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Future Long-Term Care in Canada

An Enterprise Risk Management Framework to Identify and Quantify Major Concerns

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An Enterprise Risk Management Framework to Identify and Quantify Major Concerns

Section 1: Executive Summary

What are the key concerns among experts about the future of long-term care in Canada, and how much will these concerns matter ultimately?

The purpose of this study is to report on a pilot analysis that brought together the thoughts and opinions of a panel of experts across Canada from a broad range of backgrounds in order to identify some of the major risks relating to the future of long-term care for older Canadians. We do so by taking an enterprise risk management (ERM) approach, which is a well-established tool to manage risk among large corporations in the financial sector. ERM offers a uniquely systematic structure to collect, organize, filter, and quantitatively express the web of concerns around the future sustainability of long-term care in Canada. Using a population microsimulation model to project the Canadian population through to 2050, we quantify the impacts of these risks on two fundamental metrics: public spending on long-term care and the magnitude of unpaid informal care by close family relatives.

This study provides a novel demonstration on how ERM can be applied to serve the Canadian public by informing decision makers on the risks facing the current and future delivery of long-term care. Although the study was not intended to make health policy commentary or recommendations, it has nevertheless revealed insights that are indicative of the uncertainty facing Canada with regard to the evolution of long-term care. It has also provided a starting place for provinces and interested stakeholders in carrying out a fuller ERM analysis around this pressing national concern. Good public policy should be based on a sound understanding of the problems at hand and the challenges to be faced. ERM is an invaluable structure and discipline for approaching the challenges of understanding the future of long-term care in Canada while drawing on the varied expertise and experience of our panel of experts.

Section 2: Acknowledgements

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2.2 INVESTIGATORS AND VOLUNTEER CONTRIBUTORS

The investigators contributed in the following roles:

- Bonnie-Jeanne MacDonald: Originator, project leader, and co-leader of the projection modeling with Michael Wolfson.
- Sim Segal: Provided ERM expertise, and co-conducted qualitative risk assessment (QRA) interviews to identify key risks and risk scenario development interviews to develop risk scenarios for selected key risks, both along with Bonnie-Jeanne MacDonald and Michael Wolfson.
- Michael Wolfson: Co-led the projection modeling and analysis with Bonnie-Jeanne MacDonald.
- Heidi Walsh: Carried out the scoping survey and helped to identify and contact the Canadian long-term care experts.

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Section 3: Project Overview and Introduction

3.1 MOTIVATION

A primary concern about Canada's ageing population is the stress that it will put on public health programs – notably long-term care.

Senior long-term care in Canada – the services provided to older adults living with chronic illnesses and/or disability – is currently delivered by a mixture of publicly funded programs, privately paid services, and, most of all, unpaid informal care from close relatives and friends – and many gaps remain. It is far from a cohesive system. As an area of provincial jurisdiction, and lacking an explicit federal role (unlike that of the Canada Health Act for hospitals and physicians), programs and services are fragmented, and the cost, access, and provision of care vary among (as well as within) provinces and territories. Care is made up of a complex mixture of spending programs, with rules and regulations for the delivery of services by private and public providers, with varying costs and subsidies, in a variety of settings – such as home care, assisted living, supportive housing, nursing homes, and complex, continuing hospital-based care – across a vast and diverse population. In the background are extensive informal care services – unpaid care provided by close relatives and friends acting as caregivers – which are often characterized as the backbone of long-term care in Canada.

On account of this significant diversity and vast range of public/private/personal involvement that changes by jurisdiction, long-term care is unquestionably a complex collection of programs and services that is difficult to navigate – both in practice as well as in research and analysis. This is best expressed by the Federal/Provincial/Territorial Working Group on Home Care in 1990, which wrote: "Review of available information revealed that there is hardly a statistic or description that would not be misleading or inaccurate without lengthy and complicated elaboration of its nuances, special circumstances, or unique meaning in a provincial or territorial context" (1990; quoted in Alexander 2002 pg. 26).

With population ageing and the decline in the supply of family to support older Canadians, there is concern around the future of long-term care to support equitable access to essential care, when and where seniors need it, from an appropriate provider. Many experts are pessimistic as to the prospects of meeting the challenges that long-term care in Canada faces as Baby Boomers move into retirement under the existing mix of unpaid care, pay-as-you-go tax-based financing, and private financing.[1]

Of great concern is the sustainability of publicly funded long-term care and unpaid care by relatives and friends, which constitute the vast majority of long-term care in Canada[2]. Should these two primary sources of care begin to fail, only a minority of Canadian seniors would have the funds necessary to pay privately for their care should they need it. For example, Shillington (2016) found that nearly half of Canadians are nearing retirement with a mere $3,000 in median retirement savings and no employer pension plan. Most households would soon find their retirement savings drained by privately financing the potentially large and ongoing costs associated with long-term care. The sustainability of these two sources of long-term care is therefore of interest to all stakeholders, particularly less affluent older Canadians without the ability to pay for privately funded long-term care.

3.2 PROJECT

The purpose of this study is to report on a pilot analysis that has brought together the thoughts and opinions of a panel of experts across Canada from a broad range of backgrounds in order to determine the major risks relating to the future of long-term care for older Canadians, and to quantify these risks. What worries long-term care experts about the future of long-term care, and how much will these concerns matter ultimately?

To do so, we take a value-based enterprise risk management (ERM) approach. Typically employed at large corporations in the financial sector, the ERM framework is valuable in the long-term care landscape. The aim of ERM is to help stakeholders identify, measure, and manage risks that affect the outcomes that concern them. In the case of Canadian long-term care, it does this by providing a systematic structure to an otherwise unwieldy topic, providing a common platform to collect, organize, filter, and quantitatively express a wide array of stakeholder expertise, interests, and perspectives regarding plausible risks for the future of long-term care in Canada.

The ultimate goal of ERM is to provide a roadmap for better informing decisions in terms of their impact on the overall success/failure of key objectives. Compared to a full ERM analysis, the scope of this study can be considered a pilot exercise. Our goal was to demonstrate proof of concept and illustrate the kinds of results potentially available in applying the ERM framework to an enormous and complex topic. The reader should note the reduced scope of the project – such as a smaller number of experts – relative to a typical full ERM analysis.

Overall, this study provides an initial exploration of the ERM framework as applied to the Canadian long-term care landscape. Central to this demonstration, we have identified, modeled, and quantified important risks to the future sustainability of Canadian long-term care based on interviews with long-term care experts from across Canada with a broad range of backgrounds. Looking out over the next three decades, we consider long-term care from the two key Canada-wide metrics:

1. Public cost of long-term care in terms of funding nursing homes as well as the publicly funded professional services within the homes of older Canadians
2. The number of personal unpaid, informal hours of care that would be needed by older Canadians' networks of support

It is important to emphasize that these two key metrics are not fully representative of all the major objectives of the long-term care sector in Canada; but they do enable quantification of two critically important concerns regarding the future sustainability of long-term care in the face of Canada's ageing population. In addition to their intrinsic importance, moreover, these two metrics are significant drivers of other important objectives like long-term care quality and accessibility (which could also be investigated individually in future research by applying the ERM process).

The ERM process employed in this study starts with a baseline projection of these two key metrics, and then proceeds by investigating the important risks impacting this projection – the "risk scenarios". We then assess the likelihood of occurrence and severity of impact on the key metrics. We carried out our modeling and quantification using Statistics Canada's LifePaths – a large-scale microsimulation model of the Canadian population. Conventional ERM metrics often focus on a single year or a time frame extending over a few years. However, in the case of long-term care, some risk events may take a generation to play out. As a result, in this analysis both metrics were assessed over a 30-year projection period, extending to 2050 – a period long enough that the peak of the Baby Boom cohort will have passed to its most intensive years of long-term care needs.

The project has demonstrated a process that can be employed to better understand the relative impact of risks affecting long-term care in Canada; it was not, however, intended to make health policy commentary or recommendations. Nevertheless, this analysis enumerates a range of identified risks, which in and of themselves suggest insights that could lead to new lines of thinking and novel programs of research. Good public policy should be based on a sound understanding of the problems at hand. For example, our results suggest that future scenarios that lead to additional longevity improvements and higher unit costs of delivering care, as well as a decline in the availability of unpaid caregivers, show high quantitative impacts that are also ranked as being relatively likely according to our panel of experts. Further testing and analysis would still be advisable, but this novel application of the ERM approach has revealed insights and results that should be provocative. They are also indicative of the uncertainty facing Canada with regard to the evolution of long-term care over the period to 2050.

This study also underlined the general value of the ERM approach to capture the varying opinions and concerns of a diverse group on a complicated topic in a short time frame. Two of the authors of this report were new to ERM, and found it provided an invaluable structure and discipline for approaching the challenges of projecting long-term care in Canada while drawing on the varied expertise and experience of our panel of experts.

Overall, the resulting range of projected scenarios has provided important new insights. More importantly, the project has demonstrated the value, and provided a starting place, for provinces and interested stakeholders in carrying out a fuller ERM analysis around this pressing national concern.

The paper begins with background on long-term care in Canada and ERM. It then shows the results of the study, which is the ERM process undertaken. We next discuss the results briefly and conclude.

Section 4: Background

> Enterprise Risk Management (ERM) is a process that organizations use to identify, measure, manage, and disclose key risks to increase value to stakeholders. When done properly, ERM informs better risk–reward decision-making, increases the likelihood of achieving strategic plan objectives and enhances the efficiency and effectiveness of allocating resources.
>
> (Segal, 2018, pg. 5)
>
> Long-term care (LTC) is the range of preventive and responsive care and supports, primarily for older adults, that may include assistance with Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) provided by either not-for-profit and for-profit providers or unpaid caregivers in settings that are not location specific and thus include designated buildings or in home and community-based settings.
>
> (NIA, 2019, pg. 7)

Canada's ageing population is putting pressure on its approach to long-term care. Challenges include the fact that provincial health budgets are stretched and there remains substantial unmet need for care (Gilmour, 2018). Long-term care is currently provided in a variety of settings – private homes, hospitals, and residential care facilities – through a mixture of publicly funded programs, privately paid services, and, most of all, unpaid care from close relatives and friends (and many gaps remain). The benefit and eligibility rules of the programs offered by provinces and territories are also quite variable, as are the availability, types, and quality of care available.

