Forecasting Facility and In-home Long-Term Care for the Elderly in Ontario: The Impact of Improving Health and Changing Preferences*

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Abstract

In March 2000, the Ontario Health Services Restructuring Commission ("HSRC") released a report entitled "Looking Back, Looking Forward" which attempted, among other things, to develop an integrated planning framework for Long-Term Care ("LTC") Services in Ontario. It was estimated that an additional 41,617 institutional and in-home continuing care "equivalent LTC Places" would be required by 2003 in Ontario. This figure was based on a planning model developed by the HayGroup in March 1997. There were two main shortcomings associated with the HSRC Report: (1) it did not allow for changes in preferences for health care settings by care recipients; and (2) it did not address the potential effect of compression of morbidity.

We here re-visit the original planning model developed by the HayGroup for the HSRC. We assess the sensitivity of the previous model's estimates to: (1) variations in the size and demographic composition of the Ontario population to 2018; (2) variations in the health status (longevity and reduced disability) of the elderly; and (3) modifications to preferences held by care recipients for various health care settings. Compared to the HSRC estimates, revised baseline estimates for 2003 suggest that requirements for Chronic Care beds fall by 8.2%, that for Nursing Homes/Home for the Aged ("NH/HA") beds fall by 14.1%, and that for person-year equivalent in-home continuing care places fall by 3.1%. Baseline estimates for LTC requirements in 2003 identified the need for only 7,595 additional Chronic Care and NH/HA beds and 18,826 person-year equivalent in-home continuing care places compared to the 18,055 beds and 22,179 in-home places identified by the HayGroup for the HSRC. These effects compound with time and yield significant effects on requirements for LTC beds and in-home continuing care places for 2010 and 2018. Consequently, LTC planning estimates are quite sensitive to even modest assumptions about changes in the compression of morbidity and preferences for the setting for LTC.

Executive Summary

In March 2000, the Ontario Health Services Restructuring Commission ("HSRC") released a report entitled "Looking Back, Looking Forward" which attempted, among other things, to develop an integrated planning framework for Long-Term Care ("LTC") Services in Ontario. It was estimated that an additional 41,617 institutional and in-home continuing care "equivalent LTC Places" would be required by 2003 in Ontario. This figure was based on a planning model developed by the HayGroup in March 1997. There were two main shortcomings associated with the HSRC Report: (1) it did not allow for changes in preferences for health care settings by care recipients; and (2) it did not address the potential effect of compression of morbidity.

Recent literature from around the world suggests that care recipients are expressing a desire to remain in their homes as long as possible, and that these expectations are likely to increase over time. Also, the epidemiological literature suggests that 'compression of morbidity' is occurring through increased life expectancy and improvements in health status across various demographic groups. While the effect of increased life expectancy to 2003 was considered in the original HSRC planning model, improvements in population health status and its impact on the need for LTC overall and across health care settings were not incorporated.

In this report, we re-visit the original planning model developed by the HayGroup for the HSRC. We assess the sensitivity of the previous model's estimates to revised population figures, and variations in both population morbidity and in preferences held by care recipients for various health care settings. Specifically, the LTC planning forecasts allow for: (1) variations in the size and demographic composition of the Ontario population to 2018; (2) variations in the health status

(longevity and reduced disability) of the elderly; and (3) modifications to the preferences held by care recipients for various health care settings.

The revised LTC planning model initially forecast to 2003 to facilitate comparison with the HayGroup estimates and then yields projections for 2010 and 2018. The new estimates allow the model to capture the impact of improved life expectancy, as well as the changing size and demographic distribution of the population, on the need for LTC Places over a longer time horizon. Using only the revised population figures, and abstracting from both compression of morbidity and changes to preferences for health care settings, the required number of Chronic Care beds, NH/HA beds, and person-year equivalent in-home continuing care places is expected to increase by 77.5%, 103.4% and 57.4% respectively, between 1996 and 2018.

Life expectancy is an important indicator of health status but it does not necessarily reflect changes in *quality* of life that may occur over time. When disability measures are included in the analysis, medical spending is not strongly related to age. Recent international evidence suggests that while there is a significant upward shift in the proportion of elderly in society, the elderly are living longer and are reporting better health at each point in their life course than earlier generations. This 'compression of morbidity' has important implications for LTC planning, both in terms of the appropriate setting for care, and in terms of the type and level of such care. In this report, the compression of morbidity is assumed to be a general population effect and its application to the revised population figures establishes a lower requirement for LTC. Specifically, instead of a 77.5% increase in Chronic Care bed requirements from 1996 to 2018 in the absence of compression, these requirements are anticipated to increase by 27.6% when compression is high. Between 2003

and 2018, even a high compression of morbidity factor is found to be insufficient to offset the demographic shift. It is further anticipated that the number of NH/HA beds required will increase in the coming two decades, even assuming a relatively high rate of compression of morbidity. In addition, while requirements for the number of person-year equivalent in-home continuing care places is expected to increase by 57.4% from 1996 to 2018, without compression of morbidity, this increase could shrink to 13.2% if compression were high. Consequently, requirements for in-home continuing care are sensitive to the selected rate of compression of morbidity.

Preferences of care recipients with respect to the setting for LTC and the type of services acquired, are also acknowledged as important determinants of service planning decisions. Several studies conducted in different jurisdictions report that individuals prefer to remain and receive care in their homes for as long as possible. Indeed, the notion that an individual should be allowed to 'age in place' has, at least in part, provided an important impetus for the shift in the care setting from institutions to the community. Inclusion of preferences for in-home care lowers the increase in NH/HA beds required between 1996 and 2018 from 103.4% to as low as 46.2%, and increases in-home continuing care requirements from 57.4% to as much as 103.6%.

The combined effect of morbidity compression and changing preferences on the projected number of LTC Places are lower and diverge from those reported by the HSRC. Using baseline estimates for the effects of compression and preferences suggest that relative to the HSRC estimates for 2003, the requirements for Chronic Care beds fall by 8.2%, that for NH/HA beds fall by 14.1%, and that for person-year equivalent in-home continuing care places fall by 3.1%. As such, baseline estimates for LTC requirements in 2003 identified the need for only 7,595 additional Chronic Care and

NH/HA beds and 18,826 person-year equivalent in-home continuing care places compared to the 18,055 beds and 22,179 in-home places identified by the HayGroup for the HSRC. These effects compound with time and yield significant effects on requirements for LTC beds and in-home continuing care for 2010 and 2018. Consequently, the result reported herein indicate that the forecasts produced for the HSRC are quite sensitive to even modest assumptions about changes in compression of morbidity and preferences for the setting for LTC.

The revised baseline LTC planning model presented in this report suggests that an additional 7,595 institutional LTC beds would be required in 2003, 15,862 in 2010 and 18,849 in 2018. In other words, only by 2018 would approximately 20,000 new institutional LTC beds that have recently been commissioned be fully utilised. Over expansion in LTC bed capacity has the tendency to alter practices and behaviours. Specifically, thresholds for LTC placement may be modified through the increased availability of LTC beds, the elderly may elect placement in preferred accommodation at a new NH/HA rather than accept a place at a retirement home, and some individuals may accept LTC bed placement rather than receive care at home. Each of these diverse effects modifies the revenue streams, cost structures, and other incentives for a range of stakeholders, and thereby, has lasting implications for 21st century health care in Ontario. Before adopting future recommendations for radical health service restructuring, it may be advisable to undertake a more comprehensive assessment of the diverse effects associated with such reforms**.**

I. Introduction

In March 2000, the Ontario Health Services Restructuring Commission ("HSRC") released a report entitled "Looking Back, Looking Forward" which attempted, among other things, to develop an integrated planning framework for Long-Term Care ("LTC") Services in Ontario. In that regard, the Report addressed the continuum of LTC settings, including private homes, supportive housing and care facilities (i.e. Homes for the Aged/Nursing Homes, Chronic Hospitals and Units). It was estimated that an additional 41,617 institutional and in-home continuing care "equivalent LTC Places" would be required by 2003 in Ontario.[1] This figure was based on a planning model developed by the HayGroup in March 1997.

