KCE REPORTS 167B

Federaal Kenniscentrum voor de Gezondheidszorg
Centre Fédéral d'Expertise des Soins de Santé
Belgian Health Care Knowledge Center

SOINS RÉSIDENTIELS POUR LES PERSONNES ÂGÉES EN BELGIQUE : PROJECTIONS 2011-2025

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HEALTH SERVICES RESEARCH

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PRÉFACE

Le vieillissement de notre société résonne comme une complainte qui domine tous les discours sur l'avenir de la sécurité sociale et des soins de santé. Celle-ci rappelle inlassablement qu'il faut absolument prendre des mesures aujourd'hui si on veut éviter des catastrophes demain. Pour justifier ce cri d'alarme, des statistiques fusent, censées prouver l'urgence de la situation. Mais pour définir une politique valable à long-terme, mieux vaut disposer d'un modèle de projection solide, de telle manière que les investissements pour l'avenir soient basés sur les estimations les plus réalistes.

Tous les acteurs impliqués dans les soins aux personnes âgées sont bien conscients que le moratoire qui limite la croissance des places en secteur résidentiel ne pouvait être maintenu indéfiniment. Toutefois, il n'était pas évident de définir précisément par quoi il fallait le remplacer. Aussi, le KCE a-t-il été sollicité pour conduire une étude qui permette d'estimer l'ampleur de l'utilisation des structures de soins par les personnes âgées pour les 10 à 15 prochaines années.

La construction de modèles de projection exige une expertise spécifique. Le partenariat avec les experts du Bureau fédéral du Plan a permis de disposer du savoir-faire nécessaire pour ce type d'études. Grâce à leur apport scientifique et à l'exploitation de diverses bases de données, nous pouvons proposer aujourd'hui un modèle de projection performant.

Il s'efforce d'apporter des réponses aux questions posées, conjointement à l'estimation des effets possibles de scénarios alternatifs reposant sur des hypothèses. Par ce travail, nous espérons avoir contribué à l'élaboration d'une politique scientifiquement fondée pour les soins aux personnes âgées dans les décennies à venir.

Jean-Pierre CLOSON
Directeur Général Adjoint

Raf MERTENS
Directeur Général

RÉSUMÉ

CONTEXTE

Effets du vieillissement

Selon le Bureau fédéral du Plan (2011), la proportion de personnes âgées (65 ans et plus) devrait passer de 17% environ en 2010 à 21% en 2025, voire à 26% en 2050. La proportion des personnes de 85 ans et plus progressera encore plus : de 2,2% en 2010 à 3% en 2025 et à 5,8% en 2050. Ceci induira une augmentation de la proportion de personnes âgées devant bénéficier d'une aide dans les activités de la vie quotidienne.

Soins de longue durée

Le système belge de soins de longue durée (SLD) comprend :

- Les soins infirmiers à domicile et l'assistance familiale ;
- Les centres de jour et de court séjour;
- Les résidences-services et structures équivalentes, combinant logements individuels et prestations collectives ;
- Les maisons de repos (MRPA) pour les personnes âgées ;
- Les maisons de repos et de soins (MRS).

Au premier janvier 2011, le nombre total de lits résidentiels était de 129 732 (MRPA et MRS) ou de 133 370 (en y ajoutant les places pour court séjour et soins de jour).

Protocoles d'accord et moratoire

En 1997, 2003 et 2005, trois protocoles d'accord ont été conclus entre le pouvoir fédéral et les instances régionales. Ils ont pour objectif de remplacer progressivement les lits en MRPA par des lits MRS, afin de garantir un meilleur encadrement et donc un meilleur financement des résidents dépendants de soins.

Pour maîtriser les dépenses, un moratoire a été imposé, bloquant le nombre total de lits MRPA et MRS à 140 049 pour l'ensemble du pays. Des discussions sont actuellement en cours pour déterminer la politique à mener après l'expiration de ce moratoire.

OBJECTIFS DE L'ÉTUDE

L'étude a été commanditée par le SPF Santé publique, dans le but de disposer d'une projection scientifiquement fondée de l'évolution (2011-2025) du nombre de demandeurs de soins résidentiels.

MÉTHODES

- Etude de la littérature, pour identifier les déterminants du recours aux soins de longue durée, ainsi que les modèles qui existent actuellement pour prévoir les besoins en soins de longue durée.
- Consultation des bases de données disponibles, pour identifier les données nécessaires pour alimenter le modèle de projection.
- Construction d'un modèle de projection comprenant la plupart des déterminants de l'utilisation des SLD.
- Estimation des probabilités de transition d'une situation de SLD à une autre.
- Projection de l'évolution globale du recours aux soins résidentiels, avec un scénario de base et six scénarios alternatifs.

RÉSULTATS

Déterminants du recours aux SLD

Facteurs prédictifs

Parmi tous les facteurs prédictifs identifiés dans la littérature, l'âge avancé, le fait de ne pas être propriétaire d'un logement, les déficiences fonctionnelles et cognitives et le fait de vivre seul influent fortement sur la probabilité d'être institutionnalisé. Les pathologies chroniques qui sont fortement associées à une institutionnalisation sont la démence (principalement), l'AVC, le diabète, la fracture de la hanche, la maladie de Parkinson, la dépression et les autres problèmes mentaux.

Modèles de projection existants

La plupart des modèles de projection des SLD élaborés pour des pays développés sont des macro-modèles statiques ('cell-based'). Tous

prédisent de fortes augmentations de la demande en/du recours à des soins formels, y compris institutionnels, dans les décennies qui viennent.

Bases de données disponibles pour le développement de modèles

1. L'Enquête de Santé par Interview (2004 et 2008). Etant transversale, elle ne permet pas d'estimer les taux de transition entre situations de SLD;
2. L'échantillon permanent (EPS) des bénéficiaires de l'assurance maladie publique : données de remboursement. Permet d'estimer les taux de transition entre situations de SLD. Les limitations fonctionnelles ont pu être imputées pour chaque sujet de 65 ans et + en utilisant une équation estimée sur la base de l'Enquête de Santé.

Spécification du modèle

Le modèle de projection est un macro-modèle de simulation ('cell-based'), partiellement dynamique, en ce sens qu'il utilise des taux de transition entre situations de SLD, qui tiennent compte de la situation pendant la période précédente, de l'âge, du sexe, du risque de limitation fonctionnelle, de la situation familiale et de la province de résidence.

Les projections sont effectuées pour chaque année entre 2011 et 2025. Le modèle contient les déterminants les plus importants du recours aux SLD: 1) population par âge et par sexe; 2) situation familiale (co-résidents); et, 3) limitations fonctionnelles.

La probabilité de recourir aux soins résidentiels est relativement faible pour les personnes qui ne recevaient pas précédemment de SLD. Elle est nettement plus élevée pour les personnes recevant des soins à domicile.

Les personnes qui entrent en SLD ont une espérance de vie beaucoup plus courte. Une fois en soins résidentiels, les probabilités de recourir à un niveau de soins supérieur sont importantes. En revanche, les probabilités de passer à un niveau inférieur sont nettement moindres, tandis que les chances de sortie (autrement que pour cause de décès) sont très faibles.

Il existe une forte corrélation entre les limitations fonctionnelles et l'entrée en structures résidentielles. L'impact de l'âge est assez limité, dès que l'on a pris en compte les limitations fonctionnelles. Les personnes qui vivent avec un/une partenaire ou un enfant sont moins susceptibles d'entrer en soins résidentiels. Il existe des différences importantes entres les provinces, qui pourraient être liées au niveau de l'offre en soins résidentiels.

Evolution prévue de la demande en soins résidentiels

Les projections concernent la *demande* en établissements de soins, dans le sens de leur *utilisation future*, à la condition que toute contrainte en termes d'offre reste au niveau actuel. Les chiffres tiennent compte des personnes en soins résidentiels, non couvertes par le système public belge d'assurance maladie.

Scénario de base

Le nombre projeté de personnes âgées dans les établissements de soins augmente de 125 500 en 2010 à 166 000 en 2025 (soit +32%, Figure 1), mais le niveau de soins ne change pas radicalement. L'augmentation affiche une répartition inégale entre les provinces. Certaines provinces recensant peu de personnes de 85 ans et plus connaîtront un fort effet du vieillissement à l'avenir. En revanche, pour Bruxelles, on prévoit une diminution.

Scénarios alternatifs

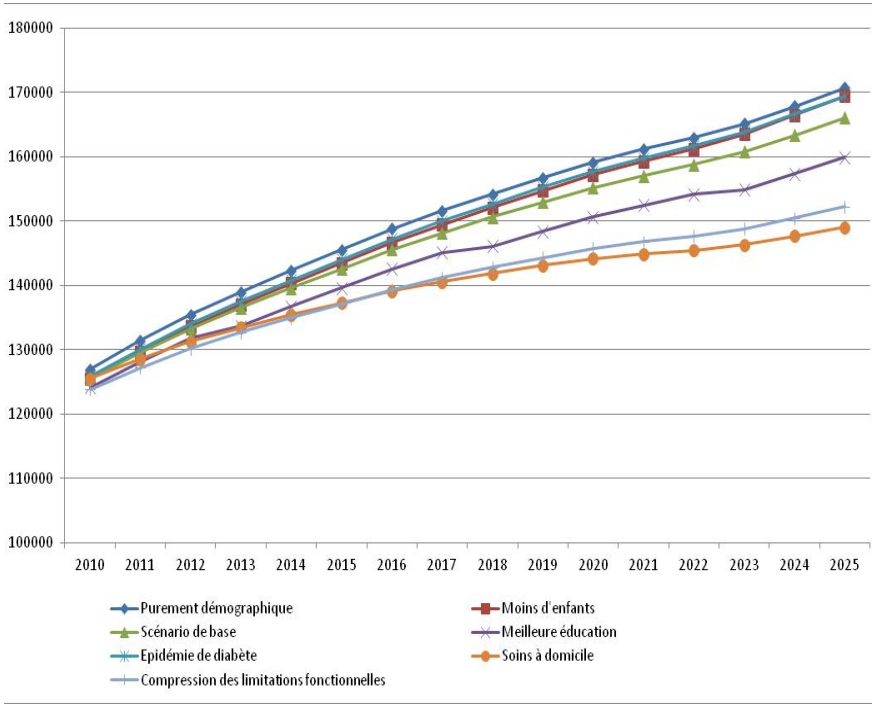
Six scénarios alternatifs ont été testés ; les nombres d'utilisateurs potentiels projetés en établissements de soins en 2025 sont donnés entre parenthèses:

1. **« Meilleure éducation »** : Baisse des pathologies chroniques en relation avec le niveau d'éducation accru de chaque nouvelle cohorte (160 000)
2. **« Compression des limitations fonctionnelles »** : La moitié de l'accroissement projeté de la durée de vie est supposée être sans limitation fonctionnelle (152 000)
3. **« Epidémie de diabète »** : Augmentation de la prévalence de 5% chaque année (170 000)
4. **« Purement démographique »** : La situation familiale des personnes âgées par âge et par sexe ne va pas changer (171 000)
5. **« Moins d'enfants »** : Le nombre d'enfants vivant avec leurs parents âgés diminuera de moitié (169 000)

6. **« Soins à domicile »** : progression de 50% (au-delà de ce qui est exigé par le vieillissement de la population) (149 000)

Si l'on suppose que les différences entre les scénarios s'additionnent, les projections montent même à 177 000 utilisateurs potentiels dans scénario le plus pessimiste.

Figure 1. Projections relatives au nombre de personnes âgées dans les établissements de soins, Belgique 2010-2025, selon différents scénarios.



CONCLUSIONS

L'étude prévoit une forte augmentation du nombre des utilisateurs des établissements de soins, d'environ 125 500 à l'heure actuelle (âgés de 65 ans et plus) à quelque 166 000 en 2025. Dans le scénario le plus favorable, on prévoit que le nombre d'utilisateurs des soins résidentiels sera de 149 000 contre 177 000 en 2025, dans le pire des scénarios.

Sur une base annuelle, l'augmentation équivaut à 1 600 à 3 500 nouvelles places par an.

Des solutions alternatives, du type déploiement de l'offre en soins à domicile, pourraient contribuer à faire face à la demande accrue en soins résidentiels. Néanmoins, même avec une augmentation de 50% au-delà de celle nécessaire pour répondre au vieillissement de la population, le nombre projeté de lits serait toujours de 149 000.

Les modèles de projection devraient être utilisés pour tester les politiques susceptibles d'influencer les besoins en places résidentielles, et il faudra également rester attentif aux conséquences économiques et sociétales engendrées par de nouvelles politiques.

Les quinze à vingt années qui viennent doivent être considérées comme une sorte de période de grâce, à mettre à profit pour préparer la hausse nettement plus accentuée des besoins attendue après 2025.

RECOMMANDATIONS[a]

- **En fonction des différents scénarios basés sur l'évolution de la morbidité, de la dépendance ou de la disponibilité des aidants informels (scénario de base et alternatives 1 à 5), il faudra ouvrir 27 000 (scénario 2) à 45 000 (scénario 4) lits supplémentaires dans le secteur résidentiel pour personnes âgées à l'horizon 2025, soit une augmentation annuelle comprise entre 1 800 et 3 000 lits (3 500 lits si l'on considère le cumul des scénarios pessimistes).**
- **Si l'offre de soins à domicile augmentait de 50% au-delà du développement requis par le vieillissement de la population (scénario 6), 23 500 lits devraient encore être ouverts, soit 1 600 par an.**
- **Le besoin en structures résidentielles sera plus aigu encore après 2025. Il est donc nécessaire d'anticiper cette évolution.**
- **Le développement de l'offre en structures résidentielles devra tenir compte de l'accroissement inégal des plus âgés (> 85 ans) ainsi que de l'offre existante au plan local.**
- **En cas de volonté d'infléchir le recours croissant aux structures résidentielles, des politiques d'encouragement du maintien des personnes âgées à domicile pourraient être envisagées (critères plus sévères d'accès aux structures résidentielles, introduction ou renforcement d'un système d'assurance dépendance, création d'un statut administratif et financier pour l'aidant 'naturel', relèvement des petites pensions, développement des soins à domicile ou de formes de logements adaptées pour personnes âgées, …).**
- **L'impact de ces politiques sur les projections de besoins de nouvelles places dans le secteur résidentiel pourrait être évalué au moyen du modèle développé dans la présente étude, à condition de pouvoir préciser comment elles affecteraient les différentes probabilités de transition. L'estimation des nouvelles probabilités de transition pourrait résulter d'études analysant le résultat d'expériences pilotes, telle que l'étude relative aux alternatives à la prise en charge résidentielle des personnes âgées fragiles, financée par l'INAMI et conduite par un consortium universitaire (protocole 3).**
- **Il conviendrait également pour chacune de ces alternatives d'accorder une attention particulière à ce qu'elles impliquent en matière de besoins en personnel qualifié.**

[a] Le KCE reste seul responsable des recommandations faites aux autorités publiques

- **Enfin, le KCE recommande de ne pas négliger dans l'évaluation des alternatives politiques les problèmes sociétaux et d'accessibilité financière que certaines réformes pourraient entraîner.**

SCIENTIFIC REPORT

TABLE DES MATIÈRES

ABRÉVIATIONS

ABRÉVIATION	DÉFINITION
AAEP	Allowance for Assistance to Elderly Persons
ADL	Activities of Daily Living
ASIM	Äldre Simulering (Elderly Simulation)
AWG	Ageing Working Group (of the European Economic Policy Committee)
BS	Belgisch Staatsblad
COCOF	Commission communautaire française
COCOM	Commission communautaire commune
COPD	Chronic Obstructive Pulmonary Disease
CPAS	Centre Public d'Aide Sociale
EPS	Echantillon Permanent(e) Steekproef
FELICIE	Future Elderly Living Conditions In Europe
FPB	Federal Planning Bureau
FPS	Federal Public Service
GDP	Gross Domestic Product
GP	General Practitioner
HIS	Health Interview Survey (Gezondheidsenquête; Enquête de santé par interview)
IADL	Instrumental Activities of Daily Living
IMA	Intermutualistic Agency
LTC	Long-Term Care
MRPA	Maison de repos pour personnes âgées
MRS	Maison de repos et de soins
MB	Moniteur Belge
NIHDI	National Institute for Health and Disability Insurance (INAMI, RIZIV)

OCMW	Openbare Centra voor Maatschappelijk Welzijn
OECD	Organisation for Economic Cooperation and Development
PSSRU	Personal Social Services Research Unit
ROB	Rustoord voor bejaarden
RVT	Rust- en verzorgingstehuis
SHARE	Survey of Health, Ageing and Retirement in Europe
UCL	Université catholique de Louvain
VGC	Vlaamse Gemeenschapscommissie

INTRODUCTION

Demographic ageing of the population in the coming decades is expected to have significant implications on the future needs and use of long-term care (LTC) in most, if not all, industrialised nations. Belgium is no exception to this demographic trend: according to the latest demographic projections made by the Belgian Federal Planning Bureau (2011), the share of older persons in the total population (aged 65 or older) is expected to rise from around 17% in 2010 to 21% in 2025 and almost 26% in 2050. The share of the oldest old (aged 85 and older) is likely to grow even more dramatically, from 2.2% in 2010 to almost 3% in 2025 and 5.8% in 2050. Unless radical shifts occur in the prevalence of age-related disability, these demographic trends will translate in growing numbers of older people in need of help with their activities of daily living, either at home or in residential care facilities.

Against this backdrop of an ageing population, and given the division of responsibilities between the federal and the regional political authorities, three protocol agreements (1997, 2003 and 2005) have been concluded between the federal government and the regional authorities, formulating common objectives for LTC for older persons and imposing a moratorium on the number of beds (Gerkens & Merkur, 2010). The agreements aimed at progressively replacing lower-care beds in homes for the elderly by higher-care nursing home beds, leading to a higher financing of heavily care-dependent residents, but within the margins set by the moratorium. The third protocol agreement (2005) covered a 6-year period. It defined a common policy framework based on the following principles: supporting older persons to live at home independently for as long as possible; supporting informal caregivers; guaranteeing access to affordable formal care services; improving coordination and integration of care (Van Audenhove et al., 2009; Gerkens & Merkur, 2010). The moratorium was set to expire on 1 October 2011 and the new propositions have to be formulated for the future.

The current study was commissioned by the Federal Public Service for Health, Food Chain Safety and Environment, in order to obtain a scientifically based estimate of the future number of older persons likely to use residential care. This estimate will help policymakers negotiating a new protocol agreement and setting new limits on the number of residential care beds for the period 2011-2025.

The explicit aim of this study is to project the future number of residential care users based on the best available information, that is, the scientific knowledge regarding determinants of needs (such as demographic and epidemiologic trends) and use (given needs, living arrangements and other relevant variables) and the most relevant and up-to-date databases available. This projection is based on estimates of the transition probabilities between care states, using a statistical model that links these transition probabilities to their socio-demographic determinants. As any model, this model is a simplified representation of the outcomes of the true underlying decision processes, which are impossible to model using the available data. A major data limitation pertains to information about the availability and use of forms of home or family care which are not covered by public health insurance, and which may influence the choice and intensity of nursing care use that we do observe. Another one is the paucity of information on the true living arrangements of the sample subjects, including the true availability of their relatives or friends as informal caregivers.

While the focus of the projection model is the number of future residential care users, the model can also produce numbers of home nursing care users. This is a by-product of the transition probability model, in which home nursing care and residential care are treated as substitutes in the choice of care setting decision. We have not, however, estimated the financial implications of the various care alternatives. These will have to be considered by policymakers, especially insofar as shifts between residential and home care use not only have implications on total LTC spending, but also on the division of the financial burden between the federal and the regional level.

The projection is of necessity based on the current and historically observed patterns of LTC use, and assumes no major disruptions in these patterns other than the assumptions that underlie the epidemiologic and socio-demographic scenarios presented in Chapter 8. Specifically, the projections are based on a “constant policy” assumption in the sense that the regulatory environment that prevailed during the observation period is implicitly kept constant over the projection horizon, and the available capacity of residential care, as well as home care is expanded in line with

projected future use. Similarly, financial incentives such as NIHDI (National Institute for Health and Disability Insurance) payments of residential and home nursing care fees, and lodging and board fees paid by the nursing home residents, are assumed to remain fixed in real terms. In general, we assume that the relevant relative prices of LTC services do not change appreciably over the projection period.

The report is structured as follows. Chapter 1 gives a general overview of the Belgian long-term care system, providing background information for the subsequent chapters. Chapters 2 and 3 review the available scientific literature on LTC models, determinants of needs and determinants of use. Chapter 4 discusses the available data and motivates our choice of the data we used in this study. Chapter 5 presents the overall model structure. A model of the determinants of disability using the 2004/2008 Health Interview Surveys is introduced in Chapter 6. Estimation results of the transition probability model for long-term care situations are discussed in Chapter 7. Finally, Chapter 8 presents the projected number of future users under the base and alternative scenarios.

1. GENERAL OVERVIEW OF LONG-TERM CARE ORGANISATION AND FINANCING IN BELGIUM

This chapter describes the Belgian long-term care (LTC) system. In section 1.1 we give a general overview of LTC services and cash benefits (1.1.1), describe recent trends in LTC supply and use (1.1.2) and give an outline of how LTC is financed (1.1.3). Section 1.2 focuses on regional differences in LTC supply and in programming and eligibility criteria. The conclusions of this general overview are reported in section 1.3.

1.1. Organization and financing of long-term care

The overall goal of LTC policy in Belgium is to provide universal access to affordable and high-quality care services[2]. As in most European countries, the LTC system in Belgium aims at allowing older care-dependent persons to live in their own homes for as long as possible. The public LTC system consists of a wide range of benefits, in cash and in kind, organized at the federal, regional and municipal levels, and is related to health and social service provision[3].

Cities and municipalities also intervene in financing the construction of the residential structures for old people. The bulk of LTC services are provided

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2 This chapter is to a large extent based on Willemé et al. (forthcoming) and Willemé (2010)

3 The federal structure of the Belgian State results in a rather complicated division of power between the federal and the regional authorities. While the organisation of the social security system (of which public health insurance is part) is a federal responsibility, the Flemish-, French- and German-speaking communities are responsible for 'person-related matters', including some that affect health and LTC. As a result, most non-medical aspects of care for older persons are community responsibilities. The Flemish and German-speaking communities assume their responsibilities themselves, while the French-speaking community has devolved its responsibility to the Walloon region for matters relevant to the Walloon territory. Despite these institutional complications, we will use the generic term 'regional' in the rest of the text to designate the sub-national level of authority.

as part of the federal public compulsory health insurance system (Compulsory Health Insurance Law, coordination of 14 July 1994, M.B/B.S. 27/08/1994), which is mainly financed by social security contributions and general taxes.

Since public health insurance practically covers the whole population, LTC coverage is also nearly universal. However, since LTC services provided through the health insurance system only cover nursing care (as well as paramedical and rehabilitation care) and part of personal care to dependent persons, a whole range of services is organized and provided at the regional and local level. The regional governments have issued decrees that regulate a wide range of issues related to LTC services: certification of facilities such as nursing homes and day care centres, integration and coordination of services at the local level, quality monitoring systems and so on. LTC policy aims at helping, supporting and nursing dependent persons. While public health insurance generally covers all age categories, many LTC services in Belgium are specifically targeted at the older dependent population. Separate regulations exist regarding special provisions and benefits for disabled persons younger than 65 years.

Generally speaking, the Belgian LTC system can be characterized as a mixed system with extensive publicly financed formal care services which complement significant informal care provided mainly within the family. Public LTC expenditure (as a share of GDP and corrected for the share of the 65+ population) in Belgium ranks among the highest in Europe (only in Sweden, the Netherlands, Denmark and Finland is public expenditure higher). As in Sweden, the Netherlands, Denmark, Germany, Estonia and Latvia, the role of private LTC funding is relatively modest in Belgium (less than 20% of total LTC spending) (Kraus et al., 2010).

1.1.1. LTC benefits in kind and in cash

As a rule, the aim of LTC policy is to support dependent older persons in their own environment for as long as possible. If limitations in activities of daily living become too severe and adequate informal or professional support at home is unavailable or insufficient, the dependent person should have access to suitable and affordable residential care facilities. To achieve these broad policy goals, a range of residential and home-based[4] LTC services has been developed. In Belgium, as in an increasing number of European countries (Pavolini & Ranci, 2008), the provision of in kind services is combined with cash-for-care schemes.

1.1.1.1. Benefits in kind

The long-term care system includes the following major services: home nursing, family care, centres for day care and short-stay centres, homes for the elderly and nursing homes.

Home nursing care is available for persons with low to severe activities of daily living (ADL) and/or cognitive limitations, irrespective of their age. The eligibility for and intensity of care, and the corresponding level of financial intervention by the federal health insurance system, is determined using the 6 items of the Katz ADL scale augmented with a cognitive criterion (disorientation in time or space) (see Appendix A.6.1 for details). Care provided by home nurses includes technical nursing interventions (for example wound dressing and administering medication) and basic nursing care (mainly hygienic care in patients with ADL dysfunction)[5] . The latter partly overlaps with care provided by family care services, which are subsidized by the regional governments. Family carers provide help with similar and other personal care tasks (for example, help with eating or moving around), along with instrumental help (for example, light housework, preparing meals).

Day care centres and 'short-stay' care centres provide nursing and personal care to older persons with moderate to severe ADL or cognitive limitations who still live in their own homes, but (temporarily) lack adequate informal care or whose caregivers need respite time. Short-stay centres provide residential services to older persons for a limited time period to temporarily alleviate the burden of informal caregivers. In day care centres, older persons are taken care of during one or more weekdays, but they spend the night at home. A fixed daily compensation is paid by the

[4] We use 'home care' as a general term for LTC services provided to older persons living at home, including (amongst others) home nursing, family care and service centres.

[5] The nomenclature of home nursing activities can be found in KCE report 122 'Financing of home nursing in Belgium' (Sermeus et al., 2010).

compulsory health insurance. Additionally, no or low-care older persons, can stay in 'service flats' and similar accommodation, which combine individual living arrangements with collective facilities (meals, home help and so on).

In the residential sector, homes for the elderly [woonzorgcentra (previously called rustoorden voor bejaarden (ROB)) in Dutch, maison de repos pour personnes âgées (MRPA) in French, and Altenwohnheime in German] provide nursing and personal care as well as living facilities to older persons with mainly low to moderate limitations. Older persons who are strongly dependent on care but who do not need permanent hospital treatment are admitted to nursing homes [rust-en verzorgingstehuis (RVT) in Dutch, maison de repos et de soins (MRS) in French, and Pflegewohnheime in German]. Each nursing home has to have a functional link with a hospital. Another requirement is to have a coordinating and advisory physician who coordinates the continuity of care with general practitioners, the medical record of each resident, the medical activities related to dangerous illnesses for the residents and the personnel, the use of a pharmaceutical formulary and all teaching activities for the personnel (hygiene, palliative care,…). Nursing homes have to cooperate with the geriatric service of the hospital and a specialised service of palliative care. Eligibility for residential care, or more precisely the level of care covered by the public health insurance scheme, depends on the degree of care dependency, and is evaluated using the same criteria as in home nursing (6 ADL items and disorientation in time or space). While medical costs and costs of care in residential care facilities are covered by public health insurance, board and lodging costs are to be paid by the resident.

Residential care services are provided by local Public Centres for Social Welfare (abbreviated as OCMW in Dutch and CPAS in French), umbrella organizations of municipalities (Intercommunale) and by both non-profit and for-profit private organizations. Home nursing care is provided by qualified nurses, either self-employed or employed by private organizations or Public Centres for Social Welfare. Both non-profit private providers and Public Centres for Social Welfare offer subsidized family care services.

1.1.1.2. Cash benefits

There are two major cash benefits targeted at alleviating the financial burden of non-medical expenses incurred by LTC recipients. At the federal level there is an 'Allowance for Assistance to Elderly Persons' (AAEP) (Tegemoetkoming voor hulp aan bejaarden/Allocation pour l'aide aux personnes âgées; Royal Decree of 5 March 1990, M.B./B.S. 05/04/90), which is part of several 'Allowances for the Handicapped'. It is a monthly allowance, allocated to persons aged 65 years or older who score a minimum of 7 points on a scale that includes ADL and IADL (instrumental activities of daily living) limitation items as well as a medical assessment. Eligibility for the allowance is means-tested and the amount of the benefit depends on the severity of care needs and on the financial situation of the applicant, which takes into account current income, financial assets and non-financial assets.

At the regional level, Flanders has set up a separate LTC insurance scheme (Decree of 30 March 1999, M.B./B.S. 28/05/1999). The Flemish care insurance pays a monthly allowance to care dependent persons, regardless of age, who score at least 35 points on the 'First-line Evaluation' scale (Beoordeling Eerste Lijn (BEL) scale) or who can prove their need for care by other means. The allowance is not means-tested. It consists in a lump-sum monthly allowance of €130, irrespective of the beneficiary's income and degree of care dependency. Eligibility is limited to the Flemish territory, with residents of the Brussels Capital Region being allowed to opt in.

Furthermore, specific monthly or annual allowances are paid by the federal health insurance to cover non-medical expenses of chronically ill persons: annual allowance for the use of incontinence material (€459.59, allocated to severely care dependent persons residing at home), annual care allowance (€279.69, €419.54, or €559.37, depending on the level of care dependency), palliative care allowance (€603.12, paid for a 1 month period, extendable by 1 month, to palliative patients residing at home), allowance for persons in a vegetative or minimally responsive state (€7 682.10 maximum per year, allocated to persons residing at home).

The communities and regions finance other services such as family aid and delivery of meals and so on.

1.1.1.3. Support for informal caregivers

In Belgian LTC policy, special attention is being given to support informal carers, who play a pivotal role in enabling dependent older persons to stay in their own homes. This support takes the form of providing informal caregivers with information and social and psychological support, to

alleviate the physical and mental burden of prolonged caregiving. It also comprises a well-established system of paid leave schemes for employees: care leave schemes for medical assistance and for palliative care, and other, more general, leave schemes. Recently, several propositions have been formulated for a regulative framework aimed at reducing the adverse financial effects and disincentives faced by informal caregivers and protecting their social security rights (Flohimont, Tasiaux, Versailles, & Baeke, 2010).

1.1.1.4. Co-ordination and integration of LTC

The diversification of LTC services is being accompanied by several initiatives to improve the collaboration between care providers in different settings (residential, semi-residential, at home) and to provide patient-oriented integrated services. At the federal level, 'Integrated Home Care Services' (Geïntegreerde Diensten voor Thuisverzorging, or GDTs/Services Intégrés de Soins à Domicile, or SISDs) coordinate the provision of care in rather broadly defined geographical areas (Royal Decree of 8 July 2002, M.B./B.S. 05/10/2002). These services organise and facilitate multidisciplinary co-operation between primary care providers, mainly general practitioners, nurses and paramedical professionals. In Flanders, home care is further coordinated by 'Primary Care Cooperation Initiatives' (Samenwerkingsinitiatieven Eerstelijnszorg, or SELs; Order of the Flemish Government of 19 December 2008, M.B./B.S. 31/03/2009), and entitlement to (federal) subsidies for integrated home care services is conditional on accreditation as a primary care cooperation initiative. In Wallonia, 'Coordination Centres for Home Care Services' (Centres de Coordination de Soins et Services à Domicile, or CSSDs; Decree of 30 April 2009, M.B./B.S. 15/06/2009) operate. Their main task is to guarantee the quality of care and the cooperation between care workers involved in home care, including general practitioners, home nurses, accredited family care services and social workers. In Brussels, a further home care cooperation initiative has been taken by the French Community Commission (COCOF) (Decree of 5 March 2009, M.B./B.S. 08/05/2009).

In addition to home care coordination initiatives, special programmes and so-called care circuits have been created to streamline the provision of care as patients move between care settings. An example is the care programme for geriatric patients who are discharged from hospital. The programme targets 'in-depth interaction between the hospital and aid and care services at home and the general practitioner, particularly via an external liaison function developed within hospitals, in order to provide a 'care continuum'' (Federale Overheidsdienst Sociale Zekerheid, 2009).

In Flanders, the recently implemented Decree on Residential and Home Care of 13 March 2009 (Woonzorgdecreet, M.B./B.S. 14/05/2009) aims at stimulating the coordination and cooperation between residential and home care services.

Likewise, the Walloon Decree of 30 April 2009 on Accommodation and Care for Older Persons (M.B./B.S. 16/07/2009) aims to bring about a better integration of residential and home care services in order to guarantee the continuity of care to older persons.

1.1.1.5. Protocol agreements

Responsibilities for the planning and accreditation of residential care facilities (homes for the elderly – ROB/MRPA and nursing homes – RVT/MRS) are divided between the different political levels, with the regional authorities having most of the competence. This division of responsibilities creates its own coordination problems, which are being addressed in inter-ministerial conferences. Since 1997, three protocol agreements (1997, 2003 and 2005) have been concluded between the federal government and the regional authorities, formulating common objectives for LTC for older persons and imposing a moratorium on the number of beds (Gerkens & Merkur, 2010). The agreements aimed at progressively replacing lower care beds in homes for the elderly by higher care beds in nursing homes. In this way, policymakers aimed at guaranteeing a better nursing supervision and a better financing of care-dependent residents (since reimbursement rates are higher for nursing home beds than for beds in homes for the elderly), but within the margins set by the moratorium. The agreements allowed each authority to decide autonomously on the implementation of the common objectives, taking local demographic needs into account (Van Audenhove et al., 2009; Gerkens & Merkur, 2010).

The main objective of the first protocol agreement (1997) was to allow older people to stay in their own homes for as long as possible, but to guarantee at the same time access to residential care if needed. Other priorities of the protocol were to harmonize federal and regional

programming and accreditation policies; to foster information exchange between federal and regional authorities; to limit supply of new beds in homes for the elderly. The first protocol agreement covered a 5-year period. It was planned to convert each year 5 000 beds in homes for the elderly into nursing home beds. In this way, policy makers aimed at guaranteeing a better quality of care since nursing home beds receive more funding than beds in homes for the elderly. At the same time however, and to keep expenses under control, a moratorium was imposed limiting the number of new accreditations.

The second protocol agreement (2003) emphasized the principle of regional autonomy in implementing the commonly agreed goals and in adapting actions to local needs. At the end of the period covered by the second protocol, on 31 December 2005, total capacity in homes for the elderly and nursing homes could not exceed 81 264 and 47 587 beds respectively.

The third protocol agreement (2005) covered a 6-year period. It defined a common policy framework based on the following principles: supporting older persons to live at home independently for as long as possible; supporting informal caregivers; guaranteeing access to affordable formal care services; improving coordination and integration of care (Van Audenhove et al., 2009; Gerkens & Merkur, 2010). It was decided to convert 28 000 beds in homes for the elderly and to spend at least 20% of the resources made available for this conversion on alternative forms of care and support, such as crisis care services, night care services, services supporting intergenerational housing arrangements or care pathway initiatives. The moratorium was set to expire on 1 October 2011 and the new propositions have to be formulated for the future. According to the moratorium, the total number of beds in nursing homes and homes for the elderly (including beds for persons in a vegetative or minimally response state and short-stay beds) could not exceed 140 049 (communication Federal Public Service Public Health, 2011).

1.1.2. Trends in LTC supply and use

As in many other European countries, expansion of home care services to postpone institutionalisation has become a priority goal in Belgian LTC policy. Home care services and public expenditures on home care have grown considerably, while expansion of residential care capacity has been limited by a moratorium (see 1.1.1.5). Successive agreements between the federal and regional governments have aimed at progressively replacing lower care beds in homes for the elderly by higher care beds in nursing homes. A part of the budget corresponding with the maximum number of beds set at the federal level is allocated to the regions, which can decide on the allocation over services in different semi-residential and residential settings or to support home care. A limited number of nursing home beds have been converted into so-called ‘coma’ beds, receiving supplementary funding and aimed at providing adequate care for persons in a vegetative or minimally responsive state.

As Table 1.1 illustrates, the number of beds in homes for the elderly has decreased steadily in the last decade, from around 88 000 in 2000 to 64 000 in 2011, while the number of beds in nursing homes almost doubled, from around 33 000 to 65 000 over the same period.

Relative to the 65+ population, the number of beds in residential care facilities has remained more or less constant over the past decade, from 71 beds per 1 000 persons of 65 years and over in 2000 to 70 beds in 2010. Relative to the 75+ population, availability of beds has decreased, from 164 beds per 1 000 persons of 75 and over in 2000 to 138 beds in 2010. The total number of residents eligible for coverage by the public health insurance scheme has increased from 115 965 in 2000 to 126 720 in 2010 and the number of eligible residents aged 60 and over increased from 113 464 in 2000 to 120 170 in 2007 (Table 1.2). The rate of institutionalisation among the 60+ population has been more or less stable over the past decade: from 50.6 residents per 1 000 persons of 60 years and over in 2000 to 50.9 in 2007.

Table 1.1. Evolution of the number of beds in residential care facilities, 2000-2011.

Year	Nursing homes	Homes for the elderly	Coma beds	Total beds	Beds/1 000 persons 65 and over	Beds/1 000 persons 75 years and over
2000	33 103	87 940	0	121 043	71	164
2001	37 489	85 055	0	122 544	71	162
2002	39 403	85 350	0	124 753	71	160
2003	45 306	79 139	0	124 445	71	156
2004	46 905	78 068	0	124 973	70	154
2005	47 165	77 917	161	125 243	70	150
2006	48 712	76 406	161	125 279	69	146
2007	51 442	73 941	156	125 539	69	142
2008	54 796	71 963	157	126 916	70	140
2009	59 504	68 760	157	128 421	70	139
2010	63 064	66 179	157	129 400	70	138
2011	65 325	64 255	152	129 732	n.a.	n.a.