Above and beyond current concerns for the delivery of long-term care in Canada, its future sustainability is further challenged by

1) An ageing population, as well as
2) Likely shifts in cultural norms and socio-economic practices that are, in combination with lower fertility rates, greater geographic mobility, and growing numbers of one-person households, making unpaid caregiver support increasingly difficult for Canadian families to find and manage

We next discuss both in turn.

Increasing proportion of older people, particularly those 85-plus

Actual and projected demographic trends form the most evident pressures on long-term care across Canada. Older Canadians are now the fastest growing segment of our population. Within 20 years, one in four Canadians will be older than 65 years of age. The year 2011 was when Baby Boomers started turning 65, leading to a 20 per cent increase to the senior population between 2011 and 2016 – the largest increase over the past 70 years. Canada's overall population growth during the same period was 5 per cent and the population of children grew by only 4.1 per cent (Statistics Canada, 2017).

The continuing increase in the proportions and absolute numbers of older people is particularly pronounced in those aged 85-plus, when the needs for long-term care become highest. For example, according to the 2009 Statistics Canada's Canadian Community Health Survey, approximately one in five seniors over the age of 85 have a severe disability – for seniors aged 65 to 70, it is only one in twenty (authors' calculations). Another example comes from Statistics Canada (Hudon and Milan (2016), Table 17), which showed that the prevalence of having at least one disability more than doubled for Canadians over the age of 85, compared to those from ages 65–84. This was true for both genders.

In 2016, seniors aged 85 and older made up 2.2 per cent (or over 770,000) of the population; by 2031 as the oldest Baby Boomers reach 85 this cohort is set to increase to 4 per cent (or over 1.25 million), and by 2051 as the youngest Boomers reach this milestone it is set to increase to 5.7 per cent (or about 2.7 million) (Statistics Canada, 2019).

Changes in care supply: Increasing female employment, changing family structures, and declining birth rates

Demographic trends are also affecting the supply of care. Increasing female employment and changing family structures will reduce the supply of unpaid care, while declining birth rates will affect the supply of close family caregivers available to provide unpaid home care. Currently, about 8 million Canadians are unpaid caregivers and, crucially, as of 2012, almost 30 per cent of Canadian caregivers were "sandwich generation" women aged 35–44 who were simultaneously raising children and providing care to an older member of their family (Sinha et al., 2018). There is also evidence of an increasing proportion of caregivers who are elderly themselves and possibly frail (Statistic Canada, 2013).

Demand for caregivers extends beyond the sphere of unpaid family caregivers. The formal health care sector is likewise struggling to find suitable numbers of paid, formal caregivers to meet the needs of an ageing population. With a demand for care that may outgrow the size of the formal long-term care

workforce, some countries (including Canada) report shortages of workers in the sector, and almost all struggle with recruitment and retention (OECD/ILO, 2019).

Anxiety about costs of care and increases in public expenditure

These demographic changes are taking place against concerns about the likely magnitude of future increases in public expenditure. Finding ways to manage demand, deliver more cost-effective home care, and maximize contributions from informal and voluntary sources are common concerns.

We see that spending on institutional care is high. Despite people's preferences for receiving care in their homes, most of the spending of long-term care is still in the institutional sector. In Canada, public spending on long-term care in institutions (1.3% GPD) is higher than spending at home (0.2% GDP) (OECD, 2017).

At the same time, these trends have implications for the sustainability and longer-term cost-effectiveness of the care provided by friends and families. Careful planning is required to support the continuation of unpaid care in the home and community. Without adequate support, unpaid caregivers are at risk of experiencing exhaustion, injury, and depression, which may lead to increased utilization of health resources by the caregivers themselves (Sinha et al., 2018).

4.2 USING ERM TO MOVE FORWARD

Taking these considerations together, there is an urgent need for both deeper research and policy-maker engagement into alternative approaches capable of achieving sustainable, adequate long-term care in Canada.

A natural first step in evaluating future long-term care trends and informing solutions is to elucidate key objectives of Canada's long-term care system, and the next is to understand better the risks that will affect those objectives. For instance, the primary legislated objective at the federal level for Canadian health care policy is "to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers"(Canada Health Act (Canada), Section 3). But how this translates into appropriate objectives for long-term care across the country is less clear – as are the implications of future trends and perspectives regarding those objectives. It is important to remember that the delivery of long-term care in Canada is not covered by the Canada Health Act in the same way as doctors and hospitals.

One challenge is that examining long-term care is a multidisciplinary exercise, spanning health, economics, demography, actuarial science, law, and business, among many other disciplines – and it draws on expertise and methodologies from individuals in academia, government, and business, and frontline providers.

A second challenge is that long-term care in Canada is not a single coherent program. It is more appropriately regarded as a collection of spending programs, and rules and regulations for the delivery of medical care and social services by private and public providers, with varying costs and subsidies, in a variety of settings – such as home care, assisted living, supportive housing, community services, chronic care, nursing homes, and complex, continuing hospital-based care – across a vast and diverse population.

For instance, in a preliminary (but significant) scoping survey for this work[3] that drew on the views of a number of panel members representing a range of backgrounds and expertise, the single most common concern identified was the jurisdictional and provider fragmentation of long-term care programs. This

fragmented structure was reported to lead to a patchwork of cost, service, and delivery of long-term care across the country, causing overlap or gaps in care for older Canadians.

The fragmentation identified within the Canadian long-term care sector is not unique. For example, Forte (2014) described the U.S. long-term care system as "an archipelago, a group of islands separated by strong currents. There is of course contact among key participants, but it is intermittent. Each participant has its particular interest, its science or truth. Some work together better than others. … At best, long-term care is a confederation with an imperfect understanding of its fellow participants and no strong links binding them together. It is a loose association of entities with little or no alignment and no common purpose" (pg. 7).

To integrate a range of expertise and perspectives, and to construct a framework for informing solutions, this study takes a novel approach by employing an ERM methodology – in particular, a value-based ERM approach, which is a synthesis of value-based management and ERM that was first introduced in Segal (2011).

Typically employed at large corporations, although increasingly being used within government[4], ERM is a systematic and rigorous approach to helping stakeholders identify, measure, manage, and disclose all key risks impacting the enterprise. A primary value in this context is that it benefits from a holistic perspective – one that spans various domains of expertise – as well as industry, government, or academia. In short, it provides an ability to examine the impact of risks on an entire enterprise – or, in this case, a broad set of long-term care issues at a national level.

The ultimate goal of an ERM analysis is to provide a roadmap for enhanced decision-support information, clarifying policymaking decisions in terms of their impact on the overall success/failure of key objectives. In this more limited pilot application of the ERM framework to long-term care in Canada, it provides a systematic structure and a common platform to collect, organize, filter, and quantitatively express a wide array of stakeholder expertise, interests, and perspectives (and worries) regarding the risks to long-term care in Canada.

A preliminary step in applying ERM to an organization is to adopt an ERM framework that will fit within the organization's mission, goals, and structure. There exist a number of ERM frameworks with different concepts of application, methods, procedures, and metrics. Some ERM frameworks are more applicable to private enterprise.

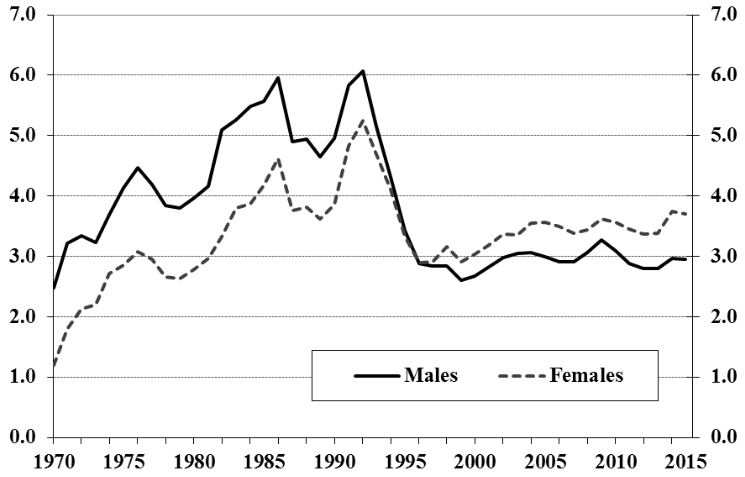
To support the purpose of this study, it was necessary to choose an ERM framework that was flexible in application and would help assess the design, supply, and sustainable funding of long-term care. It was paramount that the framework have a strong quantification focus. Having the capacity to carry out quantitative analysis is necessary when making an effective evaluation of future risk, and it is for this reason that the actuary – whose specialty lies in pricing future risk – has a key role to play in the discipline of ERM.

Management of potential risks is essential to the success of public policy reforms – particularly in the long-term care sphere. A recent example is the introduction of publicly provided long-term care "cash benefits" or "personal budgets" in the Netherlands. Cash benefits are direct money transfers that are allocated to seniors with disabilities personally by the state following an assessment of care and support needs. The idea is that, within a regulatory framework, the senior then has the flexibility and control to direct the funds for their care and support (including compensating the support care provision by family members). When cash benefits were introduced in the Dutch long-term care system in the 1990s, there was an explosion in spending over the following years, as the number of personal budget holders grew from 13,000 in 2002 to 130,000 in 2010, and costs rose from EUR 413 million to EUR 2.3 billion (European Commission, 2016) . Various reasons explained why cash benefits led to an increased spending: individuals began paying family and friends for informal care that had been provided for free; there is a greater risk of

fraudulent expenses when cash benefits are used; and recent analysis suggests that "a substantial portion of the cost increase can be explained by the growth of less severe cases receiving long-term care services" (Maarse et al., 2013, pg. 35). Ultimately, stricter regulations for the use of cash benefits were introduced to control this risk.

