

A Public Health Controversy in 19th Century Canada

David R. Bellhouse and Christian Genest

Abstract. From 1858 to 1860, the English naturalist and social activist Philip P. Carpenter toured North America. In April of 1859 he visited Montréal, Canada. Shocked by the sanitary conditions of the city, he wrote a paper that used statistical arguments to call for health reforms. Six years later he settled in Montréal and quickly became an active promoter of this cause. He began accumulating additional numerical evidence in support of his views.

In the aftermath of a cholera scare in 1866, Carpenter became the driving force behind the creation of the Montreal Sanitary Association. That same year he published a second, more detailed article that took advantage of the 1861 census data to analyze mortality rates in Montréal. He made further statistical investigations in 1869.

Unfortunately, Carpenter did not understand some of the subtleties associated with the analysis of vital statistics. An obscure bookkeeper, Andrew A. Watt, made a scathing public attack on both Carpenter's data and his interpretation thereof. In a series of newspaper articles, Watt scrutinized systematically all of Carpenter's writings, showing his faults and correcting them wherever he could.

Although Watt's arguments were correct, the public was slow to understand them. The controversy continued through 1870. When the nature of Watt's criticisms finally became better understood and Carpenter persisted with statistical arguments, the latter lost credibility and was abandoned by his own association.

Key words and phrases: Andrew A. Watt, Philip P. Carpenter, crude death rate, Montreal Sanitary Association, mortality comparisons, public health, sanitation, standardized mortality ratio, statistical controversies.

1. INTRODUCTION

Sanitation was a growing concern among social statisticians of the mid-19th century. Poor health was tied to bad living conditions, and an indication thereof was taken from the rate of mortality. In a paper on the sanitary statistics of London, Jopling (1851) stated:

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At the present time when the sanitary condition of towns is justly engaging so much public attention, a few observations bearing on vital statistics may not be without interest.

He further wrote:

Until the establishment of a uniform system of registration, statistics were denied the means of arriving at anything like a correct estimate of the probabilities of life

Civil registration of births, marriages and deaths began in England in 1837. Early mortality comparisons were made through the crude death rate, D/P , where

in a given time frame (generally a year) D is the number of deaths and P is the population size (usually at midyear). By the 1850s, however, it was well recognized that this ratio was inappropriate, since it ignored the age distribution. For example, Fox (1859) stated:

The mere comparison of the gross mortality of two populations throws very little light on their relative healthiness or vitality. Their different distribution as regards age must be taken into account, and then we can fairly place them side by side.

The English social statistician William Farr had recognized the problem over 20 years earlier. Farr (1837) calculated age-specific death rates for a range of age groups and for a variety of areas and time periods within England and Wales. He was eventually led to introduce the standardized mortality ratio (Farr, 1865), which is commonly used nowadays for comparing mortality between populations. This index is given by the ratio of the actual number of deaths in a year to the expected number of deaths in the same period, or

$$D / \sum_x P_x q_x,$$

where P_x is the number of people at age x , and q_x is the probability of death within the next year of a person aged x , taken from a standard life table.

Good estimates of the crude death rate and the standardized mortality ratio require an accurate count of the number of deaths in a year as well as reliable, detailed population figures. Census data and a civil registration system are typically needed to these ends, but neither was generally available in Canada in the first half of the 19th century. The first full census of population under British rule was carried out in 1851; a previous one, held in 1841, enumerated only heads of households. In Lower Canada (now the province of Québec), and Montréal in particular, registration was entrusted to the parish churches and copies of their registers were sent to the prothonotary, a local government official.

Some of the difficulties in the use of mortality data in 19th century Canada can be illustrated by the early work of Dr. Archibald Hall, a member of McGill's Faculty of Medicine who edited many scientific publications, including *The British American Journal*. Hall (1847) compiled the mortality data for the whole of 1846 by season and by age at death, based on the bills of mortality reported to the prothonotary's office in

Montréal. While he may have had a reasonably accurate count of the deaths, Hall did not have the population size or distribution due to the nature of the 1841 census.

To find the average lifetime in Montréal, Hall (1847) derived the distribution of the ages at death from the bills of mortality. Using a method devised by the American Lemuel Shattuck, he then calculated the average lifetime, which turned out to be much less than, for example, that in New York, London and Liverpool. In this calculation, Hall attributed the shortfall in longevity in Montréal to high infant mortality. However, his calculation would have been appropriate only in a stationary population. Chadwick (1844), for example, noted:

The erroneous conclusions as to the ages of the populations from the proportions of deaths, have perhaps arisen from assumptions of the existence of states of things rarely, if ever, found, namely, perfectly stationary populations, and perfectly stationary causes of death.

It is within this data context that a controversy over mortality data broke out in Montréal during the 1860s. Twelve years after Hall (1847), a British naturalist and social activist named Philip P. Carpenter (see Figure 1) observed that the mortality experience

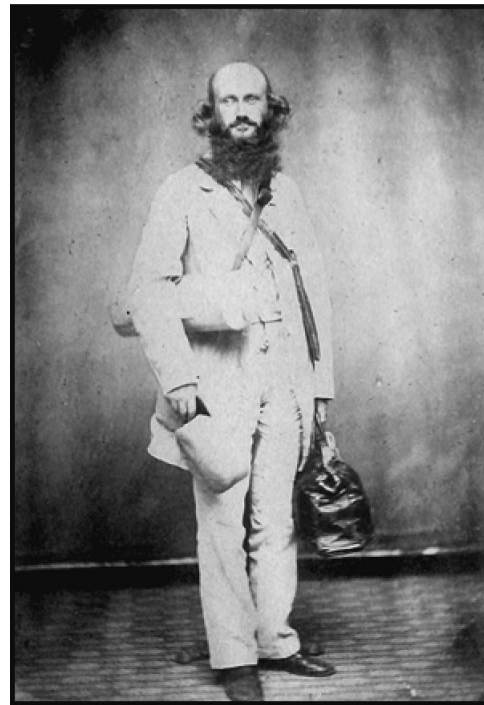


FIG. 1. A photograph of Philip Pearsall Carpenter (November 4, 1819–May 24, 1877).

of Canada's metropolis was worse than that of other major cities. He tied the high mortality rate he obtained to poor sanitation. In his drive to cleanse the city, he formed the Montreal Sanitary Association as a social action group. The statistical controversy to be described herein erupted when an obscure bookkeeper, Andrew A. Watt, publicly questioned Carpenter's use and interpretation of the data.

