Deadly Occupations: Examining the Mortality Pattern in Steel Workers, Coal and Iron Ore Miners Between 1909 and 1917 in Sydney, Glace Bay and Bell Island

by

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A Thesis submitted to the Faculty of Graduate Studies of

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Abstract

The research presented in this thesis represents a comprehensive study of Canadian occupational health in the past using an historical demographic and epidemiological model. Working age males (15-64 years) from three single-industry communities (Sydney, Glace Bay, and Bell Island) were chosen to examine how occupation affected mortality patterns during the Canadian industrial era. The interconnectedness of the three locales during the study period (1909-1917) creates a perfect setting for a comparative study. Thus the major focus of this research is an examination of how occupation can alter the mortality pattern of a specific cohort of men involved in mining and steel working operations.

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Chapter 1: Introduction

Occupational hazards can exert overall effects on the health of populations. In terms of human suffering, occupational injuries and disease place a heavy burden on a society (Steenland et al., 2003). Mining in particular has had a long history of influencing morbidity and mortality levels in populations. Inhalation of foreign particles common in welding and underground mining creates a predisposition for respiratory infections among individuals working in these occupations (Coggon and Inskip, 1994). Elevated morbidity and mortality are consistent with mining in the past and mining in the present, thus the health of miners is of particular importance in the study of epidemiology and anthropology. Interest is not limited to mining alone, but also extends to the health of workers involved in the processing of mined materials. Risks are present among steel workers, for example, who operate heavy equipment and work in extremely hot conditions, with blast furnaces and coke ovens.

Currently these occupations are less hazardous than in the past when health and safety were not at the forefront of concern, rather the concern for many companies was with production and making money. Today new technologies in air quality, the building of shafts, and techniques for rock removal are making their way into the dark mines of yesteryear and significantly changing the dynamics of hazard. There are still accidents, but these are not as common as the daily/weekly deaths found at the turn of the twentieth century.

In the industrial past, fatality caused by poor mining conditions fuelled morbidity and mortality levels of epidemic proportions. It was noted that in Cape Breton during the 1950s, it was rare to have a week go by when no miner was seriously injured or killed

(Davy & MacKinnon, 2001). Even then, the 1950s had come a long way from the mining conditions of the late 19th and early 20th centuries. Better air quality, lighting and machinery were some advances in the industry from the turn of the century's use of candle or oil wick lit hats, and pit ponies (McIntosh, 2000). Risk management procedures in today's capitalist societies have become more of a priority than in earlier times, when miners were considered a 'dime a dozen', and much more attention was given to production and profit rather than safety (Mellor, 1983; Nova Scotia Department of Mines, 1881).

Contemporary mining operations vary in health and safety levels. Presently China is leading in coal production as coal continues to be used in the domestic setting (Finkelman et al., 1999). Yet China has been noted to have a high level of accidents due to poor safety regulations (Wright, 1999). A news article for 'China Daily' in 2004 reported coal mining to be China's most deadly job, averaging about 1 death every 7.4 days; the article noted that approximately "...600,000 miners to date are suffering from pneumoconiosis...[and] the figure increases by 70,000 miners every year"[1]. According to Wright (1999:630), "China's working conditions reflect international precedents ranging from pre-industrialization to Post-Second World War capitalism". China presents an example of an area where safety protocols are likely similar to historical turn of the 20th century coal mining in Nova Scotia. Mining is still an occupation with many health risks even where health safety measures are of a high standard.

[1] Xiaohui, Z; Xueli, J. 2004. Coal Mining: Most Deadly Job in China. *China Daily* Website. Last accessed 26-05-09
http://www.chinadaily.com.cn/english/doc/2004-11/13/content_391242.htm

For example, the Sago coal mine in West Virginia had an explosion in 2006 that took the lives of 12 miners.[2]

The aim of this study is to examine the health of a working class cohort of men in three occupational settings for the years between 1909 and 1917. Research was conducted as a three-cohort comparative study to evaluate health of workers, especially miners and industrial steel workers, in Glace Bay and Sydney, Cape Breton, and Bell Island, Newfoundland. These three communities were selected based on their proximity to one another and their economic and occupational interconnectedness. Glace Bay was chosen because it is the largest coal mining community along the Cape Breton coast coal seam. Sydney is another focus because the steel industry changed this small town into a booming city and is the central link for all three communities (since both coal and iron are used to make steel). Bell Island was chosen because it provides a similar context to coal but, being a different type of mineral, may result in different risk factors. Extensive production of coal, steel, and iron created large influxes of migrants, which influences the mortality pattern for occupational health in these historic populations. The major enquiries for this study concern the morbidity and mortality profiles of the working class population of men in these communities, whether their quality of health was directly associated to their occupations, and how tuberculosis and accidents affected the overall health profiles of these communities.

Cape Breton County on Cape Breton Island, Nova Scotia has had a long history of coal mining, especially Glace Bay. Historically, harsh working conditions in the coal mines had negative health effects for miners. Around the turn of the 20th century, coal

[2] U.S. Department of Labour, Mine Safety and Health Division. Last accessed, 21-09-07 http://www.msha.gov/MSHAINFO/FactSheets/MSHAFCT8.HTM

miners in Cape Breton endured accidents, some fatal, due to lack of appropriate health and safety concerns (Nova Scotia Department of Mines, 1881). The major mining company operating during this period was the Dominion Coal Company. The Dominion Coal Company changed the landscape of Glace Bay and the overall productivity of Cape Breton County. Large migrations of people from Western Europe and Newfoundland to Cape Breton occurred as many of the small mining companies in the area merged into the Dominion Coal Company (Mellor, 1983).

Besides accidental deaths, respiratory disease was a particular concern for miners. Pneumoconiosis, or 'black lung', and tuberculosis were common respiratory diseases among coal miners. A population study on coal miners in Asturias, Spain between 1972 and 1995 that examined the risk of pulmonary tuberculosis among coal miners revealed that rates of pulmonary tuberculosis three times higher than in non-mining populations (Montes et al., 2004). This is an important finding since pulmonary tuberculosis was a common disease in the early 20th century Canada (Grzybowski & Allen, 1999); consequently many miners may have been highly susceptible.

Vital statistics death registries are the main source of data used to explore the health of miners and steel plant workers in Glace Bay, Sydney, and Bell Island. In Nova Scotia, vital statistics death records were not established until 1908. Prior to this time churches were responsible for recording deaths. To maintain continuity between the Newfoundland and Nova Scotia data, 1909 will be used as the starting point and the end point of 1917 was chosen based on the fact that after this period many men would have gone to war, thus not allowing for a full examination of occupational health. Thus the

time frame of 1909 to 1917 will provide the best available data for the study.[3] To conduct this three-locale comparative study, only males of working ages (15-64 years) are included. Women of working age are not included as women during this time were rarely, if ever, employed in the mines, likewise for children (Mellor, 1983; Martin, 1983). Miners who commenced mining at a young age, and who worked a lifetime in the mines experienced an increased temporal exposure to dust particles, likely escalating morbidity in the population as the risk for various respiratory infections, such as pneumoconiosis, become more prevalent with exposure (Castranova & Vallyathan, 2000). Accidental deaths may have also been over-represented among young miners due to inexperience.

There is a sound rational for this three-locale comparative study. Sydney had a major steel and coke (coal refinery) plant, where iron ore and coal were refined to produce steel (Nova Scotia Department of Mines, 1881; Mellor, 1983). Bell Island was mining the iron ore and Glace Bay was mining the coal that was then processed in Sydney's steel and coke plants. Thus, all three communities were tangibly connected via their major industrial grounding in mining and the products of mining.

There is no question that the risks of exposure differed depending on the materials being mined. Iron ore is not noted to have the same adverse health effects as coal (e.g. 'black lung'), however, other minerals, if present in the mine (silica) can produce another disease known as silicosis, which is known to have similar effects on health. Silicosis is not definitive with iron mining as coal worker's pneumoconiosis is with coal mining. Working conditions in the iron mines were likely similar to that of coal mines, and as a

[3] Data for 1908, the first year of registration, was not included in the study owing to the possibility of under-registration as the new system was introduced.

result may have lead to accidental deaths and injuries.[4] Silicosis is connected to iron ore mining, but is only a risk if silica is present in the mine (Jörgensen, 1986; Castranova & Vallyathan, 2000). Bell Island iron ore has been noted to contain silica (Kerr, 1959). Mining around Bell Island therefore likely increased the risk of silicosis later in life for some miners. Silicosis has also been notably associated with pulmonary tuberculosis (Steele, 1972). Silicosis encourages and modifies the progress of tuberculosis and "...may also affect the morphology of the tuberculous lesions" (Steele, 1972:27). Through the underlying mechanisms, both black lung and silicosis may influence cause of death analyses for iron ore miners and coal miners since tuberculosis was rampant during this time frame. It is likely that in both mines accidents were of epic proportions. This study provides a unique setting where historical epidemiological and demographic research on comparative occupational health can be examined.

[4] Similarities are dependent on the type of mine: above ground, underground, submerged, not submerged. In this case both coal and iron mines were underground submerged under the ocean floor, and built by associated companies (Dominion Coal Company, and Dominion Iron and Steel Company). Nova Scotia Iron and Steel Company also held deposits around Bell Island, and other coal mines along the Cape Breton Seam.

Chapter 2: Historical Epidemiology and Demography

Historical epidemiology and demography enable social scientists to understand how various processes in any given population affect health and illness. In many cases using a variety of archival resources, like death registries, census returns, and public health reports allows researchers to gain such insights. These materials assist in creating a model of community life in the past. Archival materials along with current quantitative techniques provide anthropologists and other social scientists an opportunity to create a portrait of life and death that may otherwise be lost over time. Understanding health in the past requires a close examination of community demographics, as well as economics. For example, in the industrial era in Western Europe and North America, company towns were created, mainly for either manufacturing or mining purposes. These towns often created an influx of migrants in a short period of time. Thus, understanding the role of economics and demographics will provide further insights into examinations of overall community-level health in the past. Researchers interested in this field have produced an array of literature both with respect to historical epidemiology and historical demography (see Herring & Swedlund, 2003; Luckin & Mooney, 1997; Hautaniemi et al, 1999; Condran & Crimmins-Gardner, 1978; Emery & McQuillan, 1988; Burke & Sawchuk, 2003; Sawchuk & Burke, 2000; Woods & Hinde, 1987; Ballard & Banks, 2003; Godoy, 1985; Bulmer, 1975; Knapp & Pigott, 1997; Heyman, 1995).

Death records are often maintained by either local parishes recording deaths in a community or by vital statistics agencies organized through the province/state or country. Death records provide valuable information on community patterns, and help to answer questions relating to overall community health. While consideration of the quality of the

records is necessary, the information does reflect the ideologies of medical personnel, which can assist in comprehending views on health and disease over time. Such views may reflect acceptance or non-acceptance of medical theories and may relate to the overall public health of a population. Inadequate public health measures in any community can alter the mortality record, bringing an array of infectious agents. Community level demographics can also greatly alter the mortality record. For example, the building of a company town may influence an increase in male causes of death that reflect the work environment. In addition, population dynamics may also affect the mortality record, such as the sex ratio of a community, the rate of immigration to a community, or even the age of individuals residing in a community. Such demographic factors may influence biases in the morality record (e.g. male heavy mortality, or higher rates of young adult deaths).

In general, an examination of the overall causes of death is also important to historical epidemiologists and historical demographers working with archival material, as it aids in increasing our understanding of what people had to endure in historical times. While some causes of death are rare today, others no longer exist within the Western medical framework. Consequently, it is important to understand the effects of such causes of death that plagued individuals in the past. Essentially, studies in historical epidemiology contribute to the overall knowledge of urban growth during the late 19th and early 20th centuries (Luckin & Mooney, 1997), assist in comprehending the ecological interconnectedness of community and disease (Risse, 1997), and provide a picture of life in the past.

A variety of demographic variables such as fertility, marriage, migration, population density, and occupation are all factors that can be used to examine historical health problems (Luckin & Mooney, 1997; Emery & McQuillan, 1988). These variables can impact overall health via indirect or direct associations (Luckin & Mooney, 1997). For example, declining family size during the second half of the 19th century likely affected the decline in mortality, in that fewer children resulted in decreased domestic crowding (Luckin & Mooney, 1997). Migration in urban communities of Northampton and Holyoke, New England's manufacturing sector during the industrial era, created an heterogeneous appearance in the population due to the 'Great Migration' of the late 19th century (Hautaniemi et al., 1999). Occupation and wage has been used as a marker for social class (Emery & McQuillan, 1988; Luckin & Mooney, 1997). Social class will often affect overall public health, whereby lower class individuals will experience poorer living conditions thus increasing their susceptibility to infection. Unskilled manual workers in Ingersoll, Ontario experienced higher mortality rates, in general as a result of lower nutrition and living standards (Emery & McQuillan, 1988). Thus a variety of demographic factors are essential to consider when examining mortality patterns.

Industrialization brought about changes in the geographic landscape. Population growth stimulated industrial centres, creating variation between rural and urban mortality and living conditions in each (Pelletier et al., 1997). The advent of industrialization also brought about the dawn of the company town. Early beginnings of this industrial phenomenon can be traced to 18th and 19th century Britain where "[t]echnological and economic revolutions began to transform small medieval village centers of production into what would grow into modern industrial cities" (Garner, 1992:17). It was during the

industrial revolution between the 1830s and the 1930s that these company-dominated communities appeared in the landscapes of various industrial countries (Garner, 1992; Porteous, 1970). There are a variety of terms used to describe a community that is based on a single occupational enterprise. Company town, company-dominated community, corporately-dominated community, single-industry town/community, the occupational community, labour town, or any community that is describe by the type of industrial occupation employed (i.e. mining town, oil town, steel town, mill town) all refer to this concept. There appears to be some differentiation between these terms (Frank, 1981; Heyman, 1995), but essentially all present the dynamics of a community that is based around a single enterprise.

The nature of company towns vary from town to town, by the materials produced, by the amount of control exerted by the company, and by the social constructs that change the demographic and social context (Ballard & Banks, 2003; Godoy, 1985; Bulmer, 1975; Knapp & Pigott, 1997; Heyman, 1995). According to Heyman (1995), the ideology that a company town is controlled in every aspect by the company is false. Instead most companies facilitate the general operations of community life by assisting in housing needs (Fishback, 1992), and also in aiding in civic duties (Heyman, 1995). Company housing, however, creates problems of class conflict and control of the company over its workers (Fishback, 1992). For example, miners in Pennsylvania and Cape Breton who went on strike lost their homes, as they were no longer considered employed by the company (Fishback, 1992; Mellor, 1983). Housing built and owned by the company in single industry towns also appeared to carry the stigma of poor living conditions (Porteous, 1970; Mulrooney, 1991; Fishback, 1992; Mellor, 1983; Robson,

1984). Companies commonly built boarding houses, usually meant for single men arriving without a place to stay (Ripmeester, 1994; Mellor, 1983; Fishback, 1992; Robson, 1984).

One main feature that all company-owned communities appear to have in common is population growth and expansion (Frank, 1981; Godoy, 1985; Bulmer, 1975). Many communities, especially those based on a geological material (e.g., mine towns, oil towns), are fixed to a certain area, which sometimes results in geographical isolation (Bulmer, 1975; Godoy, 1985). Such isolation can hinder the labour force/power, thereby further enhancing company control over members of the community (Heyman, 1995). In turn, the companies involved require an ample supply of labour for operations to be maintained and, as a result, there is a dependency in all aspects of the workforce (Bulmer, 1975). On the other hand, there is quite often exploitation of labour, and historically this has been observed in relation to ethnic groups as companies would seek cheap labour from immigrants and non-Anglo labourers (Bulmer, 1975; Heyman, 1995; Godoy, 1985; Ballard & Banks, 2003; Frank, 1981; Heron, 1988; Avery, 1979). Company towns created an influx of workers to small villages, thus turning many into large cities (Garner, 1992). Consequently, during the industrial era, the large influx of people would have had detrimental effects on the overall health of such communities. Mill workers in 19th century New England's manufacturing sector were exposed to crowded, dusty work conditions, poor quality housing and living conditions, and this working class tended to live in a poor financial state (Hautaniemi et al, 1999). According to Pelletier, Légaré, and Bourbeau (1997:100), "...urban mortality is more likely to rise when the increase in numbers stimulated by industrialization outruns the provision of appropriate sanitary

measures and infrastructures. Some delay may be experienced to balance these two components and to assess the benefits of each."

Infectious diseases had a critical influence on mortality throughout history, many associated with unsanitary overcrowded urban areas. The compulsory reporting of deaths in the 19th century was a key component in understanding communicable diseases and creating public health programmes to reduce the burdens of morbidity and mortality (Risse, 1997). In England between 1860 and 1920, life in towns and cities was more hazardous than in villages and hamlets (Luckin & Mooney, 1997). Historically, throughout North America, mortality patterns differed between locales, largely due to variations in living conditions, social class, and economic opportunities (among a variety of other factors) that influence mortality (Emery & McQuillan, 1988). In the United States, high mortality levels (especially from infectious disease), in the 19th century has been attributed to "...high population density, inadequate water supplies, and inadequate sewage disposal..." (Condran & Crimmins-Gardner, 1978:27).

Problems with public health infrastructure in urban centres could increase mortality burdens. On the other hand, public health movements in Montreal in the 1870s decreased the rate of mortality through improved living conditions (Pelletier et al., 1997). Throughout the United States in 1890, public health movements introduced a broad spectrum of activities to fight endemic and epidemic diseases (Condran & Crimmins-Gardner, 1978). Life expectancy at birth (e_0) in London began to improve by 1911, in turn narrowing the gap between urban and rural e_0, resulting from improvements in urban mortality (Luckin & Mooney, 1997). Another aspect of mortality decline in urban centres relates to the introduction of suburbs which were associated with the reduction of

crude death rates in London by 1911 (Luckin & Mooney, 1997). It appears that the mortality decline observed at the turn of the 20th century was associated with a decrease in population growth, improvements in public works, and a wider acceptance of medical knowledge (Hautaniemi et al, 1999).

Typhoid fever, cholera, and tuberculosis have been associated with unhygienic and unsanitary living conditions (Barkin & Gentles, 1990; Gagan, 1989; Leavitt, 1992; Sawchuk & Burke, 2000; Sawchuk & Burke, 2003). Some diseases, like typhoid fever, cholera infantum, and diarrheal diseases appear to be more directly affected by public health movements than others, such as tuberculosis, diphtheria, measles, and influenza (Condran & Crimmins-Gardner, 1978). In the 19th century, Montreal and Quebec City were hit by a cholera epidemic that mainly affected working class neighbourhoods that lacked proper sanitation and drinking water (Pelletier et al., 1997). Improvements in the water supply in urban areas of Victorian England and Wales was significant in narrowing the mortality gap between urban and rural areas (Woods & Hinde, 1987). The spread of tuberculosis was partially the result of living conditions in North American cities characterized by overcrowding, under-nutrition, improper ventilation, and poor personal and domestic hygiene (Sawchuk & Burke, 2000); thus a general improvement in the overall cleanliness of cities, as well as the cleanliness of individuals residing in cities was important (Condran & Crimmins-Gardner, 1978). In 1900 Hamilton, Ontario, rates of tuberculosis and typhoid fever were highest in the densely populated areas surrounding production centres (Gagan, 1989). Similarly, Belleville, Ontario between 1876 and 1885 was in a poor state of health owing to the absence of a proper sewage system and an inadequate water supply for a growing population (Sawchuk & Burke, 2000). Quebec

City and Montreal in the 19th century were considered unhealthy and the fact that infectious diseases were present reflects the poor living conditions and high population densities found in these urban areas (Pelletier et al., 1997).

Diet, housing conditions, and work environments appear to contribute greatly to high mortality in historical periods (Mercer, 1986). The relationship, however, is not linear or straightforward, as Luckin and Mooney (1997) note that a good wage does not always reflect good health. In Gibraltar, between 1818 and 1899, sanitary facilities were limited among the military population and as the population grew, over-crowding was prevalent in the barracks (Padiak, 2005). In Northampton and Holyoke, New England, during the late 19th and early 20th centuries crowding and population density amplified the burden of health conditions (Hautaniemi et al., 1999).

Tuberculosis was a disease that had drastic effects on mortality in many communities in the 19th and early 20th centuries. Between 1876 and 1885, tuberculosis was the leading cause of death for individuals living in Belleville (Sawchuk & Burke, 2000). In 1900 Hamilton, tuberculosis was also the cause of most deaths (Gagan, 1989). In fact, in many major cities in the United States tuberculosis was the leading cause of death (Condran & Crimmins-Gardner, 1978). It was well into the 20th century that physicians accepted the germ theory, but still insisted on the incorporation of social life as a causative factor, and conditions such as malnutrition, unemployment, crowding, and living conditions in 'slums', continued to be considered in the aetiology of tuberculosis (Feldberg, 1995). The stigma of tuberculosis as a disease of poverty was believed to have caused underreporting of cases in Belleville (Sawchuk & Burke, 2000), but also shifted attention to public health improvements and standards of living (Feldberg, 1995).

Condran and Crimmins-Gardner (1978) also noted that physicians were often influenced by their patients and, because some insurance companies were negating polices in the event of a tuberculosis death, tuberculosis in major cities in the United States could be strategically underreported.

Studies of tuberculosis mortality must consider age-based and sex-based patterns. The Belleville study revealed a notable pattern in tuberculosis and age at death, in that there was a sharp rise in deaths during the teenage years that reached a peak during the mid twenties (Sawchuk & Burke, 2000). Similar findings have been presented for Hamilton in 1900, where tuberculosis was the most common cause of death among young adults aged 15 to 29 years of age (Gagan, 1989). Sawchuk and Burke (2000) did note that women in Belleville experienced higher rates of tuberculosis than men. Meindl and Swedlund (1977) reported increased female mortality compared to male mortality between 1700 and 1850 in Deerfield, Massachusetts, although the specific cause was not provided. Mercer (1986), on the other hand, noted that females during the second half of the 19th century in Europe displayed a quicker mortality decline for tuberculosis than men. Mercer (1986) related the decrease in female mortality and increase in male mortality to working habits of the sexes, increases in tobacco consumption among males, and changes in nutritional hygiene (i.e., milk sterilization). It has long been speculated that pregnant women, many of whom were often malnourished, were more susceptible to tuberculosis in their young adult ages (Sawchuk & Burke, 2000; Burke & Sawchuk, 2003).

Mortality patterns change over time and are dependent on many circumstances such as the acceptance of the germ theory of disease, the use of public health measures,

the type of community, the types of housing, who lives in the community, and the main forms of occupation held by most individuals. During the second half of the 19th century (industrial era) respiratory diseases such as bronchitis, pneumonia, and influenza increased (Mercer, 1986). Chronic bronchitis is attributed to heavily industrial and polluted areas (Mercer, 1986). The use of domestic coal was a contributing factor for increased prevalence of chronic bronchitis (Mercer, 1986). Thus adults in industrial areas, especially industrial working males, would have been highly susceptible to chronic bronchitis and bronchopneumonia (Mercer, 1986). As a result, understanding life at the community level largely impacts on the interpretation of mortality patterns. For example, Sawchuk and Burke (2000) noted that Belleville between 1876 and 1885 was undergoing a transition from a rural to urban community. Any major transition in community life largely affects the mortality pattern. Again, Hautaniemi, Swedlund, and Anderton (1999) believed that immigration in New England's manufacturing sector affected the mortality transition, largely because these individuals were more likely to work low skill, lesser paying jobs, and were therefore more susceptible to conditions that influence trends in infectious agents. The Jewish community in Gibraltar, between 1870 and 1959, was of a higher social standing and, as a result, somewhat more buffered against many of the predisposing causes of high risk infant diseases (Sawchuk et al., 1985).

Archival research covers a variety of academic fields, including anthropology, history, geography, and health sciences, most of which have a large range of overlap. For example historical epidemiology and historical demography falls within sub-disciplines in anthropology, history, and geography. Sub-disciplines in the health sciences are increasingly concerned with epidemiological studies which can use archival resources to

investigate trends in the past in order to contextualize current trends. Health science studies also call upon medical anthropologists to assist in creating a holistic model of understanding human groups around the world. As a result, understanding illness that affected groups in the past can aid in comprehending illness among groups today.

The use of archives for this study fits nicely into the scheme of human biologists, anthropologists, human/health geographers, historical demographers, and historical epidemiologists working in the archives (see Herring & Swedlund, 2003). Examining deaths based on occupation, such as this study intends to do, can build an understanding of the mortality history of occupational groups. Archives can help achieve this through the use of death registries, mine company reports, census material, and public health reports. Collectively, all the archival documents accessed for the current study will aid in recreating the health of male miners and steel workers and their lives in the company towns of the Maritime of Glace Bay, Sydney, and Bell Island.

Chapter 3: Occupational Health: Coal Mining, Iron Ore Mining, and Steel Working

Coal mining, iron ore mining, and steel working are all hazardous occupations. Each has their own associated health risks, but some health risks overlap (Figure 3.1). Risk for tuberculosis during the industrial era, would have ultimately been heightened among males working in occupations like mining and steel working. The harsh working environment would have placed abnormal stress on the lungs. Other risks associated with coal mining, iron ore mining, and steel working include chronic bronchitis, air flow limitation, and accidents. Iron ore mining and coal mining also show similar risk for sputum production, likely associated with the similar but different occupational diseases of silicosis and coal workers' pneumoconiosis. Steel working on the other hand has risks that are not always occupationally related, but seem to be accentuated with the work environment, such as heart disease and lung cancer. Thus, each occupation has a variety of risks that workers face on a daily basis, and in turn can alter trends in mortality patterns.

Brief History of Occupational Medicine

Respiratory infections have been connected with mining for centuries. Ross and Murray (2004:304) suggest that "[t]he relationship between mining and occupational lung disease has been documented since the 1500s, when Agricola described dust with corrosive qualities eating away the lungs and implanting consumption in the body." Georgius Agricola was a town physician for Chemnitz, Germany in the 14th century who became interested in occupational medicine (Craven, 1997). Agricola familiarized himself with diseases and hazards associated with mining. He described work conditions

such as "foul smelling air" and a "wet/cold environment" (Craven, 1997). Other hazards in the mines were also recorded by Agricola, as he noted that accidents, heavy-metal poisoning, and respiratory infections attributed to dust inhalation were common among miners (Craven, 1997). Craven (1997:611) quotes Agricola's description that lung infections like silicosis and pneumoconiosis "...[penetrate] into the windpipe and lungs, and [produce] difficulty in breathing...".

Exposure to various minerals and chemicals in mining and steel working can cause a variety of respiratory related infections, such as coal workers' pneumoconiosis, silicosis, asbestosis, lung cancer, asthma, chronic cough, and emphysema, among others. Lung cancer has been identified with mining asbestos (Ross & Murray, 2004), as the fibres in the dust are highly carcinogenic (Egilman et al., 2003). Coal workers' pneumoconiosis is specifically associated with coal mining. Consequently there are a variety of respiratory problems linked specifically to the various minerals mined, and the chemicals used in steel making. The purpose here, however, is to focus on three occupations: coal mining, iron ore mining, and steel working, and to assess their respective occupational risks in three historical populations.

There are two ways in which inhaled dust damages the lungs. First, "by a non-specific effect on the airways, common to all types of dust"; and second, "by a specific action, peculiar to each type of mineral, exerted mainly on the respiratory surface and the interstitial tissues of the lungs" (Leathart, 1972:83). Non-specific damage relates to minor illnesses of the lungs brought on by dusty work conditions and/or smoking cigarettes; and results in symptoms such as such as asthma, productive cough and shortness of breath, all of which can eventually lead to chronic bronchitis (Leathart,

1972). When diagnosing chronic bronchitis as the result of working conditions, cigarette smoking must be acknowledged as another potential factor (Reid, 1972). Smoking is extremely difficult to monitor in an historic period unless there is information pertaining to lifestyle habits of workers, however understanding work environments and associated hazards can provide insights on respiratory illnesses common to employees in a given work place. Both climate and environment, such as dusty mining (and factory-steelmaking) conditions, are known to contribute to the pathogenesis of chronic bronchitis (Reid, 1972). Long term exposure to dust particles increases the risk of chronic bronchitis (Reid, 1972).

Some conditions derive more specifically from the type of mineral mined and the type of occupation (e.g., coal workers' pneumoconiosis and coal mining). Other conditions are less occupation specific, such as silicosis and iron ore mining, as silicosis is also found amongst sandblasters, and any environment where silica is present (Rosner & Markowitz, 1991). Work in a steel plant includes a variety of occupations, and, as a result, different occupational health risks. In other words individuals working at the blast furnace will face different occupational risks than individuals working at the coke oven. All three occupations, coal mining, iron mining, and steel working, involve hazards relating to respiratory health, and thus warrant further investigation.

Coal Mining

Coal mining has a long recorded history of associated respiratory problems. During the 1860s it was accepted that coal miners suffered from a distinct respiratory disease, with symptoms of coal workers pneumoconiosis, such as the production of black

sputum, and black lesions in the lungs, but it was perceived as unimportant compared to the threat of tuberculosis (McIvor & Johnston, 2007). As a result, knowledge of coal workers pneumoconiosis was lost until its revival in the 1940s (McIvor & Johnston, 2007).

> Regardless of the growing body of evidence relating to miners' health, the notion that miners succumbed to a particular type of lung disease caused by dust inhalation was rejected by most doctors in the late nineteenth and early twentieth centuries, and one of the reasons for this was the difficulty in differentiating between tuberculosis and dust-induced respiratory disease (McIvor & Johnston, 2007:67).

Two common non-specific respiratory symptoms found amongst coal miners are chronic cough and increased sputum production (Hedlund et al., 2006). Increased sputum production is often associated with 'black lung', also known as coal workers' pneumoconiosis. Pneumoconiosis is defined as any disease of the lung caused by chronic inhalation of dust, usually mineral dusts of occupational or environmental origin (Anderson & Anderson, 1990). The inhalation of dust debris clogs the lungs, making normal lung function difficult (McIvor & Johnston, 2007). Coal workers' pneumonia, however, is a specific respiratory infection related to coal mining. There are two forms of coal workers' pneumoconiosis: simple and complex (Reid, 1972). The simple form often shows few or none of the signs or symptoms associated with the complex form (Reid, 1972; Ross & Murray, 2004). Signs and symptoms in the simple form of coal workers' pneumoconiosis are often associated with the onset of lung conditions like chronic bronchitis, emphysema, and chronic airflow limitation (Reid, 1972; Ross & Murray, 2004). Airway obstruction due to chronic bronchitis is the most common respiratory symptom found among coal miners with simple pneumoconiosis (Leathart, 1972).

Simple pneumoconiosis can be mistaken for miliary tuberculosis[5], sarcoidosis[6] and extrinsic allergic alveolitis[7] (Leathart, 1972). Historically miliary tuberculosis was often confused with simple pneumoconiosis, as symptoms were similar (Leathart, 1972). Sarcoidosis can be differentially diagnosed from simple pneumoconiosis, since an enlarged lymphatic gland and spleen are present with the former (Leathart, 1972). Severe dyspnoea (shortness of breath) and crepitatians (moist sounds) are present in the lungs with extrinsic allergic alveolitis, which are not found in cases of simple pneumoconiosis (Leathart, 1972).

The complicated or complex form of coal workers' pneumoconiosis is often lethal. This second form is also known as progressive massive fibrosis (Reid, 1972; Leathart, 1972). Progressive massive fibrosis is linked with severe disability and deterioration of lung function, and is often associated with respiratory failure (Reid, 1972; Leathart, 1972; McIvor & Johnston, 2007). Late onset of symptoms is typical making prevention very difficult. Symptoms begin between approximately 40 to 70 years of age, long after miners' first exposure to coal dusts (Leathart, 1972). Signs and symptoms include opacity (cloudiness) in the lungs due to dust accumulations; a large black mass representing an accumulation of coal dust both within the macrophages and

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[5] **Miliary Tuberculosis:** "extensive dissemination by the bloodstream of tubercle bacilli. In children it is associated with high fever, night sweats, and, often, meningitis, pleural effusions, or peritonitis. A similar illness may occur in adults but with a less abrupt onset and, occasionally, with weeks or months of nonspecific symptoms, such as weight loss, weakness, and low-grade fever. Multiple small opacities may be evident on chest x-ray films" (Anderson & Anderson, 1990:568).

[6] **Sarcoidosis:** "a chronic disorder of unknown origin characterized by the formation of tubercles of nonnecrotizing epithelioid tissue. Common sites are the lungs, spleen, liver, skin, mucous membranes, and lachrymal and salivary glands, usually with involvement of the lymph glands. The lesions usually disappear over a period of months or years but progress to widespread granulomatous inflammation and fibrosis" (Anderson & Anderson, 1990: 791).

[7] **Allergic Alveolitis (Diffuse Hypersensitivity Pneumonia):** "an immunologically mediated inflammatory reaction in the lungs induced by exposure to an allergen or by adverse reaction to a drug. The disorder is characterized by cough, fever, dyspnea, malaise, pulmonary edema, and infiltration of the alveoli with eosinophils and large mononuclear cells" (Anderson & Anderson, 1990:276).

between the reticulin and collagen fibres of the lungs; and dyspnoea or shortness of breath (Reid, 1972; Leathart, 1972). Macrophages assist with the removal of dust debris in the lung, however the fibrous material in various mineral dusts along with mass accumulation from constant intake of particles aggravate the macrophages to such an extent that they are unable to function properly (Heppleston, 1991). The characteristic large black mass is a cavitation of a fibrosed accumulation coal dust and is the major pathologic symptom of coal workers' pneumoconiosis (Leathart, 1972). The black fibrosed mass produces large volumes of black-inky sputum (melanoptysis) (Leathart, 1972), hence the name 'black lung' is given to the disease. The necrotic centre of the fibrotic mass erupts into a bronchus, often with the onset of another respiratory infection, usually chronic bronchitis or emphysema (Leathart, 1972; McIvor & Johnston, 2007).

Progressive massive fibrosis is often considered a disease of elderly miners due to its late onset and slow advancement; however death from another cause (other respiratory or accidental causes) often cuts short the progression of the infection (Leathart, 1972). In historical studies the effect of progressive massive fibrosis or coal workers' pneumoconiosis on the population will likely be limited, due to misclassification of conditions and lack of medical knowledge. As well, it was not until 1942 that coal workers pneumoconiosis was actually recognized as an occupational health issue for coal miners (McIvor & Johnston, 2007). Also, coal workers pneumoconiosis was underestimated because earlier cases prior to the 1940s were misdiagnosed as tuberculosis, silicosis, chronic bronchitis or emphysema (McIvor & Johnston, 2007). Canada has been reporting a decline in coal workers pneumoconiosis hospitalization

rates.[8] Understanding the long-term effects that occur with its progression can aid in comprehending the morbidity experienced by coal miners in the past.

Iron Ore Mining

Iron ore mining does not appear to have the same invasive lung infections as coal mining, neither has silicosis (a common occupational disease among iron ore miners) been the subject of research to the same extent as 'black lung'.

> Today the general public is increasingly aware of the suffering experience by coal miners, asbestos workers and textile workers stricken by black lung, white lung, and brown lung because of popular movements and medical studies that have developed around each. However, silicosis, another occupational lung disease, remains virtually unknown (Rosner & Markowitz, 1991:3).

Often it is the particles present in iron ore mines that will determine whether there is a risk for long term infection. Silica, if present in iron ore mines, contributes to the onset of silicosis of the lung. Silica is a fibrous material. It is the inhalation of crystalline silica fibres, usually found associated with mineral quartz, which causes silicosis (Castranova & Vallyathan, 2000). Silica makes up approximately 90% of the earth's crust, and is a main component of sand, quartz, and granite (Rosner & Markowitz, 1991). Unlike coal workers' pneumoconiosis, silicosis is not exclusive to iron ore mining. Silicosis can be found in a variety of occupational settings, such as mining, sandblasting, surface drilling, stonecutting, construction, pottery making, and silica flour mill operations (Castranova & Vallyathan, 2000).

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[8] Public Health Agency of Canada. Life and Breath: Respiratory Disease in Canada. Last accessed: 29-05-09
http://www.phac-aspc.gc.ca/publicat/2007/lbrdc-vsmrc/ord-mrp-eng.php

There are four pulmonary responses to crystalline silica: acute silicosis, accelerated silicosis, chronic silicosis, and conglomerate silicosis (Castranova & Vallyathan, 2000). All forms are associated with heightened morbidity and mortality (Castranova & Vallyathan, 2000). Acute silicosis affects the middle and lower lobes of the lungs, producing granular lesions in alveolar spaces (Castranova & Vallyathan, 2000). Symptoms of acute silicosis are problems with breathing, fatigue, weight loss, decreased pulmonary function, and respiratory failure (Castranova & Vallyathan, 2000). Accelerated silicosis is similar to acute silicosis, however, chronic inflammation of the respiratory system, and large particles of silica are also found in the lungs (Castranova & Vallyathan, 2000). Chronic silicosis occurs over prolonged exposure to silica particles (Castranova & Vallyathan, 2000). Histological appearance of chronic silicosis is typical with a concentric cyclical arrangement of collagen fibres, whereby there is an amorphous centre surrounded by concentrically (circular) organized collagen fibres (Castranova & Vallyathan, 2000). In other words the collagen fibres share the same centre and develop in a cyclical pattern, becoming larger over time. Conglomerate silicosis is characterized by large nodular lesions produced over time that are formed from smaller lesions on the middle and lower lobes (Castranova & Vallyathan, 2000). The last two forms develop over time and are more likely to be found amongst workers who are in constant contact with silica particles.

Silicosis has been mistaken for tuberculosis, but also bronchitis and asthma (Rosen & Markowitz, 1991; McIvor & Johnston, 2007). Essentially, the early 20th century hype of tuberculosis resulted in the delay of silicosis recognition (Rosen & Markowitz, 1991). Tuberculosis and other infectious diseases had a major impact on

medical and social ideas of disease, and thus chronic diseases did not receive the same attention. Much of this likely has to do with chronic diseases often affecting the elderly population, and that infectious disease affected individuals of all ages.

> For much of the first half of the century, the infectious diseases, such as tuberculosis, diphtheria, and influenza, dominated public awareness of the threats faced by those in the prime of life. Silicosis brought to the national consciousness a new form of occupational illness, which caused progressive deterioration into old age (Rosen & Markowitz, 1991:7).

On the other hand many early cases of silicosis were found with tuberculosis (McIvor & Johnston, 2007). Thus it is likely that the presence of silica in a work environment, like iron mining, may have increased susceptibility for tuberculosis.

The recognition of silicosis did not begin until the 1930s, and by the 1950s the disease was virtually forgotten (Rosen & Markowtiz, 1991). The decline of silicosis recognition likely had to do with the discovery of coal workers' pneumoconiosis in the 1940s. Coal workers pneumoconiosis was a risk for a whole cohort of miners, all those working in coal. As a result, scientists and medical professionals likely saw coal workers' pneumoconiosis as a larger threat than silicosis which is determined by the presence of the fibrous silica material. To recap early cases of silicosis among coal miners are now thought to be coal workers' pneumoconiosis (McIvor & Johnston, 2007), thus silicosis brought about new ideas of chronic diseases and chronic occupational diseases.

Both quartz and silica have been associated with the Bell Island iron ore deposit (Orion, 1915; Kerr, 1959). No study on the risks of silica has been presented for Bell Island iron ore miners. However, between 1976 and 1992 six cases of silicosis at an open pit iron ore mine in Newfoundland were reported (Martin et al., 1999). Of these six

cases, three were fatal (Martin et al., 1999). Other research has studied the effects of silica on the respiratory systems of iron ore miners (Jörgensen, 1986). Dusty conditions in underground mines present many hazards to respiratory health. Prior to the 1930s, miners in Kiruna, Sweden's iron ore mines, worked in extremely dusty conditions, elevating the number of silicosis cases (Jörgensen, 1986). After the 1930s fewer silicosis cases were detected among Kiruna's iron ore miners due to the introduction of wet-drilling and better air ventilation (Jörgensen, 1986). It is very likely that a longitudinal mortality study of Bell Island iron ore miners will reveal cases of silicosis, especially if above ground/open pit miners are also affected.

Other common respiratory ailments are widespread to all forms of underground mining. In a longitudinal study of iron ore miners, it was found that underground miners experienced a higher susceptibility to chronic bronchitis, asthma, cough, wheezing, and sputum production than surface miners (Pham et al., 1986). It is apparent that the type of mine (underground or surface) figures importantly in the types of chronic respiratory infections found amongst miners. Surface miners and underground miners experience very different work environments. Above-ground miners work in an environment were a constant flow of fresh air is available, unlike underground miners who work in enclosed, dusty, wet environments, where fresh air flow is limited, and in some cases has to be circulated via air vents. As a result, the type of environment greatly affects the extent to which a miner will be susceptible to respiratory infection.

Steel Working

The occupational setting of a steel plant is diverse in comparison to mining. There are a variety of occupations which can be held at a steel plant, each consisting of their own unique work environments. Accordingly, each environment has its own health hazards. It becomes apparent through a review of the literature on the health risks of steel working that coke ovens, open hearths, and blast furnaces are the most hazardous, as those employed in these areas are dealing with hot temperatures and hazardous chemicals (Lloyd, 1971; Smith, 1971; Dancy, 1971; O'Connor, 1971; Redmond et al., 1972; Rosenman, 1979; Hutchinson et al., 1996; Corhay et al., 1998; Fitch, 1969). Coke[9] from the coke ovens, and purified iron ore from the open hearths are transferred to the blast furnace which is then used to form the final steel product.

Coke oven workers have been noted to die from respiratory cancer at twice the rate of other steelworkers, owing to the chemical process of converting coal to coke (Lloyd, 1971). Coal is decomposed through excessive heating, which removes absorbed gases like carbon monoxide, methane, nitrogen, oxygen, ammonia, as well as compound materials like pyritic sulphide (reducing it to hydrogen sulphide), in order to purify the coal mineral for the steelmaking process (Smith, 1971). The coking industry began in the mid 1800s; by the 1900s awareness of coke emission health hazards resulted in the development of holding cells for the gaseous matter (Dancy, 1971). These holding cells were not highly effective, however, as the hazardous gas emissions were still released into the air any time the oven was opened or closed (Smith, 1971).

[9] **Coke:** "coal from which most of the gases have been removed by heating: used as an industrial fuel" (Agnes, 2003:129).

During the 1960s, awareness that lack of industrial hygiene was causing higher than normal rates of lung cancer resulted in the use of respirators (O'Connor, 1971). Prior to the use of respirators, the fumes circulating the work area were inhaled by coke oven workers. Men who worked the top furnace of the coke oven were more susceptible to lung, bronchus, and trachea cancer than other coke oven workers, but all were at risk (Redmond et al., 1972). Redmond and co-authors (1972) suggest that respiratory diseases show no significant difference in coke oven workers relative to other steelworkers. Other work environments in the steel plant setting present work environments that are just as harsh as the coke ovens, such as the open hearths and blast furnaces.

