

2001 Regional Disability Estimates for New South Wales, Australia, Using Spatial Microsimulation

S. Lymer · L. Brown · M. Yap · A. Harding

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Abstract Estimating disability levels in older Australians and their demographic and socio-economic profiles is essential for identifying the need for aged care services and for the development and implementation of effective social policy on ageing. Small area estimates are produced from the spatial microsimulation model ‘CareMod’ which is based on the 1998 ABS Survey of Disability, Ageing and Carers (SDAC; ABS (1999). Disability, Ageing and Carers: User Guide, Australia. Canberra: ABS), and up-rated to 2001. Estimates are generated by reweighting the SDAC confidentialised unit record file to create ‘synthetic’ datasets for each Statistical Local Area in New South Wales (NSW), Australia. Disability levels and the need for aged care in NSW was determined across a range of age groups. The results show that there is significant variation across NSW in disability levels and the need for aged care services by older persons. With increasing age, the presence of severe or profound disability increases and, as a consequence, this subgroup of aged persons has a greater potential need for high level care. The coastal areas of NSW have a greater requirement of care provision with respect to overall numbers, as a consequence of the greater overall population. However, many inland towns have greater rates of disability amongst the elderly. The research findings will assist in the strategic planning and improved targeting of aged care services, especially in identifying areas of unmet need at the small area level.

S. Lymer (✉) · L. Brown · M. Yap · A. Harding
NATSEM, University of Canberra, Canberra, ACT 2601, Australia
e-mail: sharyn.lymer@natsem.canberra.edu.au

L. Brown
e-mail: laurie.brown@natsem.canberra.edu.au

M. Yap
e-mail: mandy.yap@natsem.canberra.edu.au

A. Harding
e-mail: ann.harding@natsem.canberra.edu.au

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Introduction

It is well known that the ageing of the population in Organization for Economic Cooperation and Development (OECD) countries, due to decreased fertility and increased longevity, is placing increased pressure on government budgets. (Casey et al. 2003; Oliveira Martins et al. 2005) One aspect of the ageing demography that is causing budgetary pressures is the rising need for long-term care, due to the increasing numbers of older persons. Whilst long-term, healthy ageing may dampen this effect, it is important to have an understanding of the levels of frail and disabled aged persons and their spatial distribution for effective use of government aged-care budgets.

Estimating disability levels in older Australians and their demographic and socio-economic profiles is essential for identifying the need for aged care services and for the development and implementation of effective social policy on ageing. The effects of an ageing Australia have been under the spotlight since the release of the original Intergenerational Report (Treasury 2002). Of key concern is the high level of public expenditure on older Australians—particularly residential aged care facilities, but also community care services—and how these costs are going to be financed. In the most recent Intergenerational Report it was projected that spending on aged care would increase from 0.8% of gross domestic product in 2006–2007 to 2.0% in 2046–2047 (Costello 2007). Reasons for this increase include demographic trends (particularly an increase in the elderly aged population) and the recent policy changes in supply of services.

In Australia, the number and proportion of the population aged 65 year and over has increased considerably in the past couple of decades. This is even more marked for those aged 85 years and over. The very large baby boom cohort born post World War II will begin to reach 65 years of age from 2011 onwards, resulting in a further sharp increase in the number and proportion of the population aged 65 years and over during the subsequent 20 years. By 2031, projections suggest that there will be some 5.8 million ‘aged’ Australians—578,000 of whom will be aged 85 years and over (ABS 2005). It is this cohort of ‘oldest old’ Australians who will place the greatest demand on formal and informal aged care services, especially high dependency aged care facilities. Research in New Zealand found that from the age of 85 years there was a higher rate of frailty. Consequently, entry into aged care facilities followed, making this a transition point into a later stage of life with associated increased illness and need for services (Barrett et al. 2006). This is in line with previous work indicating that there should be a distinction between the young-old and the oldest-old, to better capture the differences in the age groups where there is a move from healthy ageing to increasing morbidity and mortality (Baltes and Smith 2003; Neugarten 1974).

Despite the significance of the high costs of residential care, it has to be remembered that the majority of older Australians live privately within the community. In 2001, for example, it was estimated that some 1.1 million older

Australians lived as a couple without children; some 690,000 lived alone; and over 360,000 lived with a family member (AIHW 2002). The availability of family support will have implications on the need for the provision of care to the elderly in the community.

It has been observed that, “The success of the Australian aged care system depends on, and is characterised by, a mix of types of provision and a high degree of cooperation between all levels of government, service providers and the community” (AIHW 2002, p. 74). The residential care sector is already under pressure, as shown by the Australian Government's attempts to require those entering residential aged care facilities to make a greater financial contribution to means-tested daily care and accommodation fees and payments. This issue was re-examined by the review into pricing arrangements for residential aged care (Hogan 2004). Total government expenditure on residential care alone is expected to grow from 0.71% of gross domestic product to 1.08% by 2020 (Allen Consulting Group 2002).

