

Estimates of Workforce Shortages

**Understanding and Addressing Workforce Shortages
in Early Childhood Education and Care (ECEC) Project**



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The logo for the Government of Canada, featuring the word "Canada" in a stylized serif font. The letter "a" is lowercase and has a small flag-like graphic above it.

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The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

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INTRODUCTION

About the Project

Recruitment and retention is a long-standing and well-documented challenge facing the early childhood education and care (ECEC) sector. An accurate understanding of workforce shortages—the number of ECEC workers needed across Canada—and the implications of these shortages is critical in order to address this challenge. To achieve this, the Child Care Human Resources Sector Council (CCHRSC) developed the *Understanding and Addressing Workforce Shortages in ECEC Project*. Funded by Human Resources and Skills Development Canada, the project focused on:

- Defining current workforce shortages by exploring the factors that influence supply and demand of ECEC workers;
- Reporting on available data and data deficiencies;
- Documenting the impact of current shortages on the sector, labour market engagement, and on the economy;
- Identifying current strategies and other options for addressing ECEC worker shortages; and
- Exploring the feasibility of developing a forecasting model to predict future shortages.

The CCHRSC engaged the Centre for Spatial Economics (C4SE), a consulting organization created to improve the quality of spatial economic and demographic research in Canada, to conduct the project research and create reports designed to meet the project objectives.

Research Approach

Between 2008 and 2009, The Centre for Spatial Economics (C4SE) worked to define current shortages of ECEC workers, assess their impact, and explore the feasibility of predicting future shortages. Most specifically, C4SE:

- Conducted 18 key informant interviews with provincial/territorial/municipal officials of the ministries responsible for child care or their representatives, along with other key stakeholders and analysts of the ECEC sector;
- Conducted a review of literature on factors that influence the demand for and supply of the early childhood education and care workforce; and
- Analyzed a variety of administrative data provided by municipal, provincial, and territorial governments, along with public data source including: demographic, employment, labour force, hours worked, wages, child care spaces and turnovers.

By considering a variety of factors such as the available workforce, employment, unemployment rates, vacancies and wages this project will determine the current shortages facing the sector.

Project Reports

The information gathered for the *Addressing Workforce Shortages in ECEC Project* has been used to create a variety of reports that help define key findings. The **Estimates of Workforce Shortages in Early Childhood Education and Care (ECEC) Report** examines the literature on ECEC workforce shortages, describes the technique that is used to estimate workforce shortages in the ECEC sector and estimates the economic costs of current workforce shortages. The report is the third in a series of reports produced, including:

- **Literature Review of Socioeconomic Effects and Net Benefits:** This report examines the literature on ECEC and its' impact on children, their parents and society in order to determine the socioeconomic implications of workforce shortages in early childhood education and care (ECEC). The implications of workforce shortages are inferred from the available literature, as the academic literature available does not directly address this issue;

- **Literature Review of the ECEC Labour Market:** This report summarizes available evidence regarding the factors that influence the demand and supply for ECEC workers and examines some conundrums in the ECEC labour market;
- **Recruitment and Retention Challenges and Strategies:** This report examines recruitment and retention challenges in the ECEC sector from an economic and human resource management perspective. Research into these challenges is examined and ways to reduce the recruitment and retention problem are proposed;
- **Data and Model Feasibility:** This report examines existing data sources and provides an assessment of the data gaps and limitations of available data. The feasibility of developing occupational demand and supply models for the provinces and territories is also explored; and
- **Executive Summary: Understanding and Addressing Workforce Shortages in ECEC Project:** This report contains background information on the *Understanding and Addressing Workforce Shortages in ECEC Project* and a brief, plain language executive summary of each of the reports produced.

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Document Overview

The Estimates of Workforce Shortages is divided into three main sections:

Section 1: An Examination of the Literature Explaining Workforce Shortages.

Section 2: Methodology for Estimating Workforce Shortages.

Section 3: Applying the Economic Benefits of ECEC from the Literature Review of Socioeconomic Effects and Net Benefits to the Workforce Shortage Estimates.

SECTION 1: AN EXAMINATION OF THE LITERATURE EXPLAINING WORKFORCE SHORTAGES

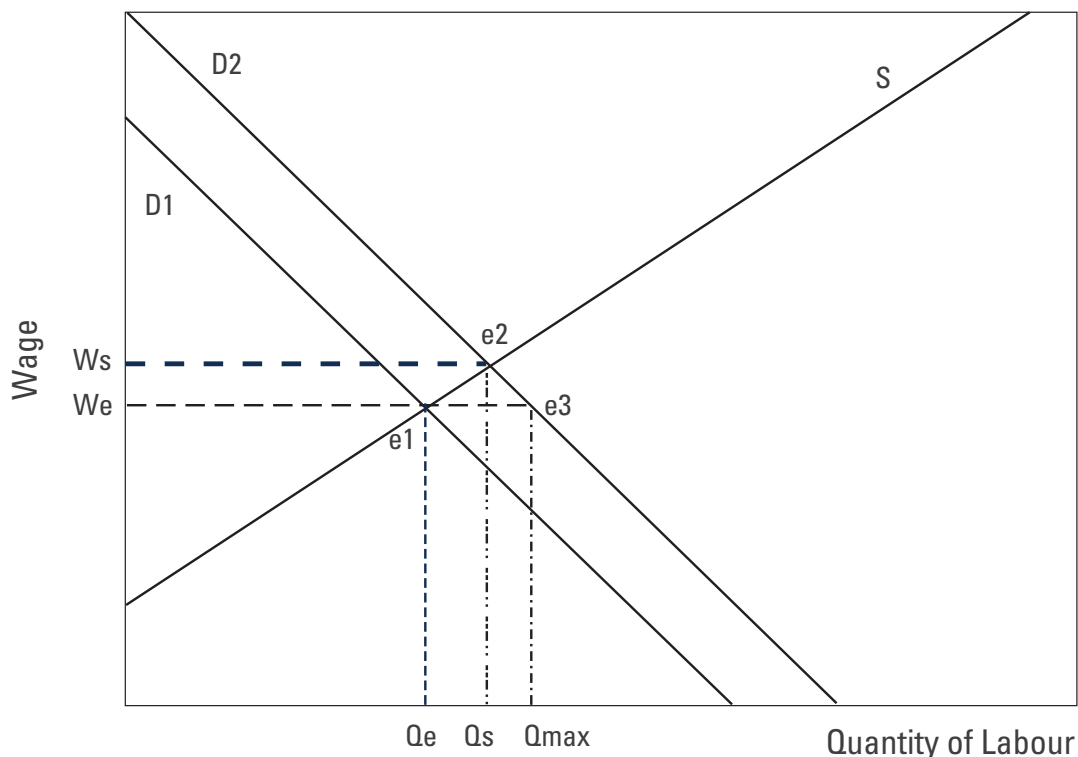
Labour Market Imbalances

To understand labour market imbalances (workforce shortages and surpluses) it is helpful to first consider basic labour market theory. This section follows the discussion in Roy et al. (1996). According to basic economic theory, in a competitive labour market, with no major impediment to price and wage flexibility, most labour market imbalances should be resolved over time. More workers will move into occupations that are in shortage as vacancies and market wages start to rise. Employers will reduce their hiring intentions as market wages go up. Labour market imbalances will therefore only exist while this adjustment process is taking place. The duration of these labour market imbalances will depend on the magnitude of the shocks hitting the economy and the speed at which the adjustments are made. Labour compensation or wage and quantity changes will operate to resolve these imbalances. The more constraints there are on changes in these variables, the more costly the adjustments will be, and the more lasting the shortage and surplus situations.

The compensation of workers may only respond very slowly to shifts in demand or supply for particular occupations or skills, leading to protracted shortages or surpluses. Institutional and regulatory arrangements (such as voluntary multi-year labour contracts between workers and employers), imperfect product-market competition, imperfect information, wage controls and social welfare provisions introduce more or less severe constraints on the structure of wages, tending to increase wage stickiness, and reduce the market-clearing role of wage adjustments. Relative wage misalignments following demand and supply shifts will result in either shortages or surpluses.

This concept is illustrated in Figure 1 where the occupational demand and supply curves are shown. The market is initially in equilibrium at point e1,

Figure 1: Wage Misalignment and Imbalances



with wage equal to W_e and the quantity of labour supplied equal to Q_e . The market demand is shown shifting out from D_1 to D_2 . Unless the market wage adjusts instantaneously to its new equilibrium value, W_s (and there are reasons to believe it will not), the quantity demanded will exceed the quantity supplied. The basic message is that when wages do not instantaneously adjust to shifts in supply and demand, whatever the reason, imbalances occur. As a consequence, employers will not be able to get as many skilled workers as they want at the market wage, while in other markets workers will not be able to find work. If wages do not adjust or adjust very slowly to shifts in supply and demand, imbalances will persist.

The literature on skill shortages at the company or firm level often focuses on non-wage adjustment mechanisms to imbalances. These adjustments have a tendency to offset the effects of the initial shock (the shifting out of the demand curve discussed above). This is illustrated by re-interpreting Figure 1. Following an initial shift in demand from D_1 to D_2 , the wage is assumed not to adjust and stays at W_e . At that wage, there is excess demand and firms may resist raising the wage if, for example, a burst in sales is expected to be temporary. Managers may instead decide to shift their demand towards a lesser-skilled occupational group where workers are available (relaxing hiring standards), or simply revise their plans down and ration their output to customers. These strategies, if followed by all firms, amount to shifting back the market demand to D_1 and cancel out the effects of the initial shock. Firms may also decide to train new workers, pay moving expenses to workers from another region, or bring in some workers from abroad. Unemployed workers in related occupations may respond positively to these new job vacancies. These factors shift the supply curve S to the right until a new balance is reached at point E_3 . Clearly, the easier these shifts are, the quicker the imbalances will be resolved with no apparent movement in wages.