Open hearths are another subdivision of the steel plant operations. The open heath is used to melt pig iron, scrap steel, and limestone to produce the preliminary steel product (Redmond et al., 1975), prior to the blast furnace stage. Individuals working the open hearth in steel plants were often exposed to extremely high temperatures and chemicals while conducting arduous tasks, which in turn affected both the respiratory and the cardiovascular systems (Redmond et al., 1975). While it is difficult to assess factors relating to heart diseases, the combination of hot temperatures and heavy work appeared to increase diseases of this sort. Heavy work, hot temperatures, and poor ventilation are more likely to precipitate an ischaemic attack in a worker than if the work conditions were more comfortable (Rosenman, 1979). Lung cancer was also likely prevalent among open hearth workers because of exposure to iron oxide and other chemicals during the steelmaking process (Redmond et al., 1972). In Hamilton, Ontario lung cancer risk is increased where the melting of molten steel (open hearths) is involved (Finkelstein et al.,

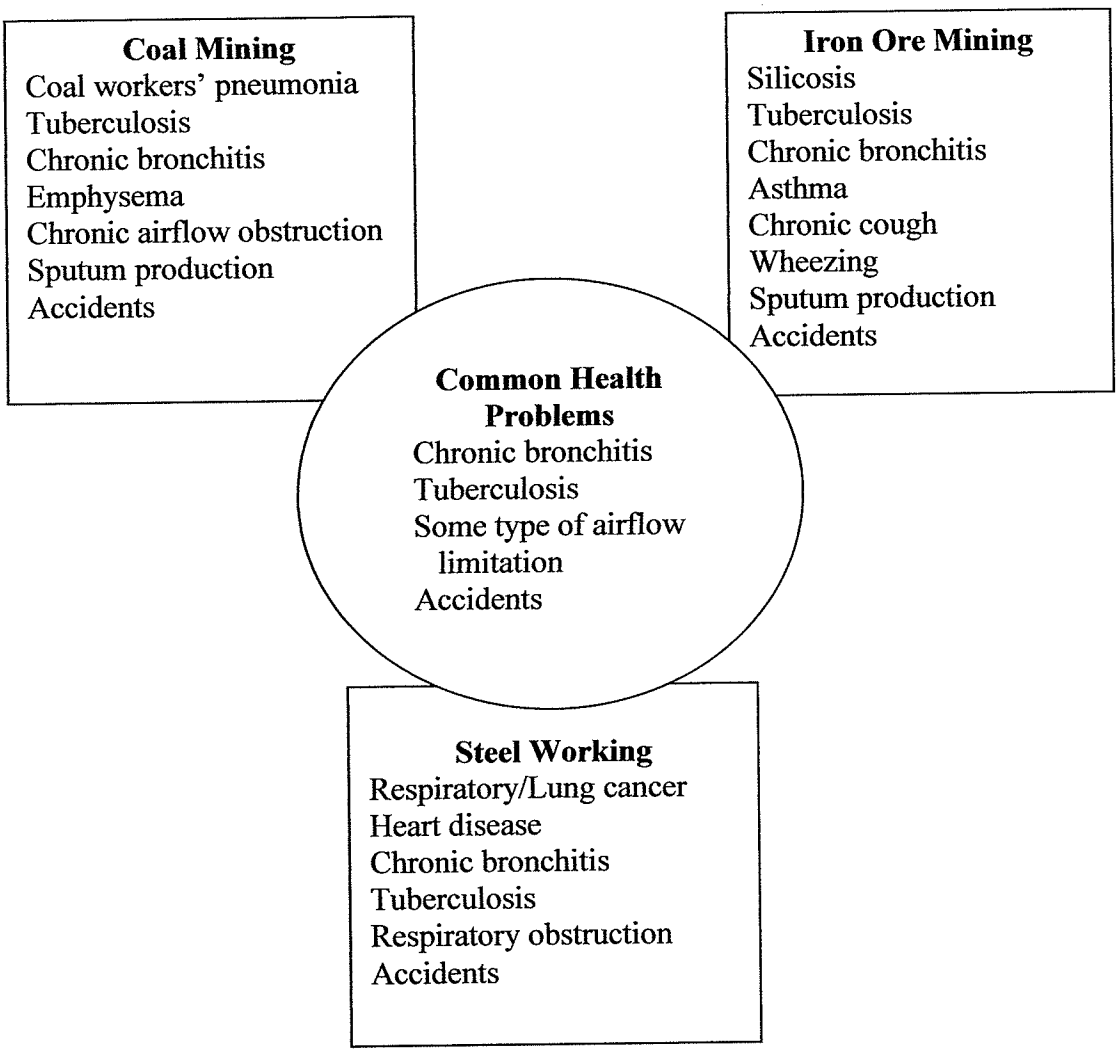
1991). Consequently, open hearths present some similar occupational health risks as coke ovens.

Blast furnace workers are also a group at risk for lung cancer and other respiratory diseases (Hutchinson et al., 1996). Refined iron ore is smelted in the blast furnace letting off an excess of carbon monoxide, resulting in carbon monoxide poisoning for many who worked in this environment (Jones & Sinclair, 1975). Essentially a variety of causes of death (apart from accidental) are associated with working at the blast furnace. Most diseases can be associated with working conditions found at blast furnaces. General working conditions at the blast furnace expose workers to excess heat and poor ventilation (Hutchinson et al., 1996), a common setting for most individuals working in the steel plant. A high risk for chronic bronchitis among blast furnace workers is suggested by the daily environment these people faced (Hutchinson et al., 1996). Blast furnace workers also worked in dusty conditions that may have promoted respiratory obstruction (Corhay et al., 1998).

Occupational tuberculosis is another common risk associated with steel working. Tuberculosis risk at a steel plant is strongly associated with the large amounts of dust in the air (Greenburg, 1925), and does not appear to be confined to one specific area of a foundry. The federal census report for the United States in 1900 showed that 31% of all steel worker deaths were cause by tuberculosis (Hutchcroft, 1911).

All occupations in the steel plant industry tend to carry numerous health problems, most of which pertain to lung function. It is crucial to understand these health issues when examining the mortality record. Mining coal has a cause specific respiratory disease, coal workers pneumoconiosis, but other non-specific respiratory ailments such as

Figure 3.1: Occupational Health Problems Relative to Coal Mining, Iron Ore Mining, and Steel Working



chronic bronchitis and asthma are also prevalent. While silicosis is not specific to iron ore mining, it does occur when certain minerals containing silica are present. Again asthma and chronic bronchitis are common illnesses found among iron ore miners.

Accidents with Respect to Coal Mining, Iron Ore Mining, and Steel Working

Accidental causes of death are common in both mining and steel working. It is evident that these occupations are dangerous, and thus, steelworkers and miners alike are highly susceptible to occupational injuries that may result in death. Underlying issues of poor work conditions, long working hours, ventilation problems, and lack of technological equipment are all factors that likely increase susceptibility to accidents in the work place, and plagued miners and steelworkers in the past. According to Hopkins and Palser (1987), there are two ways in which accidents are caused in the workplace: personal (blame the victim) and environmental (blame the system).

Coal and Iron Ore Mining Accidents

Mining accidents continue to occur and threaten the lives of workers. A variety of conditions come into play when examining accidents in mines. Variations in "...geological conditions, mine size, company structure and policies, bonus payments and productivity, technology and work conditions, age of workforce, and propensity of fake accidents" must all be taken into account (Hopkins & Palser, 1987:27). Another variation that is also likely to affect work place accidents is immigration and language barriers (Avery, 1979; Heron, 1988). The workplace independence of miners in the early decades of the 20th century was also a cause for mining accidents (Fishback, 1983).

Weeks and Fox (1983) reported a notable decline in coal mine fatalities in the United States after the 1969 *Coal Mine Health and Safety Act*. Other changes in coal mine policies that have reflected the decline post 1969 include changes in "mine ownership, composition of the labor force, and training of miners." (Weeks & Fox, 1983:1279). Blank, Diderichsen, and Andersson (1996) reported that technological development in Swedish iron ore mines between 1911 and 1990 altered the annual accidental mortality rate, increasing and decreasing the mortality rate for accidents. The environment which many miners face on a daily basis is, and was, likely to affect the morbidity and mortality patterns of iron ore and coal miners in the present study. Accordingly, Hopkins and Palser (1987:27) noted that:

> A common assumption about coal mining is that it is *inherently* a dangerous business, made dangerous by the physical conditions under which men work, particularly the ever present possibilities of methane gas explosion and roof falls.

Between 1980 and 1981, Hopkins and Palser (1987) examined accidents in New South Wales, Australia and found that explosions were catastrophic but uncommon, and that roof falls were the most common cause of accidents in coal mines. Increases in fatalities in the United States coal mines (in 1981) were likely due to the relaxation of regulatory enforcement brought about after the 1969 Act (Weeks & Fox, 1983). Weeks and Fox (1983:1278) report that:

> In 1981, for example, the fatality rate for underground coal mining was 11.1 fatalities per 10,000 full-time workers, while in heavy construction, the next most hazardous industry, the rate was 4.3.

Although today there are many health and safety protocols, it is apparent that accidents still remain and that mining continues to be considered a dangerous occupation. In

Sweden, between 1986 and 1990, 2536 occupational accidents with six fatalities were reported for iron ore mines (50.1%), and non-ferrous iron ore mines (49.9%) (Blank et al., 1995). The majority of accidents in Sweden (and likely elsewhere) occurred underground (Blank et al., 1995). Major roof falls that occurred in English mines between 1941 and 1944 were the result of improper methods of closure of previous coal seams (Whitfield, 1954). Once a seam has been worked, the area needs to be closed off or packed, often with excess rubble and stone (Whitfield, 1954), to prevent cave-ins. However, the closing of a seam can also produce a roof fall, which is dependant on the time it takes the packed area to settle. Whitfield (1954:127) explained that "[t]he rate of closure is important to the working of the face. If it proceeds too rapidly then strain on the roof may prove too great, causing major falls of roof." Underground workers have a higher risk for accidents than above ground workers (Blank et al., 1995).

Accidents in coal and iron ore mines may also be age related. Laflamme and Blank (1996: 479) stated that "[i]ndividual ability to cope with occupational demand is often presumed to diminish with age as a result of the progressive weakening of physical and mental capacities." According to Whitfield (1954:130) however, such differences in accidents between age groups may reflect differences in types of work, "...where the youngest are probably acting as assistants, those somewhat older taking the main burden, and the older men directing and supervising the work." Whitfield (1954) also states that training was an important part of mining at the time of his study which does not appear to be the case for either iron ore miners or coal miners of Bell Island and Glace Bay in the early part of the 20th century.

During the first part of the 20th century, the lack of unions and the independence of miners were also presumable causes for the high rates of accidents. According to Fishback (1986:270):

> ...[U]nionization was the source of most improvements in wages and working conditions. In contrast, if miners were hired in a more competitive coal labor market, constrained to some extent by uncertainty and risk aversion, greater risk would be compensated with higher wages and wage cuts would have ambiguous effects on accident rates. In such a market a union, by controlling labor supply, will raise wages and improve working conditions for its members, although it may be at the expense of nonunion workers.

Fishback (1986:271) also states that:

> Most underground workers were either pick miners or coal loaders, located singly or in pairs in rooms spread throughout the mine. Since direct supervision was costly and coal output was easily measured, operators paid piece-rate wages and gave each miner a great deal of responsibility. Therefore the miner was explicitly aware of the trade-off between income and safety while he made nearly all of the accidental prevention decisions within his own workplace. He decided how often to timber the roof to prevent roof falls, and how large a blast to use in dislodging the coal.

Thus, miners made most of the decisions, creating an environment unlike that reported by Whitfield (1954) between 1941 and 1944.

Glace Bay and the many small coal towns in Cape Breton County succumbed to the hazards of coal mining. Coal mining accidents were recorded in the Nova Scotia House of Assembly Journals and Proceedings: Appendix No. 6, Mines Report from 1910 to 1917 (Nova Scotia House of Assembly, 1910-1917). The Nova Scotia House of Assembly did not classify accidents by community, but rather by colliery, thus it is difficult to determine the frequency of accidents at the Glace Bay collieries. However, it

is pertinent to present some examples to highlight the heightened exposure to accidents that individuals who worked at the various collieries in Cape Breton endured (Table 3.1).

Bell Island also revealed the hazards of a mining tradition. Southey (1969) reported that fatal accidents in the Bell Island mines were uncommon and that most accidents occurred from slips and falls caused by the sloping of the submerged mine. Methane seepages did cause explosions in the Bell Island iron mines (Southey, 1969). Reports of accidents are difficult to find except in one text (see Hammond, 1982). All mining documents for Bell Island were destroyed after the companies ceased production. However, using Hammond's text can provide some insight into the situation of accidents on Bell Island (Table 3.2).

Steel Working Accidents

Steel working is an extremely hazardous occupation. Like mining, it is an occupation that comes with known risks. Injuries and accidents appear to be a far greater risk to life than the variety of occupation-related health risks. Both accidental and health associated risks coincide with one another and are equally affected by similar conditions in the work environment. Relative risks for fatal injuries relate to noise, heat, dust and fumes, and gas and vapour (Barreto et al., 1997). These risks are also associated with various chronic occupational health risks (heart disease, cancer, chronic bronchitis, respiratory obstruction). Thus, it is safe to say that if steel workers do not succumb to death via an accidental injury, then it is highly likely that they will succumb to death via the many chronic disorders associated with steel working.

Accidents claim a larger proportion of steel plant workers lives than any other single cause (Fitch, 1969). The physical and mental injury of individuals suffering an accident varies from minor degrees of shock to disablement or death (Mekelburg, 1952). The highest risks are associated with individuals employed in the steel mill, blast furnace, and coke ovens (Barreto et al., 1997). These areas are also associated with chronic health disorders. Yet, every worker is at risk because the forces to which these men are exposed are "...seemingly, always watching for a chance to get beyond human control" (Fitch, 1969:63). "The [accidental] dangers [in a steel plant] include gas explosions, pouring of molten metal or slag, movement of locomotives and wagons, furnace charges, cranes, ladles, and other loads, and falls of heavy objects" (Barreto et al., 1997:599). In Steel Valley, Brazil between 1977 and 1990, of 391 deaths, 62% were caused by injury (Barreto et al., 1996). One of the chief causes of accidental death is blast furnace explosions (Fitch, 1969). The coke ovens also present a dangerous work environment. For example, heavy ladles filled with molten steel can give way, instantly burning and often killing workers (Fitch, 1969).

The various environments that increase susceptibility to injury in the workplace are important to briefly assess. Extreme temperatures, dangerous materials, noise, gases, and dust are all factors that appear to influence the risk of injury. The majority of deaths around 1904 were attributed to accidents due to dust, heat conditions, and sudden changes in temperatures, followed closely by tuberculosis and pneumonia (Fitch, 1969). Steel plants exert extreme heat temperatures which essentially make work conditions uncomfortable (Fitch, 1969). Such prolonged exposure to heat can cause heat exhaustion and heat cramps (Barreto et al., 1997) and, as a result, increase susceptibility to

workplace injury and accidents. The work involved in this environment requires considerable strength and energy (Fitch, 1969), accordingly, the chance of heat exhaustion increases. Open hearths exert the highest temperature (Fitch, 1969). According to Fitch (1969:61), steelworkers are in constant need of refreshment, and "[d]uring working hours they drink water and after work they drink beer and whiskey."

Working with dangerous materials, such as molten steel, can also cause injury to steelworkers. "Burns may occur in many areas [of the steel plant]: for instance in front of furnaces, from the falling of molten metal out of ladles, and in the pouring of ingots" (Barreto et al., 1997:603). Fitch (1969) has also noted the increased susceptibility of accidental mortality from molten steel falling out of ladles. Thus, the dangers associated with working in a steel plant are severe. In the blast furnace, for example, there were large pits where molten steel was held; men stood at the edge of these pits, sometimes falling in and instantly being burnt to death (Caplan, 2005). Communication errors could also result in accidents at the steel plant. For example, one worker had his foot cut off because another blast furnace was being worked, causing the wheel of a car filled with manganese to crush his foot (Caplan, 2005). Some common accidents include: being caught between cars, being burnt to death, and explosions due to dampness in the ladle when pouring the molten steel (Caplan, 2005).

Steel plants exert high amounts of noise in the work environment. Such noise has been attributed to partial or slight deafness common among steelworkers (Fitch, 1969). It is likely that deafness can create problems with communication in the steel plant, in turn increasing susceptibility to workplace injuries and accidents. Language barriers between men working in the Sydney steel plant also likely increased due to the noisy environment

in the work place. Newfoundlanders were often employed in many areas of the steel plant, and were noted to be the cause of many accidents (Caplan, 2005). This likely follows the premise that difficulty with understanding one another, along with the noisy environment, added to the risk of accident and injury. Noise has been noted to create disability and irritability, which in turn alters the normal function of workers at the steel plant (Barreto et al., 1997).

Steelworkers are exposed to numerous gases, vapours, dust, and fumes in the work environment. Exposure to gases on a regular basis can cause disorientation, feelings of drunkenness, memory loss, dizziness, headaches, and sleepiness (Barreto et al., 1997; Robinson et al., 1988). Such conditions in the already hazardous work place would increase susceptibility to accidental risks. The dust and fumes ever present in the steel plant has been attributed to an increased susceptibility to tuberculosis, chronic bronchitis, and airflow limitation (Fitch, 1969; Corhay et al., 1998), but it is also associated with increased risk to injury and accident. Exposure to dust and fumes creates a cloudy environment causing reduced visibility (Barreto et al., 1997), in turn, increasing the risk of accident and injury.

Most accidents appear to occur amongst young steelworkers. In Steel Valley, Brazil between 1977 and 1990, mortality from work-related injuries in the steel plant was greatest for workers during their first years of employment (Barreto et al., 1996). Barreto and co-authors (1996:343) report that "[u]nlike cancer, cardiovascular diseases, and other chronic diseases, injury disproportionately strikes the young, being the leading cause of loss of potential years of life for the male population in many countries." According to Mekelburg (1952:181):

> Many accidents to young persons occur in the early months of their working career; due to inexperience, unfamiliarity with the dangers of machinery, natural curiosity in a new environment, and the high spirit of youth. In a young person, muscular co-ordination and mental concentration is not fully developed till the early twenties, at which age rapid co-ordinated movements are at their best and are likely to be maintained until the late thirties.

Thus young working age males appear to be highly susceptible to accidental risk in the steel plant setting.

Sydney, Nova Scotia during the present study (1909-1917) revealed numerous workplace accidents. These were reported in the 'Records of Injuries' register maintained by the Dominion Iron and Steel Company. The condition of this text was extremely poor and most pages were illegible. Furthermore, the text does not report whether the accident was fatal or non-fatal, however it does provide insight into the risks faced at the steel plant. Table 3.3 provides examples of such accidents that occurred between 1910 and 1912 (the rest being illegible) at the Sydney Steel Plant.

Occupational health is imperative to the present study, as it brings to light factors that affected the daily lives of workers in Glace Bay, Sydney, and Bell Island. Additionally, comprehension of these various factors assists in understanding the problems faced by such individuals. Understanding the adverse effects of the work environment on human life improves the overall interpretation of the mortality pattern of industrial workers. Accordingly, it is vital to establish characteristics of both the workplace and the community to fully comprehend how occupation affected the lives of working class males in the historical industrial era of eastern Canada and Newfoundland.

Table 3.1: Examples of Fatal Accidents in Cape Breton County Coal Mines
Data Source: Nova Scotia House of Assembly 1910-1917, Journals and Proceedings, Appendix no. 6 Mines Reports

Examples of Fatal Accidents: Cape Breton County Coal Mines			
Year	*Age*	*Occupation*	*Type of Accident*
1909	29	Miner	Killed by fall of stone
1909	20	Helper	Killed by fall of coal
1909	40	Miner	Killed by fall of stone
1909	18	Labourer	Injured by runaway box, died next day
1910	38	Miner	Fall of stone, face. Died of injuries
1910	29	Miner	Fall of stone, pillar. Killed
1910	18	Helper	Electric switch. Killed
1910	36	Miner	Shot blew through on slant containing water, partly driven between main slope, drowned
1911	19	Driver	Fall of rib-coal. Killed
1911	50	Shiftman	Fall of stone. Killed
1911	20	Brakeman	Fell under trip of coal. Killed
1911	30	Miner	Fall of stone pillar. Killed
1912	24	Shooter and Loader	Fall of stone. Killed
1912	32	Miner	Fall of stone in pillar. Killed
1912	22	Miner	Fall of roof. Fatal
1912	19	Driver	Fall of roof. Fatal
1913	16	Driver	Fall of stone. Fatal
1913	38	Miner	Fall of coal at face. Fatal
1913	43	Miner	Fall of stone in pillar. Fatal
1913	30	Miner	Jammed between box and roof. Fatal
1914	54	Trapper	Killed by runaway box
1914	45	Machinist	Killed by full trip
1914	17	Driver	Killed by full trip
1914	52	Overman	Killed by a box
1915	50	Miner	Killed by fall of stone
1915	42	Miner	Killed by fall of stone
1915	48	Shooter and Loader	Killed by fall of stone
1915	29	Miner	Killed by fall of coal
1916	44	Not Given	Fall of coal
1916	19	Not Given	Struck by trip of coal-boxes
1916	38	Not Given	Fall of roof
1916	30	Not Given	Caught by cage
1917	22	Not Given	Run over by trip of cars
1917	19	Not Given	Run over by trip of cars
1917	19	Helper	Fall of coal
1917	57	Not Given	Fall of stone

Table 3.2: Fatal Accidents in Bell Island's Iron Ore Mines
Data Source: Hammond, 1982
Note: Age and Occupation are Not Given in Hammond's text.

Fatal Accidents in Bell Island's Iron Ore Mines	
Year	*Type of Accident*
1909	Caught between cars
1910	Dynamite blast
1911	Crushed by cars
1911	Struck by cars
1911	Runaway car
1912	Dynamite blast
1912	Fell from loading shute and drowned
1913	Fall of ground
1913	Dynamite blast
1913	Run over by car
1913	Struck by car
1914	Struck by 20-ton car
1914	Struck by stockpile shovel
1914	Struck by car
1914	Fall of ground
1916	Dynamite explosion
1916	Dynamite explosion
1916	Dynamite explosion
1916	Dynamite explosion
1917	Dynamite blast in pier tunnel
1917	Dynamite blast in mine
1917	Clothes caught in cable and drew him into engine
1917	Fall of ground

Occurred on same day

Table 3.3: Examples of Accidents at the Sydney Steel Plant between 1910 and 1912
Data Source: Dominion Iron and Steel Company Papers 1893-1980, Steel and Coal Operations, Operations of the General Office: Blast Furnace; Records of Injuries. Dominion Iron and Steel Company
Note: Accidents were not recorded as fatal or non-fatal; Proportion of Newfoundlanders

Examples of Accidents at the Sydney Steel Plant (1910-1917)			
Year	*Occupation*	*Birthplace*	*Type of Accident*
1910	Ladleman	Newfoundland	Foot caught under ladle wheel
1910	Furnaceman	Newfoundland	Stepped in hot slag
1910	Rigger	Newfoundland	Climbing up on #2 bridge, run against electric wire
1910	Blacksmith	Canada	While cutting bar of iron, sliver went into his finger
1910	Pumpman	Canada	Fell off #1 engine, cut face
1910	Helper	Newfoundland	Burn while running iron
1910	Cleaning stoves	Barbados	Cleaning stoves, hot valve fell on his head and arm
1910	Ladle cleaner	Newfoundland	Burnt neck with hot cinder from ladle
1910	Scale carpenter	Italy	Fell off car hurt his knee
1910	Helper	Canada	While getting away from explosion of iron, fell and hurt his knee
1911	Rigger	Newfoundland	Finger smashed
1911	Helper	Canada	Burnt while tapping furnace for cast
1911	Engineer	Newfoundland	Hand burnt from flame of boiler
1911	Blaster	Newfoundland	Struck on eye while blasting
1911	Keeper	Newfoundland	Burnt on arm while stopping tapping
1911	Ladleman	Newfoundland	Neck burnt by splash of cinder
1911	Machinist	Canada	Working top furnace, got gased
1911	Helper	Canada	Burnt while drilling out tapping hole
1911	Monkey man	Russia	Eye burnt while flushing
1911	Craneman	Newfoundland	Passing stoves, gas blew out causing him to run into gooseneck
1912	Helper	Newfoundland	Struck on feet with crane handle
1912	Rigger	Newfoundland	Piece of steel in his eye
1912	Foreman	Newfoundland	Got his lung strained
1912	Binman	Newfoundland	Hit on ribs with bar while pinching a car off of a car
1912	Foreman	Newfoundland	Fingers smashed while loading scrap
1912	Foreman	Newfoundland	Burnt with gas while working top furnace
1912	Blower	Newfoundland	Got poking bar stuck in his leg
1912	Rigger	Newfoundland	Jaw injured with bar
1912	Ladleman	Newfoundland	Got his hand crushed in ladle
1912	Keeper	Barbados	Hit on mouth with hammer, lips split open

Chapter 4: Community History and Context

The Company Town

It has been said that the geological fixity of mineral resources encourages migration to areas where resources are located (Bulmer, 1975). Minerals are often in isolated areas, but in other instances can be found where populations already reside, thus creating an influx of migrants into an area and adding to an already established population. According to Godoy (1985:205), "[t[he physical and social isolation of mining communities coupled with the harsh working conditions and labour requirements of the mining industry, give rise to recurrent patterns of population dynamics, labour recruitment practices, and political organization." Consequently mining is a labour intensive operation (Godoy, 1985). The first and most important requirement of establishing a mining community is the procurement of an ample and reliable supply of inexpensive workers (Godoy, 1985). Once mining commences in an area, the industry typically creates a stratified system of labourers and company officials (Godoy, 1985). As a result, mining changes both the social and political environment as well as the physical environment.

Many aspects of mining communities, such as those mentioned above, contribute to the development of company towns. Company towns are settlements "built and operated by a single business enterprise" (Garner, 1992:3). Over the 1909-1917 study period, Glace Bay, Sydney, and Bell Island were already established company towns. During the early industrial epoch of 1830-1930 company towns became popularized in the Western Hemisphere (Garner, 1992). These towns consisted of a single labour-intensive occupation within the primary work sector (Garner, 1992). These single

occupation towns were typically governed by the owners and operators of the industry in the particular space. Housing, public spaces, and municipalities are all designed in concert with industrial development of the area.

Within this community structure Heyman (1995) argues that every corner of the company town, its civic function as well as the industrial enterprise, are owned and operated by the company. In this sense the company exerts a monopoly over all members of the town. In a typical company-dominated community, the employer or company shareholders own the store, the housing, and often provide government and municipal services such as sanitation and law enforcement (Fishback, 1992). Virtually everything is subordinate to the overarching business enterprise (Garner, 1992). This, in turn, creates a unique relationship between primary labour workers and the company officials and managers. Control over labour and resources remains in the hands of the company owners, creating a hierarchy based solely on work relations. This was especially present in Glace Bay, Sydney, and Bell Island prior to 1920, when labour strikes were unheard of and those who failed to abide to the upper hand officials could quickly find themselves out of work (Mellor, 1983).

Prior to mining and steel operations, Cape Breton County and Bell Island were pre-industrial areas with economies based on fishing and agriculture. Social stratification probably increased in this region following the introduction of mining and steel production. Mining companies, including mangers and miners, were all part of the mining community's social organization in respective order from highest to lowest class (Mellor, 1983; Bulmer, 1975). It is expected that Cape Breton County and Bell Island saw an alteration in social organization with the onset of industrial activities. Coal

mining in Cape Breton has been in operation since the early 1700s.[10] The iron ore mining of Bell Island and the steel industry of Sydney, on the other hand, began operations much later, in the late 1890s and early 1900s respectively.

The economic history of the three study locales of Glace Bay, Sydney, and Bell Island are quite similar. All were defined by their association with coal, steel, or iron. Interestingly, all three were closely connected through the companies that ran them, the Dominion Iron and Steel Company, and the Dominion Coal Company. The interconnectedness of these three single-industry towns creates a setting of similarity but also of difference. All are company-based communities, each being owned and operated by the same companies. All three are defined under the guidelines of what formulates a company town, in that the company owns and operates most if not all the buildings and municipality. For example, Glace Bay had the Company Store that was controlled by the Dominion Coal Company (Mellor, 1983). Another example is provided by the municipal government of Bell Island, which was run by the managers of the iron ore mines (Martin, 1983). Finally, Sydney's first hospital was built by the Steel Company (Burchell Family Fonds, 1912). The major difference between the three communities is the resources upon which each was based: Sydney producing steel, Glace Bay mining coal, and Bell Island mining iron ore.

[10] Miners' Museum, History of Mining. Last accessed: 07-09-21
http://www.minersmuseum.com/history_of_mining.htm

Defining the Three Locales

Glace Bay and Sydney

Cape Breton Island is situated in the Gulf of the St. Lawrence River and is located at the northern tip of Nova Scotia. The island is currently connected to mainland Canada via the Canso Causeway that was established in 1952. Cape Breton was an established fishing ground, however other economic aspects were also considered important in its economic history. Forestry, mining, and agriculture were also deemed important features of Cape Breton and Nova Scotia more generally (Saunders, 1932).

Glace Bay and Sydney are situated on the northeast coast of Cape Breton Island, at its closest point to the southwest coast of Newfoundland (see Figure 4.1). Both communities are connected to the large coal deposit known as the Sydney Coalfield in the Cape Breton County region of Nova Scotia (Frank, 1981; Millward, 1993). The eastern side of the island was considered the industrial hub as it was characterized by many historic coal towns that shaped the social history and culture of the area (Davey & MacKinnon, 2001). Many historic coal towns were dotted along the coast of the Sydney Coalfield. Glace Bay in the first half of the 20th century was the largest coal town in Cape Breton. Sydney was much smaller but, with the introduction of a steel plant in 1901, Sydney quickly rose in importance and eventually outgrew Glace Bay.

Bell Island

Newfoundland is the most easterly point in North America and is located in the North Atlantic Ocean. The island was settled on the strengths of its extensive fishing grounds and the population grew on that factor alone. In the early days of settlement in

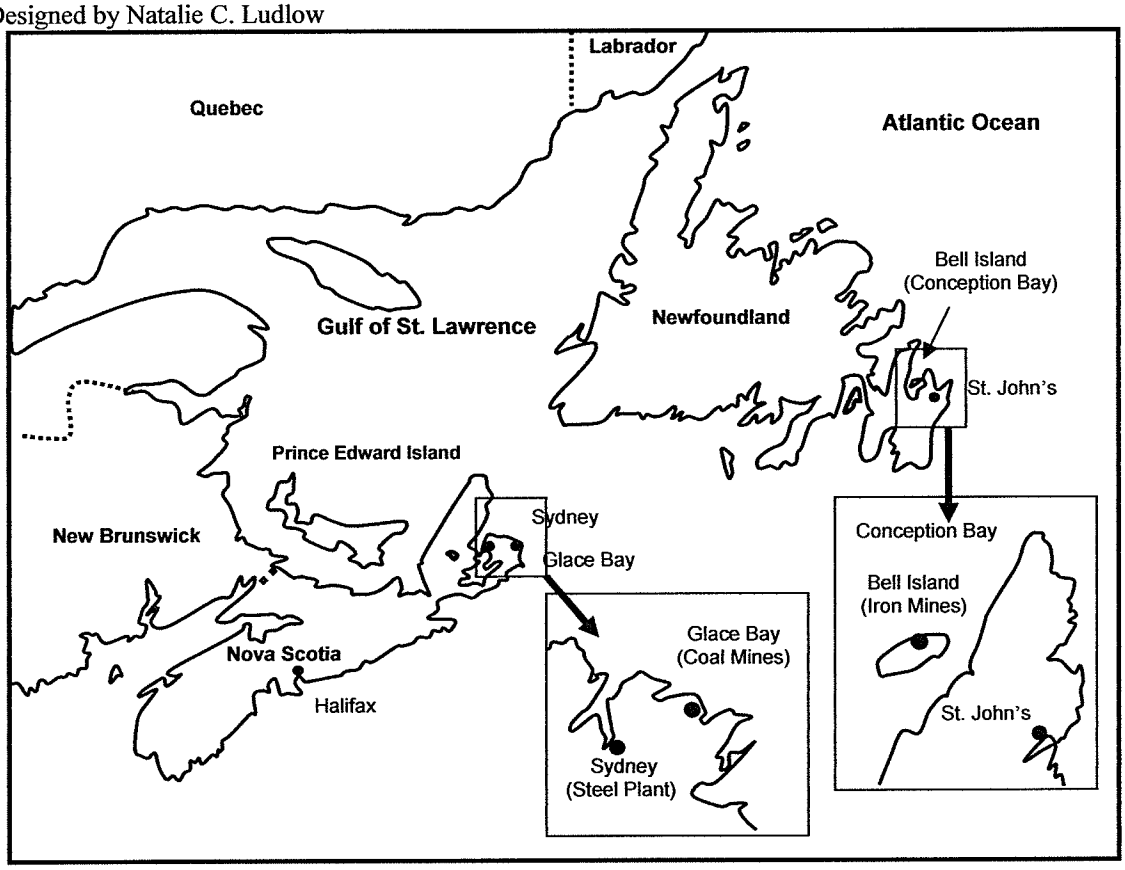
the New Land, Newfoundland was seen as a type of 'half-way house' between Europe and America (Saunders, 1939:62). The increase in population in the early history of Newfoundland is attributed to the fishery; in 1716 the population in Newfoundland was 3,295, but rose quickly to 10, 949 by 1774 (Saunders, 1939). Newfoundland was viewed as a trade post and was occupied mainly by merchants and fishermen who "...established England's oldest overseas colony" (Saunders, 1939:73). Thus the fishery was the staple of the island's subsistence and market and therefore is of the utmost importance in the economic history of the country.

Bell Island, Newfoundland is positioned on the eastern coast of Newfoundland (see Figure 4.1). It is located along the Avalon Peninsula within Conception Bay. Bell Island's social history and culture is also influenced by the industrial prospects of iron ore that built the communities that remain on the island today. Wabana began as a small mining camp, but quickly developed into the largest town on the small island. Bell Island was first settled with small fishing communities, but mining soon rose to the forefront as many families that were living in Lance Cove, Freshwater, and Beach Cove moved from their homes to Wabana (or 'The Mines', as it was known in the early era of its development).

Political Economy/Demography

The monopoly over resources among various companies in the Cape Breton area had a direct impact on the political economy of Glace Bay and Sydney. The Sydney Coalfield spanned 30 miles or 200 square miles on the north-eastern shore of Cape Breton and was bounded on three sides by salt water (Frank, 1979; Whitbeck, 1914). In

Figure 4.1: Map of Three Study Locales: Sydney, Glace Bay, and Bell Island, and Their Respective Industries Map of Three Locales.
Designed by Natalie C. Ludlow



Glace Bay, coal mining was located along the shore, but there were also submerged deposits under the sea along the coastline that were mined (Whitbeck, 1914). Similar to Glace Bay, Bell Island had a large submerged deposit of iron ore (Martin, 1983; Frank, 1979). In fact, most of the iron ore mined in and around Bell Island was submerged mining, which greatly increased dangers in the work environment. Cape Breton was the earliest mining area extensively exploited in North America, as the first mine was established in 1720 (Millward, 1993). According to Millward (1993:67) it was the "...most thoroughly developed Canadian Coalfield in terms of both capital and human resources employed." Eventually the Cape Breton Coalfields would grow into one of the Canadian economy's main industrial enterprises.

A major growth period for the economy and population of Cape Breton occurred between the 1890s and 1910s (Frank, 1981). The Sydney Coalfield was Canada's major producer of coal for over two centuries, representing a third of all of Canada's annual production (Millward, 1985). Coal built communities and drew new migrants to the area, while the building of the steel and coke mills in Sydney quickly transformed this once small town into a bustling urban centre. Bell Island's iron ore mining began production in 1894 and, like Cape Breton County, an immediate population growth followed (Smallwood & Pitt, 1967).

Recruitment of workers from Newfoundland, England, Ireland, Scotland and Wales occurred during the industrial boom at the turn of the century and created a population influx, particularly in Cape Breton County (Mellor, 1983). The recruitment system in Canada at this time favoured British Europeans over their non-English speaking counterparts and thus the Immigration Act was created in favour of British

Europeans (Avery, 1979). Most immigrants to Glace Bay lacked housing, so companies built boarding houses and duplexes to accommodate the daily arrival of hundreds of men (Mellor, 1983). Bell Island experienced a similar influx in population as The Mines became an established town soon after its development and quickly became the largest community on the island (Martin, 1983). Most migration to Bell Island occurred within Newfoundland, as Newfoundlanders left fishing outports to work in the prosperous mining industry (Crawley, 1988), which arguably was only prosperous for mining officials and not the miners.

At one point in time, the population of Glace Bay doubled that of Sydney (Mellor, 1983). In 1901 the population of Glace Bay was 14,967 which grew to 27, 245 by 1911 (Frank, 1979). Sydney, on the other hand, was considered a "sleepy little town" prior to the construction of the iron and steel plants (Heron, 1988:19). With the introduction of the iron and steel plants the population of Sydney exploded. In 1891 Sydney's population was 2,427 which grew to 9,909 in 1901 and hit 17,728 by 1911 (Heron, 1988). Sydney's population growth pattern was an "...abrupt explosion at the turn of the century, as the quiet port was suddenly transformed by a construction boom and a flood of new workers for the huge steel plant" (Heron, 1988:31). The population of Bell Island also rose with the onset of mining in the area and, like Cape Breton County, the small fishing and farming outports soon grew into industrial company-owned communities (Martin, 1983). Bell Island's population in 1890 was 709 and rose to 1320 by 1901 and increased to 3584 in 1911 (Census of Newfoundland, 1881, 1901, 1911).

As a result of this population growth, the coal and steel company communities in Cape Breton and the iron ore company community on Bell Island developed into sizeable

towns. Through the years, over seventy mines emerged along the Sydney coal seam, many of which came under the ownership of the Dominion Coal Company and were located within the vicinity of Glace Bay (Millward, 1985; Mellor, 1983). Glace Bay itself was the largest coal town in Cape Breton County (Frank, 1981). Originally a number of small communities, Glace Bay amalgamated into a town under the Dominion Coal Company's control (Mellor, 1983) and became the core of coal mining productivity in Nova Scotia, often nicknamed 'king coal' (Department of Mines, Nova Scotia, 1882, Mellor, 1983). Sydney also grew immensely owing to the development of the steel and coke plants which increased employment opportunities in the town (Mellor, 1983). Such alteration in the area began mainly in the 1880s when the island, particularly on the north-eastern side, was transformed by manufacturing activities (Farnham, 1886). Unlike the pre-existing (but growing) communities in Nova Scotia, The Mines (later renamed Wabana) on Bell Island, Newfoundland was built and located intentionally in proximity to the iron ore collieries.

The Companies Involved

Before the 1870s the Sydney Coalfield was under Imperial policy and restrictions (Frank, 1979), meaning that the government owned and operated the coal industry. From the 1870s to 1895 the mine collieries were independently owned by numerous small companies (Millward, 1993; Frank, 1979). In 1895 many of these small companies merged into the Dominion Coal Company (Frank, 1979; Frank 1981; Millward, 1985; Millward 1993; MacGillivary, 1979). From then onward the remaining companies, the Dominion Coal Company and the General Mining Association faced a "survival of the

fittest" tactic (Frank, 1979:21). Another company that had well established roots in Nova Scotia was the Nova Scotia Iron and Steel Company. Nova Scotia Iron and Steel operated outside of the Sydney Coalfield until its amalgamation with the General Mining Association in 1900 (Millward, 1993). As with Glace Bay and Sydney, The Mines, Bell Island was a company town. The iron ore mined on Bell Island was sold and shipped to the steel plants in Sydney which was owned and operated by the Dominion Iron and Steel Company (Frank, 1979), therefore creating an obvious and direct connection between these two study locales. When mining first commenced it was owned and operated by the Wabana Mining Company, but within a year of operations it was quickly signed over to the Nova Scotia Steel and Iron Company, who then sold half of the deposit to the Dominion Iron and Steel Company (Martin, 1983; Heron, 1988, Cantley, 1911), once again tangibly linking the communities considered in this study.

The Dominion Coal Company dominated the industry in Cape Breton, but co-existed with the Nova Scotia Steel Company operating different coal seams along the Sydney Coalfield. The Dominion Coal Company signed a 99-year lease in 1893 with the government of Nova Scotia for rights to a vast portion of the coalfield (Lamely, 1996; Millward, 1993; MacGillivary, 1979). According to Mellor (1985:2), "...in one swift stroke of the pen, the enormous natural resources of Cape Breton had been confiscated from the citizens and handed over to an international consortium of doubtful reputation." The lease allowed the Dominion Coal Company to acquire control of "all existing operations in the Sydney Coalfield", except the General Mining Associations holdings (Frank, 1979:22).

The Dominion Coal Company was established by Henry Melville Whitney, who also established the Dominion Iron and Steel Company in 1899 in Sydney (MacGillivary, 1979). Whitney was a businessman from the United States who greatly influenced the industrial development of Cape Breton (MacGillivary, 1979). Though both companies were formed to 'make money', considerable revenue was also spent on upgrades for the towns and to increase production in the mines (MacGillivary, 1979; Frank, 1979). The Dominion Coal Company was often criticized for having officials with little or no knowledge of coal mining, and extravagant expenditures (MacGillivary, 1979). The steel plant in Sydney apparently also lacked any significant monetary spending on the health and safety of its workers, instead focusing more on production gain and less on improvements for its workers. As with the coalfields and collieries, more extravagant spending went towards the building of the steel and coke plants (Frank, 1979). Expenditures included improved transportation systems, endless hauling ropes, undercutting machines, larger coal wagons, additional piers, shipping facilities and a coal washing plant (MacGillivary, 1979; Frank, 1979). Ports were upgraded, employment increased and mines became modernized (Mellor, 1983). These improvements were primarily aimed at increasing efficiency in mining production (time and energy) (Frank, 1979; MacGillivary, 1979; Mellor, 1983), and not necessarily on improving working conditions, therefore more workers, less skill, and longer hours would impact on the overall health issues for both miners and steel plant workers alike.

Nowhere in the literature is there any mention of expenses reported for improved safety in the collieries. It appears that profit and production were the focus of monetary spending rather than safety. Working conditions in the mines and wages for the miners

were considered deplorable, a situation which apparently deteriorated even more with the amalgamation of the Dominion Coal Company in Cape Breton County (Mellor, 1983). The mining and steel industry had an enormous social and economic impact but the industry was not stable and working conditions were harsh (Alexander, 1978).

It is important to note that the dynamics of population increase were directly related to the industrial growth of these three areas. Health risks most likely changed with the influx of people from far and near, and the type of employment opportunities available. The steel mill notably hired less skilled workers to work jobs that required skill (Heron, 1988). The term 'skill' was less classifiable during the early twentieth century than today. Skill in this sense often refers to an individual who has knowledge of their performed task and not necessarily educational background (Heron, 1988; Avery, 1979). Newfoundlanders and British migrants were brought in to work the "dirty jobs" in the steel plant that Nova Scotians and Americans would not work (Avery, 1979:67; Heron, 1988). Less skilled workers in the steel plants, including Cape Bretoners, Newfoundlanders, and British labourers, created a work environment where mistakes and confusion was common (Heron, 1988). Mistakes and confusion in dangerous, harsh and deplorable working conditions could yield a large portion of accidents.

Work in the Glace Bay mines operated on a 24 hour shift basis for six days a week throughout the year (Mellor, 1983). The steel plant in Sydney created jobs for thousands of workers. These workers were hired to work 12-14 hour days for 6 or 7 days a week (Mellor, 1983). Bell Island's conditions were similar, with miners working long hours underneath the ocean floor (Martin, 1983; Cantley, 1911). Such long work days/weeks may have created an atmosphere where accidents were frequent. As the town

of Glace Bay became established St. Joseph's Hospital was built.[11] Police and firefighters were also introduced, as well as the company store (all, of course, owned and operated by the Dominion Coal Company) (Mellor, 1983). Sydney was also established as a company town, so once again the Brookland Street Hospital and other municipal services were owned and operated by the Dominion Iron and Steel Company (Frank, 1979).[12] Workplace accidents were one important reason for the building of hospitals in both Glace Bay and Sydney, since both hospitals were built in close proximity to the industrial sectors of the communities. Bell Island also became a unified company town as the labour market and municipality was governed by Nova Scotia Steel and Iron Company (Martin, 1983), however a hospital was never established. For Bell Island iron ore miners, the closest hospital was in St. John's, which today would be a 20-mintue ferry ride plus a trek of approximately 15 kilometres.

The Dominion Coal Company, the Dominion Iron and Steel Company, and the Nova Scotia Iron and Steel all exerted economic power over employees and controlled the local labour market (Frank, 1981, Martin, 1983). This monopoly over resources exerted by these three companies is the reason for the inter-connectedness between Glace Bay, Sydney, and Bell Island, and the unification of the entire industry in Cape Breton and Bell Island. The close proximity of Bell Island to Cape Breton enabled Nova Scotia Iron and Steel Company's and Dominion Iron and Steel Company's iron ore operations to have the upper hand in relation to retailing its product to the Dominion Iron and Steel Company's plants in Sydney.

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[11] Beaton Institute, University College of Cape Breton. Last accessed: 07-09-21 http://beaton.capebretonu.ca/historical-links.php

[12] Beaton Institute, University College of Cape Breton. Last accessed: 07-09-21 http://beaton.capebretonu.ca/historical-links.php

The close proximity of coal and steel production created an industrial capital for the Canadian economy (Frank, 1979), thus the coal from Glace Bay used for steel production in Sydney was supplied cheaply to the steel plant. Iron ore from Bell Island was fairly close and the concentration of companies created a monopoly for the Dominion Coal, the Dominion Iron and Steel, and the Nova Scotia Iron and Steel companies. Heron (1988:166) suggests that "[n]owhere in Canada were mass-production factories and coal-mining communities close enough to create this particular working-class community" as found amongst the Cape Bretoners of the Sydney Coalfield. Steel workers and coal miners alike strengthened their connections within the communities and, by the 1920s, helped to end the control placed upon them by the large hovering companies (Frank, 1981). As a result, this comparative study of three locales is situated in a setting with similar geographical foundations and economic/industrial influences.

