Population Review
Volume 63, Number 2, 2024
Type: Article pp. 1-34

Capital and Cohesion: A new perspective on the analysis of mortality differentials

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Abstract

Social characteristics related to mortality, such as hierarchy or family structure, are generally represented as a unidimensional scale. This is inconsistent with much of sociological theory, which represents hierarchy as a multidimensional, or partially ordered, scale. We utilize Bourdieu's tripartite concept of Capital – Economic, Cultural and Social – to conceptualize social hierarchy and construct appropriate scales. We combine these with measures of Household Structure to investigate their relation to male and female aggregate mortality. Using data for Australian small statistical areas (SA2) from the census of 2011, we regressed male and female standardized mortality (SMR) on the scales for Capital and Household Structure, with controls for State/Territory, Remoteness, and Indigeneity of the SA2. We find that Economic and Cultural Capital significantly reduce mortality, while Social Capital has a smaller effect, significant only for males; Family Structure is at least as important as Capital in explaining levels of mortality; Geographic location, namely State/Territory and degree of Remoteness, are significant determinants of mortality risk and Indigenous areas are at a heavy disadvantage, even when we account for all other social and situational characteristics. We conclude that social space, as measured by scales of social hierarchy and family structure, is multidimensional. To understand fully why mortality is higher in some areas than in others, we need to bring together theory and data.

Keywords: Mortality; Bourdieu; Capital; Family Cohesion; Australia

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Introduction

A central principle of science is the expression of accumulated knowledge in law-like statements from which particular cases may be deduced. Among the social sciences, demography stands out for its ability to present such generalizations based on the careful analysis of reliable data. In the field of mortality studies, several such generalizations can be made: the familiar age pattern of mortality; higher male than female mortality and lower mortality where material resources are greater, or interpersonal relationships are stronger.

The specific realization of these generalizations will vary from one situation to another, and it is often in clarifying their specific operation under different conditions that we obtain insights and understanding of their mode of operation. Yet for all the comparative and complex regression analyses that have been undertaken, demographers have yet to explain most of the variation observed. The basis of the sex differential in mortality remains unclear (Luy, 2003; Cullen et al., 2016; Baum et al., 2021) while the classic (material) explanation for socio-economic differentials is inadequate, with the most part unexplained (Caselli et al., 2014).

One impediment to a greater understanding of mortality differentials is the simplicity of the conceptual framework, which often relies on a unidimensional representation of socioeconomic status (Elo, 2009). The lower mortality of the rich, healthy, and young is well known. Farr (see Whitehead, 2000) noted social inequalities in the risk of dying in the 19th century, and, at least since Antonovsky's (1967) seminal article, demographers have spent considerable effort documenting, at various levels of aggregation, this apparently obvious relationship. Nonetheless, the concept of social inequality, and in particular, the nature of the resources that give the wealthy their advantage and the relationship between these resources, have been relatively unexplored. Clearly, we need to move beyond intuitive, yet oversimplified, notions of what wealth, or social hierarchy, entails. We need to engage, systematically, with work in social theory to make clear our own basic assumptions as well as addressing the multidimensionality of inequality and power relations (Simandan, 2021). Here, we follow Bourdieu ([1979] 1984) in distinguishing three types of wealth-generating resources, or Capital, to gain a better understanding of the way access to resources conditions and affects the risk of dying.

On the one hand, these effects remain, even as standards of living increase, and all, or most, of the population comes to enjoy a necessary minimal standard of nutrition, public health, and medical technology. On the other, inequalities alone cannot explain all mortality differences between sections of the population. These, necessarily, reflect other components of the human condition, notably the quality of social relations and their emotional benefits (or disadvantages) (Durkheim, [1897], 1951; Strawbridge et al., 1997; Hummer et al., 1999; Booth et al., 2014). Family relations have been shown to be particularly important, including, at adult ages, marital status (Gove, 1973; Holt-Lunstad et al., 2010; Shor et al. 2012; Kravdal, 2017) and, at the aggregate level, family cohesion, as measured by the quality of intergenerational relations and the prevalence of marriage and of divorce (Anson 2010; Patterson, 2020).

In the second section of this study, we follow Bourdieu and conceptualize social inequality as a triple helix of access to Material, Cultural and Social Capital; the third section discusses the importance of family cohesion; the fourth, fifth and sixth sections apply these insights to the analysis of mortality differentials in 2075 small statistical areas in Australia. We round off with a discussion and some conclusions. In this way, we aim to identify what, beyond unidimensional socio-economic stratification, gives certain populations a mortality advantage over others.

Conceptualizing Social Inequality

The meaningful analysis of social differences in mortality is predicated on an appreciation of social stratification (social class) as the location of individuals or social groups in a graduated social space. The roads of social class analysis all lead back to Marx, though he himself never succeeded in defining classes operationally (Marx, [1894] 1962, Chapter LII). The focus of Marx's analysis is on class as an exploitative relationship (Marx, [1887] n.d., Ch. VII) and the consequent struggle over the distribution of the fruits of human labor. The challenge, in the ensuing "dialogue with the ghost of Marx" (Salomon, 1945: 596) has been to translate this relationship into a hierarchy of social statuses, or positions, within the social structure, while, incidentally, moving from a dynamic analysis of social change over time, to a synchronic analysis of social relationships at one given point of time. We shall touch on a few of the major landmarks on this journey, culminating in the tripartite division of Capital proposed by Bourdieu.

On Social Class, and Other Hierarchies

Over a century ago, Weber ([1921] 1946) proposed a tripartite ranking of individuals, based on their value in the labor market (human capital); the social standing, or prestige, of the social group to which they belonged (status, or Stände) and their degree of organization to achieve social goals (Party). Weber thus recognized that social stratification has many, interrelated but not identical, expressions. The English Registrar General, too, in his report for 1911, published a nominally unidimensional classification of occupations (Szreter, 1984; Carr-Hill and Pritchard, 1992). In practice, though, prestige considerations were no less important than economic ones in defining the scale. Other schema, based on type of occupation (Goldthorpe, 2007), social relations (Stewart et al., 1980), latent class analysis (Savage et al., 2013) or occupational prestige (Reiss et al., 1962) all lead to a similar ranking and to the same conflation of income, educational and (often) ethnic criteria in creating a simple scale.

Recognizing that there was more than one ranking criterion, Lenski (1954) suggested that individuals (and groups) could be ranked simultaneously on several dimensions, which, though strongly correlated, were not strictly congruent (crystalized). The implication was that social ranking was, in Guttman's terms, a partially ordered scale (Shye, 1978; Levy, 1998) in which positions may be at the same overall rank, but of a different social composition, and thus incomparable. Three individuals, one with low education and high income, one with high education and low income and one with a middling level of both may all have an equivalent score, yet their life chances are different, as are their lifestyles, and they are not socially equivalent. Wright ([1978] 1985), proposed an occupational triangle with three pure (Marxian) class types (bourgeoisie; proletariat, and petit bourgeoisie) at the nodes, with various "contradictory locations" in between. Over time, however, Wright moved towards what he termed a "pragmatic realism" (Wright, 2009: 101) in which Marxian and Weberian approaches complement, rather than compete with, each other (ibid).

Goldthorpe (2010), too, has called for a more nuanced approach to social inequality, one in which the landscape of social inequality, and its effects on individuals, are viewed in terms of the distribution of material, as well as less tangible, resources.

Social stratification, then, is multi-dimensional, and we are liable to lose important information if we simply project its different dimensions onto a single hierarchy, however close the correlation may be between them. At the same time, it is essential that we understand the meaning behind the various dimensions used to identify the social space. For example, the Weberian Stände have generally been interpreted as ethnic groups, categories that have been socially constructed within the context of the society in question. These represent socially meaningful distinctions, often with group differences on other dimensions, such as income, occupation, education, and so on. However, as we suggest below, we may do better by considering ethnicity not as a bundle of characteristics but rather as a mapping of locations in the social network.

Education, too, needs to be interpreted more carefully. While certification is often the key to social rewards, in particular steady employment and high income (Wright, 1978), it is much more than just a correlate of material welfare. Education creates socially meaningful membership categories, through ritual educational certification, and legitimates the social rights and meanings associated with these categories (Kamens, 1977). This legitimation grants its holders certain roles (prestige, rights and obligations) irrespective of their ability to realize the implied material potential in the labor market (Apodaca, 1998).

