

TORONTO STAFF REPORT

September 9, 2003

To: Board of Health

From: Dr. Sheela V. Basrur, Medical Officer of Health

Subject: Toronto Public Health's Response to the Severe Acute Respiratory Syndrome (SARS) Outbreak 2003

Purpose:

This report describes the response of Toronto Public Health (TPH) to the Severe Acute Respiratory Syndrome (SARS) outbreak. A description of the entire provincial outbreak response and the roles and impacts arising at local health care facilities is beyond the scope of this report, and will be the subject of reports released by National and Provincial Commissions.

Financial Implications and Impact Statement:

There are no new financial implications to the City arising from adoption of this report.

The estimated cost for Salaries and Benefits that were redirected from other base programs from the onset of the outbreak to mid-June was \$2.9 million. Additional incremental costs of \$3.0 million included overtime (\$1.8 million) and non-payroll costs (\$1.2 million). Therefore, the total cost to TPH of the SARS outbreak was \$5.9 million.

The Ministry of Health and Long-Term Care has agreed to pay 100% of the direct incremental and extraordinary costs for SARS outbreak response as well as any incremental costs to clear backlogs of work in other provincially mandated programs. A provincial decision is still pending on funding of the Hospital Infectious Diseases Unit approved by the Board of Health and City Council earlier this year to prevent and reduce the impact of SARS and other emerging diseases in the future. This 46 FTE unit has a budget of \$4.3 million.

Recommendations:

It is recommended that:

- (1) the Board of Health commend the efforts of staff and officials from the provincial and federal governments for their support and contribution to the City's response to the SARS

outbreak; and in particular the Board of Health express its appreciation to the public health staff from the City of Hamilton, County of Lambton, Middlesex-London, City of Ottawa and Leeds, Grenville and Lanark Health Units for their invaluable assistance;

- (2) the Minister of Health and Long Term Care (MOHLTC) revise and fund improvements to the Mandatory Health Programs and Services Guidelines for the Control of Infectious Diseases and Infection Control, in consultation with local public health units, hospitals and long term care facilities, in order to strengthen the role of public health in the surveillance, prevention and control of infectious diseases in these facilities;
- (3) the MOHLTC set out requirements and provide the necessary funding to hospitals and long-term care facilities to strengthen infectious disease surveillance, prevention and control;
- (4) the MOHLTC establish and fund mechanisms and protocols to facilitate timely communication between the province, local public health units, laboratories, health institutions, physicians and other health care providers, in order to ensure that health risk information is conveyed as quickly as possible among health facilities and with front-line health workers;
- (5) the Board of Health advocate to the provincial and federal governments for the urgent development of flexible and robust information technology (IT) systems for infectious disease surveillance, case management and contact follow-up to support the investigation and control of major outbreaks and other emergencies across local jurisdictions;
- (6) the Board of Health urge the provincial and federal governments to develop shared service agreements with local public health authorities that clarify roles, responsibilities and levels of support that would be available across jurisdictions for the investigation and management of infectious disease outbreaks and other emergencies;
- (7) this report be forwarded to Mr. Justice Campbell, to the Ontario Expert Panel on SARS and Other Infectious Diseases, the Ontario Minister of Health and Long Term Care, the Ontario Minister of Public Safety and Security, the federal Minister of Health and the federal Solicitor General for consideration and appropriate action; and
- (8) this report be forwarded to Community Services Committee and City Council for information;
- (9) the appropriate City Officials be authorized and directed to take the necessary action to give effect thereto.

Background:

Severe Acute Respiratory Syndrome (SARS) is a new human infection that spread around the world in 2003, causing widespread economic and social disruption to affected countries. The

infection is caused by the SARS virus (SARS-CoV), a new virus in the Coronavirus family (Ksaizek 2003, Drosten 2003).

Symptoms of SARS include muscle aches, fatigue, headache, dry cough, fever, occasional diarrhoea, and progressive respiratory compromise. A chest X-ray often shows pneumonia. The disease is believed to be spread by close contact from person to person through large droplets (≥ 10 micrometers in diameter). However there is also speculation that airborne transmission through small droplets (< 10 micrometers) and transmission by contaminated objects can also occur (Wenzel 2003). Case fatality rates range from 0-50% depending on age, with an overall estimate of 14-15% (World Health Organization, May 2003). The average incubation period (i.e. the time interval between first exposure to the disease and the initial onset of symptoms) is five days, with a typical range of 2-10 days. Disease transmission appears to occur only after the onset of symptoms, with severely ill people being the most infectious.

The SARS outbreak differed from outbreaks of previously known infectious diseases. There was no diagnostic test for the disease, no treatment and rapidly changing information on its transmission and virulence. This was combined with rapid spread across the health care sector and across international boundaries. These factors required a concerted response from local, provincial and federal health authorities, the health care sector, the community, and other officials.

Chronology of Events:

It is now known that the first cases of SARS emerged in mid-November 2002 in Guangdong Province, China. It is believed that SARS-CoV crossed over from animals to humans due to the proximity of humans to animals in southern China (Wenzel 2003). The disease was spread outside China by a 64-year-old physician who had been treating patients with atypical pneumonia in that country. On February 21, 2003 he went to Hong Kong for a wedding and stayed for one night on the ninth floor of the Metropole Hotel. The next day he was admitted to hospital with respiratory failure and subsequently died on March 4 (Tsang 2003). At least 16 other persons who stayed at or visited the same floor of the hotel became infected. Through them the disease spread to hospitals in Hong Kong and by international air travel to Vietnam, Singapore, Vancouver and Toronto (WHO 2003). As of July 11, 2003, 8,437 probable cases and 813 deaths had been reported from 32 countries worldwide. Major outbreaks have occurred in China, Hong Kong, Vietnam, Taiwan, Singapore and Canada (WHO 2003).

