A NEW HORIZON FOR PLANNING SERVICES AND HEALTH CARE INFRASTRUCTURE FOR THE ELDERLY

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ABSTRACT

Since the devolution of capacity planning for care for the elderly in the Netherlands in 1998, no innovations on assessing health needs and on forecasting were made for planning health care services for the elderly. The introduction of Horizon in 2006, which uses needs and deficiencies instead of linear demographic planning has been warmly welcomed. The innovation is to step away from planning on the basis of policies and to forecast demands of services on the basis of actual deficiencies and health needs. This paper will explain the reasoning behind the models and illustrate the differences in planning and forecasting between the two models. Furthermore, a practical example of an application will be shown.

KEYWORDS

capacity planning, services for the elderly, health care infrastructure

BACKGROUND

Care for the elderly is traditionally given in nursing homes (somatic and psycho geriatric care, both intramural) and assisted living facilities (intramural and extramural). Capacity planning for health care services for the elderly in the Netherlands has traditionally been done using a demand-based method. This dogmatic approach takes a certain percentage of the number of people older than 75 years. This is then taken as the planned capacity needed in intra- and extramural facilities on the date of the planning horizon. The last available percentages were construed in 1997 and had a planning horizon up to 2005 [1].

Table 1. Capacity planning model 1997

Category	Nursing homes (somatic care)	Nursing homes (psycho geriatric care)	Assisted Living
Number of places /100 75+	2	3,5	6,5

The original percentage came about after careful trend and demographic analysis in 1997. Macro-economic constraints also played a part in the acceptance of this percentage by the planning authorities. This method for planning was used in the field as a rule of thumb and comprised both extramural and intramural capacity. Up to 1998, when capacity planning was devolved to individual health care insurers, building projects by health care institutions had to be in concord with the capacity planning that resulted from this dogmatic approach.

Due to a number of reasons, this old planning method from 1997 became obsolete: the planning horizon had passed and new ideological housing policy for the elderly was adopted. Newer

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versions of this model were made by various consultants and institutions to include this type of change, but none of them changed the basic assumptions of the model: an x percentage of over 75+ people that would require a bed in an intramural institution.

METHODS

In this paper, we shall demonstrate a new approach to plan capacity at the same outcome levels. However, this approach is based on a new needs-based approach that uses actual physical and mental disabilities. In this approach, the first step is to start with the general population. Data from surveys are used about the known incidence and prevalence of physical and mental handicaps of elderly to determine care profiles. The elderly are defined as people of 65 years and older. Care profiles will be made for five-year age groups (sex differentiated) from groups of 65 years and older. These care profiles are translated into different levels of care and assistance (Step 2). We then assume a physical setting that will match the need for care (Step 3). The conceptual model is illustrated below:

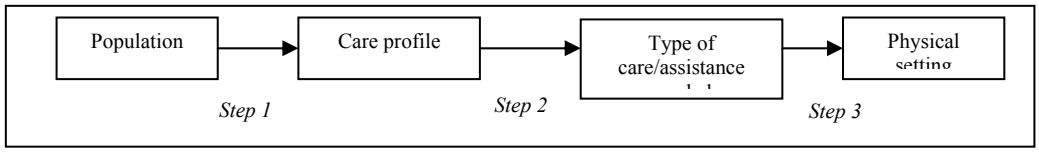

Fig. 1. Conceptual model

STEP 1

Step 1 is the most important step in this conceptual model. From questionnaires and survey we determine their personal health status, their physical abilities, their well-being and their ability to cope with daily routines in and around their homes. It is assumed that we can single out care profiles (different homogenous groups with more or less similar answers) in the intramural health care setting. The validity of these profiles is tested in the general population. It is important to notice that these sources do not address psycho geriatric indicators. This issue will be dealt with later.

Information about these health care issues is gathered from five sources. These sources all include the aforementioned aspects in their survey and feature similar questions and scales. The first two sources are surveys of intramural respondents [2] and extramural respondents [3] of health care facilities in the year 2000. In these surveys 1.817 respondents are included in total. Data from institutional care settings from 2004 are also available (1.158 respondents [4]). These data are used to validate the care profiles at the end of step 1.