2. BIOGRAPHICAL BACKGROUND OF THE MAIN PROTAGONISTS

Unfortunately, very little is known about Andrew Watt. He was a Montréal resident during the 1860s and probably worked as a clerk for an insurance company. From his writings, however, it is obvious that he was well educated and was especially well versed in population statistics.

Much more information is available about Philip Carpenter. He was educated initially at the school established and run by his father in Bristol. He continued his studies at Bristol College and then attended a Presbyterian training college at York. He graduated with a B.A. from the University of London in 1841. He then entered the ministry and served in that capacity until 1861. He early attached himself to the study of conchology, and his work in arranging and determining collections of shells for the British Museum (Reiner's Mazatlan shell collection) and the Smithsonian Institution led the State University of New York at Albany to grant him a Ph.D. in 1860. See Coan (1969) for a bibliography of Carpenter's writings and see Carpenter (1880) for a sympathetic biography written by his brother Russell.

Philip's father, Lant Carpenter, was a Unitarian divine of high repute, who was deeply involved in promoting philanthropic causes among his congregation in Bristol (Carpenter, 1842). He was a member of statistical societies in Bristol (Cullen, 1975, page 122) and in Glasgow (Glasgow and Clydesdale Statistical Society, 1836). He died in 1840 when his son Philip was 20.

Lant's eldest child, Mary Carpenter, was very much influenced by her father's philanthropic work and took a leadership role in the family at his death (Carpenter, 1880). She became interested in the education of the poor and the lot of juvenile delinquents (Carpenter, 1851, 1853, 1864). She published a paper in the *Journal of the Statistical Society of London* (Carpenter, 1857) in which she spoke of the importance to the reformatory movement of collecting appropriate statistical evidence. She was elected a Fellow of the Statistical

Society of London in 1862 (*Journal of the Statistical Society of London* 1863, Volume 26, page 447).

Philip Carpenter closely conformed to the family pattern. When confronted with a serious social issue, he collected data to support his subsequent actions. Like his father and sister, he developed interests in many philanthropic schemes. The *Dictionary of National Biography* (Stephen and Lee, 1921–1922) described Carpenter's endeavors as "... some wise and useful, others ill-considered and unfruitful." Having learned to swim in a canal, for example, he had instituted a swimming academy, and stood up for ancient rights of way. He was also heavily involved in both the antislavery and temperance movements of the 19th century. However, he was particularly keen on the necessity for proper drainage and sanitary reform. Dall (1877) wrote:

Dr. P. P. Carpenter was educated as a clergyman, and may be said to have never left the clerical mantle, so far as a continuance of earnest labors in all matters of moral and sanitary reform may be concerned. . . . Personally, he worked for righteousness in all his doings; no one could know without respecting the man, though his fiery enthusiasm was not always appreciated or understood.

3. CARPENTER'S 1859 VISIT TO MONTRÉAL

Philip Carpenter first came to North America on a tour that lasted from 1858 to 1860. He spent considerable time in Montréal. Near the end of April 1859, the Howard Division of the Sons of Temperance in Montréal sponsored a series of four lectures given by Carpenter; two of them were on sanitary reform and two on temperance. Advertisements for the lectures appeared in the local papers (e.g., *Montreal Daily Transcript*, April 22, 1859).

During his first lecture on sanitary reform, Carpenter talked in general about the British experience. He emphasized the importance of collecting reliable data and the necessity for civil registration (*Montreal Witness*, April 27, 1859). However, he was forced to put aside his own good advice in preparation for his second talk on the subject. In that lecture, he formulated his conclusions on the mortality experience of Montréal, based not on civil registration records, but on surrogate data. He then connected the rate of mortality to the sanitary state of the city.

In the week between the two lectures, Carpenter toured Montréal and collected as much mortality data as he could find. The newspaper report of the lecture opened:

In Mr. Carpenter's second lecture on Sanitary Reform, which was delivered on Friday evening last, he gave, from documentary authorities and personal inspection, a sketch of the sanitary condition of this city, at which our readers will doubtless be astounded and appalled as much as we were. [*Montreal Witness*, May 4, 1859.]

Given that it was springtime, Carpenter had found manure in the streets that had accumulated through the winter. He had also seen houses where human waste had collected for several years (Carpenter, 1859). To support his conclusions with statistical evidence, he used the 1851 census results and obtained birth and death returns for the years 1851–1858 from Montréal's prothonotary. He estimated the population size in each year by adding the excess of births over deaths to the calculated population of the previous year, and then calculated the crude death rate in each year.

Basing his comparisons on crude death rates, Carpenter found that Montréal's mortality compared very unfavorably to that of many other cities he knew of. While he realized that the data were not perfect, he felt that they were reasonably accurate, at least for mortality comparison purposes. The *Montreal Witness* report of Carpenter's conclusions stated:

Here is one of the healthiest countries, perhaps in the world (indeed, he did not remember any other that enjoyed so low a rate of mortality), with one of the most unhealthy cities of the world in it, and that arising from no natural or necessary cause. The most unhealthy city in Britain was Liverpool, when it had a cellar population of 40,000 souls, and its mortality was only 35 per 1,000; the mortality of all England being 30 per 1,000; and yet the city of Montreal, in apparently a much healthier country, had a mortality of 39 per 1,000! [*Montreal Witness*, May 4, 1859.]

The same article continued:

He would [Carpenter], therefore, take the liberty of advising the formation of a Statistical and Sanitary Committee, with a view,

in the first place, to obtain and publish correct statistical returns; in the second, to cause the sanitary laws, at present in existence, to be enforced; and in the third place, to procure additional legislation as may be necessary. [*Montreal Witness*, May 4, 1859.]

The press and public soon came on board. Siding with Carpenter on his interpretation of the city's mortality statistics, the editors of the *Montreal Witness* (May 11, 1859) and the *Montreal Daily Transcript* (May 20, 1859) severely criticized governmental apathy and called on the more wealthy and influential in the city to take up the cause of sanitary reform and to create a statistical and sanitary committee. A letter to the editor praising the paper's stand may also be found in the *Montreal Daily Transcript* of May 21.

Meanwhile, Carpenter continued his journey. In May, he wrote an article (Carpenter, 1859) reasserting that, based on crude death rates, Montréal's mortality was excessively high compared to other cities. A contemporary review in the *Montreal Daily Transcript* (June 16, 1859) states that the paper "... goes over the same ground as that covered by the lectures."