Source: NIHDI – Statistics May 2011, situation as of 1 January of each year; Population data: Research Centre of the Flemish Government.; n.a.: not available

Table 1.2. Evolution of the number of persons in residential care (eligible for coverage by the public health insurance scheme), 2000-2010.

Year	Persons in residential care - Total	Persons in residential care – 60+	Institutionalisation rate 60+ (Residents/1 000 persons 60 and over)
2000	115 965	113 464	50.6
2001	119 254	116 606	51.9
2002	111 383	108 931	48.5
2003	116 902	114 227	50.7
2004	118 997	116 179	51.2
2005	118 116	115 347	50.3
2006	122 171	119 388	51.5
2007	122 857	120 170	50.9
2008	123 101		
2009	125 932		
2010	126 720		

Source: NIHDI, residential care patients on 31 March (residents eligible for coverage by the public health insurance scheme only); Population data: Research Centre of the Flemish Government.

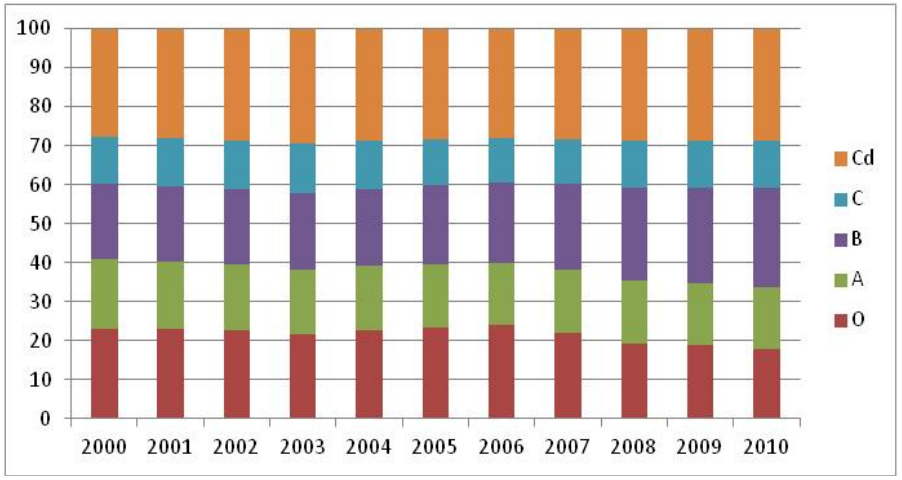
Table 1.3. Evolution of the number of beds/places in short-stay centres and day care centres, 2000-2010.

Year	Short stay centres			Day care centres		
	Beds (absolute numbers)	Beds/1 000 persons 65 and over	Beds/1 000 persons 75 and over	Places (absolute numbers)	Places/1 000 persons 65 and over	Places/1 000 persons 75 and over
2000	241	0.1	0.3	713	0.4	1.0
2001	267	0.2	0.4	793	0.5	1.0
2002	333	0.2	0.4	856	0.5	1.1
2003	408	0.2	0.5	1 088	0.6	1.4
2004	558	0.3	0.7	1 259	0.7	1.5
2005	749	0.4	0.9	1 395	0.8	1.7
2006	916	0.5	1.1	1 438	0.8	1.7
2007	1 103	0.6	1.2	1 577	0.9	1.8
2008	1 262	0.7	1.4	1 648	0.9	1.8
2009	1 401	0.8	1.5	1 747	1.0	1.9
2010	1 626	0.9	1.7	1 830	1.0	1.9
2011	1 757	n.a.	n.a.	1 881	n.a.	n.a.

Source: NIHDI – Statistics May 2011; Population data: Research Centre of the Flemish Government; n.a.: not available

Over the same period, the fraction of residents with no or limited functional limitations (care levels O and A on the Katz scale) has decreased, as is shown in Figure 1.1.

Figure 1.1. Residential care patients by level of care dependency, 2000-2010.



Source: NIHDI, residential care patients on 31 March.
Note: The level of care dependency ranges from O (no ADL limitations and no disorientation in time or space) to Cd (at least 4 ADL limitations, including incontinence, and disorientation in time and space). Appendix 6.1. provides a detailed definition of the different care levels

The availability of places in semi-residential care facilities such as day care centres and short-stay centres has increased substantially (Table 1.3) from 241 to 1 757 accredited beds in short-stay centres between 2000 and 2011; from 713 to 1 881 places in day care centres over the same period. The number of semi-residential places relative to the 65+ and 75+ populations has risen accordingly. However, supply of semi-residential care services remains rather limited.

As for home care, the total number of users of home nursing has gone up from 118 590 in 2000 to 176 598 in 2007 and the number of older (60+) users has gone up from 107 985 in 2000 to 157 280 in 2011, as shown in Table 1.4. Over the same period, the number of family care users likewise increased considerably (see Table 1.4, data for Flanders only). In Flanders, relative to the 65+ population, the number of hours of family care remained more or less stable (from 12.8 hours per person in 1997 to 13.5 hours in 2010), while relative to the 75+ population the number of hours decreased (from 32.0 in 1997 to 27.3 in 2010) (Flemish agency for Care and Health/Vlaams Agentschap Zorg en Gezondheid).

Comparing Table 1.2 and Table 1.4, the shift to providing care at home rather than in residential care facilities becomes apparent: during the past decade the number of home nursing care users has grown by more than 40% and the number of users of family care has grown by more than 20%, while the increase in residential care users amounts to less than 10% only. In residential care, the share of more care dependent residents has increased.

Table 1.4. Evolution of the number of home care users, 1997-2007.

Year	Users of home nursing - Total	Users of home nursing – 60+	Utilisation rate home nursing 60+ (users/1 000 persons 60+)	Households receiving family care[a]
2000	118 590	107 985	48.2	62 629
2001	123 664	112 029	49.8	63 225
2002	126 681	n.a.	0.0	65 870
2003	129 698	n.a.	0.0	67 005
2004	148 204	133 119	58.7	67 725
2005	139 992	126 037	55.0	70 112
2006	145 648	131 091	56.6	74 406
2007	152 318	136 832	57.9	79 181
2008	156 911	140 851	58.5	n.a.
2009	165 126	148 039	60.4	n.a.
2010	170 916	152 802	61.3	n.a.
2011	176 598	157 280	n.a.	n.a.

[a] *Data for Flanders only. Source: home nursing data - NIHDI (user counts on 31 March except for 2004: user count on 31 December); family care - Flemish Agency for Care and Health; n.a.: not available*

Between 2005 and 2010 the number of cash benefit recipients has increased considerably, as is apparent from Table 1.5. Information from the FPS Social Security indicates that in 2008 about 70% of the recipients of AAEP is Flemish and 30% is Walloon.

Table 1.5. Evolution of the number of cash benefit recipients.

Benefit recipients			
	Allowance for assistance to elderly persons	Flemish care insurance	
		Total	65+
2005	114 994	158 582	129 955
2006	118 334	170 508	140 177
2007	125 958	180 321	148 051
2008	126 816	188 399	154 144
2009	133 368	200 843	163 271
2010		210 215	170 329

Source: Allowance for assistance to elderly persons - FPS Social Security; Flemish care insurance - Flemish Care Fund.

1.1.3. LTC financing

Given the organization of the Belgian LTC system, with its division of responsibilities between the federal and the regional levels, it follows that the financial flows are rather diverse and complex. Table 1.6 gives a breakdown of total LTC expenditures in 2006 by care setting and funding source. Total LTC expenditures were approximately €5.7 billion in 2006 (1.8% of GDP), of which almost 98% was financed by a combination of social security contributions (59%) and taxes (39%).

Very broadly speaking, the part of LTC covered by the universal health insurance system (residential care and home nursing) is mainly financed with (non-earmarked) social security contributions paid by workers, employers and retirees (€3.3 billion), and to a lesser extent by taxes (€1.5 billion), while home care organized at the regional level is to a large extent financed by taxes (€728 million), and to a lesser extent by out-of-pocket expenditures (€99 million) and specific contributions (approximately €54 million contributed to the Flemish Care Insurance scheme and allocated to home care).

Despite the considerable growth in home care services, spending on residential care is still higher than spending on home care, as is the case in most European countries (Colombo, Llena-Nozal, Mercier, & Tjadens, 2011). It should be noted that not all expenditures for home care are known, since elderly people who are not eligible for or who do not want to make use of subsidized home care can and do buy services privately, often using 'service cheques'. The system was introduced in May 2003 in an attempt to increase employment rates, to regularize black economy activities in the domestic services sector and to cover unmet needs (Pacolet, De Wispelaere, & Cabus, 2010). The services provided under this scheme are paid in large part by government subsidies (around €14 per hour), with the balance paid by the user (currently €7.5 per hour). However, the amount spent on LTC is unknown. The vouchers are not only used by care dependent persons needing help with household activities, but are used rather extensively to pay for domestic help by all those who have no time/ability for housework. In 2009, 24.8% of the users was aged 65 or over (Devisscher, Gerard, Valsamis, & Van Pelt, 2010). For Flanders, it is estimated that 44% of hours provided by private for-profit providers are used by clients aged 65 or over and 8% of hours by care dependent clients (Pacolet, De Wispelaere, & De Coninck, 2011).

Table 1.6. LTC expenditures by care setting and funding source (2006, €million).

		LTC setting			
		Residential care	Home Care		Total
			Home nursing care	Other home care[b]	
Source of funding	Contributions	2 018	1 295	54	**3 367**
	Taxes	1 505		728	**2 233**
	Out-of-pocket	1[a]	7	99	**107**
	Total	**3 524**	**1 302**	**881**	**5 707**

Notes: [a] Excluding out-of-pocket expenses for accommodation in residential care; [b] Excluding public and private expenditures on the service cheques system.
Source: Update of the System of Health Accounts (SHA) data provided to the Organization for Economic Cooperation and Development (OECD).
See http://stats.oecd.org/Index.aspx?DataSetCode=SHA.

Since 2004 public health insurance funding of care in nursing homes and homes for the elderly has been based on a case-mix system. The level of funding varies according to the care dependency profile of the residents and the numbers of qualified staff (Ministerial Order of 6 November 2003 on the financing of nursing homes and homes for the elderly, M.B./B.S. 26/11/2003). Board and lodging costs in residential care facilities (approximately €2.3 billion[6]) are not covered by public health insurance. With an average pension of around €960 per month in Flanders and around €940 in Wallonia (figures on 1 January 2009) (Rijksdienst voor Pensioenen, 2010), many dependent elderly persons have insufficient recurrent income to pay their monthly nursing home bill, which was on average around €1 250 in Flanders and around €950 in Wallonia (Federale Overheidsdienst Economie, 2009). As a result, elderly home owners sometimes have to sell their home when they move to a nursing home, while other older persons have to rely on financial support from their children or on social assistance support. In the latter case, Public Centres for Social Welfare (OCMW/CPAS) have the right to claim back payments from the children. The duty for children to support their parents, which is the legal basis for this claim, is currently being debated, with some political parties in favour of lifting the duty (Moons & Vanderleyden, 2011).

Public health insurance funding of home nursing is based on a mixed system of fee-for-service payment (for technical nursing interventions), and lump sum payment (for nursing interventions for patients with ADL limitations). Since the end of the 1980s various cost-controlling measures have been introduced, such as a maximum day limit on fees and rules to avoid double payments for care delivery at home and in another setting. Recently, recommendations have been formulated to partly organise financing along the lines of a case-mix model (Sermeus et al., 2010). Patients only pay user charges, in principle amounting to around 25% of the price. However, for some nursing interventions patients do not have to contribute and, in order to promote nursing care accessibility, many home nursing providers do not collect user charges (Sermeus et al., 2010). In 2006, the total user contribution amount was €7.1 million, and it declined even further to €6.9 million in 2008 (0.6% of total home care expenditures).

[6] Estimate based on average monthly nursing home bill (adjusted upward to take account of extra costs) and the number of residential care users.

With regard to home care services subsidised by the regional governments, yearly quotas limit the volume of subsidized care hours that accredited organizations can provide. Users of home care services are required to pay user charges. The hourly fee depends on the user's income and household composition. In Flanders, the total user fee amount was approximately €65 million in 2008, which is about 12% of total home care expenditures. Co-payments are also charged for day care centres, short-stay centres and other publicly subsidized care services.

Of the two major cash benefits for LTC aimed at alleviating the financial burden of non-medical expenses, the federal AAEP is financed by general taxes, while the Flemish Care Insurance is financed by a combination of general taxes and a specific contribution paid by every adult resident into a designated fund. The contributions make up approximately half of the annual budget. In recent years cash benefit expenditure has increased substantially, as is apparent from Table 1.7.

Table 1.7. Evolution of cash benefit expenditure, 2005-2010 (in 1 000 Euros).

	Allowance for assistance to elderly persons	Flemish care insurance[a]	NIHDI Allowances chronically ill
2005	367 964	186 299	73 843
2006	377 587	197 820	67 730
2007	393 120	217 318	68 425
2008	416 412	245 085	87 004
2009	431 599	274 480	91 889
2010			97 623

[a] *Subsidies paid by the Flemish Care Insurance Fund. Source: Allowance for assistance to elderly persons - FPS Social Security; Flemish care insurance – Flemish Care Fund; Allowances chronically ill - NIHDI Statistics Health*

Recently, specific measures have been taken to further improve access and affordability for LTC users, which take the form of monthly or annual allowances to cover non-medical expenses or of a reduction in co-payments. An example of the former is the annual allowance for the use of

incontinence material; an example of the latter is the reduction in co-payments for GP visits and home nursing care for severely limited patients as well as for GP visits of palliative patients in nursing homes and homes for the elderly. In order to further improve the financial accessibility to LTC services, the Flemish government decided in 2009 to introduce a maximum billing system for home (and intermediate) care services. The system will place a means-adjusted maximum on clients' out-of-pocket expenses for home care, but has not been implemented as of this writing (August 2011).

Nevertheless, in case of severe care dependency, out-of-pocket expenses for LTC services can run high, in particular when a combination of different formal care services and/or very frequent or continuous care is needed (Pacolet, Merckx, Spruytte, & Cabus, 2010).

Key points

- **The formal LTC system in Belgium consists of a wide range of publicly financed residential and home-based care services and cash benefits organized at the federal and regional level.**
- **As a result of the so-called "protocol agreements" between the federal and regional governments, total residential care capacity expanded only slightly between 2000 and 2010, with higher care nursing home beds replacing beds in homes for the elderly.**
- **The number of users of home care services increased substantially over the same period.**
- **Residential care and home nursing is mainly financed with (non-earmarked) social security contributions paid by workers, employers and retirees, and to a lesser extent by taxes, while home care organized at the regional level is to a large extent financed by taxes, and to a lesser extent by out-of-pocket expenditures and specific contributions.**
- **In residential facilities, public health insurance funding of care is based on a case-mix system, the level of funding varying according to the care dependency profile of the residents and the numbers of qualified staff. Board and lodging costs are not covered by public health insurance.**
- **Public health insurance funding of home nursing is based on a mixed system of fee-for-service payment (for technical nursing interventions), and lump sum payment (for nursing interventions for patients with ADL limitations).**
- **Spending on residential care is still higher than spending on home care; a similar observation is reported in most European countries.**

1.2. Description of regional differences in programming and eligibility criteria

1.2.1. Diverging development of residential beds within the Belgian regions

Table 1.8 shows the evolution of beds in homes for the elderly and nursing homes per region. Between the conclusion of the first protocol agreement in 1997 and 2011, the number of beds in homes for the elderly in both Wallonia and the Brussels Capital Region decreased by approximately 20%, compared to 40% in Flanders and the German-speaking Community. In the same period, the number of nursing home beds increased by 267% in Wallonia, by approximately 240% in Flanders and the German-speaking Community and by 183% in the Brussels Capital Region.

The growth in the number of beds in nursing homes exceeded the reduction of the number of beds in homes for the elderly.

In 2010, the number of beds in homes for the elderly per 100 inhabitants of 65 years and older / 75 years and older was considerably higher in Wallonia and Brussels than in Flanders (Table 1.9); the nursing home cover ratio does not diverge much between the regions. Overall, the number of beds in residential facilities in relation to the elderly population is much higher in Wallonia and Brussels than in Flanders.

The care supply has been diversified since the mid-nineties by the development of day care centres, short-stay centres and specific beds for comatose patients. It means that within the context of the moratorium significant divergence was possible. Are the diversification efforts equally spread over the regions? The available figures are listed in Table 1.10.

Table 1.8. Regional differences in the evolution of accredited beds in homes for the elderly and nursing homes in Belgium, 1997-2011.

	Beds in homes for the elderly				Beds in nursing homes			
Year	**Wallonia**	**Flanders**	**German-speaking Com.**	**Brussels Capital Region**	**Wallonia**	**Flanders**	**German-speaking Com.**	**Brussels Capital Region**
1997	35 192	45 032	461	12 371	5 162	11 833	125	2 040
2011	27 744	26 765	277	9 469	18 923	40 200	431	5 771
Difference '97-'11	- 7 448	- 18 267	- 184	- 2 902	+ 13 797	+ 28 367	+ 306	+ 3 731
Difference %	-21	-41	-40	-23	+267	+240	+245	+183

Source: NIHDI 2011, Research Centre of the Flemish Government (SVR) 2011

Table 1.9. Number of accredited beds in homes for the elderly and nursing homes per 100 inhabitants of 65 years and older / 75 years and older, per region, 2010.

	Beds in homes for the elderly			Beds in nursing homes		
	Wallonia incl. German-speaking Com.	**Flanders**	**Brussels Capital Region**	**Wallonia incl. German-speaking Com.**	**Flanders**	**Brussels Capital Region**
Number of beds/100 inhabitants 65 +	4.9	2.5	6.3	3.4	3.3	3.8
Number of beds/100 inhabitants 75 +	9.5	5.0	11.9	6.5	6.8	7.1

Source: NIHDI 2011, SVR 2011

Table 1.10. Number of beds/places in short-stay centres, day care centres and coma beds by region, 1995-2011.

Year	Short-stay beds			Day-care places			Coma beds		
	Wal	Fl	Br	Wal	Fl	Br	Wal	Fl	Br
1995	0	3	0	0	0	0	0	0	0
2000	0	241	0	74	584	55	0	0	0
2005	178	571	0	157	1 068	170	65	80	16
2011	628	1 129	0	303	1 408	170	62	80	10

Source: NIHDI – Statistics May 2011

Table 1.11 shows that the growth in the number of beds/places in the short-stay and day-care centres in Flanders is higher than in Wallonia and Brussels. The number of provided coma beds is also the highest in Flanders. In Brussels no short-stay beds are provided.

Table 1.11. Number of beds/places in short-stay centres, day-care centres and coma beds per 1 000 persons 65 years / 75 years and over by region, 2010.

	Short-stay beds			Day-care places			Coma beds		
	Wal	Fl	Br	Wal	Fl	Br	Wal	Fl	Br
Places/1000 persons 65+	1.02	0.92	0	0.50	1.21	1.12	0.12	0.07	0.10
Places/1000 persons 75+	1.96	1.86	0	0.97	2.44	2.01	0.21	0.14	0.19

Source: NIHDI – Statistics May 2011, SVR 2010

As for the number of beds/places in proportion to the elderly population (Table 1.11), the differences between the regions with regard to the number of short-stay and coma beds are noticeably small, with a slight disadvantage for Flanders. Compared to Brussels, Wallonia has a smaller proportion of places in day-care centres, while Flanders has a higher proportion of day-care places.

1.2.2. Programming criteria of the three regions for the residential care sector

The Flemish government regulates the residential care for older persons based on the Decree on Residential and Home Care ('Woonzorgdecreet") of 13 March 2009 (M.B./B.S. 14/05/2009). It aspires to bring about an integrated regulation of all care services for older persons and home care services. The Decree concerns family care and additional home care services, logistic aid services, sitter-companion services, home nursing services, social work services by the health insurance funds, local and regional service centres, services for host families, day-care centres, convalescent centres, short-stay centres, residential care centres, associations of users and informal carers and subsidizing of entertaining activities in the residential care facilities and short-stay centres.

With the Decree of 30 April 2009 concerning the housing and accommodation of the elderly (M.B./B.S. 16/07/2009), the Walloon government aims to bring about an integrated programming and regulation of a diversified offer of facilities for older persons. The Decree concerns homes for the elderly, nursing homes, service flats, day accommodation centres, evening and night accommodation centres, day-care centres, short-stay centres and care in host families. The programming only concerns homes for the elderly, nursing homes, short-stay and day-care centres. The decree emphasizes a more homogeneous regional distribution of services and free choice between the public, profit and non-profit sector.

In the Brussels Capital Region three community commissions are authorized for the residential care facilities for older persons: the French Community Commission (Commission Communautaire française, COCOF), the Joint Community Commission (Commission Communautaire Commune, COCOM) and the Flemish Community Commission (Vlaamse Gemeenschapscommissie, VGC). These authorities regulate the homes

for the elderly, nursing homes, service flats, day accomodation centres and day care centres. Homes for the elderly should comply with the accreditation conditions and the regulation of the community commission they are associated with. We will discuss only the regulations for the COCOF and the GGC, as only few homes for the elderly are associated with the VGC (Charlot, Cobbaut, De Mets, Hinnekint, & Lambert, 2009, p. 31).

1.2.2.1. Homes for the elderly and nursing homes

Situation in Flanders

In the Decree on Residential and Home Care (”Woonzorgdecreet”) of 13 March 2009 the Flemish government brings the homes for the elderly and the nursing homes under one umbrella: residential care facilities. The short-stay centres and the convalescent centres are also associated with the residential care facilities, as are the semi-residential day care facilities.

Within its programming, Flanders differentiates according to age. The maximum number of living facilities in residential care facilities amounts to:

- 1 living facility per 100 seniors between 65 and 74 years old;
- 4 living facilities per 100 seniors between 75 and 79 years old;
- 12 living facilities per 100 seniors between 80 and 84 years old;
- 23 living facilities per 100 seniors between 85 and 89 years old;
- 32 living facilities per 100 seniors aged 90 years and older.

The resulting number of living facilities is multiplied by 1.047, to adjust for the fact that the Decree increases the minimum age for persons to enter into residential care from 60 to 65 years. The programming numbers are calculated regionally up to the municipal level.

Situation in Wallonia

In the Walloon Decree of 30 April 2009 and the Walloon Order of 15 October 2009 (M.B./B.S. 12/11/2009) the maximum capacity of beds in homes for the elderly is fixed at 47 546, including beds in homes for the elderly converted to nursing home beds. The programming per district (arrondissement)[7] takes into account the population aged 75 years and older. In spreading the available beds, districts with lower proportion beds/population have pre-eminence over better-equipped districts. The number of beds in a home for elderly must lie between 50 and 150 beds, including short-stay beds and nursing home beds. At least 29% of the beds are reserved for the public sector, at least 21% for the non-profit sector and at the most 50% for the profit sector.

Situation in Brussels

In the Brussels Capital Region, the programming for each category of residential care facilities for older persons is determined by the COCOF (Decree of 22 March 2007 concerning the policy for housing and accommodation of the elderly, M.B./B.S. 23/01/2008). The programming takes into account the needs of the older persons and their state of health, the demographic evolution, the rules concerning the programming of certain categories of residential institutions and the geographical distribution of the existing institutions and services. The Flemish government also programs residential care facilities in the bilingual Brussels Capital Region.

The GGC/COCOM determines the programming of the facilities for the elderly in the bilingual region. The programming is based on objective criteria relating to the specialisation of the facilities, their accommodation and housing capacities and their level of equipment, the quality of their maintenance, care and nursing staff and their sound administrative and financial management. The programming criteria are arithmetic rules or formulas to measure the needs, taking into account, among others, demographic figures, age structure, socioeconomic indicators, morbidity and the fair distribution of services (Ordinance of 24 April 2008 concerning the accommodation and housing facilities for the elderly, M.B./B.S. 16/05/2008).

[7] Arrondissements are administrative units, which are in between the levels of provinces and of municipalities. Most of the ten provinces of Belgium (in addition to the capital region of Brussels) are divided into up to 7 arrondissements; there are altogether 43 arrondissements. Arrondissements have no powers of their own. Arrondissements vary enormously in population size (in terms of those aged 65+), from more than 150 000 to less than 10 000.

1.2.2.2. Short-stay centres and convalescent centres

Situation in Flanders and Brussels

The programming of the short-stay centres is regulated by the Flemish government (Decree on Residential and Home Care, Circular letter 26/04/2010 of the Flemish minister of Welfare, Health and Family) as follows:

- 32 living facilities per 3 000 seniors between 65 and 69 years old;
- 5 living facilities per 3 000 seniors between 70 and 79 years old;
- 10 living facilities per 3 000 seniors between 80 and 89 years old;
- 25 living facilities per 3 000 seniors aged 90 years and older.

In 2010, the number of programmed beds in the short-stay centres amounted to 2 727, whereas the actual accredited number amounted to 1 129 (Flemish Agency for Care and Health, 2011; NIHDI, 2011). For the geographical distribution of the supply, a minimum of 60 residence units per care region – regional city is taken into account.

In the Flemish Decree on Residential and Home Care, the programming number for the residential units in the convalescent centres in the Flemish region and the bilingual Brussels Capital Region is set at 1 500. For the geographical distribution of the supply, a minimum of 60 residence units per care region – regional city is taken into account, as is determined in the annex of the Flemish Decree of 23 May 2003 concerning the division in care regions and the cooperation and programming of health and welfare facilities.

The share of the programming number for residence units in the convalescent centres in the Brussels Capital Region for 2010 amounts to 112 (Flemish Agency for Care and Health, 2011). For the time being, no permits or accreditations for convalescence centres are awarded in the Brussels Capital Region (NIHDI, 2011).

Situation in Wallonia

The Walloon government has fixed the programming of the number of short-stay beds at 1 800 (Walloon Decree of 7 October 2010, M.B./B.S. 18/10/2010), 583 of which were accredited in 2010 (NIHDI, 2011). The programming per district is based on the number of inhabitants aged 75 years and older. Again, the government determines a minimum share of 29% for the public sector, 21% for the private non-profit sector and a maximum share of 50% for the profit sector.

1.2.2.3. Day care centres

Situation in Flanders

In Flanders (Decree on Residential and Home Care) each day care centre should hold at least five residence units. The programming numbers for day care centres are determined as follows:

- 32 residence units per 3000 seniors between 65 and 69 years old;
- 5 residence units per 3000 seniors between 70 and 79 years old;
- 10 residence units per 3000 seniors between 80 and 89 years old;
- 25 residence units per 3 000 seniors aged 90 years and older.

Situation in Wallonia

In Wallonia the government (Walloon Order of 15 October 2009, M.B./B.S. 12/11/2009) fixes the maximum capacity for day care centres at 3.9 units per 1 000 inhabitants aged 75 years and older. The programming takes place per district (arrondissement) and districts should have at least 3 units per 1 000 inhabitants aged 75 years and older. Again, the government determines a minimum share of 29% for the public sector, 21% for the non-profit sector and a maximum share of 50% for the profit sector.

The Brussels Capital Region also provides a programming of semi-residential services for the elderly. There are nine day care centres for more dependant seniors (Charlot et al., 2009, p. 35).

Key points

- **There are only small differences between the regions/communities concerning the development and the use of the newer types of facilities (nursing home beds, short-stay, day care, coma beds), but there is a rather wide gap between Flanders and Wallonia/Brussels concerning the number of beds in homes for the elderly (the more traditional residential supply).**
- **The number of beds in proportion to the elderly population, the differences between the regions with regard to the number of short-stay and coma beds are noticeably small, with a slight disadvantage for Flanders. Compared to Brussels, Wallonia has a smaller proportion of places in day care centres, while Flanders has a higher proportion of day care places.**
- **Current programming efforts of all regional authorities take account of demographic criteria and aim at achieving a more equal geographical spread of care facilities. Additionally, in Wallonia, the type of supplier is taken into account.**

1.2.3. Accreditation procedure and criteria for the residential care sector

As from 1 January 2010, Flanders applies the same accreditation procedure to the residential care centres, the short-stay centres, the day care centres and the convalescent centres. In order to be accredited, these facilities have to be licensed first, and to be licensed, sufficient room must be available in the programming. The latter depends on both programming figures and assessment criteria. For the residential care centres, the assessment criteria refer to:

- the ratio between the total number of licensed and available care facilities and the programming for the concerned municipality and for the region determined by the minister;
- the current and future profile of the residential care centre;
- the relations with the other care facilities for older persons in the region;
- the residential care centre's vision on housing, living and care;
- the expected cost-effectiveness and price fixing;
- the professional quality guarantees of the initiator.

The website of the Flemish Agency for Care and Health (http://www.zorg-en-gezondheid.be/ouderenzorg/; accessed on July 29 2011) provides all the details concerning the assessment criteria and the accreditation procedure and standards.

In Wallonia, the conditions for granting principle agreements and operating licences to residential care facilities for the elderly are provided for in the Decree of 30/04/2009 (published on 16/07/2009) and its implementation orders. The principle agreement regulation applies to the homes for the elderly, nursing homes, day-care centres and short-stay centres.

The criteria for granting a principle agreement refer to:

- the institution's willingness to offer a diversity of services, aimed at supporting older people to continue to live at home and which meet the specific needs of confused elderly people;
- the architectural quality of the project, its implantation and integration in social life, the measures in favour of sustainable development, more particularly the energy and water saving measures;
- the measures to secure optimum accessibility to disabled persons and persons with sensory disturbances;
- the well-balanced distribution of facilities over the French-speaking territory.

The project must also be compatible with the programming.

Specific accreditation standards apply to homes for the elderly, service flats, day accommodation centres, evening and night accommodation centres and care in host families.

1.2.4. Eligibility criteria for admission to residential care

Not many eligibility criteria are set by legislation. From the information above we can conclude that the residential care facilities for older persons are aimed at seniors aged 60 and over in Wallonia and at seniors aged 65 and over in Flanders. Age of access has been raised from 60 to 65 in Flanders, in line with increased life expectancy and increased healthy life expectancy of older persons. No standard admission criteria have been established for the facilities to apply. In Flanders many residential care centres develop their own policy, using priority criteria such as being a resident of the municipality, the need for care and the time of application (Vastiau, 2009).

Eligibility, or more precisely the level of care covered by the public health insurance scheme, depends on the degree of care dependency, and is evaluated using the 6 items of the Katz ADL (activities of daily living) scale augmented with a cognitive criterion (disorientation in time or space) (Royal Decree of 3 July 1996 – art 148 en 150).

The residential care facilities use the Katz ADL scale to measure the need for care of older persons. As mentioned before, the public financing of the residential care facilities by the NIHDI depends on the 'care load' as measured by the Katz scale. In other words, facilities handling severe cases receive more financing. It is to be noticed that some residential care facilities also base their admission policy on the care load. When a senior with a particular care profile leaves the facility, an identical profile on the waiting list will have pre-eminence (Vastiau, 2009).

Key points

- **Age of access to residential care is set at 60 in Wallonia but at 65 in Flanders.**
- **Otherwise, no standard admission criteria have been established for the facilities to apply. However, some residential care facilities base their admission policy on the care load.**

1.2.5. Programming and development of service flats and home care services

1.2.5.1. Service flats

The service flats have not yet been integrated in the Flemish Decree on Residential and Home Care. The Order of the Flemish Government of 17 March 1998 (B.S./M.B. 24/06/1998) establishes the programming of service flats and serviced residential facilities at 2 units per 100 people aged 60 years and over. The Ministerial Order of 7 June 1999 (B.S./M.B. 29 September 1999) lays down a number of assessment criteria which determine whether the service flats suit the programming. The Flemish Decree on Residential and Home Care is aimed at converting service flats into 'assisted living facilities' but the necessary implementing orders have not yet been endorsed. According to the Flemish Agency for Care and Health, the programmed number of service flats amounted to 33 870 in 2010, 1 267 of which are located in the Brussels Capital Region. In 2010 there were 32 159 accredited service flats, 114 of which in the Brussels Capital Region. On 1 January 2010, 17 479 of them were actually available in Flanders and 82 in the Brussels Capital Region (Flemish Agency for Care and Health, 2011).

In Wallonia, the programming for service flats per district is set at 2 per 100 people aged 60 and over. The authorities have also established that 40% of them should be run by the public sector, 30% by the non-profit sector and 30% by the profit sector (Order of the Walloon Government of 03/12/1998, (M.B./B.S. 27/01/1999)). In 2010, there were 1 653 service flats in Wallonia (Walloon Public Service , 2010).

Clearly, service flats are much more developed in Flanders than in Wallonia. Wallonia has only achieved 10% of the number of service flats available in Flanders.

1.2.5.2. Service centres and day accommodation centres

Flanders distinguishes local from regional service centres. The programming of local service centres is determined per municipality. One local service centre can be set up per 15 000 inhabitants.

In each province and in the Brussels Region, a maximum of 1 regional service centre can be accredited per 100 000 inhabitants. For each region the minister determines the maximum number of regional service centres

to accredit. In 2011, the number of programmed local service centres in Flanders is set at 586, 24 of which in the Brussels Capital Region. In January 2011, 251 were actually set up, 13 of which in the Brussels Capital Region (Flemish Agency for Care and Health, 2011). In 2011 the number of programmed regional service centres reaches 63, 3 of which in the Brussels Capital Region. In January 2011, 59 of them were set up, 2 of which in the Brussels Capital Region (Flemish Agency for Care and Health, 2011).

In Wallonia, the maximum capacity of the day accommodation centres per district amounts to 2 places per 100 people aged 60 and over. The authorities established that 40% should be run by the public sector, 30% by the non-profit sector and 30% by the profit sector (Decree of 6 February 2003 amending the Decree of 5 June 1997, M.B./B.S. 12/03/2003). In 2010, 493 places were programmed in day accommodation centres in Wallonia (Walloon Public Service, 2010).

The Flemish service centres offer, among others, informative, recreational and educational activities to older persons. They answer questions about home care and organize various leisure activities (Flemish Agency for Care and Health, 2011). In Wallonia, day centres provide day care to seniors who can no longer live fully independently. They receive home and family help and, if necessary, therapeutic and social help. The Walloon authorities also provide evening and night accommodation centres. These centres offer the same services as day accommodation centres, but for seniors who are taken care of in the evening or at night (Decree of 30/04/2009, M.B./B.S. 16/07/2009).

The figures show there are far more centres in Flanders: well over 300 in Flanders, against 39 in Wallonia.

1.2.5.3. Services for host families

In Flanders, the number of services for host families is set at six. The bilingual Brussels Capital Region provides one service for host families.

The Walloon Decree of 30 April 2009 states that host families can host a maximum of three persons who are not relatives up to the fourth degree in their homes. The guests receive accommodation, help to organise the necessary care and help with activities of daily living. The Walloon government determines the maximum number of places in host families.

1.2.5.4. Family care

In Flanders, the programming of family care (hours of personal care and domestic help) is set per province and municipality on the basis of the age of the inhabitants:

- per inhabitant younger than 59 years : 0.62 hours per year;
- per inhabitant aged between 60 and 64 : 1.68 hours per year;
- per inhabitant aged between 65 and 74 : 4.58 hours per year;
- per inhabitant aged between 75 and 84 : 17.5 hours per year;
- per inhabitant aged 85 and over: 40 hours per year (Flemish Decree on Residential and Home Care of 13 March 2009).

Every year, the Flemish Government sets the total number of hours that family care services can provide in the home of care dependent persons and for which subsidies will be paid. The relevant minister divides them into the accredited public and private suppliers, taking into account the needs per regional city. In 2010, 19 186 165 hours were programmed and 15 351 872 were actually performed. In proportion to the population aged 75 and over, that number adds up to 27.7 hours per senior. As for additional home care, 3 866 129 hours are programmed. Again, every year the Flemish Government establishes the total number of subsidizable hours and the Minister divides them among the accredited services.

The Walloon Decree on supporting services to families and seniors of 6 December 2007 (published on 21/01/2008) states that the Walloon Government sets the maximum number of hours for family care and additional home care for each organisation. The following factors are taken into account:

- the level of financing of the previous year;
- the utilisation rate of the subsidized hours of the previous year;
- the number of inhabitants of the municipality where the service operates;
- the age of the inhabitants;
- the financial contribution of the service users.

In 2008, the Walloon Region subsidized 5 877 231 hours of family care (General Directorate Social Action and Health, internal note), which represents 20.1 hours of family care per person aged 75 and over.

In the Brussels Capital Region, 884 494 hours of family care were programmed, 137 643 of which were actually performed in 2010 (Agency for Care and Health, 2010). That amounts to 1.7 hours of family care per person aged 75 and over.

In the areas where the regions are fully authorized for the development of care infrastructure, there is clear evidence to suggest that Flanders has been considerably more active than Wallonia: Flanders has provided almost 50% more hours of family care, proportionally six times more service flats and far more service centres.

Key point

- **Besides residential supply, every authority regulates and funds some alternatives. Ambulatory family care is well developed in Flanders and Wallonia (with a slightly higher level in Flanders). The supply of service flats is higher in Flanders.**

1.3. Conclusion

The overall aim of the Belgian LTC system is to provide universal access to high-quality and affordable LTC services. Over the past decade, a more diversified range of care services has become available, better tailored to the needs of care dependent older persons. Between 2000 and 2010 the total number of beds in residential care facilities increased slightly, with nursing home beds having substituted for beds in homes for the elderly. Relative to the 65+ population availability of residential care beds remained stable. Availability decreased however relative to the 75+ population. Supply of home care services increased, as did supply of semi-residential services such as day care centres and short-stay centres. Availability of the latter services is still rather limited. Neither the number of short-stay beds nor the number of places in day care centres exceed 1.5 per 1 000 people aged 65 and over or 2.5 per 1 000 people aged 75 and over.

