OLDER AND WISER

SMART YOUNG DOCTORS AND NURSES PREFER TO LIVE IN SMART CITIES. HOWEVER, OLDER PEOPLE TEND TO LIVE IN OTHER PARTS OF A COUNTRY. SUCCESSFULLY PUTTING THESE TWO GROUPS TOGETHER AS THE POPULATION AGES IS GOING TO TAKE ADVANCED GEOGRAPHIC TECHNOLOGIES. HAMISH ROBERTSON AND NICK NICHOLAS PUT THE CASE FOR THE 'SPATIAL DASHBOARD' FOR HEALTHCARE

Globally, the transition away from infectious disease and early deaths has already occurred, with chronic, long-term conditions, such as heart disease, cancer and diabetes, now the major contributors to illness and death. Closely associated with these systemic diseases are the neurodegenerative conditions linked to the physical ageing of our brains. In particular, brain ageing is linked to long-term cognitive decline and a variety of problems, such as the dementias, Parkinson's disease, the various movement disorders and even falls in the elderly. Many of these have obvious disabling effects that can compound the problems experienced by older people and their support systems.

In this highly dynamic context, knowing what is happening is essential but knowing where changes are occurring is going to become even more important. The sustainability of health and social support systems will increasingly rely on nuanced responses to local conditions, not highly generalised and sweeping policies. General policy principles may set the context but for fiscal and related factors such as pensions and benefits, health insurance, workforce supply and facility distribution, sustainability will depend on a much more detailed knowledge of the local and conditional. All these patterns are likely to become increasingly nuanced and local, especially as we look for ways to better manage effective, sustainable responses.

The devil, as they say, is in the detail.

Spatial science and technology already have the capacity to contribute to this situation and spatial literacy and competencies must grow in the coming decades if planners and service designers are to build and maintain sustainable systems for the longer term. We have known for decades that health and illness vary significantly by location. The 'Glasgow effect', based on locally observed morbidity and mortality differentials in the eponymous UK city, has documented just how great these variations of health status and even life expectancy can be. US analysis has shown how life expectancy can even vary by commonplace details: in New Orleans, life expectancy can vary by 20 years in little more than a couple of kilometres. Thus, numerous health factors can vary significantly both within small geographic areas and across very short distances in space.

Future gains

Where we see future gains being made is in the integration of this understanding in the context of rising mass population ageing and the significant changes and challenges that ageing brings with it.

For example, a variety of social and economic factors come into play with ageing in regional versus urban areas. The differentials between cities which still tend to attract younger, more mobile people

and rural areas, which often support declining older populations, can become increasingly significant. Research in Japan illustrates just how serious and detrimental urban-focused policies and infrastructure strategies can be for villages and towns that are being gradually deserted by younger people and left to fend for themselves with ageing populations and infrastructure. The EU's Declining, Ageing and Regional Transformation project estimates that 30 per cent of European regions are affected by these factors and that this will rise to 50 per cent by 2050.

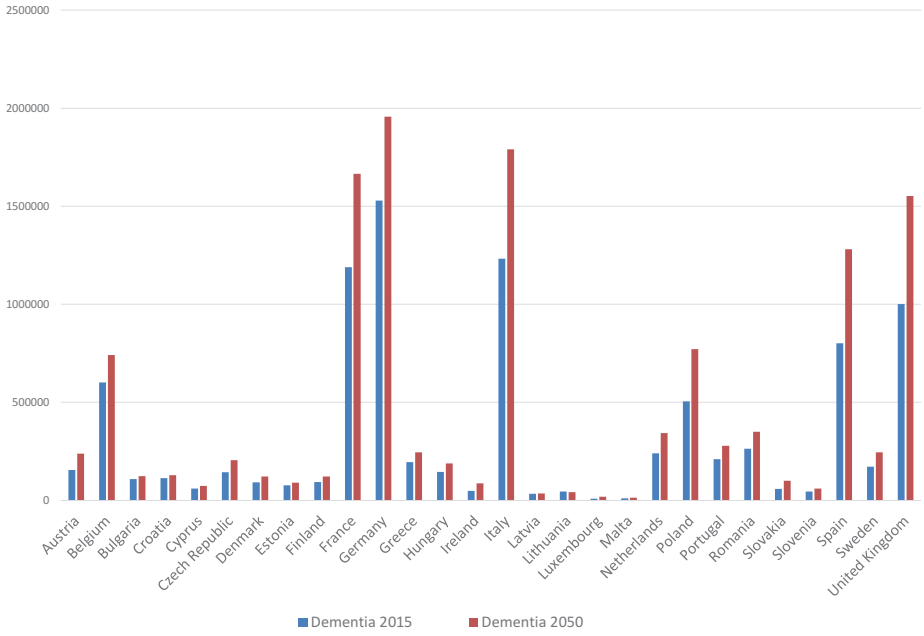
An important and practical way to support and develop the required skills is through the use of dashboard systems that emphasise both health and demography. The utility of dashboard systems is gaining momentum through Big Data. Dashboards can also integrate geographic visualisations, as well as the usual bar charts and line graphs with which most people are already familiar. This can mean users can quickly move from the already familiar to the completely new, in terms of data access and visualisation. It also provides a platform for building spatial skills and methods as a growing audience becomes much more familiar with spatial science, technology and visual data access.

