

## Maternal and Infant Mortality in Auckland, 1870–1930



IN 1873 MARY SMITH was killed by a disease that was the dread of women and the bane of medical practitioners: childbed fever. Mary was one of five Auckland women who died that year as a result of pregnancies gone wrong, a surprisingly small number given that there were close to 1500 births registered in the city. The other four women succumbed to causes representative of the common hazards that resulted in death, rather than life, being the outcome of pregnancy. Ann Davidson expired from ‘shock of a severe labour’; Fredericka White of puerperal convulsions; Catherine Stenson of haemorrhage from a retained placenta; and Suzanne Holloway from placenta previa, the attachment of the placenta to the uterine wall close to, or covering, the cervix.<sup>1</sup> Fifty years later women were dying of much the same causes. Even more surprisingly they were dying at almost twice the rate.

The data for this article emerged out of a joint project Raewyn Dalziel and I undertook in the early 1990s in order to determine whether the Auckland Birth, Death and Marriage registers had sufficient continuity to enable a family reconstitution project. Either registration was too sporadic or mobility too frequent to enable us to reconstitute nuclear families (much less multi-generational families of the kind I had analysed in my doctoral thesis which Raewyn had co-supervised), but I became interested in the frequency of maternal deaths and hired a research assistant to collect information about them. From 1875 on all living children were listed on a mother’s death registration. It quickly became apparent that there were a very large number of infants missing from their mothers’ death registrations, so we subsequently went back to the archives to collect information on all the deaths of infants under three months old that could be tied to a specific mother who had died in childbirth. Later Pam Paterson, a Masters student, analysed a sample of the data using decadal intervals. The data then languished until the editors of this volume approached me for a contribution to a special issue of the *New Zealand Journal of History*, celebrating Raewyn’s contribution to New Zealand history. It seemed fitting to return to this material to see if more could be learned from the data using the more sophisticated analytical approaches and scholarly analyses published in the intervening years.

This article examines maternal mortality among the European population of Auckland in the late nineteenth and early twentieth centuries. Historians who wish to examine Māori deaths in childbirth are severely limited by gaps

in the official data. Until 1925 there was no legal requirement for Māori to register births, deaths or marriages. The early-twentieth-century furor over New Zealand's declining birth rate, female deaths in childbirth and infant welfare did not prompt officials to gather information about Māori women or their babies. Politicians and health administrators were concerned that the 'white races' would be overrun owing to declining birth rates not that the 'brown races' were dying out. As Barbara Brookes and Alison Clarke have pointed out, from what little we know, Māori maternal mortality rates were undoubtedly much higher than European rates, but quantifying the differential precisely is impossible for the available data.<sup>2</sup>

In the late nineteenth and early twentieth centuries, there was much public policy and political debate in New Zealand about the survival of European infants. In 1904 the first of six St Helens hospitals was opened in Auckland, providing subsidized maternity care for low-income married women. In 1907 Frederic Truby King rallied the support of middle-class women to campaign for better health care for infants and young children, resulting in the formation of the Plunket Society. Care for the well-being of pregnant women was tied to their role as mothers of future citizens. Ironically, the founding of these institutions dedicated to mother and child welfare coincided with the beginning of a prolonged rise in maternal mortality in Auckland and a profound drop in the percentage of infants surviving their mothers' deaths. A 1919 United States Children's Bureau report showed that New Zealand had the highest maternal mortality rate of the 13 developed countries surveyed.<sup>3</sup> The American report spurred the New Zealand government to set up a Special Committee to investigate maternal deaths.<sup>4</sup>

The 1919 US report is indicative of concern about the high rate of maternal mortality beyond New Zealand and, indeed, beyond colonial countries. In the United Kingdom, France, Australia and the United States declining fertility rates raised fears of 'race suicide', and heightened disquiet about the reproduction, growth and 'quality' of the European populations.<sup>5</sup> The international concern over maternal health was not without basis. In 1913 the newly established Children's Bureau in the United States undertook a comprehensive study of infant mortality in ten American cities, involving 'detailed, standardized interviews with all families of infants born in the community during a specified year'. The results were shocking and included a 'substantially higher overall rate of infant mortality than that previously reported by the Census Bureau or the new Birth Registration Act'.<sup>6</sup> Moreover, infant mortality was clearly linked to maternal health and living conditions, rather than poor post-natal care: 'Elevated infant mortality was observed most

frequently among mothers in the youngest and oldest age groups, twins and triplets, births assisted by implements, closely spaced births, and artificially fed infants. Family income was inversely related to infant mortality, with an almost fourfold gap in [infant mortality rates] observed between the poorest and the wealthiest families.<sup>7</sup>

Irvine Loudon's comprehensive study of maternal mortality trends over the course of the nineteenth and early twentieth centuries is the gold standard to which contemporary scholars refer. Loudon argued that a pattern of maternal mortality was repeated, with minor variations, in all Western countries. He found a high plateau of maternal mortality from 1850–1930, a development made more striking by the background of a general decline in mortality. Infant mortality had declined precipitously, yet maternal mortality remained persistently high, despite widely varying conditions and systems of care in Western nations. Loudon attributed this principally to the medicalization of childbirth, arguing that increased interference during labour, and the concentration of maternal care among general practitioners who travelled from one patient to another, spread puerperal infection or left women at high risk of shock or haemorrhage.<sup>8</sup>

However, other factors were at work during this period. Numerous epidemiological, physiological, demographic and social factors contribute to maternal mortality rates, and these interact to affect any individual's likelihood of death. Loudon himself has posited that a new and more virulent strain of streptococcus developed in the nineteenth century and again at about 1912, contributing to elevated rates of sepsis.<sup>9</sup> Many studies have shown that urbanization, with its accompanying exposure to poor sanitation, resulted in generally higher death rates among the population, including much higher infant mortality rates.<sup>10</sup> Canadian scholars have revealed that women in Vancouver, Toronto and other cities faced higher, often much higher, rates of maternal mortality than did rural women.<sup>11</sup> Urban populations were more likely to live in conditions of poverty and overcrowding, both associated with elevated risks for women. Urbanization was also associated with increased employment opportunities for young women, and a shift away from their families and communities. Finally, not only were most single women giving birth for the first time, and thus at greater jeopardy, ex-nuptial pregnancies carried especially high risks of mortality due to social isolation, poverty and the moral opprobrium heaped on unmarried mothers.<sup>12</sup>

The decline in fertility, about which politicians were so worried, had a paradoxical effect on maternal mortality rates. The decrease in the total number of pregnancies reduced the exposure to risk across the whole population, and

decreased the proportion of mothers who were at higher risk of death because they were in their forties and had had many children. However, this was offset by the fact that a greater proportion of the women giving birth were doing so for the first time. First births were more hazardous.<sup>13</sup>

Historians have also suggested that the continued elevated risk of maternal mortality in the early twentieth century was in part attributable to an increase in the number of abortions. Abortions carried a high risk of infection or haemorrhage.<sup>14</sup> The Canadian scholars Angus and Arlene McLaren have argued that doctors tended to treat abortion deaths as they did suicides. Seeing themselves in the healing, rather than the policing, business they often recorded abortion deaths by actual cause — usually septicæmia — rather than as abortions *per se*, thus sparing families shame.<sup>15</sup>

Records from the Auckland Registers of Births and Deaths allow us to explicate patterns of maternal mortality in Auckland and test whether the register data can explain the ways in which the deaths of mothers from pregnancy-related causes changed between 1870 and 1919, the period that Loudon associates with elevated maternal mortality. The first section of this article describes the sources; the second briefly discusses the principal causes of death in childbirth; and the third examines patterns of maternal mortality in Auckland between 1870 and 1919. A fourth section analyses the data for what it reveals about underlying causes or trends. Specifically, it looks at whether there is any evidence of an elevated rate of maternal mortality owing to an increase in abortion. Finally, the results of this statistical analysis are used to consider the divergence of Auckland's rate of maternal mortality from New Zealand's from about 1903 and to discuss underlying causes of Auckland's much elevated rate.

The data for this study is drawn from the Registers of Births and Deaths for Auckland from 1870 and 1920. This register served approximately the area of Auckland City. Until 1898 it was not, however, coincident with Auckland District as constituted by official statistics or the census that covered a largely rural area from approximately present-day Wellsford to Thames. The city also changed boundaries over this period, incorporating Epsom, Ponsonby and other neighbouring boroughs. However, with the exceptions of Ellerslie and Avondale, which had their own registers from 1916 to 1920,<sup>16</sup> vital events (that is, births, deaths and marriages) in Auckland and its suburbs were recorded in the central city registers. The advantage of using the Auckland registers is that they enable analysis of those cases that are specifically related to the urban region, and provide a built-in control. This study uses only records held in these books.