Furthermore, the region in which people live profoundly affects their life experiences and the economic and social opportunities available to them. The issue of unequal distribution of care needs and funding of services across geographical areas has been a policy concern for some decades (Gibson et al. 2000). The approval of new residential aged care facility placements reflects the strong growth in the aged care industry in some areas—but there is no doubt that access to care in regional Australia will continue to be one of the most important areas of social policy, as there are already major concerns about difficulties in attracting medical and allied health professional staff to rural/remote areas and about lower service standards. Research shows that it is the rural and/or remote areas of Australia (and, in particular, NSW) that have a lower than average supply of residential care (although these low levels of residential supply need to be considered in the context of higher levels of home and community care services—Gibson et al. 2000). Issues of spatial equity are likely to become even more prominent in the next two decades—given current trends in the internal migration of older Australians to ‘sunbelt’ and coastal ‘retirement’ regional centres (ABS 2007a; ABS 2001)—and as the health impacts of the ‘baby boomers’ reaching retirement age start emerging. But the pressures placed on the overall health and aged care budgets by ever-increasing costs will limit the extent to which special regional needs can be met in the future.

CareMod is a spatial microsimulation model, developed by National Center for Social and Economic Modelling, to assist in addressing some of these key issues surrounding ageing populations. The model focuses on NSW, a large and representative state of Australia. Microsimulation techniques have been developed over the last 50 years and were originally described by Orcutt (1957). They involve the modelling of large and complex systems by simulating the behaviour of individual units within the system. Microsimulation models are based on microdata—typically the records of individuals from either a national sample survey conducted by a national Bureau of Statistics or large administrative databases (Brown and Harding 2002). Microsimulation techniques bring a range of benefits to social policy modelling, including the ability to change a greater variety of parameters independently and the capacity to provide considerably more detailed estimates and projections of the distributional effects of changes. Two key strengths of microsimulation models are that: (1) they can replicate the complexity of the policy

structures, transfers, and settings; and (2) they can be used to forecast the outcomes of policy changes and ‘what if’ scenarios i.e. the counterfactual where the results describe what, under specified conditions, may happen to particular individuals and groups (Brown and Harding 2002, 2005; Harding and Gupta 2007).

Microsimulation models have traditionally been used in tax and social security policy (for examples see Harding 1996; Gupta and Kapur 2000; Harding and Gupta 2007). Spatial microsimulation models are a more recent development and aim to combine data from the census with survey data, so as to create synthetic unit record datasets for small areas (Chin et al. 2005). In essence, the characteristics of interest unavailable in the census but available in the survey are synthesised at small geographic levels by utilising both data sources. Much of the key development of these types of spatial models has occurred in Europe (for examples see Huang and Williamson 2001; Voas and Williamson 2000; Ballas and Clarke 2001) and Australia (Chin et al. 2005; Chin and Harding 2006). It has only been in more recent years that microsimulation models have been extended to the health and aged care fields (recent examples are described in Gupta and Harding 2007). One of the first examples of a spatial microsimulation model to explore policy options for aged care was developed by Williamson (1996) to provide estimates of the elderly in need of care. In recent times spatial models have been used to explore health issues at a small area level such as health inequalities (Ballas et al. 2006) and diet-related health problems (Smith et al. 2006).

CareMod has produced small area estimates of levels of disability and the need for aged care, cross-tabulated by the demographic and socio-economic characteristics of individuals and their families (Lymer et al. 2006). In addition, the model has been built such that key parameters can be changed, so that the distributional consequences of possible policy changes and the significance of key assumptions to the modelling outcomes can be assessed.

In this paper we have considered the geographical variation in the estimated levels of disability and need for care amongst the older population across NSW. New South Wales is located on the Eastern seaboard of Australia (see Fig. 1) and is one of the most populous states in Australia, with a population of 6.8 million in 2006 (ABS

Fig. 1 Australian State boundaries and capital cities



2007b). Its population makes up approximately one third of the Australian population (ABS 2007b). Statistics about NSW are generally considered representative of trends within Australia and are a key driver of national outcomes. The consistency of the spatial distribution of need for care amongst various age groups within the target population was investigated.

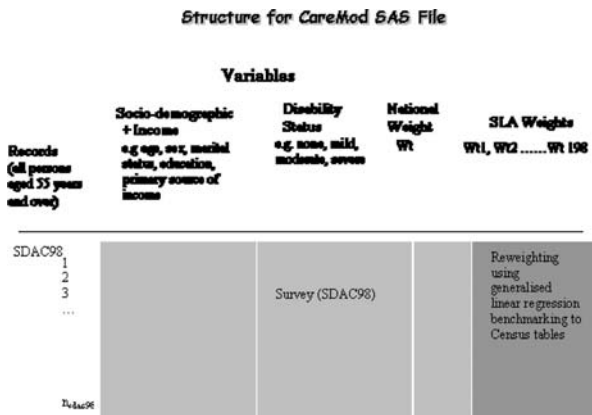
Methodology

The analysis for this paper used CareMod, a spatial microsimulation model of care needs of older Australians living in New South Wales, as its data source. As with any major microsimulation model, CareMod has taken considerable time and effort to develop. The current version was developed between 2003 and 2006 and was built using SAS code. The structure of the model is shown in Fig. 2 (see Lymer et al. 2006 for further details of the model’s construction).

CareMod allows the estimation of disability and a variety of other variables at the Statistical Local Area (SLA). This is an administrative spatial unit primarily based on the boundaries of incorporated bodies of local government (ABS 2001). CareMod is based on the unit records from the ABS 1998 Survey of Disability, Ageing and Carers (SDAC; ABS 1999). The person, income unit, family and household structures within the SDAC are retained on the model’s base file. Data such as socio-demographic variables, economic factors, functional status and availability of informal carers from SDAC records are also retained. CareMod includes both persons living in private dwellings and non-private dwellings (NPDs). NPDs are predominantly residential aged care facilities for the older population.