The first case of SARS in Toronto occurred in a 78 year old woman (the “index case”) who had visited Hong Kong from February 13 - 23, 2003, where she had stayed on the ninth floor of the Metropole Hotel. On return to Toronto, she developed a progressive respiratory illness which led to her death on March 5. She was never hospitalized. Her 43-year old son became ill on February 27 and was admitted to Scarborough Hospital - Grace Division on March 7. His condition deteriorated rapidly and he died on March 13 (Poutanen 2003). On March 14, local and provincial public health officials and infectious disease experts held a news conference which alerted health care workers and the public about four cases of atypical pneumonia resulting in two deaths within this family.

As a result of contact with the index case, five family members and a general practitioner who saw them became ill. Contact with the son of the index case resulted in spread to two other patients in the emergency department of Scarborough Hospital – Grace Division. From these initial cases, 129 cases of SARS were linked to this hospital along with 33 of their household members. The disease spread beyond Toronto when an undiagnosed case with the disease was transferred to York Central Hospital in a neighbouring municipality. A visit to Scarborough Hospital - Grace Division emergency also led to SARS infection of an elderly man who spread the disease to several members of his family. The affiliation of one of his family members with a close-knit religious community led to a cluster of 31 probable and suspect SARS cases among these family members and their contacts.

As the number of suspect and probable SARS cases increased, the Premier of Ontario declared SARS a provincial health emergency on March 26. A Provincial Operations Centre (POC) and a Scientific Advisory Group were established, both of which included representatives from the province, Toronto Public Health (TPH) and other health facilities. The POC issued a wide range of directives to hospitals, long term care institutions and other community settings, establishing stringent infection control requirements. All probable and suspect cases were placed in respiratory and droplet precautions, handwashing and symptom screening were instituted for all persons entering health facilities, and all staff and visitors were required to wear gloves, gowns and masks in patient care areas. Additional requirements were imposed on hospital staff in high-risk areas such as intensive care units, where there was continued occupational transmission. These provincial directives were revised on a regular and continuing basis to reflect new information and operational considerations.

With the implementation of province-wide public health measures the number of recognized cases of SARS declined and no further cases were detected after April 20. On April 23, the World Health Organization (WHO) issued an advisory that recommended limiting travel to Toronto. The WHO lifted this advisory six days later, on April 29.

The provincial state of emergency was lifted on May 17, when it was widely believed that the outbreak was over; in fact it was merely the end of Phase One. Four weeks after SARS transmission appeared to have been contained, new cases were identified, signalling the onset of Phase Two of the outbreak. The index case for Phase Two occurred in a 96 year old man admitted to North York General Hospital (NYGH) on March 22, 2003 with a fractured pelvis. On April 2 he was transferred to the orthopedic ward where he subsequently developed pneumonia. Since he had no known contact with a SARS case, the presumed diagnosis was aspiration pneumonia. Subsequent investigation revealed that visitors, health care workers and patients with SARS had been in close proximity to this individual. On May 20, St. John's Rehabilitation Hospital reported an outbreak of febrile illness. As part of the investigation of this outbreak it was determined that one of the reported cases had been on the orthopedic ward at North York General Hospital between April 22 and April 28. Another of these patients became very ill, was transferred to the University Health Network (UHN) and had a positive diagnostic test for SARS on May 22. That evening, local and provincial public health officials and infectious diseases experts held a news conference to alert health care workers and the public about Phase Two of the outbreak. Subsequent investigation at NYGH uncovered eight cases of previously unrecognized SARS and, as of June 9, 79 new SARS cases had been linked to this

hospital, most of which appear to have resulted from exposures that occurred before May 23 (SARS Investigation Team et al 2003).

Over the full course of the outbreak, a total of 224 (198 probable, 26 suspect) SARS cases were reported among Toronto residents (see table below). Of these, 148 cases (130 probable, 18 suspect) were female and 76 (49 probable, 27 suspect) were male. An epidemic curve for Phase One and Phase Two of the outbreak is shown in Figure 1.

Case Type	Phase One	Phase Two	Total
Probable SARS	120	78	198
Suspect SARS	22	4	26
TOTALS	142	82	224

Among SARS cases, 141 were hospitalized in Phase One and 81 were hospitalized in Phase Two. Of those hospitalized, 30 in Phase One and 20 in Phase Two were admitted to an intensive care unit (ICU). There were a total of 38 deaths among Toronto residents (24 in Phase One and 14 in Phase Two). By August 31, there were a total of 44 deaths in Ontario, including two nurses and one physician. Among 144 probable SARS cases reviewed by Booth et al (2003) in the Greater Toronto Area, 73 (51%) cases occurred among health care workers.

As of July 15, there were a total of 438 SARS cases (250 probable and 188 suspect) in Canada (Health Canada website).

TPH Outbreak Response:

The first case of SARS was initially reported to TPH on Sunday March 9, 2003 as a case of possible tuberculosis (TB). TPH investigated this as a routine matter and initiated TB testing of other family members. By Thursday March 13, the TB tests on family members had proved negative, additional family members were seriously ill, and an international health alert had been received from the World Health Organization (WHO) about atypical pneumonia in Hong Kong and Hanoi. On Friday March 14 it was confirmed with provincial and federal health officials that TPH was dealing with a cluster of atypical pneumonia cases possibly related to the WHO global alert. TPH initiated its emergency response plan, established a public information hotline and assigned staff full-time to the outbreak investigation.