Vital registration for the European population began in New Zealand in 1848 but was haphazard until the passing of the Vital Registration Act (1874). The Act made compulsory the registration of deaths (within three days of burial) and births (within two months). From 1875 the Registers of Death provide very detailed information about each individual. They included name, age and cause of death, the number, sex and age of living issue of the deceased, age at marriage, place of death (suburb, street or hospital) and the name of the attending physician. In the twentieth century, the records of deaths not attended by a physician, and deaths where the cause was unclear, or possibly the result of illegal activity such as abortion, included the verdict of a coroner's jury in place of the name of the certifying physician.

The primary database for this article includes all pregnancy-related maternal deaths between 1870 and 1919, a total of 687 maternal deaths, plus the deaths of infants who died within three months of their mothers. Staff at the registry furnished information about the total number of births in Auckland each year. For a sample of 18 years the number of neo-natal deaths (up to one month after birth), post-neo-natal deaths (one month to one year after birth), and ex-nuptial births was recorded. Data about the size of the male and female populations of both Auckland and New Zealand, plus the number of marital and ex-nuptial births in both jurisdictions, was compiled from the *New Zealand Official Yearbooks*. Although the Auckland data in the Yearbooks covers a wider area than the Auckland registers, it allows some comparison of the wholly urban information in the registers with the data for the larger Auckland region.

The information thus generated cannot be seen as representing all vital events during this period. High mobility in the Auckland population and ignorance of the law contributed to significant under-registration, especially in the early years of the study. A test of the completeness of registration of infant births and deaths in the 1870s and 1880s, for example, found that of 122 infants who died before the age of four months 20 were never recorded in the birth register, while a further 38 were registered only after the infant had died. Consequently while the descriptive section of this paper includes data from the early 1870s, analysis is based on the more consistent and reliable data from 1875 onwards, although as will be apparent even this is often opaque.<sup>17</sup>

Causes of death cannot be interpreted with complete certainty. There was a great deal of variation, both between physicians and over time, in attribution of cause. These variations are discussed below. After 1875 the registers allowed for up to three causes of death along with an indication of the duration of each contributing cause. Deaths were classified into one of

five categories: sepsis (all entries indicating fever, septicaemia or peritonitis); haemorrhage (including placenta previa); toxemia (including eclampsia, convulsions, shock, nephritis, thrombosis and embolism); medical (deaths precipitated by exogenous factors such as influenza, diabetes and chronic heart disease); and unclear (where death was attributed simply to childbirth or miscarriage). In analysing deaths from abortion, only those cases in which abortion was named as a cause of death and three cases of 'concealed haemorrhage' and/or 'perforated uterus' were included. Seventeen deaths of women due to septicaemia or 'uterine complications', where there was no indication that pregnancy was involved, were excluded. It is, however, likely that at least some of these deaths were due to abortion. These judgments are, of course, a matter of interpretation, but they have allowed for an estimate of a minimal death rate from abortion. As will be seen below, the principal causes of maternal death often interacted so some judgment is involved, and advice was sought from an obstetrician on many of the cases.

In most countries from the mid-nineteenth century to the mid-1930s the three most common causes of maternal deaths and their approximate contributions to the maternal mortality rate were puerperal sepsis (40%), toxemia (20%) and haemorrhage (20%), with other causes, such as tuberculosis and respiratory diseases, making up the balance.<sup>18</sup>

Puerperal sepsis or childbed fever, as it was commonly known, usually results from streptococcal infection of the uterus during or after delivery, although more rarely staphylococcus may be the infectious agent. It was fatal in up to 80% of cases, and was more likely to be fatal the sooner after birth it began. Physicians gave the disease many names, including puerperal sepsis, childbed fever, metritis, puerperal peritonitis and puerperal cellulitis.<sup>19</sup> In cases of puerperal fever death was caused by thrombosis, gangrene and haemorrhage from necrotic tissues, but many times these were subsumed under the term septicaemia, confusing the issue as this term technically refers only to blood poisoning. Loudon argued that, to a much greater degree than any other disease, a death from puerperal fever was liable to be attributed to negligence, and that some physicians 'hid' it by registering the deaths as peritonitis.<sup>20</sup> Sepsis was the most common cause of death from childbirth at least in part because infection was a likely side effect of any instrumental or manual interference in labour. For example, mothers who gave birth to stillborn children were at high risk because of difficult labours and the likelihood of forceps being used to extract the foetus. Toxemia, as well, could lead to sepsis when high blood pressure resulted in either constriction of blood flow to organs or to the blocking of blood vessels which caused necrosis in the surrounding tissue.

Debates about the agent of puerperal fever raged across Europe for at least two centuries before the streptococcus were identified. The Scandinavian countries were the first to recognize the problem as preventable and to tackle it through education of midwives and general practitioners in aseptic childbirth. They drastically lowered their deaths from infection long before English-speaking countries.<sup>21</sup> In the United Kingdom, the United States, Australia and New Zealand many physicians were reluctant to accept that they themselves might be the cause of maternal death, although as early as 1843 Oliver Wendell Holmes published a review of reports on puerperal fever, and argued forcefully for contagious ‘miasma’, carried by physicians, as its source.<sup>22</sup>

By the 1880s it had been generally accepted that puerperal fever was borne by germs. The application of Listerian antiseptic procedures in many lying-in hospitals in Europe and the United Kingdom dramatically reduced ‘the murderous levels of puerperal mortality that had persisted for 140 years’.<sup>23</sup> However, by 1912 rates of puerperal sepsis were on the rise again, casting doubt as to whether the decline had been caused by, or was merely coincident with, the introduction of antiseptics. Loudon argued that while antiseptic practices were instituted in lying-in hospitals this was offset by the fact of increasing medical interference in childbirth, along with scant attention to antiseptics in home births. Furthermore, although it was widely accepted that germs were the vector, it was not until the late 1920s that Leonard and Dora Colebrook, working in London’s Queen Charlotte’s Hospital, demonstrated the ubiquity of streptococci bacteria. The germs were often present in patients with tonsillitis, skin infections, colds and sore throats. Even more significantly the Colebrooks identified the phenomenon of asymptomatic carriage; up to 7% of the population carried the bacteria in their throats or nasal passages. General practitioners and others whose daily work brought them into contact with these conditions were most likely to become carriers. When sulphanilamide became available in the late 1930s Leonard Colebrook was the first to trial its use on women with puerperal fever. The drug wrought dramatic changes, and the development of penicillin finally brought the disease under control in the developed world.<sup>24</sup>

The next major cause of maternal death, toxæmia, is still little understood. It develops in the final trimester of pregnancy, with the initial symptom being high blood pressure, followed by albuminuria (protein in the urine) and oedema (retention of fluids in the tissues). Heightened blood pressure can lead to strokes, embolisms, ante-partum and post-partum haemorrhage, and heart failure, but the usual progress of the disease results in severe convulsions known as eclampsia or eclamptic convulsions, which can lead to death. The

incidence of toxæmia is higher in first than in subsequent pregnancies, in multiple than in single pregnancies, and among teenage mothers and older, multi-parous mothers. It is now thought that toxæmia may be partly an immunological reaction of the mother's body to the presence of foreign genetic material, as multi-parous mothers having a first pregnancy with a new partner have been shown to be at high risk.<sup>25</sup> However, its ultimate cause and course of development have still not been definitely identified.<sup>26</sup>

As there was no way to measure blood pressure before the second decade of the twentieth century, the identification of toxæmia or eclampsia before that time probably indicated that the disease was well advanced. Delivery is the only sure way of resolving toxæmia, so physicians tried to induce labour by rupturing the membranes and inserting a foreign object into the uterus. While this may have been successful in stimulating labour it also radically elevated the risk of infection. By the twentieth century caesarean became the preferred method of treatment, but this procedure also carried a very high risk of maternal death. According to Lisa Featherstone, for example, emergency caesareans in Australia during this period had a mortality rate of about 30%.<sup>27</sup> Both these options meant that toxæmia carried a double risk of mortality, and the foetus was at least as at-risk as the mother.