Figure 2 illustrates some of the crude death rates reported by Carpenter (1859), who provided many concrete examples and pointed to lack of sanitation as the culprit. In his paper, other plausible causes of excessive mortality are meticulously examined and discarded one by one, for example, unhealthy immigrants, excess consumption of alcohol and exposure of newborns to the elements by Catholic parents because of early baptism practices.

The journal in which Carpenter published his article was the *Canadian Naturalist and Geologist*, a seemingly unusual choice which may, however, find its

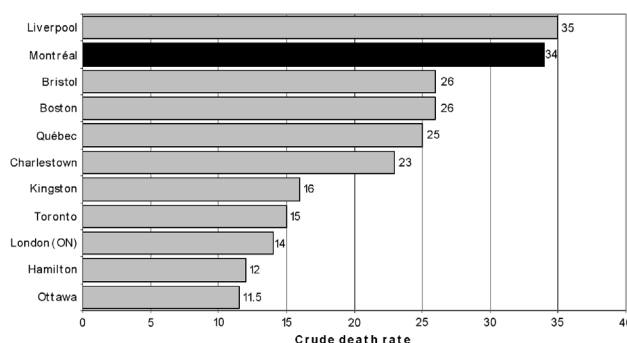


FIG. 2. Crude death rates for selected cities in Canada, Britain and the United States, as per the table on page 175 of Carpenter (1859).

roots in Carpenter's scientific background as a conchologist. While in Montréal, he struck up a friendship with geologist John W. Dawson, who was the Principal of McGill University (then McGill College). Dawson was probably responsible for getting Carpenter's paper published in that journal, for which he was an editor (Sheet-Pyenson, 1996, pages 167 and 171).

4. EARLY CRITICISMS OF CARPENTER'S WORK

By June 1859, the interest in statistical information and sanitary reforms generated by Carpenter's visit had waned. The *Montreal Daily Transcript* even became critical of Carpenter's work. Its June 16 edition expressed the view that while Montréal's mortality rate might be higher than elsewhere in Canada, some of Carpenter's data were likely unreliable. Toronto's cemetery returns were used to illustrate how inaccurate Carpenter's crude death rates were for other Canadian cities.

The following month, Carpenter's article was commented on by the press in Upper Canada (now Ontario), including the *Toronto Globe* and the *Hamilton Spectator*. In particular, the latter claimed Hamilton to be the healthiest town in Canada. In response to this blow to civic pride, the *Montreal Daily Transcript* of July 18 wrote:

It is much to be regretted that the statistics of mortality in Canada are so very defective. We are glad, however, to see that the Board of Arts and Manufactures of Lower Canada have appointed a Committee to give attention to sanatory [sic] and vital statistics, and we trust that good may result from their labours. [*Montreal Daily Transcript*, July 18, 1859.]

No report from this committee seems to have survived. However, the Board did present a petition to the Legislative Assembly in 1861, asking it to enact legislation to provide sanitary police in the cities (*Journals of the Legislative Assembly of the Province of Canada*, Volume 19, 1861, page 33).

Dawson was one of the founding members of the Board of Arts and Manufactures and was serving as its President in 1860–1861 (*Lovell's Montreal Directory*, 1860–1861). In view of his connections with Carpenter, it is probable that he had something to do with the formation of the Board committee to look into sanitary and vital statistics. It is also likely that the committee gave Carpenter's work a clean bill of health. Not only

did its members support the results of the paper, they actively promoted its recommendations. It is perhaps this committee that Carpenter's chief critic, Andrew Watt, later referred to when he wrote (Watt, 1869):

In 1859, a committee of gentlemen republished and distributed, gratis, the essay by Dr. Carpenter, which appeared in the *Canadian Naturalist and Geologist* of June that year

Watt's publication is the only record of his objections to Carpenter's work during 1859. Watt (1869) explained that soon after the gratis version of Carpenter's paper was circulated in 1859–1860, he had tried to get a letter published in a Montréal newspaper, but that it had been rejected. The letter was apparently similar to an earlier one that he had written in 1855 when mortality in Montréal seemed to be on the rise. Publication of that letter had also been declined.

By the time Watt finally got his letter published (*Montreal Gazette*, March 30, 1861), the controversy over Montréal mortality statistics was more or less over. For a time, the press had been in favor of the formation of a statistical and sanitary reform committee, but nothing had happened. There are several possible reasons for this: (i) the city of Montréal was in some financial difficulty over its waterworks project and was unwilling to spend any additional funds; (ii) Philip Carpenter, the person with the energy and zeal to carry the project through, had left; (iii) the medical profession at this time, Archibald Hall in particular, was conservative in its approach to sanitary reform and somewhat critical of the mortality data; and (iv) the press became preoccupied with a more current statistical issue, the 1861 Census of Canada.

As evidenced by two editorials published in the 1861 edition of *The British American Journal* (Hall, 1861a, b), Hall's views on the mortality data for Montréal were quite different from Carpenter's. In the February issue of the journal, he commented on an article published in the January 9 *Montreal Herald*, where statistics were given on the city's mortality experience for the previous year. Hall criticized the data collected, noting for example that they did not include the ages of death. This was a problem since Hall had known that the greatest mortality in Montréal occurred among those five and under. Hall (1861a) concluded that the situation

. . . demonstrates that the vital statistics of a city or country should be in charge of a

person thoroughly acquainted with a knowledge of the manner of conducting such investigations.

Hall pointed to William Farr and to the reports that Farr produced for the Registrar General's Office as ones that "... invariably furnish the basis upon which sanitary reforms are continually being carried out."

The press took issue with Hall's first editorial, in particular the high infant death rate. Both the *Montreal Gazette* (February 27, 1861) and the *Montreal Daily Transcript* (February 28, 1861) published the same article, asking the following question:

He [Hall] states the chief mortality to occur under the age of 5 years, giving a frightful per centage of deaths under that age. Can the editor give no reasons and propose no remedies for such a state of things?

As it turned out, the newspapers' editors had not read Hall carefully. The "frightful per centage" number was from 1846, and the papers ascribed the same percentage to 1861. In his March editorial, Hall (1861b) contended that mortality in Montréal had declined since the time of his first studies on the topic. He also reiterated the need for civil registration.

Carpenter was not mentioned in either editorial. However, both texts appear to be a tacit criticism of his work. These editorials perhaps explain why Hall did not take up the sanitary cause with Carpenter. He wanted better statistical evidence obtained from a proper registration system, and he appeared unwilling to take any action without the proper statistical information. When the Montreal Sanitary Association was formed in 1866 as a forum for advocacy and education in sanitation, Hall was not among the seven physicians to serve on its council (Montreal Sanitary Association, 1867).