The main roles of TPH included investigation and management of possible cases, identification and quarantine of contacts, disease surveillance and reporting, and provision of infection control advice to institutions, schools, workplaces, shelters, etc. Health risk assessment, public communications and managing community relations became increasingly important over time. These functions were overseen by the Associate MOH/Director of Communicable Disease Control under the leadership of the Medical Officer of Health and key provincial officials (notably the CMOH/Commissioner of Public Health and by the Commissioner of Public Safety and Security). Public health activities were carried out in concert with and informed the development of provincial directives for infection control and disease surveillance in health care settings.

The provincial Health Protection and Promotion Act (HPPA) sets out the authority and responsibilities under which TPH is required to respond to a communicable disease outbreak. The Province acted early on to adopt regulatory changes under the HPPA to designate SARS as a disease that was reportable, communicable and virulent. These changes enabled local Medical Officers of Health to issue orders for isolation and quarantine at a critical time early in the outbreak.

With intense international, national, and local media interest in SARS, daily media conferences were held by the Province that included local medical officers of health and infectious disease specialists. TPH also used community/ethnic media outlets and the City of Toronto website to disseminate health information and advice to the public. Specific efforts were made to meet the linguistic diversity of Toronto's population by translating print/web materials into 14 different languages, by seeking out staff with special language skills for Hotline functions, and by using AT&T translators for non-English speaking clients. TPH communications staff worked in close collaboration with Corporate Communications to provide electronic updates to City Councillors and the community. TPH also provided briefings to the City's Emergency Operations Centre (EOC) and Emergency Management Committee and was in constant contact with the Provincial Operations Centre (POC) and the Public Health Branch at the MOHLTC.

A core team of public health directors, physicians and managers met daily to plan responses and debrief on issues. Space, equipment (e.g. desks, phones, fax access, photocopiers, computers and printers) and reference/administrative materials were provided for staff involved in the SARS response in a very timely manner. All teams were co-located at the main TPH office at 277 Victoria Street, occupying four full floors of that building.

Up to 400 staff worked on the front-line TPH SARS response on any given day, with a total of 700 staff involved in the TPH response. Public health staff and physicians from the City of Hamilton, County of Lambton, Middlesex-London, City of Ottawa and Leeds, Grenville and Lanark Health Units also offered their assistance, which proved invaluable in sustaining the TPH response.

In partnership with the MOHLTC and coordinated by Health Canada, TPH participated in a recruitment effort to deploy health care professionals to assist affected health units and hospitals. The request was circulated to provincial and territorial governments, professional associations, public health authorities and universities across Canada. The call for assistance was successful in recruiting temporary assistance from public health nurses, public health inspectors, community health physicians and epidemiologists from Ontario and across Canada.

The majority of staff were assigned to the SARS Hotline, Case Management, Contact Follow-up, and Epidemiology teams. These teams operated seven days a week from 8:00 am until 11:00 pm on two shifts daily, from March 15 till the end of June. A description of these functions is provided below.

SARS Hotline:

The SARS Hotline provided the primary interface between TPH and Toronto residents. Hotline staff provided health information and counselling, case and contact identification, and the recognition and follow-up of emerging issues in affected institutions and communities.

The Hotline was staffed primarily by public health nurses, and at its peak had 46 staff on the day shift (8:00 am – 4:30 pm) and 34 staff on the evening shift (3:00 pm – 11:00 pm). Over 200 staff worked on the Hotline during phases 1 and 2.

The Hotline received over 300,000 calls between March 15 and June 24, with a peak of 47,567 calls in a single day. Call volumes fluctuated dramatically in concert with new outbreak developments and emerging community concerns.

The majority of calls were complex, with three or more issues being identified. Reasons for calling included self-reports of illness or exposure to a case, and access to emergency supplies of food, masks and thermometers. Callers also reported non-compliance with quarantine requirements, fears about travel or disease exposure, concerns about business failure, loss of personal income and potential loss of housing, racial profiling and fear of being shunned.

Case Management:

The isolation of people who were symptomatic with SARS (i.e. “cases”) served to protect the public from infection by separating those who were ill from those who were well. Restricting the movement of ill persons to their own homes or to a hospital limited the transmission of the SARS virus to the general community. The Case Management Team was responsible for monitoring all persons under investigation for SARS and for managing all suspect and probable SARS cases who were hospitalized in Toronto.

Cases were referred to the Team by the SARS Hotline, hospital-based infection control practitioners, SARS Assessment Clinics, and individual physicians through a dedicated case reporting line. Case investigators obtained detailed histories of symptoms, laboratory results and epidemiological linkages with other SARS cases. From this information, a preliminary determination was made as to whether the individual met the definition of a probable or suspect case, did not meet the case definition, or remained a person under investigation. Since the symptoms of SARS could be non-specific or atypical, the disease was sometimes difficult to diagnose, especially in its early stages, and required ongoing investigation and consultation until a decision could be made as to whether this met the case definition for SARS. It was often more labour intensive to rule out a case of SARS than it was to manage more easily identified cases of probable SARS, and the final decision carried major implications for the affected person, their contacts and health facilities. Therefore the Case Management Team held daily case conferences within TPH, consulted infectious disease experts and conducted joint investigations with other health units in order to identify the best public health strategy to manage complex situations.

For each case, a detailed list was obtained of activities in the ten days prior to onset of symptoms and while they were symptomatic. At-risk contacts were identified, and decisions were made regarding isolation of the case and quarantine of contacts. All potential cases were contacted daily to update their clinical status until either a final diagnosis had been made which ruled SARS out or, in suspect or probable cases, until they had been without fever and showed symptom improvement for 10 days.