The third major cause of maternal mortality is haemorrhage, either before (ante-partum) or after (post-partum) birth. Both forms of haemorrhage are more common in women who have had more than four children, and the risk grows with a woman's age and the number of times she had previously given birth. Ante-partum haemorrhage is most commonly caused either when the placenta detaches prematurely from the uterine wall (placental abruption) or when the placenta lies low in the uterus preventing the foetus from being expelled (placenta previa). Placental abruption carries high risk for the mother and very high risk for the foetus, even today. According to Loudon, placenta previa 'was of more danger to the mother than any other complication of childbirth'.<sup>28</sup> During labour the contracting uterus tears the placenta from its site causing massive haemorrhage. The bleeding cannot be stopped until the baby is delivered, but the placenta blocks the baby's exit. Post-partum haemorrhage occurs most commonly from the placental site, although it can also result from a tear in the uterus or vaginal wall. Although haemorrhaging may occur naturally when the uterus fails to contract after birth, during the nineteenth and early twentieth centuries it often happened when a birth attendant manually extracted the placenta, rather than waiting for it to be expelled through the normal process. This hastening of the detachment and expulsion of the placenta also enhanced the risk of puerperal

infection. Mary Wollstonecraft, for example, died of puerperal sepsis after having this procedure.<sup>29</sup> The manual extraction of the placenta was one of the practices that earned the term ‘meddlesome midwifery’. This practice, as well as unnecessary surgical intervention and overuse of pain medication, was to be a major target of the New Zealand Department of Health’s interwar campaign to reduce maternal mortality.<sup>30</sup>

Women also died in childbirth because of the added stress of complicating infections, such as diarrhoea, tuberculosis, influenza and typhus, and chronic conditions, such as goitre (hypothyroidism), heart disease and epilepsy. Clarke found a small number of women also died from suicide, either on becoming pregnant or as a result of severe post-partum depression (puerperal mania), although these are not evident in the Auckland records.<sup>31</sup> About 13% of the maternal deaths in the Auckland register fall into this category, while for another 10% of women the cause of death is not clear from the records.

The dimensions of maternal mortality in Auckland changed significantly between 1870 and 1919. In 1921 the Special Committee graphed the maternal mortality rates for New Zealand (Figure 1). The most striking aspect of this

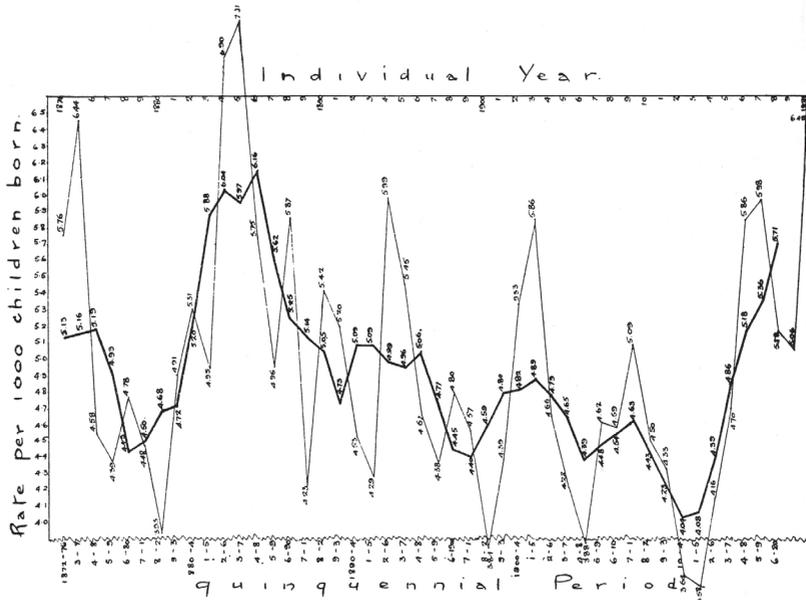
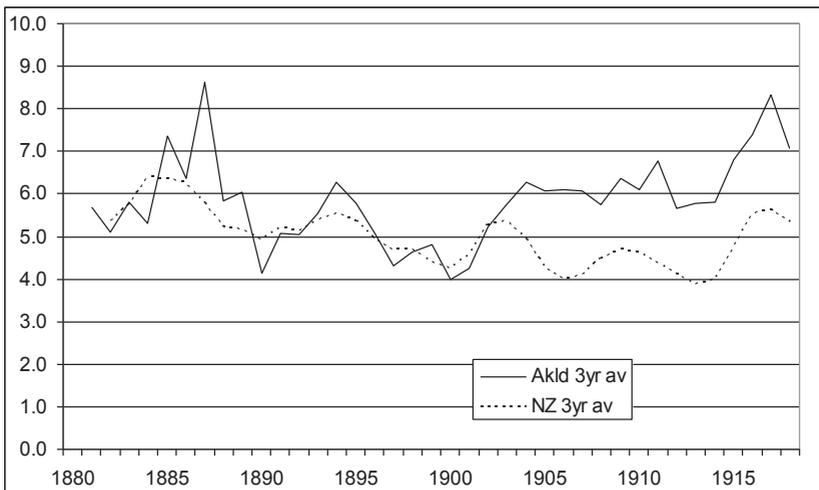


Figure 1: Maternal Mortality in New Zealand, 1872–1920, *Appendices to the Journals of the House of Representatives, 1921, H-31B, p.2.*

graph is that there was no overall drop in the number of women dying as a result of childbirth. At a time when general mortality rates and infant mortality had declined, parturient mothers continued to be at high risk from death. The report identified four distinct periods of maternal mortality. The first, from 1877 to 1881, was when mortality was comparatively low, reaching a minimum of 3.93 per 1000 live births in 1880. Between 1882 and 1890 there was a ‘somewhat extraordinary’ increase in mortality, reaching a maximum of 7.31 per 1000 live births in 1885. During the third period, from 1890 to 1913, there was a ‘progressive decline’ from 5.42 per 1000 in 1890 to 3.58 in 1913. The last period, from 1913 to 1920, showed another ‘abnormal’ increase, with the death rate rising to a peak of 6.48 mothers per 1000 births in 1920. The mortality rate for 1917 was the highest since 1894.<sup>32</sup>

In Auckland maternal mortality rates varied widely over the period, from about three per thousand live births to about seven, with an average for the whole period of 5.9. However, although the Auckland rates more or less followed the national ones — albeit at a somewhat higher level — until about 1903, from that point they diverged dramatically. After 1903 the Auckland rates were significantly higher than the national average (Figure 2). Auckland experienced an elevated death rate in 1918, as well as 1917, associated with the influenza epidemic; it is not possible to ascertain whether influenza-related deaths were excluded from the Special Committee’s statistics.



**Figure 2:** Auckland and New Zealand Maternal Mortality Rates, Three-year Moving Average, 1880–1919.

The causes of maternal mortality in Auckland echoed those found by Loudon for Western nations (Table 1), with sepsis accounting for 39.6% of all deaths, haemorrhage for 15.3% and toxæmia for 21%. A further 10.5% of women died from causes that were not clearly specified. For these women death was simply attributed to ‘childbirth’, ‘parturition’, ‘miscarriage’ or abortion. Needless to say these women likely perished from haemorrhage, infection or shock, as childbirth and abortion are not in themselves fatal. Another 13.7% died of complications brought about by the combination of childbirth and other diseases or conditions. The largest sub-category was death due to respiratory illnesses such as bronchitis, pneumonia and influenza, which accounted for 33 deaths (4.8%), including 12 women who died during the 1918 influenza epidemic. Tuberculosis was the next largest category, accounting for 18 (2.6%) maternal deaths over the period. Also included in these deaths were those associated with chronic conditions such as heart disease, diabetes, goitre, epilepsy and pelvic deformity.

|              | Sepsis                     | Toxaemia                   | Hmmrhge                    | Medical                   | Unclear                   | Total                       |
|--------------|----------------------------|----------------------------|----------------------------|---------------------------|---------------------------|-----------------------------|
| 1870–1879    | 31<br>43.7%                | 9<br>12.7%                 | 14<br>19.7%                | 8<br>11.3%                | 9<br>12.7%                | 71<br>100.0%                |
| 1880–1889    | 60<br>42.9%                | 17<br>12.1%                | 30<br>21.4%                | 22<br>15.7%               | 8<br>7.9%                 | 140<br>100.0%               |
| 1890–1899    | 39<br>37.5%                | 22<br>21.2%                | 14<br>13.5%                | 16<br>15.4%               | 13<br>12.5%               | 104<br>100.0%               |
| 1900–1909    | 53<br>35.6%                | 32<br>21.5%                | 23<br>15.4%                | 14<br>9.4%                | 27<br>18.1%               | 149<br>100.0%               |
| 1910–1919    | 89<br>39.9%                | 64<br>28.7%                | 24<br>10.8%                | 34<br>15.2%               | 12<br>5.4%                | 223<br>100.0%               |
| <b>Total</b> | <b>272</b><br><b>39.6%</b> | <b>144</b><br><b>21.0%</b> | <b>105</b><br><b>15.3%</b> | <b>94</b><br><b>13.7%</b> | <b>72</b><br><b>10.5%</b> | <b>687</b><br><b>100.0%</b> |

