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POPULATION AGEING RESEARCH FROM A GEOGRAPHICAL PERSPECTIVE – METHODOLOGICAL APPROACH

ABSTRACT. In this paper population ageing studies are shown from a geographical perspective. Four main aspects of population ageing in a geographical approach are considered: theoretical aspects in connection with the demographic transition theory, the cognitive aspect leading to territorial distribution of the level and dynamics of ageing; the application aspect connected with socio-economic consequences of this phenomenon and the use of projections as well as the methodological aspect connected with its measurement and classification.

KEY WORDS: population ageing, geographical approach, methodology of ageing studies.

Population ageing, sometimes called demographic ageing, is now a worldwide phenomenon. Technically any population whose average age is rising can be said to be ageing, but usually the term is more specifically used with reference to an increase in the proportion of persons aged over 60 or 65. Such an increase has been taking place in the currently developed regions for well over a century and is now also increasingly evident in the countries of the less-developed regions.

The study of ageing has traditionally been wide ranging, involving social scientific and health, and social care professional disciplines. Most recently, the concern in ageing research for environment, space and place has become even more widespread. Two reasons may be suggested for this. First, this interest may be part of a wider emphasis on place as a central focus of investigation within a range of social science disciplines. Second, and more practically, academic interest in space and place has also been motivated by unprecedented demographic, social, fiscal and technological changes that have impacted simultaneously in

many countries. Indeed, these are well documented, and include rapidly ageing populations, changing kinship relationships and responsibilities, an ever broader range of health and social care and increasingly limited resources with which to provide it. Together they have radically altered, and broadened, both the ways and the places in which health and social care is provided (Andrews, Philips, 2005).

In an instrumental study on the ageing process, Golini (2006) provided a conceptual framework that explicitly describes the dynamics and consequences of such a process and is an excellent teaching aid for distinguishing between population ageing and individual ageing (Fig. 1). Additionally, a third module of ageing exists that has both macro and micro-level characteristics. Referred to

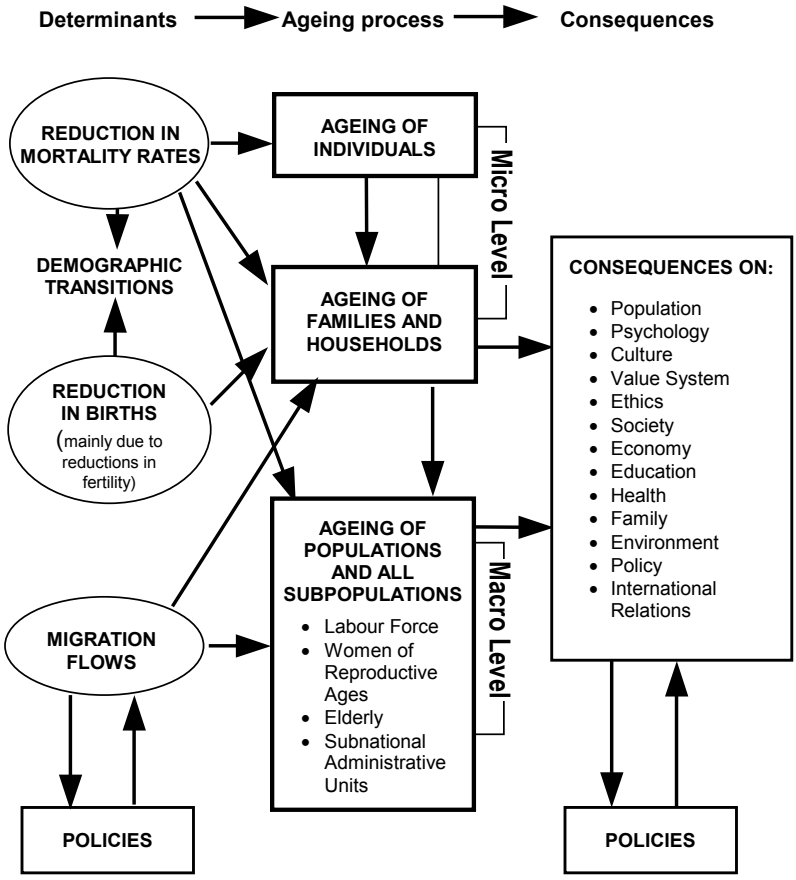

Fig. 1. A conceptual framework of the ageing process by A. Golini

Source: Golini, 2006: s. 7.

as the 'ageing of households', this module is considered a macro-level concept for the purpose of analysing the age-sex structure of households; and a micro-level concept when calculating the mean age of households. Simlarly, Frątczak (2002) presented a review of the theoretical concepts of population ageing investigations. She mentioned four basic research concepts of this phenomenon: ageing as a biological process where an individual is the object of the study; ageing of families and households; ageing of a population and ageing as a process, as an indicator of societal development (in connection with the Second Demographic Transition). In the case of population ageing the analysis is based on two research traditions: the assessment of changes in population age structure connected with the changes in the number and share of the elderly, as well as the analysis of changes in the subpopulation of the elderly (e.g. young-old aged 60–74 and oldest-old aged 75 years and over). According to Frątczak, ageing research may also concern selected determinants of ageing, such as changes in fertility, mortality or migrations, as well as the consequences of population ageing concerning the living standards and social security, intergenerational transfer, health care, housing market and so on.