There were two main shortcomings associated with the HSRC Report: (1) it did not allow for changes in preferences for health care settings by care recipients; and (2) it did not address the potential effect of compression of morbidity. The panel of experts convened by the HSRC to assist in the development of the planning model identified that "people in need of Long-Term Care services prefer independence over dependence, control over their living environment over loss of control; they prefer to stay at home."[2] The planning model used in the HSRC Report did not incorporate a quantitative assessment of the impact of changes in preferences on the need for LTC across various health care settings. Recent literature from around the world suggests that care

[1] Equivalent LTC Places were defined as the sum of LTC patient/resident days in beds designated for Chronic Care, LTC resident days in Nursing Homes and Homes for the Aged, Supportive Housing days/cases, Long-stay Home Care days/cases, Selected Community Support Services, and Alternative Level of Care days waiting for LTC in an acute care setting. HayGroup (1997) p. 7.
[2] Ibid. p. 1.

recipients are expressing a desire to remain in their homes as long as possible and that these expectations are likely to increase over time.[3]

The expert panel also identified the need to restructure the LTC sector in order to facilitate the downward substitution of health care settings. That is to say, "most people that are currently being admitted to chronic hospitals for Long-Term Care would be able to receive their care in Long-Term Care facilities" and "many people who currently are being admitted to Long-Term Care facilities would be able to receive care in their own homes or in a supportive housing setting."[4] As reported in the epidemiological literature, downward substitution of care settings may occur through a reduction in morbidity rates across demographic groups over time.[5] This 'compression of morbidity' is articulated along two dimensions: increased life expectancy and improvements in health status across demographic groups. While the effect of increased life expectancy to 2003 was considered in the original HSRC planning model, improvements in population health status and its impact on the need for LTC overall and across health care settings were not incorporated. Since the Report's release in 1997, revised population estimates have also become available that permit an extension of the forecast period to 2018. Consequently, it would be useful to identify how sensitive planning projections are to assumptions concerning: population size and its distribution; preferences for health care settings; and compression of morbidity.

[3] Chappell, N (1997); Kane R. and Kane R. (2002).
[4] op. cit. p. 2.
[5] Robine J.M., Mormiche, P. and Sermet, C. (1998); Crimmins E.M., Saito Y. and Ingegneri, D. (1997).

II. Purpose

The LTC planning model developed by the HayGroup for the HSRC in Ontario did not consider the impact of compression of morbidity and changes in preferences for health care settings on requirements for LTC. Since such factors have important implications for the projected need for LTC across health care settings in Ontario, it is our intention to re-visit the original planning model developed for the HSRC and to assess how sensitive the previous model's estimates are to revised population figures, variations in population morbidity and changes in preferences held by care recipients for various health care settings. Specifically, the LTC planning forecasts will allow for: (1) variations in the size and demographic composition of the Ontario population to 2018; (2) variations in the health status (longevity and reduced disability) of the elderly; and (3) modifications to the preferences held by care recipients for various health care settings.

III. Methods

(i) The Starting Point: Assumptions and Findings of the Original LTC Planning Model

The HayGroup LTC planning model established the utilization rate for LTC services per thousand population over 75 years of age for fiscal year 1995/1996, by summing equivalent LTC Places across six health care settings: LTC patient/resident days in beds designated for Chronic Care, LTC resident days in Nursing Homes and Homes for the Aged, Supportive Housing days/cases, Long-Stay Home Care days/cases, Selected Community Support Services (Adult Day Service and Attendant Care Service), and Alternative Level of Care ("ALC") days waiting for LTC in an acute care setting. The HayGroup did not consider the retirement home sector in its analysis. To facilitate comparability, utilization in Chronic Hospitals and Units, NH/HA and ALC in Acute-Care

were measured in terms of beds used[6], Supportive Housing in terms of places used[7] and Home Care and Community Support Services in terms of the "equivalent annual number of person-years."[8] For the purposes of this study, the number of equivalent LTC Places will refer to two distinct types of LTC: institutional care beds (Chronic Care and NH/HA); and the number of in-home continuing care person-year equivalent places.

A target range for the utilisation of LTC was set between the 25th and 75th percentiles of utilization in fiscal year 1995/1996. Thus, if utilisation in a region was below the 25th percentile, it was assumed that capacity would be increased to achieve the minimum threshold. Regions with utilisation rates within the desired range were assumed to maintain their current rate of utilisation into the future. If utilisation rates were above the 75th percentile, it was assumed that no additional capacity would be added in that region until utilisation was within the target range. This approach attempts to minimize the extent to which current shortages/surpluses in capacity are incorporated in the planning model.

The HayGroup model divided the province into two groups of municipalities (Northern Ontario and Southern Ontario) and set separate target utilisation thresholds for each. This was done to

[6] Beds in Chronic Hospitals and Units excluded beds used for short-stay programs. ALC equivalent LTC beds were obtained by dividing the number of days ALC patients spent waiting for each type of LTC by 365. HayGroup (1997) p. 7-12 and 20.

[7] Spaces in supportive housing programs in Ontario obtained from the Operations Support Branch of the Ministry of Health were used to estimate the number of annual client places. HayGroup (1997) p. 16.

[8] The total number of LTC patient days on Home Care within the fiscal year for each region was divided by 365 to produce an equivalent number of "person-years" of Long-Term Home Care places. See HayGroup (1997) p. 16-20 for details of the methodology. In terms of Community Support Services, 156 full day equivalents was assumed to equal an equivalent adult service place and each 728 hours of Attendant Service was defined as equivalent to an attendant service place. HayGroup (1997) p. 20.

"recognize and perpetuate historical differences in the distribution and use of LTC services"[9] in each region. Since differences in current utilization of LTC services were found to be significantly different across regions, and to facilitate comparison with the HayGroup estimates, the two-target approach is used in the revised LTC planning model.

When threshold utilization rates were applied to population figures for fiscal year 1995/1996, the HayGroup identified 10 municipalities that fell below the 25th percentile for a total shortage of 3,356 LTC beds and in-home continuing care equivalent places. For 2003, it was estimated that only three municipalities would report utilization exceeding the target rates. LTC utilization in fiscal year 1995/1996 was calculated to be 126,366 LTC equivalent Places and it was estimated that an additional 41,617 Places would be required by 2003 in order to achieve target utilization rates.

Requirements for LTC Places across health care settings were determined in three steps. First, the MDS/RUG III system[10] was applied to ascertain the Chronic Care bed requirements for LTC recipients. Data from Thunder Bay and Metropolitan Toronto were used to classify LTC and chronic hospital patients in the province. Those patients classified as requiring Special Care (RUG 5), Extensive Services (RUG 6) and others requiring Clinically Complex Care (RUG 4), plus those requiring respite and palliative care, were deemed to require the type of services most appropriately provided by Chronic Hospitals and Units. Second, bed requirements for Nursing Homes and Homes for the Aged (NH/HA) were based on target rates for utilization that were set at the 25th percentile of NH/HA bed utilization by age and gender in fiscal year 1995/1996. Regions with

[9] HayGroup (1997) p. 26.
[10] Fries B. E. et al. (1994).

utilisation below the 25th percentile were identified as requiring additional NH/HA beds. Finally, all other LTC Places were deemed to be satisfied with non-institutional LTC. Application of this classification system yielded estimates that approximately 20,000 additional institutional LTC (i.e. Chronic Care and NH/HA) beds would be required by 2003[11] in order to achieve the LTC utilization targets and to provide such care in an appropriate health care setting.

(ii) Incorporating Revised Population Figures

The revised LTC planning model developed in this report builds on the original model by first incorporating revised population projections (N_{rdt}) for each region (r) by demographic group (d) and year (t). The model initially forecast to 2003 to facilitate comparison with the HayGroup estimates and then yields projections for 2010 and 2018. The new estimates allow the model to capture the impact of improved life expectancy and the changing demographic (age-sex) distribution of the population on the need for LTC Places over more than two decades.