The dynamics differ between the regions. Wallonia and Brussels have developed a proportionally far higher number of residential beds. The availability of beds in homes for the elderly relative to the older population is almost twice as high as in Flanders. Relative to the older population, availability of beds in nursing homes is practically equal in the three regions. Flanders has a somewhat smaller proportion of beds in short-stay centres compared to Wallonia and Brussels, while the proportion of places in day care centres is smallest in Wallonia. In the areas where the regions are fully authorized for the development of care infrastructure, Flanders has, almost without exceptions, reserved more capacity: more family care hours, more service centres and considerably more service flats. This means that a needy elderly person has a higher probability of using ambulatory care and/or a service flat in Flanders than in Wallonia or Brussels, but a lower probability of entering a bed in a home for the elderly. There are no divergent probabilities in the use of nursing home beds. Clearly different regional authorities conduct their own regional policies.

With regard to the programming of care facilities, the regions apply similar criteria, such as age and geographical spread. A significant difference lies in the fact that, for the Walloon government, the legal status of the operator is taken into account in the programming distribution. An age criterion is used for programming the care facilities for older persons (65+ in Flanders, 60+ in Wallonia), but the legal framework provides no explicit rights on care for older care seekers.

As regards affordability, this target is at least partly met by the fact that nursing and personal care are largely part of the federal public health insurance system which combines nearly universal coverage with no (residential care) or generally low rates (home nursing) of co-payment. Several additional measures have been implemented within the federal system to further reduce out-of-pocket expenses for LTC patients, for instance for incontinence material. At the regional level, co-payments for family care services are income-dependent. Furthermore, two major cash benefits, the means-tested AAEP at the federal level and the Flemish care insurance scheme, are targeted at alleviating the financial burden of non-medical expenses incurred by LTC recipients. Nevertheless, the financial burden of medical and non-medical expenses can run high, especially in the case of severe care needs.

2. A REVIEW OF LONG-TERM CARE PROJECTION MODELS

2.1. Introduction

The aim of this research project is to develop a projection model of the number of older persons in residential care in Belgium up to 2025, building on state-of-the-art long-term care (LTC) projection methodology. This chapter reviews studies using or presenting long-term care projection models, and the results thereof. It aims to answer the following questions:

- Which projection models currently exist to make LTC projections?
- Which methods are employed and what kind of data are used?
- Which predictor variables are included, and how are these updated over time?
- Which hypotheses are underlying baseline and alternative scenarios?

Given the overall aim of the project, we looked only for models which yield quantitative projections of the number of older persons needing, demanding or using formal care, or of the aggregate costs of such care, for a country or large region. Whenever possible, we focused on the number of older persons in institutional care, but models producing projections of older persons in formal care more generally, or of the costs of such care, were not excluded.

This chapter is structured as follows. First the literature search strategy and its results will be reported. In section 2.3 we will review the selected models in a transversal way; the description of the separate models is left to Appendix 2.2. Section 2.4 will present an overview of the most relevant projection results. The conclusion of this literature review will be reported in section 2.5.

2.2. Literature search

2.2.1. Search strategy

Since studies using or presenting long-term care projection models straddle the border between medical science and the social sciences, the literature search was not limited to the first domain (PubMed), but was extended to the latter, using the Web of Science database. In both databases, we searched for publications using the keywords ‘forecasts’ or ‘projections’ or ‘future’ on the one hand, and ‘long-term care’ on the other hand. Such a focus seems justified by the fact that projections on long-term care for older persons, as distinguished from acute medical care, are found to be the subject of dedicated models and studies (or of special modules of more general models).

The literature search in PubMed and Web of Science was limited to studies that were published after 1990. While some projections of LTC may have been made before that date, it seems likely that any valuable elements in those models were adopted by later models. Also, results in such early studies would be of limited value, as they could not take account of trends during the last two decades, nor could they take advantage of data becoming available after 1990.

The only selection criterion in the evaluation of references (apart from that the language should be English, French, Dutch or German) was that the publication should include quantitative projections of long-term care. The projections could be about need for, demand for, use of or costs of LTC within a country or region. The literature search was complemented by a review of references found in selected studies, as well as publications which were already known to the research team. This expert knowledge is important, since much of the literature consists of working papers, research reports and government publications. For all models, only publications using or describing the most recent version were selected. Further details about the literature searches can be found in Appendix 2.1.

2.2.2. Results

With this search strategy, 22 relevant studies were identified. Information was extracted from these publications to complete an ‘index card’ for each model and for each projection (Appendices 2.2 and 2.3). In this way, information was gathered in a systematic and synthetic way. Table 2.1 lists the 14 models that are reviewed below.

2.3. LTC models: synthesis of results

2.3.1. Types and characteristics of models

An overview of the models that will be discussed in this section is contained in Table 2.1.

Table 2.1. Overview of long-term care projection models.

Name	Reference	Country (ies)	Macro or Micro	Static (S) or Dynamic (D)
Dynasim III	Johnson et al., 2007	USA	Micro	D
PSSRU	Wittenberg et al., 2006	England	Macro	S
Destinie	Duée and Rebillard, 2004, 2006; Le Bouler, 2005	France	Micro	D
VeVeRa III	Eggink et al., 2009	Netherlands	Micro	S
ASIM III	Lagergren, 2005	Sweden	Macro	S
"DIW-Ulm"	Schulz et al., 2004	Germany	Macro	S
Cass	Karlsson et al., 2006; Rickayzen and Walsh, 2000	UK	Macro	D
"Erasmus"	Polder et al., 2002	Netherlands	Macro	S*
WUW	Schneider and Buchinger, 2009	Austria	Macro	S
AWG	European Commission, 2009; Comas-Herrera et al., 2006	EU Member states	Macro	S
OECD2000	Jacobzone et al., 2000	OECD countries	Macro	S*
OECD2006	OECD, 2006	OECD countries	Macro	S*
"Bamberg"	Heigl and Rosenkranz, 1994	Germany	Macro	S
"ZES"	Rothgang and Vogler, 1997a, 1997b	Germany	Macro	S
FPB	Vandevyvere and Willlemé, 2004; Hoge Raad voor de Financiën, 2007	Belgium	Macro	S

** Including projected time trends within cells*
"" Without official names, names between quotes have been given by us.

For the purposes of this review it makes sense to distinguish between three kinds of models:

1. Large models which appear to be the result of a sustained effort of a research institute or a research team, which are developed through several stages, and which mostly generate several publications. Examples are the PSSRU model for England, the VeVeRa III model for the Netherlands, the ASIM III model for Sweden, the Dynasim model for the USA, and the Destinie model for France[8] .

[8] A recent dynamic model is the one developed by the MAP 2030 research group. (See http://www2.lse.ac.uk/LSEHealthAndSocialCare/MAP2030/), building on the PSSRU model. However, to date, no publications have been found using this model.

In some cases these are extensions or special modules of more general simulation models (e.g. Dynasim and Destinie), others are stand-alone models specifically designed for the projection of long-term care.

2. Single-study models which seem to be used only in one study.
3. International models used in cross-country studies. Often, these are specific versions of 'large' models, which are simplified or scaled down in order to be applicable in all countries, given data limitations. Examples are the models used by European Commission (2009) and Comas-Herrera et al. (2006), which are both based on the PSSRU model.

Obviously, large models are generally more sophisticated than the other types of models. Yet, sometimes single-study models contain elements that are neglected in the large models, e.g. immigration in Heigl and Rosenkranz (1994) and Rothgang and Vogler (1997a,b), technological advances in Schneider and Buchinger (2009).

LTC projection models have been developed for several developed countries, but by no means for all of them. Disregarding international studies, models have been found for Belgium, the Netherlands, France, Germany, the UK, Austria, Sweden and the USA.

The projected time period varies substantially across models and studies. Interestingly, it is often shorter for the large models (2005-2030 for VeVeRa III, 2000-2040 for Dynasim III, 2002-2041 for the PSSRU model) than for some of the single-study models (e.g. 1990-2050 in Heigl and Rosenkranz (1994); 2000-2050 for the CASS model). The choice of horizon is rarely, if ever, explicitly motivated. The large models incorporate many predictor variables which are difficult to project far into the future. Single-study models, by contrast, are often based on population projections only, which are fairly reliable up to a distant horizon. Having a near or far horizon is not irrelevant for the results, as the effects of ageing on LTC may accelerate after 2030, when the baby-boom cohort starts to enter the 80+ age group, where LTC care use is the highest (European Commission, 2009: 146).

Projected variables also vary. They can be categorized in three groups:

1. Number of older persons in disability. In practice this variable is equivalent to need for care, as it is assumed that anyone with a sufficiently severe level of disability needs some form of care (whether formal or informal).
2. Number of older persons demanding or using formal care. While the distinction between demand and use is conceptually important and also very relevant for policy, it is one that is implemented in few of the models reviewed. Variables that would affect the translation from latent (potential) demand to explicit demand to actual use, such as price and supply of care, are generally not included in these models. As will be noted below, mostly the assumption is made that "supply will follow demand". A partial exception is the VeVeRa III model.

   This variable is usually divided between home care and institutional care, often with further subdivisions within these broad categories, depending on the way institutional care is organized in the country in question.
3. Costs of care. This can refer to public or public-plus-private costs; mostly costs are split up between formal home care and institutional care, sometimes all costs of care are aggregated.

In this review we will focus on the number of older persons in institutional care, as that is the variable of interest in the present project. Where that is not given, we will look at the variable which is closest to it, e.g. persons needing / using formal care.

Most models also incorporate a part or module for the projection of the costs of LTC. Given that the aim of this project is the projection of the number of older persons in residential care, those are not reviewed in this chapter. The main issues here are the development of future wages and other cost factors, and the possibilities for increases in productivity in LTC. Such cost factors could also have an effect on the supply of and demand for LTC, of course (cf. Norton, 2000). However, almost all models reviewed here are mechanistic in the sense that such economic factors are not taken into account.

2.3.1.1. Typologies of models: micro-models and macro-models

In general, models used for the projection of long-term care can be divided into macro-models and micro-models. Micro-simulation models use data at

the individual level, typically the records of individuals from a large sample survey or from an administrative database. Macro-models are either cell-based (i.e. the total population is divided into a limited number of groups) or use time-series which are projected into the future. On the one hand, micro-simulation models have a number of advantages, including the ability to take account of a larger number of variables, the possibility to change a greater variety of parameters independently, and the capacity to provide details on the distributional effects of changes (cf. Lymer et al., 2009). On the other hand, micro-simulation models generally require a greater investment of time and human resources, while the presumed advantages can only become a reality if the number of cases in the database is sufficiently large. Also, a higher degree of flexibility is achieved at the expense of more complexity and less transparency.

Among the large models, some are micro-simulation models (Dynasim III, Destinie, VeVeRa III), but others are macro-models of the cell-based type. The single-study and international models are nearly all macro-models.

The importance of the distinction between micro-simulation models and macro-models should not be overstated. Reweighting the individuals in a micro-database is equivalent to adjusting the sizes of population groups in a cell-based model in every relevant aspect. At a certain level of disaggregation of cell-based models, the large number of cells may become too unwieldy, and it may make sense to switch to micro-simulation. More important is the question which variables and trends are taken into account in the projections, and how this is done. If one is interested in distributional issues, micro-simulation is the only possibility.

2.3.1.2. Static and dynamic models

Another distinction is the one between static and dynamic models. In dynamic models, the transitions between several states (e.g. degrees of disability, use of various forms of care) are modelled and simulated. In epidemiological terms, dynamic models model the incidence of various states. In static models, changes between states are not modelled as such, which implies that such models look at the prevalence, rather than the incidence of various states. Mostly, the size and composition of the population is adjusted through reweighting of individual records, or by adjusting the sizes of 'cells'. Dynamic models, in a sense, are better able to reflect the course of events as they happen in reality, and allow an analysis of trajectories and of time spent in certain states. Models using incidence rates could be more up-to-date than models based on prevalence rates, as the latter may reflect the accumulated effects of the past. If a treatment would be found that would block the onset of Alzheimer's disease, this would have an immediate effect on the incidence of Alzheimer, while the prevalence rate would fall only slowly. On the other hand, dynamic models require large panel data-sets for the reliable estimation of incidence or transition rates (cf. Le Bouler, 2005: 32). Both micro-simulation models and cell-based models can be dynamic or static. Among the large models reviewed here, Dynasim III and Destinie are dynamic. An example of a dynamic macro-model is the Cass model (Karlsson et al., 2006). Most of the large models are static, however.

A third kind of models are time-series projection models, in which past trends are projected into the future, possibly using an econometric model. Time-series regression models (e.g. Yoo et al., 2005) could have been used for this purpose, but we have found no real examples of this. The projection models of Jacobzone et al. (2000) and Polder et al. (2002) are partially of this kind, since trends within age-and-sex groups are extrapolated. OECD (2006) uses econometric equations estimated on cross-sectional aggregate data to project LTC costs per dependant older person. Time-series projection models are apparently also developed by agencies involved in the planning of government budgets without making their way to the academic literature; an example is Besseling and Shestalova (2011) for The Netherlands.

2.3.2. Databases used in models

A striking characteristic of nearly all models reviewed is that they use not one but several databases, from a variety of sources, which include administrative records as well as surveys. Micro-simulation models by necessity are based on a particular micro-database that generally does not include all variables necessary for long-term care projections. In those situations, transition rates and key characteristics are imputed using equation coefficients estimated on another database (e.g. disability in Dynasim III and Destinie). Macro-models also generally utilise several sources of data, as few databases contain all the required information. For instance, a general household survey is used to divide the population into groups defined by age, sex and marital status, another survey is utilised to estimate the prevalence rates of disability for those groups, while the mapping of the use of various forms of care on disaggregated groups is

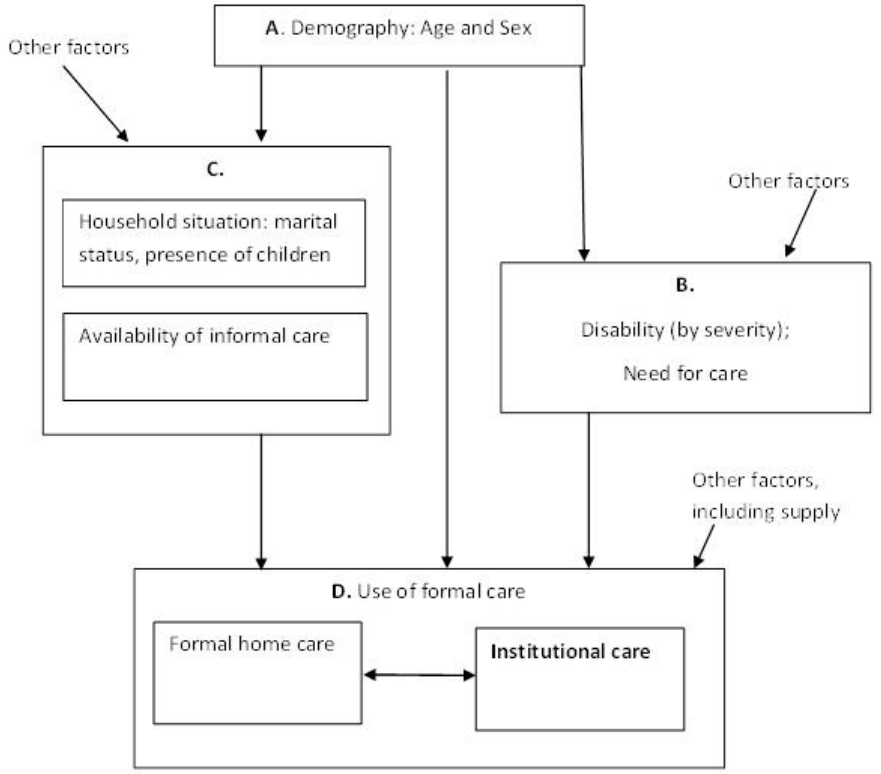
based on yet a third database (e.g. ASIM III). Alternatively, one source of data may be used for the household population, and another one for the institutionalized population (e.g. VeVeRa III). An interesting fact is that some of the surveys used are not national surveys, but one or more local ones, which in a strict sense are representative only for a certain city, region or subset of regions (e.g. the Kungsholmen survey in ASIM III and the PSSRU surveys in the PSSRU model).

Finally, often adjustments are made (implicit and explicit) to make sure that the model aggregated totals in the base year agree with observed totals from official statistics. This implies a lot of 'aligning' and 'calibrating'. Details are seldom given, so the impact of these adjustments on the results is not clear.

2.3.3. Variables

While a large number of variables play a role in LTC projection models, there are a limited number of key variables, in addition to the dependent variable, the use of (institutional) formal care. Figure 2.1. presents a schematic overview of these key variables, and the relations between them. Four blocks are distinguished: A. the pure demographic variables age and sex; B. disability, equivalent to need for care, which is determined mainly by age and sex, but also by other factors[9] ; C. household situation, which is the main determinant of the availability of informal care, and itself a function of age and sex, among other factors; D. the use of (or demand for) formal care, including institutional care. The labels in the boxes have slightly different meanings for micro-simulation models, where they refer to the characteristics of individuals, and for macro-models, where they should be interpreted as the characteristics of groups of persons. As mentioned above, the price of LTC and of its close substitutes is generally not modelled as a variable that affects the use of LTC.

Figure 2.1. Main variables and relations in projection models of the use of LTC.



Source: Adapted from Karlsson et al. (2006: 190)

Below we will discuss how these blocks and the relations between them are treated in the various models, with particular attention to the way these are updated or projected over time.

[9] Perhaps arrows should also have been drawn from household situation to disability and vice versa, for the purpose of clarity this possible effect has been omitted.

2.3.3.1. Block A: Population distribution by age and sex

The starting point of any projection of long-term care is the future distribution of the older population by age and sex. Most models use projections of this distribution which have been made by a government agency, or some other external source such as Eurostat. For some models, though, this distribution is an outcome of the modelling exercise itself, e.g. in Destinie, Dynasim III and in the Bamberg model (Heigl and Rosenkranz, 1994). In the latter cases, official mortality and fertility tables are used.

Since the projection horizon is always less than 60 years, the individuals involved in these projections are already born, and variation between these projections originates in uncertainty about the future trend in life expectancy. In the context of LTC projection models, researchers generally refrain from trying to estimate those trends, and satisfy themselves with showing results following different scenarios regarding life expectancy, either taken from the same government sources, or implemented by adjusting mortality rates (in dynamic models).

2.3.3.2. Block B: Health and disability

Disability is one of the most important factors determining need for and use of long-term care services (Geerts, 2010). Nearly all models (all models among the large ones) acknowledge this fact in some way, but the way disability is taken into account and the way future trends in disability are modelled vary enormously across models.

Health, as distinguished from disability, is generally not explicitly taken into account. The exception is the Dutch VeVeRa III model, where the equation modelling disability includes a number of chronic conditions as independent variables[10]. In both Dynasim III and Destinie, (hypothetical) changes in health are modelled through the adjustment of mortality probabilities, i.e. these probabilities are shifted unto higher ages.

Only the Destinie and the CASS models incorporate a dynamic modelling of disability. In all other models (including Dynasim III) disability is modelled either through disaggregated prevalence rates, or through a (probit or logit) regression equation. Models differ in the measures of disability, the number of disability levels, and the variables by which prevalence rates are disaggregated or that are included in the equations as predictors. Regarding the measures of disability, each country appears to have developed its own way to measure disability, though these are all fairly similar to some combination of the Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). The number of disability levels varies from 3 (in Dynasim III) to 11 (in the CASS model). A discussion of these various measures of disability is outside the scope of this report.

There is much variation between models in the variables that are used to predict disability. The PSSRU model uses prevalence rates by age and gender only. By contrast, the Dynasim III equation that is used for this purpose includes future mortality (which is itself a function of age and sex), race, education, marital status and household income as predictors. This variation appears to be mainly driven by data availability. It may be noted that the issue of modelling the prevalence of disability would not come up if a measure of disability would be present in the primary database used, but this appears to be rarely the case, the exception being the Dutch VeVeRa III model. In all models, disability rates have to be derived from or imputed on the basis of other data.

Models are equally diverse in the way they model future trends in disability. Almost all studies acknowledge that there is a continuing and unsolved debate among gerontologists about the question whether the increase in longevity will be accompanied by expansion, stability or contraction in life-years in disability. For this reason, most studies present several scenarios, based on different assumptions regarding the trend in disability. Even so, the way these scenarios are defined and implemented varies considerably across models. Models also differ in the extent to which these scenarios are based on observed trends or are completely hypothetical.

The simplest way to model future trends in disability is to assume that prevalence rates of disability by population subgroup will remain unchanged, as is done in the PSSRU model. Note that this method contains the implicit assumption that any increase in longevity results in more life-years in disability, consistent with the expansion of morbidity hypothesis.

[10] In the MAP 2030 UK model, under construction, transitions to disability and death are estimated conditional on a range of diseases. (http://www2.lse.ac.uk/LSEHealthAndSocialCare/MAP2030/).

A rather more sophisticated method is used in the dynamic micro-simulation Dynasim III and Destinie models. Here disability prevalence or incidence depends on mortality (future mortality in Dynasim III, mortality rates in Destinie). In this way, any increase in longevity is automatically translated in a later onset of disability, consistent with the stability or 'dynamic equilibrium' hypothesis about the future number of life-years in disability.

The usual way to model changes in the prevalence of disability is to assume that after a period of X years, persons aged Y years at the end of that period will be confronted with the disability rates of persons aged Y – Z years at the beginning of that period. In other words, disability rates are shifted up Z age-years in every X calendar years. In some scenarios these shifts in disability incidence or prevalence are linked to gains in life expectancy. For example, in the preferred scenario by the European Commission (2009), the profile of disability rates by age is assumed to shift by half of the projected increase in life expectancy.

These shifts in disability rates are sometimes completely hypothetical, in other studies they are made roughly consistent with the findings of empirical studies (as in Le Bouler, 2005, using Destinie), and in a few studies they are actually based on observed trends (as in ASIM III and Lafortune and Balestat, 2007). However, the number of observation points in time is often quite limited (e.g., two in the case of Destinie), and the fact that generally several scenarios are developed and presented, points to the uncertainty among researchers about the reliability of these, and about the validity of projecting them into the future. According to Lafortune and Balestat (2007), recent trends in disability vary considerably across OECD countries, rising strongly in some countries (among others, Belgium), being stable in others, and declining in Denmark, Finland and the United States (see Figures 2.4-2.8 in section 2.4 for the striking impact of these trends on projections of the number of persons in severe disability). Moreover, it is seldom clear what drives any observed trends in disability, which adds to the uncertainty.

2.3.3.3. Block C: Household situation and informal care

It is now a well-established fact that the availability of informal care is an important determinant of demand for and use of formal care (Geerts, 2010). While informal care can be provided by children, other relatives, and friends and neighbours, the partner is a very important informal carer. All large models take household situation into account in some way, though in many cases this is limited to marital status. In several of the single-study and international models, household situation is ignored; this is for instance the case for the OECD (2006) model. For the large models, typically, data on marital status, or other aspects of the household situation, in the base year are given in the primary database. The question is then how the prevalence of marital status is projected into the future.

In the simplest case, such projections are taken over from external sources, as in the PSSRU model. In the ASIM III model, the development of the proportion of married persons has been extrapolated from past trends. In the dynamic micro-simulation models Dynasim III and Destinie, future marital status of all individuals in the database is determined through dynamic simulation, using estimated transition rates.

Perhaps surprisingly, informal care and its future trends are generally not modelled. The exception is Dynasim III, which uses logit equations of receipt of unpaid help. In the projections, price of children's time is imputed, and used in logit models of paid home care and nursing home care. In nearly all other models, the projections assume, implicitly or explicitly (PSSRU), a steady state regarding the propensity (conditional on age, gender and possibly household situation) to receive informal care. In OECD (2006) the labour market participation of persons aged 50-64 is used as a proxy for the availability of informal care. Using aggregated cross-sectional data for 11 OECD countries, the impact of this participation rate on the long-term care costs per dependent older person is estimated. The estimated coefficient suggests that each percent-point increase in participation produces an increase in these costs of 3.8 percent (OECD, 2006: 37). The future trend in the labour market participation rate of persons aged 50-64 is based on another OECD source. In Le Bouler (2005) scenarios are presented with different hypothetical assumptions about future developments in the availability of informal care.

2.3.3.4. Other variables

The discussion in the preceding paragraphs covers nearly all variables that are used in the models. The PSSRU model includes also housing tenure, which in England appears to be an important independent factor explaining the use of institutional care. This variable is present in the primary database; future projections of housing tenure are derived from CARESIM, another simulation model.

Apart from the variables that have been discussed, the Dynasim III model also includes ethnicity, education and income in its disability and long-term care equations. The Dutch VeVeRa III model includes education, income, degree of urbanization, out-of-pocket price of care and use of other medical care as predictors in its long-term care equations. The future trend in education appears to have an important dampening effect on the projected use of LTC (Woittiez, 2009: 67).

Immigration is implicitly taken into account insofar its effects are included in population projection models. It is explicitly taken up in the German models of Heigl and Rosenkranz (1994) and Rothgang and Vogler (1997a, b). Given the large numbers that are assumed (250 000 or 500 000 immigrants per year, depending on the scenario), Heigl and Rosenkranz show that immigration can have a substantial impact on future numbers requiring care.

2.3.3.5. The supply of formal care

When the projected variable is the actual use of formal care, it is clear that this could be influenced as much by supply as by demand. However, all models focus on demand. The PSSRU model makes the explicit assumption that "the supply of formal care will adjust to match demand, and demand will be no more constrained by supply in the future than in the base year" (Wittenberg et al., 2006: 12). Since they totally ignore the supply of formal care, all other models implicitly make the same assumption.

The model of Schneider and Buchinger (2009) for Austria is an exception. It combines information on the regional availability of LTC services with projected numbers of dependent older persons. Future trends in the supply of formal services are based on development plans and appraisements from local authorities as revealed in expert interviews; it is unclear, though, how exactly these are taken into account.

In some models (namely Jacobzone et al. (2000), Polder et al. (2002)), past trends in the use of institutional care are projected into the future. The problem with this method is that those trends may be the result of policy changes, making it doubtful whether it is reasonable to assume that those trends can continue in the future. The authors of both studies note that the downward trends they observe for institutional care was most likely at least partly the result of an explicit policy of deinstitutionalization.

2.3.3.6. Block D: Demand for / use of long-term care

The last step in any projection model is the determination of the dependent variable, i.e. the number of older persons needing, or demanding, or using long-term care, given simulated values for the explanatory variables. The PSSRU model uses prevalence rates of residential care by age, gender, household type and disability, and assumes that these remain unchanged over the projection period. A similar assumption is made in the ASIM III and Destinie models. In the Dynasim III model, the demand for LTC is the result of several logit equations, using a large range of predictors, including education, disability of spouse, price of children's time and household income, in addition to the usual suspects: age, sex, disability and household situation. The VeVeRa-III model uses a two-step procedure. First, potential demand for / use of any form of care is modelled using a logistic regression equation; in the second step, a multinomial logistic regression is used to model the choice between several forms of care.

In the large models, the numbers in formal care are split up between formal care at home and institutional care, and within those broad categories a distinction is mostly made between care of different intensity, depending on the organization of long-term care within the country of study. This is not always the case in the other kinds of models. The relationship between formal home care and institutional care is not modelled. This is perhaps surprising, and also disappointing, as care at home and institutional care are likely to be substitutes. For policy purposes, it would seem useful to be able to project the impact of, for example, an expansion of formal home care on the number of persons in institutional care. Woittiez et al. (2009) indicate that many of the users of residential care have characteristics (such as age, education and ADL limitations) that would seem to make them suitable for home care; a substitution of home care for institutional care for all persons for whom that appears possible might reduce the projected increase in the number of institutionalized older persons by half.

2.3.4. Regional estimates of demand for / use of long-term care

Since LTC is a service that is provided locally, and older persons are generally reluctant to move long distances, the regional distribution of the use of or the need for LTC would seem to be of great policy relevance. Yet, no model or study offers projections of the demand for or the use of

LTC, disaggregated by regions, with the partial exception of Le Bouler (2005). The survey data used in all large models do not have the required sample sizes to be representative at the regional level.

A possibility is to reweigh nationally representative survey data to fit to regional marginal distributions (e.g. by age and sex), using administrative data on the regional level. However, Lymer et al. (2009) show that "survey variables not constrained in the weighting process can provide unreliable local estimates" and develop a sophisticated solution for this problem.

2.3.5. The model of the Federal Planning Bureau

Within the Belgian context, the best-known and most recent projections for public expenditure on LTC are those that are each year published by the "Studiecommissie voor de vergrijzing" (Study Commission on Ageing; SCoA in short). These are based on a model developed at the Federal Planning Bureau (Hoge Raad van Financiën, 2007: 53-74; Vandevyvere en Willemé, 2005). This model supersedes that used in earlier reports by the same commission and also Mestdagh and Lambrecht (2003). Recent projections have also been produced by Karakaya (2009), but these are based on the non-institutionalized population only.

The model developed by the FPB is similar to the PSSRU model, and also to the AWG model. It is a hierarchical model, where the population by age-and-sex category is divided into users and non-users of care. Users are further distributed by type (home vs. residential) and intensity of care.

An important difference between the PSSRU model and the FPB model is that the probabilities used in the latter are based on econometric equations, estimated on aggregated data from administrative sources[11].

Exogenous variables used in the equations are age, the probability of losing one's partner, a time trend, and, interestingly, the price of institutional care relative to the consumer price index[12]. Disability is not explicitly modelled.

In the projections of LTC expenditure, population projections made by the FPB are used. Apart from this, no trend is extrapolated into the future. This implies that, implicitly, constant prevalence rates of LTC use by age-and-sex group are assumed. Price of care is supposed to follow the evolution of real wages. The way the FPB model is developed and applied has the implication that population ageing is the main, if not only, factor driving up the costs of LTC as a percentage of GDP.

[11] The equations are logistic in form, but estimated with OLS (since aggregated data were used), separately for men and women.

[12] Only for the 'choice' between home care and institutional care. The regression coefficients for this variable were -10.9 for men and -13.2 for women, but not significant for both. Also, the authors remark that it may capture the effects of other changes across time. (Vandevyvere and Willemé, 2005: 55, 70).

2.4. Projection results

2.4.1. Introduction

In this section we will discuss the projection results. First we will focus on the main results (i.e. the 'central' or 'base' projection). In the following subsection we look at the results according to various scenarios. An overview of studies discussed in this section, and the scenarios they consider is given in Table 2.12.

Table 2.12. Overview of LTC projections (selection).

Reference	Country(ies)	Horizon	Projected variable (short) (1)	# scenarios	Scenarios differ according to: (1)			
					Longevity	Disability rates	Supply of alternative forms of care	Other
Karlsson et al., 2006	UK	2000-2050	# in institutions	3		X		
Wittenberg et al., 2006	England	2002-2041	# in institutions	9	X	X	Informal	
Lagergren, 2005	Sweden	2000-2030	Total costs LTC older persons	5		X		
Polder, 2002	Netherlands	1994-2015	Total costs LTC older persons	2			x	
Jacobzone et al., 2000	Canada, France, Sweden, US	2000-2020	# in institutions	2			x	
OECD, 2006	All OECD countries	2005-2050	Public LTC expenditure	5		X	X	
OECD, 2007	Selected OECD countries	2000/5-2030	# in severe disability	2		X		
Heigl and Rosenkranz, 1994	Germany	1990-2050	# requiring care	7	X			Immigration

Rothgang and Volger, 1997a, b	Germany	1993 - 2040	# needing care	6	X			Immigration
Schulz et al., 2004	Germany	1999-2050	# in institutions	2	X			
Johnson et al., 2007	US	2000-2040	# in nursing homes	3		X		
Le Bouler, 2005	France	2004-2030	# in institutions	10		X	X	
European Commission, 2009	All EU Member states	2008-2060	Costs of LTC	6		X	X	
Woittiez et al., 2009	Netherlands	2005-2030	# in institutions	2			Subst. between forms of care	

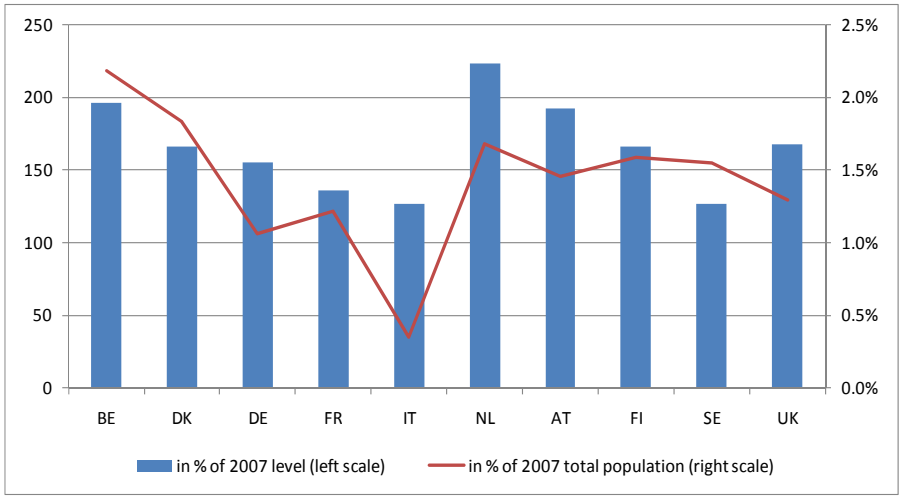
(1) See Appendix 2.3 for more detailed descriptions of projected variables and scenarios. "Institutions" are facilities for long-term residential care, which can be of various intensities. "Nursing homes" are institutions where constant nursing care is provided to persons with significant deficiencies with activities of daily living.

As can be seen, the horizons of the various studies differ, and this can of course have a substantial effect on the results. No attempt has been made to present results for a particular year, as not all studies report results for intermediate years; moreover, base years also vary across studies. Also, the 'base' or 'central' scenario is defined in quite different ways, in particular as regards the future trend in disability. Some researchers assume that the prevalence of disability by age and gender will not change. Other researchers, noting that this is equivalent to the expansion of morbidity hypothesis (given increases in longevity), regard this scenario as too pessimistic, and use a scenario assuming that the onset of disability will shift to higher ages as the 'central' scenario. A comparison of scenarios using similar assumptions was beyond the scope of this section, where the main goal is to give a general idea of where the projections end up, and the variation across scenarios. A slightly more systematic comparison is provided for projections of LTC in Belgium (section 2.4.5).

2.4.2. 'Baseline' projections

All studies predict a substantial increase in the number of persons that will need formal care in general, and that will need / demand / use institutional care in particular. A recent example is given by the European Commission (2009), in Figure 2.2. Assuming unchanged prevalence rates for disability and for formal care use, the projections for several EU countries show increases in the number of people receiving care in an institution ranging from 125% to 225%, relative to the 2007 level. For Belgium, the number of persons in residential care would increase by 196%, or nearly treble. As a percent of the overall population (in 2007[13]) the increase in the institutionalized population ranges from 0.5%-point to 2.2%-point. It appears that the increase in Belgium is the highest or the second highest among continental and Scandinavian welfare states, with developed residential care systems.

Figure 2.2 Projected increase in persons in institutional care, in selected EU countries, AWG projection (pure demographic scenario).



Source: European Commission (2009), Table 34, p. 138

Other studies also report large projected increases in the residential population. For instance, Wittenberg et al. (2006), assuming unchanged prevalence rates of disability by age and sex, report that the number of people in institutions in England is projected to rise by 115% between 2002 and 2041. The projection by Johnson et al. (2007) for the number of older persons in nursing home care in the United States presents an increase of 125% between 2000 and 2040, assuming no trend in disability rates.

13 It would be more interesting to present the change in terms of the population at each point in time, but the published data do not allow this.

2.4.3. Decomposition of the growth in LTC

A few studies decompose the total growth in use of, demand for or costs of LTC into the contributions of various driving factors. Woittiez et al. (2009: 56-67) show that on the basis of demographic developments alone (ageing and increase of the total population), the use of institutional care in the Netherlands would increase by 2.2% per year between 2005 and 2030, while the total projected increase is only 1.4% per year. The reason for the difference is that the (age-adjusted) prevalence of chronic conditions will decline, while the level of education of future cohorts of old persons will be higher than that of currently old people. Similar results are found regarding the potential demand for institutional care.

The decomposition in OECD (2006) is based on their econometric projection. It also indicates that total growth in the costs of LTC (for Belgium 0.9% of GDP between 2005 and 2050) is less than would be projected on the basis of a pure ageing effect (1.3%). The main reason for the difference is the adjustment for healthy ageing (-0.4%) while the downward income effect and the upward cost-disease effect cancel each other out. The income effect refers to the finding that demand for LTC is not very elastic with respect to aggregate income of a country, while the cost-disease effect is due to the assumption that possibilities for increases in labour productivity in the care sector are limited.

2.4.4. Scenarios

Most studies look at the impact of specific factors by working out several scenarios. As can be seen in Table 2.12, the kind of scenarios that are most often developed incorporate different hypotheses as regards future trends in disability. Three studies look at the effect of different assumptions about increases in longevity. Several studies present results for scenarios about changes in the supply of informal or formal care. For our purposes, the absolute levels of the results are perhaps less interesting than the extent to which projected outcomes vary according to the hypotheses made.

