Beyond material explanations: Fertility decline and mortality, a small area-level analysis of Israeli data

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Abstract

Social solidarity, being embedded in a network of binding social relationships, significantly extends human longevity. Yet while average incomes in the western world, and with them, life expectancies, have risen dramatically, the Second Demographic Transition has occasioned a breakdown in traditional family forms. In the present work we consider whether these trends in family life may not have held back the rise in life expectancy. We present a cross-sectional analysis of Israel statistical areas (SAs), for which we build indices of Standard of Living (SOL), Traditional Family Structure (TFS) and Religiosity (R). We show that (i) increases in all three of these indices are associated with lower level of mortality; (ii) male mortality is more sensitive to differences in SOL and TFS than is female mortality, and (iii) net of differences in SOL and TFS, there is no difference in the mortality levels of Arab and Jewish populations.

Introduction

The demography of the developed countries over the past 30 - 40 years, in particular, Western Europe, Japan, North America and Australasia, has been marked by a number of major trends and processes. Mortality has declined consistently, gaining an average of about 1 year of life expectancy every four years (Human Mortality Database 2007); total fertility has fallen to below 2 in all but one of the 25 richest countries (United Nations 2005); there has been a restructuring of family households and living patterns, often termed the Second Demographic Transition (Lesthaeghe and van de Kaa 1986, van de Kaa 1987, Lesthaeghe and Neidert 2006), and there has been a steady stream of migrants from the adjacent less developed countries (Castles and Kosack 1985, Sassen 1988, Coleman 2006a). A considerable body of work has focussed on the interactions between fertility decline, the reshaping of the population pyramid and immigration, often seen as necessitated by the effects of second demographic transition on population structure (United Nations 2000, Keely 2001, Coleman 2006b, Dalla Zuanna 2006). On the other hand, there has been little discussion of the effects of fertility decline and the restructuring of living arrangements on mortality, as if the continued mortality decline were sufficient proof that there has been no negative effect. Yet, if social solidarity reduces mortality, and the destabilisation of traditional family structures has reduced levels of social solidarity, then we may expect the second demographic transition to have an adverse effect on mortality decline. The present

paper will explore this possibility, of a negative relation between fertility decline, household structures and mortality, using cross-sectional data from Israeli statistical areas (census enumeration districts).

The Reproductive Revolution (MacInnes and Perez 2005) of which the demographic transition (Kirk 1996) was a major part, brought about a dramatic decline in mortality and fertility, a concentration of populations in urban centres, and a dissociation between the household as the locus of residence and consumption, and the workplace as the locus of production (Goldscheider 2000). In particular, it created a complementarity of roles between men and women within the household, by which men became responsible for bringing in economic resources to the household, and women for the running of the household itself (the famous, if problematic, functionalist distinction between men's instrumental role and women's affective role (Parsons 1955, esp. pp. 45-54, Zelditch 1955. For an evolutionary perspective, arguing the universality of this division, see Lopreato and Crippen 1999, esp. Chapter 6). The predominant living arrangement, however, remained the nuclear family household, so that the reproductive unit (nuclear family) and residence – consumption unit (household) remained largely coterminous. With the second demographic transition, by contrast, fertility came down to below replacement levels and, no less importantly, in many places the family-household is no longer the predominant or normative living arrangement, creating a split between the necessary loci of reproduction and consumption.

The Reproductive Revolution has long been associated with the breakdown of traditional community structures and the restructuring of social relationships on the basis of instrumental relations between individuals rather than the more amorphous and generalised sets of rights and obligations. Already in the nineteenth century, Marx and Engels ([1848],) noted that "under capitalism, all human relations are reduced to the cash nexus"; Tonnies ([1887] 2001) argued that *Gemmeinschaft,* society based on association, is giving way to *Gesselschaft,* society based on trade; and Durkheim ([1894],) bemoaned the rise of the cult of the individual. In the mid twentieth century Parsons (1951), posited a contrast between traditional and modern societies based on four pattern variables, or modes of orientation to others. In the former, relations are expressive: they are ascriptive, diffuse in content, particularistic and affectively charged, and the collectivity supercedes the individual; in the latter relations are instrumental: they are achievement oriented, content-specific, universalist and affectively neutral, and primacy is given to individuals and their interests. Only the family is exempt from this shell of steel, or "iron cage" (Weber, [1905] 2002, ,p.121). In the second demographic transition the family, too, becomes fluid (Bauman, 2000), it loses its unique identity, its borders become permeable and it loses its primacy in defining social relationships. As consumption and reproduction become separated, the once privileged family relations, too, move from the expressive to the instrumental and

the last bastion of community, as an imposed set of rights and obligations, breaks down.