Roy et al. (1996) also examine a number of situations where skill shortages may occur. One situation that might be relevant for the ECEC sector is when the wage is below a particular minimum. At the wage employers may be willing or able to pay, no workers are interested in filling the vacancies. Shortages will be reported by these employers.

One thing to be kept in mind is that there are two aspects to the demand for workers:

- **Expansion demand**, which reflects the increase in the total number of workers that results from an increase in the level of services that are provided to children; and
- **Replacement demand**, which reflects workers the employer needs to hire to replace those who leave or separate from a job. There are a host of reasons for separations, including: retirement, illness, education, family reasons, or finding alternate employment. Replacement demand for the sector as a whole reflects only those people who leave the sector, and not those who move from one firm to another.

The total number of workers that employers need is called recruitment demand, and is the combination of expansion and replacement demand.

Workforce Shortages

Generally, whenever the demand for workers exceeds supply there is a workforce shortage, and when there are more people available for work than jobs available there is a surplus. A variety of terms and definitions have been suggested in the literature to describe workforce shortages and skills gaps. The following will discuss the definitions proposed by Roy, Henson and Lavoie (1996); Shah and Burke (2003); Boswell, Stiller and Straubhaar (2004); and Richardson (2007).

According to Roy et al. (1996), a skill imbalance occurs when the quantity of a given skill supplied by the workforce and the quantity demanded by employers diverge at existing market conditions. In order to get more precise and empirically relevant definitions, Roy et al. make explicit the meaning of the terms “existing market conditions” and “requirements.” In their view, “requirements” relate to the skills employers normally utilize. “Existing market conditions” correspond to the existing level of compensation and the structure of wages to be paid to suppliers of these skills.

Shah and Burke (2003) suggest that a distinction needs to be made between the concepts of skill shortages, skills gap and recruitment difficulties. In their view:

- a **shortage** occurs when the demand for workers for a particular occupation is greater than the supply of workers who are qualified, available and willing to work under existing market conditions;
- a **skills gap** refers to a situation where employers are hiring workers they consider under-skilled or where their existing workforce is under-skilled relative to some desired level; and
- **recruitment difficulties** refer to the situation where employers cannot fill vacancies despite an adequate supply of workers. The reasons for this may be varied, and could include: relatively low remuneration being offered, poor working conditions or image of the industry, unsatisfactory working hours, commuting difficulties, ineffective recruitment effort by the firm or skills needs that are very firm-specific.

Based on interviews with key informants, the ECEC sector seems to have aspects of all of these types of shortages. In some cases there is a skills shortage because no one with the required qualifications is available to employers at existing market conditions. In other cases, skills gaps are identified where child care centres are hiring people who have lower qualifications than required because they have been given exemptions by the provincial authority on the condition that a training program is provided to the employees with lower qualifications. And there appears to be instances of recruitment difficulties too.

Boswell et al. (2004) distinguish between two types of shortage – aggregate labour shortage and shortages due to mismatch on the labour market:

1. An **aggregate labour shortage** occurs when there is (near) full employment, and a general difficulty finding workers to fill vacancies.
2. A **mismatch on the labour market** has four basic sub-types:
 - **Qualitative mismatch.** The qualifications of workers and the qualifications needed to fill available vacancies are not matched. Qualitative mismatch may also be referred to as a skills shortage—a labour market situation where there is a lack of people with the qualifications, skills or experience necessary to carry out the jobs in question.
 - **Regional mismatch.** The unemployed persons seeking work and firms offering suitable jobs are located in different regions, and the jobs and/or workers are not mobile.
 - **Preference mismatch.** There is a mismatch between the types of jobs that unemployed people are willing to take on and existing vacancies in the relevant region. Those out of work are unwilling to take certain types of work because of inadequate remuneration, working conditions or status, despite the fact that such jobs match their qualifications and skills profile, or are located in the relevant geographical region.
 - **Information mismatch.** Unemployed workers do not acquire information on relevant existing vacancies, and firms do not have the information necessary to find persons with adequate qualifications. Supply does not meet demand because of the lack of information.

Certainly in recent years the overall Canadian and provincial labour markets have experienced aggregate labour shortages. Unemployment fell in 2007 to the lowest level of the past 33 years. The ECEC labour market has also been affected by at least some of the labour market mismatch sub-types. For example, in some provinces labour shortages appear quite acute, while in other provinces the labour market is not as tight.

According to Richardson (2007), the idea of a “shortage” is a slippery concept. The supply of workers with a particular skill is difficult to measure for several reasons, including:

- Supply is not just about the number of people, but also the number of hours they are willing to work.
- Within an occupation, there may be specialized sub-sets of skills or locations that are having difficulty recruiting while other areas are not.
- Vacancies may go unfilled, not because no one is available who can do the job, but because the wages and conditions being offered are unattractive.
- Within every skill group, there is a range of ability from exceptional to ordinary. This variation in quality is important to employers, but not observable in measures of labour supply.
- Many people work in jobs that do not directly use their formal qualifications, or are of working age but not seeking employment.

In order to highlight the severity of the shortage, Richardson says that training must also be taken into account and suggests the following scheme for classifying skills shortages:

Classifying Skills Shortages	
Level 1 Shortage	Few people have the essential technical skills who are not already using them and there is a long training time to develop the skills.
Level 2 Shortage	Few people have the essential technical skills who are not already using them but there is a short training time to develop the skills.
Skills Mismatch	Sufficient people have the essential technical skills who are not already using them, but they are not willing to apply for the vacancies under current conditions.
Quality Gap	Sufficient people have the essential technical skills who are not already using them. They are willing to apply for the vacancies, but lack some qualities that employers think are important.
Source: Richardson (2007).	

Richardson (2007) makes an additional distinction between workers who do not have the essential technical skills and workers who are judged not to have the degree of motivation and other personal characteristics that the employers desire. She also points out that a Level 1 Shortage is more serious for firms to overcome and requires planning within the training system.

Shortages in the ECEC sector represent a Level 2 Shortage and/or a Skills Mismatch given that in some jurisdictions no qualifications are required, or exemptions are made to training requirements during periods of strong increase in demand.

Cyclical and Structural Shortages

Unemployment and labour shortages are two sides of the same coin. Unemployment exists when there is an excess supply of labour; while labour shortages exist when there is an excess demand for labour. Cyclical and structural factors influence labour demand, supply and workforce shortages.

Cyclical factors reflect short-term fluctuations in aggregate demand and its influence on the demand for and supply of labour. The business cycle tends to last in the neighbourhood of five to seven years (from peak to peak). Cyclical shortages occur at the peak of the business cycle when the overall unemployment rate is at or near its cyclical lows. The unemployment rate for ECEC workers is closely related with the aggregate unemployment rate, with a correlation of 0.87 from

1987 to 2007. This occurs in part because changes in employment for mothers will have a direct impact on the overall demand for ECEC services and therefore on the demand for ECEC workers. Moreover, when the demand for workers in general is at a cyclical peak the demand for ECEC services will rise and the flow of people with ECE qualifications to higher paying occupations will also be at a cyclical peak, both of which will put upward pressure on workforce shortages. Conversely, when there is a general decline in the demand for workers more people with ECE qualifications will become available and therefore the unemployment rate will rise and workforce shortages diminish.

In contrast to the relatively short-term influence that the business cycle has on the labour market, structural changes can last for decades. They reflect long-term developments occurring in the economy or society independent of short-term fluctuations in aggregate demand. Saunders and Maxwell (2003) indicate that labour markets in Canada will continue to be affected by three principal forces (or structural factors) of change: technological advances, globalization of competition, and changes in the demographic structure of the workforce. Each of these primary structural factors has significance for the ECEC sector.

According to Saunders and Maxwell (2003), technological change impacts the labour market in a number of ways. It contributes to a shift in Canada's industrial structure away from primary and manufacturing industries towards services. Technological change also increases the demand for highly skilled work relative to that for less skilled work, a phenomenon referred to as "skill-biased" technological change. The importance of technological change has been mentioned by various other researchers (see Krugman, 1994 and OECD, 1994, job reports). Briscoe and Wilson (2001) found that there was strong evidence that technological change was having a very significant impact on the occupational structure in the U.K. Also, a number of researchers have suggested that globalization will cause a change in the mix of skills needed in advanced economies, with an increase in the need for high-skilled labour and a reduction the demand for low-wage occupations. Borjas and Ramsey (1994a, 1994b, 1995) and Borjas, Freeman and Katz (1997) found that globalization had a significant negative effect on low-wage workers in the U.S.

The above structural factors mean that in Canada the demand for highly skilled workers will be rising faster than the demand for low-skilled workers in the future. Since many ECEC workers have postsecondary education, the number of alternative employment options for these workers will continue to rise because of the general rise in demand for higher-skilled workers throughout the Canadian economy. This implies that the sector will continue to face significant turnover and recruitment issues in the years ahead as workers move to other sectors.

Demographic developments will also impact workforce shortages. As indicated by the OECD (2003), demographic developments throughout the industrialized world imply an aging workforce and ultimately a declining population of working age. There is the possibility that these developments will result in labour shortages at the macro level. In the medium term—as early as 2015 for some countries—the increasing number of retiring baby-boomers will in some occupations lead to a replacement labour demand that may be hard to fill from domestic labour supplies. This means that the ECEC sector will experience a rising tide of retirements and therefore replacement demand in the years ahead. Furthermore, the sector will also be affected by the needs of other sectors to replace workers who will be retiring. These other sectors will partly meet their need to replace workers by "raiding" lower-paid occupations that have high levels of education. Therefore, the ECEC sector will experience a rising tide of departures to other occupations.