The aim of the article is to draw attention to a geographical approach in population ageing studies and to present selected methodological issues from a spatial perspective. In this work, four main aspects of population ageing in a geographical approach are considered: theoretical aspects in connection with the demographic transition theory, the cognitive aspect leading to territorial distribution of the level and dynamics of ageing; the application aspect connected with socio-economic consequences of this phenomenon, and the use of projections as well as the methodological aspect connected with its measurement and classification (Fig. 2).

The significance of population ageing studies from a spatial perspective has frequently been stressed by geographers. For example, Maik (2005) counted the investigation of population structures among one of the four areas of modern population geography and the intensifying process of ageing, mentioned as one of the expressions of social hazards in Poland, connected with the process of political transition. Similarly, Eberhardt (2005) stated that the population ageing process should be a focus of the geographers' attention during the period of change in Poland, both in methodological and theoretical terms as well as in the applied aspect. Szatur-Jaworska (1998) stressed, that the investigation of population ageing requires a great deal of dynamic analysis, allowing determination of the pace of ageing as well as highlighting the factors which in particular periods of time, accelerate or decelerate the process. She also calls for more attention to be given to spatial investigation of the demographic ageing process, which may enable better regional and local policies to be developed for the elderly. The

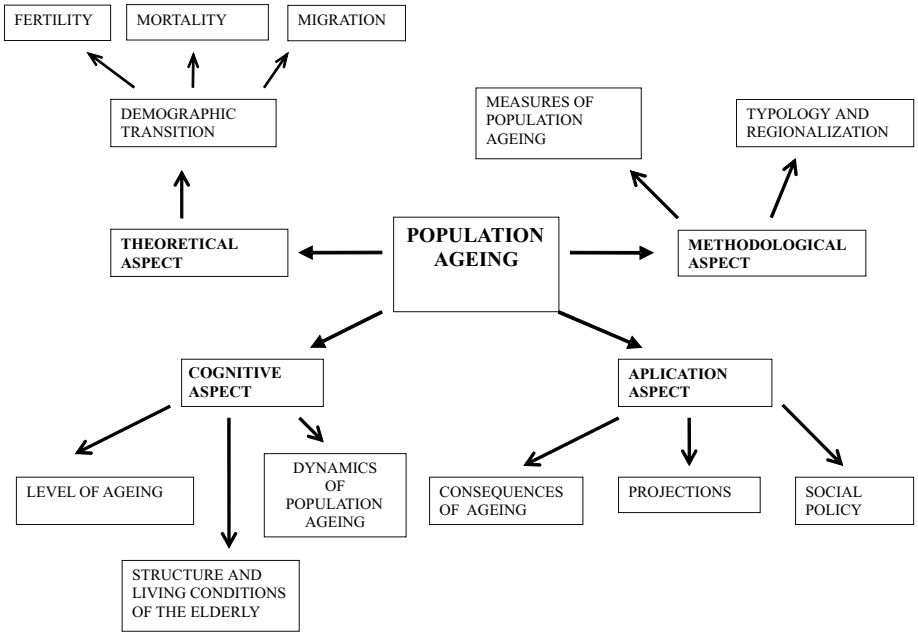

Fig. 2. The research of population ageing process from a geographical perspective

Source: Author's own study.

geographical approach, including spatial and territorial reference, is essential in the context of social policy (Kaczmarek, 2005).

Riley et al (1983) suggests some ways in which existing research might be extended to provide a more adequate understanding of the processes that determine where the elderly live and the consequences of these processes. Three major topics ought to be considered: 1) What are the demographic dynamics of change in the relative size of the elderly population in particular geographical areas? 2) How well do existing models of migration fit the elderly population? and 3) What are the consequences for the individuals and communities involved?

The geographical approach in population ageing research was also the subject of Andrews and Phillips' work (2005). They distinguished geographical gerontology which began to develop as a distinct and recognisable sub-discipline in the early 1980s (Warnes, 1982) focused predominantly on the distributive features of older population and services for the older population in space. The research has continued to consider demographic transitions and spatial distributions of older people within international and national contexts. Migration patterns of older people have continued to be an important focus and the specific