Spatial microsimulation involves the construction of spatially detailed microdata. There are many possible methods of achieving this such as data fusion, synthetic reconstruction and reweighting methods (Williamson 2002). As suitable microdata were available, reweighting was the method of choice for the development of CareMod. Within the general field of reweighting there are many alternative methods, which include generalised regression, iterative proportional fitting and

Fig. 2 Structured for care mod SAS file



combinatorial optimisation. Williamson et al. (1998) explored different forms of combinatorial optimisation (integer reweighting schemes) as a means of finding the combination of survey sample records that the best fitted the benchmarks from census data, including techniques such as hill climbing algorithms, simulated annealing approaches and genetic algorithms. In this study it was found that a modified version of simulated annealing performed the best. More recently, Tanton et al. compared the modified simulated annealing method to an iterative generalised regression algorithm, a non-integer reweighting method, and found that the results were comparable (Tanton et al. 2007).

To generate small area estimates in CareMod an iterative generalised regression algorithm was ultimately used. This method uses regression to determine an initial weight for the survey record and then iterates the regression until the difference between the estimated benchmark and the actual benchmark for the area from the census are within a set limit, or a set number of iterations are made, at which time the iterations stop. Hence, the SDAC national weight for each record is turned into a 'synthetic' SLA weight, so that the new weight now represents the likelihood of finding persons with a similar set of characteristics in the local area population. After reweighting, the weighted characteristics of the survey records should mirror those of the SLA population as revealed by the 2001 census.

The benchmarks used in the reweighting process included the following variables: age, sex, relationship in household, personal income, tenure type and education level. The optimisation algorithm developed by the Australian Bureau of Statistics called GREGWT (Bell, P. (2000). GREGWT and TABLE macros—Users guide. Canberra: ABS, unpublished), was used in the process to find a reweighted selection of the records in the SDAC records that match the classes within each benchmark for each SLA in NSW. Measures were taken to ensure that the SLA estimates of disability levels were centred to the NSW average (as shown on SDAC) and so the model weights sum to represent the New South Wales population with these particular disability characteristics. There were four SLAs (Sydney Inner and Remainder, South Sydney and Inner Newcastle) where the GREGWT algorithm did not converge—i.e. the synthetic weights did not reproduce the benchmark characteristics of each of the small area populations. Subsequently, these SLAs were excluded from analysis.

The main analysis examined the regional distribution across NSW of the various disability levels amongst the population aged 55 years and over generated in the microsimulation model. Regional patterns of disability levels are presented in terms of quintiles, both as absolute numbers as well as percentages. The percentage distribution reveals the disability levels relative to population size in each SLA, while the absolute numbers suggest the actual magnitude of demand for care needs due to these levels of disability.

In addition, analyses for different age groups were undertaken to increase our understanding of the extent to which disability levels varied with increasing age and the effect age had on the regional distribution of disability. The age groups of interest were: people aged 65 years and over, 75 years and over, and 85 years and over. Throughout the paper, 65 years and over refers to all persons aged at least 65 years and includes all persons in the cohort up to the eldest living person. Similar definitions for the age groups 75 years and over, and 85 years and over hold.

Results

It was estimated within CareMod that in 2001 in NSW around 20% of the population aged 55 years and over had a disability with at least a moderate restriction in at least one core area, with this proportion rising to around 50% for those aged 85 years and over. There are no directly comparable estimates for exactly the same year available in Australia, but estimates for NSW in 2003, from a later SDAC survey, indicated 23% of the population aged 55 years and over had at least a moderate disability, rising to almost 60% of the population aged 85 years and over (ABS 2004).

The estimated rates of disability, however, vary significantly between local areas, ranging between 13% for those aged 55 years or over in Conargo and 30% in Armidale-Dumaresq. Of the 194 SLAs in NSW, it was estimated 33 had less than 20% of people with a disability, where as only four SLAs were estimated to have more than 30% of people aged over 55 years with a disability. Amongst the very old (85 years and over) the estimated rate of those having a disability varied between 30% and 70%.

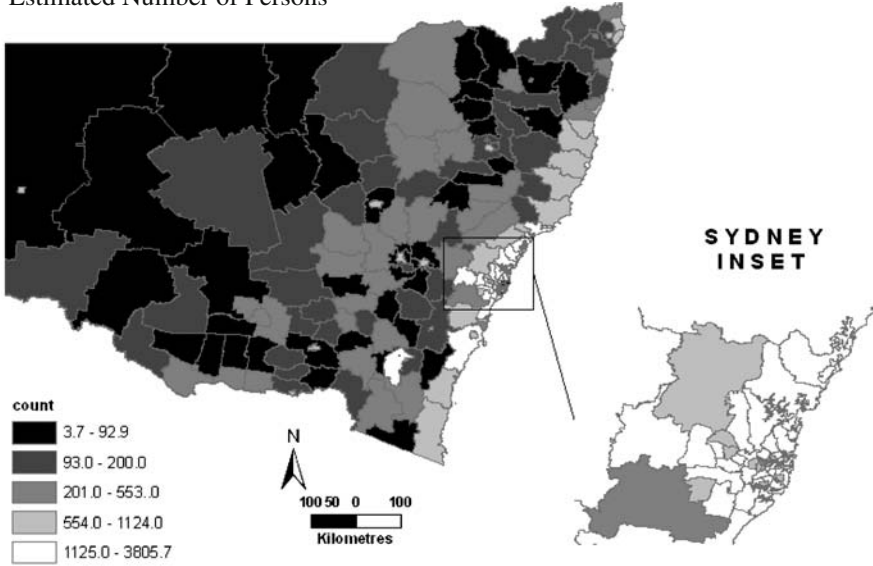
The spatial patterns of the severe and profound disability levels amongst the population aged 55 years and over, where individuals' may require some significant degree of assistance, are given in Figs. 3 and 4. Both the estimated numbers of persons aged 55 years and over and the estimated percentage of individuals in each area with each level of disability are shown in the maps. The former reflects the potential pool of clients for aged care services while the later measures relative differences in the levels of need on a population basis. The SLAs are classified by quintile.