It is in this context that the opening salvo between Watt and Carpenter was fired. It was at the same time the final punch in the first round of debate over Carpenter's sanitary statistics. An article appeared March 30, 1861, in the *Gazette* under two initials, "W. G." The letter, which was dated February 1861, was almost certainly written by Andrew Watt. Indeed, Watt (1869) stated that he wrote a review of Carpenter's work (Carpenter, 1859) at that time and had published it in the *Gazette*. The extreme acerbity of the letter is the probable reason that Watt had trouble getting his comments published. Here is one example:

A glance at the Essay was sufficient to show that Mr. Carpenter has no acquaintance with the statistics of human life. A slight examination showed the production to be incomparably the worst we have seen, and as there are bounds to ignorance and presumption, we fondly believe that it is the worst in existence.

Further on, one may read:

Mr. Carpenter may be able to multiply, divide and subtract, but to all intents and purposes he has no more knowledge of the meaning of the figures than a Babbage calculating machine has of the operations it is made to perform... Our Essayist, while pretending to be a reformer, is the personification of Red Tapeism.

In this letter, W. G. mainly questioned the accuracy of the census data on which Carpenter based his calculations, as well as the accuracy of the data from various parts of the United States that Carpenter had used for comparison. It was also the first time that Carpenter's statistical reasoning was attacked. Here is an example:

It will be evident to the most unreflecting there must be a relation between the length of life in town and country, so that, if we know the one we will be able to estimate the other with a degree of truth proportioned to the accuracy of that which is known. We will say the proportion shown to exist between the forty large cities of England and the rural districts, represents this relation. A rate of 1 to 39 in the cities gives 1 to 53 in the country. [...]

Suppose, now, that Mr. Carpenter is right in what he affirms so positively of the five cities of Upper Canada, in which the average [mortality] rate is 1 in 70, what will be the rate in the [surrounding] country?

The answer is 1 in 95. Mr. Carpenter says it is 1 in 130, and thinks he is near the truth. His reason for his conclusion gives a fair example of his logical ability. Here it is [quoting Carpenter]: 'Still each of the Upper Canadian cities, where deaths, at least, are recorded, shows so healthy a condition that the mortality of the country is probably not much greater than that recorded.' Any person possessed of the most infinitesimal

share of brains will see this is the very reason why we should think the country cannot show a much lower rate of mortality than the towns.

If the people in cities live to nearly the utmost length of life, there must be very little difference between the duration of their lives, and the lives of the people of the country.

Watt's attack was left unanswered. At any rate, nothing further could be found in the press concerning either his criticisms or Carpenter's lectures on sanitation in April 1859.

5. INTERLUDE: THE YEARS 1861–1865

George Fenwick, a Montréal physician and professor at McGill University, followed up on Hall's work with further mortality data from the early 1860s (Fenwick, 1861). Fenwick followed strictly along Hall's analysis by using Shattuck's method of calculating the average age at death, based on the distribution of the ages of death in the bills of mortality for Montréal. He found that the average age of death using this method was 24.1 years, a value that was "by no means unfavourable." Although his tacit assumption of a stationary population was questionable, Fenwick was much more concerned with the correct calculation of the deaths. He noted a lack of uniformity in Montréal's cemetery returns and called, once again, for a system of civil registration as in England and Wales.

John Langton was the Auditor of Public Accounts for Upper and Lower Canada (Ontario and Québec, respectively) from 1855, and Auditor General of Canada at Confederation in 1867. He made one careful foray into the analysis of census statistics. Langton (1863–1864) discussed the inaccuracies in the census data for 1861. He noticed grave problems with the census data, especially the reporting of deaths and to a lesser extent births. The end result of his analysis was yet one more call for a civil registration system.

Of interest here is Langton's discussion of the effect of infant mortality, which was high until early in the 20th century. Langton (1863–1864, page 112) wrote:

Indeed, from the great preponderance in all countries of the deaths in the first few years, the two things almost necessarily go together, and an increased number of births involves an increased rate of general mortality.

The bluntest criticism of the census data came from Joseph-Charles Taché, who became the first Federal Deputy Minister of Agriculture and Statistics in 1863. In January of 1865 (Taché, 1866) he wrote a report to the Board of Registration and Statistics, citing several examples that condemned the accuracy of the data collected in the censuses of 1851 and 1861. His examples were nearly the same as those given earlier by Langton. In some cases he went beyond Langton, noting, for example, that in the 1851 census the number of children living under the age of 1 was many thousands greater than the number of births in the previous 12 months. Taché concluded in general that:

What is today called our Statistics—I mean the Census Reports of 1851 and 1860—are fallacious statements, and not to be relied upon in any essential point.

Taché went on to describe a statistical system that he would like to see in place. The census of 1871, the first to be held after Confederation, was carried out under his supervision and direction.

6. PHILIP CARPENTER IN MONTRÉAL: 1866–1869

Philip Carpenter settled in Montréal in late 1865 or early 1866 (Carpenter, 1880, pages 281–282). Shortly after his arrival, there was a concern that a cholera epidemic would spread to Canada. The level of concern was expressed in a report to Montréal's City Council by doctors serving as the city's vaccinators for smallpox. They insisted on the need for civil registration in order to judge the effect of the vaccination system on the death toll due to smallpox. Regarding cholera, they added (*Montreal Herald*, February 3, 1866):

That in all human probability that disease will ere long be in our midst; whether it will be mild or severe in its dealings with our fellow-citizens, depends in a great measure upon the means which may be taken to place the city in a thoroughly sanitary condition.

The cholera scare was serious enough that the president of the College of Physicians and Surgeons of Lower Canada, Dr. William Marsden, wrote an elaborate report on methods for quarantine, should cholera occur (*Montreal Herald*, February 27, 1866). The city of Montréal issued cleansing orders on its territory and appointed an Officer of Health (Carpenter, 1880, page 284).

The cholera scare stirred Philip Carpenter once again to action. He wrote to his brother Lant on March 6,

1866 (Carpenter, 1880, pages 284–285) that in order to pressure the city government to further action, he intended to give lectures on sanitation and to form a sanitary association. The lectures began three days later. An announcement for such a talk (*Herald*, March 8, 1866) stated that Carpenter had updated his 1859 statistical analysis and would present his new findings to the audience.