socio-spatial trend of 'retirement migration' has also been researched more expansively to consider migration across national borders (King et al., 2000). Spatial distributions of older populations have also been contextualised in terms of changes in family interactions and cohesiveness over time, and the increased spatial separation of family members (Lin and Rogerson, 1995; Greenwell and Bengston, 1997). Another research examines the spatial allocation and use of resources provided by both the private and public sectors, specifically for older people. In particular, the distribution of home-based social care facilities and residential accommodation on the national (Smith and Ford, 1998) and regional scales have been the main foci of this research. These perspectives however have been refined and updated, and the distribution of social care provision for older people has been contextualised in terms of market regulation (Bartlett and Phillips, 1996) and the wider political economy of health and social care (Joseph and Chalmers, 1999; Andrews and Phillips, 2000, 2002). Another strand of research is concerned with older persons' personal and evolving relationships with places and spaces. Much of this more recent research has considered the environmental constraints affecting older people's access to services (Joseph and Hallman, 1998; Stainer, 1999). Also investigated are the problems encountered by older people in both urban and rural living environments, and the consequences for local planning and wider social policy (Bartlett and Phillips, 1997a; Cloutier-Fisher and Joseph, 2000). More generally, environment and ageing are now key planning issues in many rapidly ageing countries, for example in the Asia-Pacific region, where interest extends to interactions with long-term care, housing and other areas of social policy and service provision (Phillips, 2000; Phillips and Chan, 2002). The planning aspects of urban expansion, urban renewal and redevelopment have also become key foci in such areas (Phillips and Yeh, 1999). Meanwhile, the concept of ageing-in-place has been analysed as a complex geographical process (Cutchin, 2003).

THEORETICAL ASPECT

The major underlying cause of demographic ageing is falling fertility (Coale, 1964; Leete and Alam, 1999; Kinsella and Phillips, 2005). Declining birth rates cause the proportion of the population at younger ages to contract and, concomitantly, the proportion at older ages to expand (i.e. 'ageing from the bottom'). Rising life expectancy to date has had little impact on the proportional strength of the elderly in most populations as mortality improvements have also benefited those at younger ages. The scope for further mortality decline from infancy up to late middle age, however, is becoming limited in the more developed nations. Therefore, all future improvements in mortality will be at older ages and

will become the major contributor to population ageing (i.e. 'ageing from the top'). In recent years the shift from fertility-dominated to mortality-dominated ageing has in fact occurred in a number of very low-fertility nations (e.g. France, Italy, Japan).

Global population ageing is a by-product of the 'demographic transition' in which both mortality and fertility decline from higher to lower levels (Mirkin, Weiberger 2001; Frątczak, 2002; Okólski, 1990, 2005; Reher, 2004). The initial phase of the process is usually a decline in infant and childhood mortality, as infectious and parasitic diseases are controlled. Fertility rates tend to remain high for one or two generations before the improved infant and childhood survivorship makes a significant impact on couples' reproductive decisions. Birth rates in fact sometimes even increase in the early part of this phase due to health improvements in females. This conjunction of lower infant and childhood mortality and continuing high fertility produces large birth cohorts and an expanding proportion of children relative to adults, resulting in an initially even younger population age structure (Lee, 1994). However, longer-term, as birth rates fall and health levels further improve through social, medical and public health advances, a demographically ageing population emerges.

The differences in the timing of demographic transition influence the geographical distribution of the elderly. Some resarchers (Van de Kaa, 1987; Coleman, 2002) distinguished a Second Demographic Transition, in which the total fertility rate falls well below replacement level and is connected with the shifts in cultural and social norms and attitudes (a decline in marriage rates, an increase in the mean age of marriage and childbearing, a substantial rise in divorce rates, postponing of births, and an increase in the number of abortions). Second Demographic transition is characteristic for practically all industrialized countries. In the less developed regions, the fertility decline started later and has proceeded faster than in the more developed regions. A rapid decline in fertility started in western European countries in the 1960s, after the baby boom, while in Central and Eastern Europe it occurred after the beginning of political and economic transformation in the 1990s. In Poland, the political and socio-economic transformation posed a challenge to Polish population geographers. The introduction of the free market economy, the deteriorating situation on the labour market resulting in an increase in unemployment, generated unprecedented demographic changes. A deep fall in the fertility rate, a decrease in spatial mobility as well as a decline in population dynamics, influenced the population age structure by contributed to rapid population ageing (Kotowska, 1999). Thus, the theory of second demographic transition requires the intensification of studies on population migrations and more detailed analysis on the changes in population age structures.

The demographic transition is frequently accompanied by ageing transition (Golini, 1999; Dyson, 2001; Rowland, 2003) as well as epidemiological transition (Andrews and Philips 2005; Fig. 3). Age transition is the effect of demographic transition on age structure (Tegenu, 2003). The start of population growth during the period of demographic transition brings about a transformation of the age structure of the population. In terms of the effects of the demographic transition on population age structures, one can distinguish three distinct stages. During the