Echoing many of the cyclical and structural factors discussed above, the economic literature on labour or skill shortages suggests a number of causes.¹ According to the OECD (2003), the different causes of labour shortages can be summarized as follows:

- Technological change may lead to a structural shortage of workers in possession of the needed skills: workers neither have the time nor the opportunity to invest in these skills.

¹ See Roy et al. (1996) p. 12; McMullin et al. (2004) p. ii; Saunders and Maxwell (2003); OECD (2003).

- Slow adjustments in the labour market may cause shortages. It takes time for employers to recognize labour shortages and react to them, for example, by offering higher wages. It also takes time for workers to recognize better opportunities elsewhere and react to them. As well, employers may be reluctant to raise wages or be tied to collective agreements or inflexible remuneration structures.
- Labour shortages may result from mismatch, if, for example, wrong education investment decisions result in too few engineers, scientists and doctors.
- Insufficient regional labour mobility may cause shortages.
- Institutional or demographic causes may be involved in shortages, for example, a high number of people in retirement or invalidity (disability) pensions, or low female participation rates.

Is There a Workforce Shortage?

The simplest indicator to determine labour market shortages is the unemployment rate. If the unemployment rate is low relative to its natural rate, which reflects normal frictional unemployment in the labour market, then the occupation is in shortage. The natural unemployment rate is not observable. What is observable is that the unemployment rate for the occupation “early childhood educators and assistants” is well below its long-term average. If the occupation’s long-term average represents its natural unemployment rate, then the occupation is in shortage throughout Canada.² A large variety of approaches are used throughout the world to construct labour market indicators that include factors in addition to the unemployment rate in order to determine if there are workforce shortages. These indicators can be divided into three groups:

- indicators that use historical data only;
- indicators that use forecast data only; and
- indicators that use a combination of history and forecast data.

For national models, *the Canadian Occupational Projection System (COPS)*, *U.S. Bureau of Labor Statistics (BLS)* and *the Dutch Research Centre for Education and the Labour Market* (Researchcentrum voor Onderwijs en Arbeidsmarkt [ROA]) very developed indicators of labour market imbalances. In Canada, innovative approaches are used to construct indicators of labour market imbalances at the provincial level.³

It is helpful to examine the approach developed by the COPS to assess current labour imbalances.⁴ The COPS current imbalance indicator uses data for the unemployment rate, change in employment, and the level and change in earnings over the past three years. The COPS labour market indicator makes it possible to identify occupations currently under pressure, where the supply of labour cannot meet the demand. This approach basically modifies the methodology developed by the BLS.⁵ An occupation is considered to be under pressure if its employment growth rate is at least 50% faster than the average, wage increases are at least 30% faster than average and the unemployment rate is at least 30% below average. The method is modified so that the unemployment rate indicator also includes those occupations that have an unemployment rate close to its historic lows.

Notably, the COPS indicator of labour market pressure is a relative measure—only the fastest growing occupations are identified as having a shortage. If there is an “aggregate labour shortage” as per Boswell et al.’s (2004) delineation, then

² It should be noted that the Labour Force Survey (LFS) data for the smaller provinces, such as PEI, are of poor quality, which makes the unemployment rate calculations unreliable. The LFS rounds data to the closest 100. Since 700 people are estimated to work in the early childhood educators and assistants occupation, rounding the data has a huge impact on the unemployment rate calculation.

³ See Fairholm (2006).

⁴ Bergeron et al. (2004) pp. 8-11.

⁵ Veneri (1999).

the COPS measure does not identify this as a shortage for all occupations experiencing a labour market shortage, but only those presumably experiencing the most acute shortage. The BLS uses employment growth rate over a five-year period, while COPS uses employment growth over a three-year period. It is not clear why these specific period lengths are used. Given the variability in employment estimates from year to year, particularly at the provincial/territorial level, different relative growth rates will be calculated for three, four or five years. Furthermore, different relative growth estimates will be calculated depending on whether data from the Labour Force Survey (LFS), or the Survey of Employment, Payrolls and Hours (SEPH) are used.

Unemployment: ECEs and Assistants

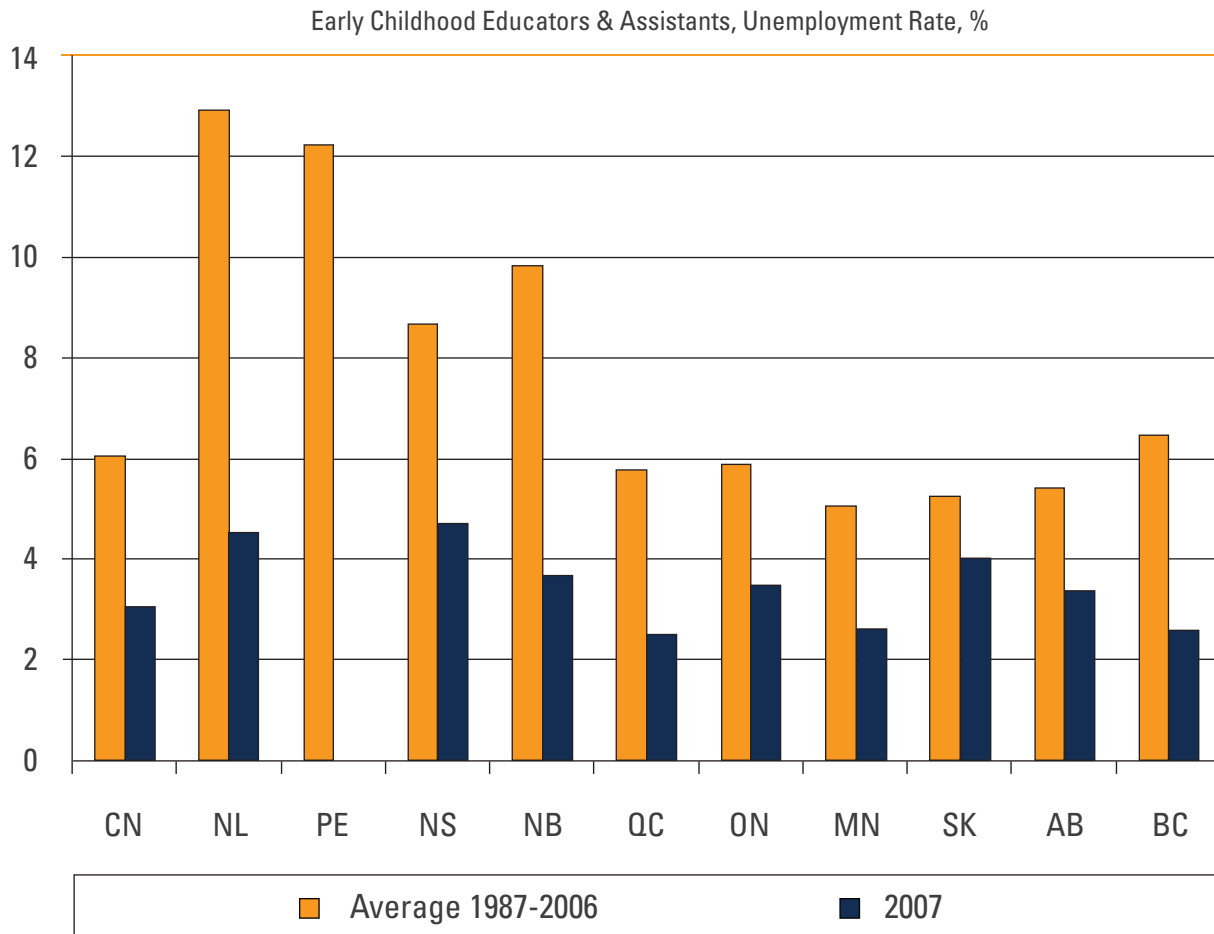
An examination of the unemployment rate data in Table 1 shows that most of the provinces are experiencing an unemployment rate for early childhood educators and assistants (ECE&A) of 30% below the provincial average over the past four years, except for Saskatchewan and Alberta, where the generally strong demand conditions have created an aggregate labour shortage. Notably, if a five-year period is used, then ECE&A are experiencing an unemployment rate of at least 30% less than the provincial average in all of the provinces. In comparison, if the average of the past three years is used, then Alberta, Saskatchewan and New Brunswick fall short of the 30% benchmark. In the cases where the unemployment rate falls short of the 30% threshold, the unemployment rates for early childhood educators and assistants are clearly below their long-term average and near their all time lows, so they would pass the shortages grade using the COPS approach, but not the BLS approach (see Figure 2).

Table 1: Unemployment Rates Comparison (Four-Year Average)

	Early Childhood Educators & Assistants	All Occupations	Ratio Early Childhood Educators/All
Canada	3.3	6.6	50.2%
Newfoundland and Labrador	8.0	14.8	54.0%
Prince Edward Island	3.1	10.9	28.7%
Nova Scotia	4.8	8.3	57.5%
New Brunswick	6.0	9.0	67.1%
Quebec	2.8	8.0	34.4%
Ontario	3.6	6.5	54.9%
Manitoba	2.5	4.7	52.4%
Saskatchewan	3.8	4.8	78.5%
Alberta	3.0	3.9	77.2%
British Columbia	3.6	5.5	65.1%

Source: Labour Force Survey and calculations by the authors.