To distinguish patterns in the population of the respondents, latent class analysis were used. A latent class model relates a set of observed discrete multivariate variables to a set of latent variables. A class is characterized by a pattern of conditional probabilities that indicate the chance that variables take on certain values. This method is suitable for characterizing different groups within a population with more or less identical health care and well-being status. The condition is that each group can be defined clearly. To determine the number of groups needed, we have tested models with one to five different groups. On the basis of different statistical fit-scales (BIC and likelihood ratio) we have selected the model with four groups. These groups are unique and different in care needs and physical abilities. For easy recognition, we have called these groups care profile 1, care profile 2, etcetera.

For each of these groups the answers to relevant questions in the survey may vary. The classification chance is the chance that the respondents, given his/her answers on the response variables (questions), is a member of a latent class (group). Every response pattern has a chance of being part of a certain group. The validity of the groups can be tested by changing the profiles to match other chances. If a new response pattern is added to a set group, the proportion of persons that belong to this group will change, as will the prevalence. This in itself is a validation of the chosen profiles, as is the choice of a model with 4 profiles, instead of a different number of profiles.

As is shown in the next figure, a steep curve is a clear indication for the validity of the care profile. Given your response pattern, you are either included (near 1.00) or not included (near 0,00) in this care profile. Including different response patterns in this care profiles will broaden the slope, giving ambiguous chances of inclusion (0,50).

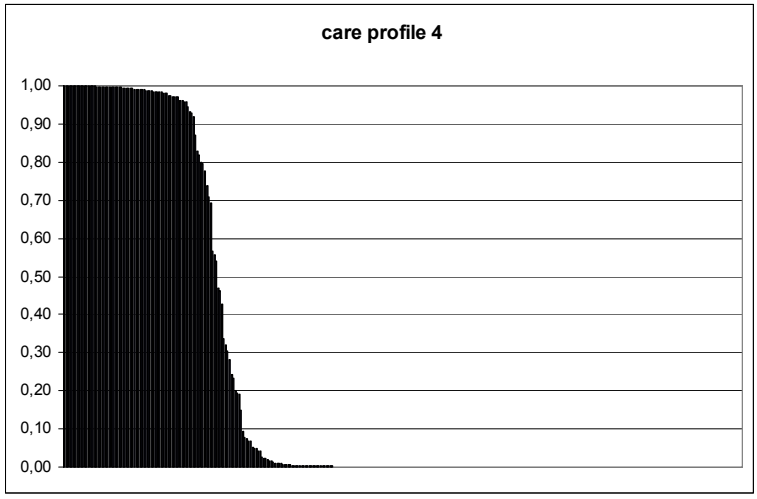

Fig. 2. Latent class analysis, classification chance for care profile 4

The order of care profiles is determined on the basis of increasing need for assistance and health status, care profile 1 being the profile with the best health status and lowest need for assistance and profile 4 the group with the worst health status and highest need for assistance.

In short, profile 1 includes relatively healthy elderly people, with minor arthritis**,** 35% of the survey (of source 1) are part of this profile. Profile 4 consists of people with a low self-reported health status, who encounter problems in performing daily routines concerning personal care, mobility and incontinence). 20% of respondents belong to this profile. Profile 2 and 3 are in between these extreme profiles. Profile 2 (16%) consists of respondents who only encounter problems with mobility (in and around their house, stairs). People who fit profile 3 (29%) do not only have mobility problems, but also have problems with personal care (getting dressed and personal hygiene). In figure 3, the four different care profiles and their characteristics are shown on a scale from zero to one. Zero indicates no problems, one indicates very serious problems (maximum category in the scale of the survey).