Bourdieu and the Three Types of Capital

One approach to encompassing multidimensionality is provided by Bourdieu (1984; 1986), in the form of an overarching logic based on a generalization of the Marxian concept of Capital. “Capital is accumulated labor . . . which, when appropriated on a private, i.e., exclusive, basis by agents or groups of agents, enables them to appropriate social energy in the form of reified or living labor” (Bourdieu, 1986: 241). In other words, capital is the cumulated product of past work that has taken on a substantive form and enables whoever controls it to further expropriate social energy, or the product of current human labor, either their own or that of someone else.

For Marx, capital was always economic capital, to be invested in industrial production. Bourdieu expanded this concept and identified three different, but interrelated, types of capital:

1. *Economic Capital* refers to material resources, including income and wealth, and comprises anything that can be directly translated into money. It thus represents an implicit hierarchy of people, families, and households according to their property rights in terms of the stocks of wealth they own and their flows of income.

2. *Cultural Capital* refers to individuals' personal access to socially relevant and valued knowledge. It is acquired through education and educational credentials, which create a social identity that grants rights and obligations with no further proof of competence required. Beyond formal education, the credential also identifies the person as someone who has acquired certain values that schools impart but do not certify: modes of behavior and social relationships, though these are also acquired in the family home. Unlike Economic Capital, however, Cultural Capital must be gained personally. It is transmitted, but not bequeathed, from one generation to the next. The signifier of Cultural Capital is, first and foremost, the educational credential, including the content of that education, or field of study, and who issued the

certificate. What is signified is socially valued knowledge, but there is a certain circularity here, as what is socially valued is determined by those who hold power.

3. *Social Capital* refers to the resources (Economic and Cultural Capital) accessible through an individual's social network relations. The network itself is built up over the lifetime, through school and university, the church, the neighborhood, the workplace, the army, active membership of a political party and many other institutions. Network membership is constantly revitalized through active participation in rituals and other common activities and provides access to resources held by other network members. The social network is divided into sections, or fuzzy clusters, and it is these that enable those who are socially advantaged to be mutually acquainted over the long term and to form coalitions that will further their accumulation of capital. Similarly, socially disadvantaged clusters will tend to reinforce the disadvantage of their members.

It is important to distinguish between Social Capital, as defined here, and the concepts developed, under the same name, by Putnam (2000) and Coleman (1988), which stem from very different sociological traditions (Siisiäinen, 2000; Tzanakis, 2013). Bourdieu's approach is Marxian: Capital belongs to individuals, something they can use to enhance their access to resources and to the products of their own and other peoples' labor. Social Capital is thus a defining element in social hierarchy because it provides access to resources. Putnam's approach stems from a tradition of pluralism: Social Capital as the characteristic of a community, providing solidarity, interpersonal trust and defusing hierarchy and conflict. To be able to operationalize these concepts, we need to distinguish clearly between these two homonymous approaches. We reserve the term Social Capital for the concept as defined by Bourdieu, and address issues of social solidarity, including issues of network density (Baum et al., 2021) separately, under the rubric of Family Cohesion.

Bourdieu thus breaks down, and widens, the concept of Capital beyond that of the strictly economic sphere. Social classes are groups of individuals who are similar in their level of economic resources (wealth and income), have similar Cultural Capital (formal and informal education, daily routines, child rearing patterns, leisure activities, and so on), and have similar Social Capital (networks of relationships, ethnic and religious affiliations, and other social connections all of which provide access to a common pool of resources). Capital is any resource that can be invested (used) to generate further Capital; and while, at the aggregate level, there is a tendency for the three to coincide, there will be various degrees of crystallization within specific aggregations.

Family Cohesion

The family is the “natural and fundamental” building block of society (United Nations, 1948), linking the individual and the population. As an institution, the family has withstood the transformations of the Reproductive Revolution (MacInnes and Perez, 2009) and the First Demographic Transition (Coale, 1989; Chesnais, 1992; Kirk, 1996), which brought major reductions in mortality and fertility and consequent changes in family structure and size. The family has also withstood the Second Demographic Transition with the restructuring of households and inter-household relationships (Lesthaeghe and van de Kaa, 1986; van de Kaa, 1987; Lesthaeghe and Neels, 2002; Lesthaeghe and Neidert, 2006; Thomson, 2014). These transitions were accompanied by the dissociation of household and workplace (Goldscheider, 2000), which has largely created the gendered roles that are being contested today. Thus, though family systems have

diversified, the family has proved resilient as the basic building block of social life (Zimmerman, 1980; Wasserman, 2020).

The restructuring of families and households, and the renegotiation of family and gender roles and inequalities, take place in different ways and at different speeds amongst different social groups. For example, the family or household can be a resource in the face of economic uncertainty (Fussell and Palloni, 2004), but can also be an impediment to the realization of gender equality (McDonald, 2000). Further, the interpersonal networks of those living alone may not necessarily be any smaller, or less dense, than the networks of those living in multi-person households (Buzar et al., 2005), but they will generally be qualitatively different. Thus, the pattern of change within families and households is likely to differ somewhat from the pattern of material change, producing an independent effect on the level of mortality.

There are several theoretical reasons to suggest a negative correlation between mortality and traditional family cohesion, net of economic welfare. Marriage does not represent merely the technicalities of living arrangements, in the sense of a more efficient use of material resources, or even of help and support in times of need. Even if formal marriage has undergone deinstitutionalization (Amato, 2004) in the sense that the normative proscriptions have grown weaker and there is a growth in legitimate alternatives (Bennett, 2017), long-term partnership has remained a basic building-block of social structure, integrating individuals into long-standing primary relationships, either with the marriage partner alone or with an immediate extended family (Kiernan 2004). Furthermore, as other types of interpersonal relationships are weakened through the casualization of work and increased migration, resulting in reduced employment, financial and health security (Therborn 1986; Tilly 1996; Gonos 1997, Kalleberg et al., 2000; McGovern et al., 2004), the couple-pair remains, for many people, almost the sole true primary relation in which they can define their whole self (Gove et al., 1990).

However, precisely under these circumstances, such companionate marriages must face the strain of inter-personal relationships alone, including the need to decide upon an appropriate pattern of dyadic interaction (Cherlin, 2004), and they depend for their efficacy on the foreseeable stability of the relationship. Yet, as divorce rates rise, this stability is not self-evident. Growing divorce rates create an anomic condition for those who are currently married (Durkheim, [1897] 1951), in that they undermine the permanency of the marital relationship. Thus, while the residential couple is ever more required to act as the major locus of social integration, performing a role previously shared with other social institutions, it is compromised in its ability to do so precisely by the breakdown of those institutions and by the fluidity of coupledom itself. If embodiment in a primary relationship, which is both binding and socially determined, is a human necessity, then the deinstitutionalization of the family, in the absence of alternative institutions of social integration and control, is liable to undermine health and survival.

The critical concept is that of traditional family organization: the extent to which life is organized around stable, multi-person living arrangements, usually in the form of family households. Traditional family societies are typified by a high rate of marriage, near universal childbearing, and a low rate of divorce, features that can also be used to gauge family cohesion. Where such family cohesion has been replaced by a more individualized and less stable pattern of inter-personal relationships, mortality rates are liable to be higher than in other populations with a similar material standard of living (Anson, 2010; Zueras et al., 2020). Mortality is lower in populations with strong moral support, in the form of social networks through marriage (Gove, 1973; Manzoli et al., 2007; Rendall et al., 2010) and the break-up of such networks,

through divorce or widowhood, can lead to an increase in mortality risks (Lusyne et al., 2001; Manor and Eisenbach, 2003).

Application to Australian mortality

Study Context

The land mass of Australia is almost the same as that of the contiguous United States (7.69 km2 and 8.08 km2 respectively), but the population (25 million in 2019) is less than one tenth of the USA. The country is divided into six States (New South Wales, Queensland, South Australia, Tasmania, Victoria, and Western Australia) and two Territories (Australian Capital Territory and the Northern Territory). The population is both unequally distributed among the States/Territories and highly concentrated in a few coastal cities, with most of the land mass being extremely sparsely populated. More than three-quarters of the population live in the eastern States of New South Wales, Victoria, and Queensland, but only one per cent live in the Northern Territory. Moreover, 86 per cent live in urban areas (Australian Bureau of Statistics, 2020a).

