MAJOR ARTICLE

The Public's Response to Severe Acute Respiratory Syndrome in Toronto and the United States

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(See the editorial commentary by Verghese on pages 932–3)

Using data from 13 surveys of the public, this article compares the public's response to severe acute respiratory syndrome (SARS) in Ontario (specifically, Toronto), the other Canadian provinces, and the United States, which had substantial differences in the number of SARS cases. Findings suggest that, even at a relatively low level of spread among the population, the SARS outbreak had a significant psychological and economic impact. They also suggest that the success of efforts to educate the public about the risk of SARS and appropriate precautions was mixed. Some of the community-wide problems with SARS might have been avoided with better communication by public health officials and clinicians.

The winding down of the outbreak of severe acute respiratory syndrome (SARS) offers an opportunity to examine how the public reacted to the outbreak. Learning more about public concern, knowledge, attitudes, and behavior during an outbreak of infectious disease can be crucial to improving communication efforts by public health officials and clinicians in response to such outbreaks.

Prior research has shown that anxiety and misperception can cause, at the extreme, instances of panic flight from the outbreak area [1, 2] or refusal to comply with quarantine efforts [3, 4]. Public reaction to past outbreaks has also had other negative consequences, including unnecessary or overwhelming demand for health care services [5, 6]; inordinate or erroneous precautionary behavior [7]; avoidance of places and activities that bear a low risk of infection, with resulting negative effects on the community and its economy [2, 8]; inappropriate refusal of or demand for vaccination, stemming from misinformation about the safety and effectiveness of vaccines [9]; and avoidance of hospitals and health care facilities out of fear of becoming infected by others [9]. Another problem associated with the fear of becoming infected has been discrimination against groups of people perceived to be "at risk," even if few people in those groups are actually contagious [10–13].

This article seeks to understand how the public in North America responded to the recent outbreak of SARS, comparing the public reaction in 3 geographical areas that had differing experiences with the disease: the Toronto metropolitan area (and Ontario as a whole), the rest of Canada, and the United States. In Canada, the majority of probable cases of SARS and deaths due to the disease were found in Toronto (250 cases and 38 deaths nationwide in Canada as of 11 July 2003); a much smaller number of probable cases (75) and no deaths due to the disease were reported in the United States [14]. Although there were few cases in the Canadian provinces outside of Ontario or in the United States, widespread media coverage may have led to extensive public response to the SARS threat in these areas.

The survey results reported here address 6 main questions: (1) How concerned were residents of the Toronto and/or Ontario area, the other Canadian prov-

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inces, and the United States about contracting SARS? (2) What precautions were households in each area taking? (3) Were the households of those concerned about contracting SARS taking more precautions than the households of those who were not concerned? (4) Would residents of the Toronto area and those of the United States accept isolation and quarantine for themselves? (5) In the Toronto area, what problems did those who knew someone who was quarantined for SARS report that person having? (6) What did residents of the Toronto area and the United States know about SARS?

Because studies have shown that, in times of perceived epidemic threat, the public places its greatest trust in clinicians [15], this article discusses the implications of these findings for clinicians and how they might communicate better with the public during a future outbreak.

METHODS

The data reported in this article are derived from 13 surveys of the general public conducted from April 2003 through early June 2003, during the period of the SARS outbreak. Each survey was conducted by telephone with randomly selected, representative samples of adults.

The surveys involved 3 different populations: 1 survey involved 501 adult residents of the Toronto metropolitan area; 4 other surveys involved Canadian adults nationwide, with sample sizes of ~1000 each; 8 surveys involved adults nationwide in the United States, with sample sizes ranging from 501 to 1201. Each of these surveys was conducted with short interview periods to provide information in a timely fashion to health care professionals involved in trying to contain the SARS outbreak or to news media that were following its course [16]. To adjust for sampling bias caused by sociodemographic differences between respondents and nonrespondents and to ensure that the sample was representative, the data were weighted on the basis of the latest census figures.

When interpreting these data, one should recognize that all surveys are subject to sampling error. Results may differ from what would be obtained if the whole population of adults had been interviewed. The size of the error varies with the number of people in the survey and the magnitude of difference in the responses to each question. For surveys with 1000 respondents, the margin of error, with a 95% CI, is approximately $\pm 3\%$. For surveys of 500 respondents, it is approximately ± 5 points. Responses were compared by testing differences between proportions using Fisher's exact test.

Prior cross-national studies of the public have shown that there are some cultural differences between residents of Canada and the United States that might affect their response to the SARS outbreak. Compared with US residents, Canadians are more satisfied with their health care system, have somewhat lower expectations for medicine, and have more confidence in the leaders of medicine in their country [17]. Canadians also have more confidence in their government than do residents of the United States [18]. However, Canadians and US residents express similar levels of interest in news about new medical and scientific discoveries and thus would be expected to react similarly to media accounts of the outbreak [19].