**Table 1:** Causes of Maternal Death 1870–1919.

The 687 Auckland women who were recorded as dying of complications of pregnancy during these years were aged from 13 to 54 years. Married women accounted for 88.7% of the total; 10.8% were unmarried; and 0.6% were widowed (Table 2). The married women’s ages ranged from 16 to 54

years, with an average age at death of 30.7; single women ranged in age from 13 to 36, with an average age at death of 22.9 years. The four widows were aged from 22 to 32 years. The women's mean age at marriage rose steadily during the period, from 21 for those dying in the 1870s to 23.5 for those dying in the 1910s, and should therefore have contributed to a fall in mortality by lowering the proportion of high-risk teenaged women in the population. However, as the proportion of single women dying increased over the period, and as these women tended to be younger, it is likely that they offset the shift in age at marriage (Table 2).

|                    | Married    |              | Single    |              | Widowed  |             | Total      |
|--------------------|------------|--------------|-----------|--------------|----------|-------------|------------|
| 1870–1879          | 64         | 90.0%        | 7         | 10.0%        | 0        | 0.0%        | 71         |
| 1880–1889          | 130        | 92.9%        | 9         | 6.4%         | 1        | 0.7%        | 140        |
| 1890–1899          | 93         | 89.4%        | 10        | 9.6%         | 1        | 1.0%        | 104        |
| 1900–1909          | 130        | 87.3%        | 18        | 12.1%        | 1        | 0.7%        | 149        |
| 1910–1919          | 192        | 86.1%        | 30        | 13.5%        | 1        | 0.5%        | 223        |
| <b>Grand Total</b> | <b>609</b> | <b>88.7%</b> | <b>74</b> | <b>10.8%</b> | <b>4</b> | <b>0.6%</b> | <b>687</b> |

**Table 2:** Maternal Deaths by Marital Status 1870–1919.

Cause of death varied significantly by marital status (Table 3). Of the three principal causes of death, single women were most likely to die from sepsis (60.8%) and least likely to die from haemorrhage (5.4%). They also had higher rates of toxaemic death than did married women, with six of the eight women under 18 dying of this disease. These figures are attributable to the fact that the unmarried women were all, as far as can be ascertained,<sup>33</sup> experiencing their first pregnancy (prima gravidas or prima paras) and therefore were at significantly higher risk of toxaemia and less at risk of haemorrhage than were women who had had more than one child. Married women were also most likely to die of sepsis (38.1%) but had significantly higher rates of death from haemorrhage (18.1%) and medical causes (14.3%) than their single counterparts. All four widows died of sepsis; at least two from complications of abortion.

|                    | Married    |            | Single    |            | Widowed  |            | Total      |
|--------------------|------------|------------|-----------|------------|----------|------------|------------|
|                    | #          | %          | #         | %          | #        | %          | #          |
| Sepsis             | 232        | 38.1       | 45        | 60.8       | 4        | 100        | 281        |
| Toxaemia           | 107        | 17.6       | 18        | 24.3       |          |            | 128        |
| Haemorrhage        | 110        | 18.1       | 4         | 5.4        |          |            | 111        |
| Other              | 37         | 6.1        | 0         | 0.0        |          |            | 37         |
| Medical            | 87         | 14.3       | 4         | 5.4        |          |            | 91         |
| Unclear            | 36         | 5.9        | 3         | 4.1        |          |            | 39         |
| <b>Grand Total</b> | <b>609</b> | <b>100</b> | <b>74</b> | <b>100</b> | <b>4</b> | <b>100</b> | <b>687</b> |

**Table 3:** Cause of Death by Marital Status 1870–1919.

From 1875 the Registrar was required to record the ages and sexes of any living children on the death certificate of the deceased. This was not done consistently until the early 1880s, but from about 1882 the records seem to be complete. Thus, after the early 1880s a mother's death registration also indicated whether her child had survived her, and gave an indication of how many other children she had borne. Registers of Deaths were searched for the deaths of any of these infants within three months of birth. Two hundred and seventy nine infants were either registered as living issue on their mothers' death certificates, listed as stillborn, or subsequently registered as dying, and are thus accounted for. For another 94 cases there would have been no infant to register. Thus, 373 of the infants can be traced in the records, leaving 314 unaccounted for. In 66 cases from the 1870s and early 1880s, either there were no surviving children recorded or the number of surviving children was recorded but not their ages, so there is no indication of whether the infant survived the mother or not. For the balance of mothers (247) there is no record of the infant on the mother's death certificate. In 130 of these cases the noting of older children on the mother's death registration suggests that the infant did not survive and yet was not registered as a death. Given the consistency of recording after 1882 it seems reasonable to assume that the balance of these — 117 cases where no surviving children were recorded — were first births. It is likely that these 247 cases represent stillbirths, under-registration of births that resulted in early neonatal deaths and hidden abortions, as well as some negligent omissions.

There is an indirect case for assuming many of these missing infants were stillbirths and unregistered neo-natal deaths. There was a monetary

motivation for not registering a child who was born alive but died within hours or even a few days of birth, since stillbirths were not required to be registered until 1913 and thus no fee was payable. Roger Scholfield has estimated that mothers giving birth to a stillborn foetus carried five times the risk of maternal death as those whose infants were born alive.<sup>34</sup> Nicky Hart has argued that there is a close link between neo-natal death rates and stillbirth rates and that these two combined are more likely to be associated with maternal health than the death of infants after one month.<sup>35</sup> Her argument is that maternal health is more likely to influence foetal and neo-natal death, while the deaths of older infants are more likely to be the result of infection, especially diarrhoea. Jo Oppenheimer's data from Ontario, covering 1899 to 1949, a period when birth was being increasingly medicalized, show dramatic increases in stillbirths and infant deaths from congenital problems from the beginning of the twentieth century, both plateauing at this high rate about 1920.<sup>36</sup>

Overall, the survivorship rate for infants whose mothers died was very low: only 44% of infants appear to have survived birth. Furthermore, 65 infants born alive (23%) were registered as dying within three months of their mothers, rendering a 54% mortality rate for infants within three months of their mothers' deaths. The influence of poor maternal health on mother and infant survival may explain why the highest risk category for infants was to have an unmarried mother. Only three infants born to the 73 single women and four widows were recorded as living on their mothers' death certificates. This compares to 270 living infants born to the 547 married women for whom there are reliable records. While survivorship rates for both sets of infants were very low, the difference is staggering.

But what lay behind this stubbornly high death rate? The Special Committee attributed the persistent and high maternal mortality rate in New Zealand to three causes: increased virulence of infectious agents and decreased resistance among mothers due to conditions of war; unsuitable surroundings for giving birth; and increased medical intervention by doctors and midwives, which resulted in the passing of infectious agents from attendants to pregnant mothers. The 1921 report also noted that there was an 'abnormally high death-rate due to septic conditions following on attempts to procure abortion'.<sup>37</sup> In his international comparison of maternal mortality Loudon also commented that both Australia and New Zealand appeared to have had very high rates of abortion, and abortion-related deaths.<sup>38</sup>