2.4.4.1. Scenarios about life expectancy

In their projection of the number of older persons in institutions in England 2002-2041, Wittenberg et al. (2006) obtained the following results according to the assumption made about the trend in life expectancy. The difference between the highest and the lowest projection is 85 percent-points.

- Baseline case: +115%
- Low life expectancy: +90%
- High life expectancy: +145%
- Group aged 85+ grows 1% faster than base case: +175%

Figures reported by Heigl and Rosenkranz (1994) imply that the number of older persons requiring care in Germany would increase by only 25% under the assumption of constant life expectancy, while the increase would be 130% when life expectancy grows by 1 year in every 10 calendar years, and 200% when life expectancy grows even more, by 1.5 years every 10 years. Rothgang and Volger (1997a,b) suggested that the impact of increasing life expectancy on the number of older persons needing care would be somewhat smaller, perhaps because their projection horizon is limited to 2040. Also for Germany, but more recently, Schulz et al. (2004) estimated that the number of older persons receiving long-term institutional care would increase by 172% between 1999 and 2050, when life expectancy increases by 6.4 years for men and by 7.4 years for women, while the increase would only be 60% at constant life expectancy.

2.4.4.2. Scenarios about trends in disability

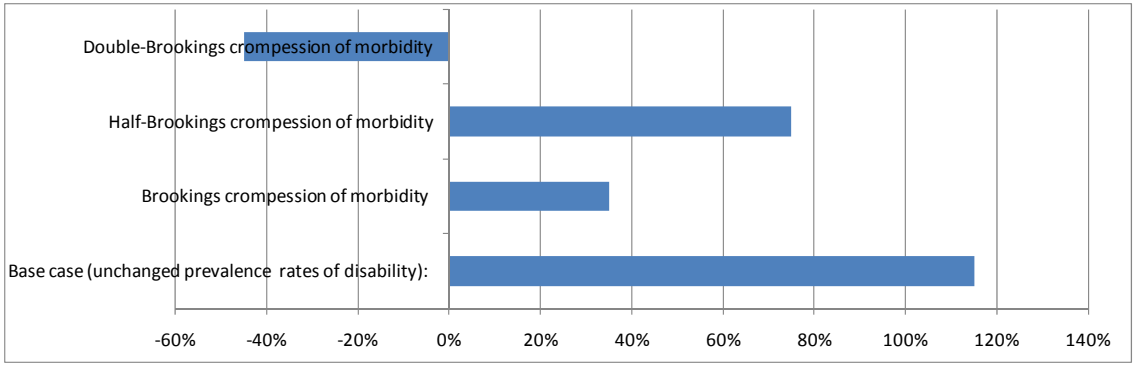
Figures 2.3 to 2.8 show results from scenarios where different assumptions as regards the trends in disability rates are made, from a range of studies in several countries. The variation in outcomes is truly staggering. As shown in Figure 2.3, Wittenberg (2006) found that, depending on the degree of compression of morbidity, the number of older persons in institutions in England might be more than doubled, or be nearly halved. (The Brookings compression of morbidity assumes that for one-year increases in life expectancy, disability rates would shift to people one year older. In the Double-Brookings scenario the shift would be to people two years older, and in the Half-Brookings scenario, it would be to people half a year older.) Admittedly, the most positive assumption of 'Double-Brookings compression of morbidity', is very optimistic. But even where the scenarios are less extreme and based on observed trends, results span a very wide range. The scenarios explored by Lagergren (2005) for Sweden (Figure 2.4) differed only in the assumption about the year when the falling

trends in disability that are observed in the past will stop: 2000 (scenario C), 2010 (scenario B), 2020 (scenario A) or not at all (scenario O). Yet, projected increases in overall costs of LTC differ by a factor of two. Johnson et al. (2007), in their scenarios for the USA (Figure 2.5), used hypotheses adopted by the Congressional Budget Office, or taken from a study on the subject. The projected increases from 2000 to 2040 in the number of older persons in nursing home care vary from 67% to 258%.

The dynamic projections by OECD (2007) are based on recent trends in disability rates in several OECD countries, as reported by various national sources (Figure 2.6). Interestingly, in some countries (e.g. Denmark) the dynamic projections are indeed below the static ones, as would be expected as long as there is no great expansion of morbidity. In others, though, the dynamic projections are above the static ones (based on constant disability rates by age and sex), implying that reported prevalence rates of disability revealed an increase (note that even the assumption of constant disability rates is equivalent to the expansion of morbidity hypothesis). For Belgium, a continuation of observed trends "results in a tripling in the number of severely disabled older persons, compared to an increase of about 50% under the 'static' scenario" (OECD, 2007: 52).

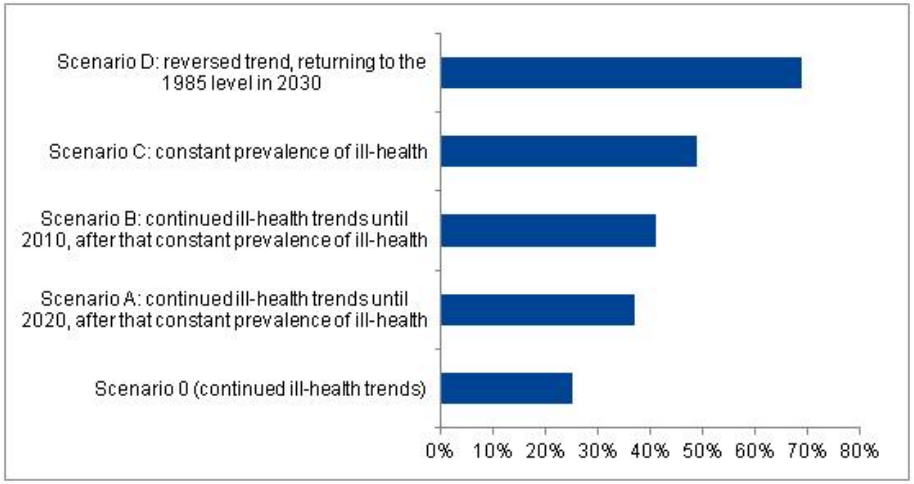
Differences are less extreme in the projections by Le Bouler (2005) for France (Figure 2.7) and by European Commission (2009) for all EU Member States (Figure 2.8). It may be noted that in the former study, the scenarios are not much different; in fact they were chosen for their plausibility, given observed trends in disability in France and elsewhere. Still, the difference in the projected number of older persons in institutions is not negligible. It is not clear why the variation between scenarios in the European Commission's projections does not seem very large. It may be noted that since the scenarios about disability are tied to increases in longevity, there will be only differences in the results in so far as the latter actually occur.

Figure 2.3. Change in number of people in institutions, England 2002-2041, by scenario about compression of morbidity.



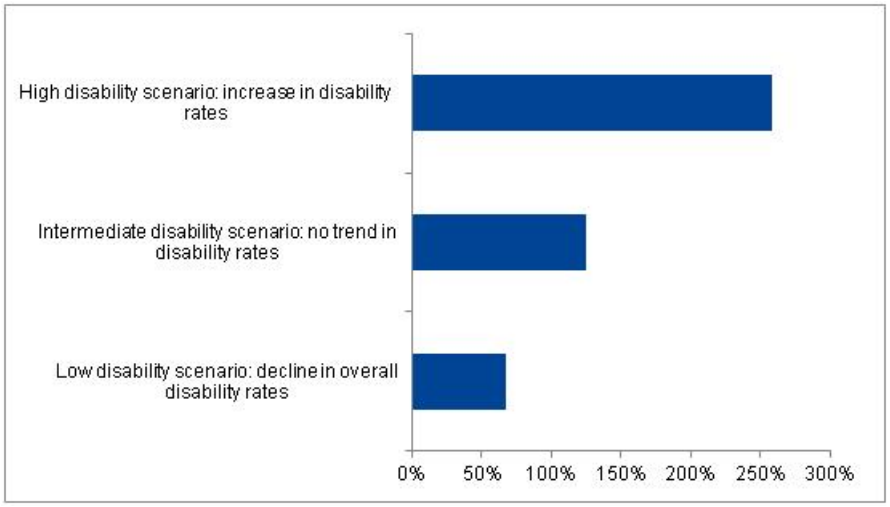
Note: see text of explanation of scenario labels. - Source of plotted data: Wittenberg et al. (2006)

Figure 2.4. Total yearly costs for the long-term care services for the elderly, increase 2000-2030, Sweden, by scenario about trends in prevalence of ill-health.



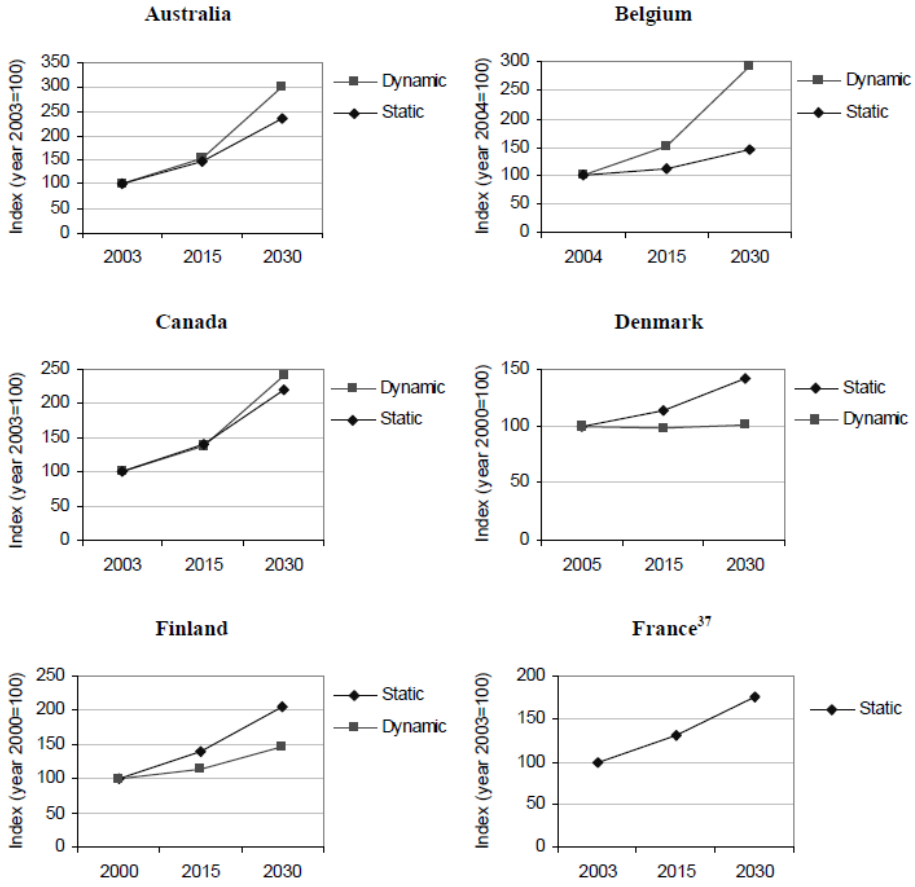
Source of plotted data: Lagergren (2005)

Figure 2.5. Change in number of older adults in nursing home care, 2000-2040, USA, by scenario about disability rates.



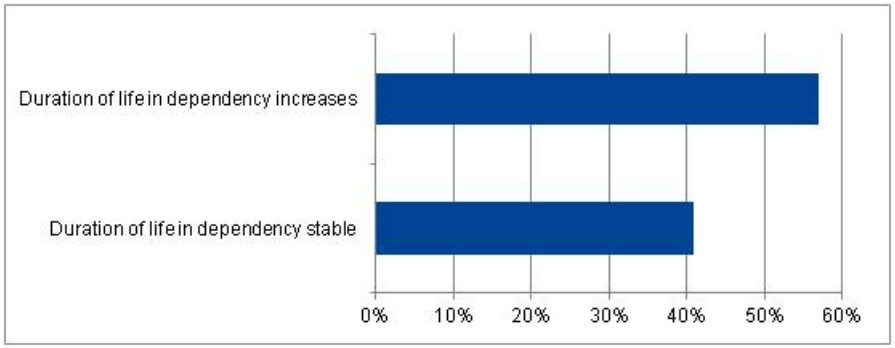
Source of plotted data: Johnson et al. (2007)

Figure 2.6. Projected number of people aged 65 and over with severe disability, based on assumptions of constant disability rates ('static') and continuation of past trends ('dynamic'), selected OECD countries.



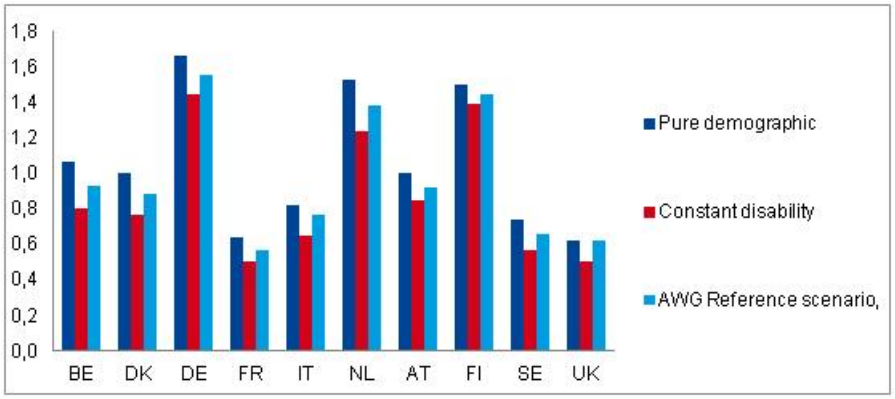
Source: Lafortune et al. (2007), p. 54

Figure 2.7. Number of older persons in institutions, change 2004-2030, France, by scenario about duration of life in dependency.



Source of plotted data: Le Bouler (2005)

Figure 2.8. Proportional (peruno) increase in public expenditure on long-term care, 2007-2060, selected EU countries, by scenario about trends in disability rates.

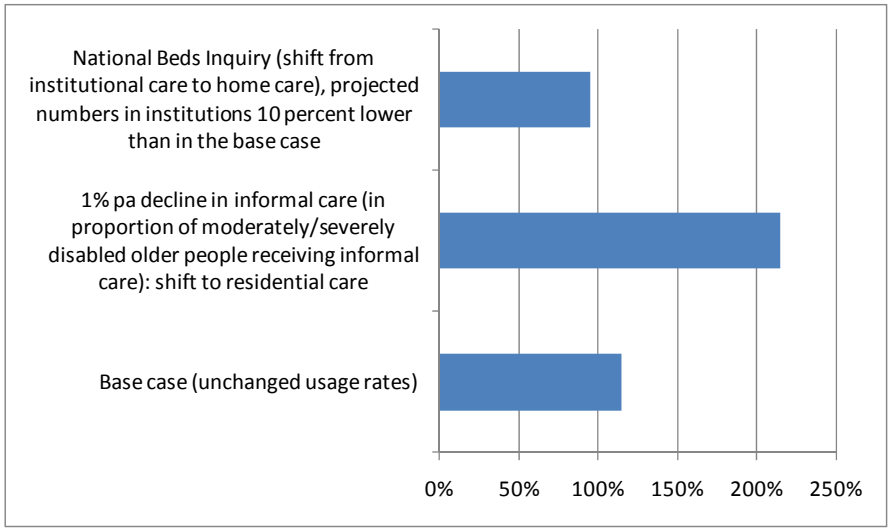


Source of plotted data: European Commission (2009)

2.4.4.3. Scenarios about changes in the supply of other forms of care, in particular informal care

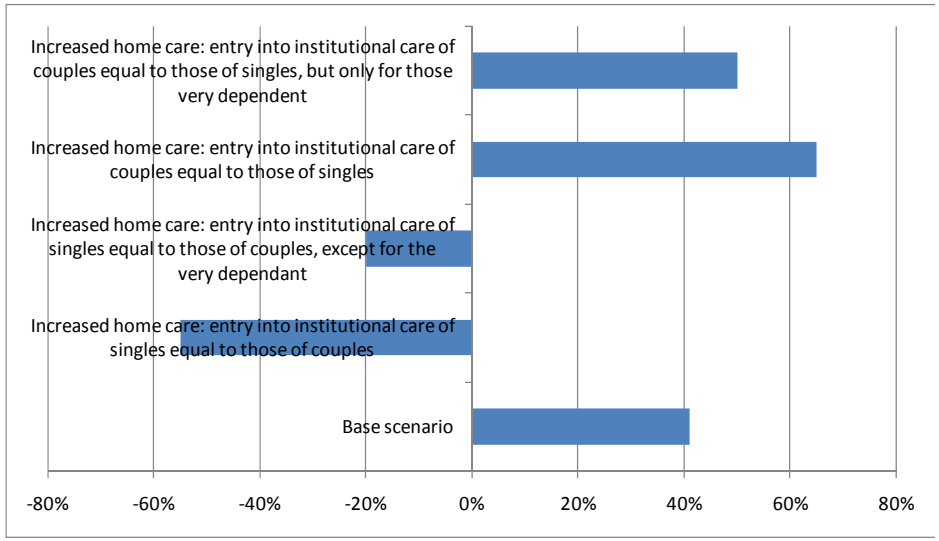
A more limited number of studies have explored scenarios on the impact of changes in the supply of other forms of care, in particular informal care. It may be noted that most of these scenarios are in each case completely hypothetical, and are not based on any observed trend (the exception being OECD, 2006, up to a point). It is therefore hard to judge the plausibility of these scenarios. It is clear, though, that changes in the availability of other forms of care could have a very substantial impact on the number of persons in institutional care. For England, a decline by 1% a year in the supply of informal care would double the increase in the number of people in institutions (Figure 2.9). The simulations by Le Bouler (2005) for France (Figure 2.10) show that if (informal or formal) home care for single people could be somehow improved to the extent that the incidence of moving to institutional care for this group would decline to the level of couples, the number of persons in institutions would be halved; even if this could be realised only for persons with only moderate disability, the numbers would still decline, instead of going up by 40%. Figure 2.11 shows that a shift from informal care into the formal sector of care of 1% (of those who so far received only informal care) would increase costs substantially. Not unexpectedly, for most countries this is especially true if all new beneficiaries would move into institutions, but not in Denmark and Austria. No explanation is given for those exceptions. Finally, Figure 2.12 shows projections by OECD (2006) of what would happen to LTC costs if the labour market participation rate among those aged 50-64 would increase to 70% (in countries where it is currently lower), given the estimated impact of this rate on LTC unit costs. (This estimate was derived from a cross-country regression.) Obviously, the effect is largest in countries where presently relatively few among the 50-64 are at work. Belgium being one of those, costs of LTC would rise by 300%, instead of 50% under a pure demographic scenario.

Figure 2.9. Change in number of older persons in institutions, England 2002-2041, by scenario about supply of other forms of care.



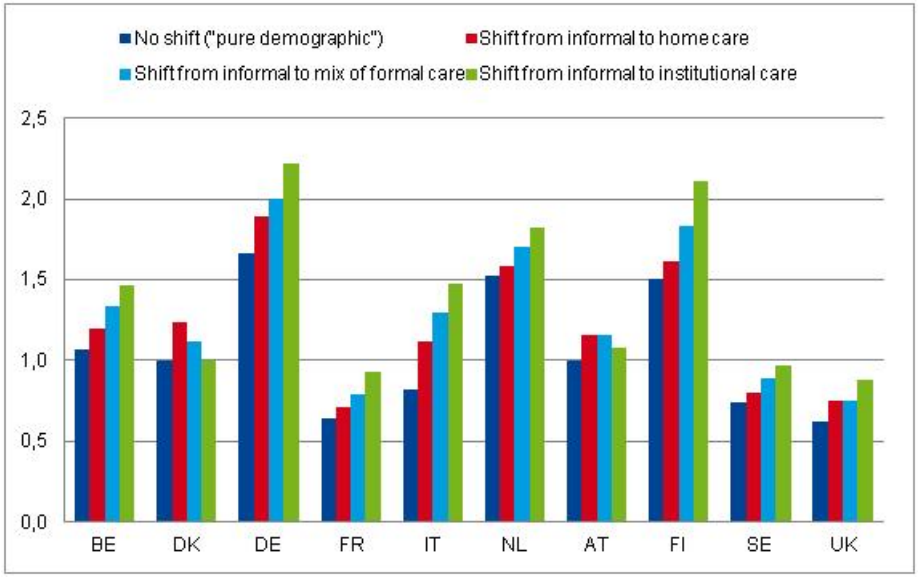
Source of plotted data: Wittenberg et al. (2006)

Figure 2.10. Number of older persons in institutions, change 2004-2030, France, by scenario about supply of home care.



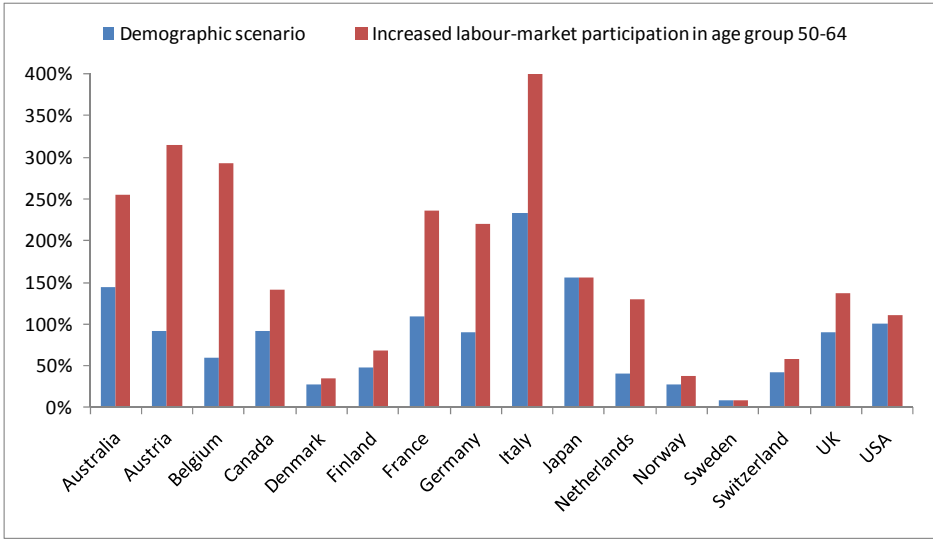
Source of plotted data: Le Bouler (2005)

Figure 2.11. Proportional (peruno) increase in public expenditure on long-term care, 2007-2060, selected EU countries, by scenario about shift from informal to formal care.



Source of plotted data: European Commission (2009)

Figure 2.12. Increase in public expenditure on long-term care, 2005-2050, selected OECD countries, by scenario about labour market participation rate of those aged 50-64.



Source of plotted data: OECD (2006)

2.4.5. Recent projections for Belgium

Table 2.13 presents some recent projections of the costs of LTC for Belgium, in percent of Gross Domestic Product (GDP). Since projections period differ, for each projection the long-term average yearly percentage increase has been calculated, using the earliest and the latest year for which projection estimates were reported. So the "1.8%" in top-left corner means that the Study Commission on Ageing (SCoA) in 2007 estimated that LTC costs, as a percentage of GDP, would rise by 1.8 percent on average per year between 2006 and 2050. For the SCoA projections, this figure has also been calculated starting from a baseline year in the near future, since the long-term projections in fact start from that year.

A comparison across the projections made by the SCoA since 2007 (when the current FPB model was adopted) shows that in terms of levels, the projections for LTC costs have gone up strongly between 2007 and 2010. Reasons for this development include new population projections adopted in 2008, the impact of the crisis, which led to lower estimates for GDP growth, and also considerably higher estimates of LTC costs in the baseline year. However, the implied yearly rate of growth in LTC costs in the SCoA projections of 2009 and 2010 does not increase as much, because the estimated level of LTC costs in the base year has increased across SCoA reports.

The results for Belgium from the international studies OECD (2006) and European Commission (2009) do not necessarily use the same definition of LTC costs. Yet, the European Commission (2009) projections are broadly similar to those of the SCoA. Of the three scenarios presented by the European Commission, "pure demographic scenario" is the one that is most comparable to the projections of the SCoA, since the FPB model in fact assumes constant or nearly constant prevalence rates for LTC use. And indeed, in terms of long-term growth rates (for the SCoA, from 2014 or 2015 on), the projections are very similar (SCoA: 1.5% per year; European Commission: 1.4% per year). In its 2009 report, the SCoA notes that the difference in the LTC costs between its projection and the Ageing Working Group (AWG) reference scenario projection when expressed in terms of percentage-point increases, is rather small (Hoge Raad van Financiën, 2009: 85).

The OECD (2006) projections are generally lower than those of the European Commission's and those by the SCoA. One has to keep in mind that the labels describing the scenarios are somewhat misleading. Since the OECD's "expansion of disability" scenario incorporates the assumption that the prevalence of dependency remains constant over time, it is in fact similar to the European Commission's "pure demographic" scenario, while the OECD's "Demographic effect" scenario is in fact similar to the AWG reference scenario. However, the OECD also assumes that "Long-term care costs per dependent increase by half of average labour productivity" (OECD, 2006: 38; italics in original). Compared to other projections, where it is assumed that unit LTC costs will rise in proportion to GDP, this is a rather optimistic assumption, which explains why the average yearly increases implied by the OECD projections are lower than the others. Note also that the OECD's estimate for LTC costs in the baseline year (2005) is actually derived from reported costs for the Netherlands (OECD, 2006: 52-53).

Projections of the living situation of persons aged 75+ have been made within the FELICIE project (Future Elderly Living Conditions In Europe), and published in Gaymu et al. (2008). These projections are based on a dynamic model for sex, age and marital status, while kinship support status (with or without children alive), education and health (disabled or not) were incorporated as additional variables. For Belgium, the main source of data is the 2001 Socio-Economic Survey (census), while age-specific disability rates (among the married only) were estimated using the ECHP (European Community Household Panel) data. Two scenarios about future trends in health were developed. In the “Constant Disability Share” scenario, it is assumed that the share of years spent with disability remains constant as life expectancy increases, implying that the number of years of disability will increase proportionally. In the “Healthy Life Gain” scenario, the assumption is that the additional years gained in life expectancy will be healthy years; the total number of years spent living with disability will therefore remain constant (Poulain, Ekamper and Dal, 2008 in: Gaymu et al., 2008).

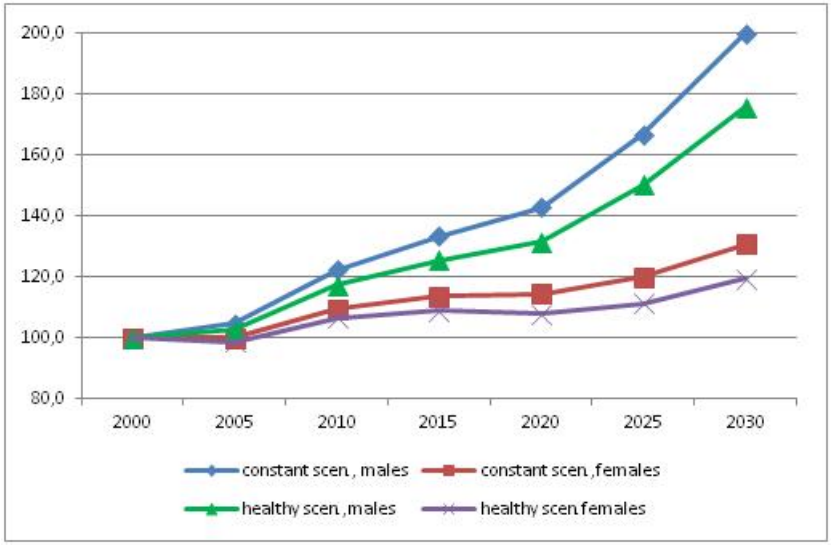
Figure 2.14 shows index numbers for the projected number of persons living in an institution, where the number in 2000 is set at 100, by sex. In the “Constant Disability” scenario, the number of men living in institutions doubles between 2000 and 2030, while the number of women increases by only 31%. The increases are substantially lower in the “Healthy Ageing” scenario. Figure 2.15 shows that FELICIE projects a downward trend in the prevalence of residential care among women aged 75+, while the trend is nearly flat (though at much lower level) for men. The most important reason for the difference between the projected trends is that in future, fewer dependent (i.e. disabled) women are projected to have no spouse and no surviving child, while this not true for dependent men (Gaymu et al., 2007).

Table 2.13. Recent projections of LTC costs for Belgium.

	Long-term average yearly increase		Level estimates, as % of GDP												
	From base year	From 2012 - 2015	2005	2006	2007	2008	2009	...	2012	2013	2014	2015	...	2030	2050	2060
SCvV 2007 Basic scenario	1.8%	1.8%		0.9					1.0					1.3	2.0	
SCvV 2007 Alternative scenario		1.7%							1.0					1.3	1.9	
SCvV 2008 (1)	2.0%	2.0%			0.9					1.0				1.3	2.1	
SCvV 2009 (2)	1.6%	1.5%				1.2					1.4			1.6		2.8
SCvV 2010 (3)		1.6%										1.5		1.8	2.8	3.1
European Commission 2009 "Pure demographic scenario"	1.4%				1.5											3.0
European Commission 2009 "Constant disability scenario"	1.1%				1.5											2.7
European Commission 2009 "AWG reference scenario"	1.3%				1.5											2.9
OECD 2006 "Demographic effect" (4)	1.0%		1.5												2.4	
OECD 2006 "Compression of disability" (4)	0.9%		1.5												2.2	
OECD 2006 "Expansion of disability" (4)	1.6%		1.5												3.1	

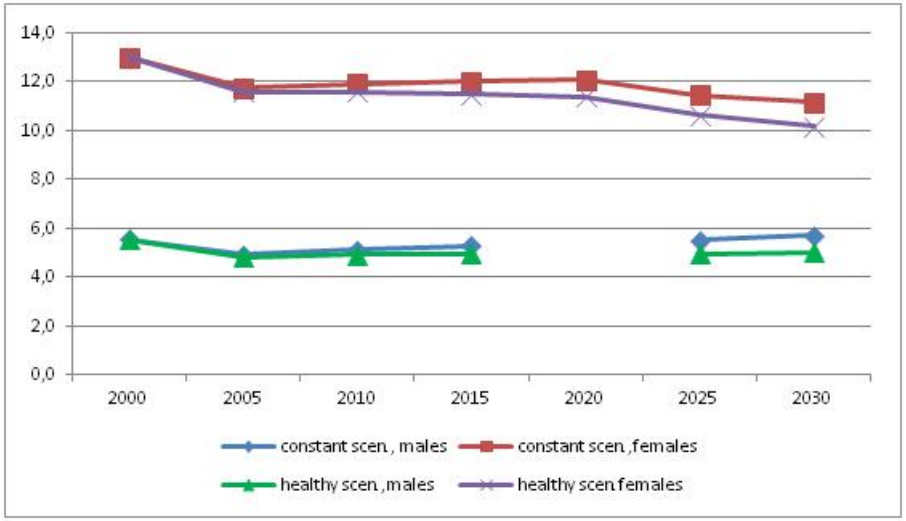
Notes: (1) New demographic projections ; (2) Change in macro-economic hypotheses due to economic crisis ; (3) Upward revision in share of long-term care in total health costs ; (4) Estimate for 2000 by applying the ratio for "Benchmark" country The Netherlands; projected changes calculated from a common base applied to all OECD countries (OECD, 2006: 53)

Figure 2.14. Projection of number of men and women aged 75+ living in an institution, Belgium 2000-2030, index numbers with 2000 = 100, for two scenarios.



Source of graphed data: Tables 2A & 2C on CD-ROM enclosed with Gaymu et al. (2008)

Figure 2.15. Projection of prevalence (%) of living in an institution among men and women aged 75+ in Belgium 2000-2030, for two scenarios*.



Source of graphed data: Tables 2B & 2D on CD-ROM enclosed with Gaymu et al. (2008)
Note: Data for males for 2020 not shown, as the published figures were evidently erroneous (around 32%)

2.5. Conclusions

On models:

1. Most projection models are static macro-models (cell-based). Dynamic micro-simulation models of LTC are modules or add-ons of dynamic models developed for other purposes. Dynamic micro-simulation may be superior to static micro-simulation if the goal is to model transitions between states, but it has high requirements in terms of human and data resources.
2. All models use data from a variety of sources, as the primary database never contains all necessary data. These databases vary in terms of representativeness and origin of data (administrative or survey).

3. Projections of the population by age and sex are generally taken from an external source.
4. Disability is nearly always imputed in a 'static' way using either prevalence rates by age and sex (sometimes additional variables), or a logistic equation (e.g. in Dynasim III). At the moment only the French model Destinie contains dynamic modelling of disability. The impact of future trends in disability is mostly explored through different scenarios. Observed past trends in disability are seldom projected into the future as such, but used to define plausible scenarios.
5. Future trends in household situation, in particular the presence of a partner, are often incorporated in the population projections from an external source. In dynamic models, these trends are a derivative result of the transition rates that are used.
6. The availability of informal care is generally not modelled (except sometimes as an outcome, i.e. informal care use as an alternative to formal care). With one exception, the projections assume a steady state (conditional on background variables) regarding the propensity to provide informal care. The possible impact of changes in the supply of informal care is explored through scenarios, where this variable is mostly adjusted in an arbitrary way.
7. Nearly all models make the implicit or explicit assumption that the supply of formal care will adjust to match demand, which implies that the projection results are driven by changes in demand.
8. Other variables that are sometimes used in the projections are: education, income, housing tenure, ethnicity, degree of urbanization, price of care; exceptionally (at the macro-level) immigration.
9. Given projections of the determinants, the demand for / use of care is projected on the basis of prevalence rates (conditional on those determinants) or of an econometric (e.g. logistic) equation. This is also true for the dynamic simulation models. While in most models a distinction is made between formal home care and institutional care (often with further subdivisions between these broad categories), the relationships between these forms of care is not modelled. Some studies explore the possible impact of changes in the relationships between home and institutional care through scenarios.
10. The model currently used by the Federal Planning Bureau for the projections of the costs of long-term care which are each year published in the report by the Study Commission on Ageing, is a static macro hierarchical model similar to the PSSRU model. In the modelling of the use of care, rather detailed distinctions are made between types of care and intensity of care. Disability is not explicitly modelled. Apart from the population distribution by age and sex, no trends in driving factors are extrapolated into the future.

On results:

1. All studies predict large increases in the demand for or the use of formal care, including institutional care, during the coming decades, driven by the ageing of populations.
2. Most studies consider a scenario with constant prevalence rates of long-term care by age and sex categories as too pessimistic. Most researchers assume that the onset of disability will shift to later ages, but it is not clear whether this shift will be slower than, equal to, or faster than the expected increase in longevity. These assumptions are equivalent to the expansion of morbidity, the dynamic equilibrium and the contractions of morbidity hypotheses, respectively. Different scenarios incorporating different assumptions about future trends in disability result in very divergent projections of long-term care.
3. Scenarios where the supply of informal care is changed are always completely hypothetical, making it difficult to judge whether they are in any way realistic. Yet, results show that such changes could have enormous consequences on the demand for formal care. Substitution between various forms of formal care could also have an important impact.
4. Projections for the costs of long-term care in Belgium indicate that these costs could increase by about 1.4% of GDP between now and 2060, implying a doubling of these costs.

2.6. Lessons learned and added value of the current project

Given the conclusions reported above, the following lessons are learned for the current project:

- Given the aims and timing of the project, a macro-model (cell-based), which can be static or dynamic, seems most realistic.
- It is likely that several databases need to be used.
- For the projection of the population, official projections, if available, should be used.
- There are few, if any, projections of disability, formal home care and informal care. The impact of these factors is assessed through the development of scenarios.
- There seems no alternative to the convenient assumption that supply will follow demand, which implies that projection results are driven by changes in demand factors.
- It is important to keep the distinction between several types and intensities of care, as it is made in the current model of the Federal Planning Bureau.
- Scenarios should be defined in such a way that they appear realistic possibilities, to avoid the conclusion that anything can happen.

The added value of the current project is that projections of the number of users of residential care will be produced for Belgium, using state-of-the-art projection methodology, and micro-data on LTC use.

3. A REVIEW OF THE DETERMINANTS OF LONG-TERM CARE USE BY OLDER PEOPLE

3.1. Introduction

This chapter reviews studies of the determinants of long-term care use. The focus is on institutional care, but formal home care is also briefly discussed. It aims to answer the following question:

- What are the driving factors of the use of formal long-term care in nursing homes and at home?

3.2. Literature search

Since recent reviews were found (Gaugler et al. (2007) and Luppa et al. (2010a) for the older persons population in general ; Luppa et al. (2008) and Gaugler et al. (2009) for demented persons), only articles published after June 2008 (the closing date for the search by Luppa et al., 2010a) were included in the literature search. Details of the literature search are reported in Appendix 2.1.

On the basis of title or abstract for full-text scrutiny, 47 articles were selected of which 27 were retained as relevant for this review.

3.3. Models and methods

3.3.1. Considerations and limitations

Most studies focus on a single country, mainly the USA, and conclusions may not carry over to other countries, as countries differ in their systems of long-term care. These differences could not only affect long-term institutional care use directly, but might also change the impact of other variables. For example, in countries where severe disability is a condition for entry into institutional LTC, disability is likely to be a stronger predictor of the use of such LTC, compared to countries where this is not the case. In countries where the supply of formal home care is very limited, dependent older persons with little access to informal care will be forced to enter institutional care earlier than is the case in countries where formal home care is more developed.

