors' assumptions.

Modelling
An analytic model of SARS spread was used to assess the economic impact of quarantine versus standard care in the case of an outbreak of SARS. The equations used to derive both the direct and indirect costs were accurately reported and described.

Outcomes assessed in the review
The outcomes estimated from the literature were several variables used in the decision model, such as:

the mortality associated with SARS,

the life expectancy of Canadian individuals,

age of death due to SARS infection,
the population density of Toronto, and
the rate of SARS transmission.

**Study designs and other criteria for inclusion in the review**
The primary studies appear to have been identified selectively. A systematic review of the literature was presumably not performed.

**Sources searched to identify primary studies**
Not stated.

**Criteria used to ensure the validity of primary studies**
Not stated.

**Methods used to judge relevance and validity, and for extracting data**
Not stated.

**Number of primary studies included**
Five primary studies appear to have been used to derive the clinical estimates.

**Methods of combining primary studies**
The primary estimates were not combined.

**Investigation of differences between primary studies**
Not stated.

**Results of the review**
The mortality associated with SARS was 11%.
The life expectancy of Canadian individuals was 71 years.
The age of death due to SARS infection was estimated to have been 56 years.
The population density of Toronto was 793 people per square kilometre.
The rate of SARS transmission ranged from 8 to 25%.

**Methods used to derive estimates of effectiveness**
The authors made some simplifying assumptions.

**Estimates of effectiveness and key assumptions**
A constant rate of SARS transmission was assumed. On average, it was assumed that each person came in close proximity with at least 10 different people each day.
Measure of benefits used in the economic analysis
The main model output was the number of averted infections with quarantine, compared with standard care. However, it was not combined with the costs. In effect, a cost-consequences analysis was performed.

Direct costs
This economic evaluation was performed from a societal perspective and the cost/resource boundary of the third-party payer was adopted in the analysis of the direct costs. The health services included in the current study were hospitalisations (in normal wards or intensive care units) for infected individuals, and all administrative costs associated with quarantine. The unit costs were presented separately from the quantities of resources used for hospital costs. Since it was practically impossible to disaggregate administrative costs, the total government expenditure on SARS was estimated using data from the first quarter (FY 2003 - 2004) report of the Ontario Ministry of Finance. Both hospital costs and resource use data were derived from studies published between 2002 and 2004. Discounting was not relevant since the costs were incurred during a short timeframe. The price year was unclear.

Statistical analysis of costs
The costs were treated deterministically.

Indirect Costs
The indirect costs associated with productivity losses due to hospitalisations and death were included in the analysis, as a societal perspective was adopted. The costs were estimated using average daily wages in Toronto, while resource use data were derived from length of stay and mortality data. The unit costs were not reported separately from the quantities of resources used. As in the analysis of the direct costs, the price year was unclear and discounting was not relevant.

Currency
Canadian dollars (Can$).

Sensitivity analysis
Sensitivity analyses were not performed.

Estimated benefits used in the economic analysis
Assuming a transmission rate of 8%, the number of averted infections with quarantine in comparison with standard care ranged from 4,672 to 4,096, depending on the wave of infection.

Cost results
Assuming a transmission rate of 8%, the estimated cost-savings associated with quarantine in comparison with standard care ranged from Can$279 million to Can$232 million, depending on the wave of infection.

Synthesis of costs and benefits
A synthesis of costs and benefits was not relevant since a cost-consequences analysis was performed.

Authors' conclusions
Quarantine was not only effective at containing newly emerging infectious diseases, but was also cost-saving when compared with not implementing a widespread containment mechanism.
CRD COMMENTARY - Selection of comparators
The selection of the comparator was appropriate as it reflected standard care. However, the authors noted that the comparator (i.e. no widespread public health intervention) reflected the situation in the early days of SARS outbreak in Toronto. You should decide whether this is a valid comparator in your own setting.

Validity of estimate of measure of effectiveness
The effectiveness data was based on published studies, but a systematic review of the literature was presumably not performed to identify the primary estimates. No information on the design and characteristics of the primary studies was provided, which limits the possibility of assessing the validity of the primary data. Clinical data on infection were derived from local sources. The analysis was performed using three alternative values of infection transmission, which was the most uncertain model input.

Validity of estimate of measure of benefit
No summary benefit measure was used in the analysis because a cost-consequences analysis was conducted. Please refer to the comments in the 'Validity of estimate of measure of effectiveness' field (above).

Validity of estimate of costs
The cost analysis was undertaken from the most appropriate perspective, that of society. Thus, all the relevant categories of costs were included. Details of the cost calculations were reported, and the unit costs were presented separately from the quantities of resources used for most items. However, the costs of the quarantine programme could not be broken down because only aggregate data were available from the Ministry of Finance. Sufficient information was provided, which enhances the possibility of replicating the study in other settings. The sources of the data were reported for all costs. No statistical analyses were performed on the economic estimates, and the costs were specific to the study setting. The price year was not reported, which makes reflation exercises in other time periods difficult. The authors stated that the cost analysis focused on the economic impact of the interventions on illness and quarantine. Other costs, such as those associated with hospitals that were forced to close to non-SARS patients, losses incurred by the tourism industry, and psychological stress on health care workers, were not included in the model.

Other issues
The authors did not compare their findings with those from other published studies. They also did not address the issue of the generalisability of the study results to other settings. No sensitivity analyses were performed and most estimates were specific to the study setting. Thus, the external validity of the study was low.

Implications of the study
The authors noted that the conclusions of the current study, which support the implementation of quarantine, have strong implications for policy decision-makers, especially in the light of the widespread fear of newly emerging infectious diseases and bioterrorism.

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Other publications of related interest
Lee ML, Chen CJ, Su II, et al. Use of quarantine to prevent transmission of severe acute respiratory syndrome - Taiwan. MMWR 2003;52:680-3.

Booth CM, Matukas LM, Tomlinson GA, et al. Clinical features and short-term outcomes of 144 patients with SARS in the Greater Toronto Area. JAMA 2003;289:2801-9.

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