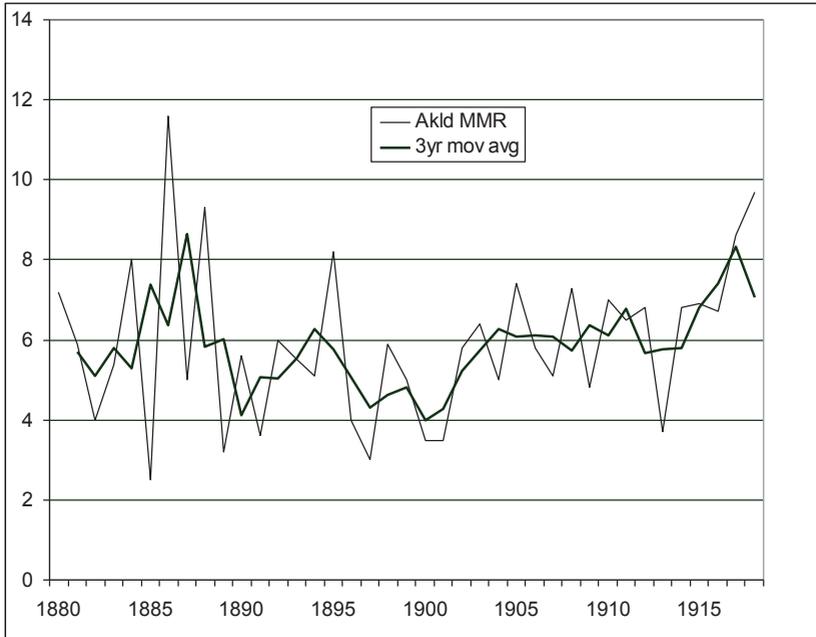
Later scholars have argued that higher death rates in the latter part of the nineteenth and into the twentieth centuries were at least in part the result of fertility decline. Women are most at risk of death during their first delivery,

not reaching the same level again until the birth of their fourth child. After that risk continues to increase, and interacts with increasing age, in itself a risk factor. Wider birth spacing lowers risk, and is also associated with decreases in infant mortality.<sup>39</sup> As fertility began to decline in the 1880s, and infant survivorship to increase, it is argued that a higher proportion of all women giving birth were high-risk *prima paras*.<sup>40</sup> Featherstone has argued that treatment for toxæmia was at the forefront of attempts to lower maternal death rates in the first decades of the twentieth century, and that doctors were more apt therefore to intervene in the birth process, with all the attendant complications for mother and child that intervention was known to hold.<sup>41</sup> Furthermore, as fertility control became accepted, if not very effective, more women used abortion to terminate unwanted pregnancies, amplifying the threat of both sepsis and haemorrhage.<sup>42</sup>

The 1921 Special Committee identified four periods characterized by differing death rates. However, comparison of national with Auckland rates reveals a somewhat different pattern. Unlike the country as a whole, Auckland did not have a low rate of maternal mortality in the earliest period considered (1870–1881). It seems likely that this first so-called low period in the national statistics may be a result of under-registration. In fact, the maternal mortality rate for this period in Auckland was higher, at 6.3 per 1000, than the subsequent period identified by the committee. In order to derive a meaningful periodization of maternal mortality in Auckland a three-year moving average was calculated, discarding the pre-1875 data, in order to capitalize on the fuller registration data in the later period and government emphasis on collecting more accurate statistics (Figure 3). After trialling a number of different periodizations, the one which best captures the gross changes in maternal death rates divides the years 1875 to 1919 into three periods: 1875–1889, which had an overall maternal mortality rate of 6.1; 1890 to 1902, with an overall rate of 5.0; and 1903–1919 (and arguably some years beyond), with an overall rate of 6.3. This produced a database of 660 deaths: 183 (1875–1889), 138 (1890–1902) and 339 (1903–1919).

Some of the data were aggregated further. Given the four widows shared all the salient characteristics of single women (*prima parous*; high abortion deaths; no surviving children; no male breadwinner) these two categories were collapsed. In addition the ‘unclear’ deaths were spread proportionately across the three causes of direct maternal mortality — sepsis, toxæmia and haemorrhage — as most deaths from abortion, miscarriage or parturition would have come about as a result of one of these three causes.

A pattern emerges which suggests that the composition of the at-risk population changed as fertility declined. The proportion of women who died



**Figure 3:** Auckland Maternal Mortality Rates, 1880–1919.

while giving birth for the first time rose steadily from 36.3% to 50.1% of deaths (Table 4). But this was more than family limitation at work. While married women giving birth for the first time accounted for 36.6% of all deaths in the last period, compared to 28.7% in the first, the percentage of single or widowed women dying almost doubled between the first and last interval, from 7.6% of deaths to 13.6%. So not only were first births rising, but the even higher risk category of single women giving birth, almost all for the first time, was rising also. Data from a sample of six years in each period showed an ex-nuptial birth rate of 29.2 per 1000 live births 1875–1889, which grew to 53.7 for the sample 1890–1902, and then to 58.6 ex-nuptial births per 1000 live births for the sample between 1903 and 1919. Single women had a much higher rate of mortality than married women. The same six-year samples showed a mortality rate of 25.1 maternal deaths per 1000 ex-nuptial births for 1875–1889, and 17.8 deaths per 1000 ex-nuptial births

for 1903–1919.<sup>43</sup> While these figures are only indicative, based as they are on a small sample, they suggest a mortality rate for single women of three to four times the overall maternal mortality rate.

|  | <b>Prima Para</b> | <b>Multi Para</b> | <b>Total</b> | <b>Married Prima Para</b> | <b>Single/ Widowed Prima Para</b> |
|--|-------------------|-------------------|--------------|---------------------------|-----------------------------------|
| <b>Number of Deaths</b>                |                   |                   |              |                           |                                   |
| 1875–1889                              | 62                | 109               | 171          | 49                        | 13                                |
| 1890–1902                              | 53                | 85                | 138          | 38                        | 15                                |
| 1903–1919                              | 170               | 169               | 339          | 124                       | 46                                |
|  | 285               | 363               | 648          | 211                       | 74                                |
| <b>Percent of Deaths</b>               |                   |                   |              |                           |                                   |
| 1875–1889                              | 36.3%             | 63.7%             |              | 28.7%                     | 7.6%                              |
| 1890–1902                              | 38.4%             | 61.6%             |              | 27.5%                     | 10.9%                             |
| 1903–1919                              | 50.1%             | 49.9%             |              | 36.6%                     | 13.6%                             |
| <b>Deaths per thousand live births</b> |                   |                   |              |                           |                                   |
| 1875–1889                              | 2.20              | 3.86              | <b>6.06</b>  | 1.74                      | 0.46                              |
| 1890–1902                              | 1.91              | 3.06              | <b>4.97</b>  | 1.37                      | 0.54                              |
| 1903–1919                              | 3.17              | 3.15              | <b>6.33</b>  | 2.31                      | 0.86                              |

**Table 4:** Number of Death by Marital Status and Parity 1875–1919.

Table 5 shows a pattern of death that is compatible with the fertility decline thesis. Deaths from toxæmia doubled between the first and last periods commensurate with a rising proportion of first-time mothers in the population, while deaths from hæmorrhage, more likely in older multiparous women, dropped by 30%. There was little variation in the deaths from complex causes. However, the percentage of deaths from sepsis dropped significantly in the middle period, rising again between 1903 and 1919 to almost the same level they had been in the 1880s. Sepsis accounted for 3.1 deaths per 1000 live births in the first period; two per 1000 in the second and 2.8 in the third, suggesting that some change in either the nature of the population, the social context, including the handling of childbirth, or the virulence of the pathogen, was at work.

|  | Sepsis       | Toxaemia     | Hmmrhge      | Medical      | Total |
|--|--------------|--------------|--------------|--------------|-------|
| <b>Number of Deaths by Cause</b>       |              |              |              |              |       |
| 1875-1889                              | 87.5         | 25           | 41.5         | 29           | 183   |
| 1890-1902                              | 55           | 34           | 26           | 23           | 138   |
| 1903-1919                              | 152          | 97           | 47           | 43           | 339   |
| <b>Total</b>                           | 294.5        | 156          | 114.5        | 95           | 660   |
| <b>Percent of Deaths</b>               |              |              |              |              |       |
| 1875-1889                              | 47.8%        | 13.7%        | 22.7%        | 15.8%        | 100   |
| 1890-1902                              | 39.9%        | 24.6%        | 18.8%        | 16.7%        | 100   |
| 1903-1919                              | 44.8%        | 28.6%        | 13.9%        | 12.7%        | 100   |
| <b>Overall Average</b>                 | <b>44.8%</b> | <b>24.5%</b> | <b>16.4%</b> | <b>14.3%</b> |       |
| <b>Deaths per thousand live births</b> |              |              |              |              |       |
| 1875-1889                              | 3.10         | 0.89         | 1.47         | 1.03         | 6.48  |
| 1890-1902                              | 1.98         | 1.22         | 0.94         | 0.83         | 4.97  |
| 1903-1919                              | 2.84         | 1.75         | 0.90         | 0.82         | 6.31  |

**Table 5:** Death by Cause 1875-1919.

The contribution of abortion to total maternal mortality also rose from 3.5% to 8.9% of all deaths. Even more surprising is the fact that until the third period all but one of the women dying following abortion was married. In the last period, however, single women accounted for half of all abortion deaths, 5% of all maternal deaths. Furthermore abortion accounted for one-third of the deaths of single women in that period, as opposed to 5% of the deaths of married women. This is in all likelihood a substantial under-registration of abortion deaths.