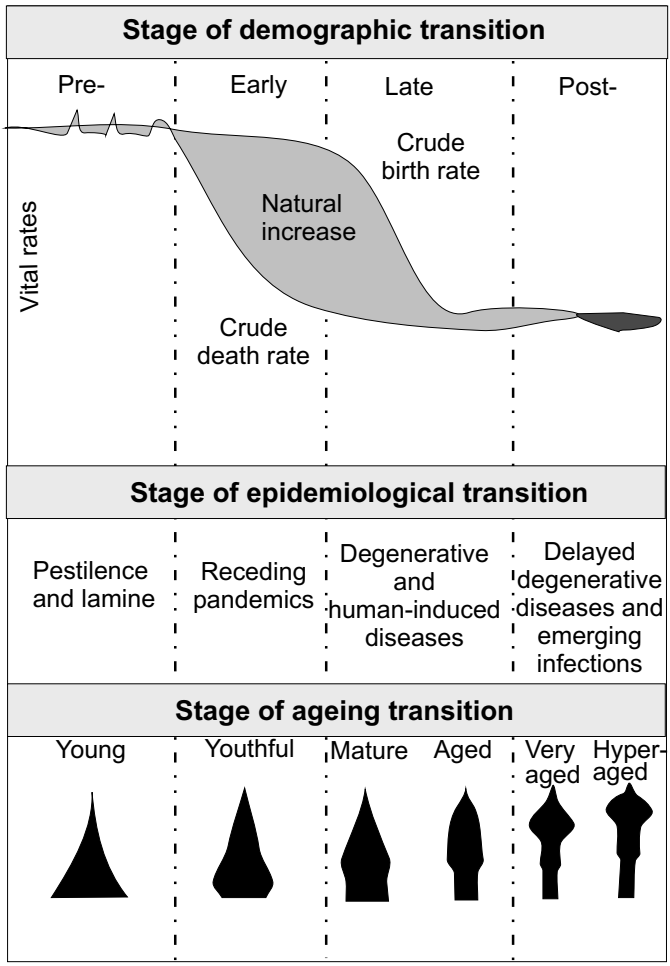

Fig. 3. The stages of demographic, epidemiological and ageing transition

Source: Andrews, G.J., Phillips, D.R., 2005: *Ageing and Place. Perspectives, Policy, Practice*, London, New York: Routledge, p. 48.

first, there is a rejuvenation of the age distribution as the proportion of children increases. During the second, triggered by fertility reductions, the proportion of children begins to decline while the proportion of adults and older persons rise. In this phase adults of working age constitute a significantly larger proportion of the total population than during the first stage of the transition, so that the number of adults of working age per dependent (that is, children and older persons) increases for a certain period until it reaches a maximum. During that period, a population is optimally placed to benefit from economically productive investment because its levels of economic dependency are low and there are relatively more potential workers to support persons in the non-productive ages (children and the older population). During the third stage, reached usually after lengthy periods of fertility and mortality decline, the proportions of both children

Table. 1. Population characterisitcs during demographic transition

Ratio	Phase 1 (*Pre-transition)*	Phase 2 (*Mid-transition)*	Phase 3 (*Post transition)*	Phase 4 (*Future declining)*[1]
Birth rates (‰)	50.0	45.7	12.9	9.8
Death rates (‰)	50.0	15.7	12.9	14.8
Natural increase (‰)	0.0	30.0	0.0	-5.0
Age structure (%)				
0–14	36.2	45.4	19.2	15.6
15–64	60.9	52.0	62.3	52.7
65+	2.9	2.6	18.5	31.7
Total	100.0	100.0	100.0	100.0
Dependency ratios				
Children[2]	59.0	87.0	31.0	29.6
Elderly[3]	5.0	5.0	30.0	60.0
Total	64.0	92.0	61.0	89.6
Life expectancy (women)				
At birth	20.0	50.0	75.0	85.0
At the age of 5	36.6	55.9	71.4	80.3
At the age of 65	7.5	11.9	15.7	22.2

[1)] Data from the last column are calculated for Italy (projections for the years 2025–2050) while data from remaining columns are taken from demographic models; [2)] Dependency ratio of children (0-14/15-64*100), [3)] Dependency ratio of the elderly (65+/15-64*100)

Source: Rowland, D. T. 2003: Demographic Methods and Concepts, New York: Oxford University Press.

and adults of working age decline and only the proportion of older persons rises. Countries seem to be evolving in a general similar direction towards ageing over the long term, except with differences in time and space as well as various phases of population momentum (Table 1).

The age transition concept (Tegenu, 2003) thus views population growth both as a burden or a gift depending on the life cycle stages and phases of the age transition. The child phase, for instance, is considered as a demographic burden, while the young adult phase is considered as a dynamic period of socio-economic transformation. The middle age phase is considered as a demographic gift because of boom in investment demand, raise labour inputs per person, more private saving, more public savings, bigger tax revenue, and fast GDP per capita growth. During the old age phase there is severe economic and social problems, social security, costly public services, and labour shortages require automation & immigration.

The scheme of age transition requires construction of theories and models at least at two levels. The first refers to a concept that explains the demographic dynamics (or the nature and determinants) of the age structural transition. This portion of the age transition schema explains the process and demographic