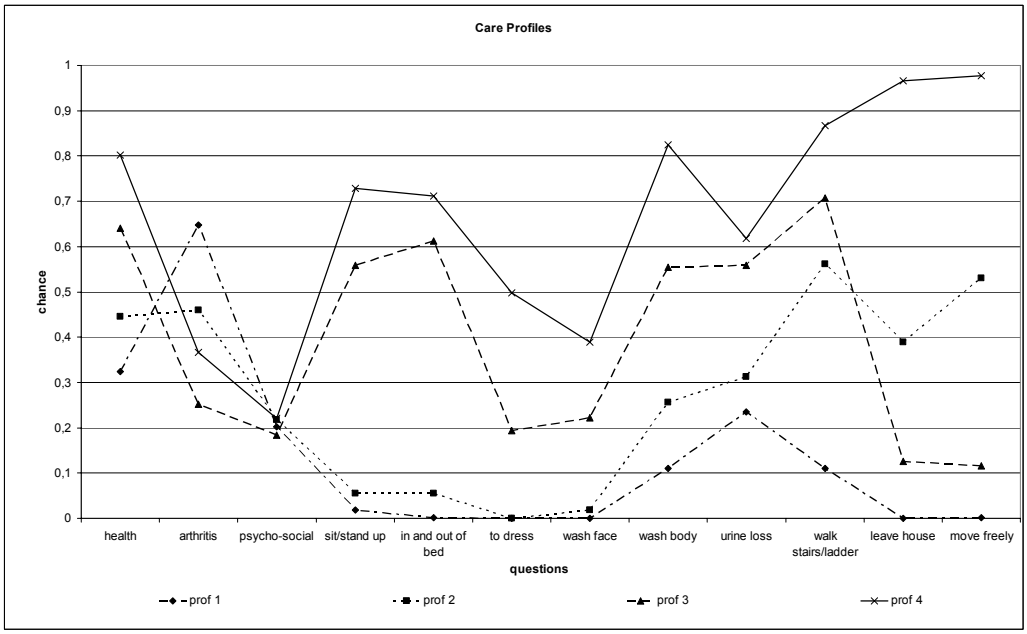

Fig. 3. Care profiles

The four care profiles are checked and validated with the use of sources [3] and [4]. The same profiles were found to be still present in the 2004 surveys and were virtually unchanged. The first four sources only included respondents in intramural and extramural care settings. The next step is to detect these care profiles in the general population.

We used a new source [5] to determine if these care profiles are also present in the general population. The fifth source is a random population survey on reported health status and well-being of individuals. This survey is carried out in the Netherlands on a yearly basis. These respondents are not institutionalized. For this research, data from 2003 were selected (number of respondents 25.163, all ages). Similar questions and scales were used, making comparisons between this source and the previous sources relatively easy. The four profiles were indeed present, but in very different prevalence rates than in the previous sources. This was to be expected. The general population is healthier than the elderly people in intramural and extramural institutions, although, surprisingly, even the more serious care profiles were found in the general population.

As mentioned, the surveys that were used did not include indicators about psycho geriatric symptoms or diseases like dementia. Therefore, a fifth profile was introduced and the number of people with severe dementia was subtracted from the other four profiles. This was done using incidence data from the ERGO epidemiological research [6]. The Health Council of the Netherlands [7] estimates that at least 35% of people with (severe) dementia are in such condition that 24-hour care and supervision are needed. It is assumed that this is an overestimation by Perenboom et al. [8] and that a percentage of 30% is more likely to be correct. The condition dementia is reduced by 70%, leaving only the people with severe dementia who are in need of 24-hour care, in the prevalence rate. Analysis of our surveys in intramural institutions show that there is the chance of suffering from dementia is equal when comparing intramural care with other living situations (specified for five year age-groups and sex-differentiated). We have therefore subtracted 30% from the prevalence categories on an equal basis and thus created the fifth care profile, people with severe dementia who are in need of 24-hour care and supervision**.**

The result from the first step is the prevalence for the five profiles in the Dutch population of 65 years and older, specified for sex and age group. On average, the older the population, the higher the prevalence of more serious care profiles is. Using demographics and predictions about future demographic trends we can predict the number of persons belonging to a certain profile for a set geographical area. These geographical areas can vary from zip-codes (4 digits), to municipalities and to the country as a whole. The validity of these predictions about the number of people belonging to a care profile at the lowest level can only be used with great caution due to the fact that not all areas are inhabited by sufficient people. The distribution in care profiles of the people of 65 years and older in the Netherlands in the year 2009 is shown below.