However, there is a striking difference between all the changes discussed above and two other patterns: maternal death from sepsis and infant survivorship. Deaths at first births rose across the three periods, as did ex-nuptial births, as one would expect of orderly demographic processes. Deaths from toxaemia rose and those from haemorrhage declined, reflecting this demographic shift. However, death from sepsis dipped in the middle period and then rose again for the final period under consideration. A drop in sepsis deaths was primarily responsible for the decline in maternal mortality overall in the period 1890-1902. Of the subsequent rise of 1.3 deaths per 1000 live births 1903-1919, 0.5 were attributable to toxaemia and 0.8 to sepsis. The other causes remained relatively stable.

Infant survivorship also followed the pattern of decrease then increase, if abortion deaths are removed. Including abortion, 55% of infants 1875–1889 survived; 53% during 1890–1902; and 43% of infants during 1903–1919. However, excluding abortions, infant survivorship was 56% 1875–1889, 72% 1890–1902, but dropped to only 47% 1903–1919. Whatever factors were at the root of the increased maternal mortality rate in the period 1903–1919 seem to also have affected infant survivorship.

In summary, then, maternal mortality in Auckland followed many of the trends identified by Loudon and other scholars for most developed countries: high rates of mortality, with puerperal sepsis being the predominant cause, and haemorrhage and toxæmia each accounting for about 20% of deaths. Demographic trends, especially a reduction in marital fertility, changed the composition of the at-risk population over the study period and thus shifted the balance of causes. Given the social conditions to which unmarried pregnant women were subjected, the increasing number of single women giving birth added to the high-risk *prima para* group. Likewise illegal abortion was resorted to by both married and unmarried women in increasing numbers over the course of the study, leading to a larger proportion of women in both groups dying from ‘botched’ abortions.

However, some aspects of the Auckland pattern appear to be distinctive. The increase in deaths from sepsis from about 1903 came earlier than that identified for New Zealand as a whole, and, indeed, predated the especially virulent strain of streptococcus that, Loudon argued, emerged around 1912.<sup>44</sup> Furthermore, for the entire period under study, and especially from about 1903, Auckland had substantially higher rates of maternal mortality than New Zealand as a whole. The final question for this paper, then, is: what drove these distinctive Auckland patterns in the first two decades of the twentieth century?

Auckland’s higher maternal mortality could be the result of three different factors: conditions directly associated with urbanization, such as poor housing, overcrowding and poor sanitary conditions; the city’s demographic profile may have meant there was a larger concentration of the high-risk groups in Auckland than in the country as a whole; and the medicalization of childbirth (that is, more exposure to physicians, hospitals and ‘meddlesome midwifery’) in urban rather than rural areas.<sup>45</sup> While it is not possible to definitively attribute an increase in maternal deaths to any one of these factors, it is possible to assess some of the ways in which each may have contributed to the elevated maternal death rate in Auckland.

Although it was constituted as a city in 1871, Auckland was, by European standards, little more than a small town, with an urban population of 12,775,

while the surrounding boroughs were populated by another 21,590 persons, many of whom would have been living rural rather than urban lifestyles. During the first period of this study (1875–1889) the city and its surrounds more than doubled in size, reaching 28,613 and 51,287 respectively. Over the next period until the early twentieth century, Auckland and its surrounds grew by less than 50%, reaching 34,213 and 67,226 by 1901, due to a prolonged economic depression that began in 1884 and did not end until about 1896. During the final period, the population of both the city and its surrounds again more than doubled to 88,429 and 157,757 respectively, with larger proportions of the population living in urban conditions.<sup>46</sup>

Both the city and the neighbouring boroughs were plagued by poor sanitation throughout the whole of this period, a major contributor to higher urban mortality. By all accounts until after the turn of the century Auckland's streets were noxious, disposal of human and animal waste completely inadequate, water supplies uncertain and unsavoury. Housing for the poorest of Auckland's inhabitants was of low quality, and overcrowding and lack of waste disposal most serious in the central city. However, after 1904 these problems were being mitigated. Water piped from the Waitakere ranges was the foundation of a secure water supply, and work began on a reticulated sewage system.<sup>47</sup> Still, the poor quality of Auckland's housing and sanitation remained a sore point. Contemporary newspaper accounts, and submissions to the Commission of Inquiry into the 1918 influenza epidemic, told of 'old, dilapidated, worm eaten, vermin-infested ... slums' that were 'a constant menace to public health'.<sup>48</sup> It has been argued that the influenza mortality rate in New Zealand's largest cities was 6.5 per thousand, while for the rural population it was 3.3.<sup>49</sup> Aucklanders who lived through the 1918 epidemic thought the city's filth contributed to the high rate of 'flu deaths'.<sup>50</sup>

The demographics of New Zealand and its largest city were also changing. Like most colonial societies, New Zealand had been characterized by a substantial differential between male and female components of the population. In 1874, there were almost twice as many males as females in New Zealand (1.8:1). By 1891 this gap had closed to 1.3 males to each female. The biggest change, however, came during the First World War when many young men were killed, so that by 1916 the ratio was 1.06 males for each female.<sup>51</sup> But this imbalance was not characteristic of New Zealand cities. By 1881 Auckland, Wellington and Christchurch had almost even numbers of males and females.<sup>52</sup> Rural occupations were not suited to single women; if dissociated from family they had few options in the countryside. Cities, on the other hand, provided employment for young women, both in domestic service and in the growing manufacturing sectors. By 1916 females vastly

outnumbered males in New Zealand's cities, with an average sex ratio of 100:115.<sup>53</sup>

The morality and the plight of single women in cities became a source of social unease as early as the 1870s.<sup>54</sup> From 1912 onwards the Auckland area, as constituted in the *New Zealand Official Yearbooks*, accounted for about 30% of all New Zealand's ex-nuptial births, as opposed to 22%–25% in the prior decades.<sup>55</sup> The first home devoted to rescuing 'fallen' women was founded in Auckland in 1872, but closed in 1875 due to a lack of funding. A second, St Mary's, was founded by the Anglican Church in 1884. Three further homes, two incorporating lying-in rooms, were founded during the 1890s. Middle-class 'rescuers' soon divided the subjects of their charity into two classes: recidivists who were devoted to life on the streets and in the city's bars and brothels, and those women who had 'fallen' for the first time, and with whom, it was hoped, their rescuers' labours would bear fruit in the form of steady employment and eventual marriage.<sup>56</sup>

There is no evidence that the single women in this study belonged to the first group. Most were very young, and all, as far as can be ascertained, were experiencing their first birth. They were, it appears, women who had 'fallen' pregnant, been abandoned and likely had little or nothing in the way of familial protection or resources to draw on. At least one-third of those in the last period were desperate enough to try abortion. Margaret Tennant, drawing on individual cases from Dunedin and Christchurch homes, found that a high proportion (up to 70%) of their inmates were domestic servants; the remainder were either young women newly arrived in New Zealand or those who had been living with their families, at least in some cases where a male family member was the father of the unborn child. Tennant argues that 'poverty, ill health, emotional suffering and humiliation were the prices nineteenth century women paid for illicit heterosexual activity'.<sup>57</sup> The costs were often paid in the life of both mother and child.