The States/Territories differ markedly in climate, vegetation, geology, and natural resources, which influence industrial and economic activity as well as disease patterns. Australia has high average income and wealth, recently ranking sixth (of 41) in the OECD Better Life Index (OECD, 2020); but social inequality is relatively high, with Australia ranking 24th (of 35) on equality (ibid). Health care is jointly administered by Federal and State/Territory, including local government, and non-government organizations (Australian Government, Department of Health, 2020) with States/Territories being responsible for public hospitals, preventive services and the funding and management of community health services (Parliament of Australia, 2020). While health services in the major Australian cities are among the best in the world, the remote and sparsely populated areas present considerable challenges for health service delivery. Thus, while life expectancy at the national level is high by international standards, 85.3 years for females, 81.2 years for males in 2020-2022, there is considerable variation between the different States and Territories. For males, e0 was only 76.2 in the Northern Territory and over 80 elsewhere, reaching 82.2 in the Australian Capital Territory; for females it was 80.7 in the Northern Territory, over 84 elsewhere and was 86.0 in the Australian Capital Territory (Australian Bureau of Statistics, 2020-2022).

The Indigenous population is significantly disadvantaged with an eight-year deficit in life expectancy compared with the non-Indigenous population (Australian Government, 2020). Comprising the Aboriginal and Torres Strait Islander peoples, with many different language groups, the Indigenous population (which is self-identified) constituted only three per cent of the total Australian population (Australian Bureau of Statistics 2018a). Much has been written on the history of European settlement and its consequences for the Indigenous population (see, e.g. Rowley, 1970; Roberts, [1978] 2008; Broome, [1982] 2019; Griffiths et al., 2016). Officially celebrated as Australia Day, the arrival of the First (British) Fleet on 26 January 1788 is remembered as 'Invasion Day' by Indigenous Australians. The current distribution of the Indigenous population is also a consequence of colonial history: Indigenous peoples are under-represented in the temperate south-eastern States of New South Wales, Victoria, and South Australia and in the major cities, and greatly over-represented in the Northern Territory and Queensland and in areas characterized by desert, scrubland, or tropical rainforest. The very different spatial distributions of the Indigenous and total populations result in particularly high Indigenous proportions in the Northern Territory (34 per cent of the

total population). Population density, location, distance, income, access to health services and Indigeneity are thus interlinked in complex ways compounded by both geography and history.

Australia is a country of immigration with a recent history of multiculturalism. One third of the current population were born overseas, representing more than 100 countries. This large and diverse immigrant population is mainly concentrated in specific suburbs of the large cities (Australian Bureau of Statistics, 2020b). Australia ranks high on irreligiosity, with 22 per cent of the population reporting 'no religion' in the 2011 census (Australian Bureau of Statistics, 2013), suggesting that reporting a religion indicates a degree of positive self-identification with that group. In 2011, 25 per cent of the population reported as Catholic and 17 per cent as Anglican. Colonial Australia was predominantly Anglican, with Catholics (mostly of Irish origin) having lower status and practicing segregation from non-Catholics in marriage and education (Borus, 1992). Catholics gained in relative strength through the immigration of Italians after World War II, and issues of status waned over the following decades.

Study Design

There is little previous research on the relationship between socioeconomic inequalities and mortality in Australia. This lack of attention to what is a significant issue stems from a paucity of usable individual data. Most studies (McMichael, 1985; Quine et al., 1995; Turrell and Mathers, 2001) have relied on area-based mortality rates and the ABS areal Index of Relative Socioeconomic Disadvantage, IRSD (Australian Bureau of Statistics, 2018b). While recent developments do enable the linkage of death registrations to individual census records (Australian Bureau of Statistics, 2020c), these data currently suffer from incomplete linkage, leading to the possibility of biased estimates of socioeconomic differentials in mortality. Further, they permit only a unidimensional social analysis based mainly on educational attainment, which is necessarily limited to adults aged 25+ (Korda et al., 2018). In this study, we adopt an area-based approach in conjunction with a bespoke set of scales designed to achieve a more meaningful, multidimensional, categorization for social analysis.

An area-based approach

Our analysis relates age-standardized mortality risks for the populations of small areas to the situational and population characteristics of these areas. We emphasize at the outset that the ecological fallacy (Robinson, 1950; Piantodosi et al., 1988) does not apply to our analysis, as we draw no inferences about the mortality of individuals. The analytical unit is the small area. We view such small areas as having ontological validity in the sense that the areal unit is a meaningful and valuable unit of analysis un its own right. Area-based analyses aggregate individual characteristics to create not only simple measures such as means and medians, but also more complex or indirectly derived indices that refer to the population rather than the individual. These measures reflect the qualities and realities of life for those who inhabit the different areas, and our results thus refer to mortality risks as they relate to these qualities and realities.

Our approach may be viewed as advantageous for several reasons. First, area-based data derived from individuals and households as well as administrative and geographic information are readily incorporated. Second, they can reflect distributional properties or standardizations that have no individual-level equivalent. Third, area-based studies enable mortality at all ages to be analyzed. A final, fourth advantage is particular to the current investigation in that the areal unit can serve as a proxy for Bourdieu's notion of space.

Social space translates into physical space (Bourdieu, 2018). The workings of the housing market make for a certain homogeneity of residents of any small area: a concentration, within the local area, of people with generally similar backgrounds, similar levels of resources and similar dispositions to act. "It is the habitus that makes the habitat" (ibid, p.111) and just as access to the three types of Capital creates a hierarchy of social spaces, so, too, there is a hierarchy of the corresponding physical spaces. However, this similarity is not just one of contiguity. People with similar social backgrounds and experiences develop similar dispositions (Bourdieu, 1990) and enhance their mutual social interaction, to the relative exclusion of others, thereby generating a localized conscience collective.

The spatial unit thus acts as a proxy for social space: it is not merely a collection of individuals but has a dynamic of its own formed of the interrelations among the people who live there (Lefebvre, [1974] 1991; Massey, 2005, Houston, 2019). These relations develop over time to create a structured hierarchy of central and peripheral places, as a function of social production, distribution, and consumption. Control and innovation flow from the Centre to the Periphery, while resources and labor flow from the Periphery to the Centre, thus creating a constant dynamic of growing inequality between them (Friedman, 1973).

In Australia, four levels of areal aggregation are used for statistical purposes. In this study, we employ the relatively small Statistical Area Level 2 (SA2) as the unit of analysis (Australian Bureau of Statistics, 2016a), which is generally small enough to be homogeneous but large enough to be tractable. There are 2,196 such areal units, with population sizes generally ranging from 3,000 to 25,000 (with an average of 10,000). To avoid unrepresentative units, we excluded SA2s with populations of less than 1,000 in 2011, mainly extremely remote areas, the small mainland Territory of Jervis Bay (principally a naval base) and various offshore Territories. Thus, our study focuses on 2075 statistical areas, with a population of 21,447,234 or 99.7 per cent of the total population of Australia at the time of analysis.

Analytical framework

Departing from previous practice, we developed a set of six social scales based on Bourdieu's three Capitals and three dimensions of Family Cohesion. These theoretically based scales are detailed below. We prefer these scales to the ABS Index of Relative Socioeconomic Disadvantage (IRSD, see Australian Bureau of Statistics, 2018b), or even the broader Socio-Economic Indexes for Areas (SEIFA) (Australian Bureau of Statistics, 2018c), as they enable us to define the scales along our chosen dimensions, using theoretically derived variables.

We expect the three types of Capital to be negatively associated with mortality. Following the discussion above and existing analyses at the individual level (Gove, 1973; Saito et al., 2020; Bourassa et al., 2019), we also expect marriage to be negatively associated with mortality, and divorce to be positively associated with mortality. We have no firm expectations about the direction of the effect of family size. Previous research, at the individual level, has shown a polytonic relation of family size with mortality, declining at low parities and then rising at higher parities (Tamakoshi et al., 2010; Dior et al., 2013) and, at older ages, a higher risk of mortality if living alone (Rogers, 1996) or family support is comparatively low (Shor et al., 2013). In addition to these scales, we include as covariates three situational variables for State/Territory, Remoteness, and Indigeneity.