RESULTS

Concern about contracting SARS. Even though relatively few cases of SARS were reported in North America during the outbreak, a large number of people in Canada and the United States quickly became concerned. In early April 2003, 69% of adults surveyed in Ontario (the Canadian province in which Toronto is located) and 57% of Canadians surveyed outside of Ontario said that they were concerned about contracting SARS

Table 1. Concern about contracting severe acute respiratory syndrome in the Toronto metropolitan area, the province of Ontario, Canada excluding Ontario, and the United States, April–June 2003, by date.

	Early April		Late April		Early May		Late May		Early June	
Geographic area	No. of respondents	Percentage concerned	No. of respondents	Percentage concerned	No. of respondents	Percentage concerned	No. of respondents	Percentage concerned	No. of respondents	Percentage concerned
Ontario	335	69[a,b,c,d,e]	335	56[a,b,d,e]	335	40[a,b]	335	37[a]	…	…
Toronto metropolitan area	…	…	…	…	…	…	…	…	251	42[f]
Canada, excluding Ontario	666	57[b,c,d,e]	665	45[b,d,e]	665	33[b]	666	30	…	…
United States	500	32[d]	497	32[d]	516	26	…	…	…	…

NOTE. Data for Ontario and for Canada excluding Ontario are from [20, 22–24]; data for the Toronto metropolitan area are from [25]; data for the United States are from [21, 26–27].

[a] Significantly higher than in Canada excluding Ontario ($P \leq .05$).
[b] Significantly higher than in United States ($P \leq .05$).
[c] Significantly higher than in late April ($P \leq .05$).
[d] Significantly higher than in early May ($P \leq .05$).
[e] Significantly higher than in late May ($P \leq .05$).
[f] Significantly higher than in early May in the United States ($P \leq .05$).

Table 2. Precautions taken against severe acute respiratory syndrome (SARS) in the Toronto metropolitan area and the United States.

Precaution	Toronto (n = 501)	United States (n = 1025)
Used a disinfectant at home or work	47	16
Consulted a Web site	27	8
Carried something to clean objects that may have come into contact with someone with SARS	22	6
Talked with doctor about health issues related to SARS	19	6
Avoided Asian restaurants or stores	19	9
Avoided people suspected of having recently visited Asia	17	11
Avoided public events	16	7
Purchased a face mask	14	3
Avoided international air travel[a]	9[b]	9[b]

NOTE. Data are percentage of respondents who acknowledged that they or a member of their household had taken the specified precaution. Significant differences ($P \leq .05$) were found between Toronto and the United States for all precautions, unless otherwise indicated. Data for Toronto are from [25]. Data for the United States are from [27].

[a] No significant difference between Toronto and the United States.

[b] Data are for those who had traveled internationally in the previous 12 months (Toronto, n = 208; United States, n = 171).

[20]. At the same time, 32% of adults surveyed in the United States said that they were concerned that they or an immediate family member might get sick from SARS during the next 12 months [21] (table 1).

Concern declined during the course of the outbreak [20–27]. By May/June 2003, 42% of Toronto metropolitan-area residents and 26% of US residents surveyed said that they were concerned that they or an immediate family member might contract SARS [25, 27].

When the US public was told that people in Asia and Canada had died from SARS, the proportion of the population who described themselves as concerned increased. In May 2003, 37% of US adults surveyed, when told that people had died as a result of SARS, said that they were very or somewhat worried that they or an immediate family member would be exposed to SARS [28]. This percentage is close to the average found in 4 surveys in which the same question was asked in April 2003 and May 2003 (range, 32%–43%) [28–31]. In April 2003, nearly as many US adults were worried they or a family member might contract SARS (35%) as were worried they might be a victim of a terrorist attack (42%) [32].

Precautions against SARS. In the Toronto area (and in Ontario as a whole), a larger proportion of households took various precautions against SARS than in the other provinces of Canada or in the United States. We report that a household took a specific precaution if the person being interviewed said that they or someone else in their household took that precaution because of SARS.

For 8 different precautions, Toronto-area households were significantly more likely than US households to report taking that precaution [25, 27]. A number of Toronto-area households were taking precautions that could have a negative impact on

Table 3. Precautions taken against severe acute respiratory syndrome (SARS) in Canada, by region.