Featherstone, in examining comparable cases in Sydney, shows that '[i]llegitimacy and infant mortality were closely linked. In New South Wales in 1900, for example, 19.5 percent of deaths under twelve months were illegitimate children. Given that illegitimate births made up only 7.01 percent of all births, illegitimate children were disproportionately represented in mortality figures.'<sup>58</sup> For the mothers, risks were high as well: in Sydney some women gave birth in the streets; 9% of births at the Royal Paddington Hospital were stillbirths.<sup>59</sup> Similarly in Melbourne '[t]he most powerful risk to infant life was having an unsupported mother ... unmarried, deserted or widowed, struggling to survive in a frontier society without traditional networks of community and kin'.<sup>60</sup>

Lastly, urban women would have been more exposed to 'modern' forms of childbirth. Philippa Mein Smith has shown that, as late as 1920, 65% of women in New Zealand still gave birth at home.<sup>61</sup> However, births in hospitals were becoming more common and were certainly being promoted as better for the health of mother and baby. These hospitals were most often two- or three-bed facilities attached to a doctor's surgery, as general hospitals in New Zealand were very reluctant to admit women for lying in due to the high risk of cross-infection.<sup>62</sup> It seems likely that more urban women were giving birth in hospitals than were rural women. During the period 1903–1919, a little over half of the Auckland women died in hospital (173 out of 339). Of these, 100 (58%) died of sepsis, not including ten whose actual cause of death is unclear, but all of whom died from either abortion or ectopic pregnancies. However, death from sepsis was long and drawn out, unlike death from haemorrhage, and it is possible that these women were moved to hospital when they became ill in order to take advantage of closer medical attention. This would seem to be confirmed by the fact that all but seven of these deaths took place in Auckland Hospital, rather than St Helens or the small private hospitals that were the more common sites of birth. There were two instances during this period where several women attended by the same physician died within two weeks of each other of puerperal sepsis in Auckland Hospital. It is not possible to state definitively that these women were infected by each other or by their physicians without examining their specific medical records. Clarke has documented an instance in Wellington Hospital in which a number of women were infected and two died from puerperal fever, a case which had national publicity and reinforced the need for separate lying-in hospitals.<sup>63</sup> Despite this, there were 13 instances of two or three women dying in Auckland Hospital of puerperal sepsis within two weeks of each other, with a peak in 1917–1918 when 13 women died. In these cases sepsis may have been spread in the hospital, rather than by attending physicians. Evidence of women dying as a result of treatment by doctors, such as gave rise to the term 'meddlesome midwifery', is invisible, as one would expect. There are only two cases where a treatment, caesarean section, is listed as a cause of death.

Assessing changes in maternal mortality is a complex task. For example, while the larger proportion of first-time mothers in the population contributed to the increased level of maternal mortality, this increase should have been at least partly offset by the decrease in the number of women with a large number of previous births, who, after four births, were at much higher risk (and constantly increasing risk) than first-time mothers. A growing number of women giving birth for the first time were unmarried, and thus likely to be

poor, malnourished and without adequate support. An increase in abortion-related deaths contributed significantly to the overall rise in maternal mortality. However, the figures from Auckland show that of the 1.3 deaths per 1000 increase in maternal mortality between 1890–1902 and 1903–1919 (from 4.97 to 6.33), only 0.32 can be attributed to the increase of deaths among single women from all causes (Table 4), while death rates from abortion actually decreased among married women (Table 6). Thus most of the 1.3 increase is unaccounted for by either abortion or the increase in single women's deaths. Almost all of that increase seems to have been attributable to the deaths of married women undergoing their first delivery, with deaths in that category increasing by 0.9, while deaths of married women with many previous deliveries increased by only 0.1, below the range of significance.

|  | Married | Single/<br>Widowed | Total Abortion | All Deaths |
|--|---------|--------------------|----------------|------------|
| <b>Number of Deaths</b>                |         |                    |                |            |
| 1875-1889                              | 4       | 1                  | 5              | <b>183</b> |
| 1890-1902                              | 11      | 0                  | 11             | <b>138</b> |
| 1903-1919                              | 15      | 15                 | 30             | <b>339</b> |
| <b>Total</b>                           |         |                    | 46             | <b>660</b> |
| <b>Percent of Deaths</b>               |         |                    |                |            |
| 1875-1889                              | 2.7%    | 2.4%               | 8.3%           |            |
| 1890-1902                              | 8.0%    | 8.9%               |                |            |
| 1903-1919                              | 8.8%    | 5.1%               | 31.9%          |            |
| <b>Deaths per thousand live births</b> |         |                    |                |            |
| 1875-1889                              | 0.14    | 0.03               | 0.18           |            |
| 1890-1902                              | 0.40    | 0.00               | 0.40           |            |
| 1903-1919                              | 0.28    | 0.28               | 0.56           |            |

**Table 6:** Deaths from Abortion by Marital Status 1875–1919.

What caused this dramatic elevation in the deaths of young married first-time mothers in Auckland? It seems likely to have been a complex set of causes. These young women may have been more likely to choose to have doctor-attended or hospital delivery than older women who had already successfully given birth. Certainly, Auckland's appalling housing conditions may have played a part. The fact that infant survivorship declined along with

maternal survivorship at a time when New Zealand was leading the world in reducing infant mortality overall suggests that something was directly increasing risk at or around the time of birth for both first-time mothers and their infants. The fact that sepsis deaths increased, when they had earlier fallen, suggests that more first-time mothers were being exposed to risk of infection at time of birth. The fact that, once the problem was seriously addressed, New Zealand was able to reduce maternal mortality before the discovery of antibiotics suggests that, indeed, meddling midwifery was likely to blame.

Historical (and other) scholarship on New Zealand women's lives has come a long way since this project was first conceived in the late 1980s. A generation of female academics, many of them taught and/or mentored by Raewyn, has in its turn taught and mentored successive generations of women who now hold academic or research positions in New Zealand and other countries. Yet, there is always more to do. Sophisticated and easily operated analytical programmes and the digitizing of vital records mean that these kinds of projects are more easily accomplished than they were in the distant days of pencils and paper. Although we cannot credit Raewyn with these technological innovations, we can pay tribute to her as a key figure who not only posed the questions about women's history, but also helped many of us to begin answering them.

MAUREEN MOLLOY

*The University of Auckland*

## NOTES

Thanks to Deborah and Caroline for their comments and suggestions, and to Jennifer Ashton for picking up a vital error at the last minute.

1 All names have been changed.

2 Barbara Brookes, 'Aspects of Women's Health, 1885–1945', in Linda Bryder, ed., *A Healthy Country: Essays on the Social History of Medicine in New Zealand*, Bridget Williams Books, Wellington, 1991, p.157; Alison Clarke, *Born to a Changing World: Childbirth in Nineteenth-Century New Zealand*, Bridget Williams Books, Wellington, 2012.

3 Henry J. Harris, *Maternity Benefit Systems in Certain Foreign Countries*, US Children's Bureau, Legal Series No. 3, Publication No. 57, Washington, DC, 1919.

4 'Report of Special Committee to Consider and Report on the Question of the Deaths of Mothers in Connection with Childbirth' (hereafter 'Maternal Mortality in New Zealand'), *Appendices to the Journals of the House of Representatives* (AJHR), 1921, H-31B.

5 Deborah Dwork, *War is Good for Babies and Other Young Children: A History of the Infant and Child Welfare Movement in England 1898–1918*, Tavistock, London, 1987; Lisa Featherstone, 'Surveying the Mother: The Rise of Antenatal Care in Early Twentieth-Century Australia', *Limina*, 10 (2004), pp.16–21; Rachel G. Fuchs, *Poor and Pregnant in Paris: Strategies for Survival in the Nineteenth Century*, Rutgers University Press, New Brunswick, 1992; Alisa Klaus, *Every Child a Lion: The Origins of the Maternal and Infant Health Policy in the United States and France, 1890–1920*, Cornell University Press, Ithaca, 1993; Richard A. Meckel, *Save the Babies: American Public Health Reform and the Prevention of Infant Mortality, 1850–1929*, John Hopkins University Press, Baltimore, 1990.

6 Milton Kotelchuck, 'Safe Mothers, Healthy Babies: Reproductive Health in the Twentieth Century', in John W. Ward and Christian Warren, eds, *Silent Victories: The History and Practice of Public Health in Twentieth-Century America*, Oxford University Press, Oxford, 2007, pp.105–34, 109.

7 Kotelchuck, 'Safe Mothers', p.109.

8 Irvine Loudon, *Death in Childbirth: An International Study of Maternal Care and Maternal Mortality 1800–1950*, Oxford University Press, Oxford, 1992.

9 Loudon, *Death in Childbirth*, p.78.

10 Naomi Williams and Chris Galley, 'Urban-Rural Differentials in Infant Mortality in Victorian England', *Population Studies*, 49, 3 (1995), pp.401–20.

11 Jo Oppenheimer, 'Childbirth in Ontario: The Transition from Home to Hospital in the Early Twentieth Century', in Katherine Arnup, Andrée Lévesque and Ruth Roach Pierson, eds, *Delivering Motherhood: Maternal Ideologies and Practices in the 19th and 20th Centuries*, Routledge, London, 1990, p.68; Veronica Strong-Boag and Kathy McPherson, 'The Confinement of Women: Childbirth and Hospitalization in Vancouver', in Arnup, Lévesque and Pierson, eds, p.76.