Similarly, stricter administration of the Canada Pension Plan (CPP) disability benefit in the mid-1990s led to a significant reduction in the incidence of new beneficiaries and a reversal in cost trends. The impact of controlling this risk exposure through stricter administration is clearly visible in the 27th Actuarial Report on the CPP (Chart 11) (OSFI, 2016), which is reproduced below (notice the drop in 1996). Leaving aside the specific considerations surrounding this rather dramatic change in CPP disability benefit utilization, it illustrates well the potential risks associated with programs like long-term care with eligibility provisions that depend on complex individual assessments and judgements, and the necessity to better consider and quantify those risks in advance.

Chart 11 Historical Disability Incidence Rates
(per 1,000 eligible)



Source: 27th Actuarial Report on the CPP (Chart 11) (OSFI, 2016)

Section 5: Project Approach: Value-Based ERM

To fulfill our objectives, this study uses the ERM framework given in Segal (2018) – a white paper published by the Canadian Institute of Actuaries, Casualty Actuarial Society, and Society of Actuaries, which sets out an ERM framework for national governments and government agencies adopting an ERM approach so as "to enhance and advance ERM practice and to serve the public beyond its traditional applications in the financial sector" (pg. 4). The ERM approach referred to here is a value-based ERM approach.

This project's scope was a pilot exercise that demonstrated proof of concept and provided initial findings. We have identified, modeled, and quantified important risks to the future sustainability of Canada's long-term care based on interviews with long-term care experts from across Canada with a broad range of backgrounds. This section reviews this process.

As noted in the Background section, the first step in evaluating future long-term care trends with a view to developing policy responses was to establish key metrics for the performance of Canada's long-term care sector, and next to understand better the risks that will affect those metrics. While the metrics used in this

ERM analysis are not indicative of the entire scope of objectives of long-term care in Canada, they are clearly fundamental to any assessments of its longer-term sustainability.

In a full ERM analysis, there are four process cycle steps:

1) Risk identification
2) Risk quantification
3) Risk decision making
4) Risk messaging

Further detail on each of these process cycle steps is provided in Appendix A.

Applying the Segal (2018) white paper's methodology to Canadian long-term care, the pilot project consisted of the following steps:

1) Articulate national objectives for Canadian long-term care
2) Specify key metrics for the provision of Canadian long-term care (specifically in terms of (a) publicly funded and (b) unpaid care)
3) Identify key risks to Canadian long-term care
4) Quantify the impact of (a sample of) key risks to Canadian long-term care

5.1 ARTICULATE NATIONAL OBJECTIVES FOR CANADIAN LONG-TERM CARE

In traditional ERM, *risk* is usually defined as a negative event, such as losses, and often with more focus on extreme losses. In contrast, a value-based ERM approach defines *risk* as an event that causes a deviation (up or down) from baseline expectations. This definition is critical to achieving buy-in from decision makers for two main reasons. First, the focus begins with whatever objective(s) – and specific target goals – the enterprise leadership has committed to achieving, and provides insights into helping achieve those targets. Second, unlike the traditional ERM approach of being limited to downside risk information, the value-based ERM approach provides both risk (downside) and the reward (upside) information, which is required for risk–reward decision making.

The first step in the process is to define the Canadian long-term care objectives, which are likely as numerous as the players involved. As already discussed, a credible and authoritative perspective can be found in the Canada Health Act. But long-term care remains defined as an "extended service" in the Canada Health Act with no legal obligation for provincial and territorial governments to provide a minimum basket of services. Given significant heterogeneity in the funding and delivery of long-term care across Canada, the expression of objectives for Canadian long-term care is, by definition, limited to more general terms. For the purpose of this project, we define the Canadian long-term care objectives in terms of the financial and physical capacity to support Canadians' long-term care needs through the two main pillars; i.e., for governments in terms of the magnitude of expenditures, and for individuals in terms of unpaid hours of care required by their network. This combination of publicly funded long-term care and unpaid care not only makes up the bulk of long-term care delivery in Canada, it is also critical to protecting older Canadians without the financial means to pay for privately funded long-term care.

5.2 SPECIFY KEY METRICS FOR CANADIAN LONG-TERM CARE

Given these two general objectives, this analysis focuses on two key metrics:

1) Government long-term care expenditures
2) Hours of long-term care in the home by unpaid caregivers

These metrics work together. Including the latter is important because a metric solely focused on government costs could give a false indication of a positive outcome through falling government costs in a risk scenario where care needs were being shifted to unpaid family members. Together, these two metrics capture aspects of care effectiveness to the extent that less or lower-quality publicly funded long-term care can result in increased disability, and/or more needs for unpaid home care – and the opposite is also true. By capturing the public and primary non-public sources of support, the balance between individual and government roles is captured. If both forms decline, then unmet needs would rise, particularly among those without the means privately to finance their care out of pocket.

Conventional ERM metrics often focus on a single year or a time frame extending over a few years. In the case of long-term care, however, some risk events may take a generation to play out. As a result, in this analysis both metrics were assessed over a 30-year projection period, extending to 2050 – a period long enough that the peak of the Baby Boom cohort will have passed to its most intensive years of long-term care needs.

Our goal was to capture, in a single statistic, how each risk metric is affected by a given risk scenario compared to the baseline projection. A single statistic is necessary because it enables us more easily to rank the scenarios in the subsequent steps.

- The financial government long-term care expenditure metric was defined as the maximum percentage increase in total annual expenditure for any year over the 30-year projection period for a given risk scenario versus that in the baseline projection. Note that the maximum increase could happen in any year – in most cases, however, it occurred in the final projection year.
- Similarly, the physical long-term care unpaid home care hours utilization metric was defined as the maximum percentage increase in the number of unpaid informal hours of care for a given risk scenario versus that in the baseline projection over the 30-year projection period.

In both cases, the baseline projection was premised on an assumed continuation of the status quo in government long-term care policy and in the current patterns of unpaid care utilization.

5.3 BASELINE PROJECTION

Central to this ERM analysis is a computer model that can project the key metrics (public long-term care expenditures, and unpaid hours of care provided) over the next 30 years.

The tool employed for this purpose was Statistics Canada's LifePaths microsimulation model – a large-scale microsimulation model of the Canadian population[5]. Appendix B discusses this tool of analysis.

The baseline aggregate projection, detailed in MacDonald et al. (2019), found that public cost of long-term care – nursing home and home care – grows from $22 billion to $71 billion in current dollars. It further found that about 75% of total home care hours are currently being met by unpaid caregivers. The demands on seniors' potential unpaid caregivers (adult children and spouses) were projected to grow by 43%, on average – from 290 hours/unpaid caregiver/year in 2019 to 415 hours/unpaid caregiver/year in 2050. This is primarily on account of Canadian fertility rates having declined significantly after the mid-1960s. The number of seniors requiring unpaid care is projected to increase by 120% between 2019 and 2050, from 345,000 to 770,000.

5.4 IDENTIFY KEY RISKS TO CANADIAN LONG-TERM CARE

The next step is to collect the risks, which are then defined in terms of events that result in deviations from the baseline for the two metrics.

To identify risks, a QRA survey was conducted. The survey involved the following steps:

a) Identify QRA participants

b) Prepare QRA participants

c) Conduct QRA interview

d) Rank the consolidated risk list

a) Identify QRA participants

The scope of the project was to have ten long-term care experts. It was important that these experts were (1) from a wide variety of backgrounds/areas of Canada, (2) leaders in their understanding and experience, and (3) (being volunteers) highly passionate so as to be motivated to remain with the process until completion.

The selection of QRA respondents started with canvassing the names of individuals with leading roles in long-term care programs and/or expertise. An initial list of experts known to have extensive knowledge or senior-level experience in the long-term care sector was drawn up. Each person was contacted by email or phone. Whether or not the individual indicated they were able to participate, we also asked them for the names and contact information for others who would be able to provide significant expertise and insight – a form of "snowball sampling". It is important to emphasize that the QRA exercise as well as the subsequent steps in this ERM analysis imposed a considerable burden on our respondents, so our final panel was ten individuals, all of whom consented to have their names listed (see above). We are very grateful for their cooperation.

b) Prepare QRA participants

We prepared the QRA participants prior to a phone interview by:

- Providing the context of the project, explaining how we are applying ERM to Canadian long-term care
- Explaining the benefits of ERM in this effort
- Describing the steps involved in their participation
- Asking them to prepare a short list of potential key risks to Canadian long-term care, keeping in mind the following:
    - Key risks are those with material impacts on the two metrics.
    - All kinds of risks should be considered.
    - A fairly detailed "credible-worst-case scenario" for each risk needed to be specified before qualitative assessment, sufficiently detailed to avoid ambiguity in later steps of the ERM process.
    - Risks should be identified by their originating source or cause. Often, risks are inadequately defined with reference only to an outcome; e.g., "reputation risk". There are multiple independent sources of risk that can trigger media coverage and then affect reputation; for this reason, each source or cause of a risk must be assessed separately.
    - Since risk is defined as any event causing a deviation from the long-term care baseline as expressed in the two metrics, negative events already embedded in the baseline projection are not risks. For example, if a slow-growth economy is already embedded in the baseline projection, then it is not a risk; however, an unexpected event that results in a further downturn in the economy would be a risk.

c) Conduct QRA interview

The QRAs were conducted with the survey participants during phone interviews of approximately 90 minutes. Each respondent was able to provide more than one risk. For each enumerated risk, whose originating source was first clearly identified, participants were asked to specify a credible-worst-case scenario; i.e., something they could imagine occurring that is extreme in its severity and rare in its likelihood but still possible.

d) Rank the consolidated risk list

The risks collected in the QRA interview were consolidated into a single overall list of risks. Typically, QRA participants would be asked to provide qualitative assessments for both the likelihood and severity of impact on the two metrics for each risk. However, to reduce respondents' burden, the authors quantified each risk's credible-worst-case scenario using simulations with the LifePaths microsimulation model (see below). A consolidated (and anonymized) risk list, along with qualitative summaries of each risk's impact on the two metrics, was provided in a second round to the QRA survey participants, who were then asked to provide an assessment of each risk's likelihood. To facilitate the interpretation of the results by the participants, this assessment was semi-quantitative; it was based on an association of words (e.g., "high" or "low") with probability ranges. The likelihood and severity scoring criteria are shown in Appendix C.