Dementia is the main cause for institutionalisation of older persons (Luppa et al., 2008). Within a population with dementia, there is little variation left for other possible predictors to explain, although they may still affect the timing. Luck et al. (2008) and Luppa et al. (2010b) recommend to look at the impact of predictors separately for persons with and without dementia.

The prevalence of institutionalisation is not only determined by entry rates, but of course also by exit, or, alternatively, by length of stay. A nursing home is not always the last residence in a person's life before death. In the Belgian Health Interview Survey of 2004, 3.3% of the non-institutionalised population aged 65+ have been in an institution for some time in the past (while 4.8% of the 65+ population is currently institutionalised) (Bayingana et al., 2006: 43).

3.3.2. Research designs and methods of analysis

Both Gaugler et al. (2007) and Luppa et al. (2010a) consider only longitudinal studies since the household situation before entry is an important predictor, and morbidity and the number of limitations may change during the stay in a nursing home. Retrospective questions are not adapted to older persons with cognitive limitations. Mostly, a representative sample of persons over 65, and not in an institution at baseline, is followed over time, with follow-up data collections at more or less regular intervals. A few studies follow a specific age cohort over time, e.g. 70-year-olds in Bravell et al. (2009). Observation periods and the number of follow-ups vary considerably across studies (Luppa et al., 2010a: 33).

Most studies used a static set predictors measured at baseline in their analysis, and thus could not account for changes in predictors that possibly influence the subsequent risk of nursing home placement (Luppa et al., 2010: 36). It is often not clear whether researchers used time-varying covariates, or predictors that are measured at baseline only. Some studies explicitly introduce change variables (e.g. living situation changed from couple to single) into the model.

Methods used to estimate the effect of predictors on institutionalization also vary. Some use logistic regression (odds ratios), while others chose a Cox regression model (hazard ratios). "Logistic regression models explore whether nursing home admission occurred or not, whereas Cox regression models examine the time to nursing home admission" (Gaugler et al., 2007). Table A3.2 in Appendix 3.1 summarizes the principal characteristics of included studies.

3.3.3. The Andersen behavioural model

The Andersen behavioural model of health service use (1968, 1995) will be used to structure the results of the review. This model suggests that people's use of health services generally, and of institutional care in particular, is a function of their predisposition to use services, factors which enable or impede use, and their need for care. Predisposing variables are mainly demographic factors and socio-economic characteristics. The need component is specified as those variables that make that persons need care of some sort, and involves the health status in its different dimensions. The enabling variables determine whether this need for care will be translated into demand for formal care, and include both personal/familial and community resources. It is not always easy to assign particular predictors unambiguously to one of those categories (e.g., income is usually put under the heading of predisposing variables, but could also be regarded as an enabling variable, if persons have to pay for care out-of-pocket). We will adopt the categorization used by Luppa et al. (2008, 2010a) in the assignment of variables to the Andersen model categories, except for marital status and living situation which we regard as enabling variables.

An alternative framework is that of economics, in which the use of formal LTC is a matter of supply and demand (Norton, 2000). However, studies using this framework identify the same variables as important predictors of the demand for formal LTC as do studies working with the Andersen model. We come back to this at the end of section 3.4.1. A large part of this literature is concerned with modelling the impact of the specific Medicaid reimbursement policies in a market where most of the suppliers of residential long-term care are for-profit agencies, and many patients are not eligible for Medicaid (cf. Reschovsky, 1998). While theoretically relevant, it is not clear whether the lessons learned from these models are transferable to Belgium.

3.4. Literature review: results

Table 3.1 summarizes the main results of the literature review, where we distinguish between nursing home admission for the general population, nursing home for the demented population, and use of formal home care. Both Gaugler et al. (2007) and Luppa et al. (2010a) employ quality criteria to implicitly or explicitly weigh the results of the studies that are reviewed. Studies selected by us were based on longitudinal analyses, using large samples, but otherwise no quality requirements were imposed. The results reported in the literature do not allow a comparison of the strength of association, but only an assessment of how likely it is that a certain predictor is associated with the dependent variable in question. The categories are described in the notes below Table 3.1.

Table 3.1. Determinants of institutional care.

		Nursing home admission		Home care use
		General population*	Demented population **	General Population ***
Predisposing variables	Age	Certain	Possible	Uncertain
	Sex	Possible	Possible	Uncertain
	Race/ethnicity	Certain	Certain	No
	Education	Possible	Possible	No
	Income	Possible	Possible	Uncertain
	Wealth	Unlikely	No data	No data
	Home-owner	Certain	No data	No data
	Characteristics of the home	Uncertain	No data	No data
	Car ownership	Uncertain	No data	No data
	Urbanization	Uncertain	No data	No
Need variables	Functional impairment (ADL)	Certain	Certain	Yes
	Impairment in IADL	Likely	Possible	No data
	Cognitive impairment	Certain	Certain	Uncertain
	Incontinence	Forget	Possible	No data
	Subjective health	Likely	Forget	No data
Enablin g variable	Marital status	Likely	Certain	No
	Living situation	Likely	Possible	Yes

		Nursing home admission		Home care use
	Having children	Likely	No data	No data
	Other sources of informal help	Possible	No data	Yes
	Formal home help	Unlikely	Possible	-
	Insurance status (incl. Medicaid)	Unlikely	No data	Yes
	Prior use of medical care	Possible	Possible	No data
	Prior nursing home use	Certain	No data	-

*Certain:Significant in the meta-analysis by Gaugler et al. (2007) AND level of evidence is "strong" according to Luppa et al. (2010a)
Likely:{Significant in the meta-analysis by Gaugler et al. (2007) OR level of evidence is "strong" according to Luppa et al. (2010a)} AND significant in at least two other studies
Possible: {Significant in the meta-analysis by Gaugler et al. (2007) OR level of evidence is "strong" according to Luppa et al. (2010a)}
OR {Not significant in the meta-analysis by Gaugler et al. (2007) AND level of evidence is less than "strong" according to Luppa et al. (2010a)} BUT significant in at least three other studies
Unlikely: {Not significant in the meta-analysis by Gaugler et al. (2007) AND level of evidence is less than "strong" according to Luppa et al. (2010a)} BUT significant in one or two other studies
Uncertain:Not mentioned in any of the reviews, and in less than three other studies
Forget: {Not significant in the meta-analysis by Gaugler et al. (2007) AND level of evidence is less than "strong" according to Luppa et al. (2010a)} AND not significant in any other studies
**Certain: Significant in majority of studies reviewed by Gaugler et al. (2009) AND identified as risk factor in Luppa et al. (2008)
Possible: Identified as risk factor in at least one study
Forget: Not identified as risk factor in any study
*** Contact with home health care, adapted from Kadushin (2004)
Yes: Significant association in more than 60% of studies
Uncertain: Significant in between 40% and 60% of studies
No: Significant in less than 40% of studies
Table is based on review articles cited, and 15 later studies listed in Table A3.2 in Appendix A3.1.

3.4.1. Predictors of nursing home admission for the general population

3.4.1.1. Predisposing variables

Age: Age is an important predictor of entry into institutional care among persons over 65 (Gaugler et al. (2007); Luppa et al. (2010a)) even though a large number of covariates reflecting health status and household situation are included in the models. When separate age categories are included (Connolly and O'Reilly (2009); Jonker et al. (2007)), entry rates increase especially strongly after age 85.

Sex: The evidence regarding sex is 'inconclusive' (Luppa et al., 2010a), since some studies reported that women are less likely than men to enter an institution (Gaugler et al., 2007, Cai et al. (2009), Harris and Cooper (2006), Jonker et al. (2007)) whereas other studies reported that women are more likely to move to a nursing home (Connolly and O'Reilly (2009) and Kasper et al. (2010)). Diverging results across studies may be due to different sets of covariates being included. Another issue is the hypothesis that sex may interact with other predictors, which will be briefly discussed in section 3.4.3.

Race/ethnicity: A very consistent finding in all American studies is that White (Caucasian) Americans are more predisposed to enter an institution than persons of other races, due to differences in supportive social networks, cultural aversion or variable geographic access. The issue of race or ethnicity may be less important in the Belgian context, except for the growing minorities of older persons of Turkish or Moroccan descent.

Education: The evidence for education being a predictor for nursing home placement is 'inconclusive' (Gaugler et al. (2007)). When a significant impact of education is found, the direction of the effect varies (Muramatsu et al. (2007) and Sarma and Simpson (2007); Nihtilä and Martikainen (2007: 309)). In all cases, the effects are not very strong.

Income: The evidence for income being a predictor for nursing home placement is 'inconclusive' (Luppa 2010a). The meta-analysis by Gaugler et al. (2007) indicates that low income is an important (positive) predictor of institutionalisation whereas results of other studies are mixed (Kendig et al. (2010), Muramatsu et al. (2007), Nihtilä and Martikainen (2007)).

Wealth: A few studies look at the effect of a person's or family's wealth on the probability of institutionalization, without conclusive results (Kasper et al. (2010), Muramatsu et al. (2007), Noël-Miller et al. (2010)).

Home-owner: The evidence is 'strong' that owning one's own home is a predictor for nursing home placement (Luppa et al. 2010, Gaugler et al. (2007), Cai et al., 2009; Harris and Cooper, 2006; Muramatsu et al., 2007; Sarma and Simpson, 2007). Home-owners are much less likely than others to enter an institution, whatever the interpretation of this finding (home ownership is a measure of property and wealth; it can facilitate the individual's return to the community after short-term institutional care, and prevent it from becoming long-term due to a strong emotional attachment to its own house).

Type of house, level of equipment in dwelling, possession of car: Living in a detached housing in Finland decreases the risk of entering an institution, while a very poorly equipped dwelling increases it. Possession of a car "is the strongest socio-economic determinant of institutional care". This variable could indirectly also measure an individual's health, as persons with functional limitations are likely to give up driving and even the possession of a car (Nihtilä and Martikainen, 2007: 310).

Level of urbanization: Living in an urban municipality in Finland is associated with an increased probability of admission in a nursing home, though for women only (Nihtilä and Martikainen, 2007: 310), probably due to differences in access to institutional care and to a higher risk of falling victim to crime in urban areas (or the perception thereof) (Lachs et al. (2006)).

3.4.1.2. Need variables

Functional impairment (ADL): Functional impairments in daily living are a predictor for institutionalization (Luppa et al. 2010). This is particularly so for having three or more ADL limitations (Gaugler et al. 2007; Harris and Cooper, 2006; Kasper et al. 2010; Luppa et al., 2010b; Noël-Miller, 2010).

Impairment in Instrumental Activities of Daily Living (IADL): IADL limitations are also found to be a predictor of institutionalization (Luppa et al., 2010a, Cai et al., 2009; Kendig et al., 2010; Muramatsu et al., 2007; Noël-Miller, 2010) whatever the number of IADL limitations (Gaugler et al., (2007)) .

Cognitive impairment: Cognitive impairment in general (Cai et al., 2009; Noël-Miller, 2010), and dementia in particular is a predictor for

institutionalization (Conolly and O'Reilly, 2009; Nihtilä et al., 2007), multiplying the risk by 17 (Luppa et al., 2010a: 35).

Incontinence: The evidence for this specific condition is 'inconclusive' (Luppa et al., 2010; Gaugler et al., 2007; Cai et al., 2009; Kendig et al., 2010).

Subjective health: Perceived health is associated with chances of institutionalization in some studies (Luppa et al. 2010b; Muramatsu et al., 2007; Cai et al., 2009; Sarma and Simpson, 2007) but not in others (Gaugler et al., 2007) (Noël-Miller, 2010; Kendig et al., 2010). The estimated impact of this variable can vary substantially depending on which indicators of objective health and functional impairment are included.

Chronic conditions

A review of the impact of chronic conditions on institutionalization is hampered by the variety in the sets of chronic conditions that are included in studies, and differences in the exact descriptions of those conditions (see Table A3.3 in Appendix 3.1). Also, studies produce sometimes contradictory results for some chronic conditions, depending on whether the variable ADL limitations is included as a covariate or not; some chronic diseases many affect nursing home placement almost completely through functional impairment (Luppa et al., 2010a: 35).

The following health conditions emerged in all or nearly all studies as triggering nursing home admission: diabetes, stroke, dementia, Parkinson's disease, hip fracture and depressive symptoms. For congestive heart failure, heart attack, arthritis, osteoarthritis, cancer, and respiratory diseases the evidence is more mixed. These results are confirmed by Wong et al. (2010), who followed a cohort of older Dutch hospital patients after discharge. Studies looking at the effect of the number of chronic conditions or the number of medical conditions found that the association with institutionalization is not significant (Kasper et al., 2010; Muramatsu et al., 2007) or small (Kendig et al., 2010).

3.4.1.3. Enabling variables

Marital status: Being married reduces the chances of getting institutionalised (Gaugler et al., 2007; Harris and Cooper, 2006; Muramatsu et al., 2007; Sarma and Simpson, 2007). For other authors, the impact is insignificant (Cai et al., 2009; Kendig et al., 2010; Luppa et al., 2010b). Controlling for living situation (e.g. in Luppa et al. (2010b)), marital status in itself may be unimportant.

Living situation: Living alone strongly increases the likelihood of entering an institution, while living with a spouse decreases it substantially (Gaugler et al. (2007)), though Luppa et al. (2010a) concluded that the evidence for living situation as a predictor of institutionalisation is 'inconclusive'. A few studies look explicitly at changes in living situation. Noël-Miller (2010: 378) showed that husbands' risk of nursing home admission doubled following spousal loss while the risk of nursing home entry among women was unchanged after spousal death. Changes in household composition are protective against nursing home entry and slow time to entry (Kasper et al., 2010).

Children: The number of children reduces chances of institutionalization, though the effect is not very strong (Gaugler et al., 2007; Kasper et al., 2010). Noël-Miller (2010) found that after spousal death, child availability buffers this risk for men, but not for women. Muramatsu et al. (2007) found that the number of siblings in itself has no significant effect, but that a child living nearby or even co-residing with the older person strongly decreases the risk of nursing home entry.

Other sources of informal help: There is moderate evidence that a poor social network or low social contacts are associated with nursing home admission (Luppa et al., 2010b; Sarma and Simpson, 2007).

Formal home help: The few studies including formal care at the person's own home produce rather inconsistent results (Gaugler et al., 2007; Luppa et al., 2010b; Sarma and Simpson, 2007: 2546). Not all studies took into account that home care may be potentially endogenous to the need for care.

Insurance status: Persons covered by public programs (e.g. Medicaid in the United States) or by private insurance for nursing home costs might be less disinclined to enter an institution earlier than those who have to pay all of these costs out of their own pocket. However, empirical results are inconclusive (Gaugler et al., 2007; Harris and Cooper, 2006; Muramatsu et al., 2007; Noël-Miller, 2010). The same is true for private insurance for long-term care.

Use of medical services: By far the strongest predictor of nursing home admission is prior nursing home use (Gaugler et al., 2007; Luppa et al.,

2010a). Yet, it is not clear whether this finding is very helpful. The results for other use of medical services (prior hospitalization, number of prescription drugs, number of visits to a GP or to specialists) are mixed (Gaugler et al., 2007; Luppa et al., 2010a, 2010b).

In summary: Norton (2000: 975-978) provides a good summary of the main results of studies into determinants of demand for long-term residential care, interpreted from an economic perspective. The primary determinant of demand for nursing home care is health status – both physical and mental health, of which the best measure is limitations in ADL. Demand for long-term care is also related to other demographic characteristics, such as age, gender, and race, but probably because these variables are proxies for health status. Regarding economic variables, some studies found that those with higher incomes were less likely to go to a nursing home. Owning a home decreases the probability of going to a nursing home. Apart from income and wealth, the other major financial determinant of nursing home care is the availability of close substitutes, for example, informal care. Therefore, married persons are much less likely to go to a nursing home than unmarried persons.

3.4.2. *Predictors of nursing home admission in dementia*

The importance of dementia as a predictor of nursing home admission is illustrated by the finding that "The institutionalization rate of persons with dementia increased from almost 20% in the first year after diagnosis of dementia to around 50% after 5 years, up to 90% after 8 years", while it is only 6-7% after a period of 3 years within the older population as a whole (Luppa et al., 2008:74). Regarding the estimated onset of the disease to nursing home placement, the reports range from 30 to 88 months (Luppa et al., 2008:73).

Predisposing variables: The effects of socio-demographic variables were rather similar to those found for the general population. Advanced age and being male imply an increased risk of shorter time to nursing home admission (Luppa et al., 2008) whereas the majority of studies reviewed by Gaugler et al. (2009: 193) reported a non significant effect for sociodemographic variables such as age, gender, education, income, as is true of later studies.

Severity of dementia: Among persons with dementia, the severity of the disease and its various symptoms is clearly associated with institutionalization. Luppa et al. (2008: 73) report that greater cognitive and functional impairment, as well as other behavioural and psychological dementia-related symptoms such as aggression, hallucinations and incontinence, increase the chances of nursing home admission. Also, patients suffering from Alzheimer's disease are at increased risk of entry into a nursing home, compared to other types of dementia.

Other need and health variables: Depression was reported by many studies as having a positive effect on nursing home admission (Gaugler et al., 2009: 195). The estimates by Luck et al. (2008) indicated that stroke has a strong delaying effect on institutionalization. Other chronic conditions do not have a significant impact within this group.

Enabling variables: As was the case for the general population, informal care is an important determinant of nursing home admission among persons with dementia. Studies found an increased risk or a shorter time to entry in an institution for unmarried (single, widowed, divorced) patients, compared to married persons, and for patients living alone, compared to living with the spouse or another caregiver. Studies also showed earlier institutionalization when the caregiver was a child or another relative, compared to the spouse (Luppa et al., 2008: 73). The physical and mental health of the caregiver is an undisputed predictor. A higher rate of institutionalization was associated with increased health problems, presence of depression, and dependencies in activities of daily living (Luppa et al., 2008: 73-74).

Several studies also look at more subjective characteristics of the caregiver, or, what Luppa et al. (2008) call 'secondary stressors'. These include the caregiver's appraisal of the burden or stress associated with the caregiving situation, his or her reaction to the behavioural and psychological symptoms of dementia, the social support the caregiver experiences, and his or her quality of life more generally.

Use of medical and social services: The impact of the use of particular medicines (cholinesterase inhibitor, psychotropic drugs) was found to be not significant, or results were inconclusive (Gaugler et al., 2009: 195). Inconsistent results were also found in predicting nursing home admission by the use of adult day services and in-home help (Luppa et al. 2008: 74). No doubt, the endogeneity of the use of such services, discussed above, also affects the results for persons with dementia.

3.4.3. Gender differences in nursing home placement

Not controlling for other predictors, older women are found to have a much greater chance of entering or living in an institution (Luppa et al., 2009). This is also true in Belgium (Bayingana et al., 2006: 42; Einiö et al. (n.y.). Einiö (n.y) finds that "Differences between men and women in entering institutions were, however, largely related to gender differences in age and marital status distribution, but also to gender differences in health and socio-economic characteristics." This conclusion is in agreement with the review of the general literature on predictors of institutional care above, where we reported that the evidence for gender was inconclusive (when controlling for other factors). Another issue is the possibility that the effects of some predictors (such as marital status and living situation) may be gender-specific (Luppa et al., 2009). Living alone and/or being unmarried involves an increased risk for nursing home placement, but the effect is higher for males than for females. Luppa et al. (2009: 1022) also reported that being a home owner, and having the use of a car, have a higher effect on the risk of institutionalization for males, than it has for females. Finally, urinary incontinence was a significant predictor of nursing home entry especially for men.

3.4.4. Length of stay in, and exit from nursing home

The overall prevalence of institutionalization is determined as much by length of stay, or, alternatively, exit rates, as by entry probabilities, but these have been the subject of few studies. Murtaugh et al. (1997) found that mean length of use among users appears to be approximately 2.5 years, but the distribution is highly skewed, with a small percentage of nursing home users accounting for a large proportion of total use. The number of distinct episodes of residential care that persons had over the lifetime was generally quite low: only 13% had more than one episode of care. Nevertheless, a large number of persons are discharged from care before death. Similar results were found in follow-up study by Spillman and Lubitz (2002).

In a recent study, Kelly et al. (2010): 1702) report that the majority of residents in nursing homes in the USA had short lengths of stay (65% died within a year from admission), but a small number of subjects had very long lengths of stay (up to 10 years). Multivariate linear regression analysis revealed that male sex, high household net worth, and diagnoses of cancer, hypertension, diabetes mellitus, lung disease, and heart disease were associated with shorter length of stay [...]. Residents with a history of stroke had a longer length of stay than those without a history of stroke (Kelly et al. (2010): 1702)). By contrast, marital status does not have an effect after adjustment for other predictors. Dementia or Alzheimer was not included among the predictors. Norton (2000: 975) concludes that "studies generally find that similar factors affect the probability of any nursing home use, length of stay, and lifetime use."

Martikainen et al. (2009) reported for Finland that over a period of 5 years, of persons ever institutionalized, 28% returned to the community. Death in the institution is consistently associated with advanced age, while younger age was associated with returning to the community, although this effect was relatively weak. Furthermore, men and women with a spouse, as well as those owning a house or flat had greater chances of return than others.

3.4.5. Predictors of formal home care use

This section is mainly based on the review by Kadushin (2004) and the work by Geerts (2010: 167-195) who has performed a non-systematic, but quite wide-ranging literature review, supplemented by original empirical analysis for Belgium using the SHARE 2004 and Health Interview Survey 1997-2001-2004 data. A limitation of both reviews is that they do not rate the methodological quality of studies, which can be quite variable. Table A3.4 in Appendix 3.1 summarizes the findings of Kadushin (2004). The discussion of predictors is structured according to the Andersen (1968, 1995) distinction between predisposing, need, and enabling variables.

Predisposing variables: Few of the predisposing variables have very clear associations with formal home care use. Among the predisposing variables examined, "age had the strongest influence on contact with care" (Kadushin, 2004: 223; cf. Geerts, 2010). Gender had an uncertain influence on contact with home health care (Kadushin, 2004: 223; cf. Geerts (2010: 170). For Belgium, Geerts (2010) indicates that women are much more likely to use home care services than men. Kadushin (2004) concludes that other predisposing variables, including marital status, education and race had no association with home care use. For education, Geerts (2010) also reports inconsistent results.

Need variables: Kadushin (2004: 224) concludes: "Among the variables discussed in this review, physical impairment had the strongest influence

on home health care utilization." Both ADL and IADL impairments are important. Geerts (2010: 182) reaches the same conclusions, supported both by the literature review, as well as by her empirical analyses for Belgium. Cognitive impairment had an "uncertain" (Kadushin, 2004: 226) or inconsistent (Geerts 2010: 182) influence on contact with services. Depression and mental health have been examined in relatively fewer studies, but merit more research (Kadushin, 2004: 226; Geerts, 2010: 182).

Enabling variables: Kadushin (2004: 223) concludes that "Living alone was strongly associated with contact with home health care." More generally, those who have a smaller social network, have a higher chance of using formal home care (Geerts, 2010: 180). The impact of the presence of children on home care use is ambiguous, however (Geerts, 2010: 181; Blomgren et al. 2008: 335). Caregiver need, including caregiver health, task burden and subjective burden, is significantly related to home care use. In the USA, having health insurance (Medicaid or private insurance), was positively associated with the use of home care. Geerts (2010: 179-80) reported that results from various studies for different countries are often contradictory regarding the effects of income and other economic status variables, such as wealth and home ownership.

3.5. Conclusions

This chapter reviewed studies of the determinants of long-term care use. The focus is on institutional care, but formal home care is also briefly discussed. It aims to answer the question, what are the driving factors of the use of formal long-term care in nursing homes and at home? The chapter relies heavily on a few recent review articles (Gaugler et al., 2007; Gaugler et al., 2009; Kadushin, 2004; Luppa et al., 2008, 2010a) as well as on the PhD thesis by Geerts (2010). The literature search mainly focused on articles that appeared after those reviews were closed. The main conclusions are as follows:

1. There is a fairly large number of high-quality studies on the entry into nursing homes, but much less attention for exit from, or length of stay in such homes.
2. There is relatively little attention for the institutional context in which older persons live and seek care, and which may well influence the impact of predictors on formal care.
3. A longitudinal study design is the only valid way to examine risk factors for institutionalization. An important limitation of many studies is that they used only a static set of baseline indicators in their analysis. Some look explicitly at changes in living situation, though.
4. The Andersen model distinguishes between predisposing, need, and enabling variables, which is a convenient, if somewhat ambiguous grouping of predictors.
5. Among persons with dementia, predictors may have attenuated effects on nursing home admission, compared to the dementia-free population, because dementia is often in itself a sufficient reason for institutionalization. If possible, it is therefore important between these two populations.
6. Among the predisposing variables, the influences of age, home-ownership and (for the USA) race/ethnicity on the chances institutionalization appear well-established. Entry rates into nursing homes increase strongly with age, even when controlling for health, functional impairments and living situation. Home-owners are much less likely to enter an institution than others. White Americans are much more predisposed to move into a nursing home than Black Americans and Hispanics. Regarding other predisposing variables, including sex, education, income, net worth, other possessions and level of urbanization, results are either inconsistent across studies, or based on too few studies to draw definite conclusions.
7. Among the need variables, functional impairment in ADL is a very important predictor of institutionalization. The evidence is less clear-cut regarding IADL limitations. Persons who are cognitively impaired have a much larger probability to enter a nursing home. The impact of the more specific condition of dementia is particularly strong. The evidence for subjective health is more mixed.
8. Because of the variety in the sets of chronic conditions included in studies, and differences in the definition of those conditions across studies, it is difficult to conclude unambiguously which chronic conditions are most strongly associated with institutionalization. Dementia is the only condition which is universally acknowledged as a very important predictor. For the rest, we venture the following list:

stroke, diabetes, hip fracture, Parkinson's disease, depression and other mental problems.

9. Among enabling variables, the main finding is that living alone strongly increases the likelihood of entering an institution, while living with a spouse decreases it substantially. The evidence for the impact of other sources of informal help than the spouse, including children, is less conclusive. Estimates of the effect of using formal home help are inconsistent, which may be due to a possible endogeneity problem of this variable with respect to the need for care. Studies also fail to find a clear impact of public or private insurance on nursing home entry.
10. A statistically very strong predictor of nursing home admission is earlier nursing home admission, but this finding may be of little help. Results regarding the effect of the use of other medical services (medicines, hospitalization, visits to GP or specialists) are inconclusive.
11. Dementia and its concomitant problems in terms of physical and cognitive impairments, depression, and caregiver problems, are almost certain to lead to nursing home entry at some point in time. Other predictors may hasten or delay this process. Their effects are similar to those in the general or non-demented population, though somewhat attenuated.
12. Older women have a much greater chance of entering an institution than men, but most of this difference is related to sex differences in health, living situation, and other socio-economic characteristics. Living alone has a higher impact for men than for women.
13. A few studies examine exit from, or length of stay in nursing homes. It appears that being male, being older, and suffering from conditions such as cancer, hypertension, diabetes, lung disease and heart disease are associated with a shorter stay. These findings are consistent with mortality patterns for the older population as a whole, irrespective of institutionalization.
14. Among predictors of formal home care, physical limitations and living alone (vs. living with a spouse or with others) have the most consistent and strongest impact on use of home care services.

3.6. Lessons learned and added value of the current project

Given the aims of the project, the following lessons are learned from this review:

- We should devote attention not only to predictors of entry into residential care, but also to exit and length of stay.
- The most important predictors of use of residential care are (in no particular order): age, home-ownership, functional and cognitive impairment (as measured by ADL) and living alone vs. living with a spouse.
- The chronic conditions which are strongly associated with institutionalization (mostly through their effect on ADL limitations) are dementia (most prominently), stroke, diabetes, hip fracture, Parkinson's disease, depression and other mental problems.

The added value of the current project is that it will take several factors into account, which were not previously incorporated in projection models for demand for residential care in Belgium: informal care, the prevalence of ADL limitations and some chronic conditions. Moreover, the projection model will use transition probabilities between several LTC situations.

4. SELECTION OF DATABASES

4.1. Introduction

This short chapter presents the data that are used for the analyses and projections, and answers the following questions:

- Which databases available for Belgium are suitable for our purposes?
- What are the characteristics of these databases in terms of data collection, sample sizes and variables?

This chapter is structured as follows. In the next section we set out the data requirements of this project. After a brief discussion of possible databases, we present the "Permanent Sample" from administrative sources (EPS) and the Health Interview Survey (HIS), and argue why we select these. As will be clarified later, the latter is used to estimate a model of disability, which is utilized to impute disability in the EPS.

4.2. Data requirements of the project

The model to be used implies three broad requirements that the data have to meet:

- The data must allow the modelling of the impact of a broad range of risk factors on disability, measured in terms of limitations in activities of daily living (ADL), which is the most important determinant of long-term care needs. Risk factors include age, sex, health status, chronic diseases and lifestyle indicators but also socio-demographic information such as income, educational level and household situation.
- The data must cover the whole population aged 65+, including those institutionalized.
- They must allow the development of a model that links care needs (disability) to formal care use, including residential care. The most important mediating variable is the availability of informal care by the spouse, children or other persons.

As it is our intention to develop a dynamic model of long-term care use, we need estimates of the transition rates between long-term care situations, which include long-term care given in several care settings and at several levels of intensity, and also the states of no care, and death. Such estimates require longitudinal data on a sufficiently large sample over a period of a number of years.

4.3. EXISTING DATABASES

This section presents the databases for Belgium that are available and suitable for our purposes: the "Permanent Sample" from administrative sources (EPS) and the Health Interview Survey (HIS). Given the aims of the project, special attention will be given to the issue of the representation of persons in institutions in these databases.

The ideal database would include both information on health care use, incomes and social security benefits that in Belgium is present in administrative databases such as the EPS, the Crossroads Bank of Social Security (cf. www.ksz-bcss.fgov.be) and tax records, as well as information on health behaviour and socio-demographic characteristics that is typically gathered in sample surveys, such as HIS and SHARE. However, linking all these databases on the individual level would run up against severe legal problems. Moreover, the EPS, HIS and SHARE are all based on samples, so that the overlap is limited.

This lack of coverage of the institutionalized population is the main reason why other databases do not seem suitable. The LOVO-1 study by the Flemish government is about Flemish persons who are living at home (Declercq et al., 2009). The (complementary) LOVO-2 survey does target persons in institutions, but is limited to the Flemish population, and excludes those with severe dementia (Bronselaer et al., 2008). The Survey of Income and Living Conditions (SILC) covers the whole Belgian population, but only those in private households, and moreover has little information on care use, health and ADL limitations. The Survey of Health and Ageing in Europe (SHARE) is an ambitious survey of persons aged 50 or older in many European countries, collecting data on many variables of interest for the current project (see www.share-project.org and www.share-project.be). Unfortunately, it does not cover the institutionalised population.

4.3.1. The Permanent Sample of Socially Insured Persons (EPS)

The permanent sample (EPS) is an instrument designed by IMA-AIM (Intermutualistic Agency, an agency set up by the seven Belgian Health Insurance Organizations (see www.nic-ima.be) and governmental partners (in particular the National Institute for Health and Disability Insurance, NIHDI) to study and monitor health care consumption and expenditure in

Belgium. At the time of writing (15.03.2011), it contained data for the years 2002-2009, though this period will be extended in future releases, as data for later years become available.

The sample is in effect drawn from the population of all persons who are a member of one of the seven Health Insurance Organizations. This implies that the very limited number of Belgian residents without public health insurance cover are excluded. The sampling fractions are 1/40 for the population aged 0-64, and 1/20 for the population of 65 and over (Préal and de Vooght, 2009). Over the period 2002-08, the number of individuals has increased from 304 300 individuals to 314 800, as newborns and immigrants are included in the sample (while deceased persons and emigrants constitute the outflow).

The EPS contains data on the specific reimbursement codes by procedure, service, admission, drug delivery, etc., including date, provider, institution and cost. It therefore makes it possible to measure LTC use in great detail, both as regards timing and kind of service delivered. In addition, it has data on age, gender, social status within the health insurance system, place of residence and family size (Préal and de Vooght, 2009).

4.3.2. The Health Interview Survey (HIS)

The Belgian Health Interview Survey (HIS) is a cross-sectional survey conducted in 1997, 2001, 2004 and 2008. A representative sample of the Belgian population was selected from the National Population Register by a multistage stratified procedure in which the household was used as the selection unit. (See the reports on the Belgian Scientific Institute of Public Health website (www.iph.fgov.be) for further details.) A total of 10 221 citizens in 1997, 12 050 in 2001, 12 945 in 2004 and 11 254 in 2008 were interviewed. The overall response rate was around 60% for the four surveys. The Belgian Scientific Institute of Public Health (ISP-WIV) is responsible for the survey.

In order to obtain more accurate estimations for the older persons and especially for the age group of 85 years and over, persons aged 65 and older were oversampled in the 2004 survey. For the 2008 HIS, the age group of 75+ was oversampled, without explanation about this change of cut-off. The sample selection procedure ensured equal selection probabilities for older persons living at home and the institutionalised elderly. Special efforts were made to effectively reach the latter group, in order to maximise chances to tackle institutionalised elderly. Table 4.1 gives an overview of the number of older respondents in the 2004 and 2008 HIS.

Table 4.1. Older respondents in the HIS 2004 and 2008 (unweighted numbers).

Age	2004	2008
65-74	1 575	879
75+	2 019	1 980
Total	3 594	2 859

In order to obtain results from the HIS that are representative for the population, the Scientific Institute for Public Health recommends to use the weights that are supplied with the data. These weights are defined both at the individual and at the household level. These weights correct for different selection probabilities due to oversampling of various groups, as well as selective non-response (see Demarest et al., 2006: 12-15 for details).

For 2004, 345 (10%) of the 3 594 older respondents were living in a residential care facility; in 2008, 11% of the 2 859 persons aged 65+ were living in an institution[14]. In 2004, the share of institutionalised persons in the HIS sample matches the rate of institutionalisation as observed by the National Institute for Health and Disability Insurance (NIHDI), except for the 85+ category, where the HIS underestimates the proportion of institutionalised older persons (26% versus 36% based on NIHDI data) (Bayingana et al., 2006). The underrepresentation of persons in institutions among the 85+ is also observed in the HIS 2008 (24% in the HIS 2008; 32% according to NIHDI figures; Demarest et al., 2010: 7)

The data were collected simultaneously for the same person through a face-to-face interview (including questions on education and nutrition) and a self-completed questionnaire (including questions on physical activity, smoking and alcohol). When the selected person was unable to answer

[14] This percentage is not comparable to that in the whole population, as it is unweighted, and the age group of 75+ was heavily oversampled.

the questions, the face-to-face interview was conducted with a proxy respondent. Proxy respondents were not allowed to answer the self-completed questionnaire. For persons aged below 85 year, proxy interviews represent less than 11% of the total, but for sample persons above that age, the proportion of proxy interviews rises to 33%. Among persons in an institution, for about half of all selected persons information was gathered through a proxy (Demarest et al., 2010: 7).

4.4. Conclusion

The HIS database is the only database that includes institutionalized older persons in sufficient numbers, and that reports information on ADL and disabilities, chronic conditions and socio-economic characteristics. However, being cross-sectional, it does not allow the estimation of transition rates between care levels and care setting. For the latter purpose, we need the EPS data. Table 4.2 summarizes the characteristics of the selected databases.

Table 4.2. Characteristics of the Permanent Sample (EPS) and the Health Interview Survey (HIS).

	EPS	HIS
Info on ADL limitations and risk factors	No	Yes
Coverage of institutionalized population	Yes	Yes
Information on formal care use	Very detailed	Some
Longitudinal	Yes	No

As we have seen in the review of LTC projection models in Chapter 2, combining several datasets is the rule rather than the exception. Yet, the EPS and HIS datasets need to be linked somehow. As a one-to-one exact match is not realistic[15], the link can only be made through statistical matching or by imputing information from one dataset onto the other. We propose to impute disability for each individual aged 65+ in the EPS for each point in time, using an equation estimated on the HIS data. The explanatory variables will include age, sex, regional information, and chronic conditions, in so far as the latter can be identified from data on the use of medical treatments in the EPS. Details on this are given in Chapter 6.

Key points

Data that will be used to develop a projection model of the number of patients in residential care in Belgium up to 2025 should meet three requirements:

- **they have to allow the modelling of the impact of a broad range of risk factors on functional limitations (needs for care);**
- **they have to allow the development of a model that links care needs (limitations) to formal care use, including residential care, taking account of mediating variables such as living situation;**
- **they have to be able to provide estimates of the transition rates between care levels and care settings.**

Databases suitable for our purposes are:

- **the Health Interview Survey (HIS) that covers older persons, including institutionalized elderly, and reports information on limitations and disabilities, chronic conditions and socio-economic characteristics;**
- **the "Permanent Sample" from administrative sources (EPS) that does allow the estimation of transition rates between care levels and care setting by imputing disability for each individual aged 65+, using an equation estimated on the HIS data.**

15 The datasets refer to independent samples, so the overlap is limited. Also, privacy considerations hamper such individual linking.

5. MODEL SPECIFICATION

5.1. Introduction

This chapter describes the projection methodology that is used in some detail, building on the reviews in the previous chapters.

In general terms, the projection model is a macro (cell-based), partly dynamic, simulation model. In cell-based models, the population is divided into a number of cells or groups, which are defined by combinations of the categories of relevant variables (e.g., age, sex, living situation, disability situation). The model is dynamic in that long-term care transition rates are used, i.e. rates that indicate the probability to be in a particular long-term care situation at a particular time, given that one was in a particular long-term care situation in the previous period. Otherwise, the model is static, implying that the results for each projection year do not directly depend on those for earlier years. The projections are made for each year in the period 2010 – 2025, and for the population resident in Belgium and covered by the Belgian public health insurance.