(iii) Compression of Morbidity

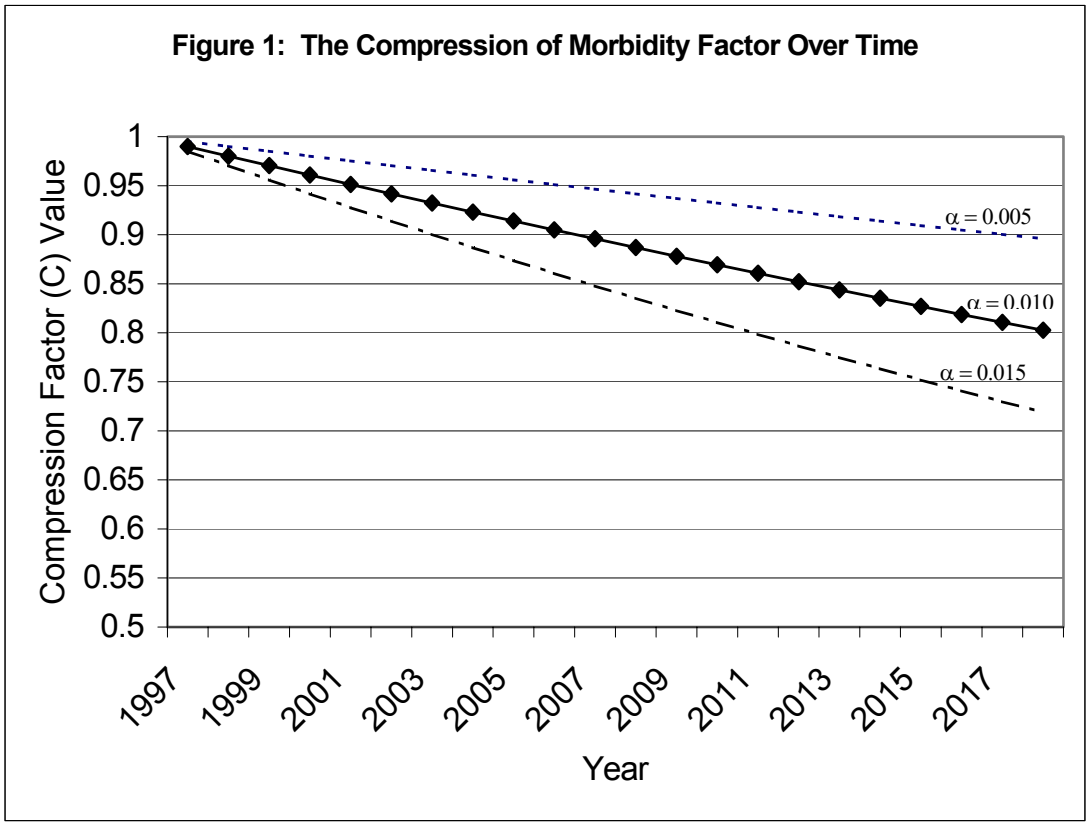
Life expectancy is an important indicator of health status but it does not necessarily reflect changes in *quality* of life that may occur over time. Earlier analysis shows that age itself is not the major factor in explaining greater utilization of medical services by the elderly. When disability measures are included in the analysis, medical spending is not very strongly related to age.[12] Recent international evidence suggests that while there is a significant upward shift in the proportion of

[11] This represents the difference between the requirement for Chronic Care (3,980) and NH/HA (55,582) beds in 1996 and the number of Chronic Care (5,193) and NH/HA (72,424) beds required in 2003 - an estimated difference of 18,055. HayGroup (1997) p. 38-39. The HayGroup (1997b) p. 20 offered slightly different estimates, with 3,287 NH/HA beds identified as being required in 1996 and 15,282 NH/HA beds for 2003.
[12] Cutler, D. (2001).

elderly in society, the elderly are living longer and are reporting better health at each point in their life course than earlier generations.[13] Manton and Gu (2001) report results from the 1999 National Long-Term Care Survey on disability trends from 1982 through 1999 in the United States. They find that disability declined throughout the period (by 6.8% in total or by 0.4% per annum) and that the decline was greater in the 1990s than in the 1980s.[14] Similarly, Cutler (2001) reports that disability among the elderly in the U.S. has declined by 1% or more each year in the last two decades. This 'compression of morbidity' has important implications for LTC planning, both in terms of the appropriate setting for care and in terms of the type and level of such care. For instance, this anticipated reduction in the service needs of the elderly might translate into a greater reliance on in-home rather than institutional LTC.

The LTC planning model developed in this report operationalises the effect of compression in morbidity by assuming that there is a compression factor C_t ($=e^{-\alpha t}$) that is independent of age and sex, and declines at a rate, ", over time. The formula used reflects declining morbidity. Moreover, given that improvements in health status and reductions in disability may asymptote, the formula assumes that the decline occurs at a decreasing rate over time (Figure 1). The compression of morbidity is assumed to be a general population effect and is therefore applied to the revised population estimates across the three health care settings: Chronic Hospital and Units; NH/HA; and In-home Continuing Care. The application of the compression factor to the revised population figures establishes a lower requirement for LTC.

[13] Crimmins E.M., Saito Y. and Ingegneri, D. (1997); Manton K., Corder L.S. and Stallard E. (1993); Manton K., Stallard E., Corder L.S. (1997); Waidmann T., Bound J. and Schoenbaum M. (1995); Robine J.M., Mormiche, P. and Sermet, C. (1998); Jacobzone (1999); Fries (1998, 2000); Mathers (1999); and Nusselder et al. (1996).
[14] The disability decline was 0.26% per year from 1982 to 1989, 0.38% per year from 1989 to 1994, and 0.56% per year from 1994 to 1999.



Note: α = Rate of morbidity compression

(iv) Preferences for Care Settings

Preferences of care recipients in terms of the setting for LTC and the type of services acquired are acknowledged as important determinants of service planning decisions. Several studies conducted in various jurisdictions report that individuals prefer to remain and receive care in their homes for as long as possible.[15] Indeed, the notion that an individual should be allowed to 'age in place' has, at least in part, provided an important impetus for the shift in the care setting from institutions to the community.[16]

To incorporate changing preferences regarding the setting in which LTC is provided, the LTC planning model developed in this report includes a preference factor P_t ($=e^{-\beta t}$) for LTC beds that is independent of age and sex. This preference factor captures the shift in preferences away from institutional LTC beds towards in-home continuing care. The strength of this preference shift is determined by the parameter β. The preference factor is applied to the NH/HA category since care recipients in the Chronic Care category are assumed to require an intensity of care that may best be delivered in a Chronic Hospital and Unit.

By augmenting the methods employed by the HayGroup for the determination of LTC requirements with factors that capture compression of morbidity (C_t) and preferences for health care settings (P_t) revised estimates for the number of person-year equivalent LTC Places required at time t (U_t) may be derived as:

$$\sum_r \sum_d N_{rdt} * B_{rd} * C_t$$

[15] Coyte PC, Laporte A, Stewart S (2001); Kane R. and Kane R. (2002).
[16] See Jamieson, A. (1992); Ministry of Social Affairs and Health, (1999); Cates, N. (1993); Vaarama, M. and Kautto, M. (1998).

where N_{rdt} is the population in region r by demographic group d in year t and B_{rd} is the benchmark (or target) utilization rate for LTC in region r by demographic group d that is based on distribution of current utilization rates and the target range used in planning future requirements for each region. The allocation of these LTC Places to various health care settings would depend on the intensity of preference for institutional LTC (P_t) and would be defined as:

$$\sum_r \sum_d N_{rdt} * B_{rd} * C_t * P_t$$

Compression of morbidity is represented by C_t ($=e^{-\alpha t}$) and the intensity of preference for institutional LTC is represented by P_t ($=e^{-\beta t}$). This formulation implies that α measures the rate of compression of morbidity (improvement in health status) and β measures the rate of depreciation in the preference for institutional LTC beds. A range of values (0.000, 0.005, 0.010, 0.015) for α and β are explored.

This formulation ensures that the factor representing the compression of morbidity (C_t) will yield a direct effect on requirements for LTC Places, while the factor representing preferences for health care settings (P_t) will only influence the assignment of such utilization between in-home continuing care and institutional LTC beds. In terms of the utilization of in-home services, two effects are expected. First, there will be a shift away from institutional LTC for those who would otherwise have received LTC should more care recipients express a preference for home versus institutional LTC (i.e. $P_t \neq 1$). Second, there will be a shift away from in-home continuing care for those who, due to the compression of morbidity, may no longer need in-home continuing care (i.e. $C_t \neq 1$). Thus, the overall use of in-home continuing care will depend on the strength of these two offsetting effects.