Public Health

In the early 1900s, Glace Bay was a boom centre for coal mining in Canada. Nevertheless, as the population grew with daily arrivals of workers, Glace Bay encountered problems with housing, sanitation, and water supply. The influx in Sydney's population created a situation were sanitation and public health were major concerns for the growing community. Such concerns were routinely reported in the Annual Reports for the City of Sydney.[13] Bell Island, Newfoundland also experienced many inadequacies in general public health and sanitary measures. The island as a whole was run by two companies, the Nova Scotia Steel Corporation and the Dominion Iron and Steel

[13] Information for Sydney is abstracted from annual reports for the years 1900 and 1917, other yearly reports for Sydney could not be located.

Company. The number of labourers needed to produce infrastructure for public health was scarce. Letters from the municipal council of Bell Island note such unsatisfactory living conditions (NSSCCo., 1910; Harris, 1911; Dover, 1912; Power, 1912; Bell Island Municipal Council, 1912; Department of Public Health, 1913; Hughes & Cramm, 1920).

Housing

Housing shortages can have drastic effects on the public health of any community. Overcrowding in homes and the building of improper structures, especially in the early 20th century, created areas where disease could proliferate. Rapid migration to communities will result in housing issues, especially when there are not enough homes to house the increasing population. All three communities, Glace Bay, Sydney, and Bell Island, saw notable increases in population during the early 1900s due to the industrial enterprises that brought groups of people to these areas.

In the early years of extensive mining operations, 1909-1917, Glace Bay encountered serious shortages in housing and other forms of accommodations (Mellor, 1983). Although there is no discussion on shack living in the Annual Reports for the town of Glace Bay, it has been noted by Mellor (1983) that Glace Bay, like Sydney and Bell Island, did have a number of men living in poorly constructed homes. Living conditions in Glace Bay in 1909 were considered "abnormal" and many people lived in an overcrowded state that increased exposure to infectious diseases prevalent at that time (McDonald, 1909). In 1915, the Medical Health Inspector for the Town of Glace Bay reported that in some parts of the town, houses were crowded into small areas, with each home housing a large population (Green, 1916). These houses were overcrowded with

extended families and friends, and in some cases accommodated up to 20 people in a small miner's house (Mellor, 1983). Due to the population boom in 1900, the Dominion Coal Company quickly provided contracts to build a thousand double miners' houses; but with men arriving by the hundreds daily, homemade shanties were built by people who otherwise would have no place to live (Mellor, 1983). Boarding houses were built for men, but even the beds had to be shared by two men, one working the day shift and the other working the night shift (Mellor, 1983).

In Sydney, shacks were prevalent in 1909, and like Glace Bay and Bell Island, were necessary due to the influx of people without appropriate accommodations for the growing populace. Medical Officer JK McLeod of Sydney presented concerns over shacks in his 1909 report, stating that "[s]hacks, unless connected with sewer and water and the inmates limited to a certain number, should not be allowed" (McLeod, 1909:22). Shacks were deemed unsanitary due to the lack of sewer connections and the overcrowded populace that occupied them.

In 1910, four items were targeted as important matters for Bell Island: housing, water supply, refuse disposal and the need for a hospital. Housing on Bell Island was in high demand. Only seventeen miners' houses were built in 1910, resulting in a reliance on shacks (NSSCCo., 1910). Shacks were not favoured by the municipal council, but such disapproval was met with opposition from the residents (NSSCCo., 1910). Since these men had nowhere else to live, and the companies were not building homes fast enough to accommodate the influx of workers, the end result was the building of shacks and poor overcrowded housing. Problems continued into 1912, as D.H. Dover (1912),

Municipal Council for Bell Island, wrote to the Minister of Justice about a lack of sufficient housing on the island.

Shortages in housing were combined with further sanitary problems involving the water supply, refuse disposal, and sewage disposal for all three communities. Houses in colliery towns like Glace Bay typically lacked provisions for house drainage (Green, 1914). For the most part, once enough houses were built in Glace Bay, the homemade shanties made of tar paper and rough boards slowly dispersed to the outer areas of the town (Mellor, 1983). Up to and including 1917, however, shacks remained a part of Sydney's landscape, as housing remained an issue for the city. Dr. MacAulay (1917), Sydney's Medical Examiner, expressed concerns over the presence of shacks, arguing it was necessary to get rid of all shacks as they were troublesome to the public health of Sydney. Housing also remained a problem on Bell Island. Even by 1920, dwellings at the mines were congested and considered a menace to the public health of Bell Island (Hughes & Cramm, 1920). No investments pertaining to regulating sanitation were made, and any attempts for improvements on Bell Island remained fruitless (Hughes & Cramm, 1920).

Water Supply

Inadequate water supplies created extensive problems for many communities at the turn of the 20th century. Shortages in water supply can create seasonal mortality patterns. Drought periods cause shortages of water, resulting in individuals relying on less regulated water supplies. The development of wells can also affect the public health of a community. If wells are not properly built, infectious agents can get into the water

supply. For example improper sewerage disposal can seep into wells increasing the risk for diseases such as typhoid fever and cholera.

Typhoid fever was present in Glace Bay, but due to a consistent water supply in the area, individuals did not have to resort to water of less quality, as a result this infectious agent declined between 1908 and 1909. The decline in typhoid fever from 1908 to 1909 was attributed to a marked reduction in well water use because of an adequate supply of water even in the dry summer months (McDonald, 1909). Typhoid fever is a good indicator of unsanitary conditions in a community, because outbreaks of the disease are caused by sewer contamination of water and food supplies. The presence of typhoid fever in Glace Bay, however, suggests the town did have problems related to the town's public health measures. McDonald (1909:19) makes a clear connection between water supply and sewerage by stating that "...sewerage is finding its way into food or drink of inhabitants. The proper disposal of sewerage, the preservation of an uncontaminated water supply is therefore of importance." Water supply in Glace Bay was considered good, but without a proper sewerage system, these benefits of water were masked (McDonald, 1909).

Sydney's water supply in 1909 was noted by Dr. McLeod (1909), Medical Officer, to be of good condition, which aided in producing better milk, in turn decreasing cases of cholera infantum (a form of gastroenteritis occurring in infants, caused by unsanitary measures, also known as summer complaint). At that time, McLeod (1909) suggested that all surface wells within city limits should be closed and houses, where possible, should be connected to the city's water service. In 1909, $4519.59 was expended for new water mains throughout Sydney (Campbell, 1909). The bulk of the

work establishing water connections to houses was undertaken in 1909 (Campbell, 1909). The quality of water seemed to depend on location. Houses located in "dead ends" often received poorer quality water than other residents, owing to a lack of circulation resulting stagnant water (Campbell, 1909). Storm water was another problem faced by the city of Sydney, as overflowing house sewers would fill the cellars of properties and their adjoining neighbour's cellars (City Engineer, 1917). This led to the construction of storm sewers throughout Sydney (City Engineer, 1917). The overflowing sewers likely had adverse health effects for the residents of these homes.

Water supply on Bell Island was also a major problem for the increasing populace. For Bell Islander's it was an issue of water shortages due to the lack of a good water source on the small island. The inevitable need for a pure clean water supply was a common concern for Bell Islander's. Living on a small island without large deposits of fresh water added to this concern. In 1910 boreing operations began, providing successful results for larger sources of fresh water (NSSCCo., 1910), however this success of locating a good clean water supply is questionable, as many problems appeared in subsequent years. In 1911, the Secretary of the Bell Island Municipal Council, James Harris (1911), wrote that the population on the island was increasing and that the water supply and sewerage system were at that point the most urgent concern. There are no lakes, ponds or watersheds of any extent on the island (Harris, 1911). The lack of a water supply added pressure on the population, especially as the population was increasing consistently. In 1912, water supply and sanitary measures were still a major concern on the island. D.H. Dover (1912) wrote to the Minister of Justice, expressing concern over a good water supply and the necessity of wells as the supply of water was

often short. Shortage of water can lead to use of water that lacks quality. Wells can become contaminated, especially if sewage and refuse disposal is inadequate (Sawchuk & Burke, 2000).

Sewerage Disposal/Refuse Disposal

Sewerage disposal, or the lack thereof, creates problems related to water supply and, in turn, public health. Improper sewerage systems presented problems for residents of Glace Bay and Sydney. There is a lack of information regarding sewerage disposal on Bell Island, but there were concerns facing the disposal of refuse.

The sewerage system of Glace Bay in 1909 was deemed "un-modern" and "putting the town in great disadvantage" (McDonald, 1909:19), again having major effects on the water supply. Even in parts of the town with proper sewers, some homeowners failed to connect their homes to the sewers (McDonald, 1909). Along with the failed attempt to connect sewer lines to homes, drainage systems were inadequate allowing fecal matter to spread over large areas throughout the town (McDonald, 1909). Outhouses also dotted Glace Bay, spreading disease and infection throughout (McDonald, 1909). Further evidence of poor sewerage handling is provided by the observation of cholera infantum. According to Green (1914), cholera infantum was the leading cause of death in 1914. This was attributed to the unsanitary nature of the town with its surface closets (outhouses, privies), heaps of manure, piles of refuse, and pools of stagnant water (Green, 1914). Privies were considered dangerous to the health of Glace Bay, and obviously presented a problem for the overall community (Green, 1914). According to Green (1914), the majority of all deaths occurred in the parts of the town

that lacked sewers. Sanitary conditions were deemed most inadequate in districts where collieries were present (Green, 1914), likely due to rapid population increase and the difficulties in accommodating such an increase. The unkempt manner of cattle and horses was also noted, and that the colliery towns, in particular, lacked satisfactory cleaning of these animals (Green, 1914).

Sydney's sanitary regulations were being acknowledged and introduced in 1909, but were far from adequate. More and more houses were being connected to sewers and new sewer mains were being laid on several streets (McLeod, 1909). With respect to infectious diseases, all but one case of typhoid fever were reported from houses not connected to sewer lines (McLeod, 1909; Curry, 1909). In 1909, "...391 loads of night soil [were] removed and 37 cesspools cleaned" (Curry, 1909:23). The collection of night soil is a form of manual labour, and clearly suggests the wanting state of sanitary improvements. Night soil refers to human excrement and, prior to modern sewage systems, individuals would have collected night soil from homes at night while people were sleeping (Davies, 2005). Cesspools were large cisterns that held human waste and often had to be emptied and cleaned. Occupations that work directly with human waste can add to rates of infectious disease and the contamination of food, depending on the quality of hygiene practiced. At this point, sewer lines were being laid, but there were still poor measures in place for the collection and disposal of waste. Typhoid fever had a marked decrease from 1916 to 1917; however complaints were made against poorer class families on the state of their toilets and sinks (MacAuley, 1917).

While attempts to get sewer systems established were important for Sydney's sanitary regime, little is discussed about Sydney's methods for garbage disposal. Sydney

did, however, have a dumping ground for waste removal. In 1909, 4980 loads of garbage were removed from the city to this dumping ground (Curry, 1909). While garbage was being removed, animals were still kept within city limits creating further insults to the city's public health. McLeod (1909) suggested that all hogs be removed from the limits of the city; Curry (1909) discusses the removal of animal carcasses from the city. No discussion of animals within city limits is presented in the 1917 annual report for Sydney.

Sewage, likely a concern, was not a major topic of interest in the correspondence between the Prime Minister and the Municipal Council of Bell Island. In 1911 it was stated that the population was increasing and that there was an urgent need for a sewage system on the island; in 1912 it was under the control of the council (Harris, 1911; Power, 1912). Excrement removal around company houses was a problem that needed enforcement (NSSCCo., 1910). The problems with the disposal of refuse or garbage were discussed more frequently in the correspondence reports. Refuse disposal was the responsibility of the companies that had interests in the community/industrial development of the area. The proper disposal of refuse, like the previous concerns of housing and water supply, was a persistent issue for the population of Bell Island. In a letter written by the Nova Scotia Steel Company (NSSCCo., 1910) to the Colonial Secretary R. Watson in 1910, listed proper refuse removal as an item of importance for Bell Island and the letter requested that the company be required to commence proper disposal of garbage, as well as cleaning and sanitation throughout the company's district. According to D.H Dover (1912), the Dominion Iron and Steel Company, on Bell Island, disposed of its refuse properly, dumping refuse as far from the community and as close to

the cliffs as possible. Nova Scotia Steel and Coal Company, on the other hand, had no such arrangement in place to rid Bell Island of its refuse (Dover, 1912).

Overall, all three communities appear to have had problems with sewage and refuse management. Bell Island appeared to experience poor methods for garbage removal, as there was conflict between the two companies (the Dominions Iron and Steel and the Nova Scotia Steel). Sydney and Glace Bay were much larger communities, and sewer management was an apparent issue during the early 20th century. Thus, health risks associated with poor management of sewer, garbage and water would have poised a threat to all persons living in the three locales.

Hospital Care

The presence of a hospital can provide better diagnosis of illness and supply emergency care that may result in fewer deaths in a population. Thus the presence of a hospital can change observed patterns in causes of death in a community. On the other hand, a hospital can also add to health problems in a community. Hospitals often bring sick people to a community from outlying areas therefore possibly manipulating the spread of disease. The lack of a hospital may result in improper diagnosis of cause of death, especially where a doctor is not present. More unnecessary deaths can occur if there is no hospital close-by. Thus the presence of a hospital in the historic period can influence the health of a population.

Annual reports for Glace Bay did not mention the hospital in the town. But, as previously mentioned, St. Joseph's Hospital was present during the study period.[14] St.

[14] Beaton Institute, University College of Cape Breton. Last accessed: 07-09-21 http://beaton.capebretonu.ca/historical-links.php

Joseph's Hospital was close to the mines, likely because of the risks involved in coal mining. The hospital was built with the contributions made by thousands of miners (Mellor, 1983).

Sydney also had a hospital that was built for the steel plant. According to the Burchell Family Fonds (1912), the Brookland Street Hospital was built for the steelworkers. It was located next to the steel plant however, since it was the only hospital at this time, it also admitted non-steelworkers (Burchell Family Fonds, 1912). It was noted in 1912 that there was a need to build another hospital to accommodate the growing population (Burchell Family Fonds, 1912). By 1917, Sydney had an Infectious Disease Hospital and a City Hospital. The City Hospital was viewed as technologically adequate in comparison to other hospitals in Nova Scotia; the Infectious Disease Hospital, on the other hand required improvements in its size and technology (MacAuley, 1917).

There was no hospital on Bell Island in 1909, thus any injured or ill person would be sent to St. John's for medical care. Local doctors could provide initial medical care (first aid) to people. Transportation of individuals off of the island to St. John's (nearest hospital) was not an easy task. Roads were considered poor, and demanded immediate attention, however getting workers for road work was difficult as the mining companies had control over all available labour on the island (Harris, 1911). The provision of a suitable hospital on the island remained a concern, as the Government of Newfoundland never considered the building of a hospital on Bell Island (Harris, 1911). The one hospital erected on Bell Island in 1912 was small and only provided first aid (Dover, 1912). Dover (1912), of Bell Island's municipal council, stated that "...if there was to be

a serious accident the party will be taken to the hospital at St. John's, if it is possible to get him there." Essentially the lingering concern over mining accidents was presented to the Prime Minister on several occasions, asking that necessary precautions be made.

In 1912, the first ambulance was requested and placed under the control of the doctor on the island (Bell Island Municipal Council, 1912). The purpose of an ambulance was to convey parties who suffered accidents in the mines to the public wharf for further transport to the hospital in St. John's (Bell Island Municipal Council, 1912). There was an obvious yet unmet concern over miners' well-being. By 1913, the Medical Officer reported the need for Bell Island to have a stationed Medical Officer (Department of Public Health, 1913). Concerns of sickness, health and public welfare, and the need for appropriate heath care measures on the island were growing. It was stated that "...conditions at Bell Island are such that if any real improvement is to be made in the sanitary conditions, constant supervision by the Health Officer will be required" (Department of Public Health, 1913).

By 1920, no suitable hospital was built, nor was an ambulance provided for conveying wounded men to the hospital in St. John's (Hughes & Cramm, 1920). Thus the ten years of requests were not heeded, yet when looking though the number of deaths or injuries related to mining over these years, there was clearly a need for appropriate health care on the island. The long trek to St. John's may have greatly hindered the survival rate of miners, whose injuries may have been minor.

The three locales create a setting that enables comparative research on the mortality patterns of these communities. All three communities were interconnected, were in close proximity to one another, were controlled by similar companies, and all

endured the rigours of early company town life. Each community will be assessed individually to examine similarities and differences in the lives and deaths of male workers in Sydney, Glace Bay, and Bell Island between 1909 and 1917.

Chapter 5: Materials and Methods

Occupation can influence the mortality pattern of a population, especially single-industry communities like Glace Bay, Sydney, and Bell Island, where certain causes of death, like accidental and respiratory causes, may alter the death record. The purpose of this research will be to examine the impact of community occupational profiles on the relative frequencies of accidental versus respiratory causes of death in single-industry communities. The rationale, that certain occupational environments can be hazardous to the health of workers. Age at death will also be considered to assess whether or not younger and less skilled miners and steel workers influenced the overall mortality pattern. Finally, language barriers can present a workplace risk, especially in already dangerous occupations like steel working and mining; an indirect measure of place of birth will be examined with respect to mortality profiles in Glace Bay, Sydney, and Bell Island.

Data for this research was collected in the fall of 2007. Material for Glace Bay and Sydney were similar in form, while data sources for Bell Island differed. These differences are likely due to dissimilarities in federal legislation between Newfoundland and Canada, but may also be simply due to what remains in the archival record. Most mine company documents for Bell Island were destroyed once the mine companies, Nova Scotia Steel and Coal, and Dominion Iron and Steel, closed down operations due to the declining market. Most, if not all, mine and steel company documents for Glace Bay and Sydney have been kept. Information for Glace Bay and Sydney are accessible either through Nova Scotia Archives and Records Management in Halifax or The Beaton

Institute Archives at Cape Breton University. Bell Island archival information was available through The Rooms Archives in St. John's, Newfoundland.

Death Registry Data

Death registry material was available for Glace Bay, Sydney, and Bell Island. It is the chief component for investigating changes in mortality in association with occupation. Data for males aged 15 to 64 between 1909 and 1917 who lived in Glace Bay, Sydney and Bell Island were collected. The time frame of 1909 and 1917 was chosen because it excludes the Spanish influenza pandemic and the First World War. Both of these events could have skewed the data and taken away from the purpose of this particular study; to examine the relationship between occupation and the mortality profile. For example, World War I could have created an influx of individuals who no longer took part in the workforce of these communities. These individuals would present a new occupation, the soldier, which would skew the data. They may have once worked in the coal mines, iron ore mines or the steel plant prior to the war period. The conclusion of the First World War brought with it a new infectious disease that would also distort the purpose of this study. The 1918 influenza epidemic, would take away from work-related causes of deaths, such as accidents. While these restrictions only leave a time frame of eight years, as opposed to a more common ten year study period, it allows for a full examination of the occupational stressors placed on the population at risk

The beginning date of 1909 was chosen due to availability of vital death registry material for all three communities. While Bell Island had vital registry records dating back to the late 1800s, Glace Bay and Sydney did not, again reflecting variation in

legislation between Nova Scotia and Newfoundland. Prior to 1908, Nova Scotia used parish records to register individual deaths in the province, while Newfoundland was using a government based vital registry. In 1908 Nova Scotia switched to a government based vital registry. Using 1909 as the starting point helped to avoid some of the confusion or misreporting that may occur within the first year of the new system.

Research began in Halifax, Nova Scotia at the Nova Scotia Archives and Records Management facility. Death registries for Glace Bay and Sydney were not microfilmed. Instead death registries were in their original form as large ledgers. These ledgers were assembled based on county; transcription was straightforward as Glace Bay and Sydney were both under Cape Breton County. A few cases occurred in which individuals did not reside in either community, but were present in the community. Their presence reflects the existence of hospitals in both Glace Bay and Sydney. Place of residence was a key factor in determining those who did not reside in either Sydney or Glace Bay. Thus those whose place of residence was neither Glace Bay nor Sydney were excluded. The place of residence presented a clear distinction of those who died in the hospitals, but were not residents of either community, from those who were residents of the respective communities.

Bell Island death registry data was collected at The Rooms Archives in St. John's, Newfoundland. The files were microfilmed, but due to changes in districts, deaths for Bell Island were concealed within other communities or districts. For example, most of the data for Bell Island fell under the district of St. John's, while in earlier years data fell under the Harbour Main district. Thus death registry information for Bell Island had to be sifted out from the other communities within each district. Using birthplace, place of

death, place of internment, and occupation as indicators for residence on the island, it was possible to determine who lived on Bell Island and who lived in other nearby communities.

Variables transcribed/collected for the cohort (males 15-64 years of age) were: date of death, age, occupation, marital status, birthplace, cause of death, and religion (Table 5.1). These variables were then inputted and coded, using the *Statistical Package for the Social Sciences Version 16.0* (SPSS). SPSS enabled statistical analyses to be performed for this particular study. The first step was in coding the data. Data were coded for age, occupation, birth place, and cause of death, as these will be significant in the final analysis. Other variables such as marital status and religion, although not relevant to the research focus, could be used for comparison to the census material.

Age

Coding age groups in the death registry is important in many ways. It is vital in the construction of age-specific mortality rates, investigating the relationship between age and cause of death, as well as examining the association between age and occupation in the death record. Thus age for working class males aged 15-64 was classified based on a common format of five years, being identical to how living age groups are commonly produced for population pyramids. Working with the specific cohort, age groups are: 15-19 years, 20-24 years, 25-29 years, 30-34 years, 35-39 years, 40-44 years, 45-49 years, 50-54 years, 55-59 years, and 60-64 years. Due to small sample size these ages were then regrouped as 'younger working age' (15-29 years), 'middle working age' (30-49 years) and 'older working age' (50-64 years). Using this form of classification provides

both a physical and social rationale, especially when investigating the death record. Socially, by organizing age in this manner, an assessment of who was dying young and who was dying old can be made. This classification can be used to assess common causes of death found in younger, middle, and/or older age groups, and also how age may factor into occupational positions and birthplace, all of which help build the case for what was occurring in these three locales.

Birthplace

Birthplace is extremely important in evaluating the migration patterns of individuals. Analyzing patterns in mortality with respect to birthplace can show interesting features of the deceased population, thus age at death and cause of death may reflect problems associated with larges influxes of people into a community. Due to a low frequency of deaths and a low frequency of immigration, Bell Island will be left out of this analysis, but can be used as a comparative measure to decipher patterns of death in Glace Bay and Sydney (Figure 5.1, 5.2 & 5.3).

Birthplace was coded based on the origins of individuals moving to Glace Bay or Sydney (Table 5.2), and further coded to account for small sample sizes. As a result, birthplace was grouped as: Nova Scotia-born, Newfoundland-born, born in English-speaking countries (Canada, United States, and United Kingdom), and born in non-English speaking countries ('Other Europe', 'Other America', and 'Other'); ill-defined were removed from analysis. Compared to the living population, evaluating birthplace can provide information where individuals were moving from, and how this modifies the

Table 5.1: Variables Transcribed from the Death Registry

Variables Transcribed From the Death Registry	
Variable	**Relevance to Research**
Date of Death	Used to establish year of death
Age at Death	Young, middle, and older working age death patterns, occupational patterns
Occupation	Examine where most men worked, whether occupation reflects the mortality pattern, age at death, and immigration patterns
Marital Status	Observe whether males who died were single, married or widowed
Birthplace	Examine mortality patterns of different groups and their occupation patterns, working age patterns, and cause of death patterns
Cause of Death	Establish patterns of cause of death with other variables, especially age at death, occupation and birthplace
Religion	Can be used to observe religious patterns: e.g. more Roman Catholics in the death record than other groups, whether certain religious groups worked in certain occupations moreover than other groups

Figure 5.1: Major Places of Birth in the Sydney 1909-1917 Death Registries: Males 15-64 Years of Age

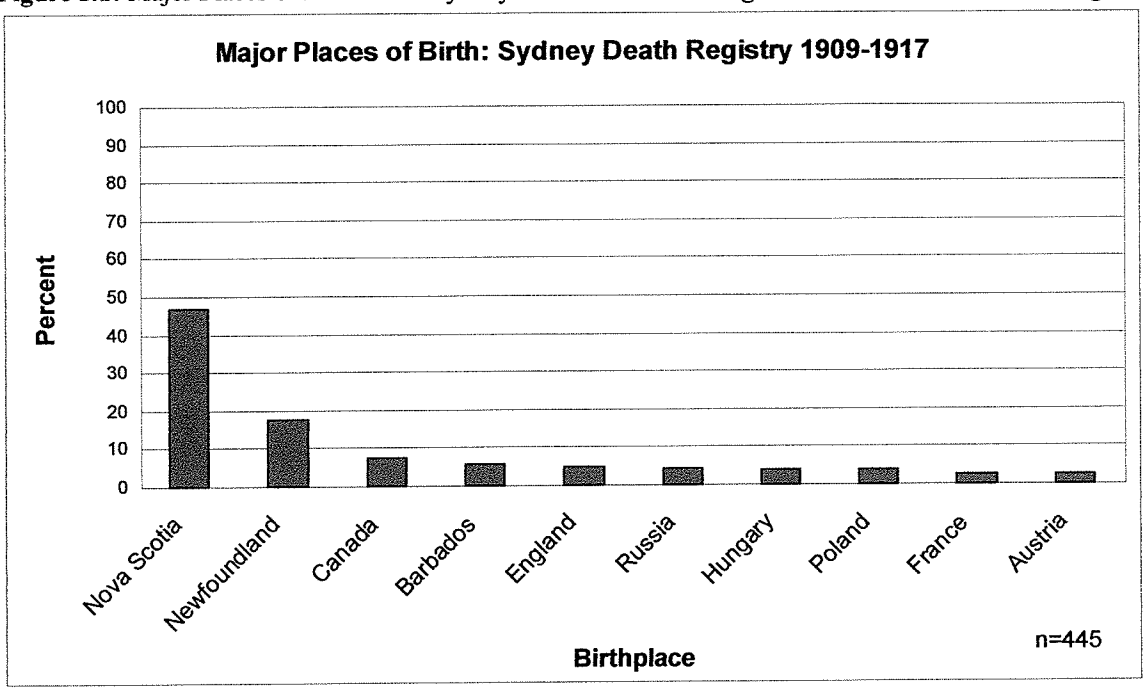


Figure 5.2: Major Places of Birth in the Glace Bay 1909-1917 Death Registries: Males 15-64 Years of Age

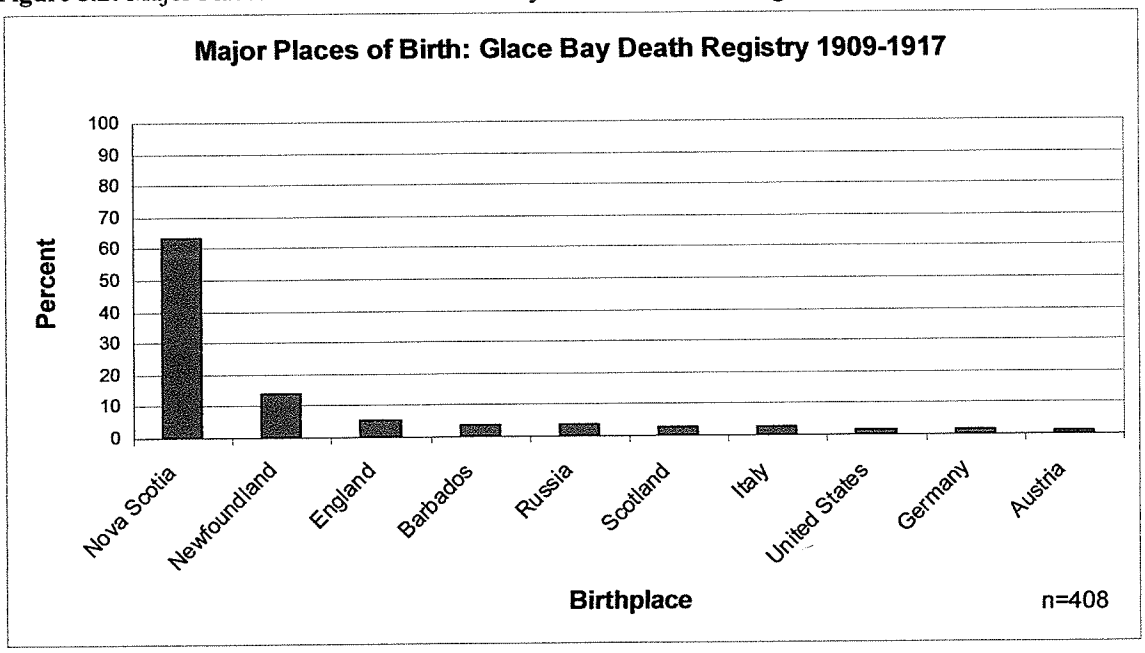


Figure 5.3: Major Places of Birth in the Bell Island 1909-1917 Death Registries: Males 15-64 Years of Age

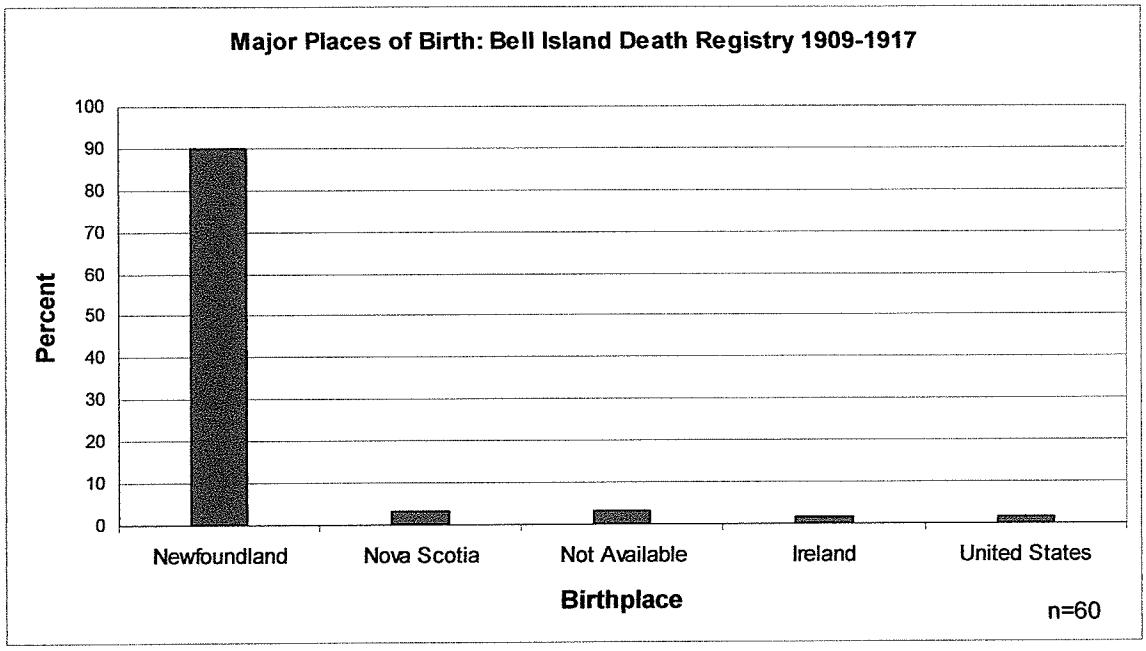


Table 5.2: List of Birthplace Groups from 1909-1917 Death Registries, Grouped for Analysis for Sydney and Glace Bay Males 15-64 Years of Age

Birthplace Classification for Sydney and Glace Bay Death Registry 1909-1917		
Birthplace	**Frequency**	**Percent**
Nova Scotia	466	47.5
Newfoundland	134	13.7
Canada and United States	56	5.7
United Kingdom	76	7.7
Other Europe	155	15.8
Other America	45	4.6
Other/Ill-defined	49	5.0
Total	**981**	**100.0**

mortality pattern. For example language barriers may cause more accidents in an already hazardous workplace. Thus it is important to monitor how birthplace and immigration may factor into the overall examination of occupational risk.

Occupational Classification

Classifying occupation from a different time period can create difficulties. It becomes tricky to place certain occupations within the current skill-based schemes. Various occupations today require skill, whereas historically, skill may not have been necessary for a particular position. Also the form of training may not be the same as today. For example, most steel workers in Sydney had on-the-job training and worked themselves up from labourers to blast furnace operators or coke oven top furnace men (Caplan, 2005).

Creating an occupational classification required a review of the literature. Van Putte and Miles (2005) used a four level scheme to examine social class in relation with occupation. The scheme appears useful, however the authors do not explain what types of positions belong in each category and if explained do not suit the needs of this research. For example, Van Putte and Miles (2005) in their four level scheme, place cabinet-makers with professionals like doctors. Interpreting accidental deaths in a variety of work sites would involve having similar work places categorized together. Having occupation classified by similar work conditions and environments is more appropriate than to organize based on skill set. Van Putte and Miles (2005) also discuss another method to classify occupation: manual and non-manual workers. While this is ideal, it is quite broad and therefore analysis may not be specific. Also, there are individuals whose

type of work is considered manual work but is more semi-manual than actually manual (e.g., a butcher performs a manual task but not to the same extent as a labourer in a steel plant).

Van Putte and Miles (2005) do mention using the Historical International Standard Classification of Occupation or HISCO (Van Leeuwen et al., 2002). The manual was created to place a variety of job titles into concurrent categories. Occupations that are no longer in use can also be found in the manual. HISCO divides occupations into seven major groupings and subgroups (see Van Leeuwen et al., 2002). Group one is assigned to professional, technical and related workers. Group two is assigned to administrative and managerial workers. Group three is assigned to clerical and related workers. Groups four and five are for sales workers and service workers, respectively. Group six is assigned to agriculturalists, animal husbandry, forestry workers, fisherman and hunters. Group seven incorporates other subgroups of eight and nine and includes production and related workers, transport equipment operators and labourers. Thus this manual provided the best form of classification for this project by associating occupations based on title and similarities in the workplace.

The first form of occupational coding for data analysis followed the HISCO (2002) form of classification. The major groups of HISCO (2002), as described above, were collapsed into three broader groups to allow enough cases for the analyses to be conducted (Figure 5.4). HISCO's (2002) groups one and two became group one in this study: professional, technical, managerial and related. Groups three, four, and five of HISCO's (2002) classification became group two: clerical, sales, and service. Finally HISCO's (2002) groups six and seven became the third group: industrial and subsistence.

HISCO Classification Reified for Research

HISCO Seven Major Groups

Group 1: Professional, Technical & Related

Group 2: Administrative & Managerial

Group 3: Clerical & Related

Group 4: Sales Workers

Group 5: Service Workers

Group 6: Agricultural, Animal Husbandry & Forestry; Fisherman & Hunters

Group 7-9: Production & Related; Transport Equipment Operators & Labourers

Occupational Classification for Research

Group 1: Professional, Technical & Managerial

Group 2: Clerical, Sales & Service

Group 3: Industrial & Subsistence

Figure 5.4: Using HISCO Classification to Classify Occupation for Research

Using the HISCO system was important in assuring that each occupation was coded into its correct category, based on an historical understanding of occupations. As a result, of the industrial setting of the three locales, a new system had to be extracted using the configuration of Figure 5.4 (Table 5.3). The professional sector and clerical sector both lacked enough individuals to include in analyses. As a result, a new classification system was created and examines more thoroughly the industrial type occupations (Table 5.4). This new classification system was named the 'industrial specific classification' and is broken up into three components: labourers and miners, skilled tradesmen, and non-industrial workers. Consequently, 'non-industrial' includes all occupations that are not considered industrial type jobs, and includes professional, technical, managerial, service, clerical, and subsistence occupations. Sydney did not have any miners, but quite a few labourers, whereas Glace Bay did not have a lot of labourers, but numerous miners; therefore, for comparative purposes miners and labourers were placed into a single category.

Cause of Death Classification

Cause of death from death registries for Glace Bay, Sydney, and Bell Island were first grouped according to similarities in type of death. For example, all tuberculosis deaths were grouped together. Grouping cause of death based on type provided a means to examine the most frequent causes of death for the whole study population (Figure 5.5). Accidental deaths were the most frequently recorded cause of death for the whole population, followed by tuberculosis, heart disease, pneumonia, and cancer.

Table 5.3: List of Occupational Groups based on HISCO that were Found in the Death Registry: Includes Bell Island, Glace Bay, and Sydney Males 15-65 Years of Age

Occupation Classification: HISCO Found in the Death Registry		
Occupation	**Frequency**	**Valid Percent**
Professional/Managerial/Technical	55	5.3
Clerical/Sales/Service	173	16.6
Industrial/Subsistence	693	66.6
Ill-defined	120	11.5
Total	**1041**	**100.0**

Table 5.4: List of Industrial Occupational Groups from the Death Registry: Includes Bell Island, Glace Bay, and Sydney Males 15-64 Years of Age

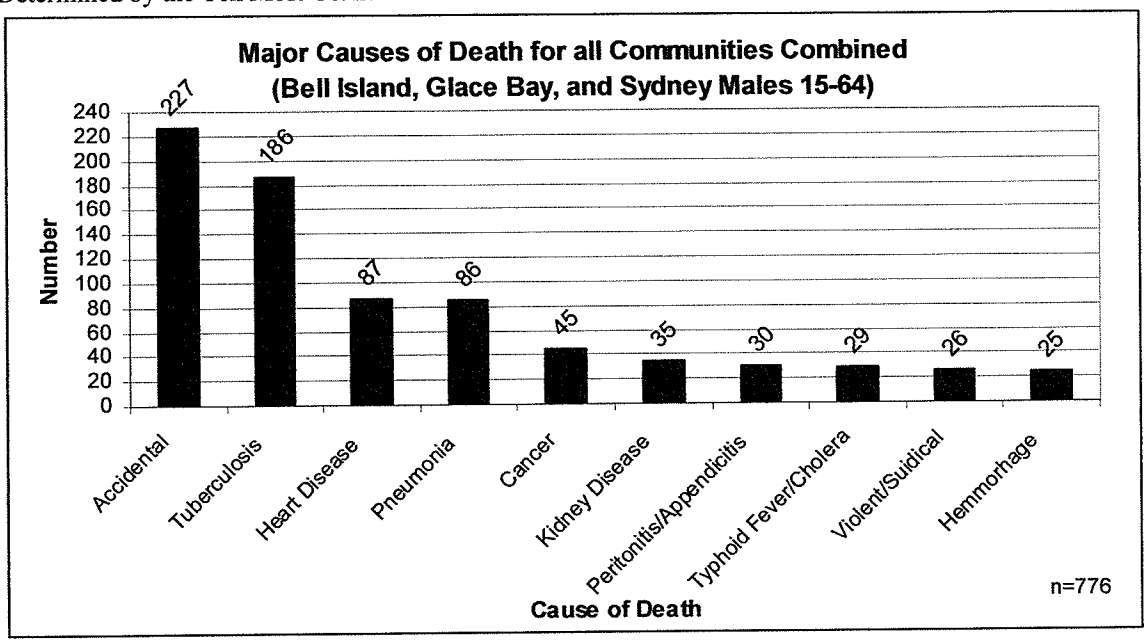
Occupation Classification: Industrial Specific Found in the Death Registry		
Occupation	**Frequency**	**Percent***
Labourers/Miners	459	44.1
Skilled Tradesmen	204	19.6
Non-Industrial Workers	258	24.8
Ill-defined	120	11.5
Total	**1041**	**100.0**

From the first classification, causes of death were collapsed into five groups: infectious diseases, non-infectious diseases, accidental, suicide-violent, and non-disease/ill-defined. The last category includes such causes of death as old age, cramps, natural causes, and unknown causes of death. Old age, cramps and natural causes are not considered a cause of death because they are either nonspecific, symptomatic, or non-disease orientated. Classification into groups is always problematic when dealing with historic material, as many ideas in medicine have changed and many causes of death are either rare or nonexistent today (Alter & Carmichael, 1999). Western medicine has often classified disease by signs and symptoms; therefore cause of death was often classified in this manner (Kunitz, 1999). Accidental deaths deserve their own group because of the extent to which they occur in these populations. Some diseases, however, do not fall into these categories as easily as others, and in many cases need further sorting.

A third classification was created for the cause of death data. It is best to keep tuberculosis and heart disease separate, because they represent a large portion of the deaths in these populations. As a result, the classification is as follows: accidental deaths, tuberculosis deaths, heart disease deaths, other infectious, and other non-infectious. High rates of diseases like tuberculosis and heart disease reflect the necessity to group into single categories, to ensure that the analyses of major causes of death are not misunderstood. Thus, this type of classification highlights the major causes of death and how these causes impacted on the working class population.

Two final classification systems were created for the analyses. The first had four categories: accidental, tuberculosis, respiratory, and 'all other'. The 'all other' category represents a 'catch all' category for causes of death peripheral to those of immediate

Figure 5.5: Major Causes of Death for all Communities Combined Males 15-64 Years of Age. As Determined by the Ten Most Common Causes of Death for all Communities Combined



interest to this study. Diseases such as cancer, kidney disease, and heart disease are included in this group. The second classification system used for the analyses groups tuberculosis and respiratory infections together, in turn leaving three categories: accidental, respiratory (including tuberculosis), and 'all other'.

Census

Data from census returns for all three communities were collected. Census material provides information on the living population which can aid in understanding the deceased population. Cross-examination can reveal many interesting features of the demographics of each community. The census year of 1911 was chosen to best reflect the study timeframe. It is best available year to compliment the study period (1909-1917). Data was collected for the Nova Scotia communities of Glace Bay and Sydney, and the Newfoundland community of Bell Island.

Comparison of census materials for Nova Scotia and Newfoundland revealed differences. The disparity is again reflective of Newfoundland being apart from Canada at this point; for example, it was excluded from the online census provided by the Canadian government.[15] Newfoundland census material was taken directly from the 1911 Census of Newfoundland, which like the Canadian census was published every 10 years. As with most census texts, the 1911 Newfoundland census included tabulations of the population by age and sex. The Canadian census text was different for the 1911 fiscal year, and did not include population by age and sex, but rather constructed population via community and sex. Other years did include tabulations of population by age and sex,

[15] Library and Archives Canada, Census of Canada 1911, ArchivaNet: Online Research Tool: Last Accessed 19-09-08
http://www.collectionscanada.gc.ca/archivianet/1911/006003-100.01-e.html

but unfortunately not the 1911 census return. Thus, data was manually transcribed from the raw census returns available online and entered into a database program.

Only the age and sex of individuals in Glace Bay and Sydney were recorded from the online census source, as it is the most important data for the final analysis. The collection of data on the population by age and sex enabled the construction of population pyramids, critical for understanding the demographics of the living population, and influential in the interpretation of the population at risk of dying in the three communities. As previously stated, population by age and sex is vital for creating and capturing mortality rates for the three populations. The 1911 Census of Canada and the 1911 Census of Newfoundland do include some important demographics on occupation, birthplace, nativity, and religion which were collected from the textual documents, and can be used for comparative purposes in the analysis (see Canada. Census and Statistics, 1912; Census of Newfoundland, 1912).

Mortality Rates

Mortality rates use estimates of population and broken down by age and gender, as well as counts for the deceased population to calculate rates that are comparable between each community. Mortality rates for males 15 to 64 years were examined, expressed as the number of deaths for males 15 to 64 years per thousand living males aged 15 to 64 years. Mortality rates can be used to assess distinctions between deceased individuals in Glace Bay, Sydney, and Bell Island. Bell Island, however, presents the issue of small sample size. The population is too small to handle division of the data by year, age, and cause of death, and consequently is not included in the mortality rates.

Crude deaths rates for Glace Bay and Sydney were constructed in two ways, first per year, and second the average mortality rate over eight years. The second crude mortality rate includes Bell Island because the numbers are large enough to support the calculation of an overall death rate for the community from 1909-1917. Crude death rates only provide initial insight into issues of significance. Thus, creating more specific mortality rates, such as age specific and cause specific death rates, will support further explorations of what was happening in Glace Bay and Sydney. Specific mortality rates can often reveal interesting findings that cannot be analyzed at the crude level.

The information provided by the death registries and the 1911 census (Canada and Newfoundland) provide the grounds for a comparative examination of Glace Bay, Sydney, and Bell Island. The data described here establish the basis for analysis, and further contextualization of issues at hand in all three communities during the early 20th century. These issues aid in understanding the working class, especially in the large industrial sector that, in some ways, changed the face of the mortality pattern for working age males.