Figure 2: Unemployment Rates Far Below Long-term Average



Employment: ECEs and Assistants

When examining employment, the situation depends on the survey used and the time period examined. Using the LFS, employment growth for ECE&A does not exceed the national or provincial average employment growth by more than 50% in over half of the cases (see Table 2). However, using the SEPH data for the “child day-care services” industry, employment growth is generally more than 50% greater than the industrial aggregate in over two-thirds of the periods examined (over five, four or three years) for the 10 provinces. Newfoundland and Labrador, Alberta and B.C. had less than 50% faster growth using these data, but all of the other provinces had employment growth at least 50% stronger than the industrial aggregate for all employees in the child day-care services industry. The data for Newfoundland and Labrador are perplexing since the SEPH provides a contradiction to the LFS data. Meanwhile, the situation in Alberta and B.C. could reflect the strong employment growth throughout these provinces. Since many other sectors have higher wages than the ECEC sector, strong employment growth in other sectors could have attracted employees from the ECEC sector, making workforce shortages in this sector worse.

Table 2: Employment Growth in Sector Relative to Total

	5 yrs	4 yrs	3 yrs
Canada	19%	-22%	63%
Newfoundland and Labrador	1470%	637%	3727%
Prince Edward Island	-276%	-100%	-100%
Nova Scotia	-56%	192%	1345%
New Brunswick	-548%	-332%	-971%
Quebec	184%	-49%	56%
Ontario	-29%	87%	370%
Manitoba	522%	453%	301%
Saskatchewan	268%	-19%	210%
Alberta	-100%	-183%	-146%
British Columbia	-48%	-31%	-131%

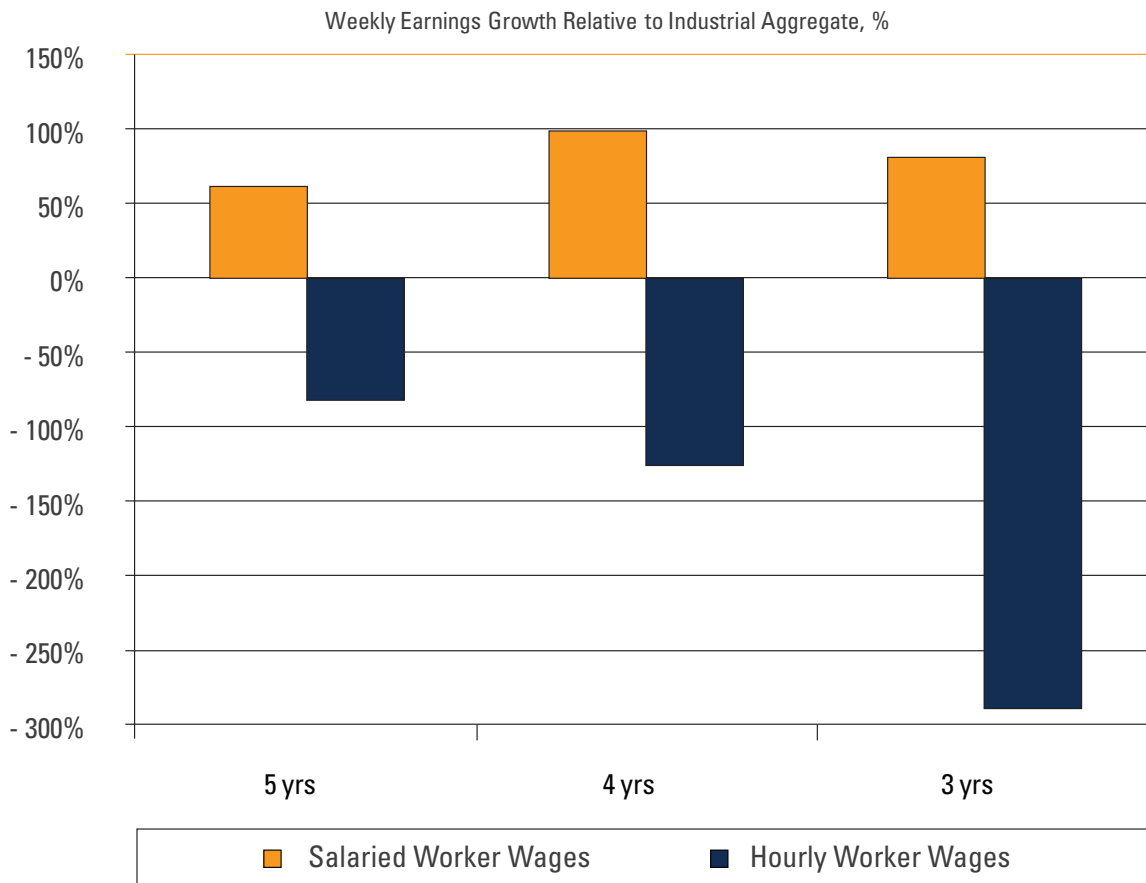
Source: Labour Force Survey and calculations by the authors.

The SEPH data allow an examination for salaried and hourly paid employees for Canada as a whole and the larger provinces; there are no publicly available data for Atlantic Canada. The surveyed employers indicate how many workers they have who are salaried and hourly paid. Within the SEPH data a large divergence in employment growth is evident between salaried versus hourly paid employees (see Figure 3). Over the past five years, the increase in demand for salaried employees vastly exceeded the rise in employment for hourly paid employees. However, over the past three years the rise in employment for hourly paid was much larger than for salaried employees. This means there was a compositional shift toward hourly paid workers.

Wages: ECEs and Assistants

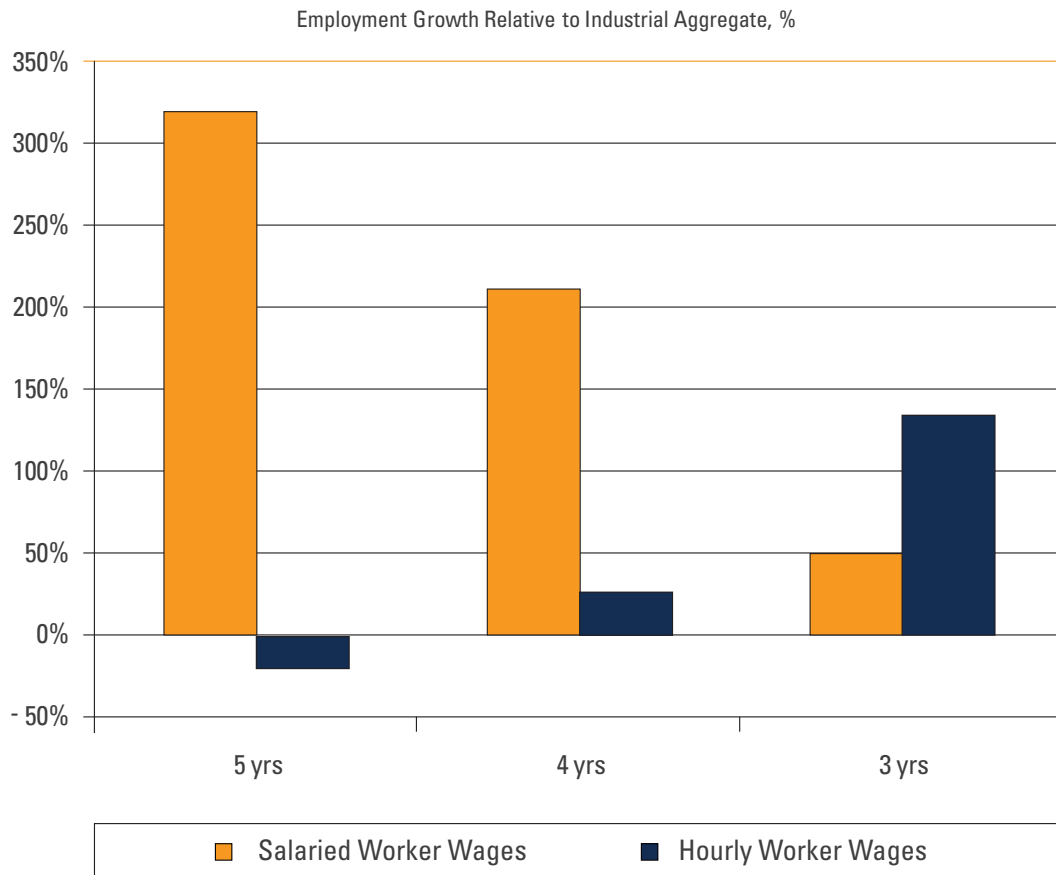
The wage data available for the ECEC sector are from the SEPH for hourly paid and salaried employees. There are data for hourly earnings and weekly earnings. This analysis uses the weekly earnings for both the salaried and hourly paid workers (see Figure 3). The data illustrate a sharp division in the earnings growth between hourly and salaried employees. Hourly paid employees have experienced minimal wage gains on average in the recent past. In contrast, salaried employees have experienced significant wage gains. Some discussions with ECEC observers suggest that in general salaried workers are a proxy for trained staff, and hourly paid workers are a proxy for untrained staff, but this may not be true in all provinces and territories. If one accepts these assumptions, then these observations are consistent with workforce shortages for trained ECEC staff, and employers hiring less qualified employees during periods of strong increases in demand. The employment data also suggest that there has recently been a strong overall increase in demand.