IV. Results

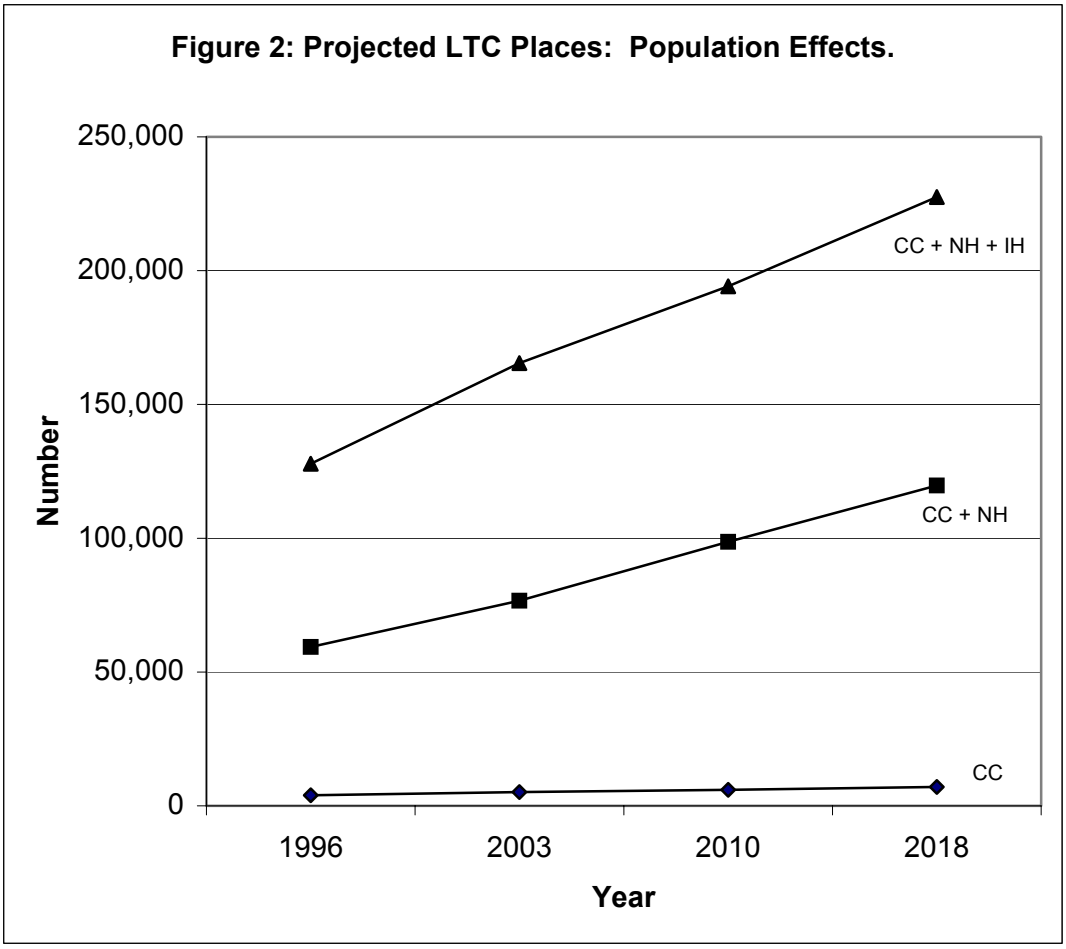
(i) The Impact of Population Change

Use of revised population figures results in a minor increase (127,543 to 127,870) in the estimated number of LTC Places required in Ontario in 1996. It should be noted that while the required number of Chronic care beds falls (3,980 to 3,972), as does the number of NH/HA beds (55,582 to 55,402), person-year equivalent in-home continuing care places increases (67,981 to 68,496). In most Ontario regions (24 of 38), the requirement for LTC Places (i.e. institutional Chronic care, NH/HA beds, and in-home continuing care) declines.[17] Revised population estimates for 2003 lowers the overall number of required LTC Places for 2003 by 1.4% from 167,777 to 165,479 (even though compared to 1996, required LTC Places are increased by 29.4%, Table 1). The revised population estimates have a differential impact on each health care setting: Chronic care (-1.5%), NH/HA (-1.2%); and in-home continuing care (-1.5%). In 2010 and 2018, the number of required LTC Places is forecast to increase to 194,147 and 227,535, respectively, up 51.8% and 77.9% from the revised figure for 1996 (Table 1). Using the revised population figures, the required number of Chronic Care beds, NH/HA beds, and in-home continuing care is expected to increase by 77.5%, 103.4% and 57.4% between 1996 and 2018 (Figure 2). Over the same period, the distribution of LTC Places across health care settings is expected to shift from in-home continuing care (53.6% to 47.4% of LTC Places) to NH/HA beds (43.3% to 49.5% of LTC Places) with Chronic Care beds remaining constant at 3.1% of LTC Places.

[17] Appendices A to D for breakdown by region and care setting.

Table 1: Impact of Revised Population Estimates on the Required Number of LTC Places in Ontario.

	1996	2003	2010	2018
Requirement for LTC Places				
Original Population Estimates	127,543	167,777	N/A	N/A
Revised Population Estimates	127,870	165,479	194,147	227,535
Requirement for Chronic Care Beds				
Original Population Estimates	3,980	5,193	N/A	N/A
Revised Population Estimates	3,972	5,114	6,002	7,049
Requirement for NH/HA Beds				
Original Population Estimates	55,582	72,424	N/A	N/A
Revised Population Estimates	55,402	71,548	92,643	112,674
Requirement for person-year equivalent In-home Continuing Care				
Original Population Estimates	67,981	90,160	N/A	N/A
Revised Population Estimates	68,496	88,817	95,501	107,811



Note: CC = Chronic Care Beds; NH = Nursing Home / Homes for the Aged Beds; IH = In-home Continuing Care

(ii) The Impact of Compression of Morbidity[18]

The compression of morbidity factor C_t was applied to the revised population estimates, across all demographic groups. The population of the province (total and by region) was then allocated, based on the MDS/RUG III system, into the proportion requiring Chronic care and NH/HA care with the residual allocated to In-home continuing care. As the rate of compression, α, is varied from 0 to 0.015, the overall number of LTC Places required in 2003 is predicted to decline from the earlier estimate of 165,479 to 148,985 (Table 2). This represents a decline of 10%. For 2010, the predicted number of Places ranges from 194,147 ($\alpha = 0$) to 157,372 ($\alpha = 0.015$), a decline of 19%, while that for 2018 ranges from 227, 535 ($\alpha = 0$) to 163,580 ($\alpha = 0.015$), a decline of 28.1% (Table 2). When α reaches 0.015, the estimated number of LTC Places required in 2010 and 2018 drops below the level predicted for 2003 ($\alpha = 0$), which implies that the improved health status of the population (compression of morbidity) more than offsets the impact of the demographic shift on the need for LTC Places.

Table 2: Effect of Compression of Morbidity on the Required Number of LTC Places

	1996	**2003**	**2010**	**2018**
$\alpha = 0$	127,869	165,479	194,147	227,535
$\alpha = 0.005$	127,869	159,787	181,021	203,833
$\alpha = 0.010$	127,869	154,291	168,783	182,601
$\alpha = 0.015$	127,869	148,985	157,372	163,580

In the absence of compression of morbidity (i.e. $\alpha = 0$), 5,114 Chronic Care beds are required by 2003. As α, and hence, compression increases from 0 to 0.015, the number of required beds falls by 10% to 4,605 (Table 3). The number of Chronic Care beds was forecast to increase to 6,002 by

[18] The regional level data for total LTC Places and by setting are reported in Appendices E and F.

2010 and to 7,049 by 2018. However, inclusion of compression of morbidity lowers these requirements, but does not eliminate the increase. Specifically, instead of a 77.5% increase in Chronic Care bed requirements from 1996 to 2018 when $\alpha = 0$, these requirements are anticipated to increase by only 27.6% when $\alpha = 0.015$.

Table 3: Effect of Compression of Morbidity on the Required Number of Chronic Care and NH/HA beds and person-year equivalent In-home Continuing Care Places.