Variations across the SLAs are very noticeable for all levels of disability being considered, with clear west-east gradients in the numbers of individuals requiring care. In terms of those with a severe disability (that potentially places high demand on care providers within the home or community or upon lower dependency residential type services), there are only seven areas estimated to have fewer than 20 individuals with severe disability levels and 20 areas estimated to have fewer than 40 individuals identified in the CareMod modelling as having a severe disability. Areas in the bottom quintile were estimated to have fewer than 65 individuals with a severe disability while those in the top quintile were estimated to have more than 845 persons with a severe restriction in core activities.

For those with a profound disability leading to potentially the highest level of care, such as nursing home care, again there are only seven areas estimated to have fewer than 20 individuals with high dependency needs, and 12 areas estimated to have fewer than 40 individuals identified in the CareMod modelling as needing high level care—and all of these areas are located in rural or remote NSW. Areas in the bottom quintile were estimated to have fewer than 93 individuals with profound disability while those in the top quintile were estimated have more than 1,125 persons with profound restriction in core activities.

These patterns do not simply reflect population distribution. There are significant regional differences in the estimated proportion of the local community populations potentially needing care, due to presence of disability. This is particularly so for profound disability, where the estimated percentage of individuals aged 55 years or over potentially requiring high level care varies between 2% in the rural area of

Estimated Number of Persons



Estimated Percentage

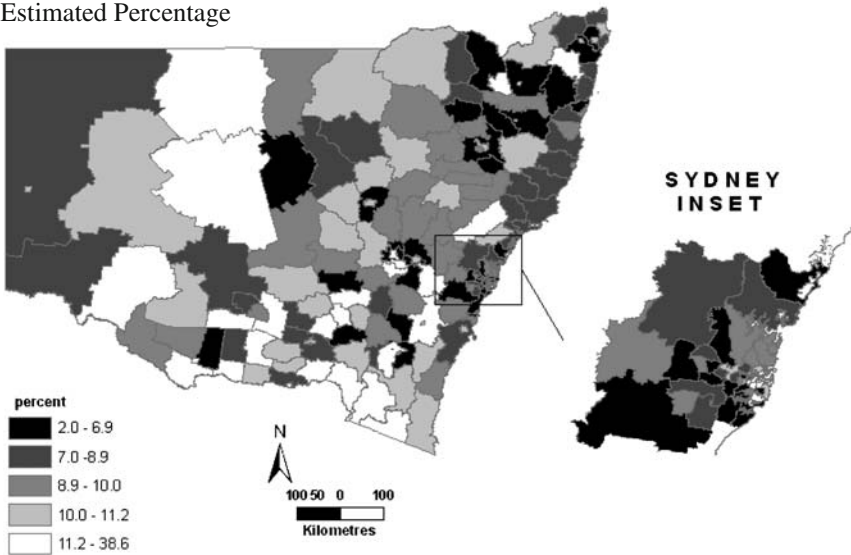
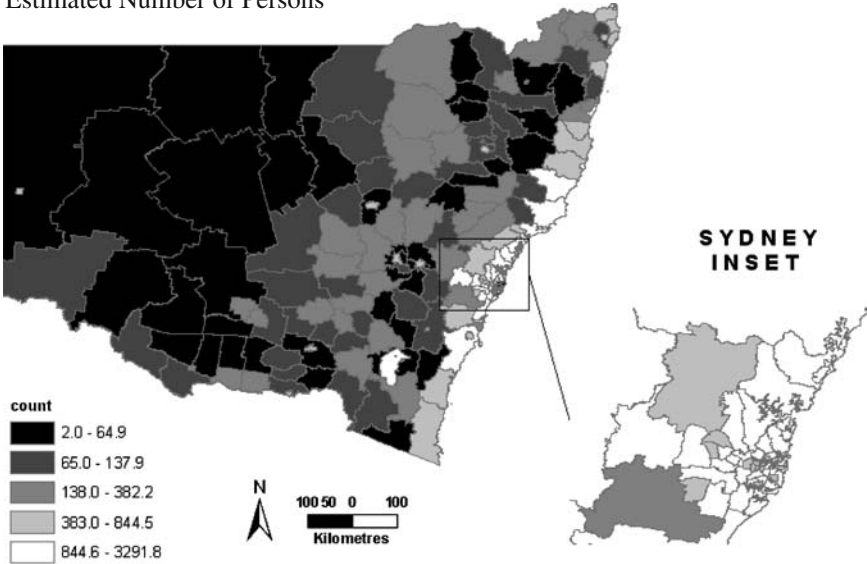


Fig. 3 Distribution of profound disability within NSW, aged 55 years and over

Cabonne to 27% in the Snowy Mountains. Of the 39 areas in the highest quintile, 30 (77%) are rural SLAs or regional centres, many of which are located in the southern part of the State. There is a more spatially even prevalence rate for severe disability across NSW.