Figure 3: Wages for Salaried Versus Hourly Employees Diverge Sharply



In general, the data discussed above suggest that there are workforce shortages in the ECEC sector for salaried employees who have the training required to work in the sector. First, the unemployment rate for ECE&A is more than 30% below that for all occupations in Canada. Second, the wage gains for salaried employees are more than 30% above the growth recorded for the Canadian industrial aggregate. Third, employment growth for salaried employees is more than 50% higher than employment growth for the Canadian industrial aggregate. For employees who work by the hour, however, the data do not support the view that there are workforce shortages based on the methodology used by the COPS and BLS. The view that there are no workforce shortages for those who are paid hourly is reinforced by the analysis in the report that examined the ECEC labour market, *Literature Review of ECEC Labour Market*, and found that during periods of strong increases in demand supply also increased quickly in part because there is a very large potential supply of untrained workers who earn less than ECEC sector workers.

Figure 4: ECEC Salaried Employment Growth Above Industrial Aggregate



It is notable that the largest underperformance in the relative wages for hourly employees (see Figure 3) occurs during the same period when employment growth for hourly paid employees significantly exceeds that for the industrial aggregate (see Figure 4). This divergence in outcomes between salaried employees and those paid by the hour suggests that over longer periods of time there has been a shift towards salaried employees, who would have higher levels of qualifications. However, when demand expands rapidly, less qualified workers are hired, leading to a drop in the overall quality of the workforce and average wages. This interpretation is reinforced by key informant interviews that indicate that the number of educational exemptions tends to rise in periods of strong demand. Also the divergence between the LFS employment data (which includes the self-employed) and the SEPH data suggests that a large shift between ECEC types occurred in the sector, with rising demand in child care centres and less in family child care in general.

SECTION 2: METHODOLOGY FOR ESTIMATING WORKFORCE SHORTAGES

The methodology for estimating workforce shortages is as follows:

1. Estimates of the components affecting workforce shortages are calculated.
2. Workforce shortages in the ECEC sector are calculated from these components.
3. These estimates are converted into hourly terms.
4. Hourly economic benefits and costs from the report *Literature Review of Socioeconomic Effects and Net Benefits* are reviewed.
5. The estimates from the previous sections are combined to give values for the economic costs of workforce shortages in ECEC.

The method used to estimate workforce shortages in the ECEC sector is the unemployment-vacancy (UV) technique. Roy et al. (1996) state the UV technique is the simplest and most common approach used by analysts to assess the presence of a shortage or a surplus in a given occupation. Roy et al. cites Meager (1986) for the unemployment-vacancy technique, which gives the following definition: analysis involves comparing aggregate demand and supply in an occupation, with a ‘shortage’ existing when $U-V < 0$, where U stands for unemployment and V stands for vacancies.

To determine the correct definition to use for the UV technique, it is important to look at the definitions for unemployment and vacancies. Consistency in definitions is a must. Morissette and Zhang (2001) give the following definitions of unemployment and vacancies in order to make these concepts comparable:

- Unemployed worker—an individual who:
 1. has not worked at all during the reference period (e.g., last week);
 2. has undertaken, within the last weeks, some specific action to find a job; and
 3. is currently available to fill a position.
- Job vacancy—a job which:
 1. is vacant for a given reference period;
 2. employers have undertaken, within the last weeks, some specific recruiting action;
 3. is available immediately; and
 4. is available to persons outside the location.

An effort will be made in this report to follow these definitions as closely as possible, particularly the definition for vacancies. The survey questions used by Galarneau et al. (2001) and et al. (2000) to measure vacancies are listed in the appendices.

Based on these unemployment and vacancy definitions, the UV technique can be defined as: “A workforce shortage exists if the number of vacancies is larger than the number of unemployed who are qualified to work in the occupation.” For the sake of consistency, since there is no mention of voluntary or involuntary vacancies, there should not be a distinction between voluntary and involuntary unemployment.

For the UV technique to be successfully applied, data are needed for the number of vacancies, number of unemployed and number of unemployed who are qualified to work. Data for the number of unemployed is given by the Labour Force Survey. The data were available from 1987 to 2007 when the calculations were done. Data for vacancies are much harder to come by.

Just as there are short-term and long-term unemployed, there are short-term and long-term vacancies. *The Workplace and Employee Survey* (WES) estimated an overall job vacancy rate of 2.6% in 1999, of which at least 40% of jobs remained unfilled for at least four months (Galarneau et al., 2001). The analysis will not explicitly take into account the long-term and short-term aspects of unemployment and vacancies, since at least the short-term unemployment and vacancies will presumably cancel each other out in the UV equation.

Estimates of Workforce Shortage Components

Estimating Consistent Unemployment

The unemployment data nationally and by province from 1998 to 2007 are listed in Table 3. The data series are quite variable, particularly for smaller provinces such as PEI, and Newfoundland and Labrador. To counteract this variability a Hodrick-Prescott (HP) filter is used to smooth out the data.⁶ The smoothed unemployment rates are illustrated in Table 4.

Table 3: Unemployment Rates - Child Day-Care Service Industry (NAICS 6244) (Per Cent)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	5.9	4.2	3.7	4.1	3.7	3.4	3.9	3.1	3.1	3.3
Newfoundland and Labrador	11.1	5.6	15.4	6.3	7.1	13.6	5.6	6.6	7.7	4.3
Prince Edward Island	22.2	12.5	12.5	11.8	11.1	12.5	12.5	11.1	11.8	12.5
Nova Scotia	8.5	2.3	7.0	6.8	6.8	8.7	5.0	2.9	4.3	4.5
New Brunswick	7.1	7.4	9.7	3.4	2.7	6.1	7.3	7.7	7.1	6.9
Quebec	5.3	3.7	3.0	5.5	3.9	2.6	2.8	3.3	3.5	3.5
Ontario	6.4	4.1	3.3	3.2	3.1	3.6	4.1	2.9	2.9	3.2
Manitoba	4.5	3.0	2.8	2.9	4.4	1.6	2.9	1.5	1.3	2.6
Saskatchewan	4.6	3.9	4.1	4.7	4.8	2.0	4.2	3.9	4.8	1.9
Alberta	5.2	6.1	2.7	1.9	4.5	2.3	3.6	2.6	1.9	2.5
British Columbia	5.8	4.4	5.8	5.0	3.8	3.7	5.7	2.6	2.0	2.6

Source: Labour Force Survey and calculations by the authors. For PEI because of the small sample size the unemployment rate could not be calculated for 2001 & 2006. For these years the average for the previous and following years were used.

⁶ Hodrick and Prescott (1980). This is a common technique to determine trend changes in the variable.

Table 4: Smoothed Unemployment Rates- Child Day-Care Service Industry (NAICS 6244) (Per Cent)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	5.7	5.3	4.9	4.5	4.1	3.8	3.5	3.2	3.0	2.7
Newfoundland and Labrador	12.1	11.2	10.3	9.3	8.4	7.5	6.6	5.7	4.8	3.9
Prince Edward Island	11.7	12.0	12.1	12.0	11.8	11.4	10.8	10.2	9.6	9.0
Nova Scotia	7.4	7.0	6.6	6.3	5.9	5.6	5.2	4.8	4.4	4.1
New Brunswick	8.7	8.1	7.5	7.1	6.7	6.5	6.4	6.3	6.2	6.2
Quebec	5.5	5.1	4.7	4.3	4.0	3.7	3.5	3.2	3.0	2.8
Ontario	5.8	5.3	4.9	4.4	4.0	3.7	3.4	3.1	2.8	2.5
Manitoba	4.7	4.3	3.9	3.5	3.1	2.7	2.4	2.1	1.8	1.5
Saskatchewan	4.9	4.7	4.5	4.3	4.1	3.9	3.7	3.5	3.3	3.1
Alberta	5.2	4.8	4.3	3.9	3.6	3.2	2.9	2.6	2.2	1.9
British Columbia	5.8	5.5	5.1	4.7	4.4	4.0	3.6	3.2	2.8	2.4

Source: Labour Force Survey and calculations by the authors.

Estimating the Unqualified Unemployed

Osberg and Lin (2000) find that: “less than one-eighth of the national unemployment rate could be due to structural mismatch between the skills demanded in available jobs and the skills possessed by the unemployed.” This would correspond to a maximum structural mismatch unemployment rate of 1.04% in 1998 (national unemployment was 8.3% in 1998). However, given that the ECEC sector has a higher vacancy rate than that in all industries (3.4% vs. 2.6%),^{7,8} one would expect a higher structural mismatch unemployment rate in the ECEC sector. Assuming a linear relationship between structural mismatch unemployment rates and vacancy rates, the maximum structural mismatch unemployment rate for the ECEC sector would be 1.36% in 1998.

Another way to estimate the structural mismatch unemployment rate is to look at the workers fired from their ECEC jobs as a percentage of all workers leaving their current ECEC job. Assuming that the currently unemployed ECEC workers are no better qualified than those leaving their jobs, the number of unqualified unemployed workers can be estimated.

Doherty et al. (2000) break down the reasons for ECEC workers leaving their job, which are: quit voluntarily (38.1%); fired for poor performance (13.3%); leave of absence (11.0%); laid off due to low enrolment (4.5%); laid off for other reason (7.0%); unknown reason (1.0%); and other reason (25.1%). Assuming the reason for the worker leaving does not affect that worker’s average tenure, and that 18.0% of those leaving for unknown or other reasons are unqualified to work in the field, an estimated 18.0% of the job leavers are unqualified to work in ECEC. If those taking a leave of absence are not included as leavers (since they will return), the estimate of job leavers unqualified to work rises to 21.1%. Multiplying this number by the unemployment rate in 1998 of 5.7% gives a mismatch unemployment rate of 1.20%. This is slightly less than the maximum structural mismatch unemployment rate for the sector of 1.36% in 1998, and therefore a structural mismatch unemployment rate of 1.20% seems reasonable. Provincial structural unemployment rates are calculated in a similar way.