How is all this related to mortality? There has been a long debate in the literature on the fundamental causes of the mortality decline during the demographic transition, focussing on the relative importance of nutrition, urban population density, public health and medical technology (McKeown 1976, Kunitz, 1983, Woods 2000, Colgrove 2002, Harris 2004). What unites all these approaches is a focus on somatic causes of longevity and mortality, their view of the body as an organism (or machine? See Vaupel 1997) which survives well in environmental conditions which prevent illness, or breakdown (Antonovsky 1972) and can cure (or "repair") it when this occurs. In analysing conditions in which mortality rates were high, and both the relative and the absolute differences between populations living under different circumstances were substantial, material conditions were undoubtedly the major cause of mortality differences between populations. As mortality declines and absolute (even if not relative) differences converge (Edwards and Tuljapurkar 2005), as the major material threats to longevity are overcome, we need to consider other, non-material, explanations for continued mortality differentials.

The major inspiration for non-material explanations for mortality differentials is undoubtedly Durkheim's ([1897] 1951) analysis of suicide rates as a function of the lack, or excess of social integration (egoism - altruism) and social

control (anomie - altruism). Suicide rates do not decline as material conditions improve (if anything, they tend to increase, but not necessarily *because* of the improvement in material conditions) and thus their relation to psychic, or affective conditions can be seen more clearly than in other causes of death. However, more recent work has clearly shown that all-cause mortality (of which suicide rates are but a very small part) is lower in populations with strong moral support, in the form of interaction networks through marriage (Gove 1973, Kobrin and Hendershot 1977, Trovato and Lauris 1989, Gove et al. 1990, Rogers 1995, Manzoli et al. 2007); religion (Kark et al. 1996, Hummer et al. 1999, Jaffe et al. 2005) or the work place (Brenner 2002, Anson 2004, Waddell and Burton 2006), and that the break-up of such networks, such as through divorce or widowhood (Lusyne et al. 2001, Manor and Eisenbach 2003) leads to an increase in mortality risks.

The latter part of the twentieth century saw a dramatic restructuring of these household, and inter-household, relationships (Lesthaeghe and van de Kaa 1986, van de Kaa, 1987). At the structural and behavioural level, this was typified, on the one hand, by a delay in childbearing and a reduction in fertility to considerably below zero population growth, and on the other by a proliferation of non-marital living arrangements, including single-person households; heterosexual and homosexual cohabitation, and separation, divorce and new household formation, through cohabitation or remarriage, creating complex household arrangements (Lesthaeghe & Neidert, 2006). The first demographic transition

reflected an important shift in the way individuals viewed their control over natural processes in general, and over procreation in particular, and in their willingness to adopt contraceptive practices (Lesthaeghe & Wilson, 1986). Similarly, the changes associated with the second demographic transition were themselves a reflection of an important ideational shift, in particular concerning gender relations – in turn deriving from the reduction in fertility and the growing participation of women in the labour market (Lesthaeghe, 1998). There is, however, a close relation between social structures and dominant values, and the prevalence of non-traditional household types itself feeds back on individual values and thus affects choices made by the next generation (Surkyn and Lesthaeghe, 2004).

The process is not homogeneous, however, and the particular patterns of household formation and structure which are observed are the outcome of a number of different factors. As a result, the behavioural and attitudinal characteristics of a population may not necessarily be synchronised in line with the components of the transition (Sobotka, 2008). Family systems are remarkably resilient, and evolve along their own lines as they adjust to, or even in interaction with, other elements of the social system such as work patterns and the gender relations they entail (McDonald, 2000; Garci, 2005). In particular, we cannot assume one pattern of household evolution or even an ultimate convergence of household types (Thornton, 2005).

What is true of countries can be no less true of sub-national populations. Households and families can be resources in the face of economic uncertainty (Fussell, 2004), but they may also be impediments to the realisation of gender equality (McDonald, 2000) and the interpersonal networks of those living alone are not necessarily any smaller or less dense than those available to people living in multi-person households (Buzar et al., 2005), though they may be qualitatively different. The restructuring of social relations, the renegotiation of traditional family and gender roles and inequalities, will thus take place at a different pace amongst different social groups, and the urban space will be partitioned according to the different patterns which have evolved among different sections of the population. Consequently, populations, defined in terms of their residential location, may be characterised by the distribution of household types and by their ideational composition and these may, in turn, be related to other characteristics of the population such as their level of mortality.

In the present analysis we test for a macro-level relation between family changes, characteristic of demographic transitions, and mortality, using local area data from Israel in the mid 1990's. As we shall see, Israel is particularly suited to this analysis due to the broad range of family structures and fertility levels (Friedlander and Feldman 1992) and the relatively high segregation of population types. The paper is divided into five sections. In section 2 we present evidence for the relation between family structure, fertility patterns and the level of mortality;

section 3 presents the data for Israeli statistical areas (SA) at the time of the 1995 census and proposes area-level indices of standard of living, traditional family structure and religiosity. Section 4 analyses male and female mortality in SA's as a function of these indices and the dominant population group (Jews or Arabs) and section 5 summarises our results and presents suggestions for further analysis.