The values of the individual likelihood scores provided by the QRA survey participants were averaged to produce an overall likelihood score. This was then used to calculate a final risk scenario ranking score by multiplying the likelihood and a weighted average of the two impact-severity scores – the percentage increase in the dollar-denominated provincial budgetary cost impact, and the percentage increase in hours-denominated impact on unpaid care needs:

$$\text{Score} = \text{Likelihood} \times (\text{Impact on Key Metric \#1} + \text{Impact on Key metric \#2})/2$$

Higher scores lead to higher rankings.

Appendix E shows the full consolidated list of risks expressed in their credible-worst-case scenario form, and their likelihoods, severities, and ranking scores. Appendix D presents this list in the more compact summary form.

5.5 QUANTIFY THE IMPACT OF A SAMPLE OF KEY RISKS TO CANADIAN LONG-TERM CARE

The final step is to select key risks for further quantification and examination. As a demonstration, we chose three risk scenarios that were both highly ranked and diverse, and expanded each so as to capture a fuller distribution of the results. In other words, the purpose is to move from a single credible-worst-case scenario to a range of scenarios that more fully represent the range of how risks could reasonably manifest. Some risks only have downside scenarios whereas others may have both upsides and downsides. The likelihoods assigned to the risk scenarios for a given key risk would sum to 100 per cent.

For each of these selected risks, each of the specified variant scenarios were then input into the LifePaths projection model and the resulting changes in the two Canadian long-term care metrics (derived as outputs of the model) were recorded as quantitative impacts for the selected risks and associated variant scenarios. The variance in the impacts across this combined set then provides an indication of the overall risk associated with the baseline projection, while its central tendency indicates whether the baseline projection might be biased.

It is important to emphasize that this result is not a comprehensive measure of bias and variance. It is rather a general indicator that combines various expert judgements with simulation modeling results. Still, given the many steps as outlined above, and the effort of combining more disaggregated judgements of respondents with expertise and experience in a variety of areas, the results can be expected to be of higher quality than the more common approach (where future unknown factors are tested in isolation without the structured, multi-step, iterative approach with engaged experts employed in this study).

For each of the three key risks selected for quantification, Appendix F shows the risk variants and their descriptions, likelihoods, and quantitative impacts on the Canadian long-term care key metrics.

Section 6: Results Discussion

6.1 GENERAL RESULTS

As discussed, Appendix E lists all of the 34 risk scenarios and Appendix D lists the ranked risks alone in a more accessible format. This is an impressively wide range of risks, including:

- Breakthrough medical advances (e.g., for dementia or heart disease) on the one side, and increasing morbidity on the other (e.g., due to drug-resistant infections)
- Major advances in new kinds of technology to substitute for care labour
- Important upward pressures on costs, especially for low-paid personal support workers (PSWs), but also possibly for drugs
- Other supply constraints, such as for physicians (gerontologists)
- Changes in families' ability or propensities to provide informal unpaid care
- More pessimistic economic projections generally, or more specific constraints of government funding
- "Out of the box" possibilities in areas such as collective living arrangements

While exploring the various health policy implications of the results is outside the scope of this project, the scenarios themselves, as well as their quantification and ranking, should be of interest to long-term care stakeholders. By using this more novel approach, these scenarios provide new insights into the future of long-term care in Canada, which should generate new avenues of research and discussion.

One of the primary objectives of an ERM analysis is to quantify risks in order to better understand the range, as well as severity, of their likely impacts. Appendix F highlights this point, where a further examination for three of the 34 risk scenarios is demonstrated (this process is outlined in Section 5.5). The ranges of the results are indicative of the uncertainty facing Canada with regard to the evolution of long-term care over the period to 2050. For example, over these twelve risk and variant combinations, impacts on government long-term care budgets range from a reduction of 25 per cent to an increase of 87 per cent. The corresponding figures for the impacts on unpaid home care hours range from no reduction to an increase of 43 per cent.

6.2 USAGE IN GOVERNMENT DECISION MAKING

Though a pilot project, this effort has produced interesting results. It has generated a ranked list of risks to Canadian long-term care. It has also illustrated how to begin applying an ERM approach to better support government decision making. To extend this work to a full ERM analysis, the following steps could be performed:

All individual key risk scenarios quantified

Conduct risk scenario development interviews for all risks and then quantify all risk scenarios. Sorting the risk scenarios by quantitative impact on each metric helps focus attention and possible actions on the most important threats and opportunities. This facilitates better allocation of limited time on and resources toward the most effective actions.

Overall likelihood of success/failure quantified

Develop a set of simulations involving selecting plausible combinations of individual risk scenarios. Develop correlation adjustments for relevant combinations and quantify the selected simulations of combinations of single risks using the projection model, creating a distribution of likelihoods and quantitative impacts on

the specified metrics. Such a distribution can provide the basis for a much richer conversation when evaluating alternate decisions, and can take into account a much larger range of factors than more traditionally available decision-support information. Government officials can ask – and get answers for – questions such as: which of the actions we are considering will increase our chances of success? For long-term care in particular, governments will be interested in knowing where to put resources for maximum impact. For example, "ageing-in-place" has been a very popular policy. Another focus for public policy is the value of better supporting, encouraging, and enabling physical activity among seniors, which could potentially delay (or even eliminate) the prevalence of disability for many seniors[6]. Research supports the very positive impact of nutrition and exercise capacity on improving the activities of daily living – including reablement programs that help seniors to regain functional capacity (see NIA (2019) for discussion). Age-friendly communities are an example of a relevant initiative, as it focuses on the development of communities that prioritize the health and well-being of people of all ages and across the life course (Government of Canada, 2016).

6.3 LIMITATIONS AND CHALLENGES ON PROJECT SCOPE AND FUTURE WORK

As in any project, the scope is dictated by our available data, tool of analysis, and resources (particularly in terms of the panel of experts). For example:

- In value-based ERM projects, a key feature is that the underlying projection model is designed with ERM specifically in mind. In this project, the underlying projection model, Statistics Canada's LifePaths population microsimulation model described in the next section, is very detailed and highly complex. Developed as a public policy tool, LifePaths provides important features that could not be found in any other single model, including its capacity to: (1) capture the realistic diversity of the Canadian population – between people and over time, historically as well as producing informed projections into the future; and (2) provide necessary data on life-course elements for individual Canadians, year by year, from birth until death. Despite its strengths, adapting it for an ERM project added the most significant challenge to the project. For one, the additional computer-code building and design necessary to model and run the identified scenarios was significant. There were originally 34 risk scenario "futures", each of which could be considered a separate project in and of itself. In addition, the simulation time in LifePaths for a single scenario is approximately six hours, plus the time involved to set up/collect the data. Overall, the modeling work for this project was substantial.
- As discussed, the chosen metrics were publicly funded costs and hours of informal unpaid care. They were chosen since they were more directly quantifiable and could be analyzed by extending our LifePaths microsimulation modeling tool to encompass long-term care for a range of risk scenarios. These two metrics, in addition to their intrinsic importance, are significant drivers of long-term care quality and accessibility. Still, in addition to financial and physical utilization objectives and associated metrics, further Canadian long-term care objectives that could be useful to investigate in future work include:
    - Quality of long-term care as perceived by the recipient and their close family members
    - Financial burdens borne directly by individuals and their families
    - Availability of long-term care (e.g., in terms of waiting lists, difficulty finding a personal care assistant to hire)
    - Fairness of perceived and actual inter-generational equity
- Further, the scope has not enabled a full value-based ERM analysis, thereby creating some practical exclusions – such as limiting the number of experts involved. Other exclusions were owing to the nature of the topic itself. For example, the usual QRA consensus meeting – where QRA survey participants are gathered to discuss and reconcile selected disparate views on key risks, reducing the dispersion of results – was omitted. In ERM implementations, the QRA survey

participants and the subject matter experts involved in the risk scenario development interviews are employees of the organization. In this project, these individuals were all volunteers. Although the QRA survey participants had deep expertise and experience in their fields, the investigators had to be mindful that they were busy professionals generously volunteering their time. By the end, it was clear that completing the process necessary for this report was sufficiently time-consuming, and asking more would have been pushing the limits. (This consensus meeting would have taken place following the ranking of the consolidated risk list and prior to identifying key risks versus non-key risks.) Although this limitation is worth noting, it is also true that the ERM process is highly flexible and can be, and frequently is, adapted to enterprise and situational constraints.

Section 7: Conclusions and Future Research

This study reports on an application of ERM analysis to the question of the future of Canada's long-term care sector over the coming three decades to 2050. Employing a comprehensive population microsimulation model, the focus has been on two key metrics for the delivery of long-term care – government dollar costs, and unpaid home care hours provided. The quantification of these two metrics provided meaningful insight on how ERM can be used to evaluate the sustainability and capacity of the current delivery of long-term care going forward. Its sustainability is particularly important to those seniors without the financial means to access privately funded long-term care.