Chronic	**1996**	**2003**	**2010**	**2018**
$\alpha = 0$	3,972	5,114	6,002	7,049
$\alpha = 0.005$	3,972	4,938	5,596	6,315
$\alpha = 0.010$	3,972	4,769	5,218	5,657
$\alpha = 0.015$	3,972	4,605	4,865	5,068

NH/HA	**1996**	**2003**	**2010**	**2018**
$\alpha = 0$	55,402	71,548	92,643	112,674
$\alpha = 0.005$	55,402	69,087	86,380	100,937
$\alpha = 0.010$	55,402	66,710	80,540	90,423
$\alpha = 0.015$	55,402	64,416	75,095	81,004

In-home	**1996**	**2003**	**2010**	**2018**
$\alpha = 0$	68,496	88,817	95,501	107,811
$\alpha = 0.005$	68,496	85,762	89,045	96,581
$\alpha = 0.010$	68,496	82,812	83,025	86,521
$\alpha = 0.015$	68,496	79,964	77,412	77,508

Requirements for NH/HA beds are reported in Table 3. In the absence of compression of morbidity, 71,548 NH/HA beds are estimated for 2003. Allowance for compression of morbidity from $\alpha = 0$ to $\alpha = 0.015$, lowers NH/HA requirements for 2003 by 10% from 71,548 beds to 64,416 beds. Moreover, instead of an increase in NH/HA bed requirements of 103.4% from 1996 to 2018 when $\alpha = 0$, the increase anticipated falls to 46.2% when $\alpha = 0.015$. Between 2003 and 2018, even

a high compression of morbidity ($\alpha = 0.015$) is insufficient to offset the demographic shift. It is anticipated, therefore, that the number of NH/HA beds required will increase in the coming two decades even assuming a relatively high rate of compression of morbidity.

Requirements for in-home continuing care for 2003 are affected by the magnitude of compression of morbidity from (Table 3). While requirements for the number of person-year equivalent in-home continuing care places is expected to increase by 57.4% from 1996 to 2018, without compression of morbidity, this increase shrinks to 13.2% if $\alpha = 0.015$. Consequently, requirements for in-home continuing care are sensitive to the selected rate of compression of morbidity.

(iii) The Impact of Changing Preferences[19]

A certain proportion of the population will have health conditions that are not appropriately accommodated in the in-home continuing care setting, even if their preference is to receive care at home. Thus, the preference factor was not applied to that proportion of the population deemed to require a Chronic Care bed. As a consequence, application of the preference factor P_t merely alters the allocation of the remaining LTC population to NH/HA beds and in-home continuing care.

The effect of preferences for in-home care (i.e. changes in β) on requirements for NH/HA beds and person-year equivalent in-home continuing care places is represented in Table 4. An increase in preference for in-home care (i.e. an increase in β) yields a shift from NH/HA to in-home continuing care that offsets (for NH/HA beds) the upward trend in requirements due to demographic change. Specifically, in the absence of a shift in preferences towards in-home care ($\beta = 0$), requirements for

[19] The regional level data for total LTC Places and by setting are reported in Appendix G.

NH/HA beds were projected to increase by 103.4% between 1996 and 2018, while in-home continuing care requirements were to increase by 57.4%. Inclusion of preferences for in-home care with $\beta = 0.015$ lowers the increase in NH/HA beds required between 1996 and 2018 from 103.4% to 46.2%, and increases in-home continuing care requirements from 57.4% to 103.6%.

Table 4: Impact of Changing Preferences on the Required Number of Chronic Care and NH/HA beds and person-year equivalent In-home Continuing Care places.

Chronic	**1996**	**2003**	**2010**	**2018**
$\beta = 0$	3,972	5,114	6,002	7,049
$\beta = 0.005$	3,972	5,114	6,002	7,049
$\beta = 0.010$	3,972	5,114	6,002	7,049
$\beta = 0.015$	3,972	5,114	6,002	7,049

NH/HA	**1996**	**2003**	**2010**	**2018**
$\beta = 0$	55,402	71,548	92,643	112,674
$\beta = 0.005$	55,402	69,087	86,380	100,937
$\beta = 0.010$	55,402	66,710	80,540	90,423
$\beta = 0.015$	55,402	64,416	75,095	81,004

In-home	**1996**	**2003**	**2010**	**2018**
$\beta = 0$	68,496	88,817	95,501	107,811
$\beta = 0.005$	68,496	91,278	101,764	119,548
$\beta = 0.010$	68,496	93,654	107,604	130,062
$\beta = 0.015$	68,496	95,948	113,049	139,482

(iv) The Overall Impact

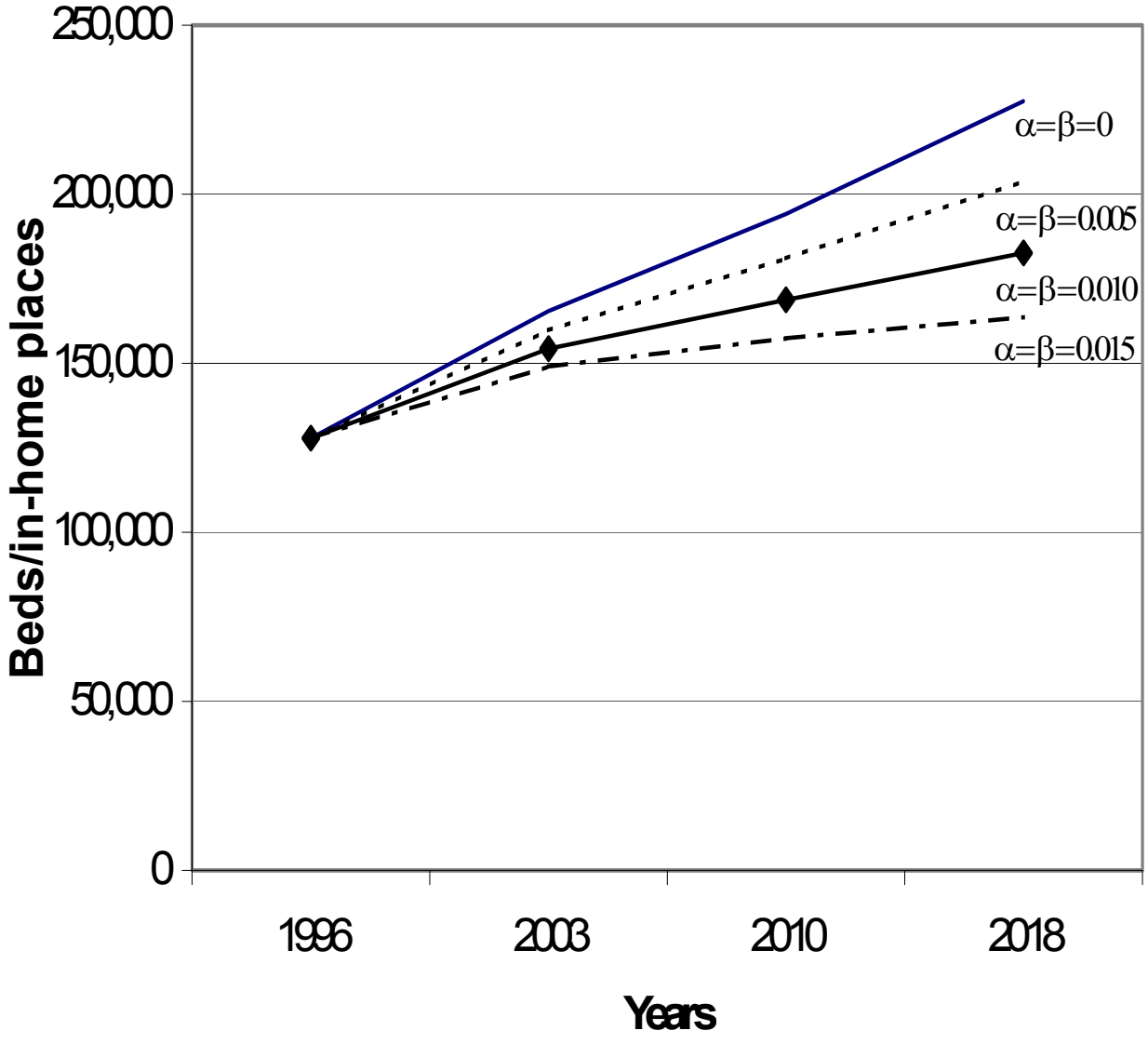
In this section, we consider the combined effect of morbidity compression and changing preferences on the projected number of LTC Places. Herein the baseline case in which $\alpha = \beta = 0.010$ is discussed. These values represent the middle-range estimates of α and β values used in the analysis and will provide the baseline estimates for the ensuing discussion. Figure 3 portrays the required

number of LTC Places 1996 to 2018 for various values of morbidity compression (α) and preferences for health care setting (β).