Data and Variables

The data comprise tabulations of registered deaths by sex, populations by age and sex and aggregated social data for each area. Death data for 2009-2013 were compiled by the Australian Institute of Health and Welfare (AIHW) from the National Mortality Database (unpublished), while the Estimated Resident Population on 30 June 2011 and aggregated social data from the 2011 census were obtained from tables published by the Australian Bureau of Statistics (ABS).

Dependent variable: mortality The number of observed deaths by sex in each SA2 in 2009-2013 (aggregated) ranged from 0 to 945, with mean 174 and variance 16474. We modelled the log of the Standardized Mortality Ratio (SMR) (Hinde, 1998: 22-3), in practice utilizing the number of observed deaths offset by the number of expected deaths. Where no deaths occurred (one instance for females), a value of 0.5 was used. The number of expected deaths by sex in each SA2 was obtained using national mortality rates for both sexes combined in 2011 (Human Mortality Database, 2018) as the standard, applied to the sex-specific 2011 populations in each SA2 and multiplied by five to allow for the five-year period.

Covariates: three situational variables To allow for the varying situational aspects of the SA2s, we include three categorical variables as covariates: State/Territory, Remoteness, and Indigeneity. State/Territory has been discussed above. The concept of Remoteness was introduced by ABS in 2001 to operationalize the distinction between city and country, based on the road distance to the nearest town or service center. Remoteness has five categories: Major Cities; Inner Regional; Outer Regional; Remote; and Very Remote (Australian Bureau of Statistics, 2018d). Table 1 presents numbers of SA2s by both State/Territory and Remoteness. About 80 per cent of SA2s are classified as Major Cities or Inner Regional and 80 per cent of these are in New South Wales, ACT, Queensland, or Victoria, while most of the Remote and Very Remote areas are in Queensland, Western Australia and the Northern Territory. The association between State/Territory and Remoteness is seen most starkly in the complete absence of Major Cities and Inner Regional SA2s in the Northern Territory, and the complete dominance of Major Cities SA2s in the Australian Capital Territory (ACT).

Table 1: Distribution of SA2s by State/Territory, Remoteness and Indigeneity

State/Territory	Remoteness						
	Major Cities	Inner Regional	Outer Regional	Remote	Very Remote	Total	Population ≥40% Indigenous
New South Wales	315	137	59	4	2	517	1
Victoria	271	117	32	0	0	420	0
Queensland	285	108	91	10	14	508	9
South Australia	93	25	30	7	6	161	1
Western Australia	143	27	28	13	11	222	3
Tasmania	0	59	33	2	1	95	0
Northern Territory	0	0	37	10	14	61	15
Australian Capital Territory	91	0	0	0	0	91	0
Total	1198	473	310	46	48	**2075**	
Population >40% Indigenous	0	0	1	4	24		29

Source: Australian Bureau of Statistics (2018d). Note: Cell values are numbers of SA2s in each combination of State/Territory and Remoteness. Thus 315 SA2s, out of a total of 2075, are in major Cities in New South Wales, etc.; also, 29 of the SA2s have 40% or more Indigenous population, of which 15 are in the Northern Territory and 24 are classified as Very Remote.

Indigeneity is also shown in Table 1. At the SA2 level, we defined an Indigenous area as having an Indigenous population proportion of at least 40 per cent, resulting in 29 of the 2075 SA2s being classified as Indigenous. Table 1 shows their distribution by State/Territory and separately by Remoteness. Almost all (24 of 29) Indigenous areas are Very Remote, with 57 per cent of the Indigenous population living in Very Remote areas, while half are in the Northern Territory. Clearly, there is considerable overlap among these three categorizations.

Independent variables: six social scales The independent variables comprise six continuous social scales: the three types of Capital and three Family Cohesion variables, as discussed above. Data for the operationalization of these social scales were obtained from tables of aggregated data at the SA2 level (Australian Bureau of Statistics, 2016b). Each scale was constructed by selecting appropriate variables and combining their standardized values to obtain a composite scale. Scale reliability was determined using Cronbach α, with a cut-off value of 0.8 for a satisfactory scale Scale values and components are summarized in Table 2.

Table 2: Social Scales, Summary and Components

Scale	Mean	s.d.	Components	α
Capital				
Economic	-0.0022	0.0899	Median personal income Median household income Median mortgage Median housing rent	0.919
Cultural	0	0.847	*Education* Proportion graduate Proportion information technology *Sector and Occupation* Proportion informatics and finance Proportion professionals	0.869
Social	-0.0007	0.814	Proportion of population non-indigenous and Born in Australia NW European origin Not immigrated past decade Anglican	0.872
Households				
Marriage	0	0.859	SMAM (reversed) I_m (logged) Proportion ever married Proportion currently married	0.880
Size	0	0.828	Proportion non-single-person families Proportion non-single-person h'holds Median family size Median household size	0.946
Divorce	0	0.884	Proportion divorcees Id (logged) Log ratio I_d / I_m	0.860

Note: Proportions transformed to logits for symmetry

Economic Capital was represented by four related measures of income and wealth: median personal annual income, median household annual income, median weekly mortgage payments and median weekly housing rent. All values relate to those individuals or households for whom the measure is relevant. The variables, which all range from low to high, were standardized and summed to give a scale of Economic Capital (α = 0.919; 1st eigenvalue = 3.23). The scale had mean = -0.0022 and s.d. = 0.899.

Cultural Capital refers to the level and quality of educational credentials in the population. We used correspondence analysis (Greenacre, 1993) to rank the SA2s on four dimensions. Analysis of education ranked the SA2s from those with a concentration of people with postgraduate degrees to a concentration of people with only a high school certificate or less. A similar analysis of field of study ranked SA2s from those with a concentration of people who studied information technology, through arts, natural sciences, social sciences, and engineering to agriculture. Industrial sectors were similarly ranked, from places with a

concentration of people in information-based industries (informatics and finance) through to manufacturing and construction; and occupations were ranked from professionals through managers to laborers and machine operatives. For each of these four dimensions, we calculated the proportion in the top-ranking category (graduate education; information technology; informatics and finance; professionals) and combined the logits of these proportions to create a scale of Cultural Capital ($\alpha = 0.869$, 1st eigenvalue = 2.88). The scale had mean = 0 and s.d. = 0.847.

Social Capital is undoubtedly the most difficult of the three Capitals to measure, and few have found adequate solutions. As we noted above, Social Capital is the ability to access resources (Economic and Cultural Capital) through an individual's network of social relations. At the SA2 level, we are essentially trying to gauge which areas have more residents with "well placed" contacts, either directly or through intermediaries. Given the structuring of Australian society, we hypothesize that these would be areas with a high concentration of non-Indigenous people who were born in Australia. By contrast, areas with a high proportion of immigrants, people who did not grow up in Australia, and particularly those who arrived in the past decade (since 2001) will generally be at a disadvantage. In a similar vein, we may expect non-Indigenous people with an Anglican, or North-West European background to be socially advantaged. These four measures at the SA2 level (proportions of the population who are non-Indigenous and: born in Australia; of North-West European background; not recent immigrants; Anglican) are closely interrelated and, combining the (logit) proportions in each area, we created a scale of Social Capital ($\alpha = 0.872$, 1st eigenvalue = 2.81) with mean = -0.0007 and s.d. = 0.814.

It is to be noted that our use of ethnic affiliation as a measure of Social Capital diverges from standard practice in the social sciences. Following Weber (1946), ethnic affiliation has generally been treated as reflecting social prestige and lifestyle, with a focus on the putative content of ethnicity in the sense of having a lifestyle that reflects a common origin. This view would place ethnicity under Cultural Capital. Yet ethnic boundaries, and content, are fluid (Davenport, 2020) and they continuously evolve through social processes in the country of destination (Yancey et al., 1976). Thus, we view ethnicity not as content (lifestyle), but as a network of relationships, and place it under Social Capital. It should also be noted that Indigeneity is not directly related to this measure, though it is clearly an important component of (dis)connectedness with the mainstream society of Australia.