This has been a first effort to apply ERM to the diverse set of programs and regulations underlying long-term care across Canada, where the primary jurisdiction is at the provincial and territorial level. It is best considered a pilot study. As the future is intrinsically unknowable, all the results presented here are no more than a careful and systematic aggregation of the views and judgements of our expert participants. Nevertheless, the systematic collection of the views of our participating experts has generated an impressively wide range of possible risks.

A fuller exploration of applying ERM to Canadian long-term care would provide a basis for evaluating more risk scenarios and ultimately an estimate on the likelihood of achieving the baseline projection scenario. The risk scenarios and the likelihoods attached to them will benefit from much further discussion and reflection by a wider group of interested and concerned individuals.

Appendix A: Main Steps in Value-Based ERM

In a full value-based ERM analysis, there are four process cycle steps:

1) Risk identification
2) Risk quantification
3) Risk decision making
4) Risk messaging

This appendix expands on each of these process cycle steps in turn.

Risk identification

The risk identification process step is comprised of three steps:

a) Risk categorization and definition (RCD)
b) QRA
c) Emerging risk identification

RCD: A uniform nomenclature is created to provide a consistent risk language through the organization. An RCD tool is created to communicate this risk language; the tool consists of risk categories, sub-categories, and risk definitions. In a value-based ERM approach, the RCD tool has the following key distinguishing features:

- Risk is an event that results in a deviation from baseline expectations.
- Risks are represented from all categories: strategic, operational, and financial/insurance.
- Risks are defined by their originating source (i.e., not by outcome).
- Risks are defined at a consistent level of granularity.

QRA: Surveys are conducted with key personnel in the organization to gather and consolidate a list of potential key risks. The consolidated list of potential key risks are collectively scored by the QRA survey participants, typically in terms of likelihood and severity, to rank them. In a value-based ERM approach, the QRA survey has the following key distinguishing features:

- QRA survey participants receive advance communication preparing them, particularly for the unique characteristics of a value-based ERM process.
- The QRA surveys are conducted exclusively in live interviews, with one interviewee at a time.
- A QRA consensus meeting is conducted following the collective scoring, during which a dialogue is facilitated to clarify and re-vote on high-dispersion results and a line is collectively agreed upon dividing the risk list into key risks and non-key risks.

Emerging risk identification: This step has two components. The first component is monitoring known risks, which involves tracking key risk indicators (KRIs) for each of the non-key risks. If a KRI indicates that a non-key risk's likelihood and/or severity is/are trending upwards beyond a given threshold, the risk may be elevated to "key risk" status. The second component is environmental scanning for unknown risks.

Risk quantification

The bulk of the process cycle step as described here has features unique to the value-based ERM approach. The risk quantification process cycle step is comprised of three steps:

a) Baseline projection
b) Individual risk scenario quantification
c) Enterprise risk exposure

Baseline projection: The process begins by identifying the "value" for the enterprise. Whatever the organization values is expressed in specific key metrics, and target values for those metrics consistent with baseline strategic plan expectations, over a long-term multi-year projection period. (This is

determined even prior to the risk identification process step, because this informs the selection of the qualitative severity metrics as well.) The projection is performed in a dynamic way such that a large number of variables that drive each component element of the value are variable, or "shockable", which will facilitate the risk quantification.

Individual risk scenario quantification: For each key risk, a manageable handful of deterministic risk scenarios are developed with subject matter experts. Each risk scenario is described from its originating source through its multi-year downstream impacts, recognizing real-world issues, such as market reaction, management actions, and external stakeholder actions. These impacts are gathered in a way that maps to the shockable variables in the model. A likelihood is also assigned to each risk scenario, such that the sum of the non-baseline risk scenarios and the baseline scenario sum to 100 per cent. The deterministic risk scenarios represent the full distribution of the risk; this includes downside risk scenarios (e.g., credible-worst-case, moderate-downside, mild-downside), upside risk scenarios where relevant (e.g., credible-best-case, moderate-upside, mild-upside), and the baseline risk scenario. The individual risk scenarios are quantified by entering the relevant variations, or shocks, to the dynamic elements in the baseline model, and the quantitative impacts are then expressed as the change in the key metrics.

Enterprise risk exposure: An entire distribution of outcomes for each key metric is produced by running simulations that include combinations of risk scenarios (upside and downside) occurring at the same time. Correlation adjustments are determined to facilitate this calculation. Once the entire distribution is created, enterprise risk exposure is expressed as the likelihood of crossing a pre-determined failure threshold called a "pain point". For example, a pain point might be "the likelihood of a shortfall of 20 per cent or more in key metric X is currently 5 per cent". Another interesting and useful calculation produced from the distribution is the likelihood of achieving or exceeding strategic plan goals, which is something about which everyone in the organization must care.

Risk decision making

The risk decision-making process cycle step is comprised of three steps:

a) Defining risk appetite and risk limits
b) Integrating ERM into risk mitigation decisions
c) Integrating ERM into routine business decisions

Defining risk appetite and risk limits: The organization defines risk appetite as the maximum limit on enterprise risk exposure. Similarly, the organization defines risk limits as the maximum limits on sub-enterprise risk exposures.

Integrating ERM into risk mitigation decisions: The organization monitors the exposure levels (both enterprise-level and sub-enterprise levels), compares them to their limits (risk appetite and risk limits), and then increases or decreases the level of mitigation, as needed.

Integrating ERM into routine business decisions: ERM information is used to enhance the level of capability in the strategic planning process, because value-based ERM approach essentially provides a dynamic strategic planning tool, projecting expected results and the levels of certainty of achieving or failing to achieve those results. ERM information is also used to enhance strategic and tactical decisions as well as decisions related to transactions. To evaluate any decision, the ERM process involves updating any impacted risks/scenarios and re-running the model to answer the following:

- How does the decision impact the baseline projection of key metrics?
- How does it impact the likelihood of achieving plan objectives?
- How does it change the likelihood of key pain points?
- Does it result in a violation of risk appetite or risk limits?

Risk messaging

The risk messaging process cycle step is comprised of two steps:

a) Internal risk messaging
b) External risk messaging

Internal risk messaging: ERM information is integrated into business performance analytics and incentive compensation.

External risk messaging: ERM information is integrated into disclosures to external stakeholders.

Appendix B: Projection Methodology – LifePaths Population Microsimulation Model

LifePaths is a computer simulation model that, while being developed, built upon and integrated a very wide range of data available at Statistics Canada. LifePaths simulates the past, present, and future of a realistic synthetic population, using behavioural equations estimated from historical data, all with a life-course perspective. It is calibrated so that it outputs a representative modeled population that is consistent with both available microdata on Canadians and more aggregated projections of the population and those of the Chief Actuary. Its microanalytic approach allows for more detailed analyses of the socio-economic experiences of Canadians than would otherwise be possible. More relevant to this study is that these behavioural equations within a computer simulation model allow for testing the impact of changes to public policies in the future. LifePaths enables us to connect both sides of the long-term care question:

- The financial side of the concerns, in terms of the costs:
    - For the individual, and the resources that he/she has in terms of financial capacity to pay personally for services and access to unpaid care, as well as
    - The provincial and federal governments, and taxpayers, to fund long-term care programs
- The demand for and supply of long-term care (evolving disability levels, demographics, and socio-economic changes)

LifePaths also allows us to test "what if" reforms to the system, and explore the implicit future risk scenarios and methods of mitigation. Its upside as well as its downside is that it is a very large and complex model that was developed for public policy analysis of the Canadian population. LifePaths, while not designed to support an ERM study, was successfully adapted to serve the purpose.

With 25 years of development, LifePaths is a long-standing model that has been employed numerous times to investigate the Canadian pension system. But in 2014, without the explicit commitment of other federal departments to provide secure and sustainable ongoing core funding, Statistics Canada discontinued LifePaths and no longer supports its development. It continues, however, to be publicly available to analysts wishing to build upon it.

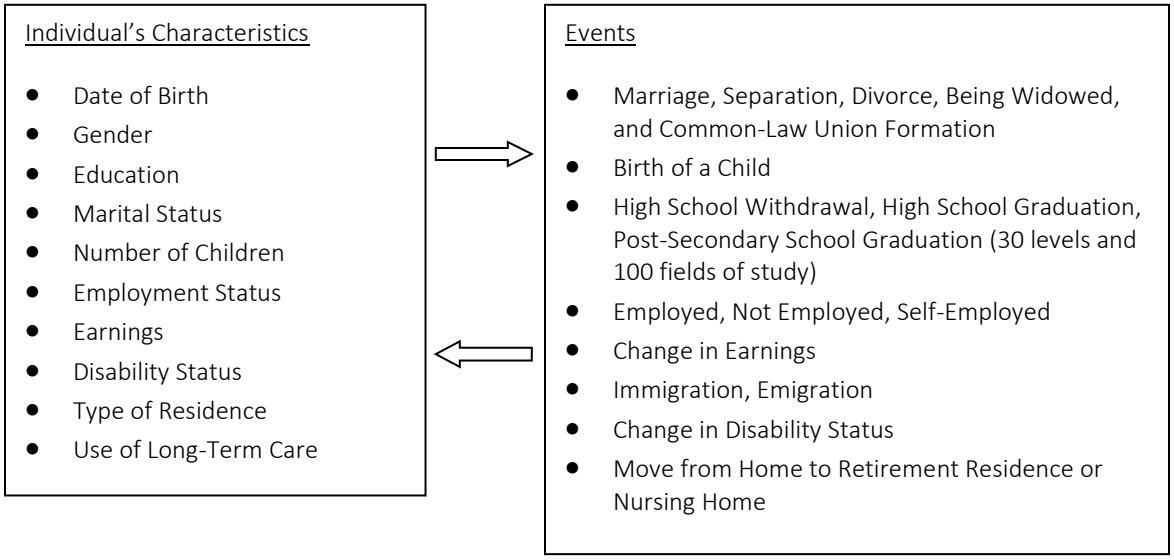
LifePaths has been used extensively for pension policy analysis, but not for projections of long-term care national costs. As a result, it has been extended for this analysis to include detailed modules for disability, long-term care utilization in physical units, and long-term care costs.