Limitations

When dealing with historical material many limitations occur. One of the most problematic for this particular study is the issue of small sample size. Sydney and Glace Bay both present a nice sized sample, and are able to provide enough cases to undertake most of the sought after analyses. Bell Island, on the other hand, presents a very small sample size. Consequently, Bell Island had to be excluded from some analyses. Thus,

Bell Island was a constant reminder of the importance of the necessity of an ample supply of cases for this form of research.

Apart from small sample size, problems with the data were another major limitation. For the most part, the information provided in the death registry was filled out completely. Often with historical death registries, some items are missing, illegible, ill-defined or not available. Missing data can be attributed to what was considered the most vital information on the death registry by the recorder. For example, age at death and cause of death are usually deemed crucial information and will most always be recorded in the death registry. Unfortunately, occupation is not always considered a vital piece of information, and may be left out. Some males between the ages of 15 to 64 years on Bell Island did not have an occupation written in the death registry, thus minimizing the sample size even further. Missing cases can also be caused by the researcher. Transcribing hundreds of deaths, especially when only looking for certain individuals, can pose the problem of missing cases. Missing cases can also occur due to the structure of the death registry. Bell Island was at one point a part of the Harbour Main district, but throughout the study time period changed districts to become a part of St. John's. Also, unlike Sydney and Glace Bay, Bell Island was included with all deaths occurring in St. John's. As a result, moving though hundreds of pages scanning each one to find individuals strictly from Bell Island may have resulted in some cases being overlooked no matter how much care was taken. Also, some workers may have been migrant workers, and are therefore lost to the record as they may not reside in the community which they work.

Historical material is often hand-written, and at times can be difficult to read, thus transcription mistakes can occur from illegible documents. Some causes of death are considered ill-defined, in that, they are symptoms rather than a true cause of death. For example, an individual dying of a 'cough' would be considered an ill-defined case. Thus, in coding these cases are often placed into an ill-defined category, and therefore not usable in analyses. As well, industry-based communities have more industrial workers and a small number of professional, clerical, or service workers. As a result, broader classification systems are needed to offset the problem of small sample size.

Chapter 6: Results

The Living Population

Population Pyramids

Using information abstracted from the 1911 Census of Canada and Newfoundland, population pyramids were created to explore the basic demographic make-up of all three communities. Bell Island (Figure 6.1) did not show any major differences in the distribution of males and females living on the island. Sydney (Figure 6.2) and Glace Bay (Figure 6.3), on the other hand, show an abundance of males between the ages of 20 and 34 years. Sydney also shows an increase in women of the ages 20 to 34 years, but the excess was not as large of an increase relative to the male population. The increase of males aged 20 to 34 years was likely the by-product of working age males migrating to Sydney and Glace Bay for employment. All population pyramids are expansive at the base, meaning that there are proportionately larger numbers of younger individuals in the communities.

The overall sex ratio for the three communities reflects overall male and female contributions to the populations. Sex ratio is expressed as the number of males to females in the population, or the number of males per 100 females. The sex ratio for Glace Bay is 115.4 males per 100 females. Sydney's sex ratio is 124.4 males per 100 females. Bell Island's sex ratio is 106.1 males per 100 females. Thus sex ratios for the populations of Glace Bay, Sydney, and Bell Island all present a higher number of males to females residing in the communities in the 1911 census year. Of the three communities, Sydney has the highest proportion of males to females, followed by Glace Bay, and Bell Island. To further demonstrate how the immigration of working age men

Figure 6.1: Population Pyramid Bell Island 1911

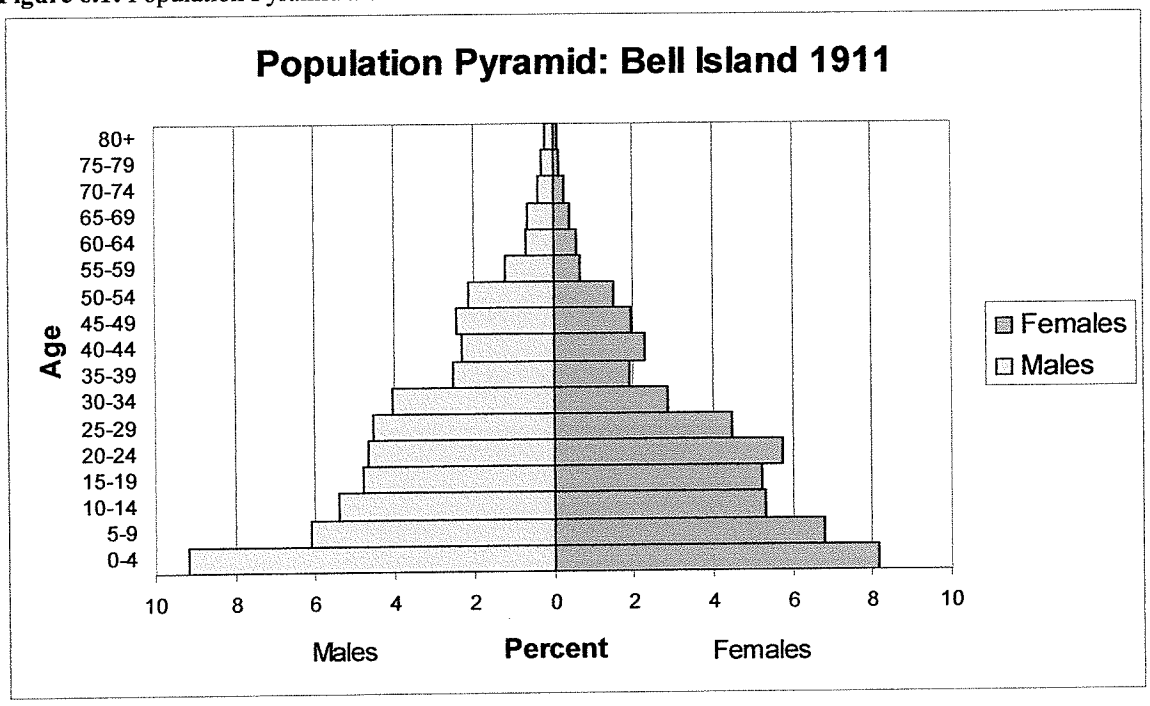


Figure 6.2: Population Pyramid Sydney 1911

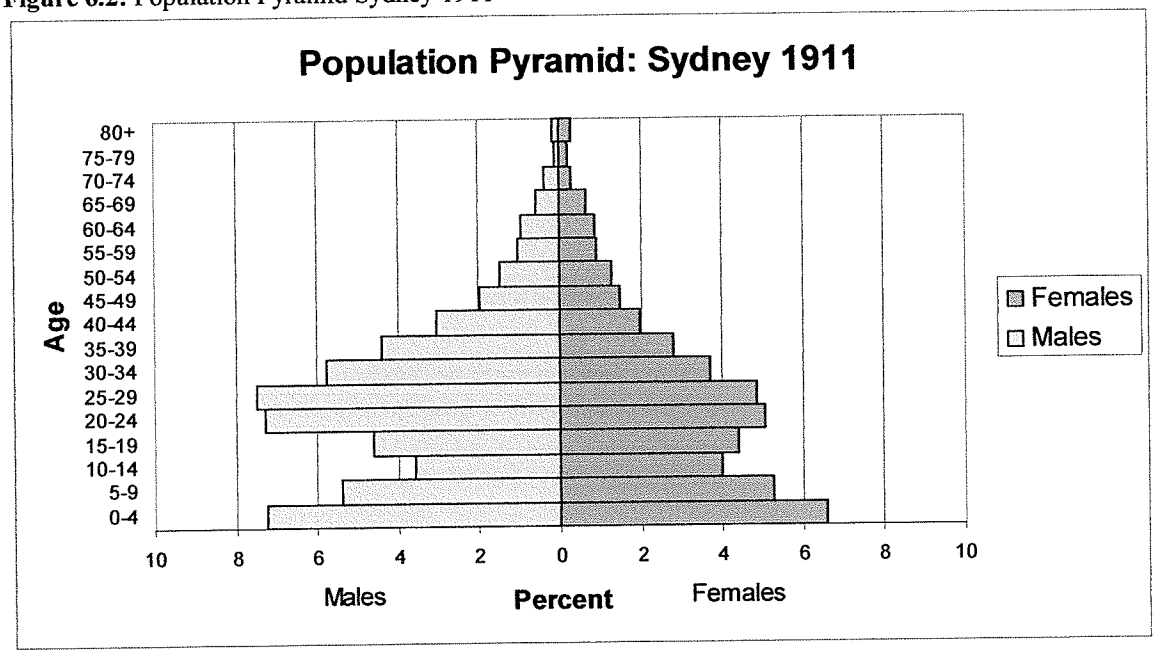


Figure 6.3: Population Pyramid Glace Bay 1911

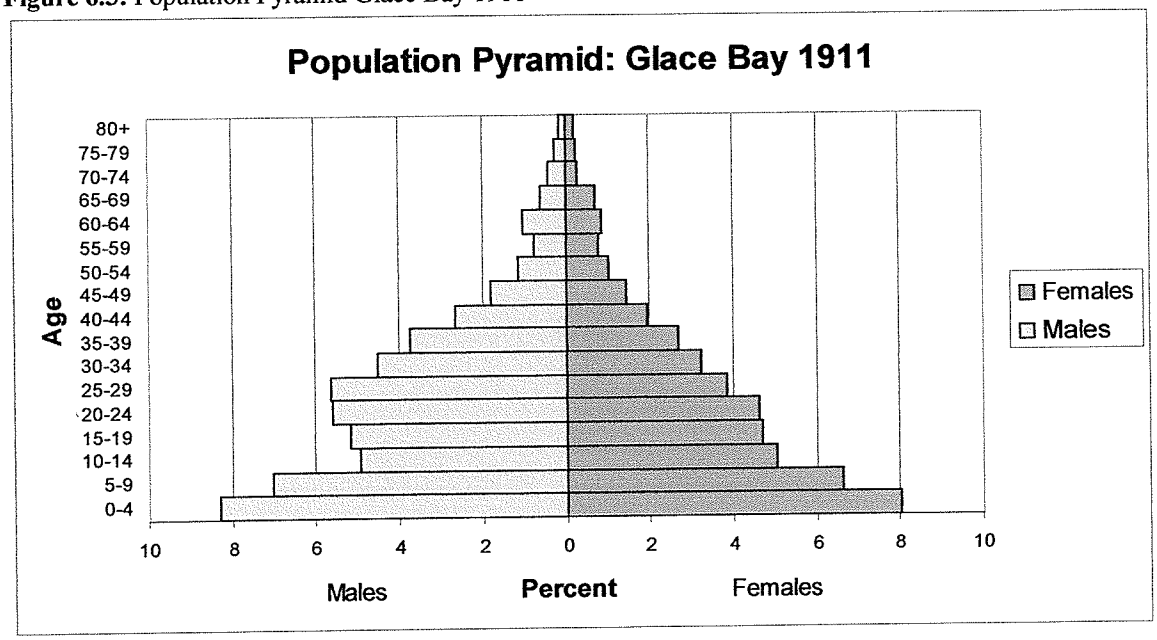


Table: 6.1: Comparative Sex Ratios for Glace Bay, Sydney, and Bell Island. Population Sizes are Based on 1911 Canadian and Newfoundland Census. Sex Ratios are Expressed as the Number of Males per 100 Females in the Population, or Specific Working Age Population.

Comparative Sex Ratios: 1911 All three Communities		
	Sex Ratio: Whole Population (n Males / 100 Females)	Sex Ratio: Working Age Population (n Males 15-64 years of age / 100 Females 15-64 years of age)
Glace Bay	115.4	126.5
Sydney	124.4	139.3
Bell Island	106.1	107.3

affected community demographics, a specific 'working age sex ratio' was calculated (Table 6.1). All three communities demonstrate an excess of males to females in the working age groups. Bell Island had only a slight increase, while Sydney and Glace Bay demonstrated a much larger increase of males per 100 females in the working age groups. Thus the increase in sex ratio among working age males substantiates the demographic characteristics of the population pyramids, in that males, likely single, were drawn to Sydney and Glace Bay for economic opportunities brought about by the steel plant and coal mining enterprises of the area. At the provincial level, Burke (2001), found that in 1901 British Columbia was the most male-dominated province, followed respectively by the Territories, Manitoba, Nova Scotia, New Brunswick, and Quebec.

> [In 1901] Higher levels of immigration increased the risk of sex ratio imbalances and age-related distortions according to the economic attraction of local areas. British Columbia's demographic instability (reflected in highly skewed sex ratios) is echoed by the observation that immigrants accounted for some 46.2 percent of the local population; this is in contrast to the very low proportions of immigrants (less than 4 percent) in the Maritime provinces of Nova Scotia and Prince Edward Island (Burke, 2001:206).

By the next census year (1911), Sydney and Glace Bay, in Cape Breton, did show a rise in immigration, and as a result will likely reflect this at the provincial level. The year 1901 was the first year for steel plant operations in Sydney, thus the rate of immigration was likely still small, as this area would not have been appealing to immigrants. From Burke's 2001 study, it appears that at the provincial level in 1901, Canada reveals a more male-dominated sex ratio, except with respect to Ontario and Prince Edward Island. Consequently, by 1911, all three locales in this study portray these country-wide patterns.

Demographics

Population growth is a key factor influencing the overall health conditions for Glace Bay, Sydney, and Bell Island. In the early part of the 20th century all three communities saw an increase in population (Figure 6.4). A rapid increase in population without proper public health infrastructure (as noted previously in Chapter 4) was problematic for all three communities. Overcrowded houses and improper water and sewage facilities were significant health problems for Glace Bay, Sydney, and Bell Island. The two former communities saw the largest increase in population. The reason for the increase is largely due to the development of industrial enterprise in these communities and the district as a whole. Glace Bay was only one of many coal mining communities along the Sydney Coalfield, however it had the largest coal seam. Sydney began as a small community compared to Glace Bay, as it was not a coal mining town. Sydney's growth depended solely on the building of the steel plant in 1901. Being owned and operated by the same company that owned the Glace Bay coal deposits, Sydney was able to expand from a small town to become the second largest city in Nova Scotia. It was the steel plant that created jobs and brought individuals from around the world. Glace Bay underwent the same changes, centered on a sole industry and company that made this part of Nova Scotia and Canada a hot spot for immigrants and other rural Nova Scotians.

To further understand the population pyramids, and the excess of males between the ages of 20 and 34 years in Sydney and Glace Bay, martial patterns were examined (Table 5.2). Burke (2001), examined nuptiality variation across Canada at the turn of the century, and noted that Cape Breton demonstrated marital delay for both men and

Figure 6.4: Population Growth between 1901 and 1911: Glace Bay, Sydney, and Bell Island. Using data from the 1911 Census of Canada, and the 1911 Census of Newfoundland

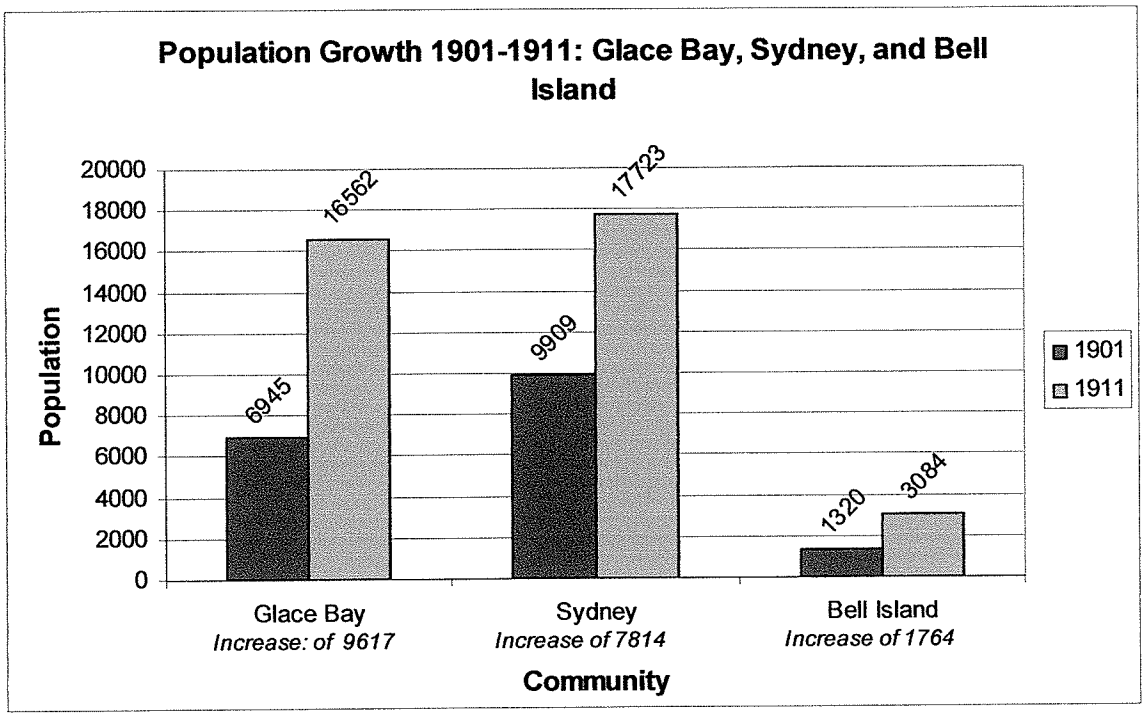


Table 6.2: Marital Status in 1911: Sydney, Glace Bay, and Bell Island.
*Census of Newfoundland 1911 Does Not Include Single or Other Categories

Marital Status for Sydney, Glace Bay, and Bell Island in 1911										
		Single		Married		Widowed		Other		**Total**
		%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)	
Sydney	Males	62.92	(6168)	35.46	(3476)	1.5 3	(150)	0.09	(9)	9803
	Females	59.91	(4745)	34.97	(2770)	5.08	(402)	0.03	(3)	7920
Glace Bay	Males	64.59	(5729)	32.51	(2884)	1.26	(112)	1.62	(144)	8869
	Females	59.51	(4578)	34.28	(2637)	4.78	(368)	1.43	(110)	7693
Bell Island	Males	N/A*		36.8 1	(583)	1.96	(31)	N/A*		1584
	Females			37.99	(568)	3.75	(56)			1495

women, with the mean age at marriage for all of Nova Scotia being 30.2 years and 25.7 years respectively. The delay in nuptiality may be characteristic of the male-heavy sex-ratio for both Glace Bay and Sydney in 1911 (see Table 6.1). Many immigrants moving to Cape Breton were male, as a result there may not have been enough females in the population, and also ideologies of suitability or desirability may have been a problem with the variety of groups immigrating to the communities. Having a large male to female ratio can affect marital opportunities, in that the prospect of finding a marriage partner is decreased (Burke, 2001). Preference or desirability may, in some cases, may be related to religious factors and can delay marriage (Burke, 2001). Immigration of different people may have also been a factor for marital delay, because different groups may have preferences for individuals of the same religion or ethnicity. Also, language barriers may present problems between individuals, as a result decreasing nuptiality in the population.

> Levels of male celibacy [never married] appear elevated in Canada's western districts, in parts of Nova Scotia, and in Eastern New Brunswick...More pronounced levels of spinsterhood [women never married] are noted in districts throughout Ontario, Eastern New Brunswick, Prince Edward Island, and the western aspect of Nova Scotia (including all of Cape Breton) (Burke, 2001:193).

Overall the excess of males would have definitely created an environment whereby male celibacy was present, at least until the sex ratio evened out.

With respect to marital status, there are a few notable observations. Sydney and Glace Bay's population demonstrate a large proportion of single males (62.9% and 64.6% respectively), as well as a large proportion of single females (59.9% and 59.5% respectively). There is only a slight difference between the proportion of single males

and single females in both Sydney and Glace Bay. Males do represent the larger number of individuals classified as 'single', which is likely a result of the increase of males in the population because of mining and steel working operations, especially males within the 20 to 39 age bracket. Another interesting point is the higher proportion of widowed females. In both Sydney and Glace Bay it was women (5.1% and 4.8% correspondingly) who were more frequently widowed than men (1.5% and1.3%). This disparity may reflect the high rate of accidental deaths caused by hazardous working condition for men or the commonly obscured phenomenon of women living longer (to become widowed) than men.

Establishing birthplace origins is important because it allows for the determination of where people were coming from and who is migrating. The 1911 Census of Canada provides information concerning migration to Sydney and Glace Bay. When birthplace is presented for males and females, it becomes apparent that proportionately more males immigrated, presumably for the employment prospects in Canada (Table 6.3). Overall, most men and women living in Sydney or Glace Bay were born in Canada. In Sydney, Canadian males made up 67.47%, and Canadian females made up 78.34% of the population. In Glace Bay, Canadian-born males and females made up 76.32% and 82.21% of the population, respectively. In Sydney, the second largest group of individuals were from countries of 'British Possession' (12.15% of males and 10.16% of females). The third largest immigration group in 1911 was from 'Foreign Europe' (as classified in the 1911 Census of Canada), making up 11.58% of all males, and 4.15% of all females residing in Sydney. 'Foreign Europe' includes all countries in Europe that are neither British possession or apart of the British Isles. Following this, are

Table 6.3: Birthplace of Individuals Living in Sydney and Glace Bay during the 1911 Census Year.
*As Labelled in 1911 Census and includes countries with small numbers.
**Includes all birthplaces in Foreign-Born Europe with a count less than 10 individuals.

Birthplace of People Living in Sydney and Glace Bay during the 1911 Census Year								
Birthplace		*Sydney*				*Glace Bay*			
		Males: 9803		Females: 7920		Males: 8869		Females: 7693	
		%	(*n*)	%	(*n*)	%	(*n*)	%	(*n*)
British Born	Overall	67.47	(6614)	78.34	6204)	76.32	(6769)	82.21	(6325)
	Canada	6.21	(609)	6.38	(505)	1.62	(144)	1.58	(122)
	Nova Scotia	61.26	(6005)	71.96	(5699)	74.70	(6625)	80.63	(6203)
British Isles	Overall	4.82	(473)	3.93	(312)	7.55	(670)	6.66	(512)
	England	3.33	(326)	2.47	(196)	5.34	(474)	4.68	(360)
	Ireland	0.30	(30)	0.25	(20)	0.27	(24)	0.12	(9)
	Scotland	1.13	(111)	1.11	(88)	1.83	(162)	1.74	(134)
	Wales	0.04	(4)	0.10	(8)	0.10	(9)	0.12	(9)
	Other*	0.02	(2)	0.00	(0)	0.01	(1)	0.00	(0)
British Possession	Overall	12.15	(1191)	10.16	(805)	8.45	(750)	6.27	(482)
	Newfoundland	10.63	(1042)	9.81	(777)	7.42	(658)	6.07	(467)
	South Africa	0.01	(1)	0.06	(5)	0.08	(7)	0.03	(2)
	West Indies	1.34	(131)	0.15	(12)	0.41	(37)	0.03	(2)
	Other*	0.17	(17)	0.14	(11)	0.54	(48)	0.14	(11)
Foreign Europe	Overall	11.58	(1136)	4.15	(275)	6.75	(600)	3.65	(282)
	Austria/Hungary	5.83	(572)	1.87	(148)	1.01	(90)	0.49	(38)
	Belgium	0.01	(1)	0.00	(0)	0.59	(53)	0.23	(18)
	France	0.51	(50)	0.25	(20)	0.19	(17)	0.08	(6)
	Germany	0.19	(19)	0.14	(11)	0.98	(87)	0.88	(68)
	Greece	0.03	(3)	0.00	(0)	0.24	(21)	0.00	(0)
	Italy	2.30	(225)	0.46	(37)	0.63	(56)	0.18	(14)
	Norway	0.12	(12)	0.04	(3)	0.01	(1)	0.00	(0)
	Russia	2.30	(225)	0.62	(49)	2.98	(264)	1.78	(137)
	Sweden	0.13	(13)	0.76	(6)	0.02	(2)	0.00	(0)
	Other**	0.16	(16)	0.01	(1)	0.10	(9)	0.01	(1)
Foreign Asia	Overall	0.69	(68)	0.33	(26)	0.29	(27)	0.06	(5)
	China	0.13	(13)	0.00	(0)	0.14	(13)	0.00	(0)
	Syria	0.53	(52)	0.30	(24)	0.15	(14)	0.06	(5)
	Turkey	0.03	(3)	0.03	(2)	0.00	(0)	0.00	(0)
United States		2.13	(209)	2.46	(195)	0.88	(78)	1.01	(78)

individuals from the British Isles. The British Isles category differs from countries of British Possession in that it only incorporates individuals from England, Scotland, Wales, and Ireland. Males of this group make up 4.82%, while females make up 3.93%, of the population. Individuals from the United States follow with 2.13% of men and 2.46% of women in Sydney being born in the US. Finally, Asia makes up a small percent of the population in Sydney, an estimated 0.69% and 0.33% of all men and women, respectively.

There are similar immigration patterns in Glace Bay. There was a higher percent of Canadian-born individuals in Glace Bay, 76.32% of men and 82.21% of women, than Sydney. Also, Glace Bay does not appear to have as high of an increase in those born in the British Isles, those born in 'British Possession' countries, or those born in 'Foreign Europe'. For males born outside of Canada, 8.45% are from countries of 'British Possession', followed by 7.55% from the British Isles, and 6.75% born in 'Foreign Europe'. The United States and Asia make up a small portion of the male population, 0.88% and 0.29% respectively. Women in Glace Bay born outside of Canada present a slightly different picture. The highest percent of women born outside of Canada come from the British Isles (6.66%), with those born in 'British Possession' countries only trailing slightly (6.27%), and a smaller proportion immigrating from 'Foreign Europe' (3.65%). Of all women migrating to Glace Bay, the smallest immigrant group was from Asia, followed by the United States, only making up 0.06% and 1.01% of the female population, respectively. One overall conclusion is that Sydney appears to be more of a "hotspot" for immigrants. The steel industry was notably attractive for immigrants

wanting to begin a new life and gain some capital prior to moving westward (Heron, 1988).

The majority of migration to either Sydney or Glace Bay occurred within Canada, and particularly within Nova Scotia. An estimated 67.47% of all males living in Sydney and 76.32% of all males living in Glace Bay were born in Canada. Both communities had slightly more females born in Canada: 78.34% for Sydney, and 82.21% for Glace Bay. In Sydney, however, Canadians born outside of Nova Scotia only made up 6.21% of men, and 6.38% women. Thus, the majority of Canadians were Nova Scotian-born. While farming was adequate on Cape Breton, it was not adequate enough to support the boom towns. Most goods were imported from other parts of Canada, as a result, "...the only thing rural Cape Breton seemed to have supplied to booming Sydney in any quantity was young men to serve as unskilled labourers" (Caplan, 2005:36). Glace Bay was also a booming town; consequently migrants from rural communities likely joined the workforce there as well. The size of the Sydney coalfield, exceeding one billion tons of possible coal production, likely drew a number of rural men looking for work, though coal had always, since European settlement, been a part of Cape Breton's economy and history (Frank, 1977; Davey and MacKinnon, 2001).

Apart from Canadian-born individuals, the second largest source of immigration came from the "British Possession" countries. The total immigration of this group to Sydney was 12.15% for men and 10.16% for females. In Glace Bay this group made up 8.45% and 6.27% of men and women, respectively. This group includes Newfoundland, which is part of the reason for the high number of immigrants from this category. Newfoundland males make up 10.63%, and 7.42% of all males in Sydney and Glace Bay,

respectively. Newfoundland women make up a slightly smaller portion of the population, 9.81% for Sydney and 6.07% for Glace Bay. The difference between males and females moving from Newfoundland to Sydney or Glace Bay was not immense; rather it shows that both males and females presented a similar migration pattern. Newfoundland's geographical proximity to Glace Bay and Sydney would have simplified the move to either community. Up until the 1941 Census of Canada, Nova Scotia had the largest population of Newfoundland-born residents (outside of Newfoundland itself) (Neary, 1982). "Within Nova Scotia, Newfoundlanders were attracted to the coal and steel industries of Cape Breton County, and to the fisheries, especially those of Cape Breton Island, Halifax County, and the South Shore" (Neary, 1982:69).

There is, however, an even greater rationale for the move to Canada from Newfoundland.

> A crisis in Newfoundland's ailing fishery and the opportunity to work in the developing wage-labour industries of Cape Breton produced between 1890 and 1914 one of the most dramatic movements of people in Newfoundland history (Crawley, 1988:27).

It was the fishery that built Newfoundland, but it was also the basis for its economic and population decline. The unavailability of work, but also the possibility of better wages would have been the likely justification of those who decided to move to Cape Breton (Crawley, 1988). The failure of the fishery in Newfoundland left many people in outport communities in destitute living conditions with poor sources of food (Crawley, 1988). Accordingly, the migration pattern from Newfoundland may reflect the possibility that men and women seeking opportunity brought their family members with them. Although there were some similarities with respect to culture, Newfoundlanders were not treated as equals in Cape Breton. Crawley (1988:28) notes that "[i]n the Cape Breton context

Newfoundlanders provided a supply of relatively cheap powerless labour..." The cheap labour and a steady job was probably a far better prospect than the impoverishment of rural Newfoundland communities during this time of hardship.

Heron (1988:77) reports that "[i]n 1910 a Nova Scotia commission of inquiry found Europeans and Newfoundlanders were filling half the jobs at Disco [Dominion Iron and Steel Company]..." It is not surprising that in Sydney, the category 'Foreign Europe' represents a total of 11.58% of the males moving to the community, while 'Foreign Europe' females only embodies 3.55% of all women residing in Sydney in 1911. The Dominion Iron and Steel Company recruited workers from a variety of countries in Europe such as Russia, Italy, Hungary, and Austria (Heron, 1988). This recruitment process is reflected in the number of males arriving in 1911 from these countries (See Table 6.3). Glace Bay presented a similar picture with respect to males and females moving to the community from 'Foreign European' countries (6.75% and 3.65% respectively). Glace Bay, however, did not share the same degree of difference between males and females moving from 'Foreign European' countries.

The British Isles was the dominant source of immigrants prior to rise of the major industrial enterprises in Nova Scotia (Heron, 1988; Whitbeck, 1914). In Glace Bay, those born in the British Isles (7.55% for men and 6.66% for women) made up a similar portion of the population as the other two major immigration groups ('British Possession and 'Foreign Europe'). Accordingly, this may reflect less recruitment by the Dominion Coal Company than was seen in Sydney. Overall, the Sydney steel plant appeared more favourable to immigrants (Heron, 1988). The percent of British-born males (4.82%) in Sydney is much smaller in comparison to either 'British Possession' or 'Foreign Europe'.

In Sydney there is not a large gap between females from the British Isles (3.93%) and women from 'Foreign Europe' (4.15%). The data in Table 6.3 reveals how the industrial enterprises of Glace Bay and Sydney affected the immigration processes on the population. In turn, these population demographics will assist in understanding the patterns found in the death registry.

The 1911 Census of Canada also provides information regarding occupation. Occupation data for both Sydney and Glace Bay is presented separately for males and females, and is further broken down by nativity and by age (Table 6.4 and Table 6.5). There are eleven occupational categories: Agriculture, Building Trades, Domestic Service, Civil Municipal, Fishing Hunting, Forestry, Manufacture Industrial, Mining, Professional, Trade Merchandizing, and Transportation. The category 'Manufacture Industrial' requires a brief explanation. The category is broad and includes all forms of manufacturing of goods. 'Manufacture Industrial' includes labourers and steel working, but also occupations such as clothes-making, an area in which a number of women worked. The category of 'Manufacture Industrial' represents the majority of male occupations in Sydney.

The overall results from Table 6.4 indicate that in 1911 the majority of men in Sydney worked within the 'Manufacture Industrial' job category at the steel plant (60.46%), while in Glace Bay most men worked in the 'Mining' sector in the coal mines (70.32%). There is a slight difference in the proportion of Canadian-born (26.41%) and immigrant (34.05%) males working in the 'Manufacture Industrial' sector in Sydney. Glace Bay presents a different pattern as there were less immigrant men (25.34%) working in the coal mines than Canadian-born men (44.98%). Again, this reflects issues

Table 6.4: Occupations of Individuals in Sydney and Glace Bay based on Nativity
*Total is Based on all Males or Females, 15-65, in Each Community.

Occupation of People based on Nativity, 1911: Sydney and Glace Bay								
Occupations	Workers by Nativity							
	Sydney				Glace Bay			
	Males 15-64: 6532		Females 15-64: 4688		Males 15-64: 5293		Females 15-64: 4184	
	Canadian % (*n*)	Immigrant % (*n*)	Canadian % (*n*)	Immigrant % (*n*)	Canadian % (*n*)	Immigrant % (*n*)	Canadian % (*n*)	Immigrant % (*n*)
Agriculture	0.38 (25)	0.21 (14)	0.0 (0)	0.0 (0)	0.93 (49)	0.11 (6)	0.14 (6)	0.0 (0)
Building Trades	7.82 (511)	1.75 (114)	0.02 (1)	0.0 (0)	3.68 (195)	0.66 (35)	0.84 (35)	0.0 (0)
Domestic Service	2.25 (147)	0.98 (64)	9.30 (436)	3.75 (176)	1.28 (68)	0.53 (28)	6.38 (267)	1.03 (43)
Civil Municipal	1.88 (123)	0.23 (15)	0.17 (8)	0.13 (6)	1.21 (64)	0.11 (6)	0.07 (3)	0.05 (2)
Fishing Hunting	0.0 (0)	0.15 (10)	0.0 (0)	0.0 (0)	0.28 (15)	0.08 (4)	0.0 (0)	0.0 (0)
Forestry	0.09 (6)	0.0 (0)	0.0 (0)	0.0 (0)	0.02 (1)	0.02 (1)	0.0 (0)	0.0 (0)
Manufacture Industrial	26.41 (1725)	34.05 (2224)	2.90 (136)	0.55 (26)	4.23 (224)	1.55 (82)	1.17 (49)	0.05 (2)
Mining	2.13 (139)	0.95 (62)	0.02 (1)	0.0 (0)	44.98 (2381)	25.34 (1341)	0.07 (3)	0.0 (0)
Professional	1.93 (126)	0.37 (24)	2.45 (115)	0.32 (15)	1.04 (55)	0.26 (14)	1.24 (52)	0.29 (12)
Trade Merchandising	8.53 (557)	2.43 (159)	3.39 (159)	0.45 (21)	5.88 (311)	2.42 (128)	2.41 (101)	0.31 (13)
Transportation	5.79 (378)	0.77 (50)	0.41 (19)	0.06 (3)	3.97 (210)	0.42 (22)	0.22 (9)	0.0 (0)
Total	**57.21 (3737)**	**41.89 (2736)**	**18.66 (875)**	**5.26 (247)**	**67.50 (3573)**	**31.50 (1667)**	**12.54 (525)**	**1.73 (72)**

of immigration policies at the turn of the 20th century, in that immigrants, besides those British-born, were not given high class occupations or citizenship (Avery, 1979). Also, many immigrants started out in industrial communities (especially steel plant communities) in eastern Canada, in order to gain capital before moving westward (Heron, 1988). Sydney displayed more variety in occupations than Glace Bay, and, based on Table 6.3, there are more immigrants moving to Sydney. In Glace Bay, the deeply-rooted mining tradition probably meant that local families established more exclusive rights to the occupation. As a result, Glace Bay showed a smaller percent (41.89%) of immigrant males in the workforce when compared to Canadian-born males (57.21%).

Although there is not a large proportion of women working in either community (23.92% of all women residing in Sydney, and 14.27% of all women living in Glace Bay), most who are employed occupy jobs in the 'Domestic Service' sector. In Sydney, of the 23.92% women working, 13.05% are working in the 'Domestic Service' sector. In Glace Bay, a similar picture is portrayed and, of the 14.27% women in the workforce, 7.41% are occupied in 'Domestic Service'. Most 'Domestic Service' occupations are taken up by Canadian-born women in both Sydney and Glace Bay, at 9.30% and 6.38% respectively, whereas immigrant women only make up 3.75% of domestic service in Sydney and 1.03% in Glace Bay. Overall, there were less women immigrating to Sydney and Glace Bay (21.03% and 17.65% respectively) than men (31.37% and 23.92% respectively). Domestic service was one of the few occupations held predominately by women at the turn of the 20th century. According to Sager (2007:510), "[i]n 1901, 38 percent of all women [in Canada] with paid labor occupations were servants, and the occupation attracted more women than the entire manufacturing sector." Although the

literature states that most domestic service was predominately undertaken by immigrants, Sager (2007:521) notes that immigrants were "slightly overrepresented among domestic servants" and that in 1901 it was more likely that a Canadian-born woman was employed. Immigrant women in domestic service were more likely to have been living in Canada for several years.

> Among the minority who were immigrants in 1901, few were recent immigrants. The 1901 census asked all immigrants to report their year of arrival in Canada: of all female live-in domestics born outside of Canada, only 8 percent had arrived within the year prior to the taking of the census, and only 16 percent had arrived between 1898 and 1901. The overwhelming majority of immigrant domestic servants had several years' experience of their new country (Sager, 2007:522).

Prior to the introduction of steel working and major coal mining, both Sydney and Glace Bay would have lacked a large influx of immigrants. On the contrary, it was only with the beginning operations of steel and coal that immigration would have largely increased. Accordingly, the domestic service sector for both communities was likely taken up by the Canadian-born women already in residence, and already having some years' experience.

Occupations were also tabulated by age, as found in the 1911 Census of Canada (Table 6.5). Major trends show that males in both 'Manufacture Industrial' occupations (Sydney) and 'Mining' occupations (Glace Bay) tend to fall within the 25 to 64 age group, whereas women in the 'Domestic Service' sector are more typically represented in the 15 to 24 age group. The division of age categories found in the 1911 census (and portrayed in Table 6.5) were not divided equally, in other words there were two age groups: 15 to 24 years and 25 to 64 years. Additionally, the major increase in the population of males for Sydney and Glace Bay, as represented in the population pyramids

Table 6.5: Occupation of People Based on Age Groups, 1911 Census of Canada, Sydney and Glace Bay
*Total is Based on all Males or Females, 15-65, in Each Community.

Occupation of People based on Age, 1911: Sydney and Glace Bay								
Occupations	Workers by Age Groups							
	Sydney				Glace Bay			
	Males 15-64: 6532		Females 15-64: 4688		Males 15-64: 5293		Females 15-64: 4184	
	15-24 % (*n*)	25-64 % (*n*)	15-24 % (*n*)	25-64 % (*n*)	15-24 % (*n*)	25-64 % (*n*)	15-24 % (*n*)	25-64 % (*n*)
Agriculture	0.02 (1)	0.47 (31)	0.0 (0)	0.0 (0)	0.23 (12)	0.55 (29)	0.0 (0)	0.12 (5)
Building Trades	2.46 (161)	6.75 (441)	0.02 (1)	0.0 (0)	0.98 (52)	2.99 (158)	0.0 (0)	0.0 (0)
Domestic Service	1.21 (79)	1.88 (123)	7.98 (374)	4.65 (218)	0.76 (40)	0.93 (49)	5.07 (212)	2.01 (84)
Civil Municipal	0.35 (23)	1.55 (101)	0.09 (4)	0.19 (9)	0.09 (5)	1.02 (54)	0.10 (4)	0.02 (1)
Fishing Hunting	0.09 (6)	0.06 (4)	0.0 (0)	0.0 (0)	0.02 (1)	0.30 (16)	0.0 (0)	0.0 (0)
Forestry	0.03 (2)	0.06 (4)	0.0 (0)	0.0 (0)	0.0 (0)	0.02 (1)	0.0 (0)	0.0 (0)
Manufacture Industrial	18.43 (1204)	41.26 (2695)	1.86 (87)	1.58 (74)	1.53 (81)	3.85 (204)	0.57 (24)	0.65 (27)
Mining	0.67 (44)	2.32 (152)	0.0 (0)	0.02 (1)	22.67 (1200)	45.25 (2395)	0.02 (1)	0.05 (2)
Professional	0.37 (24)	1.85 (121)	1.19 (56)	1.54 (72)	0.13 (7)	1.11 (59)	0.81 (34)	0.72 (30)
Trade Merchandising	3.15 (206)	7.58 (495)	2.39 (112)	1.43 (67)	2.32 (123)	5.57 (295)	2.01 (84)	0.69 (29)
Transportation	1.38 (90)	4.91 (321)	0.36 (17)	0.11 (5)	1.40 (74)	2.80 (148)	0.14 (6)	0.05 (2)
Total	**28.16 (1840)**	**68.69 (4488)**	**13.89 (651)**	**9.52 (446)**	**30.13 (1595)**	**64.39 (3408)**	**8.72 (365)**	**4.31 (180)**

(see Table 6.2 and 6.3) began in the 20 to 24 years age group, but remained high before decreasing in the 40 to 44 years age group. There was a large influx of males into the population, thus Table 6.5 does not depict the real picture. Sydney however showed that most males working in the 'Manufacture Industrial' sector were between 25 and 64 years of age (41.26%), as opposed to the 18.43% aged between 15-24 years. In Glace Bay, males 15 to 24 years of age represent 22.67% of those employed in the 'Mining' sector, whereas males between 25 and 64 years make up 45.25% of those in mining. Both the 'Manufacture Industrial' and 'Mining' sectors make up the majority of occupations in Sydney and Glace Bay. Also the majority of males in these age groups are working, thus the assignment of age groups does not give justice to the actual picture, rather organizing age into 10 year increments, or by young, middle, and old working age would provide a much clearer picture of age segregation in these occupations.

The 'Domestic Service' sector, on the other hand, presents an interesting picture of age segregation for female workers. In both Sydney and Glace Bay, proportionately more young females aged 15 to 24 years (7.98% and 5.07% respectively) are occupying domestic service jobs than women aged 25 to 64 years (4.65% and 2.01% respectively). Although the age segregation in the 1911 census is disproportionate, there are more women in the smaller age category working in domestic service. Based on 1901 census data, Sager (2007:516) notes that most women working in domestic service were "...young people in their teens and twenties; the majority left the occupation in their twenties or thirties either for another occupation or at the point of marriage." Thus the data in Table 6.5 likely represent this feature of early 20th century life for women. Tables 6.4 and 6.5 reflect the ideology of the 'company town', in that most men are working in

industrial trades, but also represent findings that young women often took up occupation in domestic service (Bulmer, 1975; Godoy, 1985; Heyman, 1995; Sager, 2007).

The Mortality Record

Mortality Rates

Mortality rates were calculated to examine any major differences between communities. Crude mortality rates were calculated for both Sydney and Glace Bay (Figure 6.5). Fluctuations between years occur for both Sydney and Glace Bay. These spikes are likely the result of small population size. Another probable explanation for the fluctuations in the crude mortality rate is that it may actually present real spikes in mortality on an annual basis. For example, more accidents may have occurred during a specific year, consequently increasing the death rate for that year. Condran and Cheney's (1982:97) study on mortality decline demonstrated that "[s]ome of the fluctuation [found with crude mortality rates for Philadelphia between 1870 and 1930] may have been due to the inadequacy of the extrapolated population figures or the death register, but much can probably be explained by the genuine shifts in the levels of infectious disease from one year to the next."

An average mortality rate was also calculated over the eight year period, using population figures provided in the 1911 census abstracts as the denominator, or the living population 'at risk of dying' (Table 6.6). Bell Island was included here, as the average encompasses all years rather than having each year segregated (since Bell Island was particularly susceptible to small population size effects). In 1921 the 'general' or crude mortality rate for Canada was 11.6 deaths per one thousand living (Dominion Bureau of

Statistics, 1956). Comparably, death rates for Bell Island (8.32), Sydney (10.25), and Glace Bay (10.53) expressed crude mortality rates (based on the 1911 population numbers) lower than the national rate (11.6) (based on the 1921 population numbers). On the provincial scale the lowest crude mortality rate in Canada in 1921 was in Saskatchewan with 7.4 deaths per thousand living, whereas the highest was in both New Brunswick and Quebec each with 14.2 deaths per thousand living (Dominion Bureau of Statistics, 1956). Newfoundland crude mortality rates were also incorporated into the provincial trends showing a mortality rate of 12.8 per thousand living in 1921 (Dominion Bureau of Statistics, 1956). The average crude mortality rate for Bell Island, based on the 1911 census (8.32 deaths/1000 living) was lower than the national rate for 1921 Newfoundland. Nova Scotia's crude mortality rate for 1921 was 12.3 deaths per thousand people living (Dominion Bureau of Statistics, 1954), again higher than the average seen in Sydney or Glace Bay using the 1911 census.