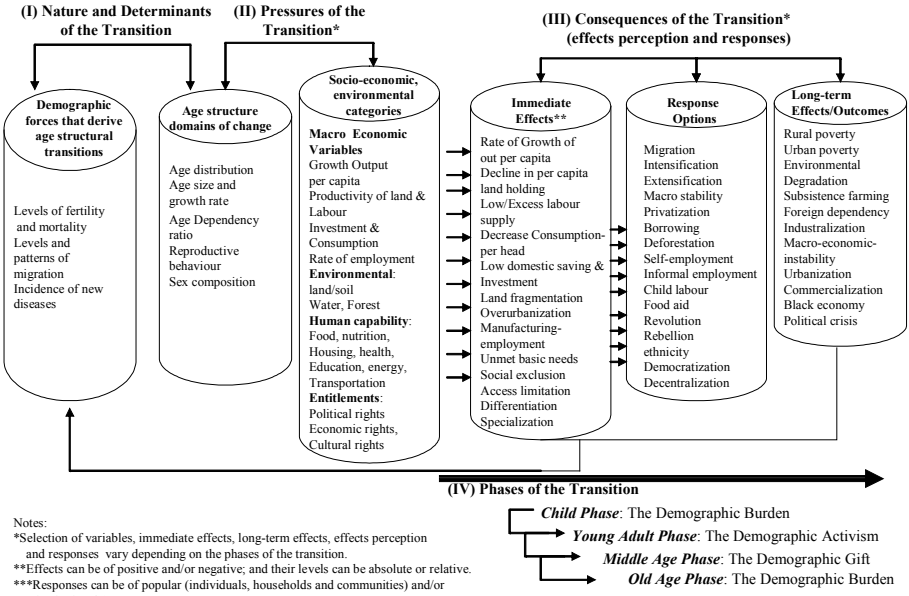

Fig. 4. The schema of age transition: integral parts and mode of linkages

Source: Tegenu, T. 2003: Socio-economic and Environmental Effects of Age Transition in Ethiopia, 1950–2000, Institute for Future Studies, Stockholm. Paper presented at the First International Conference on the Ethiopian Economy, Addis Abeba, January 3–5, 2003, p. 7.

effects of population momentum and waves created initially as a result of rapid decline in mortality, and later followed by a decline in fertility. The second level is a construction of a model that can be used to analyze the particular phase of the age transition or the subject of empirical inquiry. It refers to the conceptualization of development related to economic growth, the environment, human capability and entitlement conditions (Fig. 4).

According to the latest UN report (2005), fertility change was an important contributor to the change in the age distribution of both more developed and less developed regions in the past and is expected to continue having an important role in the less developed regions in the future. That is, much of the expected future ageing of today's population is already inscribed in its age distribution which itself is the result of the unprecedented and historical unique transition from high mortality and fertility to low levels of both.

COGNITIVE ASPECT

Population ageing studies may be of a static character, whereby the level of ageing in a given area or at a specified moment in time is determined, as well as of a dynamic nature in determining the changes in age structure. The spatial distribution of the population ageing phenomenon creates new research areas for geographers despite their methodological problems. Jagielski (1977) indicated difficulties with ageing studies on account of a mix of population in different age groups. Nevertheless, the author confirmed existing spatial regularities and distinguished areas with younger and older age structures in relation to different socio-economic factors. Furthermore, the author recognised population age structure deformations in spatial patterns, particularly among urban and rural areas, as well as in emigration and immigration regions.

The authors of the UN report on population ageing throughout the world (United Nations, 2002), indicated an expected a leveling of differences in population age structures, resulting from the tendency for fertility rates to level out, because in less developed countries a decline in births occurs later than in well developed ones, albeit it at a more rapid pace. In regional patterns, the highest level of ageing is represented by well developed countries while the highest dynamics is recorded in developing countries. In contrast with the slow process of population ageing, experienced in the past by the majority of countries in the more developed regions, the ageing process in most of the less developed regions is taking place over a much shorter period of time, and it is with relatively larger population bases. Therefore, less developed countries not only have fewer resources for adjusting to the socio-economic consequences but also relatively less time to develop appropriate policy responses. The report also shows the

ageing of the elderly subpopulation, with the fastest growing sector being the 'oldest-old' (aged 85 and over). It creates problems in terms of inter-generational support as the number of the 'oldest-old' per the number of persons who could theoretically be their children is increasing.

The study of population ageing may be conducted for various regional patterns. In addition, more and more significance is being attached to microscale investigation, (i.e. on the level of towns and communes). In Poland, the high dynamics of ageing can be observed in urban areas while a high level of ageing has been recorded in more peripheral areas, located far from important industrial and service centres (Podlasie and Sudety regions), as well as in post-industrial areas (Upper Silesia). A new element in the spatial aspect of population issues in Poland is the deceleration of ageing in suburban areas as a result of population immigration from core cities.

M. Riley et al (1983) pointed to changes in redistribution of the elderly, particularly shifts from the metropolitan core to suburban areas, small towns and non-metropolitan places. In Poland, according to shifts in population age structures in urban-rural dimensions, three zones may be distinguished. Local poles of ageing increase, represent metropolitan cores surrounded by suburban areas with relatively younger population age structures, while the peripheral rural areas also show a high level of ageing. The relative rejuvenation (or rather decelerated ageing) is proceeding towards suburban areas. In the years before the socio-economic transition started in Poland, urban areas recorded lower level of ageing than rural places, mainly as a result of intensive migration into the towns connected with the process of industrialization. After 1989, as a consequence of difficulties on a labour market, the level of migration from rural to urban areas declined and in towns the level of fertility dropped significantly. Along with the economic stabilisation, the opposite migration trend occurred and urban areas recorded a negative migration balance in relation to rural areas. The main regions of population inflow became areas located around larger towns on account of the development of family housing and the better living conditions outside metropolitan core areas.