From standard atlas projects to dynamic computerised geovisualisation, the aim of these systems is to go beyond visual representation to analysis and interrogation of the spatial environment. Software companies such as Tableau have already added basic geographic visualisation capabilities so that spatial visualisation occurs alongside conventional and developmental visuals. Consultancy firms such as McKinsey have added spatial visualisation to some of their research products, including downloadable apps that extend the accessibility of such approaches (see www.mckinsey.com/insights/mgi/in_the_news/urban_world_app). The real concern here is with the complexity of our datasets, including factors such as multidimensionality, multiple sources and time-dependency in the growing volumes of digital data organisations are having to manage.

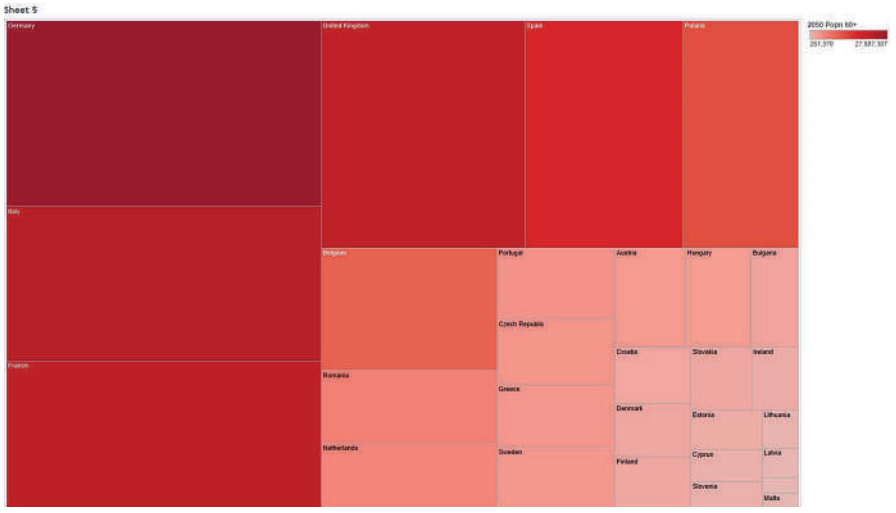
The systems of the future

These types of approaches are leading us towards some extremely flexible information intelligence systems that have spatial integration at their core. If we consider the dementias as one important health concern amongst the many that ageing populations face, we can see how visual spatial methods can assist in both understanding and responding to the complexities of ageing. The distribution of older people in a given population often reflects a mix of dynamic socio-economic and spatial factors. The infrastructure for accommodating frail older people often includes a range of outreach services as well as differing accommodation types. These are spatially patterned but can lack a direct correlation with the distribution and needs of older people. These spatial relationships grow in importance as people age. Meanwhile, the places where younger health professionals including doctors, nurses, pharmacists and psychologists prefer to live and work do not often correlate with these specific areas of need.

Connecting these various complex and dynamic elements within the one knowledge space is difficult. Current strategies are still disconnected because we have not yet adapted to ageing as the defining feature of the world we will soon live in. Visualisation, including dynamic spatial dashboards, will be central to this adaptation process. Knowing where older people with dementia are located and their patterns of engagement with the health and social care systems will raise questions that require spatially informed responses. The spatial science and technology sectors are and will be integral to improving our responses to this unfolding scenario.