In 1916, major cities in Ontario had a combined mortality rate of 14.0 deaths per thousand living (The Legislative Assembly of Ontario, 1917). The highest mortality rate recorded in major Ontario cities was in Kingston, with a death rate of 22.4 deaths per thousand living (The Legislative Assembly of Ontario, 1917). The lowest mortality rate found in major Ontario cities in 1916 was 10.3 deaths per thousand living in Port Arthur (The Legislative Assembly of Ontario, 1917). Some other comparables for mortality rates in 1916 in Ontario include Bellville (17.5 deaths/1000 living), Hamilton (11.9 deaths/1000 living), and Toronto (12.6 deaths/1000 living) (The Legislative Assembly of Ontario, 1917). Mortality rates for Sydney, Glace Bay, and Bell Island are comparably lower than the recorded mortality rates for cities in Canada.

There appears to be two factors that are problematic for the comparison. First, the crude mortality rate for trends in Canada or cities in Ontario were not broken down into sex-specific rates. As a result, it is difficult to discuss each on comparative basis. Second, the trends in Canada are based on its earliest year of availability, being 1921 (see Dominion Bureau of Statistics, 1956), hence there are definite problems assessing comparisons with the crude mortality rates of the three locales which are based on the 1911 census. The 1916 Ontario mortality rates provide the closest estimates for comparison to Sydney and Glace Bay, but are not sex-specific. Nevertheless, the crude mortality rates in Canada in 1921 and Ontario in 1916 provide some context and comparisons for the early 20th century estimates for Nova Scotia and Bell Island.

Apart from a probable spike likely experienced during the years of the first World War, the mortality rates for all three locales would likely decline. Public health movements have supported decreases in a variety of infectious diseases such as typhoid fever and a number of infantile diseases, and aided in the overall morality decline in the 19th and early 20th centuries in the United States (Condran & Crimmins-Gardner, 1978). On the other hand "[m]ortality rates may fluctuate a great deal, especially when mortality levels are high and when deaths from infectious and epidemic diseases constitute a large proportion of the total deaths" (Condran and Crimmins-Gardner, 1978:29). Nonetheless, the crude mortality rate for Canada, from 1921 to 1954, continued in a consistent decline and, by 1954, there were 8.2 deaths per thousand living (Dominion Bureau of Statistics, 1956). By 1954 Canada had, on an international scale, the second lowest crude mortality rate (8.2) with the Netherlands having the lowest crude mortality rate of 7.5 deaths per one thousand living (Dominion Bureau of Statistics, 1956). England and Wales are not

presented in the top twelve ranked countries for the 1954 crude mortality rate, however, and the United States was the last on the list with a crude mortality rate of 9.2 deaths per one thousand living (Dominion Bureau of Statistics, 1956).

The low rates observed in Sydney, Glace Bay, and Bell Island reveals some common problems with respect to historical demographical studies. It is not likely that these three communities were healthier locales, rather these three communities likely experienced some under-reporting of deaths. It has been established that some Newfoundland men worked at the mines (coal and iron ore) and steel plant as a secondary source of income to fishing. Ultimately these men would likely be lost to the mortality record, especially if they did not die in either of the three communities. Seasonal labour, such as was the case for many Newfoundland fishermen will likely cause an under-enumeration of cases in the Glace Bay, Sydney, and Bell Island death registry. Sawchuk and Burke (2000) discuss issues of underreporting in their study on Bellville between 1876 and 1885. The authors note that the small number of deaths in Bellville should be viewed with caution, as observed trends, rather than an absolute value of mortality (Sawchuk & Burke, 2000). When examining historical mortality rates nothing is precise, rather, all information must be acknowledged as trends, or patterns. The remainder of the analyses that examine the association between various factors and causes of death will not be as problematic since the majority of deaths were available in the death registry.

Male age-specific mortality rates were calculated for Glace Bay and Sydney, with two additional analyses investigating age-specific tuberculosis, and age-specific accidental deaths mortality rates (Figures 6.6, 6.7, 6.8). Overall, age specific mortality

rates for Glace Bay and Sydney reflect a similar pattern (Figure 6.6). For the most part there is a steady incline in mortality towards the older age groups. The somewhat steady incline appears to be a normal event, as many cities in the United States in 1900 reflect this trend in male age-specific morality rates (Condran & Crimmins-Gardner, 1978:30-31). Overall, Canada in 1921 also presents this general trend in male age-specific mortality rates (Dominion Bureau of Statistics, 1956). The slightly marginal decline in the male age-specific mortality rate between the ages of 30 and 34 in the three locales is interesting because it was also found at the national level for Canada in 1921 and for some cities in the United States in 1900 (see Figure 6.7; Dominion Bureau of Statistics, 1956:28-29; Condran & Crimmins-Gardner, 1978:30-31). The marginal decrease may simply reflect fluctuations between age groups. On the other hand, it may also reflect males within the middle working age, who are likely to have some skill in their occupation or are able to gain better work positions such as professional or managerial positions (thus reducing the occupation-related risks to which they are exposed).

Between 55 and 64 years of age there is a large spike in mortality among males in both Glace Bay and Sydney. Again, this is similar to what is observed in Canada in 1921 and a variety of cities in the United Sates (Dominion Bureau of Statistics, 1956:28-29; Condran and Crimmins-Gardner, 1978:30-31). Large spikes in the older age groups are reflective of smaller sample sizes in the older age groups, whereby during the early 20^{th} century age-specific morality would continue to rise in the older ages. Life expectancy at birth is used to understand average life span (Crews, 2003). In 1910 the average life expectancy at birth for men in the United States was 48.6 years (Crews, 2003:7). If a male lived to be 40 in 1910 then his average life expectancy would increase

to 67.7 years of age, and if a male continued past 67.7 years to age 85, then the average life expectancy would again increase to 88.8 years (Crews, 2003:7). Based on this information an increase in mortality risk is expected as one continues to age. It is essentially the basic concept of senescence or growing old for, as age increases, the rate of mortality accelerates (Crews, 2003).

Figures 6.7 and 6.8 examine age- and cause-specific risks of tuberculosis and accidental deaths on mortality rates. With respect to figure 6.7, Sydney and Glace Bay revealed a slightly different pattern for age- and tuberculosis cause-specific mortality rates. There is a large gap in mortality rates that begins in the 35 to 39 age group and remains until the 45 to 49 age group. From here again there is an even larger gap in Sydney and Glace Bay's tuberculosis death rate between the ages of 50 and 64 years. With respect to trends in Canada in 1921 and in the United Sates in 1901, all cause-specific death rates use a rate per 100,000 living as opposed to 1000 living (Dominion Bureau of Statistics, 1956; Condran & Crimmins-Gardner, 1978), thus making a direct comparison difficult to interpret.

In general, males in Sydney appear to be more affected by tuberculosis than males in Glace Bay. Tuberculosis does not appear to be a large problem for older males in Glace Bay. On the other hand, males in Sydney appear to be more affected by tuberculosis between the ages of 50 to 64 years. The age- and cause-specific mortality rate for males aged 50 to 54 years was 23.3 deaths per thousand living, and for ages 55 to 64 years, the mortality rate for men in Sydney was 26.6 deaths per thousand living. Overall, the tuberculosis age-specific mortality rates are higher for Sydney than Glace Bay.

Figure 6.5: Crude Mortality Rates per Year for Sydney and Glace Bay Males 15-64
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917
The number in 'Population Living' Extracted from the 1911 Census of Canada: Sydney and Glace Bay.

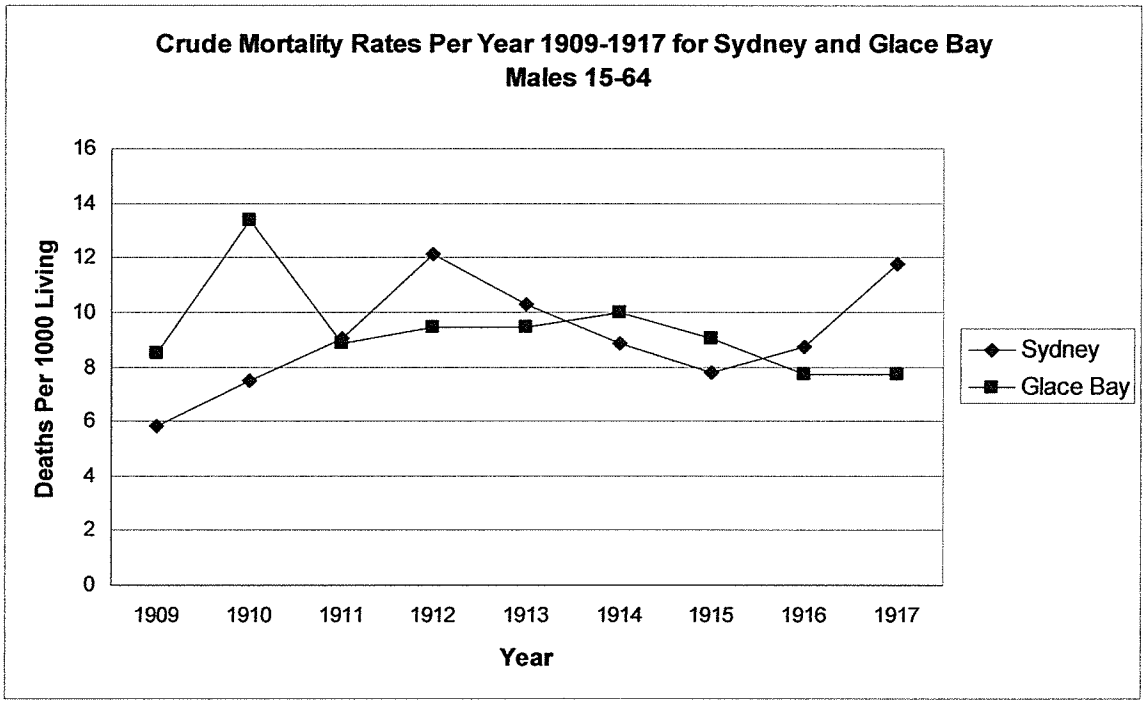


Table 6.6: Average Mortality Rates over Eight Years 1909-1917. Sydney, Glace Bay, and Bell Island
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917; Newfoundland Vital Statistics: Death Registries for 1909-1917
The number in 'Population Living' Extracted from the 1911 Census of Canada: Sydney and Glace Bay, and from the 1911 Census of Newfoundland for Bell Island

Average Mortality Rates for 1909-1917, Males 15-64 Years of Age: Bell Island, Glace Bay and Sydney Per 1000 Deaths	
Community	**Average Mortality Rate / 1000 Living**
Bell Island	8.32
Glace Bay	10.53
Sydney	10.25

Figure 6.6: Age Specific Mortality Rates for Sydney and Glace Bay
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917
The number in 'Population Living' Extracted from the 1911 Census of Canada: Sydney and Glace Bay

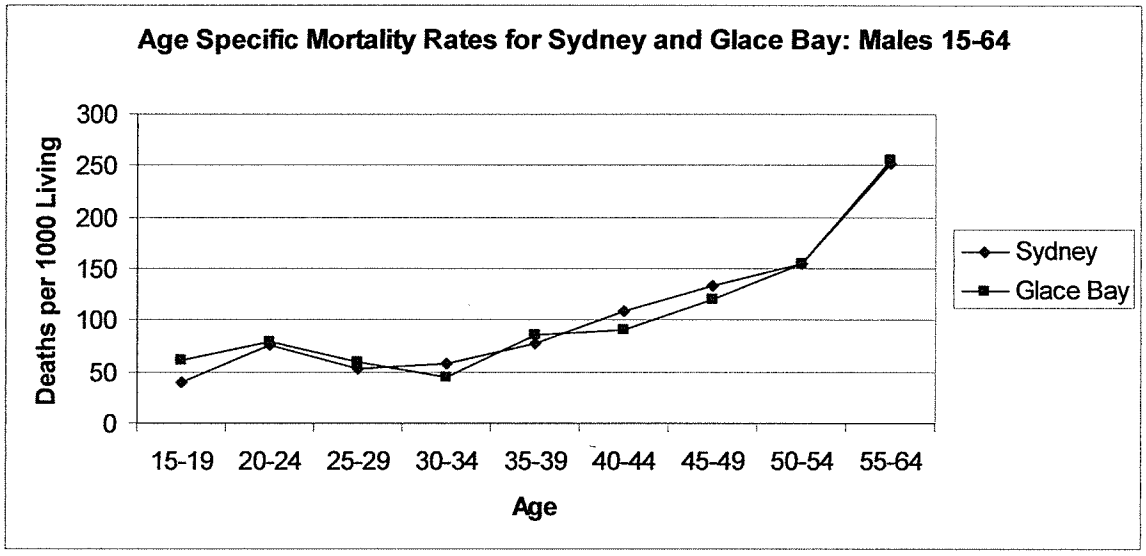


Figure 6.7: Age and Tuberculosis Cause Specific Mortality Rates for Sydney and Glace Bay
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917
The number in 'Population Living' Extracted from the 1911 Census of Canada: Sydney and Glace Bay

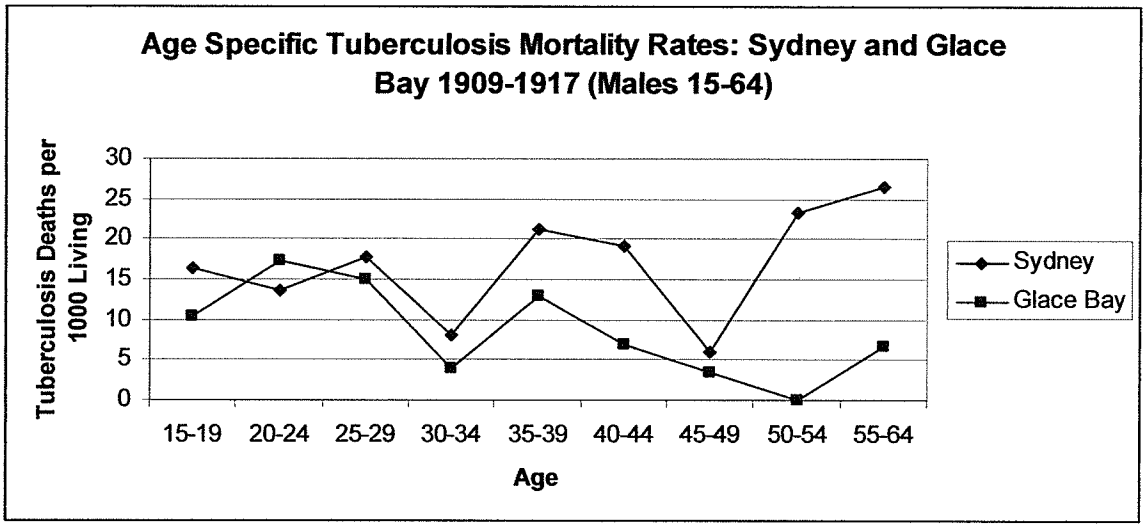
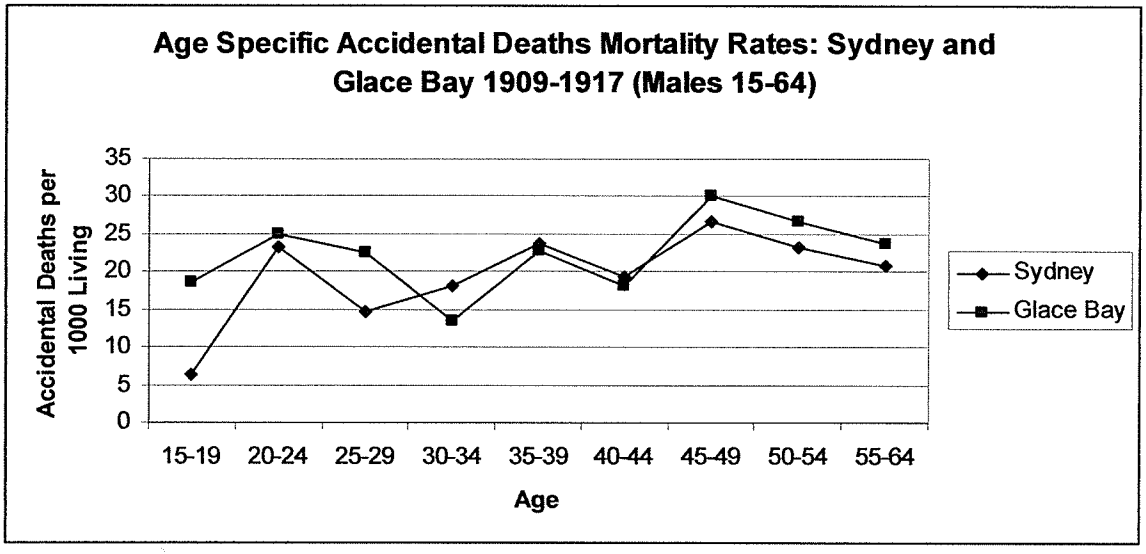


Figure 6.8: Age and Accidental Cause Specific Mortality Rates for Sydney and Glace Bay
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917
The number in 'Population Living' Extracted from the 1911 Census of Canada: Sydney and Glace Bay



Accidental cause- and age-specific mortality rates revealed a similar pattern for Sydney and Glace Bay (Figure 6.8). Generally, there appears to be less accidental deaths (per 1000 living) in Sydney. Apart from this, there are two points of interest; first there are less accidental deaths per thousand living in Sydney than in Glace Bay between the ages of 15 to 19 years. Second, there are fewer accidental deaths per thousand living in Sydney than in Glace Bay between the ages of 25 and 29 years. The gap between Sydney and Glace Bay is much greater in the 15 to 19 age group than in the 25 to 29 age group. Death rates calculated for age and accidental deaths revealed that, in Sydney, 6.3 males per thousand living males died between the ages of 15 and 19 years, whereas, in Glace Bay, the death rate was 18.7 per thousand living males aged 15 to 19 years. The second gap (ages 25 to 29 years) is not as large, producing death rates of 14.8 and 22.5 deaths per thousand living males in Sydney and Glace Bay, respectively. It appears that in Sydney at some ages (35 to 44 years and 50 to 64years) men were more prone to tuberculosis deaths, and that at other ages (15 to 19 years and 25 to 29 years) men were less affected by accidental causes of death. Overall, Glace Bay was more prone to accidental deaths among men. The fluctuations found in figures 6.7 and 6.8 may be due to small population numbers that affect the mortality rate, but may also be due to genuine differential effects of tuberculosis and accidental causes of death at various ages. The risks of accidental causes of death more likely affect working age males differently at various stages in the life course.

Mortality Pattern Results for Sydney, Glace Bay, and Bell Island

Cause-specific death analyses revealed that most deaths among working age males (15 to 64 years) in the three locales (Sydney, Glace Bay, and Bell Island) for 1909 to 1917 could be accounted for by either accidents or tuberculosis. However, mortality patterns for the three locales do show some variation with respect to the overall distribution of various causes of death (Figure 6.9). For example, Glace Bay and Sydney present a relatively similar pattern in common causes of death, with accidental deaths and tuberculosis representing most of the deaths found amongst males 15 to 64 years of age (Figures 6.10 and 6.11). Bell Island, on the other hand, displayed a notably high percent of tuberculosis deaths, followed by suicidal-violent deaths (e.g., shot, execution, hanging, shock following gunshot, suicide from gunshot, stabbed, died of wounds, died in action, drinking carbolic acid/suicide by poison) (Figure 6.12).

With respect to cause of death, some interesting features are presented for the three communities (Figure 6.13). Glace Bay showed a relative deficiency of males 15 to 64 years of age dying of tuberculosis, accounting for only 12.5% of deaths. Apart from deaths from 'all other' causes, most deaths among males 15 to 64 years of age occurring in Sydney were caused by accidents (21.5%), followed closely by tuberculosis (19.5%), and respiratory diseases (12.0%). Bell Island, however, displayed a relative excess of males 15 to 64 years of age dying of tuberculosis, representing 41.7% percent of all causes of death for males 15 to 64 years. Tuberculosis at this time was often blamed on individuals being overworked, dissipation, or unhygienic living (Kirk, 1917). Bell Island was somewhat removed from medical personnel, aside from primary first aid care, and,

Figure 6.9: Major Causes of Death by Community 1909-1917.
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917; Newfoundland Vital Statistics: Death Registries for 1909-1917

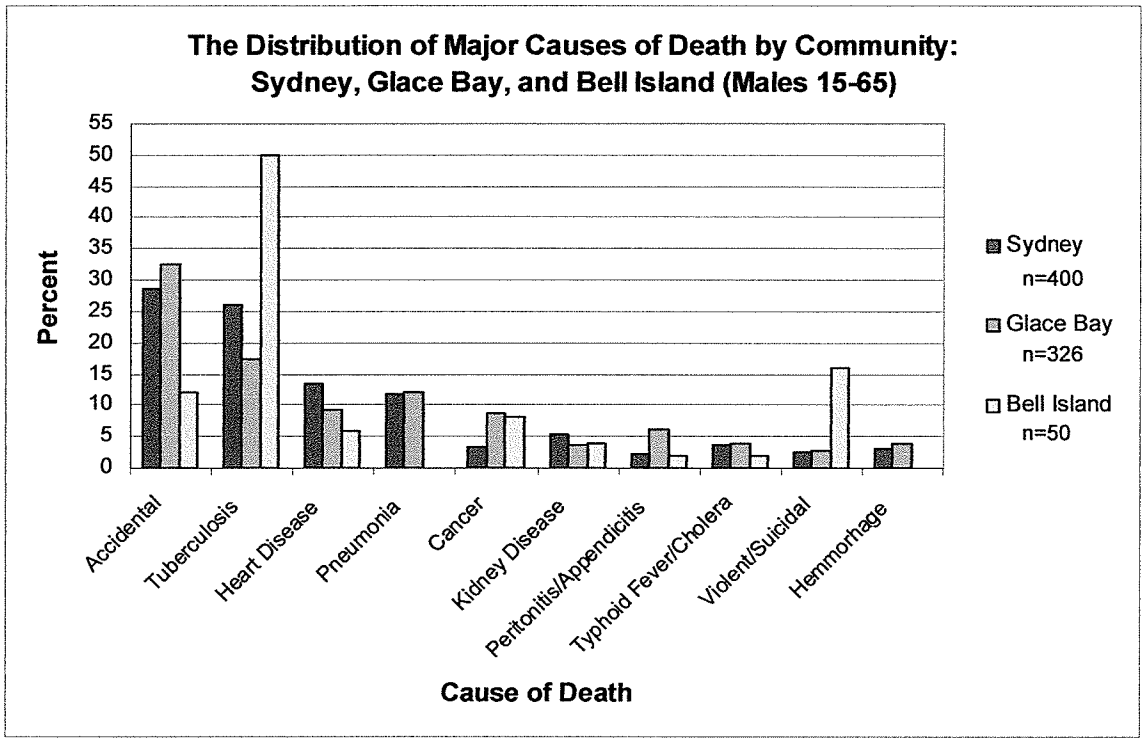


Figure 6.10: Major Causes of Death for Glace Bay 1909-1917, Males 15-64 Years of Age.
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917; Newfoundland Vital Statistics: Death Registries for 1909-1917

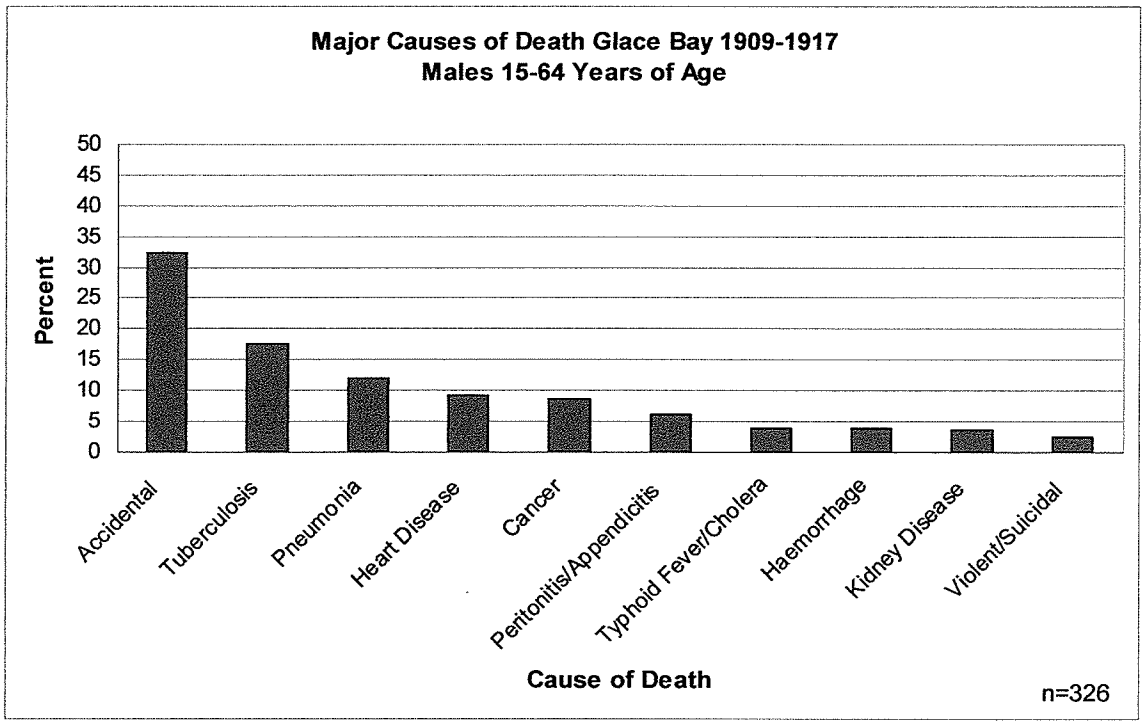


Figure 6.11: Major Causes of Death for Sydney 1909-1917, Males 15-64 Years of Age.
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917; Newfoundland Vital Statistics: Death Registries for 1909-1917

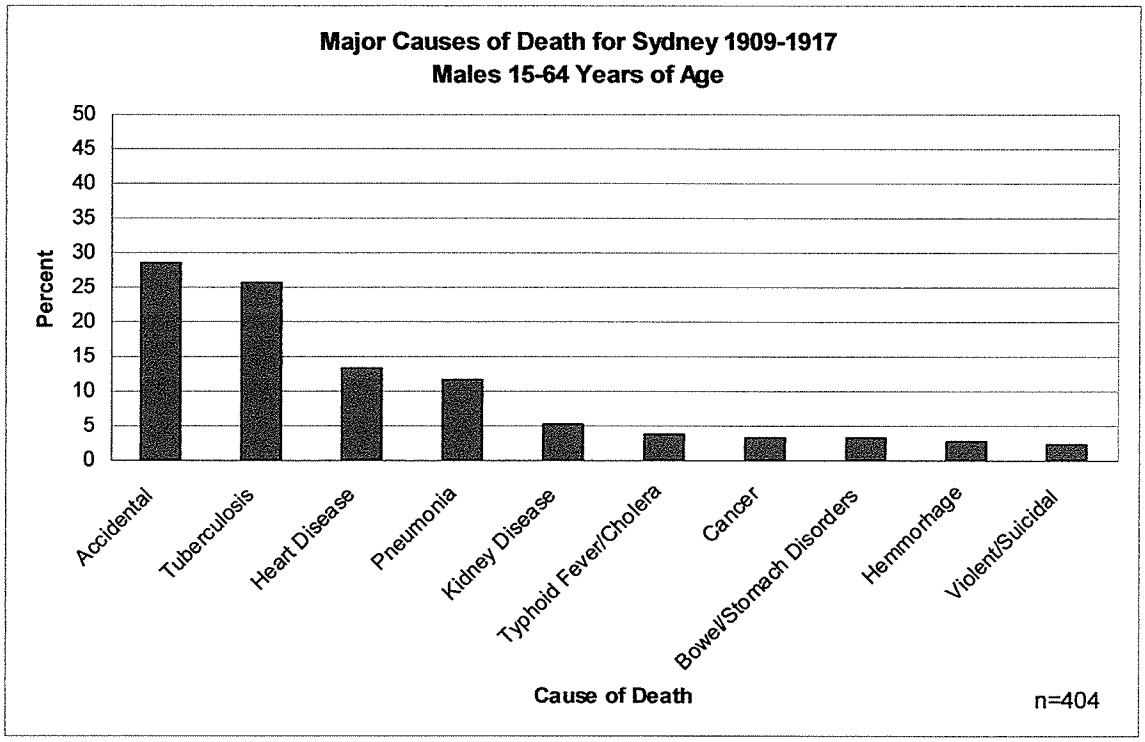


Figure 6.12: Major Causes of Death for Bell Island 1909-1917, Males 15-64 Years of Age.
Data Source: Nova Scotia Vital Statistics: Death Registries for 1909-1917; Newfoundland Vital Statistics: Death Registries for 1909-1917

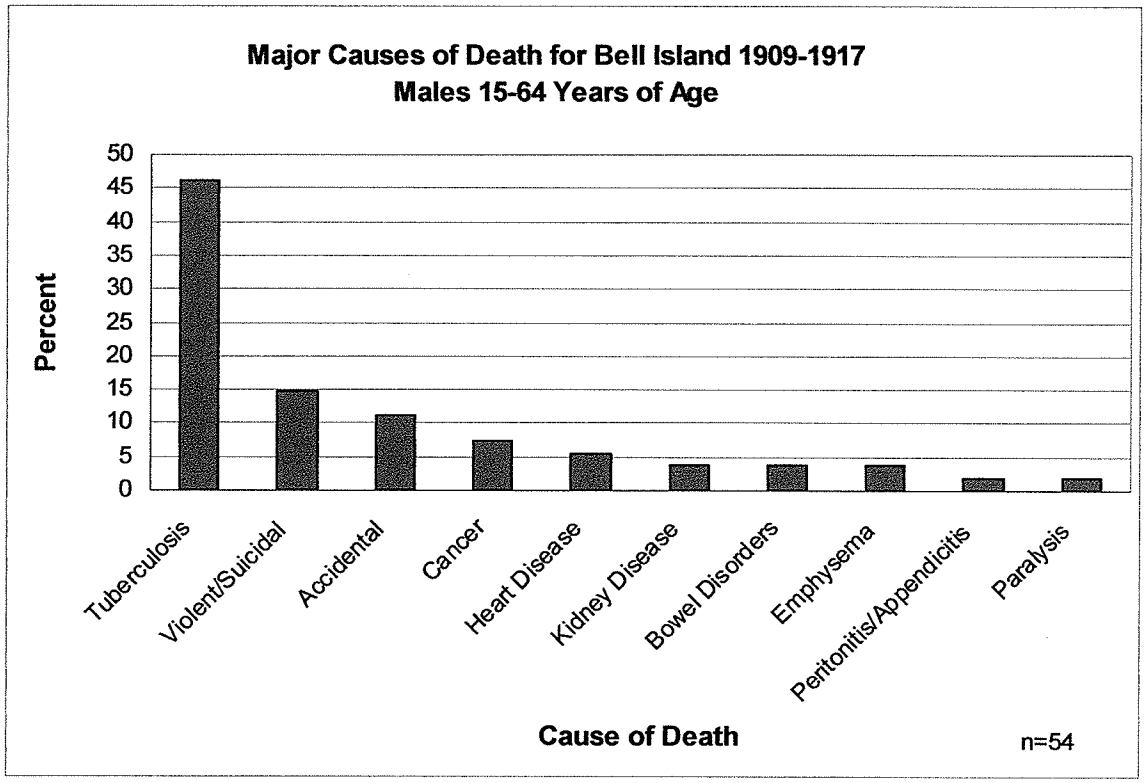
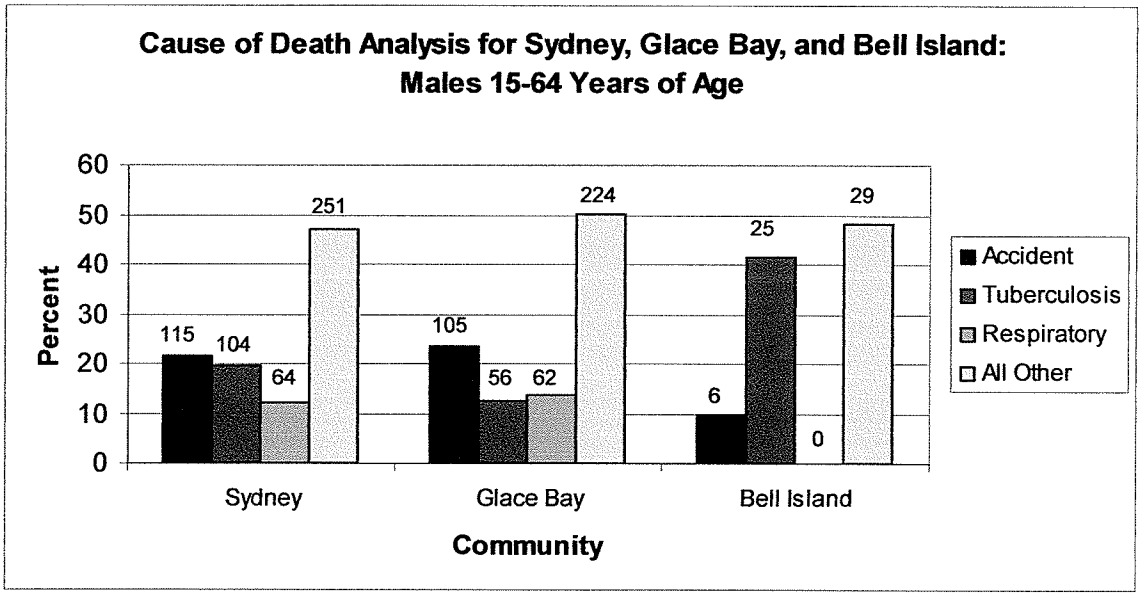


Figure 6.13: Cause of Death for Sydney, Glace Bay, and Bell Island.

(χ^2= 40.422; df= 6; $p < 0.001$)



as a result, there could have been reporting error in the recording of underlying causes of death. In turn, if the concept of tuberculosis being a deadly killer was accepted, then many people may have believed that individuals were dying of tuberculosis, without actually being diagnosed with the infection. This is particularly likely since Bell Island had no deaths due to 'respiratory' diseases, unlike Sydney and Glace Bay. It is probable that 'respiratory' diseases were listed as 'tuberculosis' in the registry, as a result, over-estimating tuberculosis due to the inclusion of other respiratory diseases such as bronchitis and pneumonia. Another possibility as to the high rates of tuberculosis may have been simply that people on Bell Island really did have a problem with tuberculosis, especially since residents arrived from a variety of communities in outport Newfoundland. It is important to note that Newfoundland showed rising death rates rather than decreasing death rates for tuberculosis in the early part of the twentieth century (Knowling, 1996).

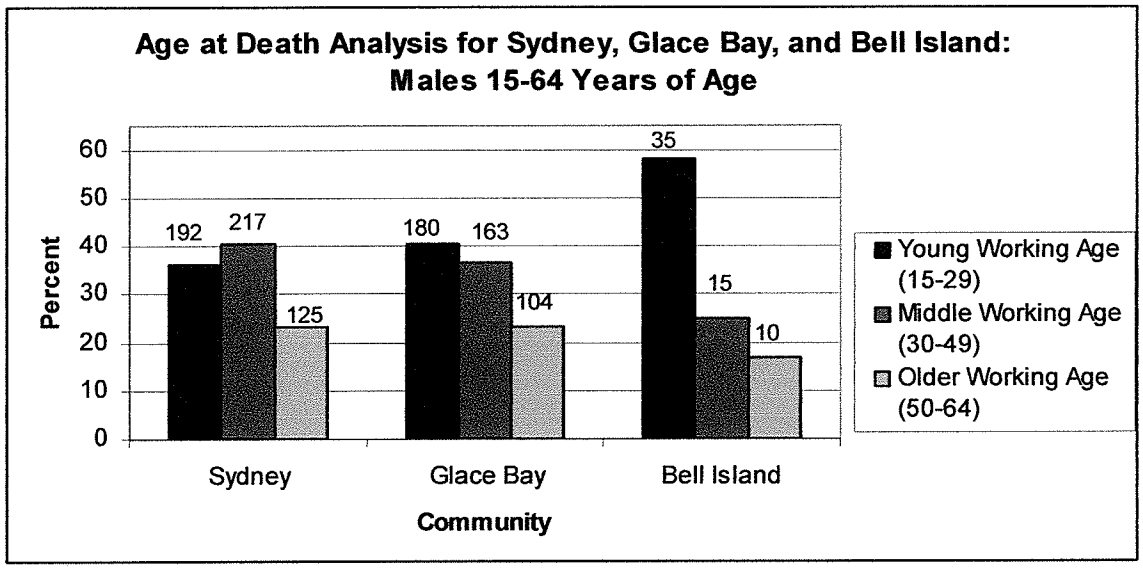
Age at death analysis for the three communities also revealed some interesting findings (Figure 6.14). Bell Island presents a more youthful death profile, in that 58.3% of males 15 to 64 years of age living on Bell Island died in the young working age (the ages of 15 to 29 years). While most deaths among working age males (15-64 years) in Glace Bay occurred in the younger working ages of 15 to 29 years (40.3%), it was only a marginal excess when compared to deaths in the middle age group of 30 to 49 years of age (36.5%). There were less older working aged males 50 to 64 years found in the Glace Bay death registry, with this age group only comprising 23.3% of all working age male deaths. In Sydney, only 36.0% of male deaths occurred in the young working ages (15 to 29 years). The lower percentage of deaths among young working age males in

Sydney may reflect the hierarchical labour positions found in steel plants. An individual starting off at the open hearths would begin as a 'third helper', working their way through the ranks of 'second and first helper' before becoming a 'melter' for example (Caplan, 2005). Thus, younger working age males might be found to work in less dangerous environments, such as the labour yard. Even when young labourers worked in more dangerous setting such as the blast furnace or open hearth, their duties would often entail carting supplies, removing debris, and cooling the iron with sand (Heron, 1988) and, as a result, they probably would have had less direct contact with the hot harmful chemicals and hot molten steel.

One possible reason for the young death profile in Bell Island may relate to occupation, public health, and the lack of a hospital. Without a fully operational hospital present, young Bell Island men, most of whom worked in the iron mines, would have been more susceptible to dying from injury in the mines. Consequently, these males may not have died an early death if a hospital providing more than first aid measures had been accessible. The younger working age men on Bell Island were also more likely to be employed in non- or less-skilled positions, working as miners and labourers, thus increasing their risk of dying young. It is important to recall that tuberculosis was the most common cause of death facing Bell Island working age males. In Newfoundland, tuberculosis was noted as "[t]he primary killer of adults between the ages of twenty and forty-five..." (Knowling, 1996:67). Life in outport rural fishing communities was believed to produce healthier Newfoundlander's compared to urban Newfoundlander's who were more likely to be susceptible to disease (Knowling, 1996). On the contrary, rural Newfoundlanders were poor and most lived in poverty (Knowling, 1996).

Figure 6.14: Age at Death for Sydney, Glace Bay, and Bell Island.

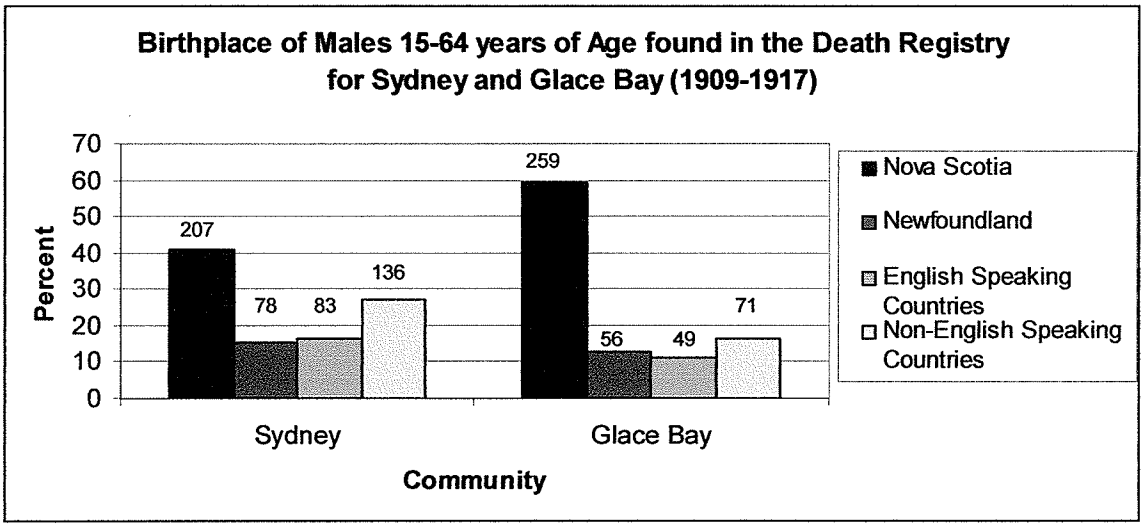
(χ^2= 12.211; df= 4; p = 0.016)



With the influx of migrants to Bell Island two items of interest arise. First, many individuals were coming from these poor rural communities; therefore there is the possibility that these young working males moving from rural fishing villages also spread disease. Second, the principal mining town on Bell Island, Wabana, quickly became a cramped and overcrowded town. Housing was major problem in the early 20th century and shacks were a common sight in this community (NSSCCo., 1910). Public health was problematic, in that the island did not have a large supply of clean fresh water, nor were appropriate methods of sewage and refuse disposal being implemented (Harris, 1911; Dover, 1912; NSSCCo., 1910). These shacks would have been problematic for public health, and were likely occupied by the young working men who moved to Bell Island to work in the mines (NSSCCo., 1910; Department of Public Health, 1913).

Results for birthplace and community, as found in the death registry, revealed some very interesting results, and are comparable to the living population demographics mentioned earlier. Bell Island was left out of the birthplace analysis due to small sample size and the fact that most working age males dying on Bell Island were born in Newfoundland, thus immigration was not as prevalent. As a result, Glace Bay and Sydney were more insightful for investigations into natality and mortality (Figure 6.15). Of males who died in Glace Bay, the majority (59.5%) were born in Nova Scotia, whereas only 41.1% of males dying in Sydney were born in Nova Scotia. Analysis of birthplace for all males who died in Sydney displayed an excess of foreign-born males dying, especially those coming from other non-English speaking countries (27.0%) which consists mainly of European countries (χ^2=33.694, 3df, $p < 0.001$). Possible inferences for the high number of foreign-born males moving to Sydney may have to do with

Figure 6.15: Birthplace of Males 15-65 from Death Registry: Sydney and Glace Bay.
(χ^2= 33,694; df= 3; p < 0.001)



Sydney being considered an urban setting, whereas Glace Bay was still considered a town during the present study period.

Foreign-born males may have moved to Sydney in light of better prospects for work, at least relative to what was available in Glace Bay. An analysis was conducted based on the occupations of men who died between 1909 and 1917 (Table 6.7). Overall, most men who died in either Sydney or Glace Bay worked in the industrial/subsistence sector (67.0% and 82.9% respectively). There were some opportunities for clerical/service positions, but more so in Sydney (24.7%, and 13.3% in Glace Bay). Very few men (who died) were in the professional/technical sector, though again there were still more opportunities in Sydney (8.3%, and Glace Bay 3.7%).

The 'skilled tradesmen' group is a large group comprising all forms of labour that requires some skill. Some examples include: blacksmith, blower[16] (steel plant occupation), electrician, machinist, pipefitter, blaster[17] (mine occupation), and rigger. The 'non-industrial' classification includes all occupations that are not related to the industrial trades. Some examples include: accountant, agents, bookkeeper, butcher, clerk, fisherman, physician, salesmen, and trader. There are some notable differences between Sydney and Glace Bay. First, there are more labourers (who died) in Sydney (36.3%) than in Glace Bay (9.3%). The majority of men who died in Glace Bay were miners (54.0%), whereas there were no miners in Sydney. This was to be expected as Sydney was never a mining town, and only grew because of the steel plant (Heron, 1988).

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[16] Blower at a steel plant supervises, directs, and coordinates activities of workers at the blast furnace. Overlooks and estimates the specified amounts of raw materials and chemicals in the making of molten metal. Observes the colour of molten metal. Directs workers in flushing and tapping furnace and in positioning ladles to receive molten metal.
Dictionary of Occupational Titles: Blower (steel & rel.). Last Accessed: 15-05-09
http://www.occupationalinfo.org/51/519132010.html

[17] Blaster in the mines uses explosives to blast holes in mines to create new shafts for mining production (Cantley, 1911).

