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Development of a Deprivation Index and its relation to premature mortality due to diseases of the circulatory system in Hungary, 1998–2004

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ABSTRACT

An association between health and socio-economic status is well known. Based on international and national studies, the aims of this study were to develop a multi-dimensional index at the municipality level, to provide information about socio-economic deprivation in Hungary and to investigate the association between socio-economic status and the spatial distribution of premature mortality due to diseases of the circulatory system. Seven municipality level socio-economic indicators were used from the National Information System of Spatial Development (income, low qualification, unemployment, one-parent families, large families, density of housing and car ownership). After normalisation and standardisation, indicator weights were evaluated using factor analysis. A risk analysis study was conducted using the Rapid Inquiry Facility software to evaluate the association between deprivation and the spatial distribution of premature mortality due to diseases of the circulatory system for the years 1998–2004. Areas of significantly high deprivation were identified in the northeastern, eastern and southwestern parts of Hungary. A statistically significant association was found between premature cardiovascular mortality and deprivation status in both genders. The Deprivation Index is the first composite index at the municipality level in Hungary and includes key factors that affect socio-economic status. The identified association highlighted the fact that inequalities in socio-economic status may reflect the spatial distribution of health status in a population. The results can be used to inform prevention strategies and help plan local health promotion programs aimed at reducing health inequalities.

Introduction

Deprivation, although not equivalent to income, can be considered a form of 'relative poverty'. It is typically multi-dimensional and dependent upon multiple interacting factors (Bokor, 1985: pp. 19–25, 1987: pp. 253–269). Since the 1960s, numerous studies have attempted to define an effective way to measure and quantify deprivation. Deprivation indices use combined and quantified variables to represent deprivation, and these can be indicators of material wealth, social factors or a combination of the two. Recent research has made considerable progress in evaluating the relationship between deprivation and health status.

Inequalities in health status across regions in Europe have been a significant area of research. Indeed, the Treaty of Rome aimed to reduce disparities in development across the European Union (EU). A key policy of the EU is to reduce any disparities across the union states and ensure a healthy environment at the community, member state and regional levels. Reducing poverty, providing effective health care for citizens and improving quality of life are all long-term development goals aimed to ensure social, economic and regional cohesion across the EU (European Parlaiment, 2008). Upon becoming EU states, however, many Eastern European countries have experienced a growth in regional problems, including disparities in health inequality (Horváth, 2004).

Understanding inequalities in health, their contributing factors and their associations are essential to reducing such disparities. Several European epidemiologic and public health studies have shown clear relationships among low income, deprivation, reduced life expectancy and increased mortality (Kawachi, Kennedy, & Wilkinson, 1999; Lynch, Smith, Kaplan, & House, 2000; Mackenbach & Looman, 1997; Markowe et al., 1985; Marmot, Rose, Shipley, & Hamilton, 1978; Miller & Reissman, 1961; Titmuss, 1962; Townsend, 1987). In the mid 1980s, education level was determined to be a risk factor associated with mortality; a study in the UK reported a 50% increase in risk of mortality from

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myocardial infarction among the least educated males, even though the study group did not smoke or drink more alcohol (Markowe et al., 1985; Marmot et al., 1978). A study in Hungary in the late 1980s evaluated the relationship between deprivation and health status and showed that the prevalence of circulatory system diseases was more than 3.6 times higher amongst deprived populations in comparison with non-deprived populations. A number of studies of Hungarian populations revealed the inequalities of socio-economic and cultural status in the population (Bokor, 1985, 1987; Kapitány & Spéder, 2004: pp. 12, 17, 30, 96–104; Kopp, Skrabski, Székely, Stauder, & Williams, 2007; Kósa et al., 2007; Tóth, 2001: pp. 10–18; Spéder, 2002). The most deprived areas were identified in the formerly industrial areas of Hungary. These areas are now predominately rural with small villages and often have higher-than-average occupancy rates of Roma populations (Bokor, 1985: pp.173–180, 1987: pp.53–58; Kósa et al., 2007).