⁷ Galarneau et al. (2001).

⁸ Doherty et al. (2000).

Estimating Vacancies

Vacancy rates for child care centers nationally and by province were estimated in Doherty et al. (2000). These data were generated through a survey which asks heads of child care centres how many vacancies they currently have. One caveat to this way of measuring vacancies is that not all of these vacancies are offered to applicants outside the firm. The definition of vacancies chosen in this report requires that these vacancies be available to outside applicants and therefore the vacancy data in Doherty et al. (2000) have to be adjusted.

The Workplace and Employee Survey (WES) analyzed in Morissette and Zhang (2001) measures vacancies much the same way as Doherty et al. (2000) (see appendix for details). However, the WES includes an additional question which asks whether the vacancy was available to applicants outside the firm. The WES does not include specific ECEC sector data, but does include vacancies in the major occupational categories as well as the percentage of the vacancies available to outside applicants in each occupational category. These data are summarized in Table 5. One caveat is that Morissette and Zhang (2001) only use data for profit-oriented establishments, though this does not seem to make too much difference in the vacancy rate, which is 2.7% for profit-oriented establishments and 2.6% overall.

The industry that has a vacancy rate most similar to the ECEC sector is the retail sector, where 83.1% of vacancies are available to outside applicants. The percentage of vacancies available to outside applicants for all industries is 78.5%. Assuming the ECEC sector lies somewhere in between, a reasonable percentage of vacancies available to outside applicants would be 80%.

Table 5: Available Vacancies (Per Cent)

	Vacancies	Percentage available to outside applicants
Forestry, mining oil and gas extraction	0.8	71.9
Labour-intensive tertiary manufacturing	2.5	88.1
Primary product manufacturing	1.3	79.8
Secondary product manufacturing	2.3	75.7
Capital-intensive tertiary manufacturing	2.2	81.0
Construction	2.4	89.3
Transportation, warehousing, wholesale trade	2.3	77.9
Communication and other utilities	2.2	51.4
Retail trade and consumer services	3.9	83.1
Finance and insurance	2.1	62.2
Real estate, rental and leasing operations	-	88.1
Business services	2.5	78.5
Education and health services	1.6	64.7
Information and cultural industries	2.5	78.8
Total	2.7	78.5

Source: Morissette and Zhang (2001).

Extrapolating Vacancy Rates

The Help Wanted Index (HWI) has frequently been relied on for evidence of vacancy trends (Osberg and Lin, 2000). One study on vacancies assumed full employment in 1966 so that the number of vacancies could be estimated as the number of unemployed that year and used the HWI to extrapolate the number of vacancies into the future (Roy et al., 1996). Some later researchers disputed this methodology, mentioning that there was in fact a workforce shortage in 1966. There are, in

fact, some problems with the HWI. Over the years there have been changes in how employers advertize for jobs, which makes the HWI inconsistent over a long time period. The HWI also currently only runs until 2002. However, the HWI does show the expected highly correlated inverse relationship between unemployment and vacancy rates (illustrated in Figure 5).

Figure 5: Unemployment Rate and Help Wanted Index, 1981-2002



Due to the almost perfect negative correlation between the HWI and the unemployment rate, the unemployment rate can and will be used to extrapolate vacancies from 1998 onwards. Morissette and Zhang (2001) give two ways to estimate the vacancy-unemployment relationship. One way is to summarize the WES data where vacancy rates are listed for several levels of unemployment. The other is to regress the WES vacancy data on unemployment rates and use the estimates to generate expected vacancy rates for each level of unemployment. This report uses the summarized vacancy rates rather than the expected vacancy rates, since the summarized vacancy rates are a direct measurement rather than a proxy measurement. Summarized vacancy rates for different levels of unemployment are given in Table 6. The vacancy rates from Morissette and Zhang (2001) are then adjusted to measure the percentage of vacancies available to outside applicants.

Table 6: Unemployment/Vacancy Rate Relationship (Per Cent)

Unemployment rate	Vacancy rate	Vacancy rate adjusted
4%-5%	3.3%	2.6%
6%-7%	2.0%	1.6%
8%+	1.9%	1.5%

Morissette and Zhang (2001) indicate that there is a linear unemployment-vacancy relationship for low unemployment values. Using this information to extrapolate the vacancy rate gives the results in the first two columns of Table 7. In 1998 the child care centre unemployment rate was 5.7% and the vacancy rate was 2.9% (adjusted). At a smoothed or trend unemployment rate of 5.7% the overall industry vacancy rate was 2.3%. Therefore, to convert the general unemployment-vacancy relationship to the child care unemployment-vacancy relationship, the results in the second column of Table 7 are multiplied by the ratio (2.9/2.3) giving the results in the third column.

Assuming the vacancy-unemployment relationship stays constant over the period 1998-2007, the above estimates allow the extrapolation of the vacancy rates over the same time period. The results of this extrapolation are listed in Table 8 for all of Canada and the provinces separately. There seem to be large structural differences in the vacancy rates for each province, most vividly illustrated by Newfoundland and Labrador, which combines high vacancies with high unemployment.

Table 7: Child Care Unemployment to Vacancy Rate Relationship (Per Cent)

Unemployment rate	Vacancy rate	Child Care Vacancy rate
1.0%	4.7%	6.0%
2.0%	4.2%	5.3%
3.0%	3.7%	4.7%
4.0%	3.2%	4.0%
5.0%	2.6%	3.3%
6.0%	2.1%	2.7%
7.0%	1.6%	2.0%
8.0%	1.6%	2.0%
9.0%	1.6%	2.0%
10.0%	1.6%	2.0%

Table 8: Vacancy Rate Estimates for Canada and Provinces (Per Cent)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	2.9	3.1	3.4	3.7	3.9	4.1	4.3	4.5	4.7	4.5
Newfoundland and Labrador	6.3	6.3	6.4	6.4	6.4	6.4	6.6	7.2	7.8	8.1
Prince Edward Island	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Nova Scotia	3.3	3.3	3.6	3.8	4.1	4.3	4.5	4.8	5.0	5.1
New Brunswick	3.1	3.1	3.1	3.1	3.3	3.5	3.5	3.6	3.7	3.1
Quebec	2.6	2.8	3.1	3.4	3.6	3.8	3.9	4.1	4.2	4.0
Ontario	1.8	2.1	2.4	2.7	3.0	3.2	3.4	3.6	3.8	3.5
Manitoba	4.1	4.4	4.6	4.9	5.1	5.4	5.6	5.8	6.0	5.7
Saskatchewan	3.4	3.6	3.7	3.8	4.0	4.1	4.2	4.4	4.5	4.7
Alberta	3.4	3.7	4.0	4.3	4.5	4.7	4.9	5.1	5.4	5.1
British Columbia	2.4	2.6	2.8	3.1	3.3	3.6	3.8	4.1	4.4	4.2

Workforce Shortage Estimates

To estimate workforce shortages, vacancies and structural unemployment are subtracted from the unemployment rate to give a workforce surplus rate. In a previous section, the structural unemployment rate was found to be 1.20% nationally with slight provincial variations. The surplus worker rate for Canada and the provinces during the period 1998-2007 is listed in Table 9. Positive values indicate a surplus of workers and negative values indicate a shortage of workers.

Nationwide there has been a workforce shortage since 2001, which has steadily increased each year. In 2007, there was a workforce shortage of around 5,000 ECEC workers. The largest shortages were in Quebec and Ontario with roughly 1,400 and 1,000 respectively. The Atlantic Provinces are least affected by workforce shortages, but these estimates might be influenced by data quality issues with respect to the rounding of the data to the nearest 100 people.

Multiplying the workforce surplus rate by potential employment (the employment that would be created if all vacancies were filled), gives the number of surplus workers. The worker surplus for Canada and the provinces during the period 1998-2007 is listed in Table 10. Positive values indicate a surplus and negative values indicate a shortage. Nationwide there has been a workforce shortage since 2001, which has steadily increased each year through 2006. In 2007, there was a workforce shortage of around 4,800 child care workers.

Table 9: Worker Surplus Rates (Per Cent of Workers)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	1.6	1.0	0.3	-0.4	-1.0	-1.5	-2.0	-2.5	-2.9	-2.4
Newfoundland and Labrador	5.8	4.9	3.9	2.9	2.0	1.1	0.0	-1.5	-3.0	-3.7
Prince Edward Island	4.9	5.2	5.3	5.2	5.0	4.6	4.0	3.4	2.8	3.6
Nova Scotia	3.0	2.6	1.9	1.4	0.7	0.2	-0.4	-1.1	-1.7	-1.9
New Brunswick	4.2	3.6	3.0	2.6	2.0	1.7	1.5	1.4	1.2	2.6
Quebec	1.5	0.8	0.2	-0.5	-1.0	-1.5	-1.8	-2.3	-2.6	-2.0
Ontario	2.9	2.0	1.4	0.5	-0.1	-0.6	-1.1	-1.6	-2.1	-1.5
Manitoba	-0.1	-0.8	-1.4	-2.1	-2.8	-3.4	-3.9	-4.4	-4.9	-4.1
Saskatchewan	0.5	0.2	-0.1	-0.5	-0.8	-1.1	-1.5	-1.8	-2.1	-2.6
Alberta	0.5	-0.2	-1.0	-1.7	-2.2	-2.8	-3.3	-3.8	-4.5	-3.8
British Columbia	2.4	1.9	1.3	0.6	0.1	-0.5	-1.2	-1.9	-2.5	-2.2

Since the analysis shows that the shortage estimates are likely for qualified ECEC workers, these shortages are quite significant. From the 2006 Census there were 39,750 people employed in the ECEC sector as early childhood educators and assistants with the most common ECE qualification (CIP 19.0709 Child Care Provider/ Assistants). Therefore, the shortage of 5,775 that year represents 14.5% of all of the qualified employed workers, 496% of all unemployed people with that qualification from the ECEC sector and occupation, and 125% of all those unemployed with that qualification.