Table 6.7: Occupational Groups Found in the Death Registry

Occupational Groups in Death Registry for Sydney and Glace Bay (HISCO and Industrial Specific)					
		Sydney (n=457)		Glace Bay (n=428)	
		n	%	N	%
HISCO Classification	Professional/Technical	38	8.3	16	3.7
	Clerical/Service	113	24.7	57	13.3
	Industrial/Subsistence	306	67.0	355	82.9
Industrial Specific Classification	Labourers	166	36.3	40	9.3
	Miners	0	0.0	231	54.0
	Skilled Tradesmen	125	27.4	77	18.0
	Non-Industrial Workers	166	36.3	80	18.7

Table 6.8: Occupational Groups Found in the Death Registry: Labourers/Miners Grouped

Occupational Groups in Death Registry for Sydney and Glace Bay (HISCO and Industrial Specific)					
		Sydney (n=457)		Glace Bay (n=428)	
		n	%	N	%
HISCO Classification	Professional/Technical	38	8.3	16	3.7
	Clerical/Service	113	24.7	57	13.3
	Industrial/Subsistence	306	67.0	355	82.9
Industrial Specific Classification	Labourers/Miners	166	36.3	271	63.3
	Skilled Tradesmen	125	27.4	77	18.0
	Non-Industrial Workers	166	36.3	80	18.7

Thus, for comparative analyses occupation was further grouped to include labourers and miners in a single group (Table 6.8). Second, Sydney had more skilled tradesmen who died relative to Glace Bay, representing 27.4% and 18.0% of male workers, respectively. It is likely that there were simply more men in the skilled trades available to die in Sydney. The steel plant required men of various trades to maintain the operations of the plant, and thus blacksmiths, carpenters, electricians, and machinists, among others, were hired by the Dominion Iron and Steel Company (Heron, 1988). Thirdly, there were more non-industrial workers (who died) in Sydney than in Glace Bay, calculated at 36.3% and 18.7% of men who died, respectively. Essentially, Sydney was more occupationally diverse compared to Glace Bay.

Sydney provided more jobs outside the industrial sector, whereas Glace Bay may have been solely a mining town with few alternate professional/clerical occupations available. Within the industrial sector there was also a greater availability of diverse occupations, as they were needed to operate the steel plant. Out of all males 15 to 64 years of age dying in Sydney and Glace Bay, most worked in the industrial sector, however, the death registry does suggest that there were more jobs outside the industrial sector in Sydney than in Glace Bay.

The steel plant in Sydney may have been more favourable as a means to gain capital, before these new immigrants moved to western parts of Canada. During this period of growth in Canada, new immigrants would often take jobs in factories before moving west (Green & Green, 1993). While the majority of professional occupations were likely held by Nova Scotians and British Europeans, other groups may have believed that they had better prospects in a city that offered a larger variety of

occupations than single industry-communities, like mining towns. While Sydney was considered a company town or single-industry community, a steel plant community would provide more diversity in occupations than a mining community simply because more types of workers were necessary for the steel plant to operate. The 1911 Census of Canada does support these inferences. Most foreign-born males did work in less skilled industrial occupations, and Sydney does show the availability of more jobs outside the industrial sector (see Table 6.4). The Dominion Iron and Steel Company brought in a number of workers from other countries, such as Germany, Russia, and Italy, who had some skill in steel working (Heron, 1988). Labour from non-British foreigners was cheap, and steel plants across Canada actively recruited such labour (Heron, 1988).

Sydney did, however, have problems with securing cheap labour due to its location, seemingly isolated from the rest of Canada (Heron, 1988). Problems in securing cheap labour may have impacted on the number of Nova Scotians found at the steel plant, because there were not enough cheap labour force recruits migrating to Sydney to ensure the productivity of the steel plant. Newfoundlanders were a major part of the labour force in Sydney (as well as Glace Bay). At this time Newfoundlanders were still considered foreigners and potentially difficult to understand but, even so, Newfoundlanders and non-British Europeans filled half of the jobs at Sydney's steel plant (Heron, 1988). Many of these immigrants from European countries later left Sydney and went westward (Heron, 1988).

In an attempt to further examine cause of death in specific occupational classifications in Glace Bay and Sydney, cases were selected for labourers/miners, skilled tradesmen, and non-industrial workers (Figures 6.16, 6.17, and 6.18). None of these

analyses produced statistically significant results. Overall, miners and labourers display a slight difference in the mortality pattern (Figure 6.16) between Sydney and Glace Bay, whereas a similar pattern is found amongst skilled tradesmen and non-industrial workers for the two communities (Figures 6.17 and 6.18). Accidental deaths were relatively similar across each occupational group. The only minor difference (and even then it is not statistically significant) is within the miner/labourer occupational group (Figure 6.16). In Sydney, there were less labourers dying of accidental deaths than tuberculosis deaths (22.3% and 31.9% respectively). On the other hand, accidental deaths were marginally higher among miners/labourers in Glace Bay than tuberculosis death (28.4% and 26.9% respectively).

The distributions of causes of deaths are fairly even between occupational groups, however some differences (although not significant) between Sydney and Glace Bay were found within both the skilled tradesmen and non-industrial occupational groups (Figures 6.17 and 6.18). Of all deaths among skilled tradesmen, Sydney displayed a higher percent of accidental deaths than the proportion found in Glace Bay (31.2% and 26.0% respectively). Thus, in comparison, accidental causes of death in Sydney were slightly more of a problem than in Glace Bay. Many skilled tradesmen in Sydney worked at the steel plant (Caplan, 2005; Heron, 1988), whereas this occupational group in Glace Bay may not have worked in the hazardous coal mines (or at least not at the same frequency), as mining (in comparison to the steel plant) was not as occupationally diverse. Non-industrial workers presented a higher proportion of accidental causes of death in Sydney (19.3%) relative to Glace Bay (8.8%). Accordingly, it is important to recall that Sydney had a more diverse workforce with more males working in the

Figure 6.16: Cause of Death for Miner and Labourers for Sydney and Glace Bay Males 15-64 Years of Age 1909-1917

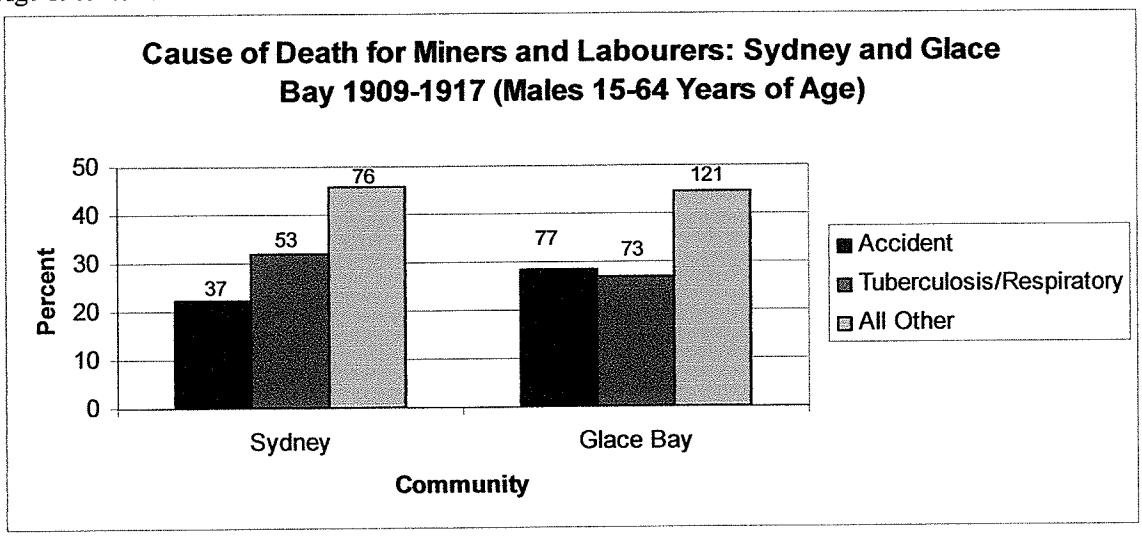


Figure 6.17: Cause of Death fore Skilled Tradesmen for Sydney and Glace Bay Males 15-64 Years of Age, 1909-1917

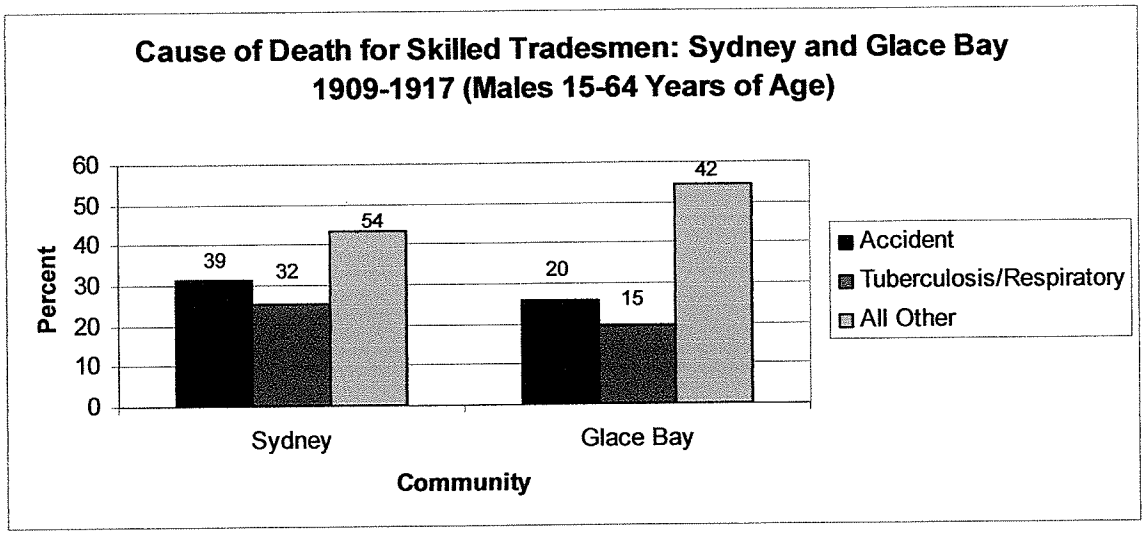
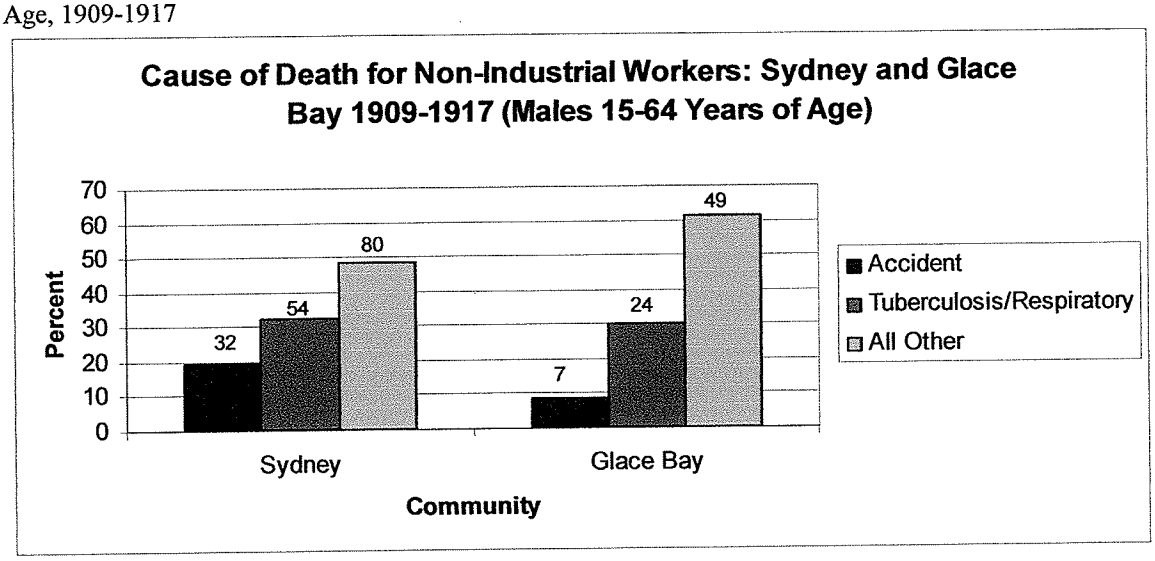


Figure 6.18: Cause of Death for Non-Industrial Workers for Sydney and Glace Bay Males 15-64 Years of Age, 1909-1917



professional and service sector than in Glace Bay. In each occupational group, most working age males (15 to 64 years of age) in Sydney and Glace Bay died of 'all other' causes. Of miners and labourers in Sydney and Glace Bay, 45.8% and 44.6% respectively died of 'all other' causes. An estimated 43.2% and 54.5% of skilled tradesmen died of 'all other' causes in Sydney and Glace Bay, respectively. Non-Industrial workers presented the highest percent of deaths from 'all other' causes: 48.2% for Sydney and 61.2% for Glace Bay. Since the focus of this research is on tuberculosis and accidental causes of death, the category of 'all other' causes of death represents a conglomerate of all remaining causes of death and, as a result, the number of individuals dying in this category is fairly large. The results of these analyses suggest that each community revealed some marginal variation with respect to occupation and cause of death.

Community-Level Mortality Analyses

Glace Bay

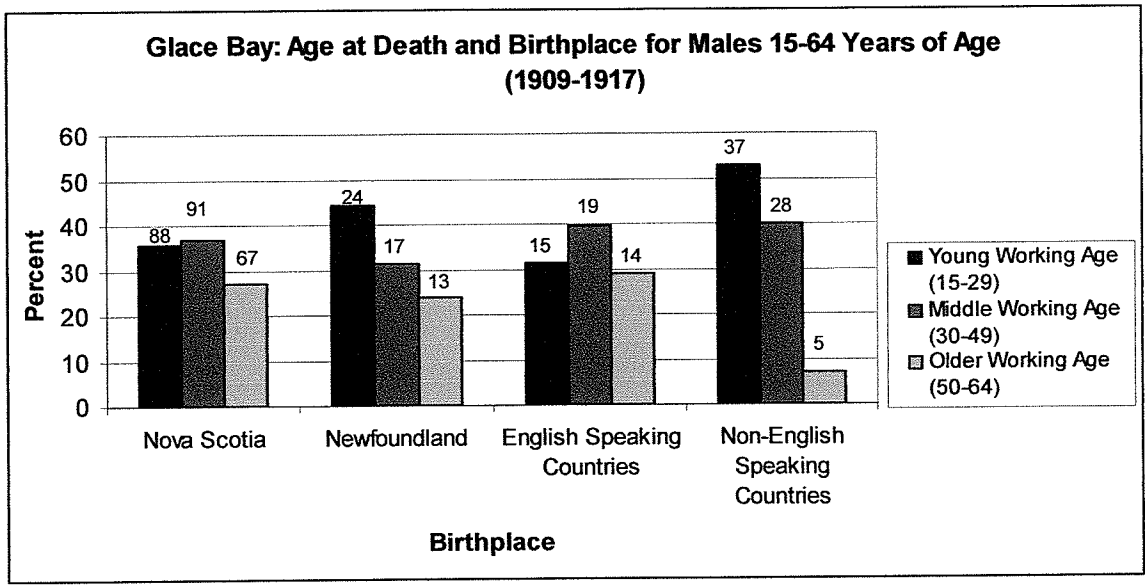
There is no doubt that Glace Bay's mortality record was affected by underground mining, the industrial occupation that encapsulated most of the male workforce. Accidental causes of death, for example, reflect the dangerous working conditions of coal mining. In order to gain insight into this community's morality profile, age at death, birthplace, and cause of death were all considered. A small sample size did present some difficulty in restricting more detailed analyses that potentially could have unveiled more insightful results.

An analysis of age at death by birthplace revealed interesting and significant results (Figure 6.19). Overall, working age profile patterns in the death registry displayed similarities between men born in Nova Scotia and those born in English speaking countries, Newfoundland and non-English speaking countries. Nova Scotia and English speaking countries revealed a marginal increase of males who died in the middle working age group (30-49 years of age). On the other hand, Newfoundland and non-English speaking countries revealed proportionately more younger working age males dying, followed by middle working age, and older working ages respectively. English speaking countries include all countries in the British Isles, Canada and the United States. Non-English speaking countries include all countries whose national language is not English. Some examples include: Austria, Barbados, Germany, Hungary, Italy, and Russia.

Three main points appear in the statistical analysis. First, older working age males (50 to 64 years of age) who died between 1909 and 1917 in Glace Bay displayed an excess of males born in Nova Scotia (27.2%). It is likely that significantly more men born in Nova Scotia lived to, and died in, the older working age group. One major possibility is the type of work that these men occupied. Nova Scotians were likely given better work positions (when available) than individuals from other countries, especially those immigrating from non-English speaking countries. Canadian immigration policies preferred individuals from Britain in the early part of the 20th century, over those from other countries. Immigration policies reflected this, as English individuals were provided better jobs and immediate Canadian citizenship, whereas the process for non-English speaking immigrants was much harder (Avery, 1979). Thus, it is very likely that Nova Scotians, Canadians, and British immigrants were given better employment positions in

Figure 6.19: Age at Death and Birthplace for Glace Bay Males 15-64.

(χ^2=15.952; df= 6; p=0.014)



Glace Bay which, in turn, could increase survival. Another possibility for the excess of older working age Nova Scotians in the death registry, is that these males, due to proximity, may have migrated to Glace Bay later in life, and, as a result, they would likely die later. A final possibility for the higher number of older working age males in the Glace Bay death registry is that Nova Scotians may not have been as prone to causes of death, like accidents, that would have likely lowered their age at death. In mining, as in steel making, language barriers likely caused threats to the lives of workers. If non-English speaking immigrants were moving earlier in life at the younger working age then they would likely be more susceptible to die earlier in life, particularly when working hazardous occupations like steel working and mining. The data reveals that males moving from non-English speaking countries to Glace Bay were indeed dying more frequently in the younger working age group (52.95%) than other working ages, especially in the older working age group (7.1%). Consequently, it is very likely that the majority of these individuals were occupying mining jobs, therefore reducing their survival prospects past a young working age.

To investigate working age, birthplace, and occupation further, data was selected on where individuals were born and where they worked, with respect to each age group (Figures 6.20, 6.21, and 6.22). The sample size, however, was too small to evaluate statistically. Overall, most working age males in Glace Bay died within the miners/labourers occupational group. Birthplace also revealed that the majority of deaths in each of the three age groups were found amongst miners and labourers. Notably, in all age groups, Newfoundlanders and males born in non-English countries displayed the highest percent of miners/labourers in the Glace Bay death registry. While Nova Scotian-

born males in all working age groups had a higher percent of males dying in the mining/labourer sector, there was a relatively higher proportion of middle working age males dying in the non-industrial working sectors, and younger working age males dying in the skilled tradesmen occupations. Examination of young working age Nova Scotian males reveals a steady decline in mortality from miners/labourers (48.9%), skilled tradesmen (29.5%), and non-industrial workers (21.6%). Similar patterns are observed for English speaking countries as well, except that in the younger working ages, there are few males (6.7%) working/dying in the non-industrial sector. By the middle and older working ages, men found in the death registry who were born in English countries were more commonly working in the non-industrial sector. Thus, the death registry shows a similar pattern in Canadian labour history, in that British-born immigrants were more likely to achieve better wage labour than other immigrants (Avery, 1979; Heron, 1988).

It appears that Newfoundlanders and males from non-English speaking countries frequently occupied jobs in the miners/labourers sector. This was apparent in all age groups. With respect to the death registry, it does appear that Newfoundlanders may have been able to gain access to some jobs outside of miner/labourer positions, but had less access than males from English speaking countries. Working age males from non-English countries showed an extreme differential in mortality patterns between miners/labourers, skilled tradesmen, and non-industrial workers. Of all non-English young working age males in the death registry, 97.3% were miners or labourers. In the middle working age and older working age groups of non-English-born males in the death registry, 92.9% and 80.0% were miners or labourers. Accordingly, these men were likely immigrating to Glace Bay, particularly for the coal mine industry. Also, as noted

Figure 6.20: Young Working Age Males (15-29 Years) In Glace Bay: Birthplace and Occupation 1909-1917

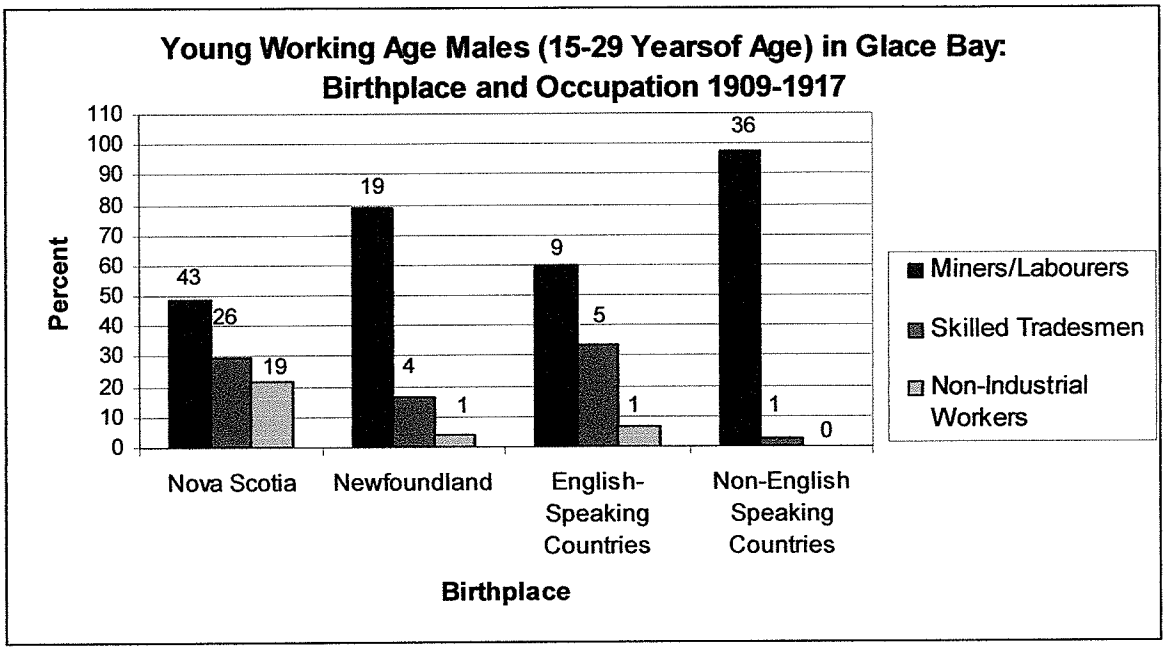


Figure 6.21: Middle Working Age Males (30-49 Years) In Glace Bay: Birthplace and Occupation 1909-1917

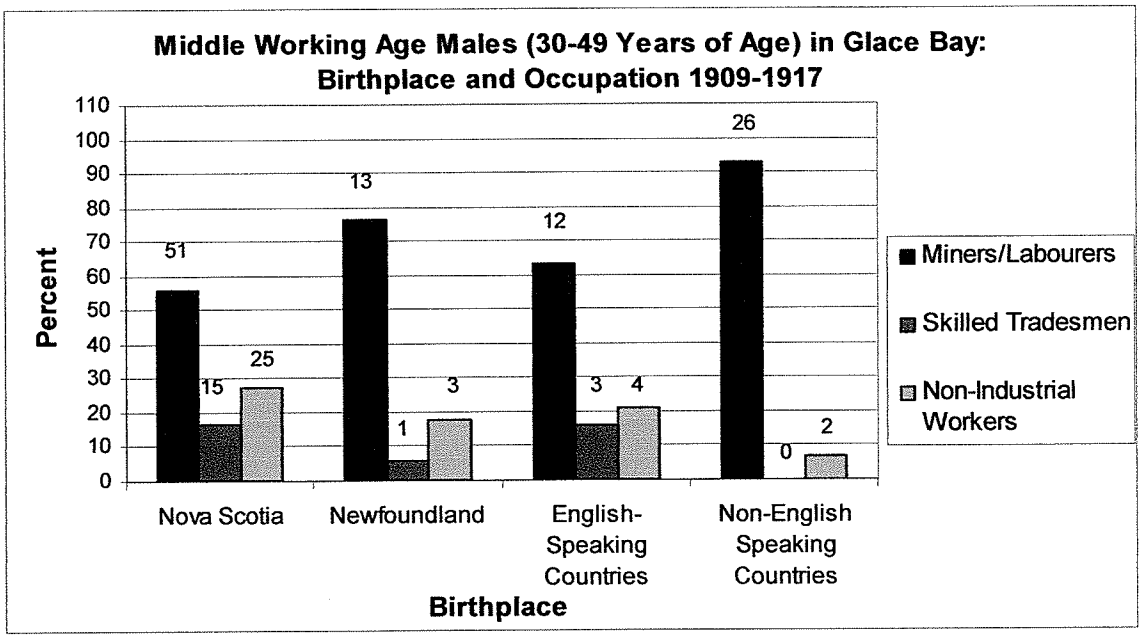
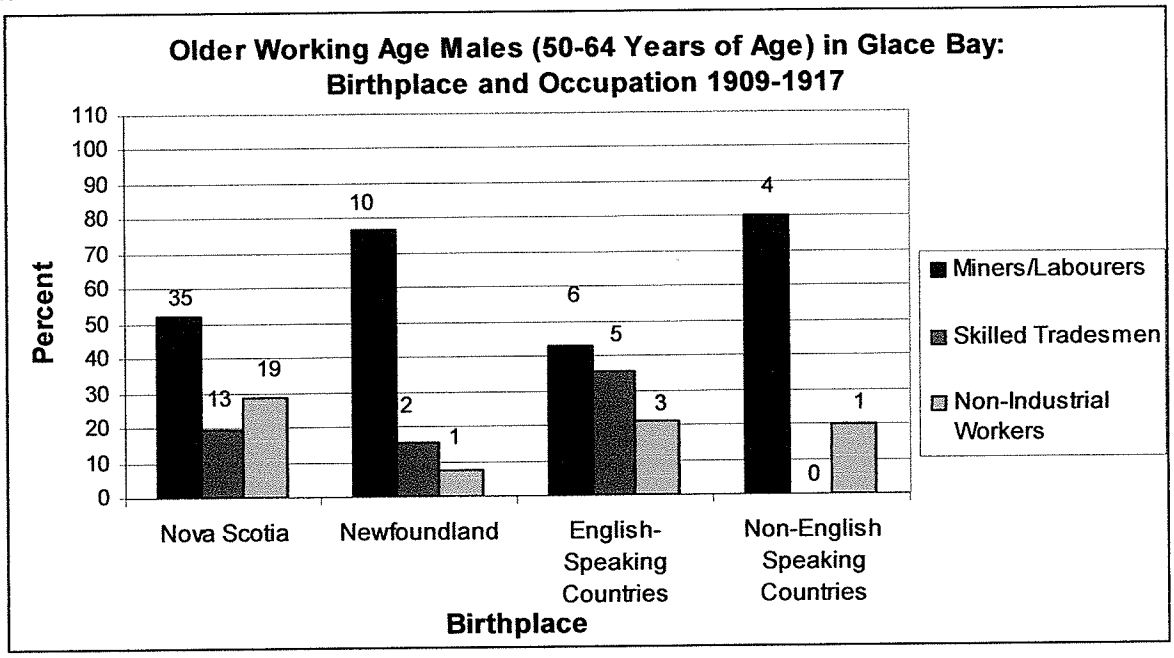


Figure 6.22: Older Working Age Males (50-64 Years) In Glace Bay: Birthplace and Occupation 1909-1917



previously, the 1911 census showed that immigrant males usually occupied jobs in mining, manufacture trades, or building trades sectors (see Table 6.4). Consequently the death registry follows concepts in Canadian labour history that suggest favouritism was given to British immigrants over other immigrants, and also that Glace Bay was indeed an industry-heavy community or single-industry town, in that most males worked in mining positions (Avery, 1979; Heyman, 1995).

During the early part of the 20th century, mining conditions were harsh, and with numerous individuals migrating from various parts of Europe, language barriers would have likely had a major effect on communication in the mines. Thus, understanding where individuals were moving from and what they were dying of may reflect the possibility that language affected the mortality pattern. The birthplace and cause of death analysis revealed highly significant results (Figure 6.23). Males from non-English speaking countries displayed a relative excess of accidental deaths, making up 35.2% of all causes of death for males born in non-English speaking countries. Newfoundlanders, alternatively, displayed a relative excess in tuberculosis causes of death, making up 21.4% of all causes of deaths for Newfoundlanders. The 'All Other' Category is quite large, however, Newfoundlanders did not reveal, comparably, as many deaths in this group (35.7%). Finally, tuberculosis did not appear to be as large of a threat to those individuals moving from English speaking countries, as there was a relative deficiency of tuberculosis deaths comprising only 2.0% of all causes of death within this group.

With respect to occupation and birthplace, the data did reveal some interesting features that compliment findings in the literature regarding occupations (Figure 6.24) (Avery, 1979; Heron, 1988). Males (15-64 years of age) from Newfoundland, and other

non-English speaking countries showed a relative excess of males who died while working labourer and mining positions, representing 77.8% of all deaths among male Newfoundlanders, and 94.3% of all deaths among males born in non-English speaking countries.

It is likely that, due to communication problems, these individuals died more frequently. Newfoundlanders in the first two decades of the 20th century were given the same privileges upon arrival to Canada as any Canadian citizen (Neary, 1982). In fact, Newfoundlanders had certain immigration policies waived, such as the literacy test (Neary, 1982). Heron (1988) also noted the difficulty of understanding Newfoundlanders, as if they spoke a completely different language. While a large percent (52.4%) of Nova Scotian males who died were miners or labourers, there was a relative deficiency of Nova Scotian-born males working as miners or labourers in the mortality record. Alternately, Nova Scotia males who died displayed a relative excess of individuals working in the non-industrial sector (25.6%) and the skilled tradesmen sector (22.0%). Essentially this furthers the idea that more native-born males were more likely to be employed in skilled trades or non-industrial positions, in turn likely working in less hazardous conditions. Of the men who died, there was a relative deficiency of males who were from non-English speaking countries and worked as skilled tradesmen (1.4%) or as non- industrial workers (4.3%), thus enhancing the idea that there were simply less of these individuals working in these positions. The population data taken from the 1911 Canadian Census did show that there was a large migration of males from foreign countries, and that these males did occupy less-skilled and more arduous jobs such as mining and labour work (see Table 6.4).

Figure 6.23: Birthplace and Cause of Death for Glace Bay Males 15-64 Years, as Found in the Death Registry. (χ^2=22.960; df=9; p=0.006)

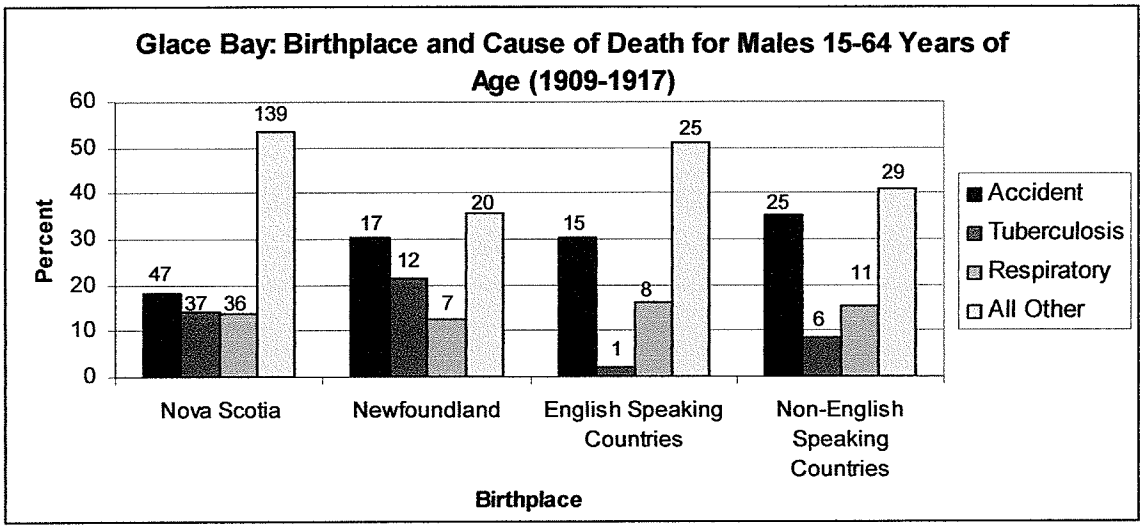
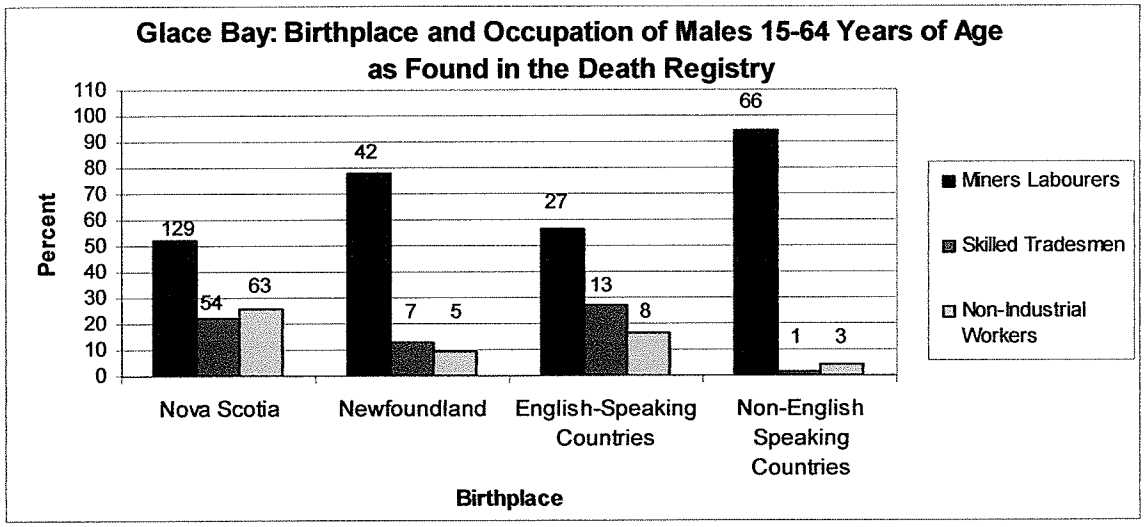


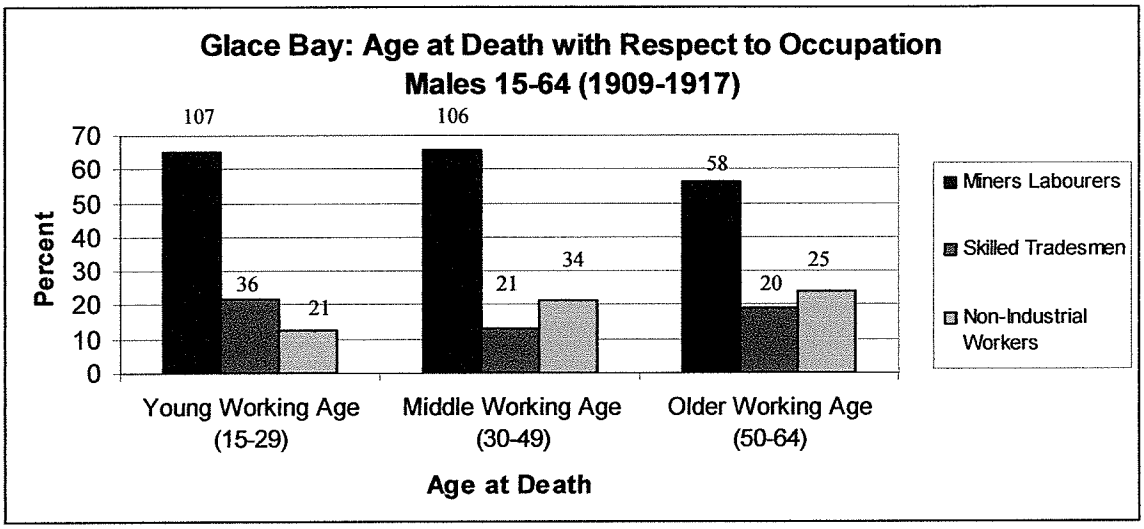
Figure 6.24: Birthplace and Occupation for Glace Bay Males 15-64 Years, as Found in the Death Registry. (χ^2=49.781; df=6; p<0.001)



Analyses of age at death by occupation present some interesting findings and provide insight into probable hazards in certain occupations with respect to age (Figure 6.25). It would be expected to observe a youthful death profile of certain occupations, like miners, labourers, and skilled tradesmen than those working in the non-industrial sector. Overall, miners and labourers make up the majority of deaths in all working ages in the Glace Bay mortality record. Apart from occupations of young working age males, non-industrial workers made up the second largest group of working age males dying in Glace Bay, with skilled tradesmen making up the smallest group. Glace Bay was a mining town, and unlike steelworkers at the Sydney plant, there were fewer requirements for skilled workers in the mines. As a result, there would likely be less skilled workers in Glace Bay. Among young working age males, however, skilled tradesmen displayed the second highest proportion of deaths in Glace Bay (22.0%). There was a relative deficiency of young working age males dying within the non-industrial sector, comprising 12.8% of all young working age males in the death record. Thus, there is likely less risk among young males working within the non-industrial sector than young males in miner/labourer and skilled tradesmen positions. On the other hand, there are likely less young males working in the non-industrial sector. Additionally, middle working age males who died in Glace Bay also displayed a relative deficiency of skilled tradesmen positions, making up only 13.0% of all deaths in this age category.

Consequently, it appears that age at death with respect to occupation does not reflect a youthful death profile among miners and labourers; rather the age at death distribution is fairly even, except amongst older working age men. The even distribution

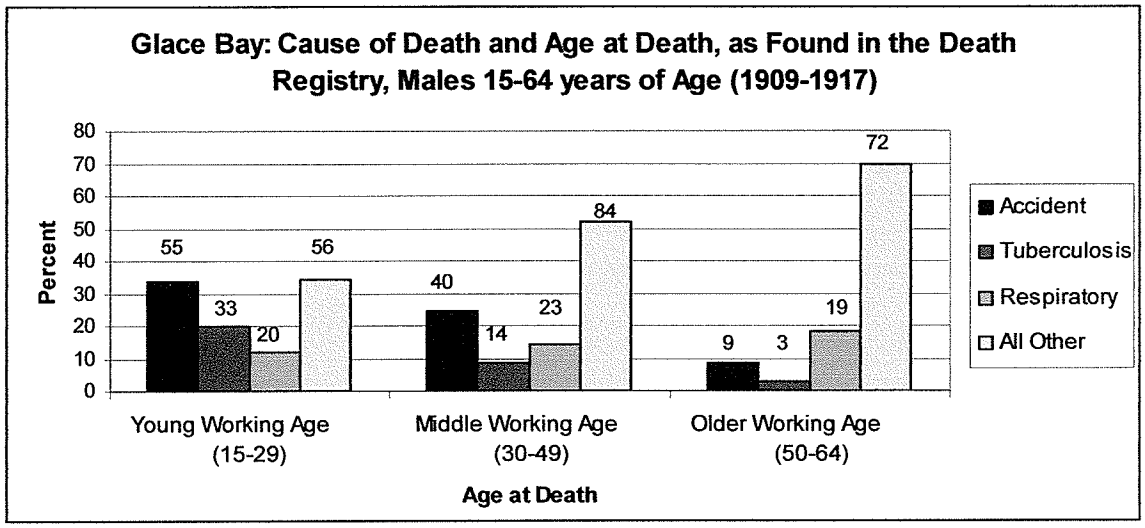
Figure 6.25: Age at Death and Occupation for Glace Bay Males 15-64, as Found in the Death Registry. (χ^2=10.057; df=4; p=0.039)



of deaths between the young and middle age groups may reflect the experience that boys had around the mines, many of whom began working around the labour yards by the age of nine, moving into the pits at around age fifteen (McIntosh, 1987; McIntosh, 2000; Mellor, 1983). Mining was likely dangerous for all ages as a 'fall of ground' could happen any time to anyone, as well as an explosion in the mine caused by the presence of methane gas. Accidents in mines may not necessarily reflect skill, rather it may be reflected more by environmental factors, such as the area being worked, or whether methane gas is present in the mines. Older miners may be more likely to work in other areas, especially if they had already succumbed to an injury. In Rossland, British Columbia, older miners would often be given work as labourers or provided jobs in the office (Ripmeester, 1994). In all, the majority of workers dying in Glace Bay being miners and labourers reflects the hazardous occupation of the mining industry.

Age at death with respect to cause of death in Glace Bay revealed some significant findings (Figure 6.26). The large percent in the 'all other' classification reflects a conglomerate of diseases, including chronic degenerative diseases, and is therefore not as insightful. Younger working age males 15 to 29 years of age showed a relative excess in both accidental causes of death (33.5%) and tuberculosis (20.1%). Conversely, older working age males revealed a relative deficiency of deaths from accidental causes (8.7%) and tuberculosis (2.9%). The excess of tuberculosis among the younger working age, and the deficiency among older working ages, is interesting because it is opposite of what would be expected. In many populations, tuberculosis is

Figure 6.26: Cause of Death and Age at Death for Glace Bay Males 15-64, as Found in the Death Registry. (χ^2=52.460; df=6; p<0.001)



found amongst young women and elderly men (Crampin et, al., 2004). Historically, coal worker's pneumonia was often mistaken for tuberculosis, chronic bronchitis, and emphysema (McIvor & Johnston, 2007). Coal worker's pneumonia, however, is a late onset disease, often occurring between 40 to 70 years of age and dependent on exposure to coal dust particles (Leathart, 1972), thus there must be other reasons for the excess of tuberculosis among the younger population. During the study period (1909-1917), coal worker's pneumonia was not recognized, in fact it was not until 1942 that this disease was considered a lethal disease with occupational origins (McIvor & Johnston, 2007). As a result, it will be impossible to actually determine the effect coal workers' pneumoconiosis had on populations prior to the 1940s. The high proportion of tuberculosis deaths among young working age males is likely accurate, as cause of death was reported by a physician and since coal worker's pneumoconiosis is considered a late onset disease. Initial simple coal workers' pneumoconiosis may have increased the tuberculosis risk by adding strain on the lungs of these young workers. Accordingly, it is likely that if these young men did not die of tuberculosis, and worked at least 20 to 30 years in the mines, they would have most definitely succumbed to coal worker's pneumoconiosis later in life.

St. Joseph's Hospital was built near the coal mines as the community grew in the first few years of coal mining operations. Younger males may have been more likely to seek professional health care, thus increasing the diagnosis of tuberculosis among that working age group. Older working age males may have been less likely to go to the hospital due to beliefs in health care at the time. Hospitals in the late Victorian era (1880-1901) were considered dreadful places, and carried a stigma of poverty and

dependence (Gagan, 1989). Hospitals were also considered places where people went to die (Sawchuk and Burke, 2000). Thus, older working age males may have carried with them such beliefs of hospitals and while cause of death was reported by a physician, the symptoms may have been based on a kin's description. Younger working age men, on the other hand, may have become more entrusting of treatments provided by hospitals, in turn seeking more assistance from a physician and, as a result, having a more thorough diagnosis of illness in life and in death. By the end of the 19th century hospital conceptions were undergoing changes, especially with the advent of Listerism (use of antiseptics) (Gagan, 1989), which may have improved the diagnoses among the younger working males.

Another highly probable reason for the excess of tuberculosis among young working age males is problems with housing. Housing in Glace Bay was a major concern for coal miners during the turn of the century. Houses were overcrowded as the town could not keep up with the influx of individuals arriving daily to work in the mines (Mellor, 1983). These overcrowded living conditions were noted to increase the exposure to infectious diseases (McDonald, 1909), one very likely contender being tuberculosis. Homemade shanties were also built as the Dominion Coal Company was unable to build enough double miners' homes or boarding houses for the surplus (Mellor, 1983). The small double homes would be overcrowded with approximately twenty individuals per six room house (Mellor, 1983). Poor housing, crowding, dampness, and reduced ventilation can increase susceptibility to infectious agents like tuberculosis and cholera (Feldberg, 1995). Consequently, individuals in Glace Bay were likely exposed to such elements at home as well as at work.

One major component with respect to living conditions that may have increased susceptibility to tuberculosis was the boarding houses in Glace Bay. These buildings were built for males coming to work in the mines. The beds were shared, usually by two males working opposite shifts (Mellor, 1983). The boarding house may have been the cause for the increased susceptibility of younger working males dying from tuberculosis. More often then not, older males would have a family, and therefore likely live in a house that would accommodate their families. A younger male, on the other hand, is more likely to be single and therefore occupy space in the boarding house. In Rossland, British Columbia, boarding houses were used for single men who did not have family (Ripmeester, 1994).