The Case Management Team was staffed by public health nurses, public health inspectors, managers and public health physicians. At the peak of the outbreak, 40 staff members, 8-10 managers and 3-5 physicians were assigned to each shift. In addition, TPH staff were assigned to affected hospitals and provided a critical liaison function. In those hospitals with evidence of disease transmission, a TPH Response Team consisting of a public health physician, a manager and several PHNs was placed on-site.

During the outbreak approximately 2,000 case investigations were conducted, each taking an average of nine hours to complete.

Contact Follow-up:

Contacts were asymptomatic persons who had been exposed to the SARS virus, and they were placed under quarantine to reduce the risk of transmission to others during the 10-day incubation period when they might fall ill. Those who developed symptoms while under quarantine were clinically assessed for SARS, while those who remained well were presumed to be non-infectious and were released from quarantine once the incubation period had ended.

Contact Follow-up was initially staffed by public health nurses, public health inspectors, team managers and public health physicians. During Phase Two, other TPH staff such as Registered Practical Nurses, dieticians and sexual health educators were also assigned to Contact Follow-up. At the peak of the outbreak, over 100 staff per day were working on contact follow-up.

Contacts were first identified by the Case Management Team and then managed by the Contact Follow-up Team. Contacts were notified by telephone (or letter if telephone contact was impossible) that they had been exposed to SARS and needed to be quarantined for 10 days after their last exposure to a case. Masks and thermometers were delivered to all people in quarantine, and referrals were made as required to the Canadian Red Cross and Salvation Army for emergency food orders. Initially, TPH staff prepared mask and thermometer packages and contacted Red Cross and the Salvation Army for pick up and delivery. Subsequently, the delivery role was performed by Community and Neighbourhood Services (CNS) staff who offered to assist TPH efforts.

After the initial assessment to determine their degree of contact and risk of infection, each close contact was called regularly to ensure that they remained in quarantine and to assess them for symptoms. As the outbreak progressed, those in quarantine were called once or twice daily by TPH to ensure that quarantine was maintained. During the later part of Phase One, provincial call centre staff made the second call in order to alleviate the time demands on TPH. In addition

to contact by phone, including the use of Bell Canada operators to interrupt calls, home visits were made as necessary.

A total of 23,322 people were identified as contacts. Of those, over 17,000 were identified during Phase One and the remainder were identified as contacts in Phase Two. All were notified by TPH, but not all were reached within the 10-day incubation period. Some were not identified as a contact until the incubation period was over, others had missing contact information which delayed TPH's ability to find them, still others could not be located during the 10-day period because the contact information was erroneous. In some cases this was a result of incomplete patient and discharge information provided by overworked hospital staff. In all, 13,374 people were placed in quarantine.

Associate Medical Officers of Health issued 27 Orders under Section 22 of the Health Protection and Promotion Act to individuals who did not maintain quarantine. In view of the extremely large number of contacts in quarantine and the restrictions this posed on their work, school and personal lives, the overall degree of cooperation and compliance with public health requirements was extremely high.

Epidemiology and Research:

Case and contact information was collected by each team and forwarded daily to the Epidemiology Team, which was responsible for updating local computer databases and transmitting data to the Ministry of Health and Long Term Care. Despite the technical difficulties described below, databases were established to support case management and contact follow-up and to produce summary reports and daily line-listings of reported cases, all of which served as the basis for daily media reports. Members of the Epidemiology Group also collaborated with researchers from the Centers for Disease Control in Atlanta, Health Canada, hospitals and universities involved in SARS research.

The Epidemiology Team was staffed by epidemiologists, data analysts, team managers and public health physicians.

Information Systems:

The volume of information generated in the SARS outbreak far exceeded previous experience. Since people have not been put into quarantine for the last 50 years in the City of Toronto, there were no information systems in place at the start of the first SARS outbreak to support the management of people in quarantine and contact follow-up of these individuals. The 14 year old provincially-mandated information system used to support the surveillance of reportable diseases (i.e. RDIS) was not equipped to handle quarantine management and, more importantly, could not be modified by the province to support SARS case management.

Initially Excel spreadsheets were used to capture case information (eg. symptoms and onset dates), and to allow for the collation and summation of data to meet reporting requirements. However, Excel spreadsheets could not be used effectively to manage contacts. As a result, staff used inefficient manual and paper-based processes, which were time consuming and sometimes

resulted in duplication of effort. Also, the spreadsheets could only be accessed by one staff member at a time due to limitations of the software, resulting in delays in providing accurate numbers.

With the support of Health Canada, the province implemented a scaled-down version of the Integrated Public Health Information System (iPHIS), to capture case and basic contact information. The province entered data from the case and contact management form into this version of iPHIS. However, this system was insufficient to meet local requirements for case, contact and quarantine management. As a result, TPH IT staff developed a Case and Contact Management System (CCMS), which included contact and quarantine management functionality. Implementation of this system occurred during the middle of Phase One. The province gave local health units read-only and restricted access to information in iPHIS during late Phase Two. This version was also insufficient to meet local functional requirements. Therefore, TPH continues to use CCMS for case, contact and quarantine management and is also working with the province and Health Canada to enhance iPHIS functionality. This would allow for easier sharing of information between health units, the province and Health Canada. When completed, the enhanced version of iPHIS will replace CCMS.

Impact of SARS:

The need to re-allocate large numbers of managers and staff to the SARS response had a significant impact on other TPH programs and services in the community. At the peak of the SARS response, many of the services delivered by Public Health Nurses and Public Health Inspectors in the areas of Family Health, Healthy Lifestyle, Healthy Environments and Communicable Disease Control were reduced to essential services only.