The Montreal Sanitary Association came into being at a meeting on April 17 (*Herald*, April 18, 1866). Significantly, the medical community was now on side. George Fenwick, who had written on mortality statistics in the early 1860s, was a member of the Association's council. So were Dr. Francis Campbell and Dr. Jean-Lukin Leprohon, two of the vaccinators for smallpox who initially expressed concern over the possible impending cholera outbreak. These doctors were also prominent in their community; Campbell and Fenwick had established the *Canadian Medical Journal* in 1864. There were several other influential people on the Association's council: William Workman, the founding president, would later be elected Mayor of Montréal. Also on the Association's council was a young lawyer, Wilfrid Laurier, who would later become the first French-Canadian Prime Minister of Canada (Montreal Sanitary Association, 1867). Philip Carpenter held the position of Honorary Secretary.

The purpose of the Association was:

to collect and diffuse information, and take action on all matters relating to public health; and, especially, to assist in improving the abodes of the poorer classes. [*Montreal Herald*, April 18, 1866.]

Because of the cholera scare, many meetings were held in Montréal during the first year of the Association. The diffusion of information was mostly practical advice for personal and public hygiene.

Philip Carpenter promoted within the Association the statistical aspect of information gathering and dissemination. The statistical analysis from his 1859 work was updated and published in the December issue of *The Canadian Naturalist* (Carpenter, 1866). In this paper, Carpenter mentioned the political measures instigated by City Council to clean up Montréal. He claimed that in spite of the city's poor efforts, the Montreal Sanitary Association had saved 470 children's lives.

While Carpenter's 1859 article had been subject to criticism that the data used were inaccurate, his

methodology had not been challenged. Consequently, Carpenter (1866) provided a critical review of the data available to him and corrected them wherever necessary, but his analysis was again based on the crude death rate. However, he was seemingly unaware of (or simply ignored) the published criticisms of the accuracy of the 1861 census.

In some ways, Carpenter's analysis of the mortality data for Montréal was very insightful. He proceeded with his analysis by contrasting the city with the surrounding countryside, focusing on the death rate for the young. He looked at the average weekly mortality per month in Montréal over a 12-year period. There he noted a trend that was distinctly different from the English experience. In England, the mortality rate was higher in the winter than in the summer months. By contrast, Montréal's monthly mortality rate remained stable throughout the year for those over the age of 12, while it rose substantially in the summer months for those under 12.

Figure 3 shows Montréal's monthly mortality rates, averaged from 1855 to 1866 as per Carpenter (1866). The latter attributed the seasonal changes in children's deaths to sanitation, arguing that greater casualties occurred in the summer when the snow did not hide the filth of the city. As he had done in Carpenter (1859), he explored other possible causes for the high mortality rate, but dismissed them all in favor of poor sanitary conditions.

Although the feared cholera epidemic turned out to be just a scare with little or no substance, the work of the Sanitary Association continued. Regular public meetings were held. Through the Association, a copy of Carpenter (1866) was sent to every member of the Montréal City Council. Political pressure was exerted in various other ways; for instance, a memorial

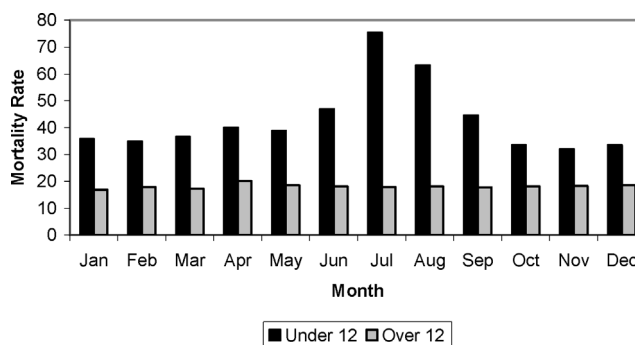


FIG. 3. Weekly average mortality in Montréal by month for 12 years, 1855–1866, for those under and over the age of 12, as per Tables 13 and 14 of Carpenter (1866).

dated March 30, 1867 (currently held in the Archives de la Ville de Montréal) was sent to the City Council chastising it for suspending the sanitary measures it had imposed during the cholera scare. In the same memorial, the Association further called on the City Council to appoint a permanent health officer and to institute civil registration in the city. The statistical results presented in Carpenter (1866) were also summarized to support the Association's arguments for further action by the City Council. A variety of political efforts continued for several years; see, for example, the *Montreal Gazette*, February 6, 1869.

The June 1869 issue of *The Canadian Naturalist* contained Philip Carpenter's final published analysis of Montréal mortality data. With one exception, Carpenter (1869) is a continuation and enlargement of Carpenter (1866). The exception was a response to charges aimed at Montréal's largest foundling institution run by the Grey Nuns, the Hôpital Général des Sœurs Grises. The charge, as mentioned by Carpenter (1869), was as follows:

Many persons have attributed this excess mortality [in Montréal] to the existence of the Foundling Hospital; and one of the 'religious' newspapers [*Protestant Echo*, June 19, 1867] asserted (although the facts of the case were easily accessible) that 'it was estimated that about 2,000 children die annually in it.'

No extant copies of the *Protestant Echo* have been found for that date. Carpenter went to great lengths to refute this charge by examining data from foundling hospitals in Massachusetts and New York, and by examining the Montréal Foundling Hospital data broken down separately by birthplace and by age of the children. He also noted that the current data corroborated his claim that the death rate for children increased substantially in the summer months. Some of these data are shown in Figure 4 for the years 1866–1868.

Carpenter's 1869 article appeared in the June issue of *The Canadian Naturalist*. Despite his analysis, the debate over the Foundling Hospital continued and seems to have divided on linguistic or sectarian lines (or both: French–Catholic versus English–Protestant). The French-language newspaper *Le Nouveau Monde* tried to argue that the children were already sick before coming to the hospital, while the *Montreal Witness* was suggestive of lack of competence at the institution (*Witness*, August 23, 1869). The latter newspaper

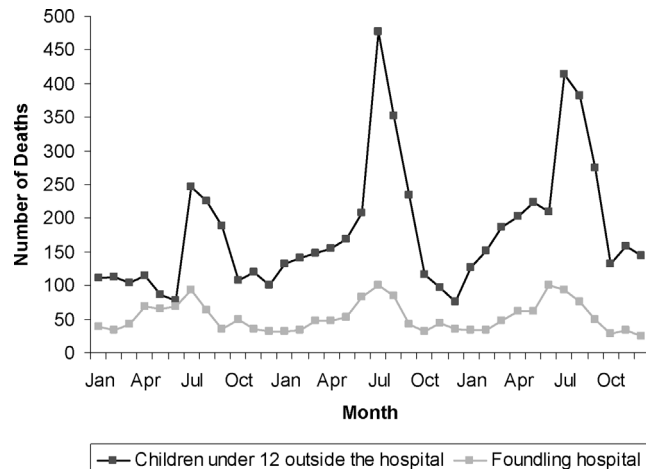


FIG. 4. Monthly number of deaths in Montréal at the Foundling Hospital and for children under 12 outside the hospital for 1866–1868, based on Tables 13 and 27 of Carpenter (1869).

went as far as accusing the hospital authorities of farming out healthy babies to (probably wet) nurses, who brought the babies back dead, possibly through malnourishment. The *Witness* found support in Carpenter's data, which showed that 98% of the deaths occurred at nurses' homes.