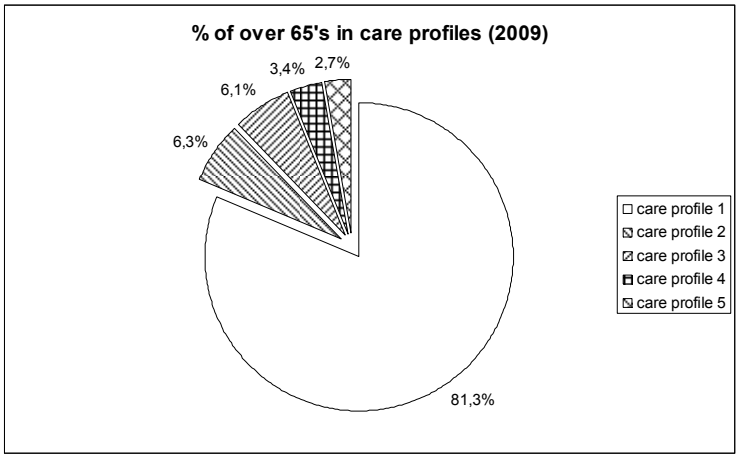

Fig. 4. Outcome of care profiles in the Netherlands, population over 65s

STEP 2

The second step is to determine the type of care that is needed for every care profile. We have transformed the care profiles into needs on the basis of expert opinion. The care profile states a general condition of the surveyed group. We know that these people already have institutional care in their immediate surroundings. The type of care in these settings varies from planned care (care giver comes to visit you at planned times to help you dress, ADL-activities, etcetera), unplanned care (people can call for assistance around the clock) and 24-hour supervision (care and supervision are available throughout day and night). The amount of care and the type of care that is supplied by caregivers is known. This is translated into the type of care needed (see table below).

Table 2. Description of care profiles

Care profile	Description	Type of care needed
Profile 1	More or less healthy people	None
Profile 2	People with mobility problems	(some) Planned care
Profile 3	People with mobility problems, personal care and unwanted urine loss	Planned care and unplanned care and services
Profile 4	People with severe somatic problems and other related mobility and personal care problems	(Un)planned care and 24-hour supervision
Profile 5	People with severe dementia	(Un)planned care and 24-hour supervision

It is not necessarily so that every care profile directly results in the above mentioned type of care, but for model purposes it is assumed that it is. In an individual case, this may deviate from the model, depending on the circumstances. See also Discussion.

STEP 3

After having determined the type of care that is needed for the profiles, we need to ascertain the appropriate physical setting. This physical setting, in all its aspects, partially determines the type of care that can be delivered. The care profiles that do not need 24-hour care and supervision or unplanned care, may feature a completely different physical setting than needed for care profiles where 24-hour care and supervision are required. Care profile 1 (no care) does not need a specific physical setting at home, for example. Care profile 2 features people whose physical condition makes it necessary to avoid stairs, steps and other obstacles. In the Netherlands, so-called 'zero-step houses' or senior-proof homes are created for the elderly in general. These would ideally suit the physical setting of care profile 2. For profile 2 and more serious profiles, enough space for care givers should be provided in the physical setting of their clients' homes. Proximity of a physical care point is important for care profile 3. If unplanned care is needed, this should be supplied from a nearby point, for example, a nursing station somewhere in a block of flats. In this case, proximity can be translated into the time needed for care givers to reach the client. People in care profile 4 and 5 need 24 hour supervision and care. The physical surroundings in which this can be provided is an intramural setting i.e. a nursing home, Alzheimer's home etcetera.

Again, it should be stated that for individual cases other solutions can apply. The approach to start by defining the care profiles and, subsequently, by defining the necessary levels of care and thus establish the physical setting in which this care can be delivered, is well defendable.

This three-step method has delivered insights into the planning of services for the elderly. Since we now have a strong idea how to plan services for these care profiles, we can use these insights to develop a planning model. Predictions about the future demographic trend are seen as an exogenous variable. The planning model can be seen as an input to strategic planning of health care infrastructure to balance future demand and supply in the long term. This model is called Horizon.

ANALYSIS & COMPARISON

The outcome levels of the two planning models - old linear planning and new planning method - both show the number of beds needed in intramural health care facilities. In order to make comparisons between the two models, we assume that the outcome in the old planning system for the categories somatic and psycho geriatric nursing homes is similar to the outcome of care profile 4 and care profile 5. Other care profiles cannot be compared, because the old model does not give results for the first three care profiles.