Postpartum mothers and babies who were discharged from hospital under quarantine continued to receive Healthy Babies, Healthy Children services through a specially trained team of PHNs. SARS screening tools were developed and implemented for ongoing individual services to the community such as dental clinics, sexual health clinics, and home visits.

However, all prenatal and parenting education groups were cancelled, telephone calls and home visits to post-partum mothers were reduced, and heart health programming was suspended. In Healthy Environments, routine food safety inspections were limited to high-risk establishments and complaint investigation; all food handler-training courses were suspended, as was all staff training and professional development. However, Health Hazard staff continued to work on West Nile virus prevention and contingency planning. In Communicable Disease Control, disease investigation was reduced to only those high-risk diseases of urgent concern as well as investigation of all outbreaks. Within the TB program there were delays in case investigation and contact follow-up, and immigration surveillance was suspended, while the Directly Observed Therapy (DOT) program continued. Many school clinics for Grade 7 Hepatitis B immunization were cancelled and the school immunization assessment program could not be completed. The City-run sexual health clinics continued to operate at reduced staffing levels.

Programs delivered in partnership with other agencies such as Canada Prenatal Nutrition Program, Nobody's Perfect and Smoking Cessation clinics were cancelled. Since community

agencies restricted public access to their facilities, service contracts with agencies such as hospitals were suspended when outpatient/community services (e.g. Pre-school Speech and Language) were cancelled. Consequently, there is a significant backlog of service, long waiting lists and, in some cases, lost opportunities to meet some community health needs. These backlogs are currently being assessed and plans to deal with them are being developed. Nevertheless, there is little doubt that SARS has had a significant impact on Toronto's population and on Toronto Public Health's ability to achieve compliance with the provincial Mandatory Health Programs and Services Guidelines for 2003.

Worksites affected by a symptomatic case required immediate quarantine of exposed workers and on-site presence of TPH staff to explain risks, assess individuals for exposure and symptoms, and to identify contacts for follow-up. TPH followed up four possible cases of SARS who had some contact with a school while ill. One school was closed by TPH for public health reasons and four by the local school board due to operational considerations when certain students and teachers were quarantined. In each case, TPH staff met with students, teachers and parents to address questions and concerns when the school was closed and again when it re-opened after their quarantine ended. Nonetheless, substantial health concerns, child care difficulties and academic challenges were faced by families and students in affected schools and post-secondary institutions.

Toronto lost hundreds of millions of dollars in revenue when conventions, conferences and meetings were cancelled and tourists changed vacation plans to visit the city. Many people who worked in the hospitality industry lost income or were laid off. Because SARS originated in China, many Chinese businesses and restaurants were especially hard hit due to public fear about SARS transmission at these establishments. The reputation of the city suffered worldwide when WHO issued a travel advisory against Toronto.

The delivery of hospital services was immobilized by the SARS outbreak resulting in significant disruption as new infection control protocols were implemented and revised. Two hospitals were closed entirely (Scarborough Hospital – Grace Division, North York General), individual hospital units were closed (e.g. trauma and ICU at Sunnybrook Hospital), there was widespread cancellation of elective surgeries and appointments, and visitors to hospitals and long term care facilities were extremely restricted. Some patients with other serious illnesses who required urgent surgery and medical care were unable to access service. Visitors who had been instrumental in providing additional care to patients were often unable to visit family members. Health care service delivery was disrupted because all persons entering hospitals and outpatient settings had to be screened for SARS before admittance, health care professionals were reassigned to SARS work and some health care professionals were themselves in quarantine.

SARS Community Relations and Communications:

Community meetings were held to address specific concerns in schools, workplaces and among community groups. Many families were affected on a personal level when member(s) became ill or were identified as contacts and had to be quarantined. Individuals and families affected by SARS were faced with multiple complex demands, including physical illness and psychological stress.

While thousands of individuals and their families were directly affected, certain groups were particularly burdened by the pressures of intense public attention. The Chinese and East Asian communities were associated with the geographical origin of the outbreak and other “hotspot” locations where SARS was present. In addition, one religious group within the Filipino community experienced tremendous stress from both the effects of the illness on several of its members and the disclosure that the entire group of about 500 persons was under quarantine. A high rise residential complex was placed on alert as a precaution and its residents and businesses were also thrust into the public spotlight. A funeral home and several workplaces were publicly identified as places where precautionary measures were being taken. In managing the “risk communications” there was a recurring trade-off between the need to protect individual privacy and the need to broadcast timely and relevant health risk messages to the wider community.

TPH was only one of several sources of information to the public. When the provincial emergency was declared, the province assumed lead responsibility for the delivery of all main messages. On occasion, leadership was delegated to TPH as the principal investigating agency and at other times Toronto relied on the provincial government to manage the complex task of keeping the public well informed of all necessary precautions without causing undue alarm or paralysis in the community. TPH provided daily input to provincial messages while engaging an extensive program of responding to the needs of Toronto residents through a range of community outreach and public education strategies.

The SARS hotline handled over 300,000 incoming calls. Updated information was translated into 14 languages and posted on the City’s web site. Targeted messages were sent to seniors’ residences, homeless shelters, church groups, conference planners, provincial jails, doctors’ offices and community, health and recreation centres. More than 20,000 handwashing notices were distributed to schools, businesses and other institutions. Regular briefings were provided to City Councillors, Board of Health members and city staff. TPH communications staff fielded about 1200 inquiries from local, national and international media, providing spokespersons and background information on all aspects of the outbreak.

Post Outbreak Activities:

The federal and provincial governments have established expert committees to review the response to SARS. The mandate and membership of these groups is outlined in Appendix 1. In addition, the Premier of Ontario and the Ontario Minister of Health have appointed Mr. Justice Campbell to investigate the specific incidents which occurred during the outbreak. The Medical Officer of Health will make submissions to all three bodies, and is a member of the federal and provincial panels. Reports from these bodies are expected in the fall/winter of 2003.