The spatial patterns of disability levels polarise with age. That is, low levels of disability and their associated needs are greatest for those 55 years and over—

Estimated Number of Persons



Estimated Percentage



Fig. 4 Distribution of severe disability within NSW, aged 55 years and over

whereas profound disability and associated higher level care needs are greatest for people aged 85 years and over. The regional patterns of disability for persons aged 55 years and over and 65 years and over are quite similar. For those who were aged 75 years and over, the regional distribution of care starts to differ from that of the younger cohort. This group has a relatively higher rate of profound disability and

needing higher level care and lower rates of mild and moderate disability. The disability pattern is again increasingly different for those who were aged 85 years and over (see Figs. 5 and 6). This group has the highest estimated rate of profound disability, followed by severe disability. The regional patterns for mild and moderate disability are lowest and somewhat similar. It is evident that with increased age, the level of disability and potential need for care increases. This was a consistent pattern across all the regional areas.

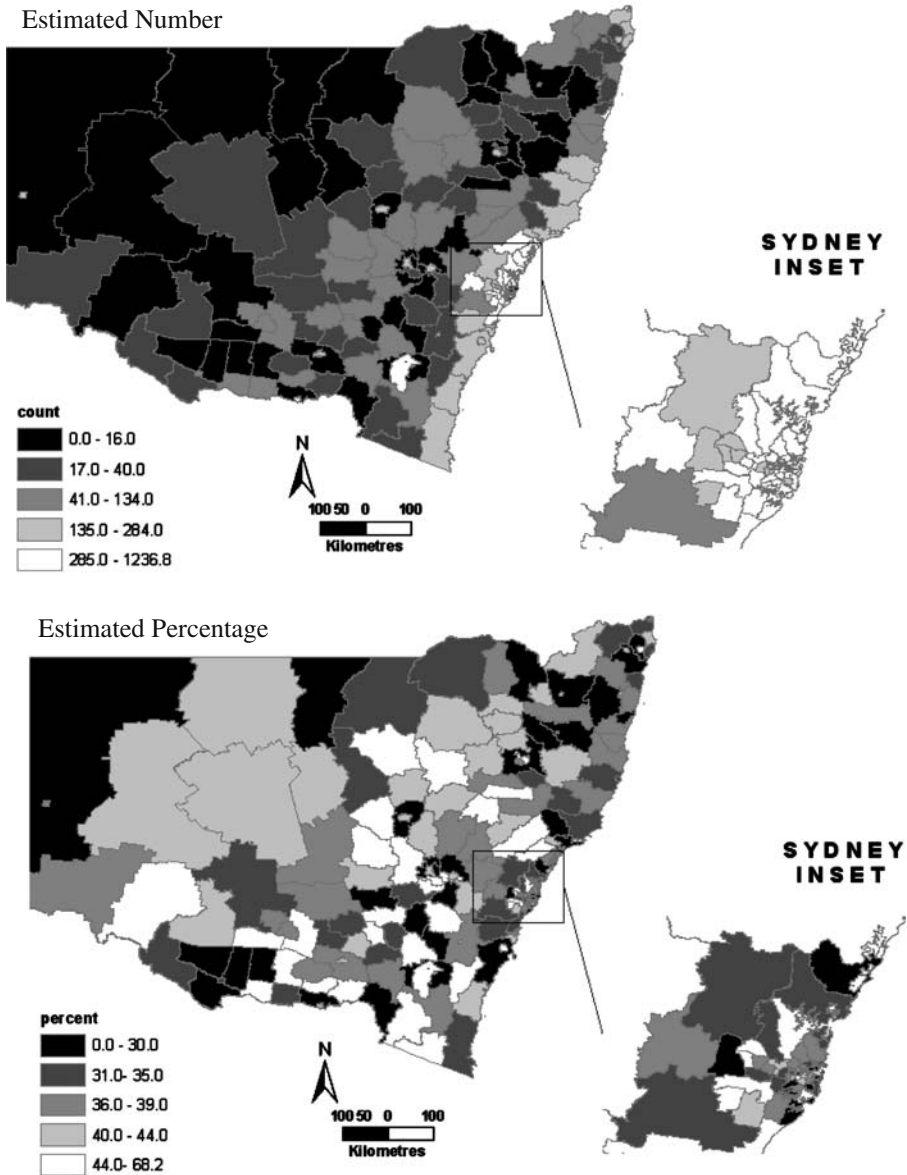
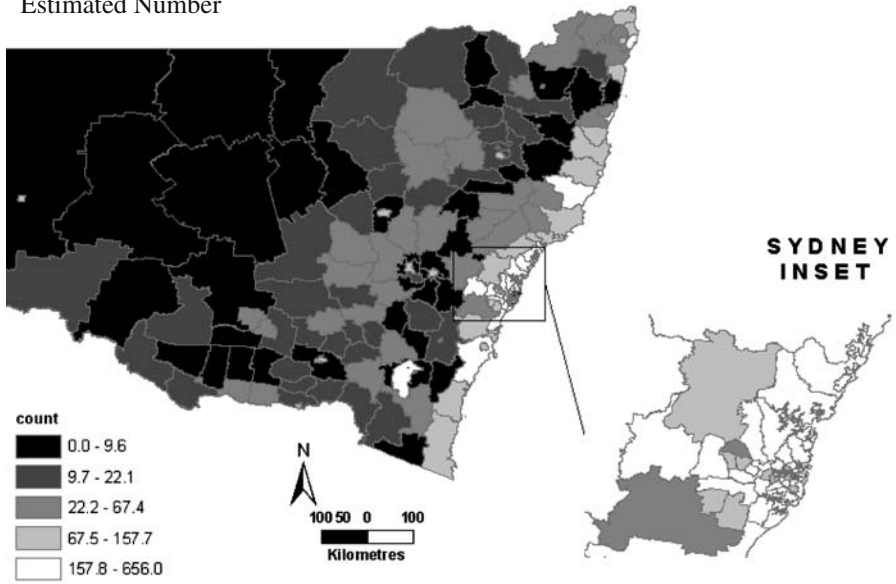