In choosing a macro (cell-based) projection model we follow most long-term care projection models reported in the literature. Two of the three micro-simulation projection models in this domain (the American DYNASIM and the French DESTINIE) are in fact parts of larger multi-purpose micro-simulation models, which took years to be developed. Given the limited time-frame for the project, a macro cell-based model is the only feasible option. Moreover, the information on disability from the health survey is linked to the longitudinal EPS database. Such imputations are intrinsically uncertain at the individual level, but become more valid as data are aggregated by population groups.

The reasons for choosing a static model (with a dynamic component) are the following. Except the Cass model (Karlsson et al., 2006), most long-term care projection models are static models. We chose to use transition probabilities, because the EPS data provide a unique opportunity (in an international perspective) to take transitions over time between various long-term care categories into account. This has the important advantage that it provides much more detailed information than mere prevalence data. It will be possible to calculate length of stay in various care situations. More realistic scenarios can be developed, e.g. about the impact of a reduced availability of informal care.

The general outline of the model is presented in section 5.2

The projection model incorporates the variables which were the certain predictors of long-term care use according to the review in Chapter 3: the projected future distribution of the population by age and sex, the level of disability (limitations in Activities of Daily Living, ADL) of older persons, and their living situation (availability of informal carers). The exception is home-ownership, due to lack of data on this variable in the EPS. The projected numbers of persons in various long-term care categories, are derived from the projections of these variables as well as estimated transition rates.

In its present form, the model applies to the population resident in Belgium, or more exactly, the population that is included in the Belgian health insurance scheme, and living in Belgium. Persons living in Belgium, but being insured under a foreign social security regime, are not included in the current projections, since those persons are excluded from the EPS sample. This has the unfortunate implication that French and Dutch older persons who are living in a care home or nursing home in Belgium, and whose care is paid for by Dutch or French insurance or by themselves, are not included in the projections per se. The assumption made is that the proportion of these persons, relative to the total institutionalised population in Belgium, will remain constant.

Persons covered by the Belgian health insurance scheme, but residing outside Belgium are also excluded, as the population projections refer to the persons living in Belgium.

5.2. General outline of the projection model

The projection proceeds in five steps:

1. STEP 1. The distribution of the total population of 65 years and older in Belgium, by age, sex and projection year (2010 – 2025), in absolute numbers. For this the most recent population projections produced jointly by the statistical service of the Ministry of Economics (ADSEI/SGSIE) and the FPB will be used. (see section 5.3 for details).
2. STEP 2. The proportional distribution of the population by living situation, for each age and sex category, and for each projection year.

This will be estimated using results from release 5 of the EPS data, which includes relevant variables. (see section 5.4 for details).

3. STEP 3. The proportional distribution of the population by disability level (ADL limitations), for each age and sex category, and for each projection year. This will be imputed, using the model estimated on the Health Interview Survey (HIS) data, see section 5.5 and chapter 6.
4. STEP 4. The proportional distribution of the population across long-term care categories, for each age and sex group, and for each projection year, taking into account the distributions by living situation and by disability level. These distributions are derived from the estimated transition probabilities (see section 5.6).
5. STEP 5. Application of the proportions on long-term care use obtained in step 4 to the projected overall population numbers by age and sex obtained in step 1, and summation to aggregated results.

5.3. Step 1: projection of absolute numbers by age and sex

In this step, the distribution of the total population of 65 years and older in Belgium, by age, sex and projection year (2010 – 2025) is produced in terms of absolute numbers. In fact, the most recent population projections jointly produced by the ADSEI and the FPB will be used for this purpose[16]. The advantage of taking these as the starting point is that the projections of long-term care will be consistent with the population projections used for the projections of future public expenditure by the Study Commission on Ageing.

These projections differentiate between persons of Belgian nationality and persons of other nationalities. For the projections of long-term care use, this distinction is not retained, as the available EPS data do not contain information on nationality.

[16] To be found at : http://statbel.fgov.be/nl/modules/publications/statistiques/bevolking/Bevolking_op_1_jan_2007-2061.jsp However, new population projections have been recently finished, have been made available to us, and will be used in the current project

5.4. Step 2: projection of the proportional distribution of living situation (availability of informal care)

As shown by the review in Chapter 3, the availability of informal care is an important determinant of long-term care use. Such informal care can be available from within or from outside the household. The EPS only contains data on the presence of potential informal carers within the household[17] , but has no information on possible sources of informal care from outside the household, in particular adult children. As the relationship to the sample person is likely to be important for the provision of informal care, six variables have been constructed, which indicate the presence of a “partner”, a “daughter”, a “son, a “parent, an “other female” and an “other male”, respectively. These variables are approximations, using information on the age and sex of these household members. Each of these three variables has three values: not present; present but not available for informal care; present and available for informal care. See Chapter 7 and Appendix 7.6 for details.

Projections of living situation for Belgium have been made available to us by Michel Poulain (UCL, 2011). In those projections, living situation is a variable with four categories: living alone, living in married couple, living with others, and living in a collective household. This variable and the projections are based on information extracted from the National Register. In order to be able to use these projections of living situations in our model of residential care, we had to align the EPS living situation variables to the categories used by Poulain. Details can be found in Appendix 8.1.

5.5. Step 3: projection of the proportion in disability by age and sex

The review in Chapter 3 indicated that disability is one of the most important indicators of the need for long-term care, and therefore also a crucial variable influencing long-term care use itself. The dominant measure of disability is the presence or number of limitations in Activities of Daily Living (ADL). Unfortunately, such a measure is not available in the

[17] As the information is based on the National Register, “within the household” should strictly speaking be read as “officially registered as living within the same household”

EPS data (cf. Chapter 4). Therefore, the presence of ADL limitations will be imputed, using a logistic equation estimated on the Health Interview Survey data. The independent variables are age, sex, selected chronic conditions (COPD, diabetes, hip fracture, Parkinson's disease, dementia) and province. The dependent variable is the presence or not of any ADL limitation. Within the baseline EPS data, the imputations are made at the individual level. For the projections, we impute the risk of being in disability within each category defined by age, sex, province and living situation (see Chapter 6 for more details on the estimation results).

To use the disability equation for the projections, we need projections of the prevalence of the selected chronic conditions by age-and-sex category for every year up to 2025. As far as we are aware, such projections have not been made for Belgium. For the baseline projections, we will assume unchanged prevalences by cell defined by age, sex, province and living situation. For a scenario where we assume that these prevalences decline in line with increased education level of older persons, these prevalences will be produced using logistic regression equations for each chronic condition, with age, sex, province and education as the independent variables, estimated using the HIS data. All selected chronic conditions, except dementia, are more common among those with only primary education, controlling for age and sex. The future proportions of persons with only primary education by age-and-sex category will be taken from projections by the International Institute for Applied Systems Analysis IIASA[18] (see Appendix 5.2 for details).

5.6. Step 4: projection of long-term care use by age and sex

In the preceding steps, the data needed for the projection of long-term care use have been assembled. These are used to distribute the population in each age-sex category across long-term care situations, including hospitalisations for those not using long-term care, and death. The LTC situations are measured at the end of each quarter, so the period across which transitions are observed is a quarter. A quarter seems an appropriate period, as spells in long-term care of less than a year are common. Details about the definition of the LTC situations can be found in section 7.2.2.

The transition probabilities used in this step are derived from the results of binary and multinomial logistic models, where the dependent variable is one of the 10 'destination' categories at time t (as detailed above) and the independent variables are age, sex, the living situation and the imputed ADL limitation indicator variable. These models are estimated on the individual EPS data 2004-09, for each 'origin' long-term care category separately[19].

For the estimation, each pair of data for one individual for subsequent quarters constitutes an observation. This amalgamation of periods increases the number of observations by a factor of about 30, resulting in estimates that are much more precise than would otherwise be the case. Since transitions are clustered within individuals, 'robust' standard errors will be calculated. The baseline projection will be based on a model without a time trend, as the realism of a projected trend out-of-sample is problematic. A time trend could be used to define alternative scenarios.

A drawback in the estimation of transition rates is that ADL limitation level is imputed, and, since the estimated model for disability does not predict this variable with certainty, the imputations are made with error. This implies that the resulting coefficients of the effects of ADL limitation level on transitions in long-term care use are biased downward.

The estimated coefficients from the multinomial equations are used to calculate transition rates from each 'origin' long-term category to each 'destination' long-term category. Obviously, these transition rates vary by age, sex, living situation and ADL limitation level. Since staying within the same category is treated as the residual situation, transition probabilities across 'origin' long-term category sum to 1.0. Combining the transition rates with the distribution across long-term categories at the baseline time, produces the distribution at the 'destination' period.

Steps 2 and 3 have delivered the joint distribution of the population within each age-sex category across the living situation variables (step 2) and five chronic conditions, including the risk of disability (step 3). Combining

[18] See http://www.iiasa.ac.at/Research/POP/Edu07FP/index.html?sb=13

[19] Alternatively, we could use one equation for all 'origin' long-term care categories, including the latter as an additional independent variable. This specification would most likely necessitate a large number of interaction terms between 'origin' long-term care category and the other independent variables. Using separate equations is more convenient.

this with the estimated long-term care transition rates (see above), the proportional distribution of the population across long-term care categories is produced.

Finally, the proportions on long-term care use obtained in step 4 are applied to the projected overall population numbers by age and sex obtained in step 1. Summing by year provides a projection of the total number of elderly persons in the various long-term care situations. Of course, we can also aggregate to intermediate levels to show the projected composition of the persons in long-term care.

5.7. The projection model in summary

The projection model can be regarded as a A * S * P * L6 * C5 * D * Y matrix, where the capitals represent:

- A: age, 8 categories (5-year intervals)
- S: sex, 2 categories
- P: province or part of a province, 17 categories (including the capital region of Brussels)
- L6: six living situation variables: “Partner”, “Son”, “Daughter”, “Parent”, “Other female” and “Other male” as defined in Appendix 7.6, 6 X 3 categories (not present; present but not available for informal care; available for informal care)
- C5: five indicator variables for the chronic conditions (COPD, dementia, diabetes, hip fracture and Parkinson’s disease), each with 2 categories (present or absent)
- Y: projection year: 2010 - 2025

Each cell in the matrix has eleven variables (apart from the A * S * P * L3 * C5 * D * Y characteristics which define it): the estimated or projected population size, the risk of disability (having at least one ADL limitation) and the proportions in each of the long-term care situations.

The total number of cells in the matrix is more than two million. This is of course quite large, relative to the sample size of the EPS (about 85 000 persons aged 65+, depending on the year). This is no problem, though, since the population within each cell is the result of equations or existing projections. In particular, the population numbers by A * S * P * Y are given in the existing population projections, while the more detailed distribution by L6 * C5 * D cells within any A * S * P * Y group will be derived from estimated equations (see below for details). The estimated or projected population within an individual cell can of course be zero or a fraction of one. Below are the details of the way the matrix is defined, which follow the steps outlined in Chapter 5.

A * S * P (distribution of population by age, sex and province):

- Base distribution: Population projections by FPB – ADSEI for 2008
- Projection: Population projections 2009-2025 by FPB – ADSEI

A * S * P * L3 (distribution of living situation by age, sex and province)

- Base distribution: EPS
- Projection: Projections of living situation categories which are taken from Poulain (2011).
- Remark: The living situation variables based on the EPS are aligned to the categories used by Poulain (UCL, 2011).

A * S * P * C5 (distribution of chronic conditions by age, sex and province)

- Base distribution: EPS
- Projection: Projections of the marginal distributions of the chronic conditions by A * S * P will be derived from logistic regressions for each chronic condition as dependent variable using the HIS data, and age, sex and province as independent variables. The joint distribution of the five chronic conditions (25 = 32 cells) by A * S * P will be derived from these marginals and the base distribution, using iterative proportional fitting (Bishop et al., 2002).

A * S * P * L3 * C5 (distribution of chronic conditions by age, sex, province and living situation)

- Base distribution: EPS
- Projection: Within any A * S * P cell, the same distribution of C5 will be applied to all living situation categories

A * S * P * C5 * D (distribution of disability by age, sex, province and chronic conditions)

- Base distribution: Imputation in the EPS using logistic equation estimated on the HIS data
- Projection: Using logistic equation estimated on the HIS data.

A * S * P * L6 * C5 (the risk of disability by age, sex, province, living situation, and chronic conditions)

- Base distribution: Imputation in the EPS using a logistic equation estimated on the HIS data
- Projection: Within any A * S * P * Y cell, the same risk of disability will be applied to all living situation categories in any year. Controlling for age, sex, chronic conditions and province, living situation had no significant effect on disability in HIS 2004 and 2008.

The steps described above will produce the estimated or projected population size. The proportions in the various long-term care situations will be estimated following the procedure outlined in section 5.6.

Key points

- **The projection model is a macro (cell-based) dynamic simulation model.**
- **The model is dynamic in that long-term care transition rates are used.**
- **The projections are made for each year in the period 2010 – 2025, and for the population resident in Belgium and covered by the Belgian public health insurance.**
- **The projection model incorporates the most important variables determining long-term care use:**
  - **the projected future distribution of the population by age and sex**
  - **the living situation (availability of informal carers) of elderly persons**
  - **the level of disability (limitations in Activities of Daily Living, ADL) of older persons**
- **The projection proceeds in five steps:**

1. **The distribution of the total population of 65 years and older in Belgium, by age, sex and projection year (2010 – 2025), in absolute numbers.**
2. **The proportional distribution of the population by living situation, for each age and sex category, and for each projection year.**
3. **The risk of disability (having at least one ADL limitation), for each age and sex category, and for each projection year.**
4. **The proportional distribution of the population across seven long-term care categories (in addition to the situations of "no care", "hospitalization" and "death"), for each age and sex group, and for each projection year, taking into account the distributions by living situation and the risk of disability.**
5. **Application of the proportions using in long-term care obtained in step 4 to the projected overall population numbers by age and sex obtained in step 1, and summation to aggregated results.**

6. MODEL OF DISABILITY USING HIS 2004 DATA

In this chapter we describe how the model which is used to impute disability in the EPS data was developed, using the data of the Health Interview Survey (HIS) of 2004 and 2008. We used logistic regression to model the presence or not of any ADL limitation.

6.1. Data

6.1.1. Dependent variable: ADL limitations

The HIS provides data on problems with six Activities of Daily Living (ADL):

1. getting in and out of bed,
2. getting in and out of a chair,
3. dressing,
4. washing hands and face,
5. feeding oneself and cut up one's food,
6. getting to and using the toilet.

The HIS 2008 contained in addition a seventh item on "showering or bathing". The answering options were not completely the same in the HIS 2004 and HIS 2008. For HIS 2004, only the answer "I can only ... with someone to help me" was regarded as evidence of ADL limitation; the other possible answers were "no difficulty" and "some difficulty". For HIS 2008, the answer "I cannot … by myself" was regarded as evidence of ADL limitation, the other possible answers were "no difficulty", "some difficulty" and "a lot of difficulty".

In case of missing answers on any of these variables in the HIS 2004, a 0 (not limited) was imputed if the answer to a general question on health limitations in "bathing, showering or dressing yourself" was "no, not limited at all", since a fairly large number of respondents who chose this response to this question did not answer the ADL items. A question on incontinence was not used, as descriptive results suggested it did not discriminate well enough those with severe incontinence problems[20].

This disability measure differs from the Katz scale used by the NIHDI to evaluate the disability level of older persons in residential care. This scale with four categories determines the level of reimbursement. The most important difference is that the NIHDI scale includes two items about the mental state: orientation in time and orientation in space, for which there is no equivalent question in the HIS. Appendix 6.1 presents a more detailed comparison of these disability measures.

The dependent variable for the logistic regression (ADL1) is coded 1 if there is any limitation (in any of the 6 or 7 questions listed above), and 0 otherwise. Table 6.1 shows the prevalence of disability, measured as having at least one ADL limitation, by age and sex. The prevalence is three percent-points lower in 2008 than it is in 2004, probably due to fact that in 2008 the ADL items had four response options, instead of three as in 2004. The pattern of disability across age and sex is very similar in the two years, increasing with age for persons aged 75 and more, and higher for women than for men within any age bracket.

[20] The HIS 2004 questionnaire contains question IL.15.01. "Do you sometimes lose control of your bladder?" with responses: 1. "yes, constantly", 2 "yes, every now and then", 3 "no". 406 respondents, or 11.3% of the sample aged 65+, answered "yes, constantly", which is considerably more than for the other ADL items (cf. see Table 4.6 in Chapter 4). Only persons choosing response 2 were routed to a follow-up question on the frequency of the incontinence problem, where the most intensive category was "once a week". In the HIS 2008, there was only a general question whether persons had suffered from urinary incontinence, ever, and during the last 12 months. So it appears that the HIS questions were not specific enough to identify those with incontinence problems which are really disabling.

Table 6.1. Prevalence of disability in the HIS 2004 and 2008, by age and sex, weighted data.

Sex	Age	2004		2008	
		Proportion	St. Error	Proportion	St. Error
Male	65-69	0.7%	0.4%	1.3%	0.7%
Male	70-74	4.8%	1.6%	0.8%	0.7%
Male	75-79	5.7%	2.3%	0.6%	0.4%
Male	80-84	7.6%	3.1%	8.7%	3.0%
Male	85-89	17.5%	4.5%	7.1%	1.7%
Male	90-94	28.8%	6.9%	10.0%	5.1%
Male	95+	30.2%	17.4%	17.7%	8.6%
Female	65-69	1.9%	0.7%	0.4%	0.3%
Female	70-74	2.5%	0.8%	0.5%	0.5%
Female	75-79	7.8%	2.0%	4.8%	1.7%
Female	80-84	19.3%	3.8%	9.6%	2.3%
Female	85-89	30.6%	3.1%	17.9%	1.9%
Female	90-94	41.5%	4.4%	30.1%	4.4%
Female	95+	56.4%	9.9%	44.9%	7.4%
All		7.8%	0.7%	4.8%	0.5%

6.1.2. Independent variables

The independent variables were age, sex, a number of chronic conditions including dementia, province of residence, education and income. Age was recoded into 5-year intervals, with the top category "95+".

Those chronic conditions were selected which in the literature review were identified as important determinants, or where the evidence was inconclusive. Dummy variables were constructed for each of these chronic conditions, which were coded 1 if the respondent indicated he/she "had this disease/condition or had had it during the last 12 months", and 0 otherwise. Only respondents who had at most 1 missing answer on any of the selected conditions were selected. Such missing answers were imputed with 0 ("does not have condition"). These chronic conditions were divided into two groups: those which can be identified in the IMA database (EPS) using medication or nomenclature data (asthma/bronchitis, diabetes, glaucoma, hip fracture, osteoporosis and Parkinson's disease), and those which could or were not (heart disease/attack, high blood pressure, depression, cancer, arthritis, other rheumatoid arthritis, stroke, spine fracture).

In contrast to other chronic conditions, there is no direct question on dementia in the HIS 2004 and 2008 questionnaires. An indicator of dementia was derived from three different pieces of information, namely the answer to the question "Why was the selected person not capable of answering the question personally", data on medication used, and two open-ended questions in the HIS 2004 about "Other serious psychiatric problems, specify ....." and "Other mental diseases, which ones ....". The answers to the latter questions were coded by us. See Appendix 6.2 for details.

Concerning geographical information, the HIS data contain province and arrondissement, as well as several indicators of urbanization, based on a typology of municipalities. Preliminary analyses showed that province was the best predictor of disability among these.

Education (highest diploma) was recoded into 6 categories: "no or only primary education", "lower secondary education", "higher secondary technical or vocational education", "higher secondary professional education", "higher education", "no information". Income refers to the equivalent monthly income of the household (IN_1), where the categories are: "€<750", "€750-1 000", "€1 000-1 500", "€1 500-2 500", "€> 2 500", "no information".[21]

6.1.3. Estimation approach

For the estimation we selected only those aged 65 or more. Cases with a missing value on the question "who answered the questions" or on the ADL dependent variable, or more than one missing value on the chronic conditions variables, were excluded. Six logistic models were estimated, in which variables were included subsequently, in the following order:

Model 1: only sex and age

Model 2: + chronic conditions which can be identified in the EPS using data about treatment (e.g. medication)

Model 3: + dementia

Model 4: + province

Model 5 + other chronic conditions

Model 6: + education, income

The distinction between several models makes it possible to see what is added to the predictive power of the model by the various variables which are present or identifiable in the EPS data, and what is contributed by variables which cannot be included in the imputation model. In this step results are unweighted, since this makes the most efficient use of the observed data.

The models were estimated on the pooled HIS 2004 and HIS 2008 data. Tests showed that there were no significant differences between the effects of predictors in HIS 2004 and HIS 2008; see Appendix 6.3 for details. A dummy variable indicating survey year needed to be included, to account for the different level of prevalence of disability in the two years.

Finally, model 4 which includes all variables which are present or identifiable in the EPS data (age, sex, the chronic conditions COPD, dementia, diabetes, hip fracture and Parkinson's disease and province), was re-estimated using the individual-level weights provided by the

[21] See the HIS 2004 Manual, pp. 30-31 for details of the construction of this income variable. Using equivalent income implies that in fact both income and household size enter the logistic equation in a particularly constrained way. Unfortunately, the HIS data do not include any other income variable

Scientific Institute for Public Health. Given the limited set of independent variables, we could not assume that our model was the complete and true model, and, given the aim of predicting ADL limitations, it was important that the results could be extrapolated to the population over 65. These weights correct for different selection probabilities due to oversampling of various groups, as well as selective non-response (see Demarest et al., 2006: 12-15 for details)[22].

6.2. Results of the logistic regressions

The results of the logistic regression which is used for the imputation in the EPS are presented in Table 6.2. Results for models 1-6 can be found in Appendix 6.3. The chronic conditions asthma, osteoporosis and glaucoma were dropped, as these were not significant; for this reason no indicators for these conditions were constructed from the EPS data. The coefficients show that women are considerably more likely to be disabled than men, even when controlling for age, chronic conditions, education and income. Unsurprisingly, the chance of being disabled rises strongly with age; this remains true when controlling for chronic conditions, and (as shown by the results in appendix) education and income.

Among the chronic conditions which can be identified in the EPS database using data about treatment, Parkinson's disease, hip fracture, COPD and diabetes are associated with increased probability of being disabled. Dementia has a very strong impact on disability.

Table 6.2. Results of logistic regression of disability, HIS 2004 and 2008.

	Model 4		
	Odds-ratio	**St. Error**	**p**
Year (1 = 2008)*	0.48	0.08	0.000
Sex (1 = female)*	1.57	0.29	0.014
Age 70-74*	1.70	0.61	0.143
Age 75-79*	4.11	1.42	0.000
Age 80-84*	9.90	3.23	0.000
Age 85-89*	16.91	5.02	0.000
Age 90-44*	31.28	9.79	0.000
Age 95+*	62.21	24.94	0.000
COPD	1.73	0.39	0.015
Diabetes	1.68	0.34	0.011
Hip fracture	4.46	1.36	0.000
Parkinson	6.51	2.68	0.000
Dementia	6.06	1.13	0.000
Antwerpen*	1.00	0.25	0.995
Vlaams Brabant*	1.54	0.56	0.227
West Vlaanderen*	1.64	0.42	0.053
Oost Vlaanderen*	0.89	0.24	0.674
Limburg*	1.85	0.69	0.097
Brabant Wallon*	1.61	0.48	0.113
Hainaut*	1.43	0.33	0.112
Liège*	0.71	0.22	0.264
Luxembourg*	0.94	0.29	0.843
Namur*	0.77	0.22	0.364

n (unweighted): 5 931
**Reference categories: Year=2004; Sex=Male; Age 65-69; Province: Brussels*
Notes: Odds-ratios in bold: significant at 0.01 level; odds-ratios in italic: significant at 0.05 level

[22] We attempted to explain the number of ADL limitations, in addition to the presence of any ADL limitation, using the zero-inflated binomial (ZINB) model. We were motivated by Zaninotto & Falaschetti (2010) who show that the ZINB model performs better than alternative models for ADL data from England. However, hardly any variable was a significant predictor of the number of ADL limitations, given that there was at least one ADL limitation. For this reason, it turned out to be impossible to impute the number of ADL limitations in the EPS data.

Overall, province turned out to have a small but significant effect, though none of the provinces has an impact on disability that is different from the capital region of Brussels. In the unweighted regressions Antwerp, West-Vlaanderen, Walloon-Brabant and Hainaut had a significant positive effect relative to Brussels. Region (Brussels, Flanders, Wallonia) in itself did not have a significant effect. We looked at the possibility of further geographical disaggregation, to the level of 'arrondissements' (after some collapsing of 'arrondissements' with few cases), instead of provinces.

The results in Appendix 6.3 show that among the chronic conditions which cannot be identified using medication data, stroke and depression have a significant effect on disability; stroke seems particularly strongly associated with disability. Education and income are not very strongly associated with disability, controlling for sex, age and chronic conditions. Regarding education, it seems that persons having no or only primary education are more likely to be disabled than all others, while there is no clear difference between higher levels of education.

6.3. Prediction of disability in the EPS

The logistic equation with estimates of the coefficients makes it possible to impute disability in the EPS. Application of the logistic equation yields, for every observation, a probability of being disabled. This probability of risk is in fact the variable that is used in modelling transitions between LTC situations (see Chapter 7).

In order to assess the quality of the predicted disability variable, a second step was applied. For every observation a random number was drawn between 0 and 1. If this number was equal to or below the probability of being disabled for that observation, the observation was imputed to be disabled; otherwise the observation was imputed to being not disabled.

This variables was then compared to the measure of actual disability. On the individual level, the results were rather dismal: the correlation was only 0.21; of those persons who were predicted to be in disability, only about a quarter were actually disabled, and the converse was also true: of those persons who were actually disabled, only about a quarter were predicted to be disabled. If we used the split-sample technique, where the model is estimated on one half of the sample, and then used to predict the dependent variable for the other half, the correlation was even lower: 0.18[23]. Results were much better on the aggregate level, though. The pattern of predicted disability by age and sex matched quite closely that of actual disability. This was also true for the pattern across provinces, though less neatly. Perhaps more convincing evidence of the validity of the prediction of disability on the aggregate level is that the profile of disability by education level was also reproduced reasonably well, even though education was not in the model used for the imputation. Further details can be found in Appendix 6.4.

Key points

- **The HIS 2004 and 2008 data have been used to estimate a logistic model of disability, where disability is defined as having at least 1 ADL limitation.**
- **When using only variables that are present or could be imputed in the EPS database, age, sex, province and the chronic conditions (dementia, Parkinson's disease, hip fracture, COPD and diabetes) were found to have a significant effect on disability.**
- **Income and education were found to have only a limited impact on disability, controlling for age, sex and chronic conditions.**
- **The reliability of predicted disability is poor on the individual level, but quite good on the aggregate level of subgroups of the population.**

[23] Average correlation across seven runs.

7. MODELLING TRANSITIONS IN LONG-TERM CARE SITUATIONS, USING THE EPS

7.1. Introduction

In this chapter we describe the construction and the results of the model of transitions in long-term care situations using data from the EPS. After describing the data (section 7.2) and the methods (section 7.3) used, the results are presented in section 7.4.

7.2. Data preparation

7.2.1. Selection of the working sample

The working sample selected from the EPS, which will be used for the transition model, consists in principle of all persons aged 65 or more. However, we encountered two problems. The first is due to the fact that the sampling fraction among persons aged 65 or more is 1/20 and among persons below that age 1/40. This means that exactly half of all older persons in the EPS have entered it on their 65th birthday, and LTC use and other variables are recorded from that date on. There is no information about them before that date. Also, we have no information on the day of birth; the only information available is that persons have turned 65 sometime during a particular year. This has the unfortunate implication that for those persons (in their first year in the EPS) we cannot distinguish between no health care use and no information (e.g., if the first recorded visit to a doctor is on 9 October, this can be because the person did not visit a doctor before that date, or because s/he became 65 on 5 October, and visited a doctor every week of the year during the whole year.)

Therefore, such observations for persons for the year when they became 65 and entered the EPS were deleted from the working sample. In order to make sure that persons aged 65 were represented in the working sample in proportion to the population, persons aged 65 in any year, who had been in the EPS before they became 65, were given a weight of two.

The second problem concerns persons not covered by public insurance for "minor risks"[24]. Until 1st January 2008, most (formerly) self-employed were not covered for "minor risks", unless they bought voluntary insurance. These "minor risks" include home care and the lump-sum payments for residential care in homes for the elderly (ROB/MRPA). Such persons were only covered for long-term care in nursing homes (RVT/MRS). Therefore, since home care and care in homes for the elderly was not covered by the public health insurance for such persons, it was invisible in the EPS data. From 1/1/2008 on, the system for the self-employed also covers "minor risks". The EPS data reveal that 3.7% of observations referred to persons who in that particular quarter had no public insurance for "minor risks". In 78.5% of cases, voluntary insurance had been taken for these risks. The tables in Appendix 7.1 show that the profile of persons not covered by public insurance for "minor risks" closely resembles that of those with public insurance for these risks during the period of analysis. Nevertheless, not having public insurance for "minor risks" was slightly more likely for those aged 90+ than for less old persons, for males compared to females, and for persons living in the provinces of West-Vlaanderen and Luxembourg.

It is clear that including persons without public insurance for "minor risks" in the working sample would produce misleading results when used in the projections, since such persons have become virtually extinct after 1/1/2008. Removing only observations of persons for the quarters when they had no public insurance for minor risks might also lead to misleading results as regards transitions in formal care. For this reason it was decided to remove completely the records of all persons who were not covered by public insurance for minor risks in any quarter. Since those persons are not distributed randomly, weights were calculated to correct for this exclusion. These weights are equal to the inverse of the proportion of persons with public insurance for minor risks, by sex, birth-year category and province. These variables were chosen because of their importance in the

[24] "Minor risks" ("kleine risico's", "petits risques") is a term used in the Belgian health insurance. It refers to health care services such as consultations of doctors, dental services, medicines bought in a pharmacy, which are usually not very expensive. Since this term is well-established, we retain it in this report.

projections. In following this procedure, we make the assumption that in future formerly self-employed persons, who had no public insurance for "minor risks" before 2008, will have the same LTC usage pattern as those who always enjoyed public insurance for minor risks, given sex, birth-year and province, at least after an adjustment period.

Furthermore, 73 895 observations (person-quarters) or 2.0% of the total sample were excluded because information on place of residence was missing for all or some years (i.e. the variable arrondissement was 0 or missing). Presumably, these were persons who were living outside Belgium during all or part of the period under observation.

Finally, a comparison of the composition of the sample by residential LTC situation (see below) with data provided by the NIHDI showed that there is very good agreement for the years 2004-09, except that the proportion of persons in category MRPA-O/ROB-O (lowest level of care dependency) is underestimated by at maximum 3 percent. The differences are larger in the years 2002-03. For this reason the latter years were dropped from the analysis. Other comparisons indicated that the proportion of persons in the EPS dying by year and quarter reproduces the population figures nearly perfectly, and that the composition of the sample by age and sex matches that of the population quite closely (see Appendix 7.2). As data of the next year were needed to measure adequately the LTC situation in the last quarter of any year (see below), we also dropped the last quarter of 2009, lacking 2010 data.

7.2.2. Dependent variable: construction of the LTC situation typology

Long-term care situations were identified on the basis of reimbursement data at the end of each quarter, more specifically the weeks 13 and 14 (1st quarter), 26 and 27 (2nd quarter), 39 and 40 (3rd quarter), and 51, 52 (in some years also 53) and the 1st week of the following year (4th quarter). Here follows the list of LTC situations that were distinguished. In case persons used several forms of care during the same quarter, the situation with the highest number on the list was given preference. See Appendix 7.3 for a detailed list of the NIHDI codes corresponding to these LTC situations.

1. no long-term care, no hospitalization
2. home-care use 'low' (categories T, A) and care in day care centres, other than category F
3. home-care use 'high' (categories B, C) and day care centres category F
4. residential care, category O (ROB/MRPA)
5. residential care, category A (ROB/MRPA)
6. residential care, category B (ROB/MRPA or RVT/MRS)
7. residential care, category C (ROB/MRPA or RVT/MRS)
8. residential care, category Cd (ROB/MRPA or RVT/MRS)
9. hospitalization
10. death

In addition to long-term care *strictu sensu* we distinguish hospitalization as a LTC situation in our typology. The reason is that hospitalization can be a precursor of institutionalization, and also an intermediate situation between residential care and death. On the other hand, health care use other than hospitalization is hardly relevant for the projection of long-term care. Hospitalization was coded if there was a stay in hospital of more than 20 days which included the last day of the quarter.

Within residential care, the distinction between ROB/MRPA (homes for the elderly) and RVT/MRS (nursing homes) is collapsed to reduce the number of states. During the period 2002-09, to which the EPS data refer, a large number of ROB/MRPA places have been transformed into RVT/MRS places. These 'conversions' are administrative in character, and do not necessarily reflect any change in the situation of the patient. Retaining this distinction would therefore imply identifying a lot of 'false' transitions[25].

Persons using day-care centres are assigned to one of the home care categories, depending on the kind of home care that they are using. If they do not use home care in the quarter in question, they are assigned to the

[25] An alternative would be to model this conversion, as in Vandevyvere and Willemé (2005: 58). Since the projection of costs is not a goal of the present project, we preferred the simpler solution of keeping the distinction out of the model.

home care 'heavy' category, if they have a code for 'category F', otherwise they are assumed to belong in the home care 'light' category.

Short-term stays are included in the corresponding residential care category. The main reason for this is that we cannot identify such stays in the EPS data before July 2007; specific NIHDI codes were introduced only at that date. Yet, special programming exists since 1995 to allow short-term stays in homes for the elderly (MRPA/ROB) and nursing homes (MRS/RVT). Therefore, removal of short-term stays from the constructed long-term care situations variable would induce artificial differences between the periods before and after July 2007. Also, such stays take up capacity in proportion to their number and their length. A disadvantage of this choice is that short-term stays are in fact overrepresented among the total of residential care instances, since reimbursement claims are bunched at the end of each quarter. Also, given that most of the persons enjoying short-term stays use home care during the same quarter, the prevalence of home care is underestimated. These disadvantages are mitigated by the fact that the number of short-term stays in proportion to overall use of residential care is quite small. See Appendix 7.4 for details.

The raw data revealed a large number of episodes of one quarter (rarely also of two quarters) of no LTC, sandwiched between longer periods of being in residential care before and after that episode, or between residential care and death. As they occurred most often in the fourth quarter, such episodes appear to be artefacts of delays in the reimbursement requests. Therefore these episodes were imputed with the LTC situation before that episode. See Appendix 7.5 for details.

7.2.3. Independent variables

Obviously sex and age are important variables. An interaction effect between these variables was tested, but found to be insubstantial. Apart from this, three independent variables were used in the analyses: disability, household situation (both are actually sets of variables) and province.

Disability was measured as the probability of having at least one limitation in Activities of Daily Living (ADL). This was imputed in the EPS data, using an equation estimated on the HIS 2004 and 2008 (see Chapter 5). Unfortunately, it was not possible to also impute the number of ADL limitations. We use the probability of disability, a continuous variable, rather than a dummy variable with two values (being disabled or not), because in preliminary analyses the former was found to have much greater explanatory power than the latter. There are two reasons for this. Transforming the probability (a continuous variable) to a dummy variable destroys information. Secondly, the probability may capture in an indirect way the number of ADL limitations (a severity indicator). The non-linear effect of disability on the transition probabilities turned out to be most adequately captured by the 4th power root of the probability of disability, a monotonously increasing function that slopes up very steeply at low values of its argument and conversely at high values. This indicates that the probability of using formal care rises sharply with the onset of disability, while it is less sensitive to additional limitations accumulating at higher severity levels.

The EPS contained a number of variables on the potential availability of household members for informal care. Household members are persons who live in the same household as the EPS sample person, according to the National Register. From these data the following variables were constructed:

- partner
- daughter
- son
- parent
- other woman
- other man

with obvious meanings. Each of these variables has three categories: not present; present but not available for informal care due to having paid work or ill health; present and available for informal care. For all variables except 'partner', the variables register the presence of at least one such person, but not the number of such persons. It has to be kept in mind that the relationship between the household member and the sample person was inferred from information on their age and sex, lacking direct data on the way they are related. A comparison of the results with data from the National Register suggests that we succeeded reasonably well in distinguishing single persons, couples and other kinds of household

situation. In some cases, a brother or sister may have been regarded as a partner. Also, it is likely that we did not always succeed in distinguishing between a 'daughter' and an 'other woman', or between a 'son' and an 'other man'. See Appendix 7.6 for details.

Both the demand for and supply of residential care could be influenced by geographical location. The most precise information on geographical location in the EPS is the arrondissement. However, because of the small size of some arrondissements[26], and in order to keep the results manageable, province of residence instead of arrondissement was included as one of the independent variables. Some provinces were split in two, when preliminary analyses indicated that the effects of individual arrondissements within a province were rather different. The splits are:

- Antwerpen: Antwerpen & Mechelen; Turnhout
- Vlaams-Brabant: Halle-Vilvoorde; Leuven
- West-Vlaanderen: West-Vlaanderen-Kust (arrondissements bordering on the coast); West-Vlaanderen-Binnen (arrondissements not on the coast)
- Oost-Vlaanderen: Gent & Aalst; other arrondissements
- Hainaut: Charleroi, Mons & Soignies; other arrondissements
- Namur: Namur; other arrondissements[27]

These splits separate arrondissements that are more urbanized from those which are less so. The provinces of Brabant-Wallon, Liège, Limburg and Luxembourg, as well as the capital region of Brussels are not split up.