Although the outbreak is over, TPH continues to participate on the provincial Scientific Advisory Group that is finalizing directives for the “new normal” status of the health care system and local communities. Active disease surveillance and strong infection control will be absolute requirements, particularly in the upcoming winter season, to ensure early detection and control of SARS if it re-emerges again. The provincial Mandatory Health Programs and Service Guidelines for the Control of Infectious Diseases and Infection Control outline the basic

requirements for Boards of Health with respect to infection control in hospitals and long-term care facilities and outbreak response (Appendix 2). The experience of SARS has shown the need for revision of these guidelines to strengthen the role of local public health units in the surveillance and control of infectious diseases in these facilities.

Conclusion:

The SARS outbreak was an international incident that was unprecedented in scale and scope. It led to the first declaration of a health emergency by the Province of Ontario and required the mobilization of public health staff, infectious disease specialists and infection control practitioners from across Toronto, Ontario and Canada. The overall response was a team effort in every respect that in many ways brought out the best in organizations and individuals.

Over 400 TPH positions were dedicated to the SARS outbreak from mid March to the end of June. This included the Medical Officer of Health, Associate Medical Officers of Health, externally hired physicians, directors, managers, public health nurses, public health inspectors, data analysts, epidemiologists, IT specialists, communications staff, support staff and others.

The outbreak was limited primarily to hospital staff, patients and visitors as well as the household members of known cases. Disease transmission rarely occurred in non-health care settings, which greatly limited spread into the community. However, SARS caused major upheaval in health care settings due to the risks of occupational exposure and the operational constraints imposed by stringent infection control requirements. The social and economic impacts arising from this outbreak made a profound impact on the lives of untold numbers of people across Toronto, Ontario and Canada.

Communication and dissemination of accurate, timely information was an area of strength for TPH, which played a key role in communicating health risks through the mass media. At the same time, the information demands of managing an outbreak of this magnitude and complexity also highlighted the limited capacity of existing information management systems at TPH. Overall outbreak investigation and response was severely hampered by the multiple and loosely linked data collection systems within TPH and the lack of compatibility between data management systems across local health units and the province. Complete, accurate and current information about cases and contacts is crucial for public health and health care staff to understand the epidemiology of the outbreak, to plan containment strategies based on evidence of risk, and to monitor the effectiveness of disease control efforts.

The SARS outbreak illustrated the vulnerability of Toronto to a new emerging disease and showed how vital a strong public health infrastructure is to the well being of the city. TPH has learned many valuable lessons from this event, which will improve future emergency preparedness. In particular, there is a need for additional training of staff and managers on the processes required for outbreak investigation and emergency incident management (or more broadly emergency preparedness). Structures and processes that provide surge capacity and facilitate emergency response without decimating other public health programs and services are also needed. It is most critical that additional resources be added to local public health units and

the health care sector to ensure stronger surveillance and control of infectious diseases, along with stronger coordination and support mechanisms across sectors and jurisdictions.

Control of this outbreak would not have been possible without the active assistance and leadership of many organizations and individuals across Canada. TPH would like to express its sincere thanks to those staff and agencies who participated in this effort and to the City's citizens and workers who cooperated with the investigation and control of the SARS outbreak.

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List of Attachments:

Appendix 1 Terms of Reference for SARS Advisory Groups
Appendix 2 Mandatory Health Programs & Services Guidelines: Control of Infectious Diseases and Infection Control
Figure 1 Toronto SARS Cases Contacts Requiring Quarantine

REFERENCES

- 1) Booth CM, Matukas LM, Tomlinson CA et al. Clinical Features and Short-term Outcomes of 144 Patients with SARS in the Greater Toronto Area. *JAMA* 289:1-9, 2003.
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Appendix 1
Terms of Reference for SARS Advisory Groups

National SARS Advisory Committee – Terms of Reference

Issue:

In the circumstances surrounding the SARS outbreak, the Minister of Health is establishing a national SARS advisory committee to:

1. provide effective third party assessment of current public health efforts and lessons learned for ongoing and future infectious disease control;
2. reinforce the necessity of effective partnerships and working together;
3. advise on the provision of effective public information.

Principles:

Creation of such a team will:

- build on current public health interventions
- foster and encourage collaboration among jurisdictions, professionals and institutions
- work towards integration of all aspects of the containment of SARS (science, epidemiology, treatment, communication, and international coordination)
- exist for a short period of time with recommendations available before the end of summer.

Mandate:

1. Provide a short term objective assessment of lessons learned from current public health interventions to contain SARS.
2. Provide advice on a research agenda and strategy.
3. Provide advice regarding issues for necessary longer-term action regarding infectious disease control and prevention.
4. Advise federal and provincial public health authorities on the current and future efforts to contain SARS.
5. Advise public health authorities on effective communications strategies.

Membership:

The panel will be chaired by Dr. David Naylor, M.D., FRCPC, Dean of Medicine at the University of Toronto. Members who have agreed to serve on the panel are: Dr. David Butler-Jones, Medical Officer of Health for Regional Health Authority #1 in Saskatchewan; Dr. Robert C. Brunham, Director of the University of British Columbia Centre for Disease Control and Medical Director of the British Columbia Centre for Disease Control Society; Gerald Dafoe, Chief Executive Officer of the Canadian Public Health Association; Mary Ferguson-Paré, Vice-President, Professional Affairs and Chief Nurse Executive at University Health Network; Frank

Lussing, President and CEO of York Central Hospital in Richmond Hill, Ontario; Kaaren R. Neufield, Executive Director and Chief Nursing Officer at St. Boniface Hospital in Winnipeg; Dr. Michel G. Bergeron, Professor and Chairman of the Division of Microbiology and the Infectious Diseases Research Centre of Laval University in Quebec City; Dr. Allison McGeer, Director of Infection Control, Mount Sinai Hospital; and Dr. Sheela Basrur, Medical Officer of Health, Toronto Public Health.