Fig. 5 Distribution of profound disability within NSW, aged 85 years and over

Estimated Number



Estimated Percentage

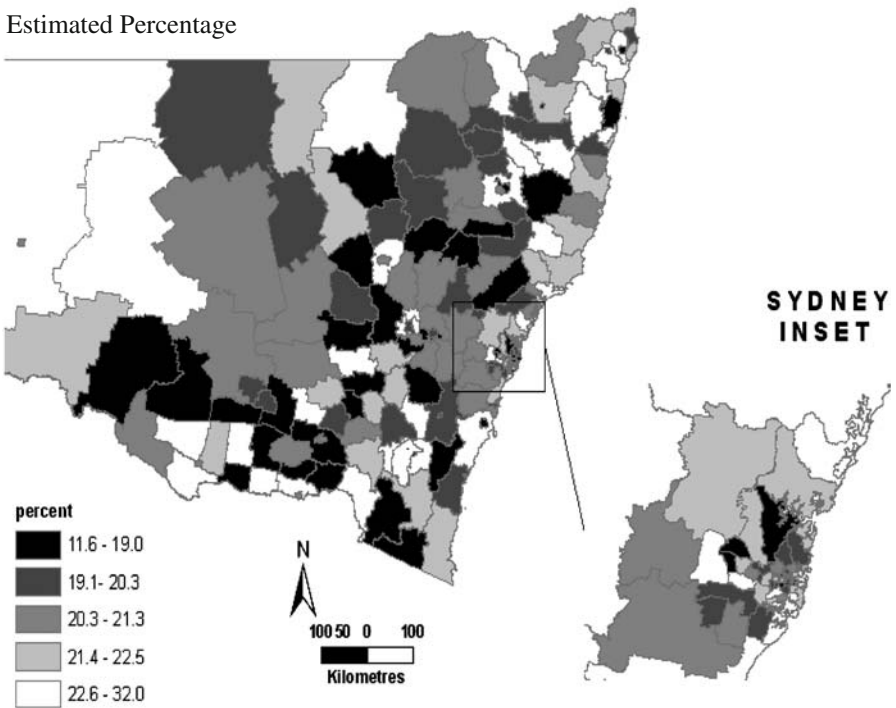


Fig. 6 Distribution of severe disability within NSW, aged 85 years and over

Looking more specifically at the elderly aged population, who have the greatest potential care needs, we found that the estimated median number of persons aged 85 years or over with profound disability and potentially high care needs per area is 72 individuals. The estimated number of persons aged 85 years and over living in each SLA who had a profound disability ranged between 0 (Windouran, Cabonne (pt B), Yarrowlumla,) and 1,240 persons (Hornsby). Only 21 SLAs in NSW were estimated as having fewer than ten very elderly residents with potential high level aged care needs. In contrast, 15 areas were estimated to have more than 500 very elderly residents with profound restrictions in core activities and potential high care needs, with these areas being the high population SLAs in Sydney (the capital city of NSW) and the coastal retirement areas surrounding Sydney such as Wollongong, Newcastle, Wyong, Lake Macquarie, Gosford and Hornsby.

The estimated proportion of SLA populations aged 85 years and over with profound disability and potential high dependency needs varies between 0% and 68% (Hunters Hill in Sydney). Only 13 SLAs in NSW were estimated to have fewer than 20% of their very elderly residents with profound disability. In contrast, ten areas were estimated to have more than half of their very elderly residents with profound disability. The median percentage of elderly residents with profound disability for the 194 SLAs analysed was estimated at 37%.

One of the advantages of a spatial microsimulation model is that the individual records are retained within the model, so that it is possible to analyse the characteristics of those with disabilities, as well as to simulate the impact of policy changes (such as increases in the price of means-tested care services). For example, Table 1 looks at the characteristics of those aged 65 years plus with severe or profound disability in two different SLAs of New South Wales—Snowy River and Hunter's Hill. Hunter's Hill is an urban, inner-city suburb of Sydney, the capital city of New South Wales, whilst Snowy River is a rural area in southern New South Wales. Both of these SLAs have relatively high estimated levels of severe or profound disability amongst their population aged 65 years and over (38% in Snowy