Precaution	All of Canada (n = 1001)	Ontario (n = 335)	Canada excluding Ontario (n = 666)
Increased frequency of hand washing	39	50	32
Avoided large gatherings (e.g., sporting events, movie theaters, restaurants)	14	22	9
Cancelled appointments at hospitals or doctor's offices	9	17	5
Avoided public transit	9	12	6
Wore protective mask in public	2	4	<.5

NOTE. Data are percentage of respondents who acknowledged that they or a member of their household had taken the specified precaution. A significant difference ($P \leq .05$) was noted between Ontario and Canada excluding Ontario for all precautions. Data are from [20].

the region's economy, including avoiding Asian restaurants or stores, public events, and international air travel [25]. Tourism was also likely to have been affected by the belief of approximately one-third (35%) of US adults surveyed that SARS had made it unsafe to travel to Canada (table 2) [27]. In fact, the Conference Board of Canada estimated that the SARS outbreak cut nearly Can$1 billion from Toronto's real Gross Domestic Product in 2003 [33]. Similarly, Ontario households were significantly more likely than households in the rest of Canada to report taking various precautions against SARS (table 3) [20].

During the outbreak, a share of Toronto households and Ontario residents wanted to limit their contact with people whom they thought had been in Asia, where many cases of SARS had been reported. In June 2003, 1 in 6 Toronto-area households surveyed were avoiding people they thought might have recently visited Asia [25]. In addition, two-thirds (66%) of Ontario residents surveyed supported the idea that people arriving from areas of Asia that were experiencing outbreaks of SARS should be quarantined or not allowed into Canada and that Canadians should not be allowed to travel to those areas [20].

Precautions taken against SARS by households. Knowing what proportion of the population is concerned about contracting a disease is important because those people and their households would be expected to take more precautions. Among Toronto-area households, we found that, for most precautionary measures, this expectation was correct. As table 4 shows, the households of those who said they were concerned that they or a family member might contract SARS during the next 12 months (i.e., those meeting our definition for "concerned households") were significantly more likely to have taken 6 of 8 precautions than were the households of those not concerned [25]. In the United States, concerned households took only 3 of the 8 precautions more often than did the households of those not concerned [27].

Acceptance and experience of quarantine. As reported by the British Broadcasting Corporation and *The New York Times,* officials in China and Taiwan had considerable difficulty getting people to comply with quarantine for SARS [34, 35]. Quarantine is a public health measure that has not been used in Canada or the United States for a long time [1]. The question of whether or not the public in the Toronto area and in the United States saw quarantine as a necessary tool and were willing to comply with quarantine orders was therefore of interest. Large majorities of both Toronto-area and US residents knew that quarantine of people who were exposed to SARS was necessary to keep the disease from spreading. More than 9 in 10 individuals surveyed said they would comply with isolation and quarantine orders [25, 27] (table 5).

More than 1 in 5 residents of the Toronto area said that they themselves, a friend, or a family member had been quarantined due to SARS exposure. Among this "experienced" group, approximately one-fourth said that being quarantined had been a major problem. When asked about specific problems related to quarantine, the 2 most frequently cited "major" problems were emotional difficulties related to the confinement and not getting paid because they had to miss work [25].

Knowledge about SARS. If people are to respond appropriately during an outbreak of infectious disease, they need to have some basic knowledge about how the disease is spread and whether there is a vaccine against the disease or an effective medical treatment that can be administered once someone con-

Table 4. Precautions taken against severe acute respiratory syndrome in the Toronto metropolitan area and in the United States, by degree of concern about contracting SARS.

	Toronto		United States	
Precaution	Concerned (n = 103)	Not concerned (n = 146)	Concerned (n = 121)	Not concerned (n = 387)
Used a disinfectant at home or work	56[a,b]	39	24[c]	14
Consulted a Web site	33[a,b]	21	9	6
Carried something to clean objects that may have come into contact with someone with SARS	28[b]	19	9	7
Talked with doctor about health issues related to SARS	23	17	16[c]	5
Avoided Asian restaurants or stores	32[a,b]	11	9	10
Avoided people suspected of having recently visited Asia	26[a]	7	21[c]	11
Avoided public events	29[a,b]	8	8	6
Purchased a face mask	21[a,b]	10	4	3

NOTE. Data are percentage of respondents who acknowledged that they or a member of their household had taken the specified precaution. Data for Toronto are from [25]. Data for the United States are from [27].

[a] Significantly higher for than Toronto residents who were not concerned about contracting SARS ($P \leq .05$).
[b] Significantly higher than for US residents who were concerned about contracting SARS ($P \leq .05$).
[c] Significantly higher than for US residents who were not concerned about contracting SARS ($P \leq .05$).

Table 5. Survey data regarding attitudes about and experiences of quarantine for severe acute respiratory syndrome (SARS) in the Toronto metropolitan area and the United States.