Ex officio members of the Advisory group are Dr. Frank Plummer, Scientific Director of the Health Canada National Microbiology Laboratory in Winnipeg, Dr. David Heymann, Executive Director, Communicable Diseases, World Health Organization, Dr. Julie Gerberding, Director, Centers for Diseases Control and Prevention (CDC).

In addition, representatives of nursing, ethics and the law, risk communication and business will be named to the advisory committee.

Provincial Expert Panel on SARS and Other Infectious Diseases – Terms of Reference

On June 16, 2003, Health and Long Term Care Minister Tony Clement named the members of an expert panel on Severe Acute Respiratory Syndrome (SARS) and other infectious diseases.

Mandate:

The mandate of the expert panel is to:

- identify the key lessons learned in the province's healthcare system handling of the SARS outbreak.
- use the understanding derived from these key lessons to provide practical, focused and forward-looking advice on all appropriate health system measures to strengthen infectious disease control in each sector and on a system-wide level.
- draw upon the expertise from those in the fields of public health, nursing, acute care, long-term and community care, primary care, emergency service, infectious disease control and information technology.
- assess required reserve capacity in the system, research and measures to strengthen infectious disease control, public health and system response capabilities; and
- provide advice and recommendations on the design and implementation of planned and future infectious diseases management initiatives.

The expert panel will report back to the minister by the end of December.

Membership:

Dr. David Walker, Dean of Medicine of Queens University will chair the panel.

Those named to the expert panel are Dr. Wilbert Keon, CEO of the University of Ottawa Heart Institute; Dr. Andreas Laupacis, President and CEO of the Institute for Clinical and Evaluative Sciences; Dr. Donald Low, Chief of Microbiology at Mount Sinai Hospital; Dr. Kieran Moore, an emergency physician at Sudbury Regional Hospital; Leslie Vincent, Chief of Nursing at Mount Sinai Hospital; and Dr. Robin Williams, Niagara Region's Medical Officer of Health.

Ex-officio members of the panel are Dr. Sheela Basrur, Toronto's Medical Officer of Health; Dr. Colin D'Cunha, Chief Medical Officer of Health; Dr. Hanif Kassam, Associate Medical Officer of Health in York Region; Dr. David Naylor, Dean of Medicine at the University of Toronto; Dr. Jim Young, Commissioner of Public Security; and Dr. Dick Zoutman, Chief, Department of Medical Microbiology and Medical Director, Infection Control Services at Kingston General Hospital.

Independent SARS Commission – Terms of Reference

Mr. Justice Archie Campbell has been appointed by the Eves government to preside over a commission to examine the SARS outbreak.

1. The subject matter of the investigation shall be:
 - (a) how the SARS virus was introduced here and what measures, if any, could have been taken at points of entry to prevent its introduction;
 - (b) how the SARS virus spread;
 - (c) the extent to which information related to SARS was communicated among health care workers and institutions involved in dealing with the disease;
 - (d) whether health care workers and patients in health care treatment facilities and long term care facilities were adequately protected from exposure to SARS, having regard for the knowledge and information available at the time;
 - (e) the extent of efforts taken to isolate and contain the virus and whether they were satisfactory or whether they could have been improved;
 - (f) existing legislative and regulatory provisions related to or that have implications for the isolation and containment of infectious diseases, including the quarantine of suspected carriers;
 - (g) any suggested improvements to provincial legislation or regulations, and any submissions that the Province of Ontario should make concerning desirable amendments to federal legislation or regulations; and,
 - (h) all other relevant matters that Mr. Justice Campbell considers necessary to ensure that the health of Ontarians is protected and promoted and that the risks posed by SARS and other communicable diseases are effectively managed in the future.
2. The investigation shall be conducted in a manner that does not impede ongoing efforts to isolate and contain SARS.
3. Mr. Justice Campbell may request any person to provide relevant information or records to him where he believes that the person has such information or records in his, hers or its possession or control.
4. Mr. Justice Campbell shall hold such public or private meetings as he deems advisable in the course of his investigation.
5. Mr. Justice Campbell shall conduct the investigation and make his report without expressing any conclusion or recommendation regarding the civil or criminal

responsibility of any person or organization, without interfering in any ongoing criminal, civil or other legal proceedings, and without making any findings of fact with respect to civil or criminal responsibility of any person or organization.

6. Mr. Justice Campbell shall produce an interim report at his discretion and deliver it to the Minister of Health and Long-Term Care who shall make the report available to the public. Upon completion of his investigation, Mr. Justice Campbell shall deliver his final report containing his findings, conclusions and recommendations to Minister of Health and Long-Term Care who shall make such report available to the public.
7. To conduct his investigation Mr. Justice Campbell shall be provided with such resources as are required, and be authorized by the Attorney General and shall have the authority to engage lawyers, experts, research and other staff as he deems appropriate, at reasonable remuneration approved by the Ministry of the Attorney General.
8. The reports shall be prepared in a form appropriate for release to the public, pursuant to the Freedom of Information and Protection of Privacy Act.
9. These terms of reference shall be interpreted in a manner consistent with the limits of the constitutional jurisdiction of the Province of Ontario.
10. In the event that Mr. Justice Campbell is unable to carry out any individual term of his mandate, the remainder of these terms of reference shall continue to operate, it being the intention of the Minister of Health and Long-Term Care that the provisions of these terms of reference operate independently.