7. THE STATISTICAL CONTROVERSY HEATS UP: 1869

At last Andrew Watt was able to make a timely reply to Carpenter's work. Carpenter's paper appeared nominally in June; Watt's reply, written under the pseudonym "Experience," appeared in the *Montreal Witness* on August 20, 1869. In all likelihood, he had been required to clean up his language somewhat. Compare, for example, two excerpts on the same theme treated by Watt:

The difficulties attending the subject of vital statistics must be apparent from an essay by Philip P. Carpenter . . . [*Montreal Witness*, August 20, 1869.]

and

The difficulties attending the subject of vital statistics must be apparent to the reader; and as an admirable example of the absurdities written upon it, we quote from an essay by Philip P. Carpenter . . . [Watt, 1869, dated November 8.]

Watt's article in the *Witness* pointed out many of the inaccuracies in Carpenter's data. Further, it commented that the mortality rate, as computed by the

crude death rate, was tied to the birth rate. Independently of Langton (1863–1864), Watt stressed that a high birth rate results in a high death rate. This is again due to infant mortality. Later in the *Witness* (August 24, 1869) there was an unsigned article, but undoubtedly due to Watt, that fully examined the issue of infant mortality and its relation to the death rate.

At about the same time, Philip Carpenter had his paper in *The Canadian Naturalist* reprinted as a supplement to an issue of the *Montreal Gazette* (August 21, 1869). Once again, Andrew Watt was able to produce a timely reply. According to Watt (1869), the latter was at the invitation of the Montréal City Council, following their meeting of September 13. At that meeting one of the aldermen had stated that he deemed Carpenter's statements about the high mortality in Montréal to be false (*Montreal Witness*, September 14, 1869). Another alderman accepted the high mortality rate, but thought that it was due to "strangers to the city." In his view new immigrants tended to bring with them sickly children who died shortly after their arrival in Montréal. The mayor, William Workman, came to Carpenter's defense, claiming that he was a "very clever man and was usually very cautious in publishing any statements that were susceptible of doubt or uncertainty." At the time, Workman was also president of the Sanitary Association.

Watt's reply appeared first in the *Montreal Daily News* (October 25, 1869) and then was reprinted as another supplement to the *Montreal Gazette* (October 29, 1869). In a series of examples in this article, Watt demolished Carpenter's contention that the data on which he based his conclusions were accurate. He then launched into a new topic: the effect of immigration on the death rate. This subject had actually been discussed, not in Carpenter's latest work, but rather in his earliest work. Its current topicality had been hinted at in the September City Council meeting. Carpenter (1859) had noted that immigration tended to increase the population size and, by tacit inference, decreased the death rate. In the *Gazette* supplement, Watt gave additional examples of those who had fallen into the same trap, including the *London Times*.

The *Times* was in good company. For example, the English sanitary reformer, Edwin Chadwick, also made the same mistake (Chadwick, 1844), further basing his inference on the fact that immigrants tended to be young, unmarried and healthy. Chadwick's analysis, and others like it, including Carpenter's work, ignored the fact that healthy young unmarried persons tended to

get married and have children. With high infant mortality, the effect of immigration might then very well decrease the average age at death or equivalently increase the death rate. Farr's *6th Annual Report of the Registrar General*, released in 1844 (see Farr, 1885, pages 470–471), described the mathematical conditions under which a population subject to migration could experience an increasing or decreasing death rate.

In the article published in the *Daily News* on October 25, 1869, and reprinted in the *Gazette*, Watt had studied systematically various aspects of Carpenter's work since 1859, commenting on the population of Montréal, as well as baptisms and burials in the city over a period of more than 10 years. His virulent attack was not only based on facts and figures, but even turned to religious mockery:

Dr. Carpenter seems to have studied the Prophecies of Isaiah with the same unprofitable result as his study of social statistics; refer to his first essay, and also to table 21 in the third. In the latter he says that Isaiah prophesied [sic] that in Montreal there would be no deaths of children under 12 years of age in the year 1867. The prophecy does not refer to the present time, for the Word errs not. He should have consulted Job, who asks, Who can bring a clean thing out of an unclean?

In his final paragraph of the *Daily News* article, Watt threw discredit not only on Carpenter's work, but on the Sanitary Association as a whole. True to his old form, he wrote:

After all, it has been shown that Montreal is more healthy than Glasgow and London, and much more healthy than Manchester; and that the deaths of children in the year of life, in Montreal, are not only, not excessive, but actually less, in proportion of the number of births, than in London.

A very imperfect sketch has now been given of the unfounded statements and erroneous views circulated by the Sanitary Association, and the reader must judge of what effect they have had on the general prosperity of the city. But of the Secretary [Carpenter] it must be said, once for all, on behalf of men who are labouring in a most uninviting field of thought; in which the work is hard and the fruit is little, that he has no place in the wide domain of Statistical Science.

In November of 1869, Watt's two articles, one from the *Witness* (August 20, 1869) and the other from the *Daily News* (October 25, 1869), were reprinted with some changes and additions in a single separate publication (see Figure 5) under the full title *Notes on the Principles of Population: Montreal Compared with London, Glasgow, and Manchester, With an Examination of the Vital Statistics by Philip P. Carpenter, B.A., Ph.D., one of the Honorary Secretaries of the Montreal Sanitary Association* (Watt, 1869). From the time of the publication of this pamphlet, the Montreal Sanitary Association began to unravel.