Marriage, at the SA2 level, refers to the level of formal marriage in the population. We identified four measures that provide a wider perspective than simple prevalence. A high level of marriage was indicated by a low mean age at first marriage (SMAM, calculated from proportions never married by age, see Hinde 1998: 89-91); Im (logged), a high proportion of fecund life spent in the formally married state (Coale, 1969); a high proportion of the population ever married (logit); and a high proportion currently married (logit). These four variables formed a unidimensional scale of Marriage ($\alpha = 0.880$, first eigenvalue = 3.00). The scale had a mean of 0 and s.d. of 0.859.

Household Size, at the SA2 level, refers to the tendency of the population to live in large family households, rather than small or single-person households. Two measures, each relating to families and to households, were used: the logit proportion of non-single-person families and households, and the median size of families and households. These four variables formed the scale of Household Size ($\alpha = 0.946$, first eigenvalue = 3.44). The scale had a mean of 0 and s.d. of 0.828.

Divorce, at the SA2 level, refers to the level of divorce in the population. Again, we identified several variables in order to achieve a more comprehensive measure than prevalence alone: the logit proportion of divorcees in the population; a divorce index, Id, based on current divorcees by age, analogous to Im; and the log ratio of the divorce and marriage indices, log(Id / Im) (α =0.860, first eigenvalue = 2.37). The resulting scale of Divorce had a mean of 0 and s.d. of 0.884.

Analysis

We commence by considering mortality levels, log(SMR), by sex, according to each of the three situational variables. We then use a multiple regression model to examine the effect of the six social scales (Capital and Family Cohesion) simultaneously and an extended model to consider the relative importance of the social scales and situational variables and the effects they have on each other. We have two mortality measures for each SA2, for males and for females, and these are nested, using multi-level modelling (Hox et al., 2018), within the SA2 and broader aggregations, SA3 and SA4.

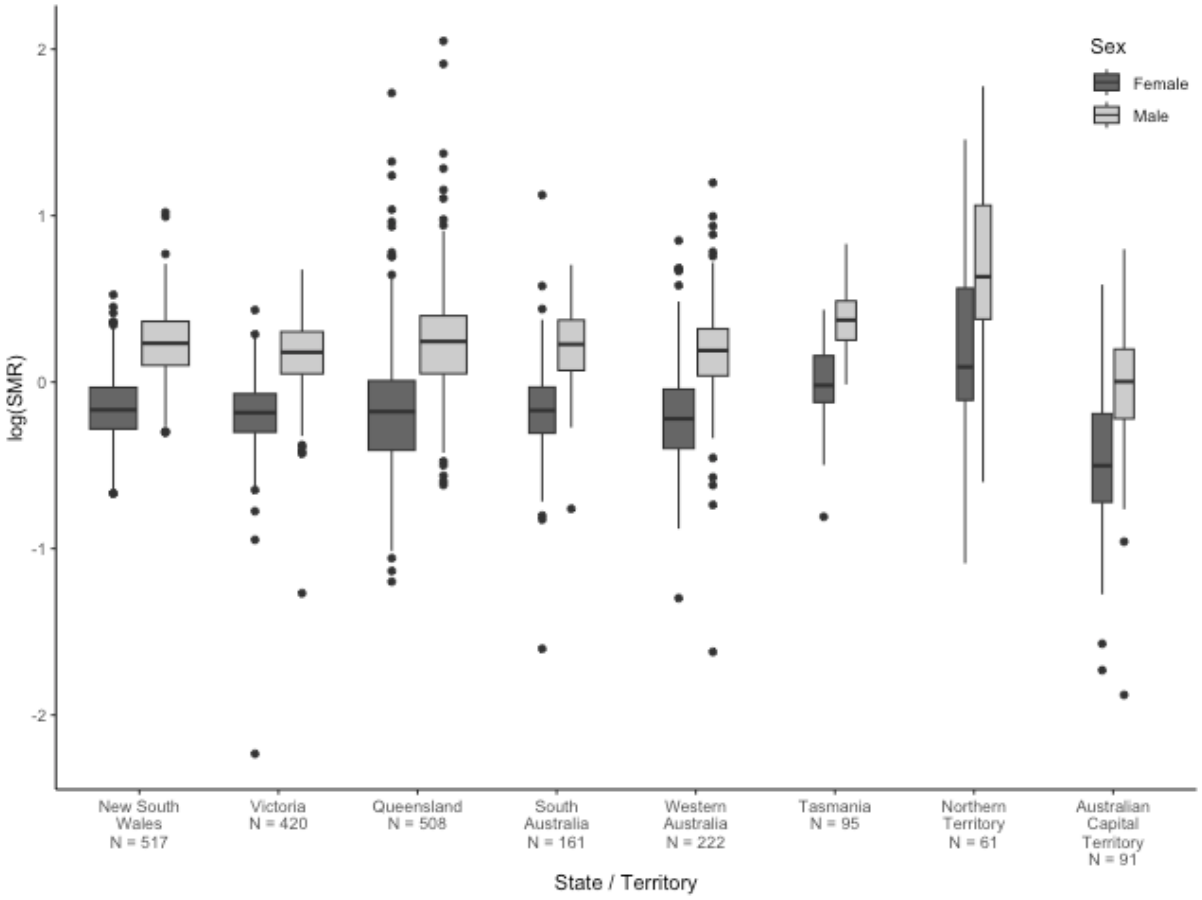
Situational variables: State/Territory, Remoteness, and Indigeneity

Figure 1 shows mortality levels by State/Territory and sex. There is little difference in mortality among the five major States (New South Wales, Victoria, Queensland, South Australia and Western Australia). Mortality is higher in Tasmania, and even higher in the Northern Territory though with considerable variation. In the ACT, by contrast, mortality is appreciably lower.

Figure 2 shows mortality levels by Remoteness, and sex. We see that the Major Cities have lower mortality than the Inner and Outer Regional areas, which in turn have lower mortality than the Remote and, in particular, the Very Remote areas. A greater contrast can be seen by Indigeneity (Figure 3), with Indigenous areas having, on average, almost three times the mortality level of the rest of the country (median log(SMR) differences of about 1).

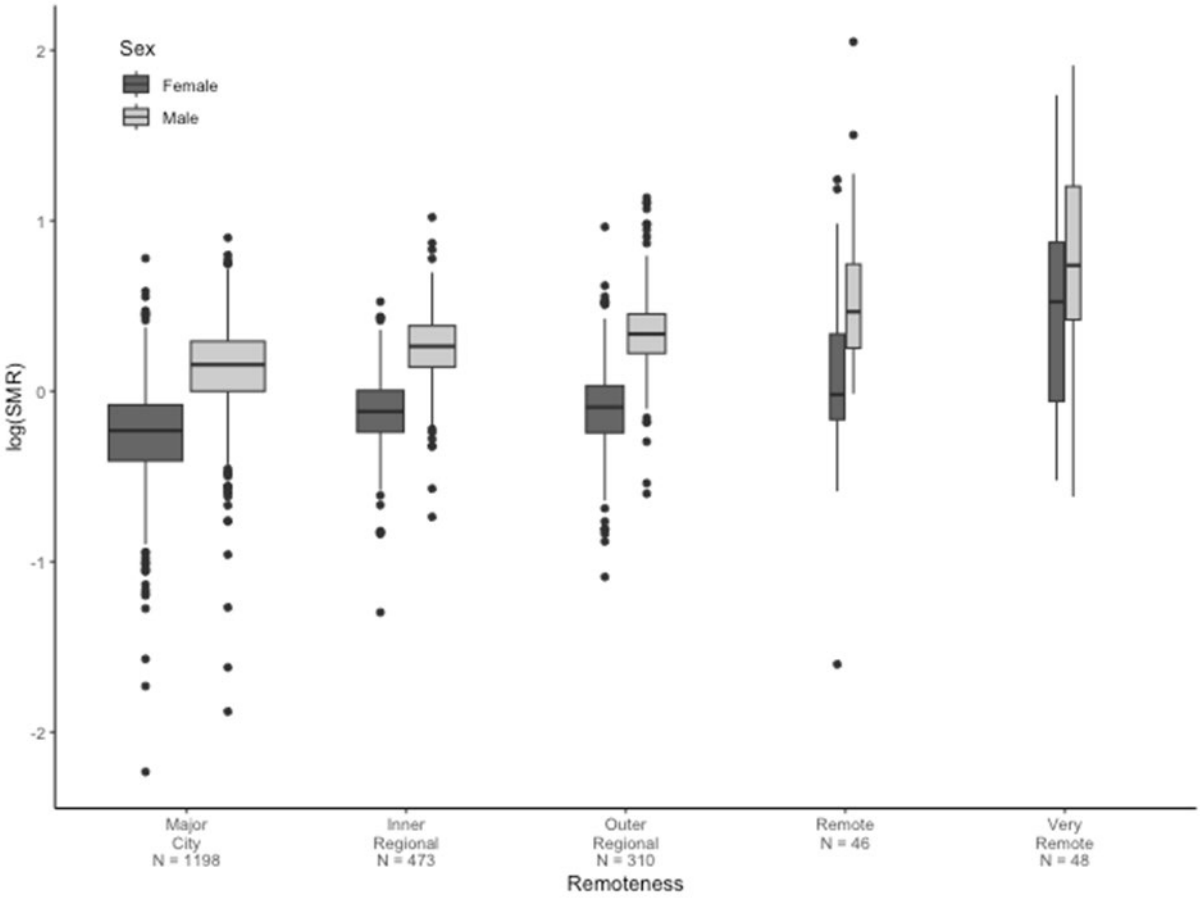
These bivariate findings hold true for both females and males, with males having consistently higher mortality than females. The patterns of conjunction among the three categorizations, noted above (Table 1), should be borne in mind in interpreting these differentials, and are taken into account in the following analysis.