Comparison between the LTC requirement estimates developed for the HSRC for 2003 (Table 1) and those associated with the revised estimates based on the preceding discussion yields significant divergence. A small component of this variance was attributed to the revised population figures that lowered the estimated requirements for Chronic Care beds (-1.5%), NH/HA beds (-1.2%) and person-year equivalent in-home continuing care places (-1.5%). Inclusion of baseline estimates for compression of morbidity (α = 0.010) and preferences for institutional care (β = 0.010), lead to a further reduction in estimated requirements for Chronic Care (-6.7%) and NH/HA (-13.1%) beds and in-home continuing care (-1.7%). Compared to the HSRC estimates, revised baseline estimates for 2003 suggest that the requirements for Chronic Care beds would fall by 8.2%, that for NH/HA beds would fall by 14.1%, and that for person-year equivalent in-home continuing care places would fall by 3.1% (Table 5). These effects compound with time and yield significant effects on requirements for LTC beds and in-home continuing care for 2010 and 2018 (Figures 4a-4c).

While the revised estimates are lower and diverge from those reported by the HSRC, baseline estimates for requirements for LTC Places in 2003 are 20.7% higher than those in 1996. Moreover, the requirements for Chronic Care and NH/HA beds are 20.1% and 12.3%, respectively, higher than those in 1996, thereby resulting in increased bed requirements for 2003 (compared to 1996). Furthermore, requirements for in-home continuing care are 27.5% higher than those for 1996. Together, these revised estimates highlight the importance of LTC planning and the need for LTC capacity enhancement for a range of health care settings.

Figure 3: The Impact of Compression of Morbidity (α) and Changing Preferences (β) on the Required Number of Long Term Care Places

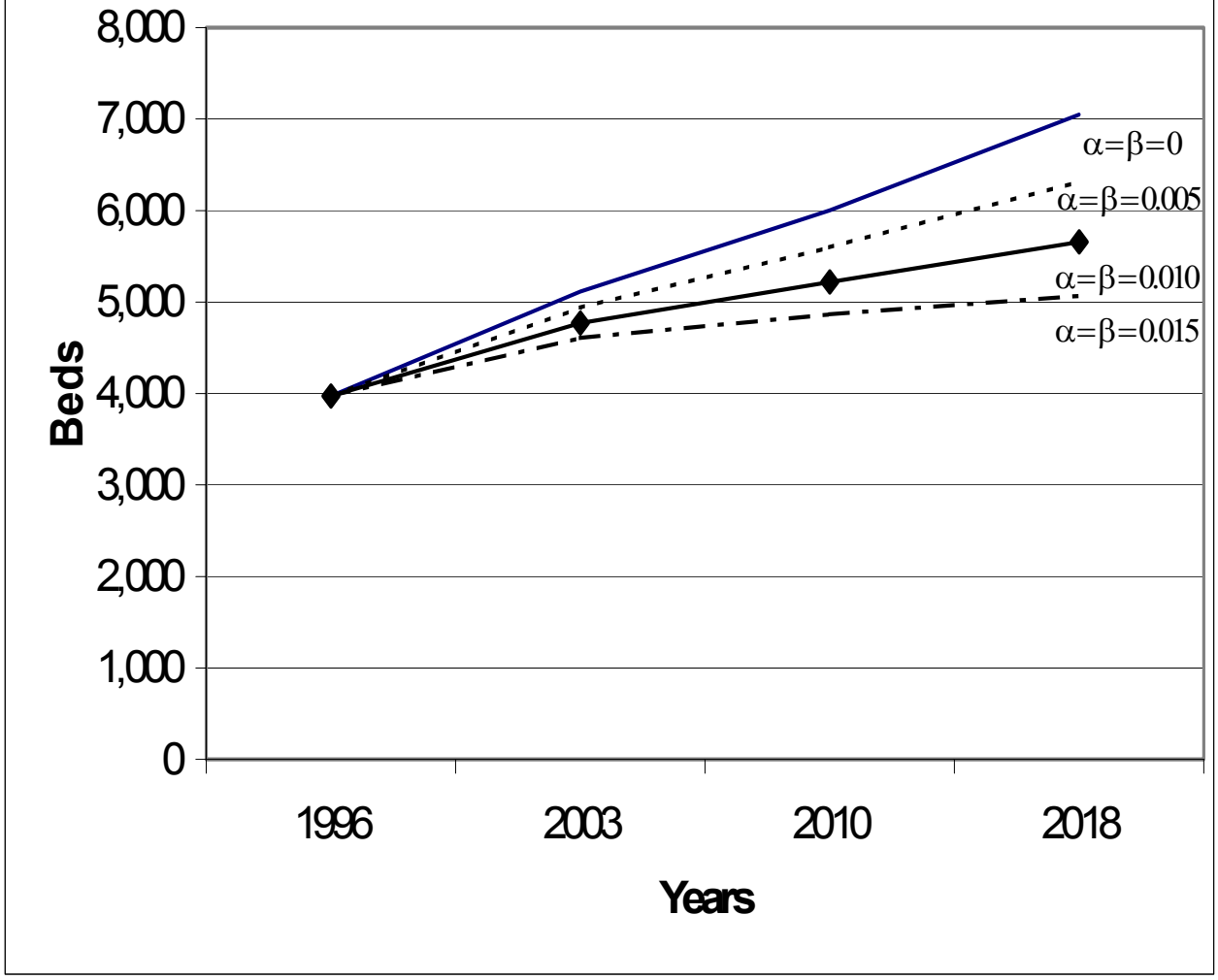


Note: α = Rate of morbidity compression; β = Rate of preference shift

Table 5: Impact of Compression of Morbidity (α) and Changing Preferences (β) on the Required Number of Beds and person-year equivalent In-home Continuing Care places using Revised Population Estimates. (CC = Chronic Care, NH = Nursing Home/Home for the Aged, IH = In-home Continuing Care)