Dementia in the 28 European Union countries in 2015 and the predicted levels in 2050

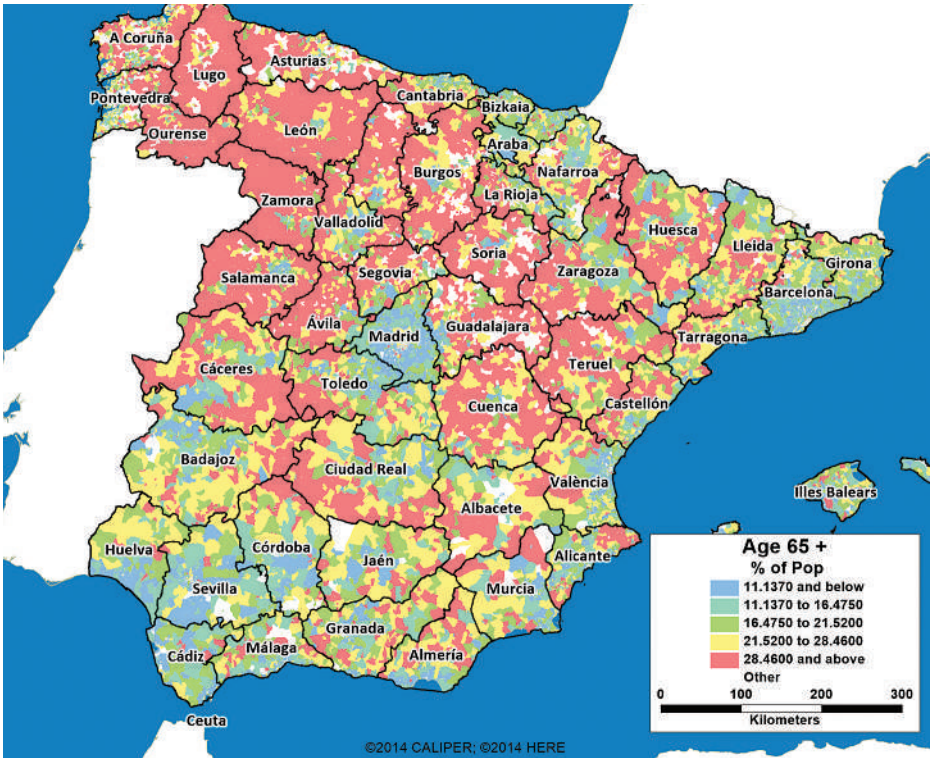


Share by country in 2050 of the total number of dementia cases in the EU

Future functions

A variety of basic spatial functions need to be integrated into standard health information systems to begin the trend to greater spatial literacy in the health sector. These include fundamental geocoding across a variety of healthcare environments; the capacity to geocode (both automatically and selectively) patient records within health information environments; the capacity to import and work with geocoded datasets, including those produced using GPS collection systems; the geocoding of information feeds from and between different service providers; and the spatial relations of the patient to nearby health service providers (acute, community, respite, rehabilitative and so on). If the information is not coded and transferred in a consistent spatial manner, acting in meaningful and timely ways on that data will be difficult if not close to impossible.

Basic spatial functions such as heat-mapping, travel-area or travel route analyses will become integral to both acute and



The number of people in Spain aged 65 or more. The capital, Madrid, is in the centre

non-acute healthcare systems management. Gradually, we can expect to see an extension in the spatial analytical methods available, from moving averages to autocorrelation and spatial regression techniques.

The risks

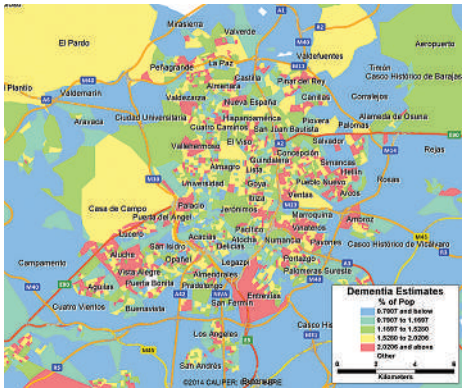
These will become increasingly automated but will still require the improvement of spatial literacy and skills in healthcare more generally. Head office functions can be managed by a trained spatial expert, but the huge variety of field staff in healthcare will need to be trained and herein lies a risk. Health information systems history is replete with the negative consequences of new systems being introduced too quickly or with insufficient training and integration. Patient safety and systemic failure are major considerations for such introductions but the inevitability of this technology means that these issues need to be addressed sooner rather than later.