LifePaths is a *micro*simulation model, which means that it operates at the level of individuals, rather than groups or aggregates. Each of millions of individuals have their complete life paths or biographies synthesized via simulation. These synthetic individuals, by construction, collectively form a representative sample of the Canadian population, and individually each biography is intended to be as realistic as possible.

Of course, not every attribute of individuals' biographies is simulated. Figure 1 illustrates some of the main characteristics and events incorporated in LifePaths.

Figure 1

ILLUSTRATION OF LIFEPATH'S SIMULATION OF A CANADIAN LIFE COURSE



Adapted from MacDonald et al. (2011), Figure 1.

At any point in the simulation of one individual's biography, values for each of the characteristics shown on the left in Figure 1 are included. The simulation model updates these characteristics in line with a variety of discrete events, as shown on the right in Figure 1. For example, union formation and dissolution events occur based on detailed statistical analysis of demographic data where, for example, entry into a common-law union or legal marriage has been estimated as a probability conditional on age, educational attainment, and labour force participation (among other covariates). Similarly, disability transitions have been defined in terms of three categories (see sidebar) and have been estimated from detailed statistical analysis of Statistics Canada's longitudinal National Population Health Survey. The three disability levels employed in our projection are defined as:

- Mild disability: Mobility problem but does not need any help; Dexterity problem but does not need any help from someone else (may or may not use special equipment); Somewhat forgetful and slight difficulty in thinking; Moderate and/or severe pain prevents performing some or few tasks
- Moderate disability: Requires wheelchair or mechanical support to walk; Dexterity problem and needs help to perform some tasks; Very forgetful and a lot of difficulty in thinking; Severe pain prevents performing most tasks
- Severe disability: Cannot walk or needs help from others to walk; Dexterity problem and needs help for most or all tasks; Unable to remember or think

Utilization of long-term care has been divided into three main areas: home care provided to individuals living in their own "home" (rented or owned, single detached or multiple unit), those living in retirement residences (like apartment buildings but with congregate dining, considered "collective dwellings" by the population census), and nursing homes. In the first two cases, long-term care takes the form of "home care" services, predominately as provided by PSWs when publicly funded, with the bulk coming from unpaid care. The latter case, nursing homes, are institutional settings for individuals with the most acute care needs.

Unfortunately, Canada suffers from very serious limitations on the data needed to describe accurately the utilization and costs of these various forms of and settings for long-term care. For home care, both in

"homes" and in retirement residences, we have made use of detailed administrative data from Ontario (the interRAI assessments), coupled with data from Statistics Canada's NPHS to impute utilization for the entire country. Nursing home residence was derived from the population census. In all these cases, long-term care utilization has been estimated separately by sex and five-year age groups up to age 85-plus. See MacDonald et al. (2019) for further discussion of data sources and methodology.

Since long-term care is generally in provincial/territorial jurisdiction, there is a great deal of variation across jurisdictions in the details of these programs, including the range of services covered by provincially funded programs. Further, there are no national standards for defining or measuring various kinds of long-term care service utilization and their unit costs (though a new measure for nursing homes is under development at the Canadian Institute for Health Information). As a result, the simulation modeling has made the assumption that PSW services cost $30/hour ($18 for salary and $12 for overhead), and nursing homes cost $175/day. These are plausible amounts on average, although there exist a variety and range of actual costs across the country (see MacDonald et al., 2019, for further discussion).

For the ERM analysis, it is a central feature to have a baseline projection or scenario against which various risks are defined. For this baseline, the key assumptions are:

- Life expectancy continues to improve in line with the middle range of Statistics Canada's official demographic projections.
- Age-specific disability prevalences decline in a way that leaves the ratio of health-adjusted life expectancy to overall life expectancy roughly constant, in line with recent evidence that over the past two decades this is the pattern observed (Bushnik et al., 2018).
- While the Old Age Security pension and the individual income tax system legislation specify that their key values increase over time in line with the inflation rate (i.e., these major programs are price indexed), the historical evidence is that there are periodic ad hoc changes which are tantamount to their being indexed in line with average wages, so as a result we have assumed they are wage-indexed over the period to 2050.
- The number of hours of government-funded home care services, privately paid home care services, and unpaid informal support received by elderly individuals in Canada is distributed based on five-year age group, sex, and health status in the Ontario interRAI home care population.
- Average wages, over the projection period to 2050, increase by 1.1 per cent per year in real (i.e., constant dollar) terms.
- PSW and nursing home unit costs similarly increase 1.1 per cent per year in real terms.

Further, baseline LifePaths simulations already embody the following trends:

- A modest trend away from marriage (among all age cohorts, including seniors)
- A flattening out of increasing female labour participation rates and post-secondary educational attainment
- A modest trend of fewer children across future cohorts according to the medium demographic assumptions for Statistics Canada's official population projections (Statistics Canada, 2005)

The key part of the ERM analysis is the specification of a number of "risk scenarios" – departures from the baseline projection just described. These departures are simulated by changing one or other of the parameters or assumptions in the baseline projection. Many of these risk scenarios involve alternative views of the future trends in disability, mortality, and entrance into nursing homes; others involve alternatives regarding the costs of long-term care. These alternatives have been simulated using the

LifePaths model by changing the time profiles of costs, and/or by changing transitions into nursing homes and adjusting disability and mortality dynamics. In the latter two cases, the risk scenarios have been constructed by assuming an “age shift”. In effect, individuals at a given age are exposed to the probabilities of a change in disability status or mortality hazards for someone older or younger than their actual (simulated) age. For example, a reduction in disability can be simulated by positing that a 75-year-old faces the disability dynamics of a 70-year-old; i.e., a five-year age shift.

Please note that the assumptions and calculations underlying the LifePaths simulation results were prepared by MacDonald and Wolfson co-leading the modeling efforts, and the responsibility for the use and interpretation of these data is entirely theirs.

Appendix C: Qualitative Risk Assessment Scoring Criteria

Likelihood Score	Chance of Occurring (within 30-year projection period; assume earliest possible onset)
Very High	>20%
High	≥10% and <20%
Medium	≥5% and <10%
Low	≥2% and <5%
Very Low	<1%

Strategic Goal	1 Government Budget Impact	2 Unpaid Informal Home Care Impact
Metric	ease vs. Baseline in Percentage In blic Long-Term Care Costs (maxi projection period)	Increase vs. Baseline in Percentage Increase in Aggregate Needed Unpaid Informal Home Care Hours (maximum over projection period)
Very High	≥10%	≥10%
High	≥5% and <10%	≥5% and <10%
Medium	≥2.5% and <5%	≥2.5% and <5%
Low	≥1% and <2.5%	≥1% and <2.5%
Very Low*	<1%	<1%
None	0%	0%

* This captures negative increases, or decreases, in the key metric; this is appropriately ranked very low, because this portion of the ERM exercise is seeking extreme downside events.

Appendix D: Consolidated Risk List

Rank	Risk
1	Unanticipated cures for heart disease and cancer are found.
2	Changing expectations place increased pressure on nursing homes, resulting in quality of care improvements.
3	Advocacy against age discrimination within the current system leads to pressure to improve the quality of care in nursing homes and home care.
4	Government-supported “home first” policies will lead to more seniors staying at home than expected.
5	Due to lower-than-expected availability of informal home care, there is a growing inability of seniors to absorb the cost of home care.
6	Unexpected changes in family composition result in a gradual shift of home care costs from government-funded to non-government-funded.
7	The supply of homecare PSWs decreases.
8	Governments in all provinces stop direct involvement in long-term care and shift to providing payments to individuals to help defray costs.
9	There is a decrease in family members’ expectation and willingness to provide informal care.
10	Unexpected inability to maintain the ageing physical infrastructure/facilities up to required compliance standards (such as fire safety) emerges.
11	Class-action litigation over elderly abuse in nursing homes and home care.
12	Unexpected advances in collective living emerge.
13	An unexpected increase in co-morbidity (due to increases in obesity, alcoholism, etc.).
14	An inability to procure an adequate supply of formal homecare caregivers.
15	An unexpected additional decline in availability of informal care providers.
16	An unexpected decrease in ability to hire Continuing Care Assistants (CCAs)/PSWs.
17	Climate change results in more extreme weather events.
18	Unexpected increase in use of unwarranted medications results in poorer outcomes (e.g., increased falls, hospitalizations, and drug interactions).
19	The cost of modifying private homes to better accommodate the disabilities associated with ageing-related increases.
20	A change in government policy results in inefficiencies.
21	There is an unanticipated increase in the isolation faced by seniors living in rural areas (15% of senior population), where home care resources cannot reach them.
22	Governments decrease funding to nursing homes and home care.
23	Government long-term care budget changes.
24	An unanticipated decline in the number of physicians.
25	Inability of multiple computer systems to effectively communicate re orphan patient care.
26	The supply of informal unpaid homecare workers decreases.
27	Drug costs increase.
28	An increase in litigation alleging lack of efficiency in health care delivery.
29	Drug-resistant infections become much more prevalent.
30	A cure/more effective prevention for macular degeneration is discovered.
31	A pre-treatment screening for dementia is discovered.
32	Unexpected technological advances gradually reduce the informal and formal caregiving needs of disabled individuals.
33	Higher public expectation that government will cover a larger share of care costs leads to pressure that results in a shift of funding from the individual to the government.
34	Canada-wide long-term stagnation.