Appendix 2

Mandatory Health Programs & Services Guidelines: Control of Infectious Diseases and Infection Control (December 1997)

Control of Infectious Diseases

Goal:

To reduce the incidence of infectious diseases of public health importance.

Objective:

To reduce morbidity and mortality associated with infectious diseases.

Requirements and Standards:

1. The board of health shall provide:
 - a. an on-call system that ensures 24-hour availability of appropriately trained and qualified board of health staff to respond;
 - b. assessment of a reported incident and a first response within 24 hours;
 - c. written outbreak response plans which include coordination with the public health laboratory;
 - d. identification and appropriate response to outbreaks; and
 - e. an infectious disease policy and procedure manual with current relevant information on all reportable diseases under the Health Protection and Promotion Act.
2. With respect to cases of Reportable Diseases and amendments, as outlined in Ontario Regulation 559/91 and Ontario Regulation 569/90, the board of health shall:
 - a. receive and investigate reports, in accordance with the Health Protection and Promotion Act;
 - b. apply provincial case definitions to reported cases as defined in the Reportable Diseases Information System manual;
 - c. provide on-going monitoring, including computerized data collection and analysis and application of results; and
 - d. forward reports to the Ministry of Health, including weekly transmission of data through the Reportable Diseases Information System.

3. With respect to cases of Communicable Diseases, as outlined in Ontario Regulation 558/91, the board of health shall:
 - a. receive and investigate reports in accordance with the provisions of the Health Protection and Promotion Act;
 - b. apply provincial case definitions to persons reported to be infected with an agent of a Communicable Disease as outlined in the Reportable Diseases Information System manual;
 - c. ensure public health management of persons found to be infected with an agent of a Communicable Disease in accordance with the infectious disease policy and procedure manual of the board of health; and
 - d. ensure the identification and appropriate management of contacts of persons found to be infected with an agent of a Communicable Disease in accordance with the infectious disease policy and procedure manual of the board of health.
4. The board of health shall provide information regarding infectious diseases to health care professionals, institutions and the community. This information shall be provided a minimum of once per year, through written material and/or presentations.
5. The board of health shall ensure implementation of the Ministry of Health *Notification of Emergency Service Workers Protocol (August 23, 1994)*.
6. The board of health shall provide or ensure the availability of travel health advice and immunizations for travelers.

Infection Control

Goal:

To reduce transmission of infectious diseases.

Objective:

To reduce morbidity and mortality associated with infectious diseases in institutions, day care centres and personal service settings.

Requirements and Standards:

1. The board of health shall ensure appropriate input to hospital infection control programs in the health unit. This shall include as a minimum:
 - a. representation of the medical officer of health or designate on each hospital infection control committee;
 - b. reporting of designated communicable diseases from hospitals, including emergency rooms and outpatient clinics, to the medical officer of health as required under the provisions of the Health Protection and Promotion Act;
 - c. consultation with the hospital infection control committee on the development and revision of infection control policies and procedures and an outbreak contingency plan;
 - d. providing advice when requested or when needed for the appropriate management of communicable diseases and infection control;
 - e. providing epidemiological information as needed regarding communicable diseases existing within the community and other institutions; and
 - f. collaboration or assistance in annual in-service education for hospital staff about communicable diseases.
2. The board of health shall ensure that infection control programs are in place in all nursing homes and homes for the aged. Activities shall include as a minimum:
 - a. representation on infection control committees;
 - b. ensuring that all nursing homes and homes for the aged designate a registered nurse or registered medical laboratory technologist to be responsible for infection control programs in the facility, in accordance with the Long Term Care Facility Program Manual;
 - c. ongoing consultation about a surveillance program to include the collection, analysis and appropriate management of nosocomial infections;
 - d. consultation on the development and revision of infection control policies;
 - e. development, in collaboration with the institution, an outbreak contingency plan consistent with good public health practices;

- f. informing the institution about required reporting of designated communicable diseases and outbreaks of diseases to the medical officer of health as required under the provisions of the Health Protection and Promotion Act;
 - g. annual promotion of influenza vaccination to staff; and
 - h. ensuring the provision of annual in-service education for staff on infectious diseases.
3. The board of health shall ensure an annual inspection of :
 - a. boarding houses and lodging houses with five or more residents;
 - b. migrant farm workers' housing;
 - c. residential facilities for the aged;
 - d. homes for retarded persons; and
 - e. homes for special care,

to ensure the existence of safe drinking water, safe food and sanitary facilities. Additional inspections shall be conducted when the requirements in Ontario Regulation 562 are not met.
4. The board of health shall ensure that infection control programs are in place in day nurseries. Activities shall include as a minimum:
 - a. consultation on the development of infection control policies and procedures such as hand washing, daily observation of children, immunization, health evaluation of children and staff and communication with parents;
 - b. inspection of premises at least twice a year to include diaper routines and general housekeeping practices and to ensure existence of safe drinking water, safe food and sanitary facilities;
 - c. ensuring the creation of a written policy on the management of infectious communicable diseases, exclusion of sick children and the reporting of designated diseases to the medical officer of health as required under the provisions of the Health Protection and Promotion Act; and
 - d. provision of annual in-service education in basic infection control for all staff providing direct care, consistent with generally-accepted infection control standards.
5. The board of health shall ensure that infection prevention practices as defined in the Ministry of Health *Infection Control in Personal Services Settings Protocol (January, 1998)* are in place in settings where there is a risk of exposure to blood, such as, but not limited to, hairdresser and barber shops, tattoo and body piercing studios, electrolysis and aesthetic clinics.