APPLICATION ASPECT

The shift in age structure associated with population ageing has a profound impact on a broad range of economic, political and social conditions both at national or regional level. For example, concerns are growing about the long-term viability of intergenerational social support systems, which are crucial for the well-being of both the older and younger generations. The rising share of elderly people in the total population would exert pressure on government budgets as the demand

for health services and social welfare increases. The changing age structure would also result in a shift in overall consumption and saving patterns with a long-term impact on investment and growth. Increasing migration due to adjustments in regional and international labour markets in response to rapid ageing would have implications on domestic labour markets, particularly on supply and productivity of labour. Governments would be increasingly under pressure not only for devising innovative mechanisms to deal with issues arising from an ageing population but also for undertaking market reforms and policy coordination to ensure long-term viability of social welfare programs, while minimizing the negative effects on the economy.

In recent years, there has been increasing recognition of the importance of viewing people's health and well-being, and also their social and economic activities, in a life course perspective rather than compartmentalising 'the elderly' into a separate category (United Nations, 2004). This is now widely adopted by more enlightened policies which view ageing as part of the life course and emphasise the inter-generational relations that are crucial at the family and societal levels. For future policies and research, this perspective will no doubt become increasingly important. The socio-spatial variations in health and development over people's life courses will be extremely important to the need for differential levels of social support, formal and informal.

The WHO has developed an associated policy of active ageing, which it sees as 'the process of optimising opportunities for health, participation and security in order to enhance the quality of life as people age' (WHO, 2002). The term 'active' refers to continued participation in social, economic, cultural, spiritual and civic affairs, not just the ability to participate in work. Older people who retire can be just as active as many others and can contribute to families and communities. Many feel that active ageing has a cumulative effect and extends healthy life expectancy, providing double benefits to individuals and society. Furthermore, people with disabilities and handicaps are also encouraged in the active ageing framework to participate as much as they wish or can.

A related concept is successful ageing, which is related to the broad issues of coping and adaptation in later life (Rowe and Kahn, 1998). There are growing numbers of older persons who do not exhibit chronic health problems and declining cognitive skills that many have previously assumed are almost an inevitable part of the ageing process. Successful ageing can be thought of partly as successful psychological adjustment to ageing and as maximising desired outcomes and minimising undesired ones such as losses. It has been explained in part as a process of selective optimisation with compensation to manage one's life and has been conceptualised as a hierarchy, consisting of three tasks shown in Figure 5. There is discussion as to how those who age successfully differ from others and

also the extent to which external factors have a role in the process. Nevertheless, the concept clearly has many implications for designing policies and interventions that can help set the scene for successful ageing and minimise factors that can inhibit it. That successful ageing varies spatially and socially is almost certain, but little systematic, comparative research has been conducted, so this is a major area for future studies (ageing and place).

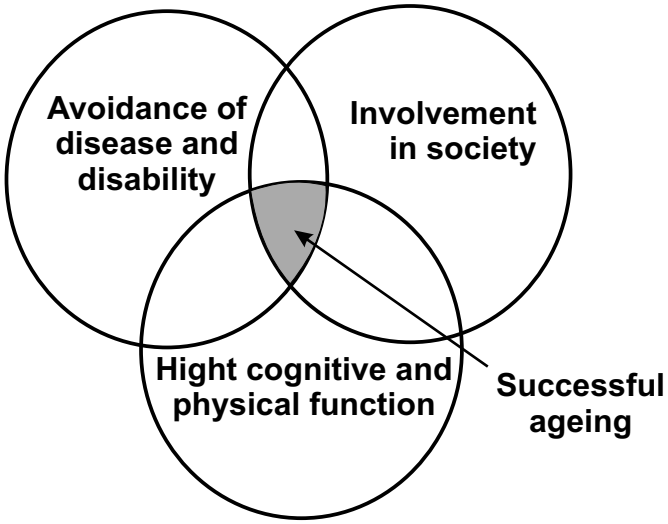

Fig. 5. Successful ageing

Source: Andrews, G.J., Phillips, D.R. 2005: *Ageing and Place. Perspectives, Policy, Practice*, London, New York: Routledge, p. 60.

American geographers (Plane, 2004), indicated an increase in the significance of the practical function of geographical population research, for the needs of local business, territorial administration and the public sector in the form of applied population geography. It is favoured by the development of a data retrieval system and geographical information systems. The formation of local government structures also directed the attention of Polish geographer's attention to local systems and small areas analysis (Jagielski, 1995; Grochowski, Kowalczyk, 1999; Dehnel, 2003; Parysek, Stryjakiewicz, 2004). According to Parysek (1999, 2004), the practical function of geographical research on a micro- and mezoscale, is connected with the realization of local government demand, concerning the diagnosis of the state of a commune in its socio-economic and spatial structure, in order to determine and satisfy its social needs, to develop

relations with other administrative units or to work out a strategy for its development.