Premature cardiovascular mortality, the primary reason for cause-specific deaths in Hungary during the years 1998–2004, is a very important public health issue. Furthermore, the rate of premature mortality due to cardiovascular diseases in Hungary in both genders was three times higher than the rate across the EU (with members before May 2004) at the turn of the millennium (World Health Organization Regional Office for Europe, 2008).

Using available data, this study aims to develop a multi-dimensional index at the municipality level across Hungary. This index will provide a valuable resource for public health and epidemiological research, as well as public health planning and intervention programs at both national and local scales. Furthermore, this research attempts to evaluate the association between the developed Deprivation Index and the spatial distribution of premature mortality due to diseases of the circulatory system (ICD-10: I00-I99) in Hungary.

Methods

Deprivation Index

Socio-economic indicators for the Hungarian Deprivation Index were chosen from available data stored at the Regional Informational System of the Ministry of Local Government and Regional Development. Administratively, Hungary is divided into 19 counties, which together with the capital Budapest form 20 European regions at the third-level of Nomenclature of Territorial Units for Statistics (NUTS) regions. The counties are further subdivided into 174 sub-regions, and Budapest is its own sub-region. Since 1996, the counties and the City of Budapest have been grouped into 7 regions for statistical and development purposes, constituting NUTS level 2 units of Hungary. The 3152 smallest administrative areas or municipalities were formed from Local Administrative Units 2 (LAU2), formerly known as NUTS level 5, with a mean of 3253 inhabitants (European Communities, 2003). The data were

Table 1
Selected indicators for determining the Deprivation Index.

Indicator	Indicator used in previous index	Reference
Income (gross income serving as the basis for the personal income tax per person as a member of the permanent population)	Human Development Index Indices of Multiple Deprivation Low income scheme index Leaken Indicators	United Nations, 1990: pp. 12–13 Jordan, Roderick, & Martin, 2004; Noble et al., 2004 David Lloyd, Harris, & Clucas, 1995; Kondor, 1971 Council of The European Union, 2001; Hungarian Central Statistical Office, 2007, Wilkinson, 1992 Spéder, 2002; Kapitány & Spéder, 2004 Bokor, 1985, 1987
Low qualification (Proportion of the population with basic education and illiteracy in the total population older than 15 years)	Indices of Multiple Deprivation Leaken Indicators	Jordan et al., 2004; Noble et al., 2004 Council of The European Union, 2001; Hungarian Central Statistical Office, 2007 Tóth, 2001; Bokor, 1985, 1987
Unemployment (as a proportion of total population of productive age)	Jarman Deprivation Score Townsend Index Carstairs score Index of Local Deprivation SOCDEP Leaken Indicators	Jarman, 1983 Townsend, 1987 Carstairs & Morris, 1989; Morris & Carstairs, 1991 Office of the Deputy Prime Minister, 1998 Forrest & Gordon, 1993 Council of The European Union, 2001; Hungarian Central Statistical Office, 2007
One-parent families (single mothers with children, as a proportion of families)	Jarman Deprivation Score SOCDEP Index of Local Deprivation Leaken Indicators	Jarman, 1983 Forrest & Gordon, 1993 Office of the Deputy Prime Minister, 1998 Council of The European Union, 2001; Hungarian Central Statistical Office, 2007 Spéder, 2002; Kapitány & Spéder, 2004
Large families (Parents with three or more children, as a proportion of families)	Leaken Indicators	Council of The European Union, 2001; Hungarian Central Statistical Office, 2007 Tóth, 2001; Spéder, 2002; Kapitány & Spéder, 2004
Density of housing (persons per room)	Jarman Deprivation Score Townsend Index Carstairs score MATDEP Index of Local Deprivation Indices of Multiple Deprivation	Jarman, 1983 Townsend, 1987 Carstairs & Morris, 1989; Morris & Carstairs, 1991 Forrest & Gordon, 1993 Office of the Deputy Prime Minister, 1998 Jordan et al., 2004; Noble et al., 2004 Bokor, 1985, 1987
Car (Passenger cars per 100 inhabitants)	Townsend Index Carstairs score MATDEP	Townsend, 1987 Carstairs & Morris, 1989; Morris & Carstairs, 1991 Forrest & Gordon, 1993