Comparisons between the old and new planning methods reveal interesting differences. On average, the new model predicts a slightly increased bed capacity for the Netherlands as a whole, for the year 2009. There is some variation between the two models at the local level of individual municipalities. This is due to the demographic distribution of elderly citizens. To compare the two models we have taken the outcomes of both methods (care profiles 4 and 5 and the linear percentage of 5,5 %). A perfect match between the two models at outcome level is a score of 1.00. The positive and negative deviation, i.e. the difference in outcome between the old and new model, is calculated for all municipalities in the Netherlands (n=458). In the following figure, these scores are shown in ascending order**.**

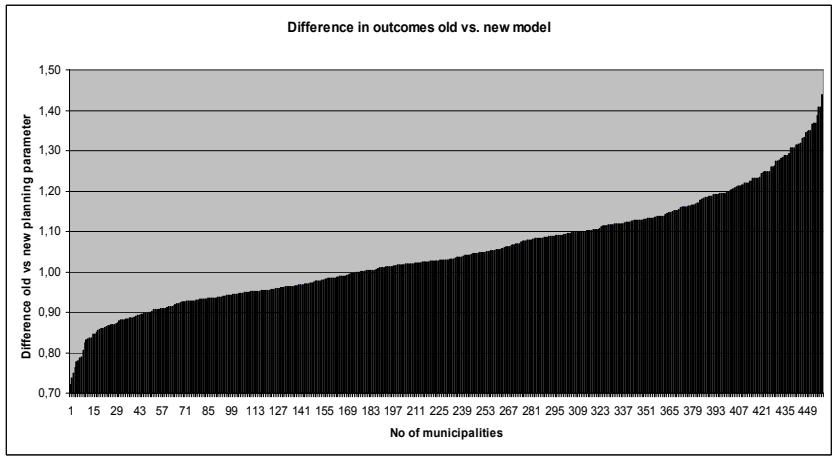

Fig. 5. Differences in outcomes at municipality level (beware: break-off point y-axis is 0,70)

The average score is 1.04 (standard deviation 12,8). The difference between the lowest score (72) and the highest score (144) is 72 at the extremes. The differences between the old and new model is not very dramatic for most of the municipalities. On average, the rule of thumb of the old model (5,5% of over 75s) coincides quite well with the new model. As a coarse planning method, the old model certainly gives similar outcomes. It is at the extremes that the new model gives different predictions. As the new model takes into account the unequal demographic distribution of people in municipalities, we feel that this model is more accurate than the old model.

APPLICATION: CITY OF THE HAGUE

An interesting example to demonstrate the advantages of using the new planning model, is the city of the Hague. The Hague has a deviation score of 1,37 in 2009. That means that the new planning model actually predicts a far greater bed capacity than the old planning model.

The estimated number of over 65s for the Hague is 62.919 in 2009. The distribution of these elderly people (split into different five-year groups and sex-differentiated) is shown as below (data from 2007, taken from Dutch Statistical Office, [9]):

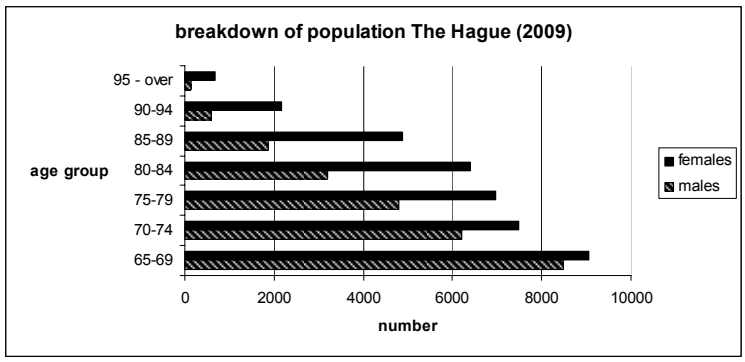

Fig. 6. Breakdown of population of the Hague in 2009, by sex
(Source: CBS)

Under the old planning rules a set % was taken to calculate the needed bed capacity. The old model (62.919 x 5,5%) predicts 3.461 beds for care profile 4 and 5. The new planning model predicts 4.348 beds. This can be explained by taking a closer look at the demographic figures of the municipality of the Hague in the year 2009 and comparing these figures with the average breakdown in the Netherlands.

Table 3. Breakdown of population the Hague and the Netherlands (Year = 2009)

Age group	% of 65+ the Hague	% of 65 in the Netherlands
65-69	28%	30%
70-74	22%	24%
75-79	19%	20%
80-84	15%	14%
85-89	11%	8,1%
90-94	4,4%	2,7%
95 - over	1,3%	0,7%
Total	100%	100%

The Hague has a different composition of population from the rest of the Netherlands. The city has a larger number of 85+ citizens. Therefore, due to higher prevalence rates amongst older persons, a higher number of beds was predicted than in the old model. Remarkably, the composition of the population of the Hague will change dramatically in the next few decades.