Appendix E: Consolidated Risk List with Likelihood, Severity, and Ranking Scores; Risks Expressed in Their Credible-Worst-Case Scenario Form

Rank	Risk Scenario	Average Likelihood	(Modeled) Government Long-Term Care Expenditures Severity	(Modeled) Unpaid Home Care Impacts Severity
1	Unanticipated cures for heart disease and cancer are found such that, by 2030, Canadians experience a decline in mortality rates beyond those projected, equivalent to a chronological shift in mortality rates by five years, e.g., a 70-year-old faces the mortality of a 65-year-old. However, these mortality reductions do not affect the disabilities associated with living with heart disease and cancers, so have no impacts on chronic disability prevalence.	3.9%	Very High (≥50%)	High (≥10% and <50%)
2	Higher expectations for better care among Baby Boomers places increased pressure on nursing homes, resulting in quality of care improvements (e.g., correcting issues such as: too many beds in a room; use of physical and chemical restraints due to inadequate staff; non-secure buildings so people with dementia walk out into the winter nights and freeze; etc.), such that from 2030 to 2050, unit costs of care to governments for nursing home bed-days rise from $175 to $300.	7.3%	Very High (≥50%)	Very Low (<1%)
3	Advocacy against age discrimination within the current system (people of equivalent care needs, where older individuals do not receive on average the same level of care as middle-age people) leads to pressure to improve the quality of care in nursing homes and home care such that, by 2030, the cost of both doubles. The associated increase in quality extends health-adjusted life expectancy so that the equivalent of five years of additional age are gained between 2020 and 2050 (a 75-year-old in 2050 experiences levels of disability a 70-year-old in 2050 would have experienced).	3.1%	Very High (≥50%)	Very Low (<1%)
4	Government-supported “home first” policies will lead to more seniors staying at home than expected. This shift increases the average acuity/complexity of both home care and nursing home populations, though the number of individuals in nursing homes declines compared to the baseline projection. Specifically, by 2030, there is a 15% decrease in the number of seniors going to nursing homes, a 10% increase in the daily cost of caring for the higher complexity of those seniors admitted to nursing homes, and a 20% increase in cost of caring (and 20% higher unpaid hours) for severely disabled seniors who stay at home rather than being admitted to a nursing home.	8.5%	Low (≥1% and <5%)	High (≥10% and <50%)

5	Due to lower-than-expected availability of unpaid home care (fewer children, higher divorce rates, lower effectiveness of friends/neighbors to substitute for direct family), there is a growing inability of seniors to absorb the cost of home care. As a result, by 2035, the current baseline projection of 75% of home care hours supplied by unpaid informal sources shifts to 25% (with private-pay continuing to cover 8%).	4.2%	High (≥10% and <50%)	Very Low (<1%)
6	Unexpected changes in family composition result in a gradual shift of home care costs such that, by 2035, the current baseline projection of 75% coverage of hours by unpaid sources shifts to 25% (with private-pay continuing to cover 8%).	2.8%	High (≥10% and <50%)	Very Low (<1%)
7	The supply of homecare PSWs decreases to the point such that by 2030, their wages will have increased by another (real, i.e., CPI-adjusted) $10/hour over the expected PSW real wage growth rate, home care costs increase from $30/hour to $40/hour and nursing home costs increase from $175/day to $200/day.	5.6%	High (≥10% and <50%)	Very Low (<1%)
8	By 2032, governments in all provinces stop their direct involvement in long-term care and shift to providing payments to individuals to help defray costs, where the amount of the payments per individual is capped at the total level of government funding at that time. This privatization increases costs, which is absorbed by 15% greater unpaid informal hours of care. A further consequence is that the poorest 25% of disabled seniors have increased unmet needs that cause their severe disability rates to increase by 30% from 2032 to 2050 over the baseline projection.	4.4%	Low (≥1% and <5%)	High (≥10% and <50%)
9	There is a decrease in family members' expectation and willingness to provide unpaid care. This shift increases the demand for formal senior care workers, resulting in an increase in their wages across Canada, an increase in home care costs from $30/hour to $38/hour and an increase in nursing home costs from $175/day to $195/day. These shifts start in 2030, phasing in to 2040 and continuing at these higher levels to 2050.	5.4%	High (≥10% and <50%)	Very Low (<1%)
10	Unexpected inability to maintain the ageing physical infrastructure/facilities up to required compliance standards (such as fire safety) emerges so that by 2040, facilities have been closed without adequate replacement, decreasing nursing home admission rates by 30%. This shift continues to 2050. The result is increases in the cost of care as more are admitted to hospitals, shifting nursing home beds to alternate level of care (ALC) beds. The cost to stay at home (or occupying a hospital alternative level of care bed) is 200 hours/month @ $55/hour = $365/day (compared to the original $175/day in a nursing home).	4.9%	High (≥10% and <50%)	Very Low (<1%)

11	Class-action litigation over elderly abuse in nursing homes and home care results in government settlement costs of $1B in 2025–2027 and another $1B over 2027–2037. To mitigate abuse, staffing, training, and the increased presence of advocates drives up both nursing home and home care costs by 25% over 2022–2050. The resultant increase in care quality extends disability-free life equivalent to individuals facing disability prevalence of those age five years younger. This reduction in disability phases in from 2025 to 2037, and continues until 2050.	2.2%	High (≥10% and <50%)	Very Low (<1%)
12	Unexpected advances in collective living emerge so that seniors are less sparse geographically, leading to better access to home-based community care such that, phasing in by 2030, there is a 20% decrease in the expected proportion of seniors going to nursing homes. This proportionate change continues to 2050.	5.6%	Very Low (<1%)	High (≥10% and <50%)
13	An unexpected increase in co-morbidity (due to increases in obesity, alcoholism, etc.) takes place such that, between 2020 and 2030, there is a gradual two-year age shift in disability prevalence (i.e., 75-year-olds exhibit disability at the same rates as 77-year-olds). This shift persists until 2050.	3.2%	Medium (≥5% and <10%)	Medium (≥5% and <10%)
14	An inability to procure an adequate supply of formal homecare caregivers starting in 2021, peaking in 2032, and ending in 2043 (primarily due to the Baby Boomer wave), results in a 20% increase in salaries for formal homecare caregivers in urban areas where they can be procured, but in non-urban areas (15% of senior population) this is not possible and instead results in a 25% increase in severe disability rates with the additional disabled being placed in ALC beds instead of nursing home beds.	5.4%	Medium (≥5% and <10%)	Very Low (<1%)
15	An unexpected additional decline in availability of unpaid care providers, such that by 2035, there is an increase in unmet needs leading to a 50% increase in the Severe Disability prevalence rate of 50% of disabled seniors (e.g., higher likelihood of falling, poorer nutrition, less follow-up to GPs, etc.).	4.2%	Medium (≥5% and <10%)	Low (≥1% and <5%)
16	An unexpected decrease in ability to hire CCAs/PSWs results in a 50% decline in this kind of labour gradually from 2020 to 2030. The main result is an increase in labour costs, both in homes and in institutions. Specifically 60% of these care hours that formerly cost $18/hour are replaced by care hours by LPNs (at ~$25/hour), 20% by RNs (at ~$35/hour), and 20% by a new "fourth level" of care workers (at ~$13/hour). Put together, this increases hourly salary costs from $18/hour to $21.30/hour: an increase in home care costs from $30/hour to $35/hour and nursing home costs increase from $175/day to $190/day.	4.2%	Medium (≥5% and <10%)	Very Low (<1%)
17	Climate change results in more extreme weather	2.0%	High (≥10% and	Medium (≥5% and

	events such that by 2025, all Canadians experience increasing disability, including more falls on ice and lack of physical activity (cannot go outside owing to too hot or too cold). These changes in the physical environment have the effect of a biological two-year advance in disability prevalence (as if they are two years older).		<50%)	<10%)
18	Unexpected increase in use of unwarranted medications results in poorer outcomes (e.g., , increased falls, hospitalizations, and drug interactions), such that from 2020 to 2050, long-term care costs increase by additional 7.5% (0.25% per year).	4.6%	Medium (≥5% and <10%)	Very Low (<1%)
19	The cost of modifying private homes to better accommodate the disabilities associated with ageing-related gradually increases more than expected, such that, by 2030, the cost has increased an additional $2,500 per year (in constant dollars) for the 70% of the disabled population in private homes that can afford it, while the remaining 30% that cannot afford it face increased unmet needs, resulting in their severe disability prevalence rates increasing by 25%.	4.8%	Low (≥1% and <5%)	Low (≥1% and <5%)
20	A change in government policy, lasting two terms (eight years: 2020–2028) results in inefficiencies, affecting 5% of the age 65-plus population, resulting in a 20% increase in their transition into severe disability over those eight years and a 5% shift from nursing home beds to ALC beds at $500/day, returning to original baseline after 2028.	2.7%	Medium (≥5% and <10%)	Very Low (<1%)
21	There is an unanticipated increase in the isolation faced by seniors living in rural areas (15% of senior population), where home care resources cannot reach them. As a result, among those in rural areas, there is a 50% increase in the prevalence of severe disability, with a corresponding increase in nursing home entry, starting in 2020 and phasing in to 2030, then holding steady through 2050.	5.5%	Low (≥1% and <5%)	Very Low (<1%)
22	Between 2030 and 2035, governments have decreased funding to nursing homes and home care by 5%, increasing severe disability rates by 50% for the 25% of people who cannot afford care, and resulting in facilities being closed without replacement. These funding cuts are not reversed after 2035, but trend growth in funding resumes until 2050. [As a result, the cost of care increases as more are admitted to hospitals, shifting nursing home beds to ALC beds, and for those staying at home, their home care costs also increase. Specifically, the costs to stay at home or in an ALC bed at 200 hours/month rise to $365/day.]	1.9%	Medium (≥5% and <10%)	Low (≥1% and <5%)