Question, response	Toronto (n = 501)	United States (n = 1025)
Is SARS one of the diseases in which people who are exposed need to be quarantined?		
Yes	96	84[a]
No	3	9[a]
Do not know	2	7[a]
If you had SARS, would you agree to be isolated for 2–3 weeks?		
Yes	95	95
No	4	3
Do not know	<.5	2
If exposed to SARS, would you agree to quarantine?		
Yes	97	93[a]
No	3	5
Do not know	<.5	2
Experience with quarantine[b]	22	…
Being quarantined was…[c]		
A major problem	24	…
A minor problem	51	…
Not a problem at all	21	…
Do not know	3	…
The following were major problems due to being quarantined[c]		
Emotional difficulty being confined	11	…
Did not get paid due to missing work	10	…
Unable to communicate with family members who were not there	6	…
Unable to get food or water	4	…
Unable to get regular medical care and prescriptions	3	…

NOTE. Data are percentage of respondents. Data for Toronto are from [25]. Data for the United States are from [27].

[a] Statistically significant difference ($P < .05$).

[b] Includes respondents who were quarantined or who had a family member or friend who was quarantined for SARS.

[c] Data include only those respondents who were quarantined or who had a family member or friend who was quarantined for SARS (n = 111).

tracts it. The level of public knowledge about SARS was similar in the Toronto metropolitan area and the United States. Although ~9 in 10 individuals surveyed knew that SARS was contagious and that there was no vaccine against SARS, only approximately one-half knew that there was no effective treatment for people who have contracted SARS. More than one-third thought that there was such a treatment (table 6) [25, 27].

A majority of those surveyed in each region knew that it was possible to contract SARS in each of 5 ways. The largest difference in the percentage of individuals with knowledge of a particular mode of transmission was 13%: significantly more Toronto-area residents than US residents knew that one could contract SARS by touching objects or surfaces that had been in contact with someone with SARS. Approximately one-half of those surveyed knew that SARS could be contracted through blood transfusions [25, 27].

DISCUSSION

These findings suggest that, even at a relatively low level of spread among the population, the SARS outbreak had a significant psychological and economic impact in Toronto and Ontario as a whole and, to a lesser extent, in the other Canadian provinces and the United States. Our findings suggest that the success of efforts to educate the public about the risk of SARS and about appropriate precautions against the disease was mixed. Some of the community-wide problems involving SARS

Table 6. Survey data regarding knowledge about severe acute respiratory syndrome (SARS) in the Toronto metropolitan area and the United States.

Question, response	Toronto (n = 501)	United States (n = 1025)
Is SARS contagious?		
Yes	95	89[a]
No	4	3
Do not know	1	8[a]
Is there a vaccine against SARS?		
Yes	4	4
No	93	88[a]
Do not know	4	8[a]
Possible to contract SARS by		
Being in close contact with someone with SARS	94	88[a]
Touching objects or surfaces that have been in contact with someone who has SARS	77	64[a]
Shaking hands with someone who has an active case of SARS	76	70[a]
Being on the same airplane with someone with SARS	73	76
Eating food prepared by someone who was infected by or exposed to SARS	66	66
Blood transfusions	50	58[a]
Is there an effective treatment for people who have contracted SARS?		
Yes	38	36
No	50	47
Do not know	12	17

NOTE. Data are percentage of respondents. Data for Toronto are from [25]. Data for the United States are from [27].

[a] Statistically significant difference ($P \leqslant .05$).

might have been avoided with better communication by public health officials and clinicians.

On the positive side, large majorities of the public in both the Toronto metropolitan area and in the United States knew that SARS was contagious and supported the principle of quarantine, saying that they themselves would comply with a quarantine or isolation order. In addition, the public was generally knowledgeable about the ways in which the disease can spread. One-half of Ontario households took the positive precaution of washing their hands more often. Finally, large majorities in both areas knew that there is no vaccine against SARS.

On the negative side, one-half of the public in the Toronto area and in the United States did not know that there is no effective method for treating SARS in an individual who has contracted the disease. Also, public health officials and clinicians might have been more effective in reducing the number of people who took unwarranted precautions that could have a negative economic impact. In the Canadian provinces outside of Ontario and in the United States, where there were few cases of SARS, one would ideally have wanted to see fewer people expressing concern about contracting the disease and taking unnecessary precautions against the disease. In addition, public health officials and clinicians need to examine how, in the future, they might alleviate some of the problems experienced by people who are actually quarantined, particularly the emotional difficulty associated with being confined and the problem of not getting paid because of missed work.

These findings suggest that media coverage of an outbreak of infectious disease can be a double-edged sword. On the positive side, news media inform people about how a disease is spread, what precautions to take, and whether a vaccine is available. On the other hand, because of national and international news coverage of an outbreak, people who are far distant from the site of the outbreak can become concerned and start taking precautions as if they were in the affected area. In an ideal world, news media would be more effective at conveying the level of risk and the relative need for precautions in high-risk versus low-risk areas. One way to do this in the future would be to work with local broadcast journalists in advance of a threat to ensure that they know to whom they can turn for up-to-date and credible information.

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