Table 10: Worker Surplus (Number of Workers)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	2726	1446	469	-664	-1868	-2949	-3853	-4865	-5775	-4802
Newfoundland and Labrador	98	88	46	47	28	23	-1	-23	-39	-88
Prince Edward Island	35	37	38	42	41	33	28	28	17	26
Nova Scotia	166	114	79	60	32	11	-17	-39	-81	-84
New Brunswick	170	93	87	75	75	54	60	50	32	73
Quebec	599	331	72	-290	-555	-994	-1240	-1498	-2030	-1429
Ontario	1780	1160	783	346	-87	-414	-687	-1130	-1405	-1035
Manitoba	-7	-52	-104	-150	-189	-225	-274	-310	-398	-325
Saskatchewan	35	11	-6	-19	-33	-57	-70	-91	-89	-142
Alberta	80	-28	-192	-271	-338	-505	-559	-599	-728	-624
British Columbia	569	350	258	111	23	-101	-248	-371	-520	-429

The lack of workforce shortages in PEI and New Brunswick is puzzling and may be caused by lower data quality due to smaller sample sizes in the Atlantic provinces. Examining child care industry unemployment rates from the 2006 census (see Table 11), unemployment rates are lower for workers with an ECE specific education, indicating higher overall workforce shortages for ECE educated workers and workforce shortages for ECE educated workers in PEI and New Brunswick.

Table 11: Unemployment Rates - Child Day-Care Service Industry (NAICS 6244) (Per Cent)

	Overall	ECE Specific Education*
Canada	4.1	2.7
Newfoundland and Labrador	11.6	2.8
Prince Edward Island	7.7	4.4
Nova Scotia	6.8	7.1
New Brunswick	7.2	5.0
Quebec	3.1	1.8
Ontario	4.5	3.0
Manitoba	4.3	3.4
Saskatchewan	5.4	2.8
Alberta	3.0	3.2
British Columbia	4.2	2.4

* ECE specific education includes “Early Childhood Education & Teaching” CIP 13.1210 and “Child Care Provider/Assistant” CIP 19.0709.

Hourly Workforce Shortage Estimates

The unsmoothed weekly work hours for ECEC workers (from the LFS) are listed in Table 12. The smoothed weekly hours using an HP filter are listed in Table 13. Multiplying weekly hours by 2006 Census data for average weeks worked by ECEC workers in a year by province gives average annual hours (see Table 14). Multiplying the annual hours by the shortage of workers gives the yearly hours shortage (see Table 15). Positive values indicate surplus of hours and negative values indicate shortage of hours.

Table 12: Weekly Hours

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	29.5	32.2	33.2	32.5	32.5	31.5	31.5	32.9	31.1	32.3
Newfoundland and Labrador	29.8	33.8	37.5	33.4	33.2	31.1	28.6	33.7	31.9	34.7
Prince Edward Island	26.7	34.4	33.1	37.1	35.8	35.2	34.0	38.8	37.8	37.3
Nova Scotia	26.3	31.9	36.0	33.0	33.5	35.7	33.7	32.6	34.7	33.3
New Brunswick	25.2	31.2	31.2	30.8	29.6	30.7	32.6	33.6	33.2	31.7
Quebec	29.9	32.6	34.0	31.5	31.8	32.2	31.8	32.7	30.0	31.2
Ontario	28.8	32.5	33.3	33.2	33.4	30.6	32.1	32.0	30.7	33.0
Manitoba	31.9	33.3	35.8	34.5	31.2	31.9	31.8	32.6	33.1	34.2
Saskatchewan	31.0	34.1	36.0	33.8	32.9	31.2	32.1	36.1	34.1	32.3
Alberta	30.9	31.8	32.7	33.6	35.2	32.6	30.7	34.7	34.5	33.3
British Columbia	30.2	30.0	29.9	30.8	29.8	30.9	28.8	33.8	31.1	31.9

Table 13: Weekly Hours (Smoothed)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	30.7	31.1	31.4	31.6	31.8	31.9	32.0	32.1	32.2	32.2
Newfoundland and Labrador	30.6	31.1	31.5	31.8	32.1	32.2	32.3	32.4	32.5	32.5
Prince Edward Island	32.1	32.8	33.5	34.2	34.8	35.2	35.6	35.9	36.1	36.2
Nova Scotia	28.2	28.9	29.5	30.0	30.5	31.0	31.3	31.6	31.8	31.9
New Brunswick	29.9	30.7	31.5	32.2	32.8	33.3	33.7	34.0	34.3	34.6
Quebec	30.7	31.1	31.4	31.6	31.7	31.8	31.8	31.7	31.6	31.4
Ontario	30.9	31.2	31.5	31.8	31.9	32.1	32.2	32.3	32.3	32.5
Manitoba	31.2	31.6	32.0	32.2	32.5	32.6	32.8	33.0	33.1	33.3
Saskatchewan	32.3	32.6	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9
Alberta	31.7	32.1	32.4	32.7	33.0	33.2	33.4	33.5	33.7	33.9
British Columbia	29.7	29.9	30.1	30.3	30.5	30.7	30.9	31.2	31.4	31.6

Table 14: Average Annual Hours

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	1274	1291	1303	1311	1320	1324	1328	1332	1336	1336
Newfoundland and Labrador	1086	1104	1118	1129	1140	1143	1147	1150	1154	1154
Prince Edward Island	1332	1361	1390	1419	1444	1461	1477	1490	1498	1502
Nova Scotia	1114	1142	1165	1185	1205	1225	1236	1248	1256	1260
New Brunswick	1145	1176	1206	1233	1256	1275	1291	1302	1314	1325
Quebec	1326	1344	1356	1365	1369	1374	1374	1369	1365	1356
Ontario	1282	1295	1307	1320	1324	1332	1336	1340	1340	1349
Manitoba	1279	1296	1312	1320	1333	1337	1345	1353	1357	1365
Saskatchewan	1276	1288	1296	1304	1307	1315	1319	1327	1331	1339
Alberta	1281	1297	1309	1321	1333	1341	1349	1353	1361	1370
British Columbia	1182	1190	1198	1206	1214	1222	1230	1242	1250	1258

Table 15: Surplus Hours (Millions)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Canada	3.2	1.7	0.6	-0.8	-2.3	-3.7	-4.9	-6.2	-7.5	-6.3
Newfoundland and Labrador	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Prince Edward Island	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Nova Scotia	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	-0.1	-0.1
New Brunswick	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1
Quebec	0.7	0.4	0.1	-0.4	-0.7	-1.3	-1.6	-2.0	-2.7	-1.9
Ontario	2.1	1.4	1.0	0.4	-0.1	-0.5	-0.9	-1.4	-1.8	-1.4
Manitoba	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.4	-0.5	-0.4
Saskatchewan	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2
Alberta	0.1	0.0	-0.2	-0.3	-0.4	-0.6	-0.7	-0.8	-0.9	-0.8
British Columbia	0.6	0.4	0.3	0.1	0.0	-0.1	-0.3	-0.4	-0.6	-0.5

SECTION 3: APPLYING THE ECONOMIC BENEFITS OF ECEC FROM THE LITERATURE REVIEW OF SOCIOECONOMIC EFFECTS AND NET BENEFITS, TO THE WORKFORCE SHORTAGE ESTIMATES

Hourly Costs and Benefits of Early Childhood Education and Care

The hourly costs and benefits of ECEC are estimated by the Centre for Spatial Economics (C4SE) in the *Literature Review of Socioeconomic Effects and Net Benefits*. C4SE estimated that the 2005 hourly ECEC cost was \$2.77. This figure was arrived at taking into account the cost savings from fewer informal child care spaces (for every formal child care space created, a certain fraction of informal spaces are eliminated) and using information on staff-child ratios and staff wages.

C4SE estimated that the 2005 hourly ECEC benefit was \$7.04. The benefit comes from benefits to children and mothers. The main benefit to children is higher future earnings due to higher high school graduation rates, and consequently, higher postsecondary attendance and graduation rates. Other benefits to children include lower smoking rates, lower grade retention rates and lower special education rates. The benefits to mothers come from higher present and future earnings. Access to ECEC allows mothers to increase their labour force activity. This translates into more working hours, which increase mothers' present earnings. The additional experience gained from these extra hours increases mothers' future wage earnings.

Subtracting hourly ECEC costs from hourly ECEC benefits gives a net 2005 ECEC benefit per hour of \$4.27. Unfortunately, there was too little provincial data to calculate costs and benefits of ECEC by province, which means that national data will be used to calculate the cost to each province. The 2005 net benefit estimate is extrapolated back to 1998 and forward to 2007 using an inflation adjustment of 2% a year.

Economic Costs of Workforce Shortages in Early Childhood Education and Care

The economic cost of workforce shortages in ECEC are found by multiplying the net economic benefit from an extra hour of ECEC by the total shortage in ECEC worker hours. The economic cost is zero in years of worker surplus and positive in years of worker shortage (see Table 16). Nationally, between 2001 and 2008 the ECEC workforce shortage has an estimated cost of \$141 million of lost economic activity in net present value terms. It should be kept in mind that this cost estimate is comprised of a loss of \$231.8 million in benefits and a reduction in net costs of \$91.2 million (cost of \$167.3 million and savings of \$76.1). So even ignoring the savings to society caused by children being switched from lower quality care to higher quality care, the net present value of the benefits exceeds the direct costs. Furthermore, these estimates do not include multi-generational effects and some of the benefits that research has identified in the U.S., for example, the impact on the criminal justice system. In addition, the benefits to mothers are estimated to be less than what the short-term stimulus exercise found. Considering these additional lost benefits that were not included, the estimates are fairly conservative.