Watt's *Notes* was the subject of a debate at the Montréal City Council in late November (*Montreal Gazette*, November 22, 1869). One of the aldermen pressed Mayor Workman to have Carpenter react to Watt's criticisms. The mayor's reply shows the first steps in Philip Carpenter's abandonment by his Sanitary Association colleagues. After making the point that Carpenter had done his work without any fees, so that he had no obligation to respond, Workman carefully and politically stated:

Dr. Carpenter had simply read his statements before the Association and it [the Association] was not responsible for them. There was a general feeling amongst all classes of people that the Association did a great deal of good. [*Montreal Gazette*, November 22, 1869.]

The reporter for the *Gazette* added that Mayor Workman "did not like the spirit in which the letter of 'Experience' was written, and did not think Dr. Carpenter ought to be scolded." However, in response to an alderman who reminded him that the maxim "Silence gives consent" held good in the circumstances, the mayor indicated that "he had that day been speaking to Dr. Carpenter as to the propriety of noticing the letters of 'Experience'."

Carpenter found support among the French clergy and medical community. In a lecture given at the Collège Sainte-Marie in late October, Dr. Leman wholeheartedly supported Carpenter's work (*La Minerve*, October 28, 1869; *Le Pays*, October 29, 1869). Leman went over Carpenter's data in detail and added in the mortality experience of France by way of further comparison. The francophone community's interest in sanitation and public hygiene issues went well beyond statistics. Shortly after Leman's lecture, Dr. A. B. LaRocque gave a talk to l'Union Catholique, covering the history of the subject from ancient to modern times (*L'Ordre*, October 30, 1869).

Philip Carpenter did eventually reply to Watt's charges, not directly to his critic, but in a letter to Workman that was published in the press. English versions can be found in the *Montreal Gazette* and the *Montreal Herald*, November 29 and 30, 1869, respectively. A French version appeared, for example, in *La Minerve*, November 30, 1869. The first two paragraphs of his very polite rebuttal read as follows:

DEAR SR.—I beg to reply to the questions addressed to me, through you, at the last meeting of the City Council.

My silence in reference to the letters of 'Experience' does *not* show that I am convinced by his reasonings or cowed by his insinuations against myself. I laid each of his letters, as they appeared, before the Sanitary Committee; they were duly discussed, but I was not instructed to reply to anonymous attacks. I invited him (through the printer) to attend our meetings, but he has not yet

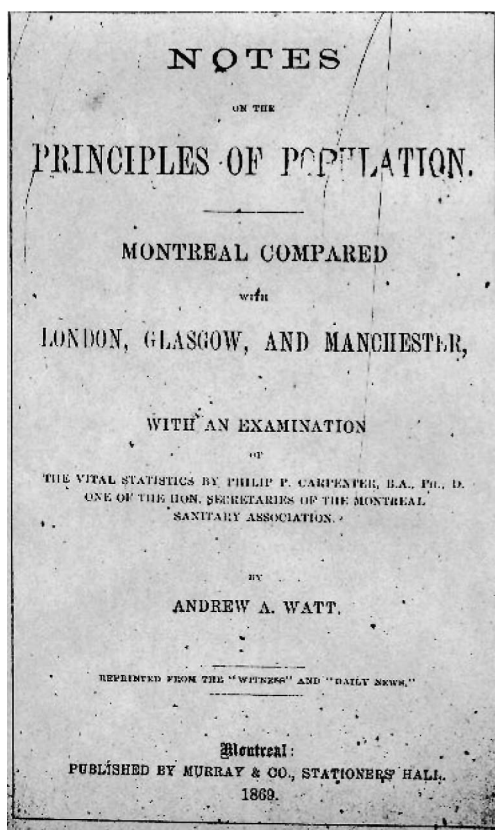


FIG. 5. Front cover of Andrew A. Watt's pamphlet titled "Notes on the Principles of Population..." (Watt, 1869).

accepted our call. I thought I was being criticized by one much older than myself, and I waited to see what he had to teach me. Now that he has combined his thoughts into an essay and appended his name, it is just to you that I should state wherein I think him right and wherein wrong

In this letter, Carpenter recognized some of the errors in matters of fact that Watt had pointed out, but remained adamant about two issues. First, he maintained that although the census data were of poor quality, there were trends in month-to-month comparisons that allowed him to make some valid comparisons such as an increase in mortality during the summer months. Second, he persisted in his use of the crude mortality rate. He argued that it was the standard method for making mortality comparisons and that eminent statisticians had employed it. Carpenter further mentioned that he intended to submit his work to some of these distinguished people for comment. However, no responses have ever come to light, possibly for good reason. Carpenter had ignored a body of literature (some of which is mentioned in Section 1) that had seriously questioned the use of the crude mortality rate.

At this point, the debate had become too technical for most people. The *Montreal Witness* commented:

There is a controversy going on upon this subject [sanitary statistics] between Mr. A. A. Watt and Dr. Carpenter, but, as most of it is incomprehensible to common readers, we decline to enter into it at any length. [*Montreal Witness*, November 30, 1869.]

The *Witness* then went on to quote from Carpenter's letter about the standard use of the crude mortality rate by many renowned statisticians.

Despite the public's incomprehension, the debate grew more heated. An advertisement for a meeting of the Sanitary Association stated:

This Society meets this evening at the Mechanics' Institute. Those holding different views from the members of this Association are equally invited with those who hold the same opinions. An animated discussion may be looked for. [*Montreal Witness*, December 1, 1869.]

The meeting was duly held and came out in support of Carpenter's main points that the mortality in

Montréal was too high, in particular that the ratio of infant-to-total deaths was unacceptably high, and that the death rate in the summer was excessive. The high mortality was again attributed to Montréal's poor sanitary conditions (*Le Nouveau Monde*, December 3, 1869). Some of Watt's criticisms had hit the mark, however. The meeting supported a call to the government to institute civil registration and to take such action that would make the upcoming census in 1871 more accurate.

8. DÉNOUEMENT: 1870–1871

Although the work of the Montreal Sanitary Association continued through 1871, statistical studies seem to have been dropped and statistical issues treated gingerly. In fact, Carpenter and the Association were exhorted in the press to concentrate on sanitary education and were chastised for their continued and stubborn use of statistics that brought Montréal a bad name. This is illustrated in the following translation of an article that appeared in *Le Nouveau Monde*, January 25, 1870:

The Association was wrong to prove itself so overly sensitive when the accuracy of its data was questioned, and the kind of stubbornness with which it argued so tenaciously that city life was extremely unhealthy is to be regretted by everyone.

We wish the members had conducted themselves more wisely, and agreed at least that the issue could be considered from different perspectives.