Table 1 Socio-economic characteristics of Hunter's Hill compared to Snowy River

	Hunter's Hill	Snowy River
Population aged 65 years plus	3,475	1,571
Percent living in non private dwelling	25	38
Percent with severe or profound disability	28	35
Percent living in community who live in their own home	62	44
Percent primary source of income—pension	30	21
Percent primary source of income—superannuation	8	7
Percent primary source of income—interest bearing deposits	11	8
Percent lone person income unit	34	28
Percent married without children income unit	58	62
Average personal income per week (\$)	423	308
Percent with severe or profound disability whose income was more than the pension and owned their home	3.1	1.8
Percent with severe or profound disability whose income was less than the pension and was renting	0.5	0.1
Population aged 85 years plus	434	<50
Percent with profound or severe disability	82	72

River and 25% in Hunter's Hill). However, despite the relative high levels of disability, the model illustrates where their underlying socio-economic characteristics differ. Hunter's Hill has a larger population aged 65 years and over, and consequently, a larger number of severely or profoundly disabled persons aged 65 years and over compared to Snowy River (just over 950 compared to just under 550). Amongst the population aged 85 years and over, in Hunter's Hill, 82% had a severe or profound disability compared to 72% in Snowy River. The number of persons aged 85 years and over was just over 500 in Hunters Hill compared to less than 50 in Snowy River. The older population in Hunter's Hill were more likely to live on their own (34% compared to 28%) and were more likely to own that home (62% compared to 44%). The main source of income for both areas amongst the older population was the government pension: however the average weekly cash income in Hunter's Hill was just over \$AUS 400 compared to just over \$AUS 300 in Snowy River. Contributing to this difference in earnings would be the greater percentage of older people in Hunter's Hill whose main cash income is from interest bearing deposits.

To further illustrate the advantages of spatial microsimulation, and its ability to facilitate geographical examination of the inter-dependencies between disability, socio-economic and demographic factors, the estimated distribution of persons aged 65 years and over, who had a severe or profound disability, and lived in rental accommodation on their own was examined. The estimated percentage of persons aged 65 years and over, who had a severe or profound disability, and lived in rental accommodation on their own ranged between 0.01 in Inner Sydney to 5.2 in Weddin, a small country town in Western NSW. The estimated median percentage was 4.2, indicating that the distribution is highly skewed, with most SLAs having a percentage between 3.8 and 4.5. The overall pattern of the dispersion across NSW of this particular group, as shown in Fig. 7, is one of decreasing percentages moving from the coast into the remote far west regions of NSW.

Discussion

The analysis using CareMod indicates that the prevalence of disability and need for aged care varies significantly across NSW, both in absolute and relative terms. Further, it appears that the greatest spatial variability occurs in the prevalence of older persons with profound restriction in core activities. Thus, there are greater concentrations of people with high care need in certain SLAs. In part, this is a reflection of the current location of aged care facilities in certain areas but it also pinpoints areas that potentially have unmet need of care provision.

The rate of Australians aged 65 years and over with a profound disability has been increasing, as has the percentage of these people living alone. In addition there is no evidence that the prevalence of disability in older Australians is declining, especially in terms of severe or profound core activity restrictions (AIHW 2000). In fact, the age standardised rate of severe or profound core activity restriction for persons aged 65 years and over increased from 16.2% in 1981 to 19.6% in 1998, with the increase being most marked for the very old (AIHW 2000, 2003). The number of older persons with severe disability has been projected to increase by

Estimated Percent

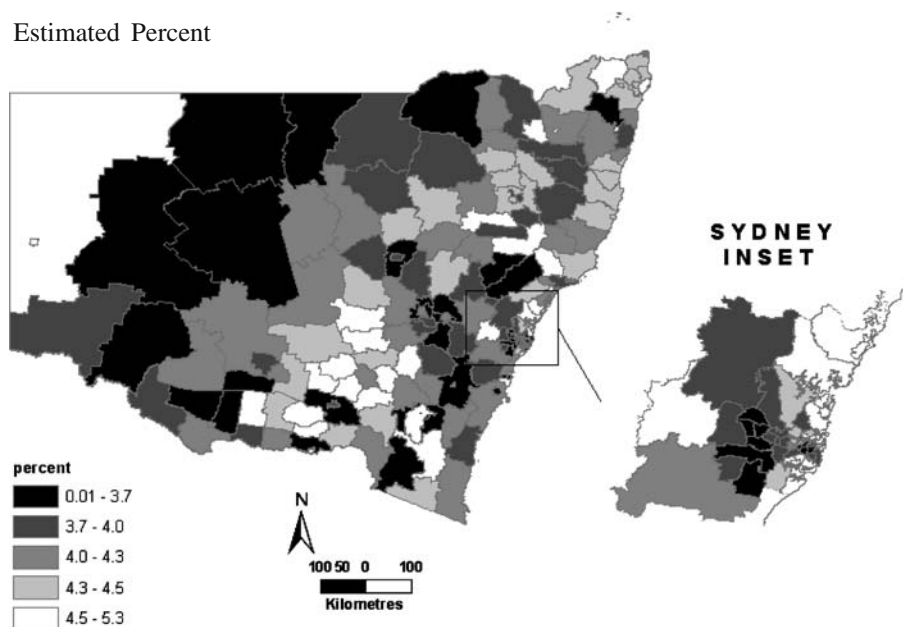


Fig. 7 Distribution of persons with severe and profound disability living alone in rental accommodation within NSW, aged 65 years and over

35% over the next 30 years, and those with profound disability by a staggering 70% (Singh 1995; Giles et al. 2003; Percival and Kelly 2004; AIHW 2004). This is largely due to increases in the number of older Australians with musculoskeletal, nervous system, cardiovascular and respiratory health conditions, and stroke.