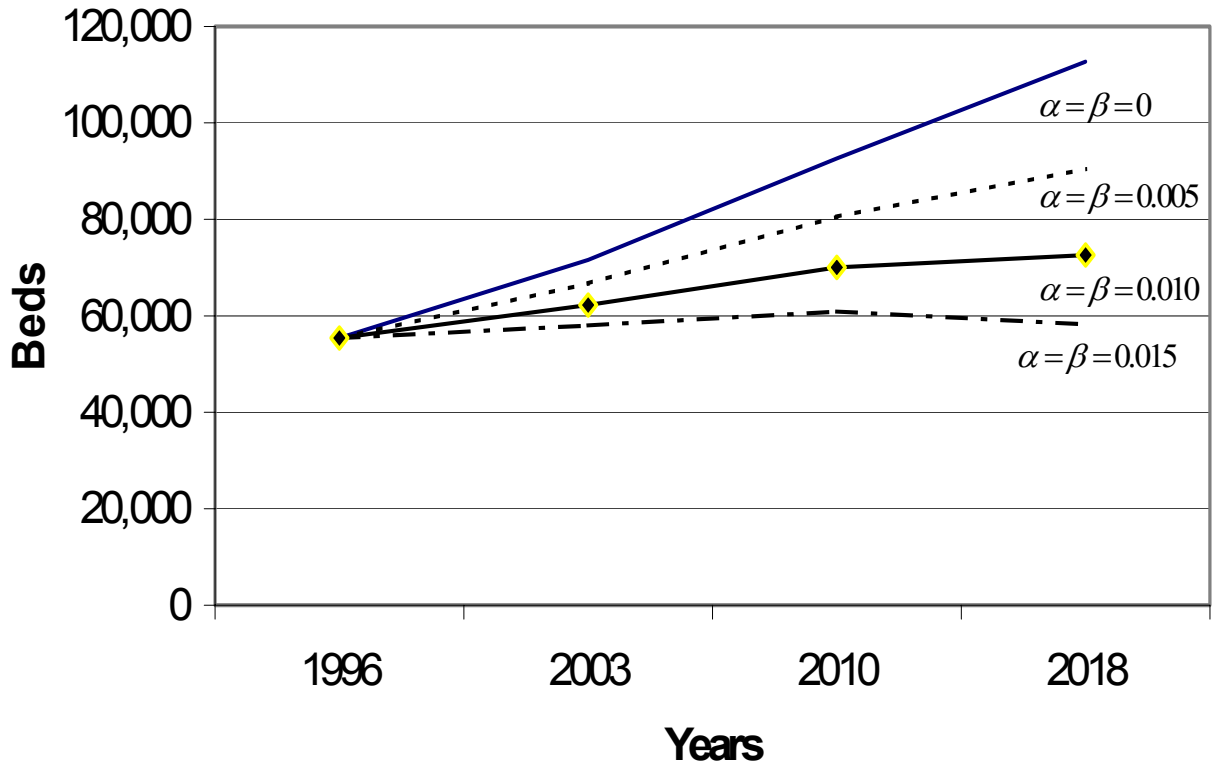
		α			
1996		*0.000*	*0.005*	*0.010*	*0.015*
β	*0.000*	**CC: 3,972** **NH: 55,402** **IH: 68,496**	--	--	--
	0.005	--	--	--	--
	0.010	--	--	--	--
	0.015	--	--	--	--
2003		*0.000*	*0.005*	*0.010*	*0.015*
β	*0.000*	**CC: 5,114** **NH: 71,548** **IH: 88,817**	CC: 4,938 NH: 69,087 IH: 85,762	CC: 4,769 NH: 66,710 IH: 82,812	CC: 4,605 NH: 64,416 IH: 79,964
	0.005	CC: 5,114 NH: 69,087 IH: 91,278	**CC: 4,938** **NH: 66,710** **IH: 88,138**	CC: 4,769 NH: 64,416 IH: 85,107	CC: 4,605 NH: 62,200 IH: 82,180
	0.010	CC: 5,114 NH: 66,710 IH: 93,654	CC: 4,938 NH: 64,416 IH: 90,433	**CC: 4,769** **NH: 62,200** **IH: 87,322**	CC: 4,605 NH: 60,061 IH: 84,319
	0.015	CC: 5,114 NH: 64,416 IH: 95,948	CC: 4,938 NH: 62,200 IH: 92,648	CC: 4,769 NH: 60,061 IH: 89,462	**CC: 4,605** **NH: 57,995** **IH: 86,385**
2010		*0.000*	*0.005*	*0.010*	*0.015*
β	*0.000*	**CC: 6,002** **NH: 92,643** **IH: 95,501**	CC: 5,596 NH: 86,380 IH: 89,045	CC: 5,218 NH: 80,540 IH: 83,025	CC: 4,865 NH: 75,095 IH: 77,412
	0.005	CC: 6,002 NH: 86,380 IH: 101,764	**CC: 5,596** **NH: 80,540** **IH: 94,885**	CC: 5,218 NH: 75,095 IH: 88,470	CC: 4,865 NH: 70,018 IH: 82,489
	0.010	CC: 6,002 NH: 80,540 IH: 107,604	CC: 5,596 NH: 75,095 IH: 100,330	**CC: 5,218** **NH: 70,018** **IH: 93,547**	CC: 4,865 NH: 65,284 IH: 87,222
	0.015	CC: 6,002 NH: 75,095 IH: 113,049	CC: 5,596 NH: 70,018 IH: 105,406	CC: 5,218 NH: 65,284 IH: 98,280	**CC: 4,865** **NH: 60,871** **IH: 91,636**
2018		*0.000*	*0.005*	*0.010*	*0.015*
β	*0.000*	**CC: 7,049** **NH: 112,674** **IH: 107,811**	CC: 6,315 NH: 100,937 IH: 96,581	CC: 5,657 NH: 90,423 IH: 86,521	CC: 5,067 NH: 81,004 IH: 77,508
	0.005	CC: 7,049 NH: 100,937 IH: 119,548	**CC: 6,315** **NH: 90,423** **IH: 107,095**	CC: 5,657 NH: 81,004 IH: 95,940	CC: 5,068 NH: 72,566 IH: 85,946
	0.010	CC: 7,049 NH: 90,423 IH: 130,062	CC: 6,315 NH: 81,004 IH: 116,514	**CC: 5,657** **NH: 72,566** **IH: 104,378**	CC: 5,068 NH: 65,007 IH: 93,505
	0.015	CC: 7,049 NH: 81,004 IH: 139,482	CC: 6,315 NH: 72,566 IH: 124,952	CC: 5,657 NH: 65,007 IH: 111,937	**CC: 5,068** **NH: 58,236** **IH: 100,277**

Figure 4a: The Impact of Compression of Morbidity (α) and Changing Preferences (β) on the Required Number of Chronic Care Beds



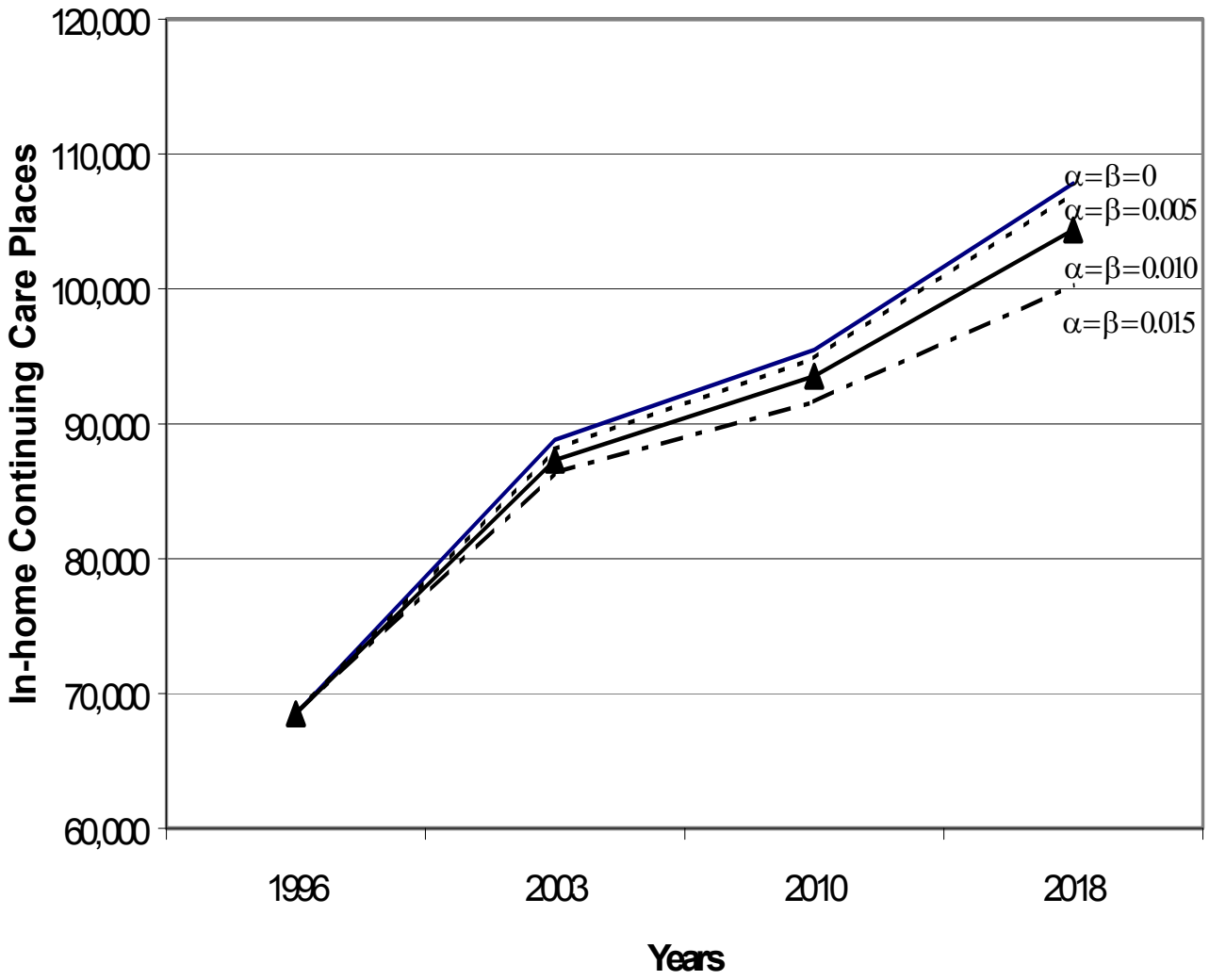
Note: α = Rate of morbidity compression; β = Rate of preference shift.