Accidental causes of death among the younger male population were likely due to lack of experience. Whitfield (1954) did notice a slight surplus of accidents for both the young and old, and that younger men were often new to the industry. The older males may have been coming from other industrial/subsistence occupations and probably had some understanding of risks involved in labour-intensive jobs. It is highly unlikely that the older working age were coming from professional/managerial positions, unless there was a Depression, but there was not, as this was the time of the Great Migration. The Great Migration of Canada was a major period of industrial enterprise and economic and demographic growth, thus jobs at this point in Canadian history were plentiful (Heron, 1988), and therefore there was no shortage of work during this industrial period. Also, according to Whitfield (1954), only older men who were physically fit would continue as colliers. As a result, these men would have both experience and physique to continue mining, and therefore would probably be less likely to die from an accident. On the other

hand, the older working age men may have also been working in less hazardous environments, perhaps supervising or directing other miners (Whitfield, 1954).

Analysis of occupation and cause of death for Glace Bay revealed highly significant results (Figure 6.27). Both miners/labourers and skilled tradesmen were highly susceptible to accidental causes of death in comparison to non-industrial workers (28.4%, 26.0%, and 8.8% respectively). The work environment would likely influence accidental causes of death among miners/labourers and skilled tradesmen. Miners/labourers did reveal a relative excess of accidental causes of death when compared to the remaining occupational groups. Non-industrial workers, on the other hand, revealed the opposite, notably a relative deficiency of accidental deaths. Mining and labour work was and still is exhausting and arduous, thus accidental deaths would likely be frequent, and a continual threat to the lives of miners. The Springhill coal mines underwent three different mine disasters in 1891, 1956, and 1958, each taking 125, 39, and 74 lives respectively.[18] "In 1992, twenty-six miners were buried alive in the Westray Mine in Nova Scotia" (Marshall, 1996:26). In 2006, an explosion at the Sago coal mine in West Virginia entrapped miners underground.[19] In February, 2009, a blast in a mine in China killed 74 people, and hospitalized 119 people, 5 in critical condition. [20] Non-industrial work (apart from the small number of subsistence workers) would not be as strenuous, and accidental causes of death may have been less likely to occur, than amongst the miner cohort.

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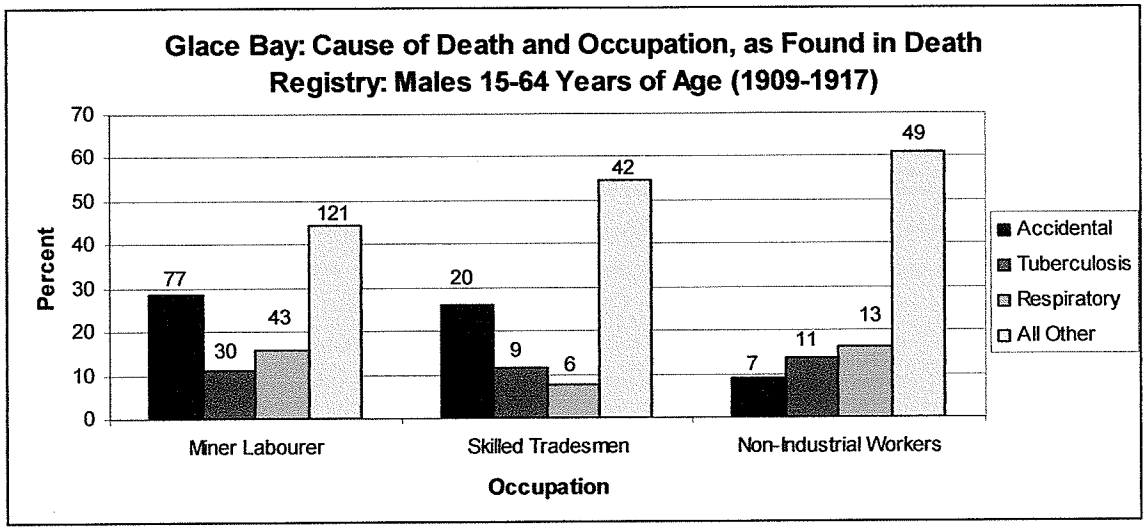
[18] Nova Scotia Archives and Records Management Website: Men in the Mines, Disasters in the Mines: The Springhill Mine Disasters of 1891, 1956, and 1958. Last accessed: 29-04-09 http://www.gov.ns.ca/nsarm/virtual/meninmines/disasters.asp?Language=English#springhill

[19] New York Times Website: The Sago Mine Disaster, 05-01-06. Last accessed: 29-04-09 http://www.nytimes.com/2006/01/05/opinion/05thu1.html

[20] National Post Website: Blast in China Coal Mine Kills 74, 22-02-09. Las accessed: 29-04-09 Http://www.nationalpost.com/related/topics/story.html?id=1317485

Figure 6.27: Cause of Death and Occupation for Glace Bay Males 15-64, as Found in Death Registry.
(χ^2=17.139; df=6; p=0.009)

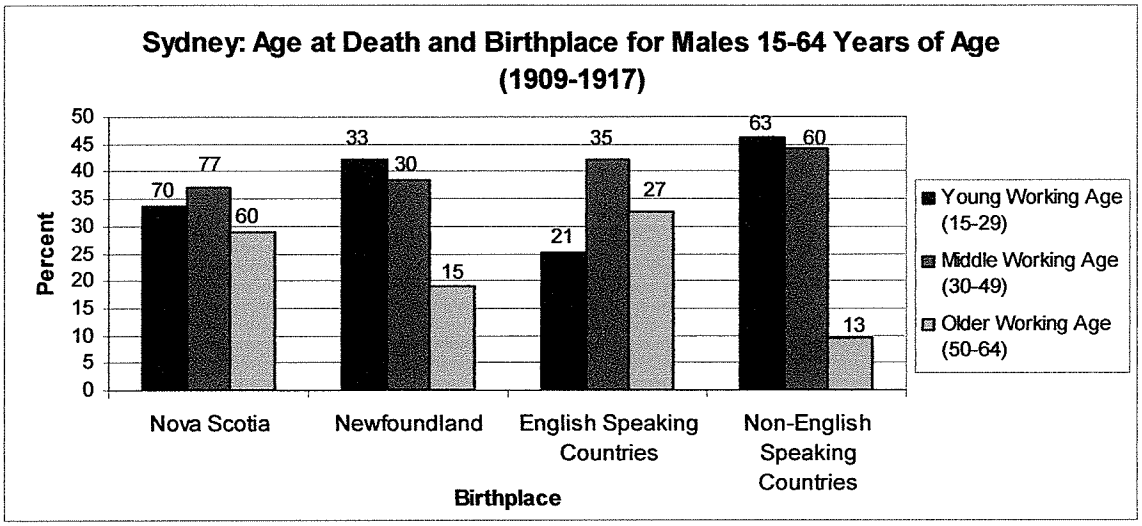


Sydney

Like Glace Bay, Sydney's mortality patterns amongst working age males reveal the effects of harsh working conditions. Sydney's landscape was defined by the steel plant which enabled the community to grow rapidly during the early 20th century. As a result, the mortality pattern for working age males reflects the industrial-centred occupations, the rapid growth, the influx of working class individuals, and the relative increase in susceptibility to certain causes of death, such as accidents.

The association between birthplace and age at death for males dying in Sydney presented some highly significant results (Figure 6.28). Overall, all males in the death registry displayed a similar percent of middle working age deaths for the four major places of birth (Nova Scotia: 37.2%; Newfoundland: 38.5%; English speaking countries: 42.2%, and Non-English speaking countries: 44.2%). Of young working age males, Newfoundland men and men born in non-English speaking countries presented the highest proportion of deaths, at 42.3% and 46.3% respectively. Men born in Nova Scotia and English-speaking countries did reveal a relative excess of older working age males dying, at 29.0% and 32.5% respectively. There was a relative deficiency of males born in English speaking countries that died in the younger working ages (25.3%), whereas those born in non-English speaking countries showed a relative excess of males dying in the young working age group (46.3% of males from this birthplace). On the other hand, there was a relative deficiency of older working age males from non-English speaking countries in the death registry, making up only 9.6% of all males born in non-English speaking countries. The data suggests that those who immigrated into the workforce from non-English speaking countries were young, and that half of these men died young.

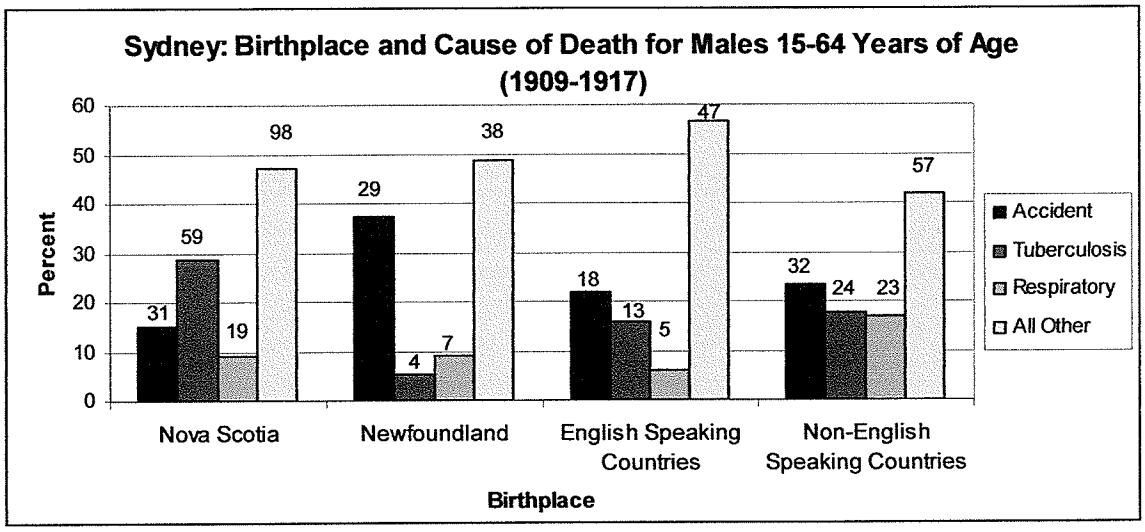
Figure 6.28: Age at Death and Birthplace for Sydney Males 15-64, as Found in the Death Registry. Note the high percent of young working age males from Newfoundland and non-English speaking countries (χ^2=26.328; df= 6; p<0.001)



The 1911 census does not break down occupation by nativity and age into one table, however, there was a large influx of immigrants from non-English speaking countries (see Table 6.3). The majority of immigrants were working in the 'manufacture industrial' sector, which incorporates the steel industry (see Table 6.4). Also, a large proportion of males working at the steel plant were within the ages of 25 and 64 years (see Table 6.5). The large influx of immigrants into Sydney's population were mostly males (see Table 6.3), and the sex ratio in Sydney was 139.3 males per hundred females (see Table 6.1). In turn, it is highly likely that foreign males were young, based on the high male to female sex ratio and the excess number of males arriving from other countries. Other evidence of this probability is that there were slightly more single males in the population (62.9%) compared to single females (59.9%) (see Table 6.2). The data in the census does reveal that a large proportion of immigrant males worked at the steel plant, some 34.05% of the 41.89% working age male immigrants (see Table 6.4). Most immigrants were hired at the Sydney steel plant specifically for cheap unskilled labour (Heron, 1988), thus it is possible that the lack of skill may derive from the lack of experience which would often come with age.

An analysis of birthplace by cause of death for Sydney showed statistically significant findings (Figure 6.29). Males born in Nova Scotia displayed a relative deficiency of accidental causes of death (15.0%). Alternatively Nova Scotians showed a relative excess in tuberculosis deaths (28.5%). Newfoundlanders showed a relative excess for males dying of accidental deaths (32.2%). Heron (1988) discusses how Newfoundlanders in the Sydney Steel Plant were often blamed for accidents in the workplace due to difficulty in understanding the language spoken by this group. English

Figure 6.29: Birthplace and Cause of Death for Sydney Males 15-64 as Found in the Death Registry.
(χ^2= 40.076; df= 9; p<0.001)



is the language spoken by Newfoundlanders and these individuals may have been given jobs with other English speaking workers. Due to isolation, however, the Newfoundland language developed into a dialect that may have been difficult for others to fully comprehend thus causing more accidents in the workplace. Newfoundlanders often worked the coke ovens and blast furnaces (Caplan, 2005, Heron, 1988), two of the most hazardous environments in the steel plant. According to Caplan (2005:37), "[t]he bulk of the accidents at the Steel Plant seemed to happen to Newfoundlanders, which may be indicative of the kinds of work they were asked to do, and also their high proportion in the plant." Males from non-English speaking countries displayed a relative excess for respiratory causes of death (16.9%). Respiratory systems were constantly exposed to harsh elements of hot temperatures and various chemicals in the plant (Hutchinson et al., 1996), thus it is likely that all steel workers were exposed to such elements. Most immigrants from non-English speaking countries did work at the steel plant (see Table 6.4), and while Newfoundland steel workers were at risk of accidental deaths, non-English speaking groups may have been a higher risk group for respiratory infections under plant conditions.

With respect to associations between occupation and birthplace, analyses based on the death registration data are highly significant and present some very interesting outcomes (Figure 6.30). First of all, there is a relative deficiency of Nova Scotians working as labourers (14.8%), and a relative excess of both skilled tradesmen (36.1%) and non-industrial workers (49.1%) in this group. Males from English-speaking countries also showed a relative deficiency of males working as labourers (13.7%) and, like Nova Scotians, reflected a relative excess (54.8%) of males working in the non-

industrial sector. Again, Heron (1988) and Avery (1979) discuss how English/British immigrants were treated as Canadians, able to work better jobs than individuals born outside of Britain. Ideologies of who is a 'Canadian' and who is an 'immigrant' definitely reflected job structure in Canada during the Great Migration. Amongst those born in non-English speaking countries, most of the males dying between 1909 and 1917 in Sydney were labourers (77.7%), revealing a relative excess amongst this group. The data suggests a reflection of Canadian labour history with respect to job structure, in that there were simply more male labourers from non-English speaking countries available to die. Immigrants from non-British countries were more likely to work as unskilled labourers at steel plants across Canada (Heron, 1988).

An analysis of occupation and age at death was undertaken to examine any connection with working conditions that may affect the age at death profile (Figure 6.31). The analysis revealed highly significant results. Labourers dying in Sydney displayed an excess of younger working age males, some 44.4% of all males in the young working age cohort. In turn, labourers who died in Sydney showed a deficiency of older working age males (24.3%). Non-industrial workers displayed an excess of deaths among the older working age cohort (49.5%). Subsequently, non-industrial males showed a deficiency of deaths in the younger working age cohort (24.8%). Following from the previous analyses for Sydney, these labourers were primarily immigrants of non-English descent who died young, likely due to the circumstances of the work environment. Approximately half of the non-English speaking cohort died young, and often occupied labourer positions.

Working age, birthplace, and occupation were, like Glace Bay, examined at a more detailed level. Cases were selected by age groups (young, middle, and older

Figure 6.30: Birthplace and Occupation for Sydney Males 15-64, as Found in the Death Registry.
(χ^2=1.440; df=6; p<0.001)

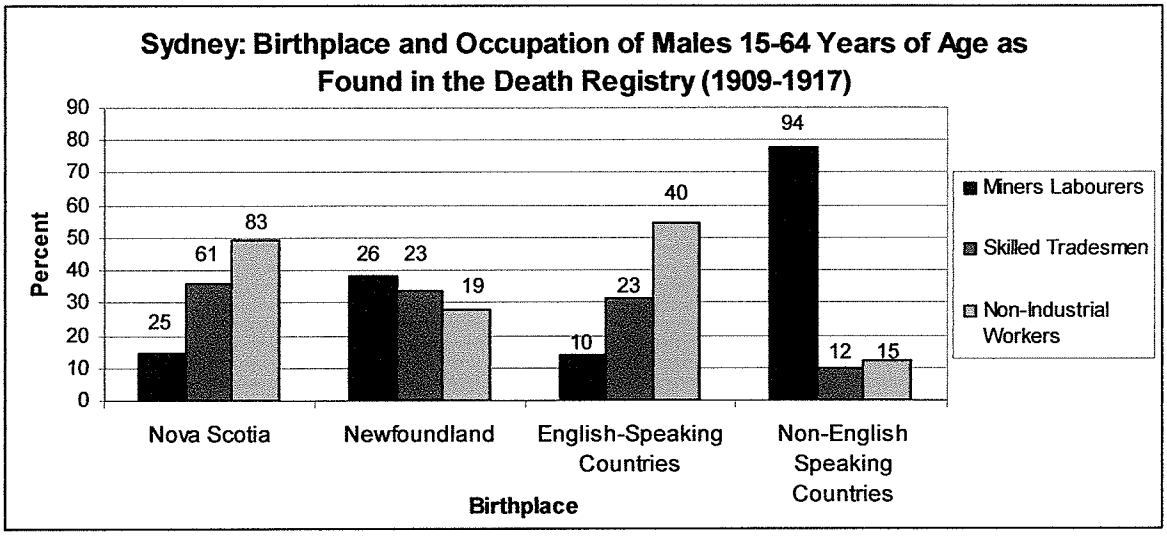
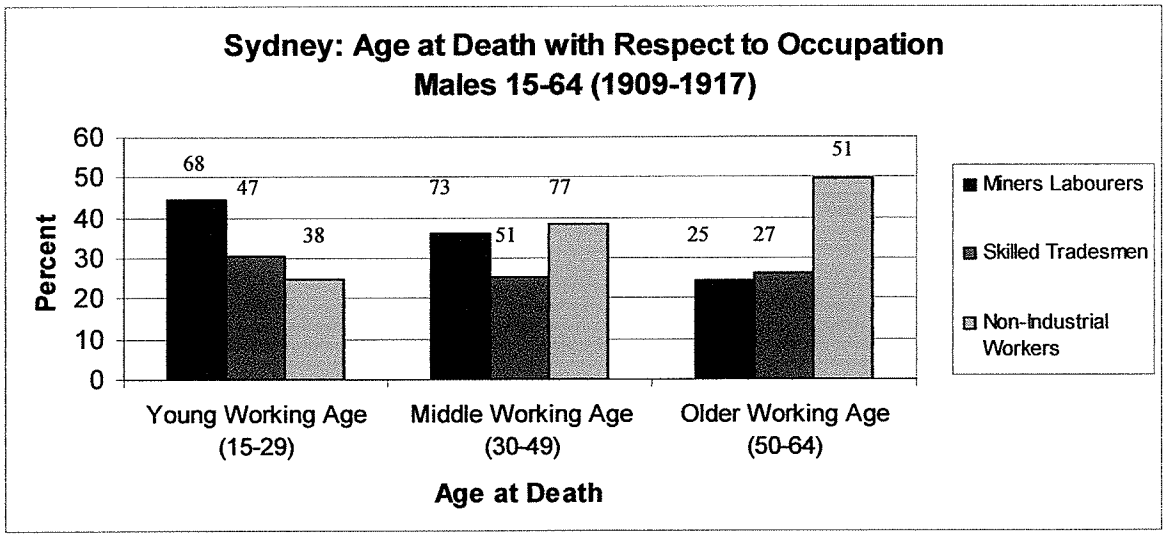


Figure 6.31: Age at Death and Occupation for Sydney Males 15-64, as Found in the Death Registry. Note that labourers died young, while non-industrial workers lived to the older ages.
(χ^2=18.577; df=4; p=0.001)



working ages) (Figure 6.32, 6.33, and 6.34). Like Glace Bay, the sample size was too small to statistically analyze, except amongst the middle working age group where results were statistically significant (Figure 6.33). Overall, most labourers in all age groups who died were from either Newfoundland or non-English speaking countries. Whereas, most non-industrial workers in all working ages were either born in Nova Scotia or English speaking countries, especially in the middle and older working age groups.

Among males in the younger working age cohort, there was a high percent of Nova Scotians who died working as skilled tradesmen (49.0%). Young Newfoundland males who died in Sydney were often employed as labourers (41.4%). Of the young males born in English-speaking countries, 43.8% worked in the non-industrial sector. Males born in non-English speaking countries that died in Sydney were mainly working as labourers (79.2%).

Amongst middle working age males in Sydney, there is an excess of males from Nova Scotia (55.1%) and English-speaking countries (58.8%) who were employed in the non-industrial sector upon their deaths. Newfoundlanders displayed a relative excess (44.4%) of males dying in the skilled tradesmen sector. Males from non-English speaking countries who died in Sydney showed an excess of deaths in labourer positions (77.2%).

Within the older working age cohort of males who died, those born in Nova Scotia and in English speaking countries frequently occupied jobs in the non-industrial sector. Again, of males within the older age cohort, males from non-English speaking countries appear to be frequently employed as labourers (72.7%). With the sample size being small it is difficult to assess older working age Newfoundland males (refer to 'n'

Figure 6.32: Young Working age Cross-Analyzed Chi-Square Analysis with Birthplace and Occupation for Sydney 1909-1917

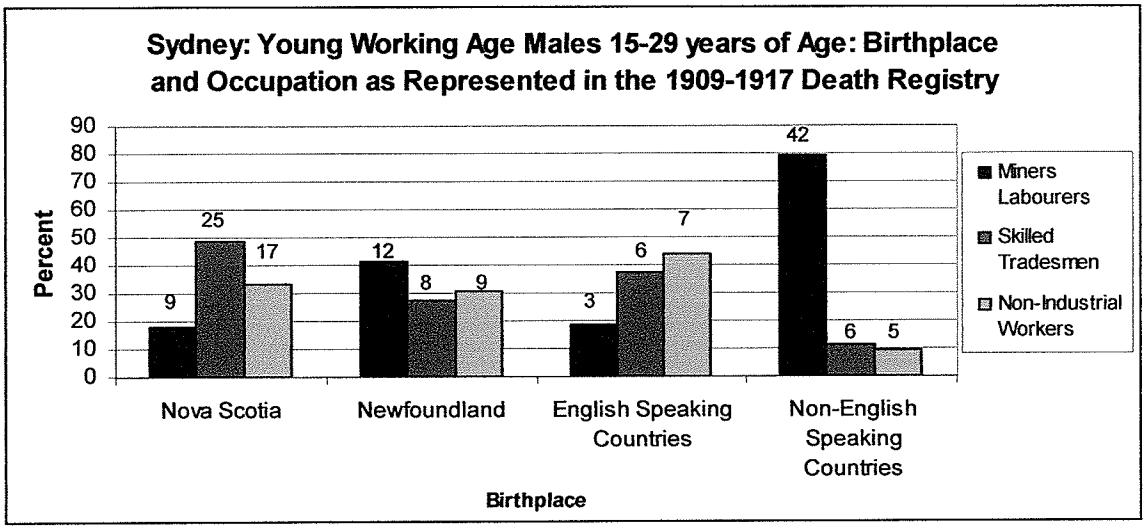


Figure 6.33: Middle Working age Cross-Analyzed Chi-Square Analysis with Birthplace and Occupation for Sydney 1909-1917 (χ^2=74.268; df=6; p<0.001)

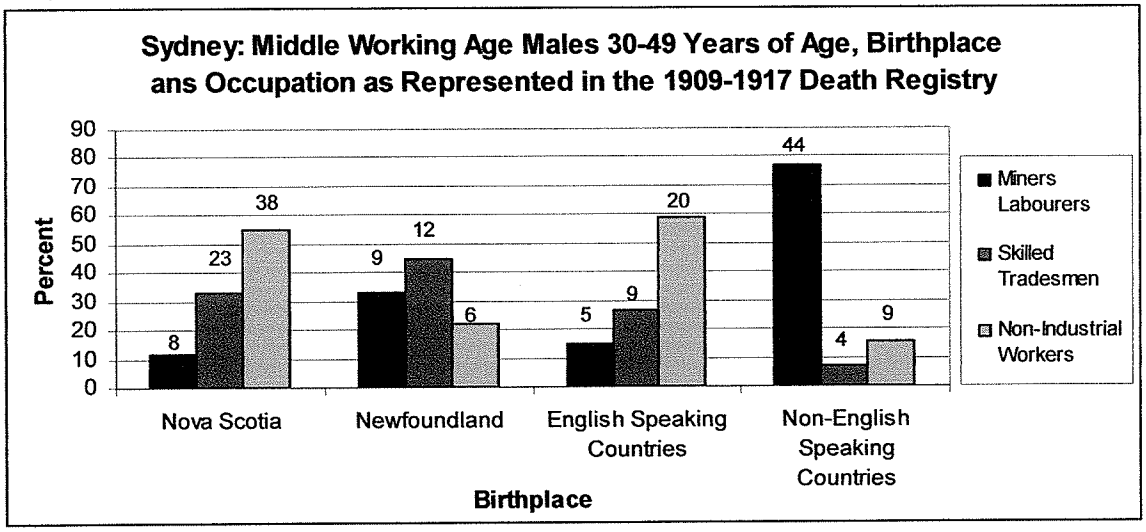
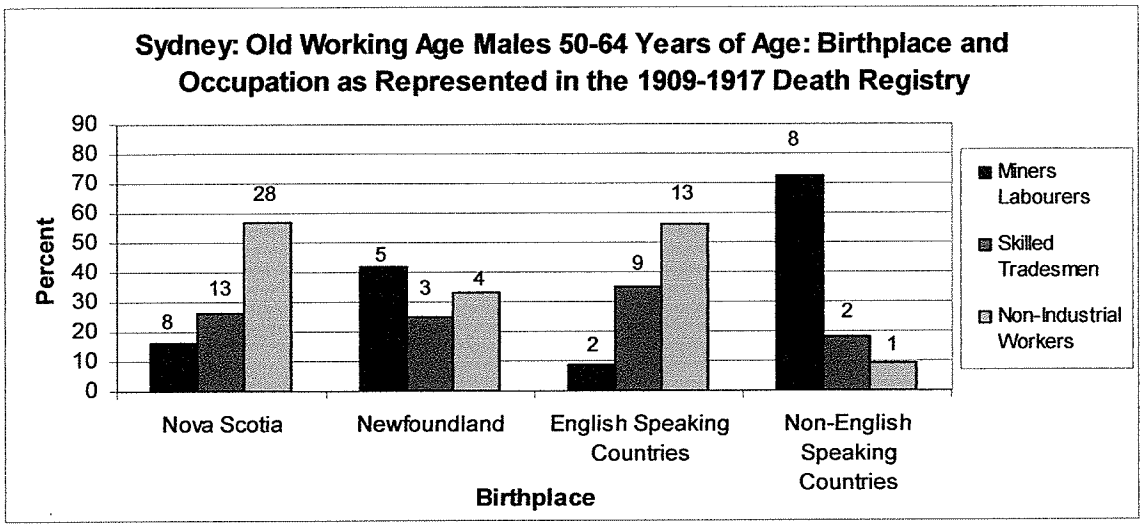


Figure 6.34: Old Working Age Cross-Analyzed Chi-Square Analysis with Birthplace and Occupation for Sydney 1909-1917

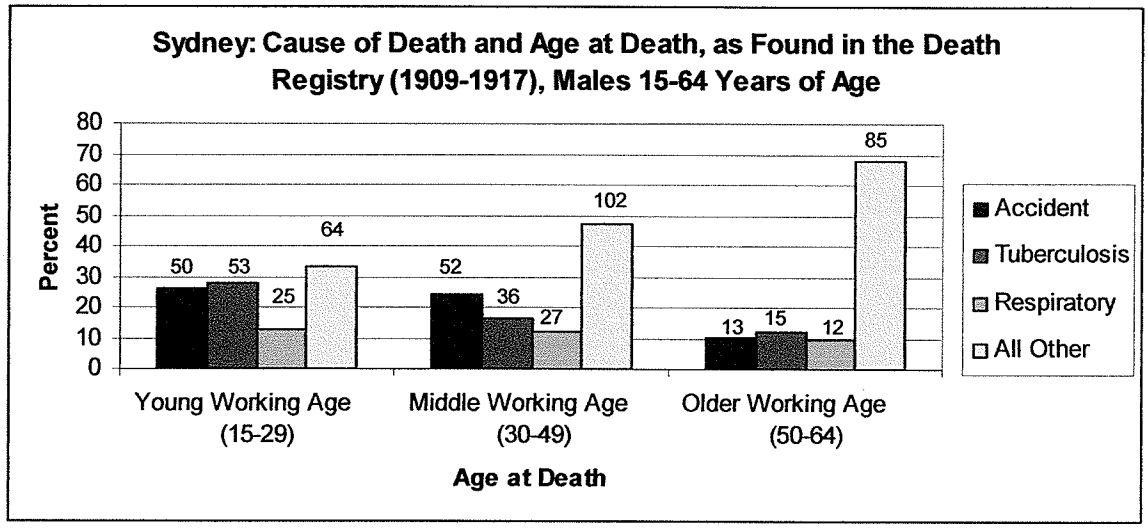


sizes in Figure 6.34). Also, there is a huge decline in the number of individuals from non-English speaking countries in the older working age cohort compared to the young and middle working age groups (refer to 'n' sizes Figures 6.32, 6.33, and 6.34). Thus, this further suggests that immigrants from countries of non-British origin who lived and died in Sydney were for the most part younger than 50 years of age. The results are reflective of common observations in Canada's labour history and the 1911 Canadian Census that Canadians and British-born individuals were more likely to hold jobs in the professional, clerical, managerial, and service sectors than individuals from 'foreign born' non-English countries (see Table 6.4; Avery, 1979; Heron, 1988).

The analysis of age at death and cause of death for working age males in Sydney produced statistically significant results (Figure 6.35). In Glace Bay, there was a relative excess of tuberculosis deaths among young working age males (20.1%) (see Figure 6.26). Sydney also displayed an excess in tuberculosis deaths among young working age males (27.6%). As in Glace Bay, older working age males in Sydney showed a relative deficiency in accidental and tuberculosis deaths (at 10.4% and 12.6% respectively). There was, however, a relative excess in older working age deaths for deaths due to 'all other' causes (68.0%). It is important to recap once again that the 'all other' category includes all chronic degenerative diseases and, as a result, it is likely that the older working age group would present an excess for 'all other' causes of death.

Some reasons for the increase in tuberculosis deaths among the younger working age men may reflect lifestyle and living conditions. Shacks were in full use in Sydney between 1909 and 1917 and were deemed 'unsanitary' as these forms of housing lacked sewer and water lines (McLeod, 1909). Also, a specific area, known as Whitney Pier,

Figure 6.35: Cause of Death and Age at Death for Sydney Males 15-64 Years, as Found in the Death Registry. (χ^2=40.790; df=6; P< 0.001)

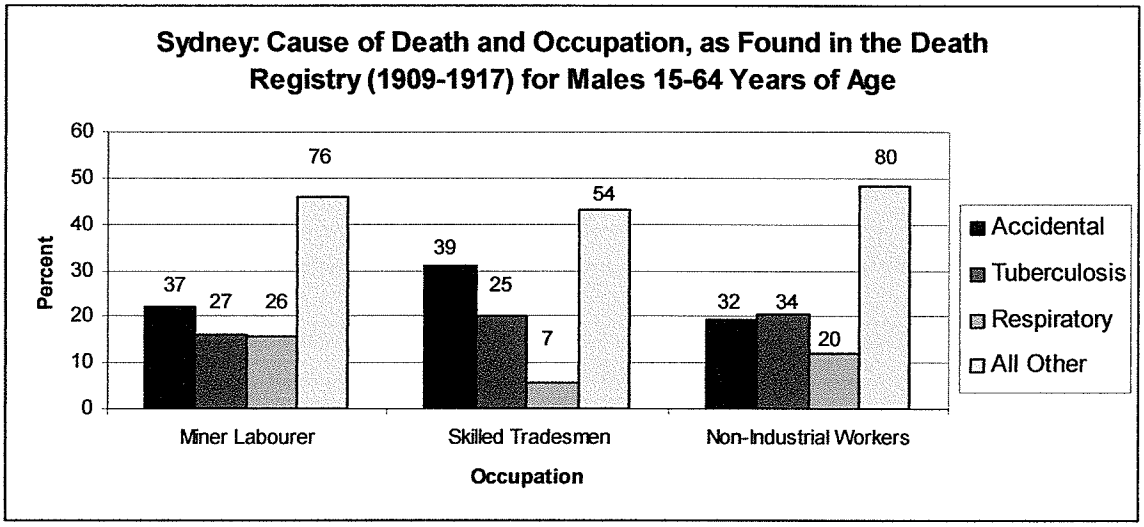


was where most steel workers lived. These homes were built by the company and, like Glace Bay, were small and filled with people. The lack of adequate housing caused overcrowding, and therefore led to unsanitary conditions (Caplan, 2005). Boarding houses were also crowded and, as with Glace Bay, beds were shared between shifts (Caplan, 2005; Mellor, 1983). After work, younger men would likely go to the local bar in Whitney Pier, where cigarette smoke was prominent, thus adding strain to normal lung function. According to Caplan (2005:39), "[t]here were a great number of drinking establishments, especially at the Coke Ovens and the [Whitney] Pier..." Consequently, the younger proportionately more unmarried population likely put themselves at higher risk for tuberculosis than older proportionately married males who would more likely go home to their families after a long day at work.

The Brookland Street Hospital was specifically designed to serve steel workers, thus it is more likely that the younger population went to the hospital when sick than the older population due to stigmas attached to the hospital that may have carried over from the previous century (Gagan, 1989). As a result, diagnoses of tuberculosis may have been more frequent among younger working males. To recap, Sawchuk and Burke (2000) did note that the hospital in Bellville between 1876 and 1885 was believed to be a place where people went to die; thus these ideas may have been more common amongst the older population in Sydney and Glace Bay.

An analysis of cause of death and occupation produced non-significant results (Figure 6.36). Though not statistically significant, accidental deaths, when compared to tuberculosis and respiratory infections, appear to be high amongst skilled tradesmen, and only slightly higher among labourers. Tuberculosis appears to have been a problem for

Figure 6.36: Cause of Death and Occupation for Sydney Males 15-64 Years, as Found in the Death Registry. (χ^2=12.060; df=6; P= 0.061)



all occupational groups. Respiratory infections, on the other hand, did not appear to affect skilled tradesmen or non-industrial workers as much as labourers (though the difference is not significant). Skilled workers at steel plants across Canada in the early 1900s often lacked formal training, learning instead by a trial and error approach and by working their way up the ranks (Heron, 1988; Caplan, 2005). Skilled workers were used in every area of the steel plant (Heron, 1988), likely placing them in more hazardous environments than the labourer who provided help for the skilled worker.

Logistic Regression Results

Logistic regression is a statistic used to model the potential effects of a number of independent variables on a dependent variable. Unlike the descriptive statistics detailed in the previous analyses, logistic regression offers the advantage of being able to include all independent variables in the model at the same time, rather than assessing associations one-by-one. The analysis allows for a bivariate dependent variable and constructs the analysis to include a variety of independent variables. In this case two bivariate (dependent) variables were selected for two different analyses: one predicting for tuberculosis deaths and the other predicting for accidental deaths. Independent variables chosen to include in the analyses were: age at death, place of birth, occupation, marital status, and community of residence of the deceased. These variables place importance on factors that would largely have affected the mortality pattern, such as working age, immigration, and the type of work. As previously discussed, these factors potentially intertwine with one another as, for example, immigration status often influenced the type of occupation, and working age would likely influence skill and occupation.

Predicting for Tuberculosis Deaths

The logistic regression model predicting for tuberculosis deaths revealed statically significant results for three factors: age at death, males born in Nova Scotia, and males who lived in Glace Bay (Table 6.9). The indicator variable (or comparison group) used in all results was the last category: old working age males, non-English speaking countries, non-industrial workers, married/widowed, and Sydney. As a result, all independent variables will be compared to their respective indicator variable.

With respect to age at death, younger ($b=1.680$, $df=1$, $p<0.001$) and middle ($b=0.736$, $df=1$, $p=0.003$) working age males were at significantly greater risk of dying from tuberculosis than older working age males. Relative to older working age males, younger working age men had an odds ratio of 5 to 1 for tuberculosis deaths. As a result, young men had a higher risk of dying from tuberculosis. There was a decline in tuberculosis risk from the young working age males to the middle working age males. Thus, relative to older working age men, middle working age men had an odds ratio of 2 to 1 for tuberculosis deaths. Middle working age men displayed significantly higher odds of dying of tuberculosis, but the risk of tuberculosis death was highest among younger working age men.

Place of birth was also a significant predictor of tuberculosis mortality. Relative to men born in non-English speaking countries, Nova Scotian-born men had an odds ratio of 2.5 to 1 for tuberculosis deaths ($b=0.920$, $df=1$, $p=0.003$). It is surprising that Newfoundland-born men did not produce significant results with respect to tuberculosis. Tuberculosis in the outport fishing communities in Newfoundland was rampant during the first half of the 20th century (Knowling, 1996). The major cause of death on Bell

Island for working age males was tuberculosis. Clearly the result of the logistic regression does not support the notion that Newfoundlanders were highly susceptible to tuberculosis. On the other hand, some Newfoundland men who worked at the Glace Bay mines or the Sydney steel plant were migrant workers, only working in these communities during the off-fishing season, therefore there may be underreporting of tuberculosis cases among Newfoundland miners in Glace Bay.

The non-significant results for tuberculosis deaths for immigrants is interesting because it may indicate selective immigration policies at the time, whereby immigration officers only allowed healthy looking individuals into Canada. According to Beiser (2005:31) "[u]ntil at least the middle of the 20th century, the idea that immigrants were sick and that the public needed to be protected from them dominated North American thinking." Historically, there have been a variety of immigration policies or policies against the sick, occurring as far back as biblical times and as recent as present day 21st century. Some examples include: the isolation of lepers during biblical times, the quarantine of plagued individuals in 14th century Europe, the quarantine of immigrants in North America with cholera, plague and typhus in the 1700s, the screening of 19th century immigrants from Europe prior to their arrival in North America for tuberculosis and syphilis, and current screening practices in North America in the 21st century with the screening of immigrants from Asian and African countries for tuberculosis and AIDS (Gushulak & Williams, 2004; Beiser, 2005). The *Immigration and Refugee Protection Act* in Canada states that an individual can be rejected for admission into Canada if they are considered a danger to public health (Beiser, 2005). Immigrants from Europe during the 19th (and likely early 20th century) were screened for tuberculosis, among other

diseases considered harmful to public health and, as a result, it is likely that the non-significant result for immigrants from Europe may characterize the selective process of immigration policy in Canada and North America.

Additionally, recruiting officers for the steel plant and coal mines were likely looking for healthy robust men to work in the arduous environments. Thus, unhealthy looking men may have not been recruited as they may not have portrayed the qualities needed for such forms of work. According to Heron (1988:78), most immigrant men were recruited from "...distant villages where their peasant families required cash to cope with worsening underemployment, overpopulation, and agricultural depression." Rural and urban differentials for tuberculosis have been frequently reported (see Luckin & Mooney, 1997; Woods & Hinde, 1987; Pelletier et al., 1997). Thus, the men actually recruited may not have been as susceptible to tuberculosis because many lived in remote rural areas of Europe, and reflected the ideal of hard-working, healthy, robust men.

The logistic regression analysis did not reveal any significant results for either occupation or marital status. All working age males were equally at risk of dying from tuberculosis death whether they were miners, labourers, skilled tradesmen, or non-industrial workers. Single working age males were not at a greater risk of dying from tuberculosis than married or widowed working age males, as previously interpreted based on the chi-square descriptive analyses. Consequently, there are factors other than marital status that caused risk for tuberculosis. It is still likely that younger working age males living in boarding homes had a higher susceptibility for tuberculosis deaths, but it is unreflective of whether these men were single, married or widowed.

At the community level, the logistic regression analysis did reveal significant results that men in Glace Bay had a higher risk for tuberculosis death than men in Sydney, irrespective of occupation (b=0.731, df=1, p=0.001). Relative to working age males in Sydney, males in Glace Bay had an odds ratio of 2 to 1 for tuberculosis death. Sydney was considered a city, while Glace Bay was still a town during the study period. Historically, tuberculosis has been reported to be more common in urban areas, where poor living conditions and high population density was present (Pelletier et al., 1997; Sawchuk & Burke, 2000; Gagan, 1989; Woods & Hinde, 1987; Condran & Crimmins-Gardner, 1978). Luckin and Mooney (1997), describe the fact that it was cities and towns that were more dangerous than villages and hamlets. It is curious that Glace Bay presented a higher risk for tuberculosis deaths than Sydney, as Sydney was a city. However, Glace Bay cannot be considered a typical rural area since, like Sydney, it was overcrowded and presented high population density. Sydney, being a more urban centre, may have introduced public health protocols (sewage disposal, water connection and treatment) at a faster rate than Glace Bay. However, relating back to immigration policy, it was revealed in the population data (see table 5.4) that there were more immigrants moving to Sydney than Glace Bay. Based on the idea of the selective immigration effect, collectively immigrants in Sydney (via their presence) would lessen (or skew) the burden of tuberculosis deaths on the population, as the logistic regression model has revealed that Nova Scotian-born males were at greater risk of tuberculosis deaths (and proportionately more Nova Scotia-born men lived in Glace Bay).

Table 6.9: Logistic Regression Results for Tuberculosis Deaths

Tuberculosis Death Logistic Regression						
Independent Variables	**b**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Age at Death (compared to old working age)						
Young working age	1.680	0.373	20.319	1	0.000	5.367
Middle working age	0.736	0.34	4.668	1	0.031	2.088
Birthplace (compared to non-English speaking countries						
Nova Scotia	0.920	0.305	9.117	1	0.003	2.509
Newfoundland	0.006	0.378	0.000	1	0.987	
English-Speaking Countries	-0.052	0.419	0.016	1	0.900	
Occupation (compared to non-industrial workers)						
Miners/labourers	-0.179	0.268	0.446	1	0.504	
Skilled Tradesmen	-0.261	0.276	0.898	1	0.343	
Martial Status (compared to married and widowed)						
Single	0.028	0.248	0.013	1	0.909	
Community (compared to Sydney)						
Glace Bay	0.731	0.226	10.431	1	0.001	2.077
-2 Log likelihood Model χ^2	645.957 $\chi^2 = 57.942$, df = 9, $p < 0.001$					

Predicting for Accidental Deaths

The analysis of accidental deaths revealed statistically significant results for three factors in the logistic regression model: young and middle working age at death, and males with an occupation under the skilled tradesmen category (Table 6.10). Again, the indicator (comparison) variable was based on the last category in each variable: older working age males, non-English speaking countries, non-industrial workers, married/widowed, and Sydney.

With respect to working age, young ($b=1.349$, $df=1$, $p<0.001$) and middle $b=1.096$, $df=1$, $p<0.001$) working age males were at greater risk for accidental deaths than older working age males. Relative to older working age males, young working age males had an odds ratio of 3.8 to 1 for accidental causes of death. There was a slight decline in risk for accidental deaths from the young working age to the middle working age group. Relative to older working age males, middle working age males had an odds ratio of 3 to 1 for accidental causes of death. This likely reflects previous arguments on skill whereby younger males may not have acquired skill or training, thereby making them more susceptible to accidental deaths in the workplace (see also Caplan, 2005; Heron, 1988; Whitfield, 1954). The decline in between age groups likely reveals increasing maturity in training and skill over time in the work environment. At the older working ages the lower risk for accidental deaths may also result by virtue of acquiring office jobs at the steel plant or mines, especially after succumbing to an accident in the mines or steel plant (see also Whitfield, 1954).

There was no significant association for birthplace and accidental deaths. As a result, all working age men, no matter where they were born, were all at risk of dying an

accidental death. This is interesting because language barriers may have presented problems in the hazardous work environments, and Heron (1988), and Avery (1979) both comment on the high rates of accidents among immigrants, especially in work environments such as steel plants and mines. Thus, there may be other impeding factors, working age in particular, that contribute to accidental causes of death besides birthplace.

The logistic regression analysis for accidental causes of death did reveal a significant result for skilled tradesmen (b=0.738, df=1, p=0.003) and no significance difference for miners/labourers. Relative to non-industrial workers, skilled tradesmen had an odds ratio of 2 to 1 for accidental deaths. As a result, skilled tradesmen were at a higher risk of accidental deaths than any other occupational group in the two locales. This is quite interesting as it reflects the hazardous work environment of skilled tradesmen during the first half of the 20th century. In terms of this study, skilled tradesmen are at an even higher risk to die an accidental death than miners, which is not what would be expected, as it is well documented that miners worked in extremely hazardous conditions, whereas less is written about the everyday risks faced by skilled tradesmen in their work environments. Examples of accidental deaths suffered by skilled tradesmen include: 'shock from infumes', electrocutions, 'gas suffocation', 'fall of stone/coal in mines', and fractures (skull, pelvis, back). Also, mining accidents may be clustered, due to large-scale catastrophes that may have influenced the perception of mining as more dangerous. For example on May 23, 1913, two men died from injuries to the spine. This may have been a single episode. Thus a 'fall of coal/stone' in a mine may include more than one person, however there does not appear to be any major

catastrophes that occurred in the Glace Bay mines over the eight year study period that may have elevated the risk of accidents in mining occupations.