Those individuals aged 85 years and over with profound restrictions place the most demand on high dependency residential aged care facilities or community programs providing high levels of home care. It is acknowledged that these patterns represent only part of the picture—namely, the demand side.

The availability of support from family is a crucial issue. Currently, one in three NSW residents aged 65 years or over lives alone. (ABS 2007c) In the next two decades, there will be a significant rise in the number of older Australians living by themselves, many of who will have some impairment in core activities and will require assistance. The increasing numbers of older persons with disability—allied with the relative decreasing numbers of younger persons that may be able to act as care givers poses a very real challenge to the ability of the informal sector to continue to provide, at current levels, this key welfare support role (AIHW 2004; Percival and Kelly 2004). Furthermore, research indicates that there also will be an increase in the proportion of carers that are elderly themselves (Percival and Kelly 2004; AIHW 2004) and who may struggle to be able to provide the necessary levels of care.

One of the key issues in this analysis is the iterative generalised regression algorithm used for reweighting in the development of the data source, CareMod and how well the generated small area weights when applied to the SDAC reproduced the census benchmark data for the SLAs. In this model, the reweighting process

(generalised linear regression) worked better for some areas than others. There were 4 instances where the reweighting process yielded unsatisfactory results (i.e. the sum of the difference between the synthetic estimate and the benchmark value, across all benchmarks, was unacceptably high). Subsequently, these small areas were excluded from further analysis. These four areas were Sydney, both Inner and Remainder, South Sydney and Inner Newcastle. Each area could be considered to be non-typical and had exceptional concentration of some characteristics within its population.

Validation for this spatial model also included comparison, across a wide variety of variables (of most importance being percentage and number of persons living in a non-private dwelling), of the synthetic estimates with known values at the small area level obtained from census data. The quality of the synthetic estimates showed considerable inconsistency across variables examined. There were some variables that provided reasonable estimates—such as being married or in a de facto relationship (which was highly correlated to the constrained variable of relationship in the household i.e. being a husband, wife or de facto spouse). After alignment, the model proved reasonable estimates of the percentage and number of persons in non-private dwellings. In addition, the weighted average across SLAs for per cent with a disability and the SDAC98 Australian average had percentage point difference of less than one.

Comparison of the CareMod results and the ABS small area estimates of disability is currently being undertaken as part of the validation process for CareMod. The ABS produced small area estimates of disability across Australia for 2003 at the LGA level for the National Disability Association using regression based modelling (Elazar and Conn 2005). Their estimates when aligned for the same target population were similar. Our estimates showed the same relativities between the small areas as those produced by the ABS. In general, for the older population living in the community our estimates of profound and severe disability were slightly greater. The difference seen in estimates could be attributed to a variety of reasons including: the different methods used, the different spatial areas used in the modelling, the different base year for the estimates and the different target population considered in the modelling. Further investigation to quantify and understand the differences in the estimates from the two methods is currently being undertaken.

Sensitivity analysis in microsimulation modelling enables greater understanding of the parts of the model that have the largest impact on the model outcomes and consequently allows assessment of possible sources of error (Klevmarken 2005). It can include comparison of output under different algorithm specifications as well as changes to the model structure and modules included (Citro and Hanushek 1991). Formal sensitivity analysis on CareMod is part of the current work plan for this model.

The “demand” information provided by CareMod—on local areas’ disability rates and distribution of types of care required—needs to be combined with the “supply” data on the existing provision of services and likely changes in supply to be able to identify areas of unmet need now and in the future. The addition of supply components to the model would allow the estimation of the impact of the placement of new aged care services as well as account for the geographic location of the disabled elderly due to the placement of nursing homes. It is the areas where current

service provision is lacking and the areas in which demand will grow strongly in the future that will need to be identified and then targeted in terms of planning and resource allocation. It is anticipated that in the next version of CareMod, the model will be enhanced to include these supply components of the aged care system.

Conclusion

The primary aim of this study was to provide estimates of the need for care amongst the older population in NSW. The local areas in which individuals live are unique in their social and physical fabric. Small areas are spatially diverse and analysis from planning tools such as CareMod contributes to the understanding of local needs and to providing solutions to allow older Australians to undergo healthy and productive ageing. There are significant variations in the need for aged care services by older Australians across NSW, as shown in our analysis. There are greater numbers of older disabled persons in the major cities on the coast of NSW compared to more inland remote areas. With increasing age, there is greater polarisation of the levels of disability and consequent need for care between the major cities and the remote areas.

This methodology has the benefit of synthesising estimates at the small area level that are not available in current Australian data collections. Its major advantage is the retention of individual level data in the estimation, so interdependencies between disability, socio-economic and demographic attributes can be examined from a geographic perspective. Finally, this methodology allows distributional analysis of policy changes to aged care provision and/or financing. However, it must be remembered that these are simulated estimates and not precise counts. Additionally, this model does not include aspects of service supply, which affects the current location of the elderly disabled population.

The disabled elderly population have differing levels of social and financial support available to them in their older age. In further analysis, such issues as social and financial support available to the disabled aged population, as well as current supply of services, will be investigated. Future development of CareMod will see the basefile updated to the latest SDAC and Census data. In the latest version of the census, disability information is available to use in benchmarking during the synthesis of the survey and census data, which will strengthen the quality of the estimation. The basefile can be further enhanced by improvement of the wealth module of the model to allow consideration of who has the ability to pay for enhanced services.

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