Even though the estimate of the size of the loss of income to the economy from workforce shortages derived above is fairly conservative, it illustrates that the gains to the economy significantly outweigh the gross and net costs in the long run. Therefore, removing workforce shortages in the early childhood education and care sector is economically advantageous and will benefit society more than the direct costs of removing these shortages.

The net benefits of \$141 million mean that society could receive \$5,675 in net benefits per position filled per year. If all of these net benefits were used to support training (note: education spending has a high short-term multiplier and long-term benefits), there would be \$5,675 available per trainee if they all went into ECEC. However, if those who are trained stayed in the profession, so that only the peak number of required new workers received these funds for training, there would be \$24,346 available per trainee (or \$12,163 if only half of trainees go into the ECEC workforce). Alternatively, these net benefits could be used to supplement wages, which would boost the income of those employed in the sector with the most common college education (CIP 19.0907) by \$3,088 as of 2006, including those who were needed to fill the workforce shortages of 5,775 that year.

Table 16: Economic Cost of Workforce Shortage (\$ Thousands)

	1998	1999	2001	2001	2002	2003	2004	2005	2006	2007
Canada	0.0	0.0	0.0	3437.1	9919.9	16023.5	21420.4	27675.8	33612.3	28509.8
Newfoundland and Labrador	0.0	0.0	0.0	0.0	0.0	0.0	3.4	113.5	197.7	452.1
Prince Edward Island	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nova Scotia	0.0	0.0	0.0	0.0	0.0	0.0	85.7	205.4	441.6	472.7
New Brunswick	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Quebec	0.0	0.0	0.0	1562.9	3057.8	5606.3	7132.4	8758.4	12067.7	8608.6
Ontario	0.0	0.0	0.0	0.0	464.4	2263.9	3844.7	6467.8	8204.5	6199.7
Manitoba	35.5	255.2	528.4	782.7	1016.0	1232.6	1545.2	1790.3	2351.1	1973.0
Saskatchewan	0.0	0.0	30.5	100.0	172.6	308.7	384.8	517.4	513.2	847.3
Alberta	0.0	138.1	971.5	1413.9	1814.9	2780.0	3159.3	3463.1	4319.5	3793.8
British Columbia	0.0	0.0	0.0	0.0	0.0	505.8	1278.7	1967.5	2832.2	2394.2

Another option would be to hire more than 5,000 extra workers above and beyond what the workforce shortage estimates suggest under the assumption that the calculation underestimates the number of qualified workers needed. The estimate was calculated using the available aggregate sector unemployment rate from the LFS, and it is known that qualified workers are experiencing greater excess demand pressures than less qualified workers, as the lower unemployment rate for qualified workers from the 2006 Census data shows.

Notably, using 2007 as an example, the shortage of 4,800 workers represents 33,636 child care spaces and 3,700 mothers who could not look for full-time work. (In our short-term stimulus exercise, we assumed half of the child care spaces to be full-time—as was the average for child care centres in Canada during 2007—and that 0.22 women worked full-time per full-time child care space.)⁹ Furthermore, from 2001, when ECEC workforce shortages first appeared, to 2007, there was a cumulative shortage of 24,776 ECEC workers.

Based on our calculation of the short-term impacts of ECEC workforce shortages as described in the report on the socio-economic effects of early childhood education and care, it can be estimated that the lack of ECEC workers in 2007 caused a hypothetical loss of 6,724 jobs through indirect, induced and mothers’ workforce participation, or an additional 1.4 jobs lost for every job in the ECEC sector that was not filled. This means that since 2001, the lack of ECEC workers cause an estimated loss of 34,686 person-years of employment in other sectors.

These estimates illustrate that ECEC workers not only provide benefits to society via early childhood development and long-term benefits to the economy, but that the sector also provides significant short-term economic stimulus and removes a potential roadblock for parents in general and mothers in particular to participate in the workforce and add to Canada’s economic potential.

⁹ 33,636 lost child care spaces * 0.5 (full-time spaces) * 0.22 (number of mothers working full-time) is 3,700

CONCLUSION

This report examined the reasons workforce shortages exist. In order to determine if workforce shortages exist in the ECEC sector, publicly available data were used in combination with an approach used by the BLS and the COPS. In the case of early childhood education and care, it was determined that salaried (qualified) ECEC workers are experiencing a workforce shortage, while hourly paid ECEC (lower qualified) workers are not experiencing a shortage.

The unemployment-vacancy technique was used to estimate the number of ECEC positions in short supply. The workforce surplus rate (the opposite of the workforce shortage rate) is calculated as the unemployment rate less the vacancy rate and the structural unemployment rate. The unemployment rates for the ECEC workforce are relatively easy to calculate since data for these exist in the LFS. However, there are no data for structural unemployment rates for the ECEC workforce. Using two different methods to calculate minimum and maximum structural unemployment gives a range of national structural unemployment for the ECEC workforce of between 1.20% and 1.36%. To be conservative, this report adopts the lower estimate of 1.20%. The vacancy rate for the ECEC workforce is taken from Doherty et al.'s (2000) analysis, but the vacancy rate is brought forward to 2007 by using the relationship between vacancies and unemployment rates over time.

The analysis shows that workforce shortages first started to bite in 2001. After 2001, workforce shortages worsened, and reached 4,800 workers by 2007. Converting this figure into hourly terms yields a shortage of 6.3 million ECEC hours by 2007. From 2001 to 2007, there was a cumulative shortage of 24,776 ECEC workers. This shortage represents 19,100 lost full-time work years for mothers.

We estimated the national and provincial yearly economic costs of workforce shortages by applying the hourly net benefits of ECEC from our report, *Literature Review of Socioeconomic Effects and Net Benefits*, to the shortfall in hours. The estimated national economic cost of workforce shortages in the ECEC sector in the period 2001-2007 was \$141 million.

The net benefits of \$141 million mean that society could receive \$5,675 in net benefits per ECEC position filled. If all of these net benefits were used to support training, there would be \$5,675 available per trainee if they all went into ECEC. However, if those who were trained stay in the profession, so that only the peak number of required new workers received these funds for training, there would be \$24,346 available per trainee (or \$12,163 if only half of trainees go into the ECEC workforce).

It is estimated that an additional 1.4 jobs were lost for every job in the ECEC sector that was not filled. This means that since 2001 when workforce shortages first emerged in Canada, the lack of ECEC workers caused an estimated loss of 34,686 person years of employment in other sectors.

These estimates illustrate that ECEC workers not only provide benefits to society via early childhood development and long-term benefits to the economy, but also that the ECEC sector provides significant short-term economic stimulus and removes a potentially debilitating roadblock for parents in general and mothers in particular to participate in the workforce and add to Canada's economic potential.

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APPENDIX I

Galarneau et al. (2001) vacancy survey

Question 3(a) How are vacant positions usually staffed? For all applicable categories (A. Managers, B. Professionals, C. Technical / Trades, D. Marketing / Sales, E. Clerical / Administrative, F. Production workers with no trade / certification, G. Other). Check only the most frequently used method.

- From within the workplace
- From another workplace within the same legal company or business enterprise
- From outside the company

Question 3 (b) At this location, are there any vacant positions that you are currently trying to fill?

Yes

No - Go to Question 4 (a)

Question 3(c) In total, how many vacant positions are currently unfilled at this location?

Question 3(d) Of those, how many positions have remained vacant for four months or longer in the following categories:

- A. Managers
- B. Professionals
- C. Technical / Trades
- D. Marketing / Sales
- E. Clerical / Administrative
- F. Production workers with no trade / certification
- G. Other

For each group with vacant positions for four months or longer, identify the reason(s) for the vacancies. (Check all that apply)

- Too few applicants
- Most applicants lacked educational requirements
- Most applicants lacked job experience
- Most applicants declined job offer

APPENDIX II

Doherty et al. (2000) vacancy survey

Section F: Staff turnover

F1 How many current vacancies do you have in each category of staff?

_____ assistant teachers (persons working with children under the direction of a teacher, supervisor or the centre director)

_____ teachers (persons with primary responsibility for a group of children. This person may supervise an assistant teacher working in the same room)

_____ supervisors (persons who have supervisory responsibility for teachers and may also have primary responsibility for a group of children)

If none of your teaching staff has left the centre in the past 12 months, skip to Section G.

If any teaching staff have left over the past 12 months, please complete the table on the following page.

Assistant teacher - persons working with children under the direction of a teacher, supervisor or the centre director.

Teacher - persons with primary responsibility for a group of children. This person may also have staff supervisory and/or administrative duties.

Supervisor - persons with both teaching and supervisory duties

F2 How many staff in each category left the centre in the past 12 months? Please include staff who left for temporary leave of absence as well as those who were dismissed or left the centre’s employ voluntarily.

F3 Of those who have left in the past 12 months, how many in each category left for the reasons given? Please write in the number of people beside each applicable reason.

_____ were fired or dismissed for poor performance

_____ were laid off due to low enrollment

_____ were laid off due to budget cutbacks

_____ contract ended

_____ were laid off for other reasons

_____ quit the centre

_____ took a leave of absence

_____ don’t know the reason

_____ Other (specify)