[26] Arrondissements are administrative units, which are in between the levels of provinces and of municipalities. Most of the ten provinces of Belgium (in addition to the capital region of Brussels) are divided into up to 7 arrondissements; there are altogether 43 arrondissements. Arrondissements have no powers of their own. Arrondissements vary enormously in population size (in terms of those aged 65+), from more than 150 000 to less than 10 000

[27] The order of provinces here and elsewhere is that used by Statistics Belgium.

7.3. Estimation strategy

Since we look at transitions, each pair of data for one individual for subsequent quarters constitutes an observation. This amalgamation of periods boosts the number of observations, resulting in estimates that are much more precise than would otherwise be the case. Obviously, unobserved heterogeneity between individuals could bias the estimated standard errors of the coefficients in a pooled model. The natural way to account for this heterogeneity in the present context would be to estimate a random effects model, but that turned out to be computationally impossible. The software package Stata does not include standard estimation procedures for multinomial random effects panel models. While it is in principle possible to estimate these models using Stata's maximum likelihood routine "gllamm", the computational burden is prohibitive with our data (the method involves numerical approximations of multiple integrals). The alternative procedure proposed by Haan and Uhlendorff (2006), which is based on maximum simulated likelihood and is reported to be faster, was also considered not to be practically feasible. As a second-best solution, we estimated the pooled model using Stata's "logit" and "mlogit" procedures with the "vce(cluster)" option, which allows for intragroup correlation, relaxing the usual requirement that the observations be independent.

Ideally, we would have used multinomial logit models, where the dependent variable consisted of the ten 'destination' categories in the next quarter. Unfortunately, this ran into computational problems due to the very large sample size, the use of weights and the necessity of taking account of intra-individual correlation across observations. Therefore, we used a series of logistic regressions, as well as multinomial logistic regressions for more limited analyses, which are ordered in a hierarchical way, as indicated in Figure 7.1. Other orderings would have been possible. The present structure seemed to follow most closely the structure that is imposed on or followed by older persons. Death comes first, since being alive is a sine-qua-non for all the rest. Being hospitalized is an event that is likely to be exogenous and which precludes all other possible transitions, when an acute health problem arises.

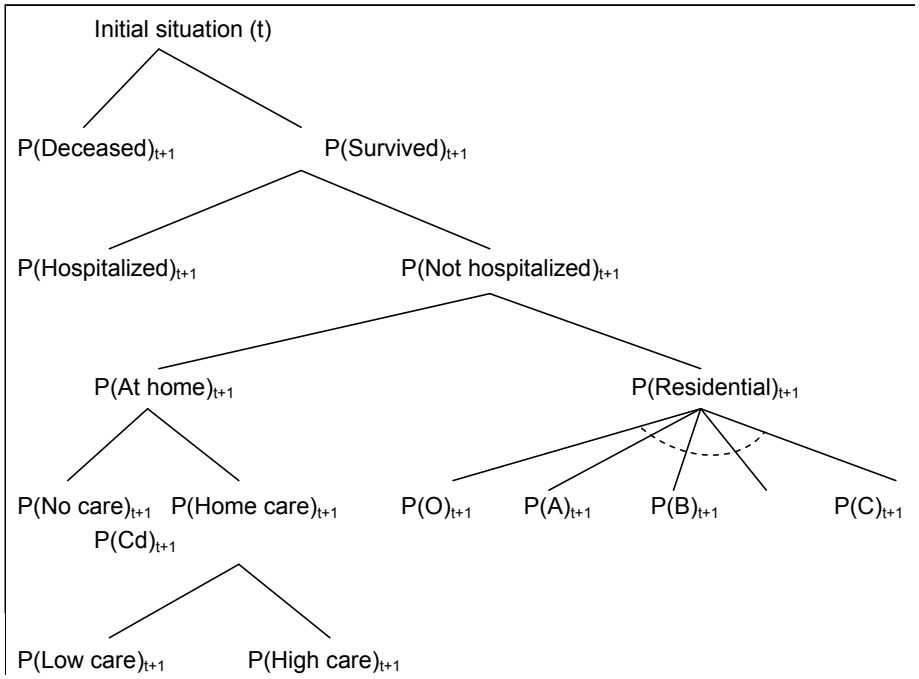
The decision to move into residential care is often a definitive one that is taken after much deliberation and hesitation, and which largely determines subsequent transitions. When moving into residential care, the level of

care is determined by the number of ADL limitations. When staying at home, people can choose or not whether to use home care. Mostly, analyses were performed separately by origin state (all residential care categories were collapsed, though). Note that Figure 7.1 reflects this "decision tree", but not the transitions that are modelled; e.g. a transition from home care to residential care is of course perfectly possible.

As a check on the sensitivity of the results of the choice for a series of binary logistic regressions, we ran one multinomial logistic model (for persons in origin state "no care"), and compared the resulting predicted probabilities for making a transition into any LTC situation with those that are derived from the series of hierarchical (or nested) logistic models. The predicted probabilities were extremely close together, with correlations of at minimum 0.97, and mostly 0.99; see Appendix 7.8 for details. This shows that for all practical purposes, the result of the series of logistic regressions used here, and those of a multinomial logistic model are equal to each other.

All independent variables were entered into the models as state variables. It seems likely that some transitions are triggered by changes in some of the independent variables, e.g. the death of a partner. However, the introduction of change variables into the logistic regression for the transition from no care into residential care (specifically, a change in the probability of disability and a change from having a partner to no partner), using several time lags, was unsuccessful in that none of the coefficients of these change variables was statistically significant.

Figure 7.1. The hierarchical structure of the transition probability model.



The figure shows the way decisions or events regarding LTC situations are modelled. It does not indicate which transitions are possible (see text).

7.4. Results

7.4.1. Transition tables

We first show transition probabilities by quarter, after one year, and after five years in Table 7.1. For the first part of Table 7.1, any pair of subsequent quarters for the same sample person, constitutes an observation. Transition probabilities across a period of one year are calculated starting from the first quarter of each year. The five year part of Table 7.1 refers to the period 2004 quarter 1 – 2009 quarter 1. Each column of the table shows, for a certain origin state indicated at the top of the column, the proportions of persons that go to various destination states, which are in the rows of the table (after a quarter, a year, and five years, respectively). It can be seen that the situation of “no care” (i.e. no long-term care) is a rather stable situation; even after five years, nearly two-thirds of the persons in this category are still there. The most common exit category is death. Transition probabilities into home care or residential care are rather low. Stability is much less in any of the other LTC situations. Once persons enter care, their risk of dying becomes much stronger. Persons in home care, especially if it is rather intensive, have a higher chance of moving into residential care than those with no care. Interestingly, when the origin state is home care, the destination state is more often MRS/RVT level Cd, than any of the other residential LTC situations. There is substantial movement, in both directions, between the LTC situations of home care low and home care high. When in residential care, the probabilities of moving to a higher level of care are substantial, although this is less true for the lowest level (MRPA/ROB-O) than for the other ones. The probabilities of moving to a lower level are much smaller, and the chances of exiting (other than through death) are quite small. Transitions to “no care” may not be real, but artefacts of the variable construction. It is striking that the probability of being hospitalized is rather low for persons in residential care and decreasing with the level of care. Those using home care are most likely to be hospitalized. After hospitalization, many people move or return to residential care. It must be kept in mind that this category refers to rather long hospitalizations, of at least 20 days.

Table 7.1. Transitions in LTC situations after a quarter, one year (evaluated from the first quarter of each year) and five years (2004-2009), EPS data, 2004-09.

Quarter	No care	Home care low	Home care high	Resid. care level O	Resid. care level A	Resid. care level B*	Resid. care level C*	Resid. care level Cd*	Hospitalization	Total
No care	97.8	5.8	3.6	0.9	0.5	0.4	0.2	0.1	34.2	84.9
Home care low	0.7	85.2	4.3	0.2	0.5	0.4	0.3	0.1	10.5	5.2
Home care high	0.1	2.3	80.6	0.0	0.1	0.2	0.5	0.2	5.6	1.5
Resid. care level O	0.1	0.2	0.1	87.3	4.0	1.3	0.4	0.1	1.9	1.2
Resid. care level A	0.0	0.5	0.3	4.6	79.7	3.7	1.4	0.3	2.6	1.1
Resid. care level B*	0.1	0.8	1.0	2.6	7.4	78.8	3.2	1.5	4.6	1.4
Resid. care level C*	0.0	0.2	0.8	0.8	1.8	3.0	78.6	1.0	3.0	0.7
Resid. care level Cd*	0.0	0.3	1.2	0.5	1.5	6.2	5.8	85.8	4.1	1.8
Hospitalization	0.6	2.4	2.9	1.1	1.3	1.2	1.2	0.8	24.7	1.0
Deceased	0.6	2.0	5.3	2.0	3.4	4.8	8.3	10.1	8.8	1.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% in origin category	86.1%	5.2%	1.5%	1.3%	1.1%	1.4%	0.8%	1.8%	1.0%	100.0%

4 quarters	No care	Home care low	Home care high	Resid. care level O	Resid. care level A	Resid. care level B*	Resid. care level C*	Resid. care level Cd*	Hospitalization	Total
No care	93.4	7.4	4.4	1.6	0.6	0.5	0.2	0.2	31.8	81.2
Home care low	1.9	66.8	5.9	0.3	0.4	0.4	0.2	0.0	9.5	5.3
Home care high	0.4	5.6	57.6	0.1	0.1	0.1	0.3	0.2	4.8	1.5
Resid. care level O	0.2	0.8	0.2	65.7	7.0	2.3	0.7	0.1	2.7	1.2
Resid. care level A	0.2	1.7	0.7	10.6	49.9	5.8	2.2	0.5	3.2	1.1
Resid. care level B*	0.3	2.6	2.3	6.4	15.8	48.5	5.0	1.9	5.0	1.4
Resid. care level C*	0.1	1.0	2.2	2.0	4.4	6.0	48.7	1.4	3.0	0.7
Resid. care level Cd*	0.2	1.5	3.1	1.9	4.7	15.2	12.6	60.2	4.8	1.8
Hospitalization	0.7	2.5	2.1	1.0	1.0	0.9	0.8	0.5	12.9	0.9
Deceased	2.7	10.3	21.4	10.5	16.2	20.3	29.4	35.0	22.4	4.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% in origin category	86.1%	5.1%	1.5%	1.3%	1.1%	1.4%	0.8%	1.8%	1.0%	100.0%

5 years (2004/1 - 2009/1)	No care	Home care low	Home care high	Resid. care level O	Resid. care level A	Resid. care level B*	Resid. care level C*	Resid. care level Cd*	Hospitalization	Total
No care	73.1	4.9	2.6	0.8	0.1	0.5	0.1	0.0	18.4	64.0
Home care low	4.8	24.2	2.0	0.6	0.1	0.3	0.0	0.0	5.8	5.4
Home care high	1.2	5.9	14.8	0.0	0.0	0.1	0.0	0.2	2.4	1.5
Resid. care level O	0.8	1.3	0.2	21.7	4.1	0.6	0.0	0.0	1.4	1.1
Resid. care level A	0.8	2.5	1.3	8.7	11.0	2.1	0.2	0.2	1.7	1.1
Resid. care level B*	1.0	4.7	2.1	7.5	9.4	8.2	2.0	0.7	3.5	1.5
Resid. care level C*	0.5	2.4	2.7	3.8	3.4	3.9	7.1	1.0	2.5	0.8
Resid. care level Cd*	1.1	4.7	4.2	5.0	7.5	14.1	8.5	12.2	4.3	1.8
Hospitalization	0.8	0.9	0.5	0.5	0.2	0.4	0.3	0.0	4.8	0.8
Deceased	16.1	48.6	69.9	51.5	64.2	69.9	81.8	85.8	55.2	22.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
% in origin category	86.9%	4.7%	1.3%	1.3%	1.0%	1.2%	0.8%	1.8%	1.1%	100.0%

*Note: * both homes for the elderly (MRPA/ROB) and nursing homes (MRS/RVT)*

7.4.2. Results of binary and multinomial logistic regressions

The results of the logistic regressions with deceased or not and hospitalized or not as dependent variables are shown in Appendix 7.7, and discussed only briefly. Unsurprisingly, higher age and being male are associated with a higher risk of dying, as is true for a higher probability of being disabled. However, for persons in formal care, both at home and in institutions, disability is not significantly related to the risk of death when taking account of the level of care. Persons with a partner are less likely to die than single persons. The risk of dying is unevenly spread across provinces (controlling for sex, age and disability); interpreting these results is beyond the ambition of this report. Remarkably, the probability of moving to a hospital decreases monotonously with rising age, most strongly among those in residential care. Disability is associated with a higher chance of getting hospitalized. For persons in formal care, the impact of disability is much smaller when controlling for the level of care, as level of care is itself determined by disability. Persons in different provinces do not have an equal risk of staying in a hospital, controlling for sex, age and disability.

The results of the logistic regression models for the transition into residential care are shown in Table 7.2. We use predicted average effects to illustrate the effects of the independent variables, which are easier to interpret than logistic equation coefficients or odds-ratios. These predicted average effects show the estimated percentage moving into residential care in the next quarter for the category in question, if all other variables would be distributed within the category as they in fact are within the sample as a whole. Therefore, these parameters show the impact of the category, undistorted by the effects of other variables, in terms of proportions or probabilities. For example, the predicted average effect of 0.32% for 'Age 90-94' in the second column of Table 7.2 means that persons in that age category would have a probability of 0.33% to move into residential care, if for them disability, living situation and province would be distributed as they are for the sample as whole, rather than as they in fact are for that particular age category.

A first important result is that these predicted percentages are much higher for those in home care than for older persons who are not in LTC or in hospital. The chance of moving into residential care is quite substantial for older persons who experienced a hospital stay of 20 days or more. Some of these persons may have been in residential care before they went to hospital.

For persons not using any LTC, who are hospitalized or using home care at a low level, higher age is associated with a greater likelihood of entering into residential care, though the effect levels off in the higher age brackets. The effect of age in itself is not very large. Persons in the age groups above 85 years are in fact much more likely to be institutionalized than persons aged below 85, but this is mainly due to their higher risk of disability. Perhaps surprisingly, women are slightly less likely than men to move into residential care, controlling for age, disability and household situation. Among persons in home care at a high level or who were hospitalized, the effect of age is smaller, and generally not significant. Disability increases the chances of moving into residential care quite strongly for those currently not getting care, and also for persons who were in hospital. Since disability was not a categorical variable, it is not included in Table 7.2. The strong effect can be gauged from the fact that at a probability of 5% for having an ADL limitation, the predicted percentage entering residential care 0.14%, but when the probability of disability rises to 50%, the predicted percentage increase tenfold to 1.4%. The nonlinear way in which the probability of disability was entered in the equation implies that at low risk of disability, the impact on the odds to enter residential care is quite strong, and then levels off at higher levels of risk. The effect is substantially smaller for those in home care, mainly because these persons have a significant risk to enter an institution even at a low risk of disability. This reflects probably the fact that those persons, especially those using home care with high intensity, are already suffering from ADL limitations (which may not always be picked up by our measure of disability), so that their move to residential care is mainly triggered by other factors.

The presence of a partner who is available for informal care reduces the chances of older persons moving into residential care substantially, though much less so when they are receiving home care at a high level. The proportion of partners who are not available for informal care due to paid work or ill health is very low, so the effect of this category is largely irrelevant. Preliminary analyses indicated that other household members do not make any difference when a partner is present, and therefore those variables were set to zero for persons with a partner, implying that the

effect shown refers to single persons only. Single persons who are living with one or more of their children are less likely to move into residential care, especially when she or he is available for informal care. The sex of the child does not seem to make much difference; daughters are more prevalent than sons, though. Also for single persons, preliminary analyses indicated that parents and other men or women do not have an impact, so these variables were removed from the regressions.

Looking at the effects of provinces, among persons not receiving LTC, those living in Limburg are much less likely to move into residential care than older persons elsewhere, given sex, age, disability and household situation. The same is true, to a lesser degree, for those living in West-Vlaanderen and in the arrondissement of Leuven. Persons living in the province of Liège, in the capital region of Brussels, and in the arrondissement of Namur have a higher probability of entering an institution than those living elsewhere in Belgium. Except for the negative effects of Limburg, West-Vlaanderen and Leuven, the pattern of coefficients across provinces is rather different for persons receiving home care. Given the large standard errors of these coefficients, reflecting the relatively small size of these groups, it is difficult to interpret these results by province.

A multinomial regression was performed, where the dependent variable is the level of residential care, given that persons move into residential care. The results tabulated in Appendix 7.7 reveal that few variables have a significant effect. Age and province are not included here, as preliminary analyses indicated that these variables were not significant for any of the residential care categories.

Those with a higher probability of disability are more likely to move into the more intensive levels of residential care. The same is true for those who were getting home care compared to those without formal care. Similar results are found for the transitions between the levels of care for those who are already in residential care: a higher probability of disability increases the risk of moving to a higher level of care, and reduces the chances of going down the intensity scale[28]. Finally, transitions from residential care to no care or home care are quite rare, and appear unrelated to any variable in the model.

7.4.3. Predictive validity of the model for residential care

As can be seen in Appendix 7.7, the pseudo-R^2 values for the various models are not very large, and sometimes quite low, indicating that many factors that influence LTC transitions are not taken up in the model. For the purposes of this project, it is important to evaluate the predictive power of the model, i.e. the extent to which it is able to predict accurately which categories of older persons will enter and use residential care. On the individual level we calculated the split-half correlation coefficient for the model of residential care (starting from the situation of 'No care'). This is the correlation coefficient between the actual transition into residential care and the predicted probability of entering residential care, where the model is estimated on one half of the sample, and then applied to the other half. The estimate is 0.4573, which is in fact a quite reasonable value for a model of a transition.

More importantly is the predictive validity of the model on the aggregate level: does it correctly reproduce the usage patterns in the population? Table 7.3 shows that the model reproduces the actual number of patients in residential care by sex and age very adequately. Especially in the quantitatively important categories of women aged 80-95 the match is very close.

[28] In these analyses, age was entered as a continuous variable, rather than a categorical one, because of the smaller sample size.

Table 7.2. Predicted average effects for the transition into residential care, EPS data, 2004-09.

	From "No care"			From "Home care low"			From "Home care high"			From "Hospital"		
	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*
Man	0.25%	0.01%	Ref. cat	2.31%	0.11%	Ref. cat	3.67%	0.24%	Ref. cat	27.36%	0.72%	Ref. cat
Woman	0.20%	0.00%	0.000	2.19%	0.05%	0.842	3.54%	0.14%	0.987	23.14%	0.42%	0.000
Age 65-69	0.09%	0.01%	Ref. cat	1.41%	0.26%	Ref. cat	2.40%	0.60%	Ref. cat	18.18%	1.44%	Ref. cat
Age 70-74	0.12%	0.01%	0.048	1.62%	0.18%	0.190	3.47%	0.48%	0.213	19.91%	1.07%	0.823
Age 75-79	0.17%	0.01%	0.076	2.03%	0.12%	0.009	3.97%	0.33%	0.131	23.18%	0.78%	0.404
Age 80-84	0.24%	0.01%	0.000	1.99%	0.08%	0.007	4.09%	0.24%	0.073	24.14%	0.71%	0.194
Age 85-89	0.28%	0.01%	0.000	2.51%	0.10%	0.000	3.62%	0.25%	0.177	28.47%	0.98%	0.006
Age 90-95	0.33%	0.02%	0.000	2.74%	0.17%	0.000	3.13%	0.30%	0.395	32.44%	1.73%	0.000
Age 95+	0.32%	0.04%	0.000	2.75%	0.33%	0.000	2.27%	0.36%	0.884	27.28%	3.31%	0.090
No partner	0.28%	0.01%	Ref. cat	2.35%	0.06%	Ref. cat	3.94%	0.19%	Ref. cat	30.06%	0.53%	Ref. cat
Partner unav.	0.16%	0.05%	0.052	1.73%	0.52%	0.347	7.74%	2.03%	0.018	22.02%	4.27%	0.099
Partner avail.	0.13%	0.00%	0.000	1.87%	0.09%	0.000	3.11%	0.18%	0.004	14.74%	0.55%	0.000
No daughter	0.22%	0.00%	Ref. cat	2.24%	0.05%	Ref. cat	3.67%	0.13%	Ref. cat	24.97%	0.37%	Ref. cat
Daughter unav.	0.17%	0.02%	0.015	1.84%	0.26%	0.182	3.41%	0.53%	0.628	20.21%	2.00%	0.039
Daughter avail.	0.12%	0.01%	0.000	1.92%	0.24%	0.213	2.66%	0.36%	0.023	14.16%	1.51%	0.000
No son	0.21%	0.00%	Ref. cat	2.27%	0.05%	Ref. cat	3.71%	0.13%	Ref. cat	24.81%	0.37%	Ref. cat
Son unav.	0.17%	0.01%	0.005	1.66%	0.18%	0.006	2.98%	0.40%	0.113	20.40%	1.61%	0.009
Son avail.	0.14%	0.02%	0.000	1.77%	0.22%	0.054	2.49%	0.39%	0.014	17.61%	1.95%	0.001

Table 7.2. Predicted average effects for the transition into residential care, EPS data, 2004-09, continued.

	From "No care"			From "Home care low"			From "Home care high"			From "Hospital"		
	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*	Pred. Eff.	St. error	Sig*
Antwerpen-Mechelen	0.19%	0.01%	Ref. cat	2.84%	0.18%	Ref. cat	5.15%	0.59%	Ref. cat	26.67%	1.02%	Ref. cat
Turnhout	0.18%	0.02%	0.606	2.36%	0.22%	0.116	5.41%	0.71%	0.775	23.44%	1.98%	0.156
Brussels	0.27%	0.01%	0.000	3.32%	0.33%	0.180	4.40%	0.60%	0.415	26.32%	1.16%	0.845
Halle-Vilvoorde	0.16%	0.01%	0.104	2.29%	0.23%	0.116	4.39%	0.65%	0.473	22.20%	1.55%	0.021
Leuven	0.14%	0.01%	0.006	1.90%	0.18%	0.001	2.87%	0.49%	0.006	21.32%	1.77%	0.014
Nivelles	0.23%	0.02%	0.062	2.68%	0.35%	0.739	3.56%	0.70%	0.133	20.07%	2.05%	0.005
West-Vlaanderen-Kust	0.11%	0.01%	0.000	1.42%	0.12%	0.000	3.76%	0.40%	0.059	18.37%	1.10%	0.000
West-Vlaanderen-Binnen	0.13%	0.01%	0.000	1.53%	0.13%	0.000	3.93%	0.45%	0.139	22.41%	1.40%	0.019
Gent-Aalst	0.23%	0.02%	0.038	2.27%	0.16%	0.020	4.42%	0.48%	0.379	27.35%	1.38%	0.633
Oost-Vlaanderen-rest	0.28%	0.02%	0.000	2.02%	0.17%	0.001	4.01%	0.50%	0.173	29.53%	1.54%	0.093
Charleroi-Mons-	0.19%	0.01%	0.523	2.52%	0.18%	0.216	2.56%	0.30%	0.000	24.00%	1.17%	0.050
Hainaut-autre	0.20%	0.02%	0.834	3.04%	0.27%	0.575	3.28%	0.46%	0.015	24.28%	1.59%	0.141
Liège	0.44%	0.02%	0.000	4.67%	0.35%	0.000	5.73%	0.68%	0.488	27.98%	1.23%	0.408
Limburg	0.08%	0.01%	0.000	1.16%	0.10%	0.000	2.20%	0.22%	0.000	20.82%	1.30%	0.000
Luxembourg	0.23%	0.03%	0.061	4.54%	0.79%	0.013	2.28%	0.80%	0.028	22.76%	2.59%	0.203
Namur-Namur	0.30%	0.03%	0.000	3.11%	0.42%	0.651	3.95%	0.85%	0.286	27.23%	2.62%	0.823
Namur-autre	0.26%	0.04%	0.052	2.67%	0.44%	0.613	1.38%	0.56%	0.002	20.52%	3.43%	0.117

*Note: * Sig indicates whether the marginal effect of a category is significantly different from that of the reference category. These are taken from the logistic regressions themselves.*

Table 7.3. Comparison of predicted and actual number in residential care, EPS, 1st quarter 2006, by sex and age.

		Predicted number	Actual number	Predicted / Actual
Men	Age 65-69	69	83	83.8%
Men	Age 70-74	117	131	89.0%
Men	Age 75-79	199	176	113.2%
Men	Age 80-84	341	323	105.8%
Men	Age 85-89	300	272	110.2%
Men	Age 90-95	192	181	106.1%
Men	Age 95-99	56	39	142.1%
Men	Age 100+	7	8	93.7%
Women	Age 65-69	111	106	104.9%
Women	Age 70-74	230	197	116.7%
Women	Age 75-79	543	531	102.3%
Women	Age 80-84	1 134	1 116	101.6%
Women	Age 85-89	1 230	1 186	103.7%
Women	Age 90-95	907	923	98.2%
Women	Age 95-99	335	351	95.5%
Women	Age 100+	50	52	96.1%
Total		5 822	5 675	102.6%

Note: no alignment or calibration has been applied to the predicted numbers

Key points

- **We distinguish ten long-term care situations, including no care, hospitalization, death, two home care situations and five levels of residential care. The LTC situations are defined on a quarterly basis for a sample of all persons aged 65 or over for the period 2004-2009, using EPS data.**
- **A descriptive analysis of transition rates showed that in any quarter or in any year, the probability of moving into residential care is quite low for persons not receiving any long-term care. It is much higher for older persons with home care. Once persons enter long-term care, their risk of dying becomes much stronger. When in residential care, the probabilities of moving to a higher level of care are substantial. The probabilities of moving to a lower level are much smaller, and the chances of exiting (other than through death) are quite small.**
- **The results of multivariate analyses show that for all persons, disability is very strongly associated with entering into residential care. The impact of age is fairly limited, when disability is taken into account; of course the risk of disability increases strongly with age. Persons living with a partner or with a child are less likely to enter residential care. There are important differences between provinces regarding the chances for institutionalization, which could be related to variation in the supply of residential care. For older persons moving to or living in residential care, a higher probability of disability makes it more likely to make a change to higher levels of LTC. For the same population, the transition back to their own home is hardly or not associated with any of the variables in the model.**
- **The predictive validity of the model on the aggregate level is quite good.**

8. PROJECTION RESULTS

8.1. Introduction

This chapter presents the projection results, using the model, methods and databases described in Chapters 4 to 7. We first show the overall projected evolution in residential care for the base scenario, followed by disaggregated results for 17 provinces or parts of a province. The fourth section presents results for alternative scenarios, based on different hypotheses about the future evolutions in morbidity, household situation and the availability of informal care.

An important limitation of these projections (as of almost all projections of this kind, cf. Chapter 2) is that we project the need for residential care, in the sense of the future use of residential care. The variables that enter the projection are those that influence need. We assume that the variables that determine demand and use, given a certain level of need, do not change, or change in such a way that use expands in the same proportion as need. Those variables include prices, incomes, and the supply of residential care and of alternatives to residential care. This implies that any possible supply constraints on future use are not more nor less binding than today. The question whether at this moment more persons are in need of residential care than are actually using it, is beyond the scope of this report. Obviously, if in the coming years supply of residential care does not follow increasing demand, the projections will not become reality. It implies also, and most importantly, that formal home care will have to be expanded substantially in line with increased needs due to the ageing of the population.

8.2. Overall evolution, base scenario

The base scenario has the following characteristics:

- it uses population projections made by the Belgian Federal Planning Bureau (FPB) and the statistics office (ADSEI).
- prevalence of five chronic conditions (COPD, dementia, diabetes, hip fracture, Parkinson's disease) by age, sex and province remains unchanged, which implies that the prevalence of disability itself by age, sex and province is also constant across the projection period.
- the trends in household situation follow the projections made by Michel Poulain (2011). See Appendix 8.1 for further details.
- the numbers are adjusted to take account of the fact that a substantial number of beds in residential care in Belgium are occupied by persons who are not covered by the Belgian public health insurance (mainly foreigners cf. Chapter 4). The assumption is that the proportion of these persons relative to the overall number of users will remain constant across the projection period.

Figure 8.1 shows the overall trend in the projected number of older persons in residential care. The projected number rises from 125 500 in 2010 to 166 000 in 2025, which is an increase of 32%. This rise is almost completely driven by the ageing of the population. The prevalence of being in residential care (i.e. the number of persons in residential care divided by the total number of persons aged 65 or over) is nearly stable, first rising a bit to a maximum of 7.1% in 2017 and then falling during the projection period, so that in 2025 it is practically at the same level (6.8%) as in 2010 (6.7%). The slight drop in the prevalence rate after 2019 is due to the fact that the relatively smaller cohorts born around the 2nd World War then start to reach the ages where use of residential care is most prevalent.

Figure 8.1. Projected prevalence and number of older persons in residential care, Belgium 2010-2025, base scenario.

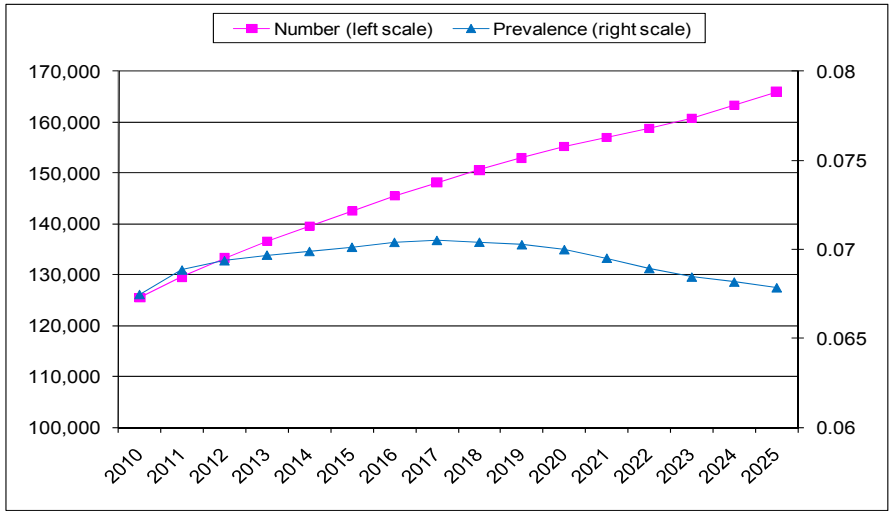


Figure 8.2. Projected composition of persons in residential care by care level, Belgium 2010-2025, base scenario.

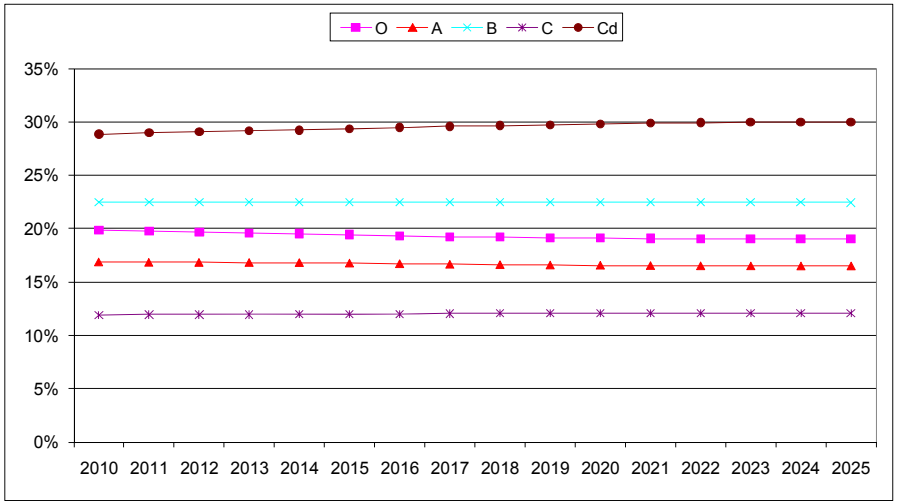


Figure 8.2 shows that the number of persons in any level of intensity of residential care rises nearly in proportion to the overall number in residential care (see Appendix 8.2 for the absolute numbers). There is a small increase in the percentage in the most intensive level Cd from 28.8% in 2010 to 30.0% in 2025, which occurs mainly during the first half of the projection period. The percentages in the other care levels remain virtually unchanged. The near-constancy of these proportions obviously follows from the assumption of a constant prevalence of the chronic conditions related to disability (and hence of disability itself).

Some of the mechanisms behind the projection results are illustrated in Table 8.1. The first row of this table shows that among males aged 65-69, the prevalence of residential care rises slightly from 0.8% to 1.0%. The proportion that is single (i.e. living alone) increases from 17.6% to 21.7%, while the proportion living with a partner (with or without others) drops from 77.3% to 73.1%. The remainder of this age group is composed with persons without a partner living with others. Finally, the last two columns show that in 2010 this group constituted 12% of all persons aged 65+; in 2025 this will have increased to 13.7%. The prevalence of residential care declines in many sex-age groups. The small increase among men aged 65-79 and women aged 65-69 is due to a rise in the proportion of single persons in these age groups, especially among men. This reflects the impact of increased divorce rates in the recent past. Among women the higher number of divorcees is partially compensated by the smaller number of widows, due to the fact that men will live longer. The increased longevity of men and women is responsible for the decline in the proportion of single persons and the rise in the proportion of persons with a partner in the groups aged 80 or more.

The latter shift produces a decline in the prevalence of residential care in some of these age groups (men aged 85-95 and women aged 80-84). The finding that the decline does not occur in all age groups is due to what happens among persons without a partner living with children or other household members. Finally, an important boost to the overall proportion in residential care is given by the substantial rise in the number of women aged 90 or more, among whom over half are institutionalized.

As mentioned in Chapter 2, recent projections of the living situation, including living in residential care, have been made within the FELICIE project (Future Elderly Living Conditions In Europe; Gaymu et al. 2008). These projections are considerably below the ones presented in this report, see Appendix 8.2, where we have adjusted our projections to make them comparable to the FELICIE ones. However, compared to our projections, the FELICIE results suffer from a number of limitations, as explained in Appendix 8.2. Disability rates were estimated using less reliable data. Population projections are less up to date and imply a smaller increase in the number of persons aged 75+. The FELICIE projections refer only to the population aged 75+, and within that group, only two age groups are distinguished. Finally, the FELICIE projections are made only in terms of index numbers, not of absolute numbers of persons. Note also that the projected prevalence of residential care for women in 2010 is considerably below the observed prevalence in 2010, though this does not necessarily invalidate the projected trends.

Table 8.1. Projected characteristics of sex-age groups, Belgium 2010-2025, base scenario.

		Prevalence residential care		Single* %		With partner* %		% of total population 65+	
Sex	**Age**	**2010**	**2025**	**2010**	**2025**	**2010**	**2025**	**2010**	**2025**
M	65-69	0.8%	1.0%	17.6%	21.7%	77.3%	73.1%	12.0%	13.7%
M	70-74	1.5%	1.7%	17.6%	20.5%	70.8%	67.9%	11.1%	11.5%
M	75-79	2.4%	2.5%	20.4%	21.9%	73.9%	72.5%	9.3%	9.3%
M	80-84	5.9%	5.7%	26.8%	25.2%	67.8%	69.5%	6.0%	5.5%
M	85-89	12.4%	11.7%	40.0%	36.4%	51.4%	56.2%	3.0%	3.4%
M	90-95	18.7%	17.9%	40.0%	36.4%	50.1%	55.1%	0.6%	1.3%
M	95+	26.8%	26.6%	42.8%	39.6%	44.9%	49.7%	0.1%	0.3%
F	65-69	0.8%	0.9%	27.3%	29.0%	66.6%	65.0%	13.1%	14.6%
F	70-74	1.6%	1.6%	33.7%	32.6%	57.2%	58.8%	13.2%	12.7%
F	75-79	5.0%	4.6%	44.2%	39.6%	45.7%	51.2%	12.6%	11.1%
F	80-84	13.2%	12.4%	58.2%	53.9%	30.2%	35.4%	10.0%	7.4%
F	85-89	28.3%	28.3%	73.8%	73.2%	12.7%	16.4%	6.5%	5.5%
F	90-95	48.0%	48.2%	73.8%	73.2%	12.0%	15.8%	1.8%	2.8%
F	95+	63.0%	63.7%	75.4%	75.6%	9.7%	12.8%	0.7%	0.9%

** With partner includes persons with other household members in addition to the partner; single persons are persons with no other household member.*

8.3. EVOLUTION BY PROVINCE, BASE SCENARIO

Table 8.2 presents the projected number of persons in residential care by province or part of a province. Parts of a province have been distinguished when preliminary analysis on the level of arrondissements indicated that there were important differences within the province regarding the impact of individual arrondissements on the use of residential care (see Chapter 7)[29]. It is immediately seen that the increase in the number of older persons in residential care is unevenly spread across provinces. Very strong increases occur in the arrondissement of Turnhout and in Limburg. On the other hand, a decrease is projected for Brussels, and limited increases of less than 25% in Hainaut, Liège and Luxembourg. The reasons for these divergent developments are obviously demographic. In Turnhout and Limburg less than 10% of all older persons are aged over 85 at the moment, and these provinces will undergo the strongest ageing-within-ageing effect (i.e. an increase in the number of the oldest old). In the capital region of Brussels, the proportion of persons aged 85+ is now the highest among all provinces, and this proportion will in fact decline over the projection period.