In the year 2019, the composition will have changed, as it will reflect the passing away of the current elderly population and the decreasing number of elderly people. We expect the need for bed capacity to have dropped to around 3.910 beds (-11%) by that time. In contrast, the old model advises the bed capacity to be raised to around 4.035 beds (+13%). Two very different conclusions!

The new planning model Horizon does not only give a more accurate prediction of the capacity that is needed for intramural care facilities. It also has a wider focus than the previous model, as it includes care profiles 2 and 3. These profiles have not been demonstrated in the example of the Hague, but can forecast the demand of ‘zero-step’ or ‘senior-proof’ housing. This can be compared with the current and future housing stock of this typology.

Planning decisions can be prepared with available data on the current capacity in the city of the Hague; the known functional quality of this capacity and the future need in number of beds. Not only can the inclusion of the full range of care profiles predict the intramural capacity, it can also, as a derivative, help in estimating the need for local care points for extramural care. Council planners, health care boards, housing corporations and insurers can jointly make plans on how and where to invest in intramural and extramural housing projects for the elderly. Horizon can be used from the current year up to around 2030. This is the end of the planning horizon at the lowest scale level (zip code). At the moment more than 135 case-studies have been executed and the output of the model is used to make actual planning decisions. It is widely accepted as the best possible option, although it has some minor drawbacks, which we will discuss next.

DISCUSSION

In the Netherlands, the use of Horizon is widely accepted. Currently, the Ministry of Health, Welfare and Sport is adopting the model. One of the chief benefits of the model is that it takes the debate out of the ideological and political corner, by introducing prevalence of care profiles instead of policy- driven arguments about macroeconomic limitations and desired supply of extramural care.

Planning models are hard to validate. Not only because they predict future demand, but primarily because of the implicit self-fulfilling prophecy. The old planning model used in 1997 predicted the capacity needed in 2005. Health care planners started building-programmes to create the extra number of beds for the year 2005. The data on available beds in 2005 reflect exactly that predicted number. But is this due to the increased demand (validation of the old model) or due to the completed building-programmes (which started as a consequence of the model)?

One of the weaknesses of the model is that a certain care profile does not automatically lead to a specific physical setting. A need for care is not the same as an actual demand for care. People categorised in a certain care profile sometimes carry on in their own house (in other words, they accept), find alternative solutions by adapting their own housing situation (solve). They can also hire private nurses or have support from spouses or family. In that case postponement of (formal) care can be achieved for the lighter care profiles or even the most serious care profiles. New technologies for supervision, community support and aided care can be used to enable an extended stay at home, decreasing the actual demand for intramural care. However, the physical and mental impairments do not change. It is coping with these impairments that changes, through technology, care models etcetera.

Not included in this study are the effects of socio-economic status and the availability of support from family. The demand and use of formal care is dependent on socio-economic status and aiding partners/families. If indicators on the lowest scale level are available, more accurate planning decisions can be made. Although we are aware of the impact of socio-economic status on the prediction of care profiles, unfortunately, it cannot be applied. This is due to missing information on socio-economic status at the lowest scale level.

Results from the most recent four-yearly care survey (last executed in 2008) were not available yet and the validity check on care profiles is still relying on data from 2000 and 2004. The new data will be taken into account when the model is improved over the next years. Other pending improvements are the expansion of the model for other health care sectors in the Netherlands (mental health care and care for the disabled).

CONCLUSIONS

The Horizon model as presented in this paper and applied in the Netherlands can be used to balance local demand and supply of services for the elderly. It gives policy makers a range of options, as current data on supply of services is known and available. The new approach, taken on the basis of care profiles instead of linear planning, has a definitive advantage over the old approach. As shown in a practical example, it gives a more refined estimate, based on clear needs and deficiencies instead of a ‘black box’-approach. Although the older model has proved itself as rule of thumb, the new model addresses the capacity needed with greater certainty. It has not only proved itself as a validation of the old model, it also includes new possibilities to predict care needed in any given community. Furthermore, the latent class analysis has proved to be a powerful method to determine sub-groups with similar characteristics in a large survey. A similar latent class analysis could possibly be used in other countries as well, depending on the availability of population surveys and other relevant data.

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