Figure 4b: The Impact of Compression of Morbidity (α) and Changing Preferences (β) on the Required Number of NH/HA Beds



Note: α = Rate of morbidity compression; β = Rate of preference shift.

Figure 4c: The Impact of Compression of Morbidity (α) and Changing Preferences (β) on the Number of Person-Year Equivalent In-home Continuing Care Places



Note: α = Rate of morbidity compression; β = Rate of preference shift.

Based on the estimated rate of LTC utilisation (127,543) in Ontario in 1996, the original HSRC planning model predicted that approximately 20,000 additional institutional LTC (Chronic Care and NH/HA) beds would be required by 2003. The revised LTC planning model presented in this report which used baseline values for compression and preferences of $\alpha = \beta = 0.010$, suggests that an additional 7,595 institutional LTC beds would be required in 2003, 15,862 in 2010 and 18,849 in 2018.[20] In other words, only by 2018 would approximately 20,000 new institutional LTC beds be fully utilised. These results indicate that the forecasts produced by the original planning model are quite sensitive to even modest assumptions about changes in compression of morbidity and preferences for the setting for LTC.

V. Limitations of Study

Before considering the implications of the above findings for policy, it is necessary to highlight a number of assumptions and limitations to the data and the analyses that may have an impact on the findings. They are:

- Future population estimates are just that, estimates. Actual figures, as shown in this study, often diverge from projections, thereby affecting in either a positive or negative direction the predictions.
- The analyses hold constant the demographic characteristics of the population; i.e., the rate of population replacement (birth rate, and migration in and out of the country); the dependency ratio (the number of individuals in the workforce versus the number of dependents (children, the

[20] In 2003, the estimated requirement for both Chronic Care and NH/HA beds using the revised LTC planning model, with $\alpha = \beta = 0.010$, would be 66,969, while the number of beds utilized in 1996 was 59,374. Consequently, the number of new LTC beds needed by 2003 would be 7,595. Similarly, the number of new beds needed for 2010 and 2018 are 15,862 and 18,849, respectively.

elderly, etc.) in the population); the changing nature of the workforce, and therefore the availability of future family caregivers to allow seniors to live out their preferences for less intrusive/dependent environments; etc.

- The analyses assume that the compression of morbidity is a uniform population effect. However, there is some evidence indicating that health status and disability varies by gender, race and by socio-economic status (education, occupation, income, etc.), such that women and individuals of low income and lower levels of education have poorer health.[21] Moreover, some evidence also shows that utilization of health services by the elderly is correlated with health status.[22] While it is valid to assume a uniform population effect on a macro planning level, the correlation of health status and gender, race, and SES requires greater subtlety when considering policy levers.
- Numerous explanations for the decline in disability have been offered, which include: medical care improvements (e.g., joint replacement surgery, cataract surgery, nonsteroidal anti-inflammatory drugs, anti-hypertension medication); improvements in health behaviour (e.g., decline in smoking); increased use of aids which allow people to cope with impairments (e.g., walkers, microwave ovens); improved educational levels and work histories; and the decline in infectious diseases. Without more knowledge of the factors responsible for the downward trend in disabilities, it is difficult to be accurate about forecasts for future needs. Nevertheless, the diversity in contributing factors suggests a continuation in the direction of change, if not the magnitude of change.[23]
- The analyses assume that preferences are not overruled by need and are static over age, sex, health status and social circumstances. This assumption simplifies the analysis and allows

[21] Ulysse (1997); Crimmins and Saito (2001); Cutler (2001); Wolf (2001).
[22] Black et al. (1995).
[23] D. Cutler (2001).

Chronic Care to be invariant to the preference factor. Of course, there may be some high intensity residents of NH/HA who may be best cared for in their current setting, rather than at home. If these residents were common, the revised estimates would overestimate the shift towards in-home continuing care.

VI. Policy Implications

Based on the HayGroup's earlier analysis, to prepare for the increasing number of seniors in the population, Ontario made the decision to add an additional 20,000 new A-standard LTC beds to its institutional stock and to upgrade its existing stock. With the new beds, Ontario will have a bed ratio of 99 beds/1000 population over the age of 75 by the year 2006. Maintaining this bed ratio into the future will require considerable capital investment given population projections. However, the above analysis provides a simulation of the moderating impact of the compression of morbidity and seniors' preferences for care settings on the future need for in-home and community care, chronic continuous care, and residential LTC care. Using the baseline α and β values of 0.01, only by the year 2018 would Ontario need an additional 18,849 beds to be added to its 1996 stock. The requirements in the other two care settings would similarly be moderated. These analyses have obvious implications for future expansions of home care and institutional care, the overall costs of LTC, and the timeframe over which adjustments to the capacity of each care setting need to be accomplished. The Organization for Economic Cooperation and Development (OECD) demonstrated that decreasing trends in disability and institutionalization, if they continue, will moderate LTC costs.[24]

[24] OECD (2002).

While the data show that Ontario has built more institutional capacity than it will need, it still has one of the lower bed ratios per 1000 population 75+ and a much more balanced mix of institutional and in-home care than other jurisdictions in Canada.[25] The 20,000 new beds not only added to the existing stock, but also expanded the availability of A-standard beds. Nevertheless, these findings indicate the value of exploring other policy options to institutional care and to the provision of a third and intermediate alternative to institutional and in-home care.

The average income of seniors has not only risen 18% between 1981 and 1997, but also comes from a diversity of sources affording them a greater measure of financial security and independence.[26] These higher levels of income, along with the preferences of seniors to 'age-in-place' and to maintain independence, privacy and autonomy, will likely lead to greater demands on non-institutional alternatives. Given the relative cost effectiveness of in-home compared to institutional care,[27] Ontario might consider providing greater assistance or incentives for home modifications, as well as opportunities and incentives to owners of B, C and D-standard beds (and to other private entrepreneurs) to create other forms of seniors' congregate housing, such as assisted living and supportive housing units.[28] These policy options will allow tomorrow's elderly to live out their preferences.

[25] Baranek et al. (2002).
[26] Statistics Canada (2000).
[27] Hollander (2001a, 2001b, 2001c).
[28] For a review of assisted living as a potential policy option for Canada, see Golant S. (2000).

Even without taking seniors' preferences into consideration, the moderating effect of improving health status of today and tomorrow's elderly, indicates the importance of this factor to future planning and LTC costs. To ensure continued improvements in health, provincial governments would be well advised to provide resources to health promotion and disease/disability prevention initiatives, to environmentally sustainable development, and to other initiatives that contribute to overall health and well-being. Moreover, given the correlation between health status and gender, race, and SES, the design of these policy levers should be sensitive and tailored to these variations.

Declining birth rates and increasing life expectancies have implications for the ability of future workforces to provide the goods and services for its dependents, and to fund the tax base necessary to provide publicly funded services for the elderly.[29] In addition, the increased participation of women in the workforce has implications for future family caregiving. The LTC sector has traditionally relied more on the supplemental nature of family caregiving than other health sectors. To ensure the continuation of their involvement in the care of elderly family members, Ontario could introduce various initiatives to assist family caregivers. For example, Australia provides a number of supports for family caregivers, which include improved financial support, respite, and information and support services. Assistance with the costs of care is available through a Carer Allowance and caregivers may be eligible for income support through a Carer Payment.[30]

Over expansion in LTC bed capacity has the tendency to alter practices and behaviours. Specifically, thresholds for LTC placement may be modified through the increased availability of LTC beds, the elderly may elect placement in preferred accommodation at a new NH/HA rather

[29] OECD (2000).

than accept a place at a retirement home, and some individuals may accept LTC bed placement rather than receive care at home. Each of these diverse effects modifies the revenue streams, cost structures, and other incentives for a range of stakeholders, and thereby, has lasting implications for 21st century health care in Ontario. Before adopting future recommendations for radical health service restructuring, it may be advisable to undertake a more comprehensive assessment of the diverse effects associated with such reforms.

Finally, planning is an inexact exercise and needs to be an ongoing process. Planning algorithms need to be continually updated not only with more current estimates data, but also with new evidence of other influencing factors that become available. Governments are well versed in this activity. This study shows the importance and benefits of considering changing health status and preferences of the elderly in planning for future care.

[30] OECD (1999).

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