Across provinces, in 2010 or in any other year, the prevalence rate is in fact strongly correlated with the proportion of older persons who are aged 85 or over. Perhaps surprisingly, there is no correlation with the proportion of older persons who are disabled. Yet, the ranking of provinces by disability rate as shown in Table 8.2 agrees quite well with results from the Health Interview Surveys of 2004 and 2008, see Appendix A.3. Further exploration of these geographical patterns at this level of analysis would require an analysis of the supply of residential care, which is beyond the scope of this report.

[29] We will continue to use the term “provinces” for these regional entities. “Regions” would be a better term, if “region” did not have a very specific meaning within the Belgian federal state (cf. Chapter 1).

Table 8.2. Projected numbers and prevalence in residential care, percent aged 85+ and percent disabled by (parts of) province, Belgium 2010-2025, base scenario.

	Prevalence of residential care		Number of persons in residential care		Increase in %	Age 85+		Disabled %*
	2010	2025	2010	2025	2025 / 2010	2010	2025	2010
Antwerpen-Mechelen	6.6%	6.5%	15 294	19 563	27.9%	12.9%	15.0%	6.4%
Turnhout	5.2%	5.5%	3 472	6 142	76.9%	9.7%	13.0%	6.0%
Brussels	8.2%	6.8%	12747	12 223	-4.1%	16.2%	14.2%	7.7%
Halle-Vilvoorde	6.1%	6.5%	6 118	8 843	44.5%	11.9%	14.7%	8.8%
Leuven	5.9%	6.0%	4 824	7 069	46.5%	12.4%	14.8%	9.1%
Nivelles	7.3%	6.8%	4 111	6 082	48.0%	13.1%	13.7%	10.1%
West-Vlaanderen-Kust	6.0%	6.2%	7 772	11 711	50.7%	12.1%	14.1%	9.4%
West-Vlaanderen-Binnen	7.7%	8.2%	7 461	10 494	40.7%	12.6%	16.2%	10.1%
Gent-Aalst	6.8%	7.0%	9 430	13 138	39.3%	12.4%	15.5%	6.3%
Oost-Vlaanderen-rest	8.2%	8.4%	9 065	12 766	40.8%	11.9%	14.7%	6.2%
Charleroi-Mons-Soignies	7.4%	6.4%	10 471	11 753	12.2%	13.4%	12.3%	9.5%
Hainaut-autre	9.4%	8.5%	7 211	8 706	20.7%	14.4%	13.9%	10.0%
Liège	7.9%	7.1%	14 195	17 186	21.1%	12.8%	13.1%	5.9%
Limburg	4.3%	4.9%	5 571	10 390	86.5%	9.6%	13.0%	9.3%
Luxembourg	6.6%	5.9%	2 745	3 401	23.9%	12.9%	13.2%	6.7%
Namur-Namur	7.6%	6.8%	3 531	4 619	30.8%	13.1%	13.3%	6.0%
Namur-autre	5.2%	4.8%	1 481	1 944	31.3%	13.0%	13.0%	5.6%
Belgium-total	6.4%	6.4%	125 500	166 000	32.3%	12.6%	14.1%	8.4%

*Notes: All % (except column 6 "Increase ...") as % of all persons aged 65+. * Only shown for 2010 since by assumption disability by age, sex and province remains unchanged*

8.4. ALTERNATIVE SCENARIOS

While the population projections used in this study are fairly robust, this is less true for the assumptions about trends in disability and the availability of informal care. In order to show the sensitivity of the projection results with respect to alternative hypotheses, we explore six alternative scenarios, three of which are about disability, two about informal care, and one about home care. Three are more pessimistic than the base scenario and three are more optimistic. They are:

1. The prevalence of chronic conditions declines in line with the increased educational level of each new cohort of older persons;
2. The risk of disability by age and sex will decrease in future, in the sense that half of the projected increases in longevity are assumed to be spent free of disability (disability compression);
3. The prevalence of diabetes will increase by 5% annually during the projection period;
4. The household situation of older persons by age and sex group will not change during the projection period;
5. The number of children living with their older parents will be halved during the projection period;
6. Home care expands by 50% (beyond what is required by the ageing of the population).

The aim of these alternative scenarios is to show the sensitivity of the projected number of users of residential care to various possible developments. We do not make any claim regarding the likelihood of the future trends in disability, informal care and home care that are incorporated in these scenarios.

8.4.1. Alternative scenarios on disability

The first scenario “Better education” involves a substantial reduction in the prevalence of chronic conditions in Belgium during the projection period 2010-2025. This scenario is suggested by two facts: first, that among older persons, the prevalence of most chronic conditions is smaller, within any age-and-sex group, among those with more than primary education. This is shown by results from the Health Interview Surveys of 2004 and 2008. The second fact is that in every cohort, the proportion of persons with more than primary education is larger than in the previous cohort. This implies that the educational level of older persons in future years will be higher than it is now. Moreover, this trend is reinforced by differential mortality, as those with better education live longer. The International Institute of Alternative Systems Analysis has made projections of the future educational level of older persons. See Appendix 8.3 for details.

From these facts it does not follow necessarily that the prevalence of chronic conditions (controlling for age and sex) will decline in line with improved education among older persons during the period 2010-2025. However, there are reasons to hope that this may be the case. For the United States, Freedman and Martin (1999) found that greater educational attainment for the cohort reaching older ages accounted for the largest share in the observed declines of measures of functional limitation between 1983 and 1993, and these authors suggest that this positive trend may continue into the future. The reasons that are proposed for the finding that better-educated persons have fewer chronic conditions, and for the decline in the prevalence of some chronic conditions, partially coincide: better working and living conditions in the past, better access to health care in the past, more avoidance of risky behaviour such as smoking (cf. Laditka and Laditka, 2000; Lynch et al., 2000). The “better education” scenario is a specific version of the more general “disability compression” hypothesis, which implies that in future years disability rates by age and sex will fall. Of course, it remains a scenario; we do not know how the likelihood of it becoming reality. The mechanisms linking education to better health may be such that they do not lead to improved health for older persons in the future.

Analyses by Van Oyen and Deboosere (2008) using subsequent Health Interview Surveys provide no clear indication that the health of older persons in Belgium has improved between 1997 and 2004: results depend much on the health problem and the population group considered.

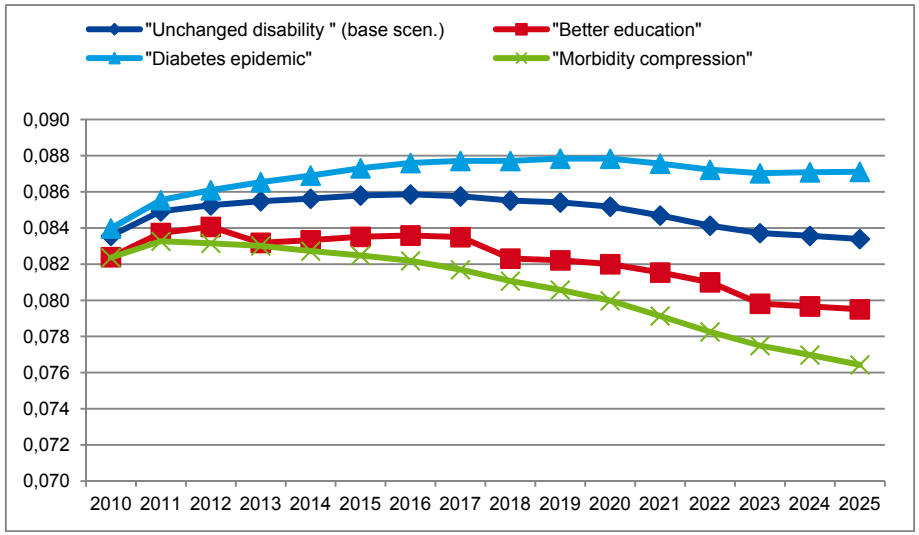
In the second scenario “disability compression”, we assume that increases in longevity during the projection period are accompanied by a delayed onset of disability. More specifically, it is assumed that for every year added to life expectancy (at age 65), disability rates are shifted to a later age by half a year. This is the reference scenario of the Ageing Working Group of the EU’s Economic Policy Committee (European Commission,

2009: 144). It is similar to the first scenario in that it implies decreasing disability rates for any sex-age group, but by contrast no specific hypothesis about the mechanisms which produces the disability compression is proposed.

The third scenario “Diabetes epidemic” is suggested by recently observed trends for Belgium. In Belgium, the average yearly growth in diabetes medication (in terms of Delivered Daily Doses) delivered to patients was 7.9% between 1996 and 2006 (Instituut voor Farmaco-Epidemiologie van België/Institut Pharmaco-Epidémiologique Belge, 2007; http://www.ipheb.be/Index_FR.htm). Passa (2002) reports very strong increases in diabetes type 2 prevalence (by far the most common type of diabetes) for the UK, Germany, Italy and France. We assume an overall increase in diabetes prevalence by 5% per year between 2010 and 2025, and that this increase occurs uniformly in all sex-and-age groups. This means that the prevalence of diabetes will more than double during the projection period, up to 26% in 2025. By contrast to the previous two scenarios, this scenario implies an expansion of morbidity.

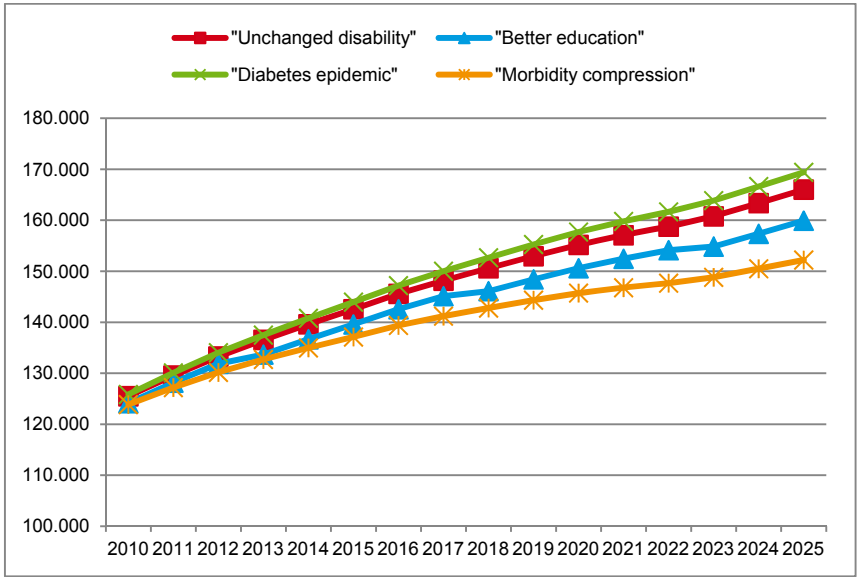
Figure 8.3 shows trends in the overall projected prevalence of disability according to the four scenarios. The “unchanged disability” in the base scenario refers to unchanged disability rates by sex-and-age group, so demographic shifts produce small changes in the overall prevalence rate. Unsurprisingly, the “better education” and “morbidity compression” scenarios involves lower prevalence rates, and generally downward trends in disability. Disability is higher, and rising in most years, following the “diabetes epidemic” scenario. Perhaps more surprising is that the differences between the scenarios are quite small (in Figure 8.3 they are inflated by the reduced scale): in 2025 disability prevalence is only 0.4% lower following the “better education” scenario than in the base scenario, and 0.7% lower according to the “morbidity compression” scenario, and in the “diabetes epidemic” it is only 0.4% higher. The basic reason for these limited effects, despite significant hypothesized changes in the prevalence of chronic conditions, is the dominating impact of age on the probability of being disabled, where the impact of age should be interpreted as the joint effect of age-related health problems other than those which are explicitly in the model. Or, in other words, many persons who in the future would avoid, e.g., a hip fracture, are hit anyway by other conditions which eventually lead to disability.

Figure 8.3. Projected trends in the prevalence of disability, Belgium 2010-2025, following four scenarios.



Despite their limited effect on disability, some of the three alternative scenarios have important effects on the projected increase in the number of older persons in residential care. Following the “better education” scenario, there would be about 6 000 fewer older persons in residential care in 2025 than according to the base scenario, while the “morbidity compression” scenario would lead to nearly 14 000 fewer persons in residential care. The number would be about 3 000 higher following the “diabetes epidemic” scenario. An interesting finding (not shown in Figure 8.4) is that these differences are concentrated in the least and in the most intense care categories O and Cd, while the net impact on the numbers in the intermediate categories A, B and C is small. Because of the methodology used (in particular the fact that disability is imputed in the EPS), it is possible that the impact of disability on the use of residential care is underestimated, and that the differences between these scenarios would actually be larger.

Figure 8.4. Projected trends in the number of older persons in residential care, Belgium 2010-2025, following four scenarios about disability.



8.4.2. Alternative scenarios on household situation

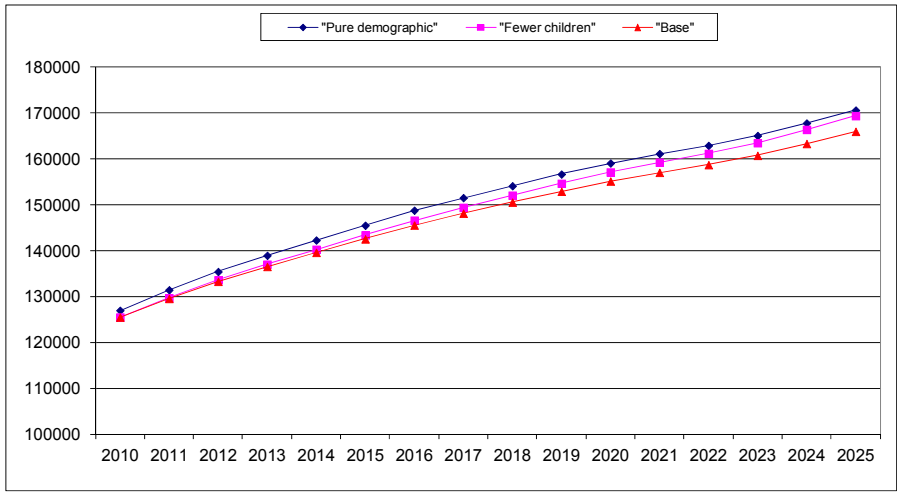
We present two scenarios regarding the future development of household situation, which, due to data limitations, is the only source of informal care in this projection study. Household situation concerns the presence of a partner, children and/or other household members. In the fourth scenario, we assume that the household situation within any sex-age group does not change over the projection period. Following other projection studies (cf. Chapter 2) we term this the “Pure demographic” scenario.

In the fifth scenario we hypothesize that fewer children will live in the same household as their parents. Concretely, within any sex-age group, the number of older persons living with their children will drop by half over the projection period. Across past decades, the proportion of older persons living with their children has declined steadily. It is not clear whether this trend can be projected into the future, especially for the rather specific group of women aged 85 or more, which is the key group in a projection of residential care. This somewhat arbitrary scenario, called “Fewer children”, is included to show the sensitivity of the projection results to such a change in the availability of informal care.

Figure 8.5 shows that following the “pure demographic” scenario, the projected number of persons in residential care would be only slightly higher than in the base scenario; the difference amounts to about 4 600 in 2025. There are two reasons why this difference is so small. First, the projected shifts in household situation in the base scenario are in fact rather limited, as shown by Table 8.1. Secondly, they do not all move in the same direction; while the increase in the proportion of women aged 80 or more that have a living partner dampens the use of residential care, the increase in the proportion of single people among older persons aged 65-74 has the opposite effect.

The impact of a reduction of the availability of children for informal care is quite small, relative to the base scenario: if their presence in the households of older persons would be halved, the projected number of older persons in residential care would be about 3 400 higher than in the base scenario. As indicated above, it is hard to judge the realism of this scenario.

Figure 8.5 Projected trends in the number of older persons in residential care, Belgium 2010-2025, following three scenarios about household situation.

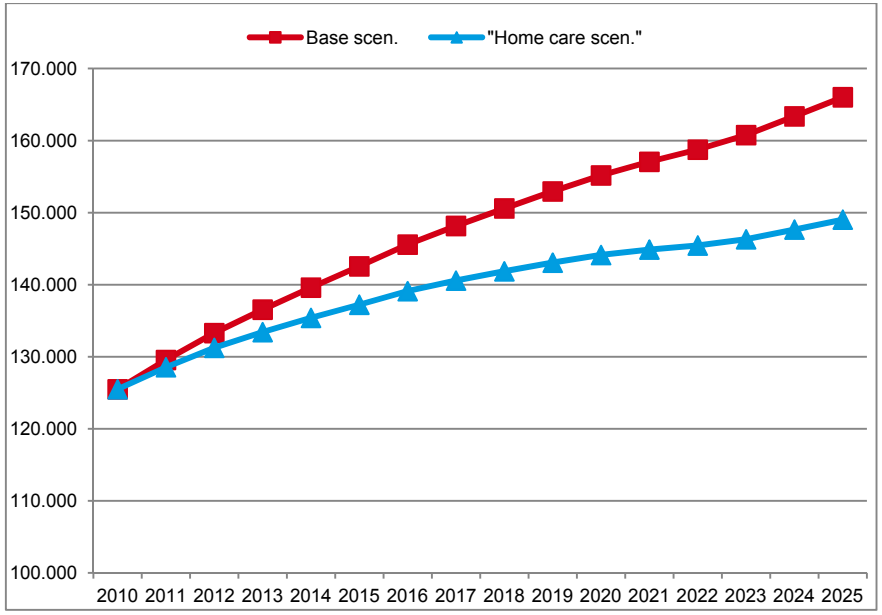


8.4.3. Alternative scenario on home care

The design of the projection model makes it impossible to simulate effects of change in the supply of home care in a simple way. In order to provide an estimate of the possible impact of an expansion of home care, we proceeded in the following way. We assume that the additional home care is equivalent to the care given by a partner, i.e. has the same impact on the probability to enter an institution. The simulated additional home care is targeted to single persons with a probability of disability of at least 5%; the results of a model of the transition to home care indicates that this is in fact a threshold above which older persons are much more likely to start using home care. Fairly arbitrarily, we assumed an expansion of home care by 50%. Note that this assumed expansion is beyond what is already required by the ageing of the population; results not reported here indicate that the latter is of the same magnitude as the projected increase in residential care.

Figure 8.6 shows that in this scenario the projected number of persons in residential care would be lower; our estimate for 2025 is 149 000, or about 17 000 less than in the base scenario. Of course, our simulation is rather crude, and it is possible that better targeted home care would have a larger dampening impact on the transition to residential care. Even so, the results indicate that large changes are required in the supply of home care in order to substantially reduce the projected growth in the number of persons in residential care.

Figure 8.6. Projected trends in the number of older persons in residential care, Belgium 2010-2025, in base scenario and "home care" scenario.



8.4.4. The scenarios compared

In Figure 8.7 we compare the various scenarios. Table 8.4 gives the exact numbers. The projected numbers vary from about 149 000 in the optimistic “home care” scenario, to about 170 000 in the pessimistic “fewer children” and “diabetes epidemic” scenario. Assuming that differences between scenarios are additive, in a worst-case scenario, with “fewer children”, (otherwise) “unchanged living situations” and a “diabetes epidemic” (otherwise) “unchanged living situations”, the number of persons in residential care could be as much as 177 400.

Figure 8.7. Projected trends in the number of older persons in residential care, Belgium 2010-2025, according to various scenarios.

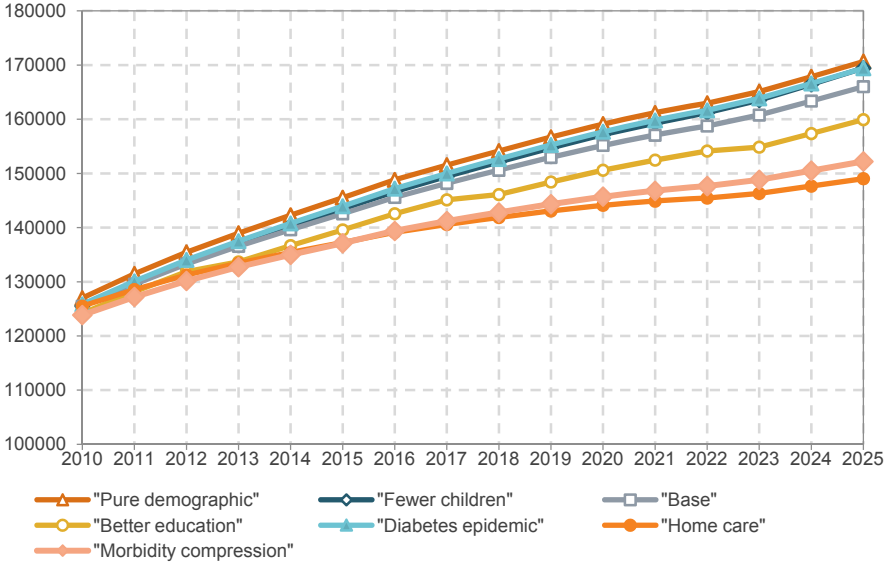


Table 8.4. Projected trends in the number of older persons in residential care, Belgium 2010-2025, according to various scenarios.

Year	Base	Pure demographic	Fewer children	Better education	Diabetes epidemic	Home care	Morbidity compression
2010	125 500	126 990	125 500	124 137	125 840	125 500	123 870
2011	129 558	131 464	129 712	128 156	130 090	128 554	127 199
2012	133 296	135 447	133 620	131 858	134 031	131 254	130 162
2013	136 547	138 965	137 047	133 666	137 497	133 431	132 712
2014	139 611	142 299	140 297	136 676	140 780	135 403	134 977
2015	142 558	145 527	143 436	139 580	143 953	137 239	137 118
2016	145 574	148 811	146 639	142 561	147 196	139 119	139 384
2017	148 167	151 551	149 445	145 126	150 014	140 584	141 205
2018	150 593	154 141	152 092	146 104	152 667	141 867	142 792
2019	152 957	156 702	154 694	148 420	155 258	143 074	144 333
2020	155 176	159 116	157 159	150 596	157 699	144 131	145 729
2021	157 063	161 176	159 284	152 463	159 785	144 883	146 783
2022	158 752	162 961	161 225	154 138	161 656	145 455	147 672
2023	160 778	165 112	163 528	154 852	163 858	146 315	148 827
2024	163 367	167 850	166 442	157 357	166 618	147 660	150 506
2025	166 030	170 666	169 442	159 927	169 421	149 038	152 210

Key points

- **The number of users aged 65+ of residential care in Belgium is projected to increase from about 125 000 in 2010 to about 166 000 in 2025.**
- **This increase is wholly due to population ageing; the prevalence of residential care among older persons hardly changes (assuming constant disability prevalence).**
- **The increase is unevenly spread across provinces or parts of provinces. In some, the increase in number of users would be more than 75%; for Brussels a decline is projected.**
- **If compression of morbidity, which implies a shift of the onset of disability to later ages, would accompany increased longevity, the number of persons in residential care could be lower.**
- **If household situation by age-and-sex group would remain unchanged, the number of users of residential care would be slightly larger than in the base projection.**
- **If the availability of children living with their older parents for informal care would be halved, the projected number of users of residential care in 2025 would be only about 3 400 higher than in the base projection.**
- **If home care could be expanded by 50%, beyond the increase that is required by the ageing of the population, the projected number of users of residential care in 2025 is about 17 000 less than in the base projection.**

9. OVERALL CONCLUSIONS

9.1. Residential care capacity requirements 2011-2025

The main driver of the future demand for residential care is, without any doubt, the expected demographic ageing of the Belgian population. The model developed in this study is based on estimated transition probabilities between care 'states', which depend on the age, gender, disability and availability of informal care of older persons. Under the assumption of constant prevalence of chronic conditions that are associated with disability, these transition probabilities remain essentially constant over the projection period. The baseline projection results are therefore similar to those that would be obtained with a constant prevalence model in the absence of major policy interventions. This result seems plausible in the sense that a substantial deviation from the past and current LTC use patterns would require very strong shifts in future disability prevalence, informal care availability or other factors that may affect LTC use. There is little objective information to support such radical shifts, but we have explored alternative scenarios that provide some guidance to the sensitivity of the results to changes in the non-demographic determinants of LTC use.

The projections are based on a "constant policy" assumption in the sense that the regulatory environment and price regime that prevailed during the observation period is implicitly kept constant over the projection horizon, and the available capacity of residential care, as well as home care, is expanded in line with projected future use. Similarly, financial incentives such as NIHDI payments of residential and home nursing care fees, and lodging and board fees paid by the nursing home residents, are assumed to remain fixed in real terms. In general, we assume that the relevant relative prices of LTC services do not change appreciably over the projection period.

The study projects a strong rise of the number of users of residential care from about 125 500 currently (aged 65 or older), to about 166 000 in 2025 (including foreigners not covered by the Belgian public health insurance), an increase of about 40 500. One also has to take into account that a number of beds are occupied by persons aged below 65 which are not included in the projections. Given that the number of beds in 2011 is 129 732 (home care for the elderly, nursing homes and coma beds; cf.

Chapter 1), it is clear that the supply of residential care has to be expanded considerably. Considering the base scenario and the alternative scenarios based on the evolution of morbidity, functional limitations, availability of informal caregivers (base scenario and alternatives 1 to 5), 27 000 (scenario 2) to 45 000 (scenario 4) supplementary beds have to be created. In annual terms, the increase amounts to between 1 800 and 3 000 extra beds per year (3 500 if we consider the combination of the most pessimistic scenarios). To put this result into perspective, it is considerably more than the average yearly increase of about 790 beds observed between 2000 and 2011. On the other hand, the number of reimbursed days for residential care rose by 1.5% on average per year during the period 2000 – 2009.

9.2. Geographical variation

The increase is unevenly spread across provinces or parts of provinces. In some (Limburg and the arrondissement Turnhout), the increase in number of users would be more than 75%; for Brussels a decline is projected. These varying growth rates in the number of persons using residential care are driven by the uneven tempo of the ageing of the population across the provinces of Belgium. It must be stressed that in these projections, current differences across provinces in the likelihood of entering residential care, given age, disability and living situation, are preserved across the projection period.

9.3. Sensitivity to alternative assumptions about disability and living situation

Apart from sex and age, other important determinants of the use of residential care are disability (i.e. limitations in Activities of Daily Living) and the availability of informal care. As regards disability, the results indicate that if the prevalence of five important chronic conditions (COPD, dementia, diabetes, hip fracture and Parkinson's disease) would go down in line with the higher education level of future cohorts of older persons, this would have only a limited effect on the projected number of users of residential care. If increased longevity would be accompanied by compression of morbidity, i.e. a shift of the onset of disability to later ages, the increase in the projected number of persons in residential care would be significantly lower.

This study could only consider the availability of informal care within the household as determined by living situation, i.e. the presence of a partner, children or other persons. It was shown that projected developments in the living situations of older persons, in particular an increase in the proportion of very old women that are married, have a downward but rather small impact on the projected number of persons in residential care. It is hard to predict the extent to which potential informal care (from within or without the household) will actually be provided; few observers expect that the willingness to provide informal care will increase substantially. One should also keep in mind that current practices of informal care may involve a huge social cost, as the mental and physical health of informal carers may be negatively affected by having to care for dependent relatives. The burden of living with a demented husband, wife or parent can hardly be overestimated.

Under the most favourable scenario, the expected increase in residential care users is projected to be about 149 000, which we consider the absolute minimum of extra capacity required. Under our most pessimistic scenario, as many as 177 000 users are projected in 2025.

In conclusion, it is highly unlikely that realistic scenarios regarding the future development of disability and the supply of informal care would lead to a trend in the use of residential care that is substantially lower than the one which is projected in this study.

9.4. Expanding home care instead?

Are there alternative ways to meet the increased demand for residential care? An obvious measure would be to increase the supply of home care. The mechanics of the projection model make it impossible to project the consequences of an expansion of home care in a direct way. However, a suggestive finding is that if home care would be expanded by 50 percent (beyond the increase that is required already to keep up with the ageing population), and would provide care that is equivalent to that given by a partner, the projected number of users of residential care would still be 149 000. So, in this situation, 23 500 beds have to be created, for an annual increase of 1 600 beds. It should be noted, moreover, that the expected ageing of the population will not only push up residential care use, but will put substantial upward pressure on the demand for home care as well. This is a challenge in its own right that will be difficult to meet even

without additional pressure resulting from a policy to keep patients at home longer. Along the same lines, it could be argued that the current low-care residential population (about 23 000 in MRPA/ROB-O) forms a buffer stock of residential capacity that could be made available for patients with more severe disability in the future. Again, this can only be achieved if suitable living arrangements can be provided for these elderly persons, either at home or in other semi-residential facilities (service flats, assisted living facilities, ...).

9.5. The projections in long-term perspective

It is important to be aware that 2025 will not see the end of the expansion of residential care for older persons, or LTC generally. Figures 9.1 and 9.2 show that the number of persons aged 85 or over will start to rise considerably only after 2030, when the earliest members of the baby-boom generation will have reached that age. Persons in that age group are the dominant users of LTC.

Figure 9.1. Projected number of older persons in Belgium, 2000-2060, by age bracket, men.

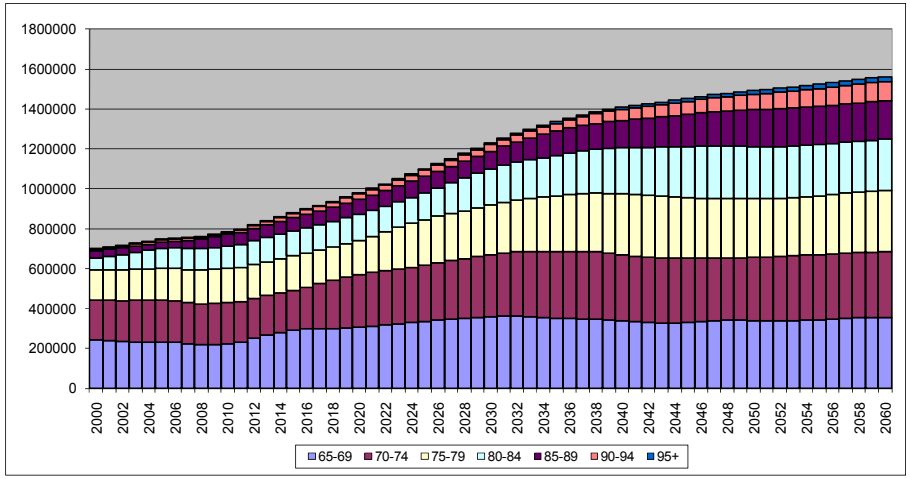


Figure 9.2. Projected number of older persons in Belgium, 2000-2060, by age bracket, women.

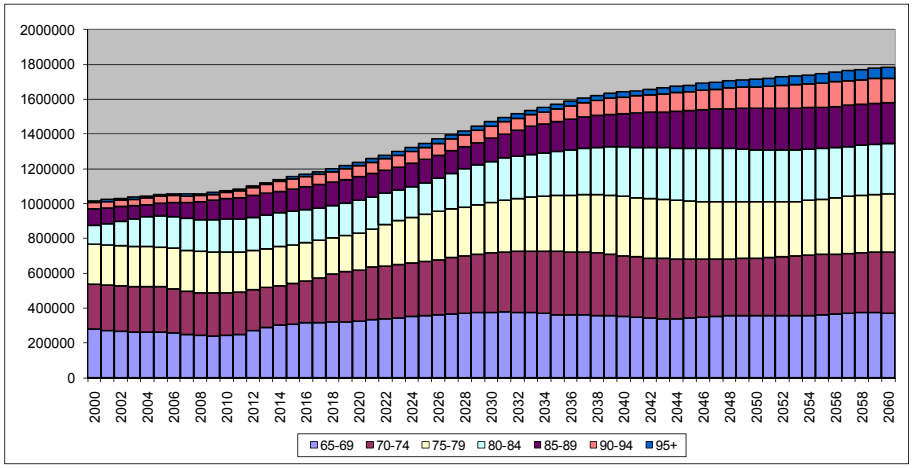


Figure 9.3. Projected number of older persons in residential care in Belgium, 2010-2050, according to a "pure demographic scenario".

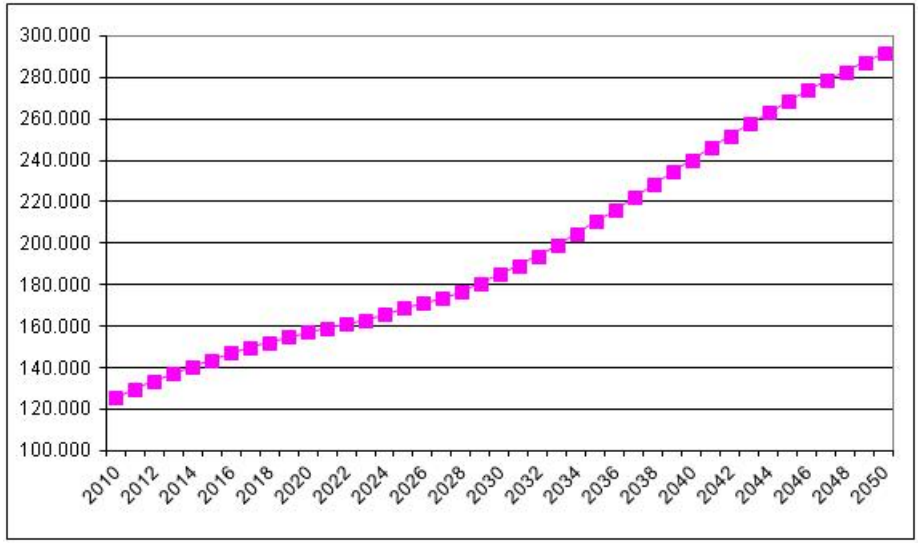


Figure 9.3 shows the projected trend in the number of older persons in residential care until 2050, using a “pure demographic” scenario, which assumes constant prevalence of institutionalization by age and sex, without possibly mitigating effects of disability and living situation. According to such a scenario, the number of residential care users would increase by nearly 72 000 in the fifteen years after 2025, compared to a bit more than 43 000 in the fifteen years up between 2010 and 2025. While a “pure demographic” scenario is probably too pessimistic, this result does indicate that the growth in demand for residential care will most likely accelerate after 2025. In fact, as far as LTC is concerned, the coming fifteen to twenty years should be regarded as a kind of grace period within the overall process of the ageing of the population, during which demand will only grow moderately, and which should be used to prepare for the much stronger increase which is likely to occur after 2025.

9.6. Stakeholder meeting

At the end of the research process, a stakeholder meeting was organized on the 10th October 2011. Stakeholders are groups or organizations which potentially will be affected by, or have an interest in and may in a consultative role impact on the actions or aims of an organization, project or policy directions. In this project, a large group of stakeholders were invited to participate in this meeting, as representatives of the following groups: policymakers at federal and regional levels, federations of cities and municipalities (Fédération des CPAS de l’Union des Villes et Communes / Vereniging van Steden en Gemeenten), healthcare professional organizations (hospitals, homes for the elderly and nursing homes, home care), service providers, sickness funds, FPS Public Health and NIHDI. Overall, 17 stakeholders participated.

The main objectives pursued by this stakeholder meeting were to enhance the transparency of the research process and the results obtained in terms of projection models (base model and alternative models) and to facilitate the acceptance of the policy recommendations that will be formulated. To promote active participation by the stakeholders in this meeting, the synthesis of the report was sent 3 weeks earlier. A formal presentation of the scientific report introduced the debate. Only the main points of discussion are summarized below.

A main comment concerned the share of the residential sector and the home care sector in the future expansion of care for older persons. The current low-care residential population (about 23 000 persons in MRPA/ROB level O) is quite large. In the report, the possibility to provide home care instead of residential care for these persons was suggested. However, stakeholders stressed that most of them are in fact socially isolated or in a poverty situation and hence that institutionalization is required more for socio-economic reasons (poverty, isolation, urban violence,…) than for medical ones. The financial affordability is a cornerstone of the choice of some old people to prefer a residential structure instead of home care. Moreover, the financial burden for the NIHDI for older persons with an O-level of care is not really significant. Furthermore, homes for the elderly require less nursing personnel than home care for these low-care population due to economies of scale. Nevertheless, new social initiatives could be proposed to take care of such persons without using the residential sector (MRPA/ROB) for old people.

According to the stakeholders, the alternative scenario that envisages to expand professional home care by 50% beyond what is required by the ageing of the population is not realistic for this moment and is a very expensive measure. However, if this potential expansion would include the informal home care, proactive policies to promote informal care are required. Yet, recent policies which raise the age of retirement of the current working cohort probably will reduce the availability of household members for informal care.

Another main comment concerned the number of beds currently occupied by older persons covered by a foreign social security system (mostly French and Dutch persons) or who pay out-of-pocket for residential care. It was not possible to obtain data about these old people and to include them in the current projections. Consequently, the assumption was made that their share in the total institutionalized population in Belgium will remain constant. However, the moratorium does not concern these persons but only those whose expenses are covered by the Belgian health insurance scheme.

In Flanders, only about 75% of currently programmed capacity is actually realized. The criteria used in the programming have recently been validated by a scientific study. There is therefore a concern that there is a

shortage of beds at the current moment. The projection methodology implies that such a shortage would be projected into the future.

Finally, all alternative scenarios were proposed under unchanged policies. For the future, the projection models should be used to test specific policies that could affect transition probabilities of LTC use, and hence the required expansion of the residential sector. Projections models are undoubtedly useful to plan the future. However, new policy actions aiming to shift the current trends from using residential facilities to enhance home care will also have economical and societal consequences, that have to be taken into account.

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