23	Government long-term care budgets are kept flat for three years, starting in Year 3 and reversing by Year 6 (flat between 2023 and 2026), resulting in a cost shift to individuals and more people delaying transition to nursing homes. As a result, governments' costs of care increase as more are admitted to hospitals, shifting nursing home beds to ALC beds at $500/day. There is an increase in unmet needs for 5% of seniors. This 5% of the population experience a 20% increase in transitions into mild, moderate, and severe disability, which is equivalent to a biological five-year advance in disability prevalence during those three years. Between Years 6 and 9, the government spending catches up to what was originally projected, and the biological five-year advance in disability prevalence returns to baseline.	3.8%	Low (≥1% and <5%)	Very Low (<1%)
24	By 2030, an unanticipated decline in the number of physicians has emerged (older physicians retire and are replaced by younger physicians who work fewer hours) to the point that 5% of Canadians lose access to doctors, resulting in a lack of timely access to primary care and more hospital visits. These changes in access to care result in a permanent 25% increase in disability rates phasing in between 2020 and 2030 and continuing at that new level until 2050 (e.g., a biological six-year advancement in disability prevalence).	5.3%	Low (≥1% and <5%)	Low (≥1% and <5%)
25	Inability of multiple computer systems to effectively communicate re orphan patient care increases costs (e.g., duplicate/unnecessary tests, results not addressed in timely manner) and an increase in legal costs such that from 2020 to 2050, nursing home and home care costs increase by additional 7.5% (0.25% per year).	1.9%	Medium (≥5% and <10%)	Very Low (<1%)
26	By 2040, the supply of informal unpaid homecare workers decreases to the point where the percentage of those receiving government-funded homecare that also have an unpaid homecare worker decreases from 93% to 80%, resulting in a substantial increase in unmet care needs. The result is a 50% increase in severe disability rates for those individuals by 2040, continuing to 2050.	4.4%	Low (≥1% and <5%)	Very Low (<1%)
27	Beginning in 2020 and continuing to 2035, drug costs increase to the point of being unaffordable for many, resulting in poor chronic disease management. As a result, by 2035, 30% of the age-65-plus population experience a biological two-year advance in disability prevalence (as if they are two years older). This increase in disability continues to 2050.	2.3%	Low (≥1% and <5%)	Low (≥1% and <5%)
28	An increase in litigation alleging lack of efficiency in health care delivery increases costs, such that from 2020 to 2050, nursing home and home care costs increase by additional 3% (0.1% per year).	1.5%	Low (≥1% and <5%)	Very Low (<1%)
29	Drug-resistant infections become much more prevalent, causing an across-the-board increase in	2.7%	Very Low (<1%)	Very Low (<1%)

	mortality. Canadians experience an unexpected decline in longevity, starting in 2025 and fully phased in by 2035 and continuing to 2050. The mortality increase is equivalent to a five-year increase in age beyond age 65 (e.g., a 70-year-old faces the mortality rates of a 75-year-old).			
30	A cure/more effective prevention for macular degeneration is discovered and deployed by 2030, creating a 30% decline into disability beginning in 2030, equivalent to a biological eight-year delay in disability prevalence – e.g., a 73-year-old will have the disability level of a 65-year-old.	4.5%	Very Low (<1%)	Very Low (<1%)
31	A pre-treatment screening for dementia is discovered and implemented beginning in 2025 and by 2035 is provided to [50%] of those who would ultimately get dementia. The result is equivalent to a five-year age setback in the onset of dementia-related disabilities of all severities. This shift in dementia prevalence then persists until 2050. As dementia is the main impairment for about 50% of those aged 65-plus with any disability, this new screening will affect about 25% of the 65-plus population.	7.2%	Very Low (<1%)	Very Low (<1%)
32	Unexpected technological advances gradually reduce the informal and formal caregiving needs of disabled individuals, such that by Year 15 (2035), the number of hours of home care needed is 15% lower than expected. This reduction persists through to 2050.	2.8%	Very Low (<1%)	Very Low (<1%)
33	Higher public expectation that government will cover a larger share of care costs leads to pressure that results in a shift of all future real-dollar cost increases (from currently projected average constant dollar cost levels per senior) from the individual to the government. These shifts start in 2020 and continue through 2050.	6.1%	Very Low (<1%)	Very Low (<1%)
34	Canada-wide long-term stagnation results in a 1.0% immediate and permanent annual decrease in the real growth rate of long-term care government spending (current baseline = 1.5% annual real growth rate) and a 0.5% immediate and permanent decrease in all wages (including long-term care workers).	6.3%	Very Low (<1%)	Very Low (<1%)

Appendix F: Selected Key Risk Scenarios with Likelihood and Severity Impacts

	Scenario			
	Baseline	Credible-Worst-Case	Moderate-Downside	Upside
Risk Rank #2: Changing expectations place increased pressure on nursing homes, resulting in quality of care improvements	No risk event	From 2030 to 2050, unit costs for nursing home bed-days rise from $175 to $350	From 2030 to 2050, unit costs for nursing home bed-days rise from $175 to $275	From 2030 to 2050, unit costs for nursing home bed-days decrease from $175 to $125 due to efficiencies
Probability:	45%	10%	25%	20%
Government Budget Impact:	0%	87%	50%	-25%
Informal Hours of Care Impact:	0%	0%	0%	0%

	Scenario			
	Baseline	Credible-Worst-Case	Moderate-Downside	Upside
Risk Rank #4: Government-supported "home first" policies will lead to more seniors staying at home than expected	No risk event	By 2030, there is a 20% decrease in seniors going to nursing homes, a 20% increase in cost of caring for the higher complexity of those admitted to nursing homes, and a 30% increase in cost of caring for severely disabled seniors who stay at home	By 2030, there is a 15% decrease in seniors going to nursing homes, a 15% increase in cost of caring for the higher complexity of those admitted to nursing homes, and a 25% increase in cost of caring for severely disabled seniors who stay at home	By 2030, there is a 15% decrease in seniors going to nursing homes, a 0% increase in cost of caring for the higher complexity of those admitted to nursing homes, and a 5% increase in cost of caring for severely disabled seniors who stay at home
Probability:	60%	5%	25%	10%
Government Budget Impact:	0%	12%	10%	-7%
Informal Hours of Care Impact:	0%	43%	34%	13%

	Scenario			
	Baseline	Credible-worst-case	Moderate-Downside	Upside
Risk Rank #7: The supply of homecare PSWs decreases	No risk event	By 2030 and persisting until 2050, PSW wages will have increased by another $15/hour (CPI-adjusted) over expected PSW real wage growth rate, unit costs for nursing home bed-days rise from $175 to $213 (government absorbs higher costs without shifting burden to	By 2030 and persisting until 2050, PSW wages will have increased by another $12/hour (CPI-adjusted) over expected PSW real wage growth rate, unit costs for nursing home bed-days rise from $175 to $205 (government	By 2030 and persisting until 2050, PSW wages will have increased by another $5/hour (CPI-adjusted) over expected PSW real wage growth rate, unit costs for nursing home bed-days rise from $175 to $188 (government absorbs higher

		informal care)	absorbs higher costs without shifting burden to informal care)	costs without shifting burden to informal care)
Probability:	35%	5%	20%	40%
Government Budget Impact:	0%	26%	20%	9%
Informal Hours of Care Impact:	0%	0%	0%	0%

Endnotes

[1] For insightful discussions on some of the concerns raised by experts as per the funding and other challenges of long-term care in Canada, see Adams and Vanin (2016), which was an invited essay on the topic that was complemented by a series of short essays in response by eight leading long-term care thinkers across Canada. The sum of these papers made up the journal volume.

[2] Private-pay long-term care services play a relatively minor role, making up less than 8% of home care hours for Canadians in Ontario, for example (see MacDonald et al., 2019). On the other hand, 75% of home care hours are provided, unpaid, by the seniors' network of friends and family. While the public funds approximately 17% of home care services (whether in private homes or in seniors residences), the bulk of public expenditure is on nursing home care (see MacDonald et al., 2019).

[3] With the direction of Heidi Walsh (co-investigator on this report), we began this study using a questionnaire survey carried out across a spectrum of long-term care stakeholders from a variety of backgrounds to collect insights on the key risks. The questionnaire was designed to have subject matter experts identify risks related to the delivery of long-term care to seniors in Canada. To capture the enormous range of interests and expertise that underlie long-term care in Canada, we used a series of open-ended questions posed to stakeholders across the country that were intended to identify risks across the long-term care sector. These questions included: What are the current key components of the Canadian long-term care system? What are the strengths/weaknesses? Looking into the future, what do you think are the key risks to providing adequate long-term care to seniors in Canada? The fragmentation of the system was the most emphasized challenge of long-term care in Canada.

[4] Historically, ERM was not adopted widely at the provincial level, but this is changing. BC has created a Chief Risk Office, and issued Risk Guideline for the BC Public Sector in April 2019. However, the federal government has taken a more comprehensive approach to risk management since 2001, when the Treasury Board Secretariat (TBS) of Canada introduced a risk management framework used for the assessment of risk and strategic leadership. The TBS created a risk taxonomy that can be used by an organization as a comprehensive, common and stable set of risk categories. In addition, in the United States, OMB Circular A-123 requires all executive federal government agencies to have an ERM program (United States, 2016).

[5] An overview of LifePaths can be found at the Statistics Canada Modelling Division (Spielauer 2013), which is publicly available to the interested reader and can be found on the Statistics Canada website: www.statcan.gc.ca/microsimulation/lifepaths/lifepaths-eng.htm

[6] Insight was provided by Shannon Patershuk through personal correspondence.

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