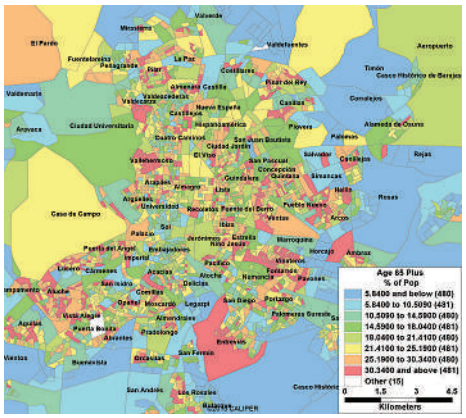
Emerging technologies such as mobile monitoring devices will produce increasing volumes of real-time health status data. The conventional 2D map will soon be a redundant format for engagement with this multi-dimensional data because it is both too static and it does not maximise the use of visual techniques already available. These emerging data types will be coded for very fine gradations of location and time across a wide range of variable types including basic client/patient data but also multiple physical sub-systems and soon, almost certainly, psychological data as well. These data volumes will only increase with rising chronic disease and ageing patterns globally.

Geovisualisation strategies offer a distinct range of benefits. Visualisation enables a much broader audience to engage with data in a summary form and to do so with various forms of visual representation including bar charts, line graphs, trend lines (including built-in regression analyses) and this expanding domain of methods. More than this though, it requires a commitment to spatially referenced and enabled data that has been lacking in the past but which permits another tranche of visual and analytical approaches to be employed. Dashboards make complex data and data representations much more accessible than has been the possible before. The capacity to link 'live' data from existing information systems, such as electronic medical records, pharmacy information and personal monitoring systems, is going to change this field very soon in significant ways, with spatial technology leading the way.

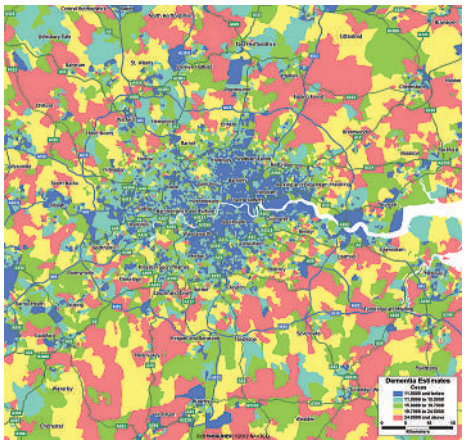
Spatially enabled dashboard systems will make the multi-scalar geography of health and social complexity much more accessible and manageable for a much larger audience. Population ageing and the dementias represent an enormous opportunity for the spatial science industry because they require the capability to deal with both innovation and dynamic complexity concurrently.

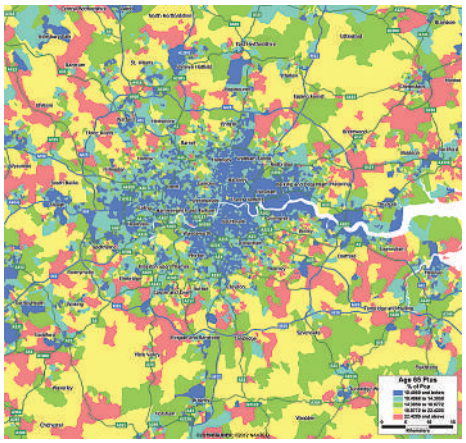
POPULATION AGEING AND THE DEMENTIAS REPRESENT AN ENORMOUS OPPORTUNITY BECAUSE THEY REQUIRE THE CAPABILITY TO DEAL WITH BOTH INNOVATION AND DYNAMIC COMPLEXITY





The number of people in Madrid, Spain, aged 65 or more and the locations of those people with dementia





The number of people in London, UK, aged 65 or more and the locations of those people with dementia

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