Marital status and community of residence did not reveal significant results. This means that, single, married or widowed men were all equally susceptible to accidental deaths. More important than marital status perhaps, were the logistic regression results comparing Sydney and Glace Bay. The logistic regression analysis reveals that community does not matter when predicting for accidental deaths. In other words, both Sydney and Glace Bay are equally at risk for accidental causes of death. In turn, coal mines are just as dangerous as steel plants with respect to accidental deaths. If this was not the case, then Glace Bay should have a higher odds ratio than Sydney, and the results should have some significance. This is quite interesting as it supports previous arguments of the hazardous workplace of both environments. Thus, despite the radical difference in work environments, workers are at equal risk of dying from accidental deaths. Factory work and underground mining operations offer two radically different work environments, yet both are equally at risk for accidental deaths. Common types of accidental deaths in mines include: 'crushed between box and cart', 'electric shock', ' fall of stone/coal', 'run over by coal car', and fractures (skull, neck, back). Common types of accidental death occurring at the steel plant include: 'falling down elevator', 'shock from 'infumes'/gas suffocation', electrocutions, burns, and fractures (skull, pelvis, back).

The logistic regression results do reflect most of the findings observed throughout this research, in that tuberculosis presented more of a problem for younger working age males in both Sydney and Glace Bay, and also that accidental deaths occur more frequently in more arduous occupations experienced by skilled tradesmen. The logistic

regression model also reflects on other findings that appear to have importance in the chi-square descriptives, but not in the logistic regression. So, if say, occupation has an association with accidental deaths, then at the same time, a logistic regression can control for the effects of, say, young age. This is something that cannot be controlled for with the descriptive chi-square analyses, thus it allows observation to be made regarding the effects of occupation without worrying that it may simply reflect an age effect. If, for example, young men tend to be labourers, then questions arise of whether it is young age or being a labourer that increases risk of tuberculosis or accidental deaths. The logistic regression model enables an evaluation of each variable independently yet simultaneously against the chosen dependent variable. In all, the logistic regression model controls for variables that cannot be controlled for using the two-way descriptive chi-square analyses which, in turn, assists in determining the true importance of certain variables with respect to (in this case) tuberculosis and accidental causes of death.

Table 6.10: Logistic Regression Results for Accidental Causes of Deaths

Accidental Death Logistic Regression						
Independent Variables	**b**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**
Age at Death (compared to old working age)						
Young working age	1.349	0.316	18.197	1	0.000	3.855
Middle working age	1.096	0.281	15.225	1	0.000	2.992
Birthplace (compared to non-English speaking countries						
Nova Scotia	-0.437	0.242	3.271	1	0.071	
Newfoundland	0.405	0.263	2.375	1	0.123	
English-Speaking Countries	0.060	0.295	0.041	1	0.839	
Occupation (compared to non-industrial workers)						
Miners/labourers	0.459	0.243	3.554	1	0.059	1.582
Skilled Tradesmen	0.738	0.250	8.681	1	0.003	2.092
Martial Status (compared to married and widowed)						
Single	0.091	0.208	0.191	1	0.662	
Community (compared to Sydney)						
Glace Bay	-0.045	0.185	0.060	1	0.807	
-2 Log likelihood Model χ^2	856.408 $\chi^2 = 57.491$, df = 9, $p < 0.001$					

Chapter 7: Discussion

Sydney, Glace Bay, and Bell Island were all shaped by the industrial enterprises that developed in each community. Each community follows the underlying basis of what encompasses a company town, growing out of a single enterprise (Heyman, 1995; Frank, 1981). Sydney's growth was based on the steel industry, while Glace Bay and Bell Island were based on coal and iron ore mining, respectively. While these three communities were single-industry towns, they were connected by their industries, and therefore present an interconnected industrial triad of single-industry towns. In other words, while coal mining and iron ore mining could continue without the steel plant in Sydney, their geographical proximity made these communities a vital part of Canada's labour history (Mellor, 1983; Heron, 1988). These three communities enabled the Eastern part of Canada to become the largest producer of steel. Essentially, however, each community was its own entity. While many mining communities are established in isolation (Bulmer 1975; Godoy, 1985), Cape Breton was dotted with many small coal towns (Davey & MacKinnon, 2001). Bell Island, on the other hand, followed the conception of isolation as presented by Bulmer (1975) and Godoy (1985). Bell Island was the only area in Conception Bay with known iron ore deposits, and the deposit was quite large (Martin, 1983).

Company towns are intertwined with a set of complex relationships that enable the survival of these predominately isolated communities that began in Britain around the 1830s and dominated the industrial landscape until the 1930s (Ballard & Banks, 2003; Godoy, 1985; Garner, 1992; Porteous, 1970). It is the ecological interconnectedness of factors that cause death (Risse, 1997), that are essential in understanding how company

town life may have altered the mortality pattern. There is dependence between both employer and employee (Bulmer, 1975). Employers depend on the migration of workers to the area, while the workers depend on the employer to provide civic duties (Bulmer, 1975; Fishback, 1992; Porteous, 1970). All three locales in the present study revealed the dependency of the employer/employee relationship ever present in company towns. The recruitment of immigrants to Glace Bay and even more so to Sydney, is reflective of the coal and steel operations of each community respectively.

Within a ten year period the small towns began to grow into a large town (Glace Bay) and an urban area (Sydney). Large groups of men were recruited from various countries in Europe and elsewhere to work at the Sydney steel plant (Heron, 1988). Since both the Dominion Coal Company and the Dominion Iron and Steel Company were owned and operated by the same men (Mellor, 1983, Frank, 1979), it is likely that many men were also recruited for the coal mines in Glace Bay. The population pyramids reveal that both communities had a male-heavy population especially for men in their twenties and thirties, with Sydney being more male-heavy in these ages than Glace Bay (see Figure 6.2 and Figure 6.3). Working age sex ratios also revealed a male-heavy population (see Table 6.1). Working age sex ratios for Glace Bay and Sydney were 126.5 and 139.3 males per one hundred females, respectively. Flin Flon, Manitoba during its initial mining stages (1920s) witnessed an influx of predominately males (Robson, 1984), thus it is likely that many company towns reflect this demographic peculiarity.

Bell Island also displayed population increase, but this was at the local level, whereby rural fishermen were migrating to the island for employment (Hammond, 1982; Goldring, 1988), though there was also some recruitment of immigrants from Russia,

Germany, Hungary, and Nova Scotia (Marin, 1983). The recruitment may also reflect the influence of the Dominion Iron and Steel Company presence on the island. The influx of rural Newfoundlanders to Bell Island in the early stages was seasonal, as many men would travel back home during the fishing season (Goldring, 1988). As a result, many men who worked as miners may be lost to the record because they likely established their residence elsewhere. Also, these migrant workers (if recorded) may have shown a higher proportion of males in the population to females. Consequently, the sex ratio for Bell Island (107.3 males /100 females) reveals that the presence of women on the island was close to that of men (see Table 6.1). Also, the population pyramid for Bell Island displays a fairly even distribution of males to females in the population (see Figure 6.1). Initially, Flin Flon, Manitoba was never expected to be a permanent site, thus presenting a predominately migrant male working relationship with the mining camp, but over time this changed as more families moved to the mining town and increased the frequency of women (Robson, 1984).

The influx of workers, and in some cases their families, required a reliance on the company to provide enough infrastructure to sustain the growing populace. According to Pelletier et al. (1997:100), there is the potential for conflict:

> [U]rban mortality is more likely to rise when the increase in numbers stimulated by industrialization outruns the provision of appropriate sanitary measures and infrastructures. Some delay may be experienced to balance these two components and to assess the benefits of each.

The large influx of workers in the initial stages of any company town appears to reflect this imbalance between appropriate sanitary measures and infrastructure. It appears throughout literature on company-dominated communities that initially conditions were

poor (see Robson, 1984; Hautaniemi et al, 1999; Heyman, 1995; Pelletier et al., 1997; Fishback, 1992; Porteous, 1970; Mulrooney, 1991; Mellor, 1983; Ripmeester, 1994). Once major operations were underway in Sydney, Glace Bay, and Bell Island, the companies involved (Dominion Coal Company, Dominion Iron and Steel Company, and Nova Scotia Iron and Steel Company) began constructing houses and boarding houses for steelworkers and miners (Mellor, 1983; Hammond, 1982). Due to isolation in many company towns, the company "...was obliged to provide many facilities, including housing and public utilities in order to sustain the lives of its employees" (Porteous, 1970:131).

Ownership of houses by companies enabled the companies to increase productivity and profit by maintaining control over their labourers (Mulrooney, 1991). Such company-owned housing incorporated the existing monopoly held by companies in single-industry towns (Fishback, 1992). Glace Bay displayed this form of monopolization, as miners who rebelled against the company would find themselves homeless (Mellor, 1983). Accordingly, Pennsylvanian coal miners between 1880 and 1930 also faced eviction had they caused trouble, especially labour disputes (Mulrooney, 1991). Thus, company towns have a unique relationship between house, community, and work. Once relations with work were broken, so too was the relation of having a home (Fishback, 1992). As a result of company control, strikes in Glace Bay and Sydney were minor and largely un-unified until the 1920s (Lamey, 1996). According to Fishback (1992:347), coal towns had a distinct nature in the United Sates, whereby "...the majority of employees lived in company housing." However, company housing appears to be a general theme for most company towns, and in some ways are still present today in the

semi-permanent mining and oil camps in Alberta. Glace Bay and Sydney, in particular, were completely run by the Dominion Coal Company and the Dominion Iron and Steel Company:

> Living in company towns and company houses, forced to buy food and other necessitates of life from company-owned stores, worshipping in churches where the collection was deducted along with other debts from their weekly pay envelopes, miners and steelworkers in Cape Breton felt they were in grave danger of being subjugated into medieval form of serfdom that could eventually prove oppression as that experienced by the lower classes in Britain during the Middle Ages. (Mellor, 1983:11).

Two major problems came associated with company housing: first, quality issues and, second, shortages. Company house quality could range from "comfortable to shoddy" (Fishbank, 1992:347). Some houses found in company communities in the United States ranged from shacks for bachelors, to decent homes for families, and higher-quality houses for the operators, foremen and other professional managerial workers associated with the company (Fishback, 1992). Unfortunately, in the United States, this diversity was also reflected among ethnic groups, as poorer housing was typically provided to minorities (Mulrooney, 1991). Flin Flon, Manitoba built temporary bunkhouses for the single male population, and as the site became permanent, family houses were also built by the company (Robson, 1984). Housing often displayed uniformity in style and was built to a low grade standard (Porteous, 1970). The low standard grade of housing is likely due, for the most part, to companies' attempts to obtain and retain labour by building inexpensive dwellings near work sites (Mulrooney, 1991). Sydney and Glace Bay did show the uniformity of the company house (Mellor, 1983). Miners' homes were semi-detached, single level structures with six rooms, and, in Sydney, a similar housing pattern existed for steel workers (Mellor, 1983). In Sydney,

these homes still stand in what was once the steel district known then (and still today) as Whitney Pier. The houses in Whitney Pier look identical to one another, except for the variety of colours in which they are painted. These homes were situated next to where the steel plant once stood. It is likely that the similar appearance of house structures in Sydney and Glace Bay is once again reflective of the interconnectedness of the companies involved.

Mulrooney (1991) found that mining companies in the coal towns of Pennsylvania built boarding houses strictly for single males and, once boarding houses became full, families would take in single miners as boarders. The mining town of Rossland, British Columbia also built boarding houses for single males (Ripmeester, 1994). Boarding houses were a prominent part of the landscape for both Sydney and Glace Bay (Mellor, 1983). This style of housing aided, somewhat, in managing the massive influx of male workers into Sydney and Glace Bay's population. Mellor (1983) and Caplan (2005) have described the situation for both Glace Bay and Sydney in a similar regard: that boarding houses were typically at full capacity and beds were shared by workers working separate shifts. Accordingly, these boarding houses were most likely kept for single males. The 1911 census information does reveal that overall there were more male immigrants than female immigrants moving to Glace Bay and Sydney (see Table 6.3). To reiterate, the sex ratio for working age individuals for both Sydney and Glace Bay revealed a male-heavy working age population. Marital status did reveal a marginal difference between single males (64.59% and 62.92%) and single females (59.51% and 59.91%) in Glace Bay and Sydney correspondingly (see Table 6.2).

Overall, there was a surplus of males in these communities, which in turn led to more single males in the populations. The high imbalance in sex ratios can be attributed to high levels of immigration (Burke, 2001). Sydney and Glace Bay are well noted for attracting male immigrants, especially those from Europe and Newfoundland (Heron, 1988; Avery, 1979). There were more males immigrating from European countries (other than the British Isles) than females (see Table 6.3). Results from the death registry data also displayed a significant excess of non-English speaking males in Sydney, and Glace Bay reflected an excess of Nova Scotian-born males, likely influenced by more recruitments for Sydney than Glace Bay (Heron, 1988; Mellor, 1983). As a result, both the recruitment of immigrants and rural Nova Scoitian-born men moving to either Sydney or Glace Bay increases the likelihood that boarding houses were built for single men. The boarding house in Glace Bay was an open shared bed accommodation (Mellor, 1983), which essentially may have increased the susceptibility for tuberculosis among young males. For example, a male who had tuberculosis living in a boarding house could potentially pass the airborne infectious agent throughout the boarding house, thus increasing the rate of infection among younger males who were living in these accommodations. The overcrowded company houses revealed even further problems for housing quality, as men without a home upon arrival to Sydney and Glace Bay often built shacks, also known as shanties.

Glace Bay, Sydney, and Bell Island all depended upon shacks or shanties during their boom years. Perhaps the appearance of such poor living was due to the initial stages of town growth or may have reflected the temporary nature of workers and community (Porteous, 1970; Robson, 1984). Either way, this form of living would have had drastic

effects on the public health of men living in such conditions. Shacks were considered unsanitary in all three communities, and appear problematic and prevalent throughout the study period (MacAulay, 1917; Mellor, 1983; NSSCCo., 1910).

It is very likely that the living conditions endured during the early part of the 20th century affected the health and mortality patterns of workers (and others) living in Sydney and Glace Bay. Urban centres were increasingly more dangerous to health than rural centres (Luckin & Mooney, 1997). Throughout North America mortality patterns differed and were largely due to variations in living conditions, social class, and economic opportunities (Emery & McQuillan, 1988). Typhoid fever was present in Glace Bay but, due to an adequate water supply, this infectious agent declined between 1908 and 1909 (McDonald, 1909). Typhoid fever and cholera have been largely associated with unhygienic and unsanitary living conditions (Barkin & Gentles, 1990; Gagan, 1989; Leavitt, 1992). Other infectious diseases (e.g. tuberculosis), on the other hand, are related more indirectly to living conditions, whereby an unhealthy, unsanitary environment will ultimately increase susceptibility (Condran & Crimmins-Gardner, 1978).

While the frequency of typhoid fever deaths among working age men in Glace Bay between 1909 and 1917 was too small to show any significant results, there were thirteen causes of death from typhoid fever or cholera present. In Sydney there were fifteen deaths of typhoid fever or cholera between 1909 and 1917 among working age males. Certain areas of Sydney received poorer quality water, and many houses were not hooked up to the city's water supply (Campbell, 1909). Sydney in 1917 also faced another problem reflecting poor public health that likely resulted in increased

susceptibility to infectious diseases. The lack of storm sewers throughout the city caused an overflow of house sewers that would fill the cellars of the houses affected with sewage (City Engineer, 1917). In the 19th century, Montreal and Quebec City were hit by a cholera epidemic that mainly affected the working class neighbourhoods lacking in proper sanitation and drinking water (Pelletier et al., 1997). It is quite apparent that the majority of people in all three locales in this study were of a poorer social class, working under deplorable conditions in the mines and steel plant for small wages (Mellor, 1983; Martin, 1983). The death registry data also suggests that most males worked in the industrial sector, 67% for Sydney, and 82.9% for Glace Bay (see Table 6.7). Bell Island had a much smaller population making most analyses difficult. Being a small island, Bell Island lacked sufficient quality fresh water (NSSCCo., 1910) which, more than likely, caused problems for the residents. However, only one case (out of a total of 60 deaths) of typhoid fever was found for working age males on Bell Island. On the other hand, the considerable proportion of tuberculosis deaths (41.7%) among young working age males may reflect the problems with public health that were present.

Crude mortality rates (for 1911) for Sydney, Glace Bay, and Bell Island all revealed lower rates than those found for the nation as a whole in 1921. As mentioned previously (in the results section), this difference may be the result of the Canadian crude mortality rates not being broken down by sex, but also, the result of under-enumeration due to seasonal labour of groups of people (e.g. Newfoundlanders). As a result, it is difficult to make an accurate comparison between Canada and the three locales. Male age-specific mortality rates in the United States (1900), Ontario (1916), and Canada (between 1926 and 1930) did reveal similar findings with Sydney and Glace Bay (see

Condran & Crimmins-Gardner, 1978; The Legislative Assembly of Ontario, 1917; Dominion Bureau of Statistics, 1959). The present study and the study conducted by Condran and Crimmins-Gardner (1978) exhibit an incline in mortality rates in the older ages. This mortality incline found in the older age groups is the basic premise of senescence (growing old) (Crews, 2003). Comparing cause- and age-specific mortality rates was difficult due to the fact that the national calculations used per 100,000 rate as opposed to the per 1000 rate used for this study (see Dominion Bureau of Statistics, 1956; Condran & Crimmins-Gardner, 1978). Additionally, the Dominion Bureau of Statistics (1978) does not segregate cause-specific mortality rates by age or sex. Between 1926 and 1930 the national tuberculosis mortality rate was 80.3 per 100,000 living, and the national accident mortality rate was 58.9 per 100,000 living (Dominion Bureau of Statistics, 1956). In Philadelphia, between the ages of 20 and 39 years, the tuberculosis mortality rate was 291.0 per hundred thousand (Condran & Cheney, 1982). These rates were not segregated by sex. Tuberculosis was a significant cause of death for individuals between 20 and 39 years of age in Philadelphia, and throughout the United States during the turn of the 20th century (Condran & Cheney, 1982; Condran & Crimmins-Gardner, 1978; Crimmins & Condran, 1983).

One interesting observation found in the age-specific accident-related mortality rates calculated for Sydney and Glace Bay relates to the fewer accidental deaths found among males aged 15 to 19 years in Sydney than in Glace Bay. In addition, Sydney's age at death profile did display a statistically significant deficiency of younger working males dying accidental deaths (36.0%) in comparison to Glace Bay (40.3%) and Bell Island (58.3%). The mortality pattern for both Sydney and Glace Bay does indicate a

high proportion of accidental deaths. There were more skilled tradesmen dying in Sydney than in Glace Bay (27.4% and 18.0% respectively). It is important to note that the young working age group represents males 15-29 years, whereas the age-specific mortality rates are created by a five year interval (15-19, 20-24 etc.). By the 20 to 24 age group in the age-specific accidental mortality rate calculations, the mortality rate for accidental death sharply increases. It is likely that by the ages of 20 to 24, especially closer to 24 years, more males were gaining experience and therefore, working more intensively in hazardous environments (Heron, 1988; Caplan, 2005). Younger and less experienced workers were more likely to have been working in the labour yards (Caplan, 2005).

Accidents in the steel plants in early 20th century Pittsburgh claimed a larger percent of lives than other causes of death (Fitch, 1969). Thus, the case in Pittsburgh is similar to the case in Sydney, since the analysis of the major causes of death for Sydney's working age males between 1909 and 1917 revealed that accidents were the most frequent cause of death (see Figure 6.11). In addition, due to employment diversity, it is probable that men 15 to 19 years of age were local and may have stayed in school, or worked in clerical positions. Skill of various stages was prevalent in steel mills, as there are a variety of stages of steelmaking (Caplan, 2005; Heron, 1988; Fitch, 1969). The most dangerous sectors were the open hearth, coke ovens, and the blast furnace, which have been noted to produce a high burden of accidents and health disorders (Caplan, 2005; Fitch, 1969; Lloyd, 1971; Smith, 1971; Dancy, 1971; O'Connor, 1971; Redmond et al., 1972; Rosenman, 1979; Hutchinson et al., 1996; Corhay et al., 1998). Glace Bay did not show as much employment diversity and thus, it is well documented that young

boys and young men living in Glace Bay typically lacked a full education and went straight to work at the colliery (Mellor, 1983; McIntosh, 2000).

Coal mines are also extremely dangerous in terms of accidents. Like Sydney, accidental deaths among working age males presented the highest percent of deaths found in Glace Bay (see Figure 6.10). With respect to age at death and occupation, most miners and labourers found in the death record were mainly within the young and middle working age groups at the time of their deaths (see Figure 6.25). Young working age males were more prone to accidental deaths than other age groups in Glace Bay (see Figure 6.26). According the Whitfield (1954) differences in accidents between age groups may reflect differences in work. However, Whitfield's (1954) argument was for an observed decrease in accidents among younger workers, which is the opposite of what was found amongst Glace Bay males. Younger males, according to Whitfield (1954), would have worked safer seams until deemed skilled enough to work harder seams, thus placing younger males at less risk. Whitfield's (1954) study period is from 1944 to 1946; as a result, new technology could have made working conditions somewhat safer relative to the chosen time period for this study (1909-1917). There may have also been fewer immigrants moving to the area between 1944 and 1946, as the highest rate of immigration in Canada occurred during the 'Great Migration' era of the late 19th and early 20th centuries (Avery, 1979). Most males (found in the death registry) that immigrated from non-English speaking countries and Newfoundland were miners and labourers, who were more prone to accidental deaths than males from Nova Scotia and English speaking countries (see Figure 6.24, and Figure 6.25). Based on labour history,

this reflects immigration policies, as well as language barriers (Heron, 1988; Avery, 1979; Caplan, 2005).

In terms of health, all three locales did reveal tuberculosis as a major cause of death (the most common cause of death for Bell Island, and second highest for Sydney and Glace Bay). Bell Island, in particular, displayed a young death profile with respect to tuberculosis (41.7% of all young working age men died of tuberculosis). Glace Bay and Sydney also presented a pattern of young males dying of tuberculosis (20.1% and 27.6% respectively). During the late 19th and early 20th centuries, tuberculosis was often a major cause of mortality in urban areas, and frequently carried a stigma attached to poor and unsanitary living (Gagan, 1989; Condran & Crimmins-Gardner, 1978; Feldberg, 1995; Woods & Hinde, 1987; Sawchuk & Burke, 2000; Risse, 1997). Bell Island was not a major urban centre but, like Glace Bay and Sydney, presented a variety of unsanitary public health issues reflective of the period. There appears to be a notable variation between rural and urban mortality (Woods & Hinde, 1987), though Bell Island was a boom town, and therefore experienced conditions likely similar to high population density. Unhygienic, overcrowded, and unsanitary living conditions are common elements of urban centres in the 19th and early 20th centuries, and have been associated with tuberculosis (Barkin & Gentles, 1990; Gagan, 1989; Leavitt, 1992; Sawchuk & Burke, 2000). England and Wales both displayed improvements in urban living conditions which essentially led to a decline in tuberculosis mortality by 1911 (Woods & Hinde, 1987); however this was not necessarily the case for Sydney, Glace Bay, and Bell Island. For all three locales, overcrowding was a major concern, which in turn likely assisted in the spread of tuberculosis. Due to the industrial enterprises in all three

communities, working and living conditions remained poor well into the first two decades of the 20th century. Based on reports to the Prime Minister and Public Health reports drafted between 1909 and 1917, Bell Island, Sydney, and Glace Bay, shacks were commonplace in the industrial landscape of these communities. On top of this, many houses in Glace Bay and Sydney were extremely overcrowded and boarding houses were often at full capacity (Mellor, 1983; Caplan, 2005), features which could escalate the spread of tuberculosis between individuals.

Hamilton during the early 1900s shared a similar landscape with Sydney: the steel plant as the centre of production. The main difference between the two was that Hamilton also had other industries (Heron, 1980; Heron, 1988) so it was not technically a single-industry community. However, Hamilton did display high rates of tuberculosis in the densely populated parts of the city that surrounded the production centres (Gagan, 1989). Areas where population was dense in 19th century Montreal possessed higher rates of infectious disease (Pelletier et al., 1997). Mill workers in New England during the 19th century were also exposed to crowded and poor living conditions (Hautaniemi et al, 1999). Thus it appears that overcrowding in many instances struck a clear association with tuberculosis, and infectious disease more generally.

Overcrowded boarding houses were a common problem for single-industry towns. Often, companies were unable to keep up with the demand for housing, both family homes and boarding homes (Mellor, 1983; Caplan, 2005; Ripmeester, 1994; Mulrooney, 1991; Robson, 1994; Fishback, 1982). Most often these boarding homes were built for single men without a family (Mellor, 1983; Caplan, 2005; Ripmeester, 1994; Mulrooney, 1991; Robson, 1994; Fishback, 1982). Essentially, this may be one major reason for the

high proportion of tuberculosis deaths found amongst the younger working age males in Sydney and Glace Bay.

Work conditions may have also been associated with tuberculosis. Steel plants in the first half of the 20th century have been well documented for having extreme temperatures, with many chemicals and dusty conditions without proper ventilation (Fitch, 1969; Lloyd, 1971; Smith, 1971; Dancy, 1971; O'Connor, 1971; Redmond et al., 1972; Rosenman, 1979; Hutchinson et al., 1996; Corhay et al., 1998; Caplan, 2005). Consequently, the lungs of steelworkers would likely have been irritated, making it easier for pulmonary tuberculosis to take effect. Fitch (1969) believed that the irritation from dust found among steelworkers in Pittsburgh in the early 20th century likely led to tuberculosis. Tuberculosis was common at various ages among steel- and ironworkers in the United States prior to 1925 (Greenburg, 1925). It is interesting that Greenburg (1925) noted that the death ratio (per cent of deaths due to tuberculosis) from ages 15 to 44 ranged between 30.0% and 34.3%, but then sharply decreased after the age of 44 years (Greenburg, 1925). This reflects a tuberculosis age at death profile similar to Sydney, where tuberculosis mortality among older working age males was less of a problem than tuberculosis burdens among younger working age males (27.6% and 12.6% respectively). This is interesting because older workers would have been exposed to the work environment for a longer period of time, so if tuberculosis is related to the work environment, specifically, the poor work environment, then these men should have been highly susceptible. The work environment, however, likely affects those who are already infected with tuberculosis, inducing sickness and death quickly and earlier in the life

cycle; while those with greater immunity are able to withstand the stressors of the work environment and live long enough to die of other causes.

Underground coal miners and iron ore miners were also likely to find their work environments hazardous to their health and in turn likely contributing to tuberculosis and other respiratory disease deaths. The data, however, did not reveal any excess in tuberculosis or respiratory deaths for miners or labourers, instead revealing a relative deficiency in Glace Bay. A study on mortality rates among coal miners in the United States during the 1950s found that accidental deaths created a large excess of deaths among this cohort when compared to other workers (Enterline, 1964), thus it is likely that accidental causes of death were so frequent that other causes were not as common in the mortality record. Examining morbidity among coal miners may actually reveal more signs of respiratory infection than research on mortality, especially during a time when accidental deaths were so frequent. In his study of tuberculosis and respiratory diseases among American coal miners in the 1950s, Enterline (1964) attributes disease burdens to environmental conditions both at work and at the social economic level of society. What Enterline (1964) found with respect to respiratory and tuberculosis causes of death was that they increase in frequency with age. Among working age males in Glace Bay, there was a relative deficiency of older working age males dying of tuberculosis, consequently, not presenting an increase in tuberculosis deaths as noted by Enterline (1964).

While the work environment likely contributed to tuberculosis mortality among industrial workers, the symptoms of coal workers' pneumonia and silicosis may have been misdiagnosed as tuberculosis, especially with the characteristic symptom of sputum. During the early 1900s the pronounced symptoms and effects of 'black lung' and silicosis

were not understood; tuberculosis, however, was one of the most common causes of death during the period. Common symptoms may have resulted in the misdiagnosis of coal workers' pneumoconiosis and silicosis as tuberculosis. Simple coal workers' pneumoconiosis has been known to be mistaken for miliary tuberculosis (Leathart, 1972). It is possible, therefore, that this may have been the case for the coal miners in Glace Bay between 1909 and 1917.

Another reason for a lack of this respiratory infection in the 1909-1917 death registry records may be due to the late-stage chronic condition of 'black lung'. This is more common with the complex form of coal workers' pneumoconiosis. It is known to begin at later stages in life and is lethal (Reid 1972; Leathart, 1972). This form of progressive massive fibrosis occurs around the ages of 40 to 70 years, and is the result of a life of coal mining (Leathart, 1972). Thus the study period ends in 1917, only giving approximately 20 years from whence the mines first opened. In turn, this may not provide ample time to observe the presence of such a long-term and chronic disorder, especially with respect to causing death. While this occupational disease was acknowledged as early as the 14th century, the threat of tuberculosis had overshadowed the attention paid to this disease by the late 1800s and early 1900s; coal workers' pneumoconiosis and silicosis were subsequently forgotten until their respective revivals in the 1930s and 1940s (Craven, 1997; Rosner & Markowitz, 1991; McIvor & Johnston, 2007). It appears that conceptions of occupational diseases such as silicosis and pneumoconiosis have undergone periods of popularity and rejection (McIvor & Johnston, 2007).

Bell Island showed an excess in tuberculosis deaths, representing some 41.7% of all causes of death for working age males. Silicosis was not recognized until the 1930s, however many early cases were noted to involve tuberculosis (Rosner & Markowitz, 1991; McIvor &Johnston, 2007). Accordingly tuberculosis likely hid the initial onset of chronic silicosis. Early stages of silicosis would have increased susceptibility to tuberculosis, because the various stages of silicosis disrupts normal lung function, thus this may explain why tuberculosis was such a problem on Bell Island. Silica has been associated with the iron ore deposits on and around Bell Island (Orion, 1915), and was therefore a probable threat to the overall health of miners on this island specifically. As a result, the heavy burden of tuberculosis deaths among working age Bell Island males may reflect this environmental reality, in that tuberculosis hid initial onset of silicosis, which was further overlooked due to the lack of attention given to this occupational disease during the time of infectious diseases. Also, the fact that tuberculosis was widespread in Newfoundland at this time (Knowling, 1996) likely decreased the number of males who would live long enough to succumb to silicosis. Bell Island did display a relative excess of deaths among young working age males, thus it is likely that tuberculosis caused their demise before silicosis or other occupational ailments could take hold. The dark, wet, and dusty environment in which these submerged underground miners worked also likely had a major effect on the impact of tuberculosis deaths among the iron ore miners of Bell Island, and any submerged underground miners for that matter.

Steel working also presents a variety of occupational disease risks. Again, occupational diseases like chronic bronchitis, cancer, emphysema, and heart disease were not considered to be of occupational origin in the early 20th century (Rosner &

Markowitz, 1991). Thus while these diseases may have affected steel workers, it is probable that the impact of such diseases did not reveal themselves to their fullest. Again, like common diseases in iron and coal mining, the time period from initial steel working in Sydney and the study end date lacks the sufficiently long time period needed to examine the impact of such diseases which are usually considered chronic and late onset. As a result, a longer time period for studying the long-term adverse affects of steel working is essential. The work conditions in steel plants include a variety of risks to a workers' health, including excessive temperatures, a variety of chemicals, heavy lifting of materials, the transfer of hot molten steel, and the accumulation of dust particles throughout the plant (Rosenman, 1979; Caplan, 2005; Redmond et al., 1972; Corhay et al., 1998). In turn, these risks have been attributed to causing a variety of health problems, such as cancer, respiratory diseases, and heart disease (Hutchinson et al., 1996; Corhay et al., 1998; Redmond et al., 1972). Respiratory diseases, when examined, did not, however, represent a large portion of deaths in Sydney (see Figure 5.36). It is likely that the working conditions in the steel plant did impact on the onset of tuberculosis among young working age males. The environment, like that of mining, may have interfered with the proper functioning of the lungs, thus increasing workers' susceptibility to tuberculosis. Whatever the case, steel workers in Sydney, like coal miners in Glace Bay and possibly iron ore miners on Bell Island, were exposed to dangerous work environments, which presented a variety of hazards. However, many of these individuals would likely succumb to other dangers in the workplace over time, revealing even more occupationally-related symptoms that occur later in life, especially after the mid-century decline in tuberculosis burdens.

Logistic regression analyses predicting for tuberculosis and accidental deaths revealed information that could not be assessed with chi-square descriptive analyses. When predicting for tuberculosis, young working age men were at a higher risk for dying of tuberculosis than middle working age and older working age men. Nova Scotian-born men were also at a higher risk for dying of tuberculosis than immigrants. Glace Bay did reveal a relatively higher risk for tuberculosis deaths than Sydney. Plausible reasoning for these results may reflect lifestyle between age groups, immigration policies, immigration recruitment, and the nature of the living population residing in the two communities. Younger men may have been more susceptible to tuberculosis because of lifestyle, being a younger person, going to the local 'smoky bar' after work rather than going directly home, and possibly living in more susceptible environments (boarding homes and shacks). Immigration policies in many countries over time have attempted to prevent the spread of disease and infections by screening and quarantine methods. Canada during this study period (and today) screened immigrants for a variety of ailments prior to leaving their homeland and again before they entered Canada (Gushulak & Williams, 2004; Beiser, 2005). Miners and steelworkers who arrived in Glace Bay and Sydney were being recruited by the companies involved (Heron, 1988) and officers likely looked for healthy robust men to work in these arduous occupations. Additionally, these men were often recruited from rural areas as opposed to the unhealthy urban areas of Europe at that time (see Heron, 1988; Luckin & Mooney, 1997; Woods & Hinde, 1987; Pelletier et al., 1997). Census data on the living population revealed a larger immigrant population in Sydney than Glace Bay. Thus, the selection of healthy-looking immigrants likely lessened or skewed the burden of tuberculosis, with Glace Bay, home to a greater

proportion of Nova Scotian-born men, carrying a greater tuberculosis burden than Sydney.

Predicting for accidental deaths revealed that young working age males were the highest risk group for accidental deaths. When considering occupation and accidental risk, skilled tradesmen had the highest odds for dying an accidental death. Plausible reasoning for these results may reflect skill differences between young, middle, and older working age groups, and the heightened dangers of mining and steel working.

Young working age males likely had less skill in the early years of working in the mines or steel plant. It has been reported elsewhere that most accidents in steel plants and mines occur within the first year of employment (Barreto et al., 1996; Mekelburg, 1952; Whitfield, 1954). It is undeniable that steel working and mining are dangerous occupations. Both occupations require skill, either by acquiring a specific skill set or gaining experience over the years. The exposure of both occupational groups to the harsh working conditions made these men highly susceptible to accidental deaths compared to non-industrial workers.

Working age males in Sydney and Glace Bay revealed interesting results with respect to mortality patterns. These men were clearly susceptible accidental deaths and tuberculosis, though risks varied through the life cycle. It is likely that, over time , those who did not succumb to death via a work place hazard or tuberculosis, would eventually give in to one of the many chronic ailments common to individuals who were exposed daily to the dangerous work environments of the steel plant and mines of Sydney, Glace Bay, and Bell Island.

Chapter 7: Conclusions

The major findings of this research include:

- That intense population growth in company-towns occurs during the initial onset of industrial development and men mainly work in the industrial sector.
- Accidental deaths were the main cause of death for working age males (15-64 years) in Glace Bay and Sydney, followed closely by tuberculosis, while the single major cause of death for Bell Island males was tuberculosis.
- In Glace Bay and Sydney, men from Newfoundland and non-English speaking countries frequently died in the younger working ages than men from Nova Scotia and English speaking countries frequently died in the older working ages. Bell Island displayed a youthful death profile, and most men were born in Newfoundland.
- Younger working age males in Sydney and Glace Bay were at a higher risk for tuberculosis and accidental deaths than any other working age group.
- Newfoundland men and men from non-English speaking countries mainly occupied jobs as miners and labourers, while men from Nova Scotia and English speaking countries mainly occupied jobs as skilled tradesmen and non-industrial workers, thus supporting notions of Canada's history of occupational hierarchy.
- Glace Bay men revealed a higher susceptibility to tuberculosis than men in Sydney, reflecting possible selectiveness of immigrants, as Nova Scotians were more susceptible to tuberculosis than any other group of people, and made up a higher proportion of the population in Glace Bay than Sydney.

- Working age males in both Sydney and Glace Bay were of equal risk of dying from accidental causes, suggesting that hazardous work environments characterized both communities.

During the early part of the 20th century many industrial countries experienced a new form of community, the company town or single-industry town. This new form of community brought with it a whole new set of demographics to community life. Being centred specifically on a single industrial enterprise created a social setting and hierarchy not found in more multi-economic communities. These communities created a situation whereby most men worked in a similar environment conducting a similar pattern of work. Mining towns are probably one of the most extreme forms of a company town, because literally the majority of working age men are miners. There are some skilled workers in mines, but their frequency is not comparable to that of miners. Steel plant towns are a little different because the prerequisite to make steel requires a variety of skills and occupations. In either case, however, all workers in a company owned town report to one 'boss', the company. This company often performs all the functions needed to make the community operate, including the provision of housing, public utilities, and the stores in which employees buy their goods. As a result, a two-tiered hierarchy emerges, the employer and employee. Of course there are other workers, like physicians and teachers, but these are largely unnoticed in the mass of workers in the industrial trades. Mindful that all company towns are different and often reflect differences in company responsibilities, the bottom line is that there lacks a heterogeneity of occupations found in major urban centres such as London, New York, or Toronto.

It is essentially the dynamic of a company town that creates a setting for mortality patterns that are similar in many ways, yet differ in one essential area: that occupations, especially industrial occupations, can create environments that are hazardous to the health of workers. A study such as this, at the cohort level, reflects such differences in mortality patterns among workers. Men were often the main breadwinners during this time and in company towns this is highly represented, as there would be little opportunity for women to find employment aside from domestic service. By examining occupation as an attribute to mortality, it becomes apparent that accidents in the workplace were frequent in company towns such as Sydney and Glace Bay. The environments in which these men worked would have also had detrimental effects on the overall health of industrial workers. These men would have been susceptible to various industrial diseases (e.g. silicosis and coal workers' pneumoconiosis), as well as diseases that are not solely related to occupation but have likely been made worse by the work environment (tuberculosis, asthma, chronic bronchitis, heart disease, emphysema).

Sydney, Glace Bay, and Bell Island all revealed high frequencies of tuberculosis deaths. Such deaths can be attributed to the many public health problems faced in these communities. Company towns in the initial onset of development grow rapidly and appear to reveal a male-heavy population. This was the case for Sydney and Glace Bay, as it is well documented that hundreds of workers arrived daily during the initial onset of industrial enterprise (see Mellor, 1983) and population pyramids and working age sex ratios reveal a male-heavy working age cohort. The large influx of workers increased problems with public health in all three communities. All three locales, in the first 10 to 15 years of industrial onset experienced problems with water supply, sewage/refuse

disposal, overcrowding, and housing. Sydney and Glace Bay also revealed accidental deaths as one of the most important causes of death among working age males. These deaths were found mainly amongst industrial workers, which suggest the association between hazardous work conditions and mortality.

Men from Newfoundland and non-English speaking countries appear to have been at a higher risk of death in the younger working ages. These men more often than not occupied industrial jobs. Nova Scotians and men from English-speaking countries, on the other hand, were at a higher risk of dying in the older working ages, and, when available, occupied jobs in non-industrial and skilled trades. These observations support conceptions of labour history that favoured British, English immigrants over non-English immigrants (see Avery, 1979; Heron, 1988). Newfoundland men present an interesting case, as these men were residents in a territory of British possession and spoke English, and occupied some skilled tradesmen positions, especially in Sydney. Newfoundlanders, however, displayed an excess of accidental deaths in Sydney, which likely suggests minor favouritism over non-English speaking immigrants, as Newfoundlanders often worked in more hazardous areas of the steel plant which required skilled labour. Thus, these men may have occupied some better positions than their non-English speaking counter-parts, but frequently died from accidental deaths. Newfoundland men were blamed for many accidents at the steel plant due to language barriers, as their English dialect differed from other English-speaking men. Thus the fact that these men spoke English likely got them better paying jobs, than say labourers who were mainly from non-English speaking countries, but they were more prone to accidents likely due to the

fact that the dialect spoken by Newfoundlanders was sometimes indecipherable to other English speaking men.

Youthful death profiles among working age men in the three locales reflects problems associated with the work environment. All three were industrial communities, with associated risks. Sydney and Glace Bay in particular showed no differential with respect to accidental death risk. As a result, men in both communities were equally at risk of dying an accidental death. Bell Island's youthful death profile reflected the wrath of tuberculosis that took so many lives throughout Newfoundland during the early 20th century. Tuberculosis may reflect problems with public health, but also work conditions. The damp, cramped and submerged iron and coal mines of Bell Island and Glace Bay would have had adverse effects on normal lung function. As well, the hot, dusty, and gaseous environment of the steel plant in Sydney may have also aided in higher susceptibility to both tuberculosis and other respiratory diseases. Glace Bay did reveal a higher susceptibility to tuberculosis deaths than Sydney, likely associated with the large number of Nova Scotians in Glace Bay, and the high influx of immigrants in Sydney, who did not appear to have a high susceptibility to the disease, possibly the by-product of selective processes of the Canadian and Dominion Iron and Steel company's recruitment policies at the time.

The purpose of this study was to broaden the research on 19th and 20th century historical trends in epidemiology and demography. The intent was to explore the idea that variations in demographic, social, and economic factors create diversity in patterns relating to health and mortality across a vast landscape. Looking at different transitions through time and place aids in building the understanding of what people were dealing

with over specific points in time. When examining such transitions at the community or cohort level, a whole new set of factors influence the patterns found. This particular study is the first to examine Glace Bay, Bell Island, and Sydney's mortality patterns using death registry material and the 1911 census. Other studies on these communities have offered detailed historical depictions of life in these towns. More research of this kind on these communities will aid in building the understanding of patterns of life and death during the height of industrial enterprise in Canada and in the communities involved. Truly, a more detailed population study on Sydney and Glace Bay would likely reveal other interesting points relating to public health problems, such as infantile mortality, maternal mortality, and childhood mortality. A more detailed study would expand on other aspects of life in these communities, not only work-related issues.

Future research considerations would include a longer study period (e.g. 20 to 50 years) to provide a larger sample size, making analyses more comprehensive. Long term studies, especially those related to health and occupation, provide insights into how changes in the work environment can ultimately alter susceptibility to occupational health hazards. For example, the use of water to spray down the walls of mines decreases exposure to dust, which is a known cause for lung disorders. Proper ventilation in mines would also decrease the risk of explosions and, in steel plants, would decrease the amount of heat. Coal workers' pneumoconiosis and silicosis were not present in the study sample and that may have been the result of misdiagnosis of tuberculosis or the fact that occupational disorders were practically forgotten during the study period. A longer time frame would likely show the beginnings in the death record for the appearance and acceptance of such occupational diseases. With respect to steel working, a longer time

period may also reveal an increased susceptibility to other causes of death such as heart disease, cancer, chronic bronchitis, and emphysema. As a result, a longer study period would likely reveal interesting information that was not available for this particular study.

Another viable route for future research into occupational health studies would be to examine other communities for comparison, but also to add more depth to this specific research focus. Other occupations, such as sandblasting and asbestos mining, for example, are extremely hazardous to the health of workers. Continued research on historical mortality patterns would create a more comprehensive database on this particular subject, in turn providing future researchers with greater knowledge of the mortality and morbidity patterns which certain occupational groups endured in history.

With respect to the dynamics of housing, a future research project using census material and death registries could examine a variety of company towns to further understand the essence of overcrowding in small company-owned houses, company-owned boarding houses, and shacks. This type of study would take into consideration company housing design, and how the lack of appropriate infrastructure may have induced illness in the population. Future research will surely unravel new concepts for understanding occupational health in Canada's past, as occupation should no longer be considered only as an indicator for socio-economic status, but also a central factor influencing mortality patterns.

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