Figure 1: Small area (SA2) mortality (SMR) in Australia, by sex and State / Territory, 2009-2013



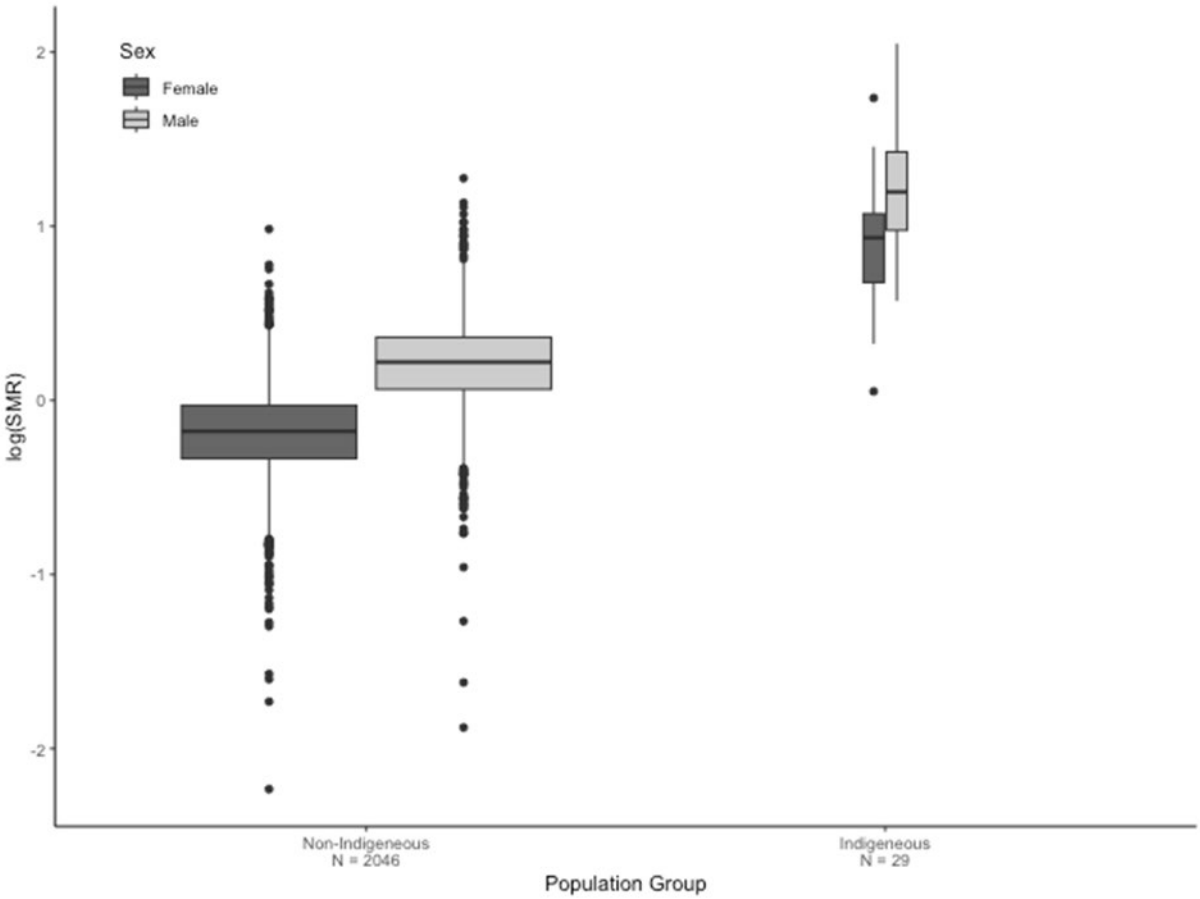
Source: Authors' calculations. Mortality data, 2009-2013, as obtained from the Australian Institute of Health and Welfare; resident population data from tables published by the Australian Bureau of Statistics (ABS). Baseline (standard) Age Specific Mortality Rates from Human Mortality Database. Note: Boxplot shows median with upper and lower quartiles. Whiskers continue beyond the quartile to actual extreme value or 1.5 x inter-quartile range (considered a reasonable limit for a symmetrical distribution). Points beyond whiskers are outliers, box width proportional to $\sqrt{}$(number of cases).

Figure 2: Small area (SA2) mortality (SMR) in Australia, by sex and remoteness, 2009-2013



Source: Authors' calculations. Mortality data, 2009-2013, as obtained from the Australian Institute of Health and Welfare; resident population and remoteness data from tables published by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2018d). Baseline (standard) Age Specific Mortality Rates from Human Mortality Database

Figure 3: Small area (SA2) mortality (SMR) in Australia, by sex and indigeneity, 2009-2013



Source: Authors' calculations. Mortality data, 2009-2013, as obtained from the Australian Institute of Health and Welfare; resident population data from tables published by the Australian Bureau of Statistics (ABS). Indigenous areas are SA2s with 40% or more of their population self-classified as Indigenous. Baseline (standard) Age Specific Mortality Rates from Human Mortality Database

Multiple regression analysis

Table 3 presents our multi-level, multiple regression analysis. Given the over-dispersion of the dependent variable (mean number of observed deaths = 174, variance = 16,474) we used a negative binomial regression model, with the observed number of deaths as the dependent variable, offset by the expected number of deaths from the SMR calculations (Hoef and Boving, 2007; Yang and Berdine, 2015). In practice, the results were indistinguishable from a standard Poisson regression. The first level is the Male and Female populations within each SA2. Subsequent levels are the areas within which the populations are grouped. Level 2 is the 2,075 SA2 areas. These are nested within 325 SA3 areas (Level 3) which in turn are nested within 87 SA4 areas (Level 4). By nesting within these areas, we seek to control for broader area effects on the SA2 coefficients. Models are nested within sex, that is, each term is in interaction with the sex variable – essentially identical to a full variable by sex interaction model – and the intercepts are those of the models for Females and Males. Coefficients are exponentiated to show relative risk. For variables in

which one of the coefficients is significantly ($z \geq 2$) greater than that for the other sex, the coefficient is highlighted in bold text. Non-significant ($z < 2$) coefficients are italicized.