12 Lisa Featherstone, 'The Value of an Infant: The Rise of Paediatrics in Australia, 1880–1910', *Health & History*, 10, 1 (2008), p.124; Margaret Tennant, *Paupers and Providers: Charitable Aid in New Zealand*, Bridget Williams Books, Wellington, 1989, pp.117–19; Margaret Tennant, 'Magdalenes and Moral Imbeciles: Women's Homes in Nineteenth Century New Zealand', in Barbara Brookes, Charlotte Macdonald and Margaret Tennant, eds, *Women in History 2: Essays on Women in New Zealand*, Bridget Williams Books, Wellington, 1992, pp.9–75; Margaret Sparrow, *Rough on Women: Abortion in 19<sup>th</sup>-Century New Zealand*, Victoria University Press, Wellington, 2014; Clarke, *Born to a Changing World*, pp.83–84, 234–40.

13 Angus McLaren and Arlene Tigar McLaren, 'Discoveries and Dissimulations: The Impact of Abortion Deaths on Maternal Mortality in British Columbia', in Arnup, Lévesque and Pierson, eds, p.126.

14 Judith Allen, *Sex and Secrets: Crimes Involving Australian Women Since 1880*, Oxford University Press, Melbourne, 1990.

15 McLaren and McLaren, 'Discoveries and Dissimulations', p.21.

16 These registers contain 58 and 53 births that were not included in this study. Onehunga had its own register from 1887 and is not included in the scope of the study; Maureen Molloy, et al, 'Survey of the Auckland Registers of Births, Deaths and Marriages. Final Report to the Auckland City Council and the University of Auckland Research Committee', in author's possession.

17 Molloy, et al, 'Survey of the Auckland Registers of Births, Deaths and Marriages'; Tafili Utumapu, et al, 'Survey of the Registers of Births, Deaths and Marriage held in the Auckland Registry: Preliminary Report to the Auckland University Research Committee, Auckland City Council and the Registrar of Births, Deaths and Marriages, 1989', in author's possession.

18 Irvine Loudon, 'Maternal Mortality: 1880–1950. Some Regional and International Comparisons', *Social History of Medicine*, 1, 2 (1988), pp.183–228, 193.

19 Irvine Loudon, *The Tragedy of Childbed Fever*, Oxford University Press, Oxford, 2000, pp.8–10.

20 Irvine Loudon, 'The Measurement of Maternal Mortality', *Journal of the History of Medicine and Allied Sciences*, 54, 2 (1999), pp.312–29.

21 Anne Lokke, 'The "Antiseptic" Transformation of Danish Midwives, 1860–1920', in Hilary Marland and Anne Marie Rafferty, eds, *Midwives, Society and Childbirth: Debates and Controversies in the Modern Period*, Routledge, London, 1997, pp.102–33; Irvine Loudon, 'Midwives and the Quality of Maternal Care', in Marland and Rafferty, eds, *Midwives, Society and Childbirth*, pp.180–200.

22 Loudon, *Tragedy*, pp.53–57.

23 Loudon, *Tragedy*, p.136.

24 Loudon, *Death in Childbirth*, pp.81–82.

25 De-Kun Li and Soora Wi, 'Changing Paternity and the Risk of Preeclampsia/Eclampsia in the Subsequent Pregnancy', *American Journal of Epidemiology*, 151, 1 (2000), pp.57–62.

26 Mandy J. Bell, 'A Historical Overview of Preeclampsia-Eclampsia', *Journal of Obstetric, Gynecologic and Neonatal Nursing*, 39, 5 (2010), pp.510–18.

27 Featherstone, 'Surveying the Mother', p.20.

28 Loudon, *Death in Childbirth*, p.101.

29 Loudon, *Tragedy*, pp.1–2.

30 Philippa Mein Smith, *Maternity in Dispute: New Zealand 1920–1936*, Historical Publications Branch, Department of Internal Affairs, Wellington, 1986, pp.69–88.

31 Clarke, *Born to a Changing World*, pp.172–214.

32 'Maternal Mortality in New Zealand', pp.1, 2.

33 Estimation of parity is based on whether any other children were registered on their mother's death certificate as living. It is, of course, likely that some of these women had borne other children who had not survived.

34 Roger Schofield, 'Did the Mothers Really Die? Three Centuries of Maternal Mortality in "The World We Have Lost"', in Lloyd Bonfield, Richard M. Smith and Keith Wrightson, eds, *The World We Have Gained: Histories of Population and Social Structure*, Blackwell, Oxford, 1986, p.236.

35 Nicky Hart, 'Beyond Infant Mortality: Gender and Stillbirth in Reproductive Mortality before the Twentieth Century', *Population Studies*, 52, 2 (1998), pp.215–29.

36 Oppenheimer, 'Childbirth in Ontario', p.59.

37 'Maternal Mortality in New Zealand', p.2.

- 38 Loudon, *Death in Childbirth*, pp.473–5, 479.
- 39 Loudon, *Death in Childbirth*, pp.500–507.
- 40 Oppenheimer, ‘Childbirth in Ontario’, p.126.
- 41 Featherstone, ‘Surveying the Mother’, p.2
- 42 Barbara Brookes, ‘Housewives’ Depression: The Debate over Abortion and Birth Control in the 1930s’, *New Zealand Journal of History*, 15, 2 (1981), pp.115–34; Maureen Molloy, ‘Citizenship, Property and Bodies: Discourses on Gender and the Inter-War Labour Government in New Zealand’, *Gender and History*, 4, 3 (1992), pp.293–304.
- 43 The incidence of single women dying was too low in the sample years of the middle period to give a credible calculation.
- 44 Loudon, *Death in Childbirth*, p.78.
- 45 I have considered whether the difference might be the result of my categorization of maternal deaths versus that used by the Special Committee, but the fact that the rates were so close up to 1903 would seem to confirm that the difference is not an artefact of classification.
- 46 G.T. Bloomfield, *New Zealand: A Handbook of Historical Statistics*, G.K. Hall, Boston, 1984, pp.57–58.
- 47 The insanitary conditions in Auckland during this period are discussed extensively in Graham Bush, *Decently and In Order: The Government of the City of Auckland 1840–1971*, Collins, Auckland, 1971, pp.42–187.
- 48 ‘Report of the Influenza Epidemic Commission’, AJHR, 1919, H-31A, p.31.
- 49 It is interesting to note, however, that small towns had an even higher mortality rate than the four cities, possibly because of the lack of infrastructure to cope with mass illness. Kirsten McSweeney, Atalie Colman, Nick Fancourt, Melinda Parnell, Sara Stantiall, Geoffrey Rice, Michael Baker and Nick Wilson, ‘Was Rurality Protective in the 1918 Influenza Pandemic in New Zealand?’, *New Zealand Medical Journal*, 120, 1256 (2007), <http://www.nzma.org.nz/journal/120-1256/2579/>. Accessed 12 January 2017.
- 50 Geoffrey Rice, *Black November: The 1918 Influenza Epidemic in New Zealand*, Allen & Unwin, Wellington, 1988, p.182.
- 51 Bloomfield, *New Zealand*, p.72.
- 52 Charlotte Macdonald, ‘Too Many Men and Too Few Women: Gender’s “Fatal Impact” in Nineteenth-Century Colonies’, in Caroline Daley and Deborah Montgomerie, eds, *The Gendered Kiwi*, Auckland University Press, Auckland, 1991, p.28.
- 53 McSweeney, et al, ‘Was Rurality’, p.3
- 54 Raewyn Dalziel, *Focus on Family: The Auckland Home and Family Society*, Home and Family Society, Auckland, 1993.
- 55 *New Zealand Official Yearbook*, Wellington, 1870–1919.
- 56 Tennant, ‘Magdalenes’, pp.67, 73–74.
- 57 Tennant, *Paupers and Providers*, p.117.
- 58 Featherstone, ‘Value of an Infant’, p.123.
- 59 Featherstone, ‘Value of an Infant’, p.124.
- 60 Janet McCalman, Ruth Morley, Len Smith and Ian Anderson, ‘Colonial Health Transitions: Aboriginal and “Poor White” Infant Mortality Compared, Victoria 1850–1910’, *History of the Family*, 16, 1 (2011) pp.68, 69.
- 61 Mein Smith, *Maternity in Dispute*, p.1.
- 62 Clarke, *Born to a Changing World*, pp.75–96.
- 63 Clarke, *Born to a Changing World*, pp.75–96.