Far be it from us to fall into the temptation to dismiss the considerable—very considerable indeed—good that the Sanitary Association has done, nor to discard the very positive influence it has had on the decisions of the Health Committee: but we would have preferred that it be more concerned with hygiene and less with acrimonious debate, and that its work be focussed on the dissemination of proper notions of hygiene in the population rather than on tarnishing the reputation of the city abroad.

Despite the growing acceptance of Watt's arguments, Carpenter continued to use statistical arguments to the end of his tenure as Honorary Secretary to the Association. One of the Council members of the Sanitary Association, George Fenwick, as editor of the *Canada Medical Journal*, had Watt's *Notes on the Principles of*

Population reprinted in that journal (Watt, 1870–1871). Nevertheless, Carpenter soldiered on. In his final report (Montreal Sanitary Association, 1871), he went over the issue of children’s deaths in Montréal. Significantly perhaps, he worked only with the raw counts and did not calculate any crude death rates.

The Montreal Sanitary Association was disbanded and reconstituted under the same name over meetings that took place in 1871. Carpenter no longer held a position in the new Association, but remained a member. Although Russell Carpenter (1880, page 297) claimed that the reborn Association never met, minutes of its meetings for parts of 1873 and 1874 are on file at the McCord Museum in Montréal.

Philip Carpenter’s loss in credibility on statistical issues can be seen in one more attempt he made to rally the city on sanitary problems using statistical arguments. At a meeting of Montréal’s Natural History Society in 1872, it was reported that Carpenter was planning to write a paper on the mortality returns in Montréal (*Montreal Herald*, February 27, 1872). On this occasion, he talked at length about sanitary issues and expressed concern that the mortality rate in Montréal was rising that year. Several members of the audience suggested that it should be up to the (new) Sanitary Association to pursue these matters.

A month or so later, Carpenter and some others, without any overt support from the Sanitary Association, presented a memorial to the City Council (*Montreal Herald*, April 4, 1872). The memorial noted “the enormous death rate [in Montréal] offered on the altar of willful neglect” and made several recommendations for sanitary improvements in the city.

9. POSTSCRIPT

The controversy over Montréal’s mortality experience began with issues over the quality of the data. To this criticism, Andrew Watt added the measure of mortality that had been used, showing that the crude death rate was inadequate for this purpose. Modern experience has shown that great care must be exerted in the use of statistics for discussions of public policy that has caught the attention of the media. The general public typically does not understand statistical arguments. When the alarm is sounded over an issue of public health, for example, fallacious statistical arguments used to support the cause are difficult to refute unless the rebuttal can be expressed in the simplest of nontechnical terms.

The issue of sanitation in the Montréal of the 1860s supports modern experience. Andrew Watt’s explanation of the issue was too technical, and perhaps his writing too acerbic, for the audience of the day, and it took time for his ideas to catch on. Once the problems of Philip Carpenter’s analysis had been exposed and understood properly, he lost credibility with many of his supporters and was abandoned by the Montreal Sanitary Association that he had founded.

Concerns about sanitation in Montréal remained, however, and were addressed by different people using alternative arguments and approaches; the statistical polemic was cast aside. In the short term, at least, some statistical wisdom was acquired in the press of the time, as illustrated by the following translation of a quote from *Le Nouveau Monde*, January 25, 1870:

All those who have studied statistics, be it just a little, know that contradictory views and diametrically opposed conclusions can be extracted from the same data. It is a weapon that can strike down either friends or enemies, depending on whether it is handled with ignorance or dexterity.

When used in the service of economic theories, statistics is a helpful tool that can work for or against the government, and no one could ever hope to have the political upper hand unless he is versed in the art of playing with the numbers.

We do not wish to negate, however, the genuine usefulness of statistics; but what we view as incontestable is the extreme care with which people who truly have a serious interest in the public good examine data before they use them.

Numerical data stand on their own as absolute and are not open to manipulation through pruning or augmentation; it is the circumstances under which these data come about that is relative.

One question remains. What if Carpenter had used the correct statistical method, that is, the standardized mortality ratio of Farr (1865)? Would his conclusions have been any different? Consider, for example, Montréal and Hamilton, for which Carpenter (1866) had calculated the crude death rates per thousand to be 22.5 and 11.3, respectively. The death counts in both cities, as given in the census, are highly unreliable. For Montréal, however, the cemetery returns compiled by

Fenwick (1861) for 1860 provide a reasonable approximation.

The count for Hamilton is much more speculative. The census count of the number of deaths in Hamilton is 217 according to Carpenter (1866), but from the *Hamilton Spectator* (January 27, 1860), there were 437 burials in the year 1859. The newspaper also commented that the cemetery returns in the past had been poorly kept but were now much better. Complete returns for 1860 could not be found; the *Spectator* reported (July 6, 1860) that the register for one cemetery was missing. Previous counts of burials can be found in the *Hamilton Weekly Spectator* (July 28, 1859). From July 1, 1857, to July 1, 1858, 531 burials were reported, and for the same period in 1858–1859, there were 441 burials.

A range of values can thus be presented for Hamilton's standardized mortality ratio. In order to compute it, the age distribution in each city and an appropriate standard life table are needed. The age distribution is available from the census and the Carlisle life table, the mostly commonly used life table in the 19th century (see, e.g., Jones, 1844), was used as the standard. Except at the younger ages, however, the population counts were given in 10-year age intervals. For the present purpose, the yearly counts were thus obtained by smoothing the original counts using splines, and the population count was interpolated at yearly ages.

In the end, the standardized mortality ratio for Montréal is found to be approximately 1.53 for 1860. For Hamilton, the ratio is 1.25, based on 531 deaths, and 1.03, based on 437 deaths. Accordingly, the standardized mortality ratio for Montréal can be estimated to have been between 22 and 49% higher than it was in Hamilton in the year 1860. This is considerably less than Carpenter's 100% figure. This may well be the appropriate measure, but there are still concerns over data quality that will never go away. Taché's conclusion that the census data of that period were "not to be relied upon in any essential point" is a valid one.

ACKNOWLEDGMENTS

The authors are grateful to M. François Cartier of the McCord Museum and to the personnel at the Service des Archives de la Ville de Montréal and at the Archives Nationales du Québec for their kindness and patience in helping them locate various historical sources. They are also thankful to Professor Bruce Curtis (Department of Sociology, Carleton University), to the Editor and to two anonymous referees for some

very helpful comments and suggestions. Partial funding in support of this work was provided by the Natural Sciences and Engineering Research Council of Canada and by the Fonds québécois de la recherche sur la nature et les technologies.

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