Table 3: Multi-level regression of mortality on social and situational variables

Model:	**Baseline**		**Social variables**		**Situational variables**		**Combined**	
	Female	Male	Female	Male	Female	Male	Female	Male
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.857 (-9.19)	**1.266** (13.9)	0.859 (-14.0)	**1.262** (21.5)	0.823 (-12.0)	**1.210** (11.8)	0.842 (-14.0)	**1.255** (18.6)
Capital Scales								
Economic Capital			0.929 (-7.24)	0.915 (-8.91)			0.949 (-5.57)	**0.916** (-9.50)
Cultural Capital			0.936 (-5.64)	**0.912** (-8.00)			0.939 (-5.17)	0.933 (-5.77)
Social Capital			*0.995* (0.426)	**0.966** (-3.27)			*0.994* (-.0595)	**0.970** (-3.00)
Household Scales								
Marriage Scale			0.891 (-13.7)	**0.869** (-16.9)			0.904 (-12.1)	**0.879** (-15.6)
H'hold Size Scale			**1.102** (12.4)	1.071 (8.90)			**1.090** (11.0)	1.062 (7.79)
Divorce Scale			*1.000* (-0.031)	**1.018** (2.34)			1.022 (2.74)	1.035 (4.26)
States: NSW = 1								
Victoria					*0.985* (-0.730)	**0.953** (-2.045)	0.968 (-2.0)	**0.920** (-5.27)
Queensland					*0.972* (-1.22)	*0.992* (-0.362)	0.953 (-2.98)	0.955 (-2.88)
South Australia					*1.002* (0.050)	*0.974* (-0.828)	*0.989* (-0.500)	**0.922** (-3.66)
Western Australia					*0.946* (-1.85)	*0.954* (-1.58)	0.949 (-2.41)	0.947 (-2.56)
Tasmania					1.114 (2.51)	*1.066* (1.49)	**1.091** (2.97)	*1.020* (0.680)
Northern Territory					1.163 (2.44)	1.274 (4.04)	1.173 (3.40)	**1.298** (5.93)
Aus. Capital Terr.					0.829 (-2.84)	0.834 (-2.77)	0.918 (-2.17)	*0.933* (-1.77)

Table 3: Multi-level regression of mortality on social and situational variables (continued)

Remoteness Major cities=1				
Inner Regional	1.064	1.083	1.049	1.054
	(3.69)	(4.78)	(3.02)	(3.29)
Outer Regional	1.079	**1.132**	1.060	1.083
	(3.64)	(5.98)	(2.87)	(3.99)
Remote	1.207	1.257	1.178	1.202
	(4.62)	(5.83)	(4.34)	(5.12)
Very Remote	1.128	1.133	1.149	1.129
	(2.15)	(2.41)	(2.61)	(2.48)
Indigeneity: Non-Indig. = 1				
Indigenous	2.293	2.100	1.583	1.389
	(12.5)	(12.0)	(6.59)	(5.07)
Deviance	38677	38243	38376	37976
Degrees of freedom	4144	4132	4120	4108
Deviance Gain (df)		434 (12)	301 (24)	701 (36)
SA2 variance	0.0294	0.0252	0.0288	0.0250
SA3 variance	0.00505	0.00240	0.00380	0.00230
SA4 variance	0.0212	0.00788	0.00282	0.000414
Theta	175	6871	321	8883
N Observations = 4150 (2075 SAs for each sex)				

Notes: Models are nested within sex. Coefficients are relative risks (eβ), hence baseline = 1, with z-values in parentheses; figures in italics indicate a non-significant coefficient, $p > 0.05$. Figures in bold indicate a significant difference between male and female coefficient, $\left(\frac{|\Delta|}{\max(se_m, se_f)} > 2\right)$

The baseline model, columns (1) and (2), controls only for sex. The female risk is about two-thirds that of the male risk, a ratio that is approximately maintained across all models. The second model, columns (3) and (4), considers the net effects of the six social variables (scales), Capital and Family Cohesion. The three types of Capital exert a significant negative effect on mortality, excepting a non-significant effect for Social Capital among females. Of the three, the weakest effect is undoubtedly that of Social Capital, as reflected in the values of both the coefficient and the considerably smaller z-value, which for females is non-significant (noting that all three scales have a mean of approximately 0 and similar standard deviations). In two of the three cases, Cultural and Social capital, the male effect is significantly greater than the female effect. Among the three Family Cohesion scales, the greatest negative effect is associated with a more traditional marriage pattern, particularly among males. In this model, areas with larger households have higher mortality, especially among females, and areas with higher levels of divorce have greater mortality among males.

The third model, columns (5) and (6), shows the net effect of each category of the three situational variables. Compared with New South Wales (the largest State), mortality is higher in the Northern Territory and among females in Tasmania, and lower in the Australian Capital Territory and among males in Victoria. Mortality increases with remoteness, through Inner and Outer Regional areas to the Remote areas. Additionally, Indigenous areas have dramatically higher mortality than the rest of Australia. Most of these situational effects do not differ significantly between male and female mortality.

The combined model, columns (7) and (8), includes both the social and situational variables. The coefficients are largely unchanged, both in direction and in size, but there are some notable exceptions. The effect for Economic Capital among females is reduced, becoming significantly smaller than the effect among males. The effect for Cultural Capital among males is also reduced and is now similar to that for females. The Divorce effects are now both positive and significant, as expected. Except for Household Size, the net social effects are greater among males than among females.

The changes in the effects for the situational variables were generally larger than for the social variables, and generally larger among males than among females. The largest changes are reduced effects for the ACT, bringing them into line with the effects for other States/Territories, especially among males. Sizably reduced effects also occurred for Tasmania, whereas for the remaining States/Territories increased effects occurred. Significant differences by sex in these net coefficients were found for Victoria and South Australia, with the greater advantage being among males, Tasmania with a greater disadvantage among females, and Northern Territory with a greater disadvantage among males.

In contrast, the effects for Remoteness were reduced in the combined model by greater amounts among males than among females, resulting in smaller sex differences. Finally, the effects for Indigeneity are dramatically reduced. Clearly, an important part of the Indigenous disadvantage, which leads to Indigenous areas having more than twice the non-Indigenous mortality risk when social variables are excluded, stems from the social conditions in which they live. However, even when these are accounted for, Indigenous areas still have a mortality risk that is one and a half times that of the rest of the population.

The multi-level model breaks down the residual variance (variation in sex-specific mortality rates) into variation attributable to each of the higher-level components (in our case, SA2, SA3 and SA4). At each level, the variance reflects variation in the outcome variable between level categories (e.g. SA3 statistical areas) which cannot be attributed to the fixed effects (regression) coefficients (Hox et al., 2018, esp. Ch. 2). The reduction in residual variance for these random effects indicates that the SA2 variance in the combined model has been reduced by about 15% in comparison with the baseline model. Most of this reduction is attributable to the social variables. SA3 variance has been reduced by over a half, also mostly attributable to the social variables. However, SA4 variance has been reduced by about 98%, attributable to both social and situational variables. A similar model excluding the SA3 and SA4 levels does not differ substantively from this combined model (not shown). We thus conclude that the substantive effects on mortality of the broader area are marginal, and it is unlikely that cross-boundary effects substantively influence the conclusions of our analysis.

Discussion and Conclusions

Capital

Through deconstructing the notion of socio-economic resources, we have cast new light on the nature of their relationship with mortality and demonstrated this to be a meaningful and fruitful approach using Australia as a case study. Following Bourdieu, we have treated socio-economic resources as consisting of three components, finding significant and almost equal net effects for Economic and Cultural Capital. In other words, mortality is lower both in areas with a higher material standard of living and in areas with a greater concentration of people with high educational credentials in socially valued fields of knowledge and working in the most prestigious professional occupations. The effect of Social Capital on the other hand, is much smaller, and for females is non-significant.

The separate effects of material standard of living and education on mortality are well known (Geyer et al., 2006; Hoffmann et al., 2020). Our analysis extends previous research by theorizing the difference between them and seeking to understand how they operate separately. We make an important qualitative distinction between Economic and Cultural Capital. Economic Capital is acquired through the inheritance of wealth or through income, by fair means or foul, but however it is acquired, Economic Capital can be lost, as it requires ongoing maintenance and is subject to conditions beyond the holder's control. By contrast, Cultural Capital is both personal and permanent. Meaningful educational certificates, socially valued knowledge and particular behavioral dispositions, are marks of personal achievement that are accumulated over the lifetime. This process of accumulation starts young, with the linguistic and behavioral codes transmitted in the home (Bernstein, 1971), and it is these that form the basis for socially valued educational achievement. The prestige and social approval bestowed upon the holder of Cultural Capital are thus far less ambivalent than in the case of Economic Capital. Further, unlike material wealth, Cultural Capital, once achieved, cannot be lost, and thus provides a security of social position that usually endures throughout life. This long-term social security is a main strength of people with prestigious certification and occupation.