In modern societies, it is crucially important to make demographic projections for the needs of spatial planning, regional or population policy. The projected data regarding population numbers or population structures by gender, age and territorial distribution is necessary, for calculating future labour resources, distribution of investments, planning of housing construction, transport, education, health care, social care and other services. In the case of predicting the elderly population for 50–60 years ahead the task is made easier, because this population had already been born and the only methodological problem is calculating survival rates. However, if we want to predict the structure of this population and its relation to children or working age groups, we have to make detailed population projections by age and gender. Additionally, in spatial layout, the impediment is to set reliable fertility and mortality rates on account of small statistical populations.

METHODOLOGICAL ASPECT

There are several techniques for measuring the age of populations. One of the indicators of population aging are mere head-count ratios (HCR), that is, they simply relate the number of individuals in large age categories. In this case, declines in the proportion of youth or increases in the proportion of older persons lead to population ageing, and vice versa. One problem with these measures is that they sometimes convey ambiguous information regarding the changing age composition of the population. In the United States, for example, the maturation of the Baby Boom cohort is currently raising the median age of the population, with little or no commensurate increase in the proportion of the population over age 65. Head-count ratios fail to take into account the age distribution within these large categories, in particular among the elderly. When the fertility and mortality trends responsible for population ageing have been fairly regular over time, the population growth is positively correlated with age (i.e., the oldest age groups are growing fastest). This implies that if the proportion of the population over age 65 is increasing, within that 65-and-over population the proportion over, say, age 80 is also increasing. As health, financial situation, and consumption patterns may vary greatly between 65 year-olds and 80 year-olds, simple ratios conceal important heterogeneity in the elderly population. Increasingly, attention is paid to the 'oldest olds' (typically age 80 and over). A long-time subject of curiosity, the number of centenarians is growing even faster. Estimated at 180,000 worldwide in 2000, it could reach 1 million by 2030 (United Nations, 2002). Also Cyrus Chu (1997) pointed out that the head-count-ratio is completely insensitive

to the information within the right tail of age distribution. The head-count-ratio cannot reveal the distance between particular groups of the elderly and the critical age. Specifically, a 15% head-count-ratio (over 65) may correspond to either a population with 15% of most people in the range 65–69 or a population with 15% mostly in the range 75–79. Moreover, the head-count ratio is also insensitive to the relative proportions of various age groups among the old, and any change in the age density within the right tail cannot affect the head-count ageing index. Cyrus Chu proposed alternative ageing indexes which meet both monotonicity axiom (an increase in age of a person older than the critical age must increase the ageing index) and transfer axiom (a pure transfer of age from a person older than the critical age to anyone younger must reduce the ageing index).

$$I_\alpha = \frac{1}{\omega - z} \sum_{p_j = p_z}^{p_\omega} (j - z)^{\alpha - 1} * p_j \quad \text{for } \alpha = 1,2,3$$

where: I_α – ageing index
p_j – the proportion of people in the age interval j
z – critical age (i.e. 65)
ω – the upper bound of the oldest age interval.

For α=1, the given formulae represents the conventional head-count ratio, for α=2, the ageing index is a weighted proportion of the old, which weights the proportion older than the critical age z by the difference between and their corresponding ages; for α=3, the ageing index is a similar weighted sum except that more weight is placed on people who are particularly aged (the oldest-old). Figure 6 shows the level of ageing in towns and communities in Poland according to alternative ageing index by Cyrus Chu.

The second class of indicators for population ageing is the group of statistical measures of location (median, mean and modal ages of population). The median age – the age at which exactly half the population is older and another half is younger – is perhaps the most widely used indicator. Because it is more sensitive to changes at the right-hand tail of the age distribution (i.e., the oldest old ages), the mean age of population might in fact be preferred to the median age to study the dynamics of population ageing. increases in either the mean or median age correspond to an ageing of the population, and vice versa.

Since population ageing refers to changes in the entire age distribution, any single indicator might appear insufficient to measure it. The age distribution of population is often very irregular, reflecting the scars of the past events (wars, depression etc.), and it cannot be described just by one number without significant loss of information. Were the age distribution to change in a very irregular fashion over the age range, for instance, much information would be lost by

