

**Modelling the Demand for Long-Term Care Services under Uncertain Information**Teresa Cardoso¹, Mónica D. Oliveira¹, Ana Barbosa-Póvoa¹, Stefan Nickel²¹ Centro de Estudos de Gestão do IST (CEG-IST), Instituto Superior Técnico, Lisboa, PORTUGAL² Institute of Operations Research, Karlsruhe Institute of Technology, Karlsruhe, GERMANY

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Objectivos (Objectives): Developing a Long-Term Care (LTC) network is currently a health policy priority in many countries. In particular, in countries with a National Health Service structure the development of such a network requires proper planning and demands for information on the future demand for LTC services. Since this information is often not available, the development of methods to properly predict demand is mandatory. Most methods proposed in the literature to predict such demand make use of information on current levels of utilization, which might be problematic for planning as utilization is highly constrained by the services supply. Moreover, few studies have built methods to predict demand at the small area level, and up to our knowledge, no study has considered the impact of different types of uncertainty on demand forecasts. This study attempts to contribute to overcome these drawbacks and develops a new method to predict the demand for LTC services at the small area level, so as to inform the planning of a LTC network.

Metodologia (Methodology): A simulation model based on a Markov cycle tree is proposed to predict annual demand (and subsequent utilization) for LTC services. The model is multiservice as it allows to predict the number of individuals requiring different types of LTC services (domiciliary, inpatient and outpatient) and the resources to be provided for these individuals (inpatient beds, domiciliary visits and consultations). This model differs from those presented in the literature by using a needs-based approach with need being defined by the health and socioeconomic status of the populations. In particular, among other factors, it considers the prevalence and incidence of chronic diseases, the level of dependency, the household composition and the level of income of individuals, which are key determinants for the need of LTC. The model allows the estimation of demand at the small area level, and in order to account for uncertainty, an integrated approach that combines scenario analysis with probabilistic sensitivity analysis using Monte Carlo simulation was built. The model was applied at the Lisbon borough level for the 2010-2015 period using: i) demographic and mortality data (aggregated and disaggregated by type of chronic disease) from the National Institute of Statistics; and ii) a wide range of information estimated from the 4th National Health Survey on the prevalence and incidence of chronic diseases, on the level of dependency, on the household composition and on the level of income of populations. Validation of the model consisted in running the model in the 2005-2010 and comparing results with demographic data and with reference indicators from the literature.

Resultados (Results): Applying the model to all Lisbon boroughs has shown that LTC demand is expected to increase in the 2010-2015 period, with the highest increase found for outpatient care. Additionally, roughly half of the population needing LTC has low income and is below the poverty line. Results indicate that the current supply of services is far from meeting the need for LTC. Running alternative scenarios has shown that estimates on the number of beds and domiciliary visits required to meet the predicted demand will highly differ, depending on the pattern of delivery of care.

Conclusões (Conclusions): The current work addresses the need to predict the demand for LTC services and a simulation model based on a Markov cycle tree is proposed. The model was able to provide key information for health care planners making decisions concerning a LTC network, such as on which supply is required to meet demand at the small area level. Results suggest that policy makers in Portugal should thus consider: i) the expected increase in the LTC demand in coming years; ii) the gap between the current supply of services and the need for LTC; and iii) the implications from a large proportion of the population requiring LTC not having resources to pay for it.