This distinction between Economic Capital, as extrinsic or changeable and subject to external influence, and Cultural Capital, as intrinsic or personally realized and permanent, provides a plausible, if partial, explanation for their separate effects on mortality. Economic disadvantage and insecurity are major sources of chronic stress and ill-health, while economic security can be used to purchase healthier living conditions and lifestyles and to secure access to better and more immediate healthcare in times of need. On another level, education, and Cultural Capital in general, is a major factor in mitigating the effects of economic insecurity, acting as a salutogenic, generalized resistance resource that gives a greater sense of control over the life space, preventing breakdown (Antonovsky, 1972, 1979). More concretely, the knowledge inherent in Cultural Capital operates through such factors as better nutrition, enhanced understanding of health, less risky lifestyle, and better health service use (Saint Onge and Krueger, 2017).

The effect on mortality of Social Capital, being related through social networks to people with resources, in the form of Economic and Cultural Capital, is much smaller. Indeed, the effect is non-significant for female mortality. Among non-Indigenous males, Australian or North-West European birthplace and Anglican religion exert a modest effect. In other words, the social advantage of access to mainstream network resources is relatively weak compared with the personal advantages of wealth

or education. While it is important to recall the limitations of our operationalization of the concept of Social Capital, these findings are consistent with the strong multicultural ethos in Australia, coupled with inclusive social security. The stronger effect for male mortality than for female mortality is likely to be related to differences in men's and women's social networks: women's networks emphasis emotional relationships and are more likely to involve friends and confidants, while men's networks emphasize instrumentality and activity and involve fewer intimate relationships (Antonucci and Akiyama, 1987; Shye et al. 1995). Thus, while the benefits to males of social networks are likely to be expressed in terms of Economic and Cultural Capital, the social network benefits to females occupy a different and less tangible social space, which is not covered by the variables included in this analysis.

Family Cohesion

Our analysis has shown that, while Capital is important, the most powerful social predictor of low mortality is a high prevalence of formal marriage, backed up by a low prevalence of divorce. Net of these, SA2s with larger households on average have higher mortality, especially among females.

Marriage (or long-term partnership) can be considered a basic role (Banton, 1965), and much of what we do in life, from work to leisure, is predicated on it. Precisely because of this, marriage creates order in what would otherwise be a chaotic set of social relationships, though the myriad forms of family life observed in different societies around the world make it clear there is no one, definitive, solution. The social control involved in marital regulation is symptomatic of a more general situation of being enmeshed in a multi-fold and pervasive network of social relations through which individuals' rights and obligations are defined and personal desires are structured and contextualized. The precise nature of this control will vary from one social situation to another, as will the point at which this control becomes excessive and detrimental. Marriage is the formalization, the public announcement of a particular social relationship, with its attendant rights and obligations, but as mores change, so does the meaning of marriage and its alternatives. What was once termed "living in sin" has become cohabitation and is being institutionalized through partnership registration, such as exists in France and the Netherlands (Schrama, 1999; Festy, 2001; Martin and Thèry, 2001). However, whether such relationships can bestow the same protective advantage as formal marriage remains a moot point and is almost certainly context-specific (Lund et al., 2002; Anson, 2003; Scafato, 2008; Liu and Reczek, 2012; Frisch and Simonsen, 2013).

In practice, our data only enable us to compare formal marriage with the statuses of never married, separated, divorced, and widowed, even though these may all be concurrent with cohabitation. Higher mortality and morbidity associated with these statuses has been widely observed (Liu et al., 2020; Kojima et al., 2020; Vigezzi & Strozza, 2024). The effect has often been found to be greater for men than for women (Wang et al., 2020) and may be mitigated by having other close relationships (Manvelian and Sbarro, 2020). Further, for area-based mortality, the effect of marriage need not be confined to the partners involved. Formal, more stable, relationships can play a role in the well-being of all sections of society, including children, young adults, and elderly parents, thereby reducing mortality overall. This also applies to the divorce scale with its implied instability.

Situational Dimensions

As already noted (Table 1), there is considerable conjunction of the three situational covariates: State/Territory, Remoteness and Indigeneity. All SA2s in the ACT (essentially, Canberra and its suburbs) are designated as being in a Major City whereas Tasmania has no Major City, and NT has no Inner Regional SA2s either (see Table 1). Rather, the Northern Territory stands out for its high proportion (almost 40 per cent) of SA2s categorized as Remote or Very Remote. Furthermore, Indigenous areas are concentrated in Remote and Very Remote areas and away from the main population centers on the East and South coasts. Net of locational effects (State/Territory and Remoteness), Indigenous areas have over twice the mortality risk of the rest of the country (Columns 5 and 6 of Table 2). Such high mortality is partly attributable to social conditions, as can be seen by its reduction to "only" one-and-a-half times the mortality risk in the combined model. However, the disadvantage in Indigenous communities goes considerably beyond the, admittedly, Euro-centric variables that were available for inclusion in our models (Sutton, 2009).

The States and Territories can be grouped into three main levels: a central level comprising the five mainland States (Queensland, New South Wales, Victoria, South Australia, and Western Australia); lower mortality in the ACT; and significantly higher mortality in the Northern Territory and, to a lesser extent, in Tasmania. These effects are reinforced by the gradient in mortality from the Major Cities through the Inner and Outer Regional areas to the Remote areas. By contrast, the high level of mortality in the Very Remote areas observed in Figure 2 is partly attributable to their high concentration in the Northern Territory.

Remoteness and population sparsity have enormous cost and logistical implications for service delivery. For the Northern Territory, health service delivery to its very low density Remote and Very Remote areas presents considerable challenges. The famous ‘Flying Doctor’ service was an early NGO response, which is still partly supported by private donations (see www.flyingdoctor.org.au), while recent health expenditure per capita in the Northern Territory far exceeds that in other States/Territories (Australian Institute of Health and Welfare, 2020). By contrast, health service delivery in the ACT presents no logistical impediments. Relatively high mortality in Tasmania may also be linked to health service delivery in that, while only 3 per cent of SA2s are Remote or Very Remote, the population is relatively decentralized, with a large proportion (58 per cent in 2011) residing outside of what is a small State capital (authors' calculations).

Conclusion

Australia is undoubtedly one of the wealthiest countries in the world today and enjoys a high life expectancy. Nonetheless, by mapping Australia in both physical and social space, we have been able to draw four main conclusions concerning the social structuring of mortality. First, of the three types of Capital, Economic and Cultural Capital reduce mortality. The third type, Social Capital, appears to have a smaller effect, significant only for males, but we note the tentative nature of the operationalization, which needs further development. Second, the strength and form of social relations, in particular Family Cohesion as reflected in the prevalence of marriage and divorce, are at least as important as position in the social hierarchy, reflected in the three types of Capital, in establishing the mortality risk of a locality. Third, geographic location, as in the State/Territory and degree of Remoteness, are important elements in determining mortality risk. In particular we have noted the net

disadvantage of the Northern Territory and the increase in mortality as we move from the Major Cities out through the Inner and Outer Regional areas to the Remote and Very Remote areas. Finally, Indigenous areas are at a heavy disadvantage, even when all other social and situational characteristics have been accounted for. When we compare mortality in Indigenous areas directly with the rest of Australia, as in Figure 3, the mortality risk is almost three times as large (a difference of one on the log scale). Allowing for geographic location and social variables reduces this risk to "just" one and a half times that of non-Indigenous areas. Thus, while about half the excess mortality of the Indigenous areas can be attributed to geographic location and social conditions, the other half needs to be sought in the history of the relations between Indigenous peoples and the European settlers (or invaders) and its consequences.

In Australia, as elsewhere, the risk of mortality is a social phenomenon that is heavily dependent on the way in which social relations are structured and social resources distributed. We have seen that, in relation to mortality, these resources cannot be represented by a simple scale but can usefully be broken down into three domains, those of Economic, Cultural and Social Capital. These conclusions are, of course, dependent on the way in which we have operationalized these three Capital domains and the scales used to capture Family Cohesion. Further work is required to investigate whether our findings can be replicated and generalized to other countries.

Acknowledgements: The bulk of this paper was prepared while the first author was a visiting scholar on sabbatical leave at the School of Demography, ANU. We are grateful to the Australian Institute of Health and Welfare (AIHW) for access to mortality data aggregated by Statistical Areas and to colleagues at ANU for comments on previous drafts of this paper. The authors bear full responsibility for the analysis, which expresses the opinion of themselves alone.

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