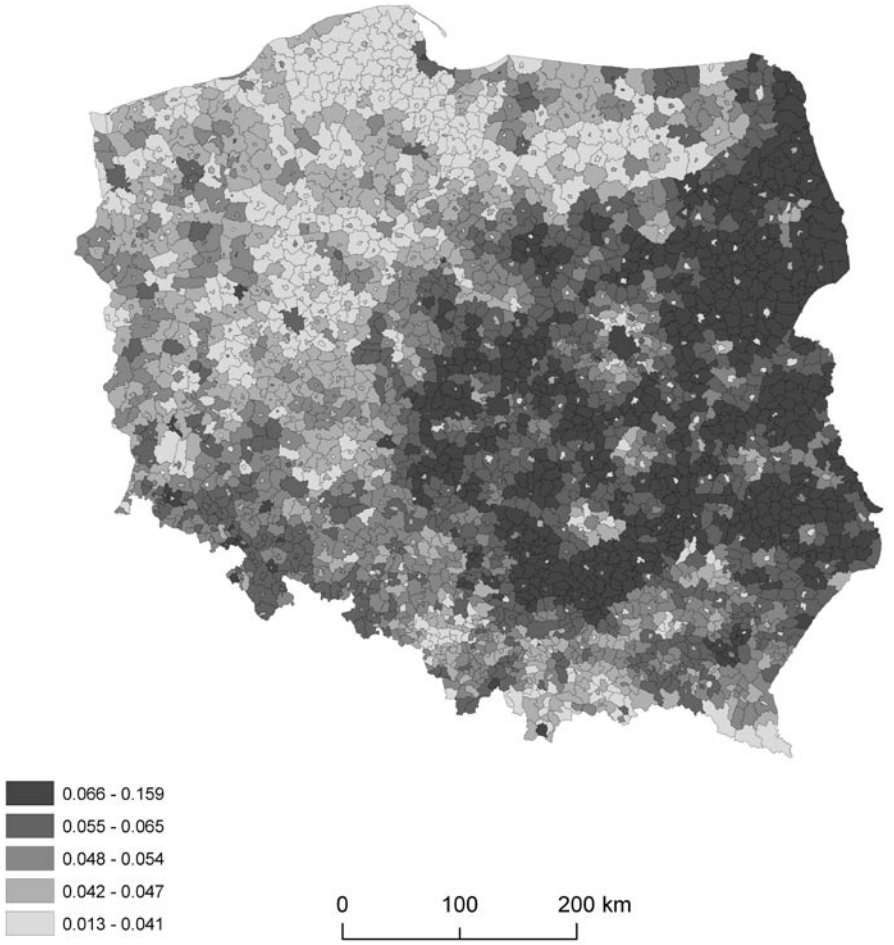

Fig. 6. The alternative ageing index in Poland in 2005

Source: Author's own study.

a single-index summary. Therefore, perhaps the most adequate approach to study population ageing is to explore the age distribution through a set of percentiles.

The measurements of population ageing dynamics, despite the changes in the percentages of youth or elderly, show a general picture of ageing trends and do not take into account changes in middle age groups such as working age groups. A particular solution is the index of changes in the age structure, calculated as the differences between the youth and the elderly and also the mobile and immobile working age population, comprising the whole age structure (Kurek, 2003).

In typological procedures of population age structures, researchers used the table method of plus/minus signs, and the Ossan triangle or typographs based on the deviations from an average or on a system of coordinates with 3 or 4 parameters. Nevertheless, the possibility of using the full number of parameters is strictly limited, because with the use of four parameters we may obtain 16 types which are difficult to analyse. The answer to this problem could be taxonomic Ward's or the k-means method, where more variables can be accepted, for example, 5-year age intervals. The methodological problem arising from this classification is to rank the distinguished types from relatively older to the young, because as a result of the taxonomic procedure we obtain groups of similar objects on account of population age structure. Also, we can use additional calculations, counting ageing indexes for distinguished groups and classfiying them in this way.

The following research procedure is the regionalization of population ageing phenomenon. In population geography literature there were relatively few attempts at creating demographic regions, comprising different population variables. This is because of the difficulties involved in distinguishing such regions which should be characterized by spatial cohesion. In addition, and related to the high dynamics of population phenomena, is the significant problem of the lack of stability of demographic regions, over longer periods of time as well as the individuality of urban areas, which hinder the recognition of demographically homogenous areas (Jagielski, 1977).

During the period of socio-economic transformation, a decline in an interest in population regional research occurred, probably on account of rapid demographic changes, that made it impossible to determine durable geographical range borders for the regions. Nevertheless, it seems that these studies should be carried out taking into account both the level and dynamics of ageing as well as ageing projections. Also J. Z. Holzer (2003), highlighted the necessity of developing methods enabling comparable studies in demographic regions. He stated that, conducting parallel analysis in various spatial systems increases the possibilities, of synthetic assessment of existing variations in population processes and structures.

The regionalization of population ageing is an extremely difficult task on account of diversity of age structures in rural and urban areas. Furthermore, population habitation of remote areas can be characterized by similar age structures. The next difficulty in classifying this phenomenon in modern societies, is the fact that population ageing is a complex and widespread process and rejuvenation practically does not exist. One of the solutions could be distinguishing population ageing regions within predetermined types of age structures, based on the criteria of spatial density.

Existing spatial disparities in the population ageing phenomenon and its rapid dynamics in modern societies have created new research areas for socio-economic geographers. Apart from the theoretical aspect, consisting of placing population ageing process within the general model of demographic transition, the investigations of this phenomenon should focus on recognizing its spatial regularities on a local scale (in urban-semiurban-rural systems) as well as making them available to local governments in spatial planning of the social infrastructure. Moreover, a significant aspect of ageing study is action aiming at classifying this phenomenon in terms of typological and regionalization procedures, taking into account modern demographic changes.

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