Mortality and fertility transitions

The end of the 1960's and the early 1970's marked a watershed in the demographic history of most developed countries. Mortality levels, which in many cases had levelled out during the 1960's, began a renewed and steady decline; sex differentials in mortality, which had been widening, began to narrow in many countries (Trovarto and Heyen 2004), and fertility, which had been expected to cycle upwards following the post baby-boom decline, remained low and even continued to decline. Cohabitation increased, both as a precursor and as a substitute for marriage, leading to a decline in marriage rates and proportions married, and the proportions divorced, as well as those of extra-marital births, also increased. It is these changes in household structures and living arrangements, no less than the decline in fertility, which Lesthaeghe and van den Kaa have labelled the Second Demographic Transition. Others, on the other hand, have suggested that there is no necessary link between the changes in household structure and fertility levels (Coleman 2004). In particular, it has been noted, fertility is actually

lowest in Italy and Spain, where family ties are strongest and even, it has been suggested, *because* of the strong family ties (Livi-Bacci, 2001; Dalla Zuna, 2004).

Surprisingly, perhaps, there has been little to no attempt to consider the relations between fertility declines, and in particular, the household changes highlighted by the proponents of the second demographic transition on the one hand, and mortality changes on the other. On the face of it, the relation would appear to be positive: in those countries where second demographic transition is most in evidence, mortality has fallen the most and sex differences have narrowed the most. At most, we might say, this is a spurious relationship with both second demographic transition and mortality changes hinging on growth in material welfare. Yet there are a number of theoretical reasons to suggest that there might be a suppressor relation (Maassen and Bakker 2001, Shieh 2006) in which the positive correlation between economic welfare, mortality and second demographic transition variables hides a *negative* correlation between the last two, net of economic welfare.

Mortality is lower among the married than the unmarried, even though the particular form of this relationship may vary from one society to another (Hu 1988, Goldman and Hu 1993). 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 illness. Even if formal marriage has undergone deinstitutionalisation (Amato 2004) in the sense that the normative

proscriptions have grown weaker and there is a growth in legitimate alternatives, long-term partnership remains 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. It would appear, too, to be a condition that most adults are either in, or aspire to be in (Kiernan 2004). Moreover, as long-term employment is replaced by casualisation and other forms of serial and part-time employment (Therborn 1986, Tilly 1996, Gonos 1997) reducing employment, financial and health security (Kalleberg et al. 2000, McGovern et al. 2004); and as residential migration breaks up long term peer-attachments and strains the maintenance of face-to-face kin relationships (Glenn and Supancic, 1984, Glenn and Shelton, 1985), the couple-pair remains almost the sole true primary relation in which individuals 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. As Durkheim ([1897] 1951) noted, growing divorce rates create an anomic condition for those who are currently married, 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 deinstitutionalisation of the family, in the absence of alternative institutions of social integration and control, is liable to undermine longevity. As Durkheim noted, " . . . where families are smaller, weaker, less fertile, individuals, being less close to each other, leave gaps between them through which there blows the icy blast of egoism, chilling the heart and breaking the spirit," (Durkheim, [1888] 1992: 195). The critical variable is that of traditional family organisation: the extent to which life is organised around stable, multi-person living arrangements, usually in the form of family households. We argue that where such a normative arrangement (typified by a high rate of marriage, near universal childbearing, and a low rate of divorce) has been replaced by a more individualised, less stable pattern of inter-personal relationships, mortality rates will be higher than in other populations with a similar material standard of living. Our purpose in this article is to test this contention, using small local-area data from Israel.

Table 1 about here

Data: Israel Statistical Areas

In comparison with most other developed countries, demographic conditions in Israel presents an anomalous pattern. Mortality is at, or below, that of other countries with a comparable mean standard of living, but fertility remains relatively high and family formation patterns remain considerably more familial, with earlier and more lasting marriages, and a longer proportion of the fecund life span spent in marriage (Peres and Katz 1981, Fogiel-Bijaoui 2002).

This does not mean, however, that Israel is pre- or non-transitional. Table 1 presents comparative data for Europe and Israel, with a third column presenting data for the Occupied Palestinian Territories, as an example of a non-transitional society. Total fertility in Israel is higher than that for any European country, but considerably lower than for Palestine, and women's mean age at marriage (SMAM)[1] in Israel is at the lower edge of the European distribution, whereas for Palestine it is considerably below the European values. Marital levels (I_m)[2] (Coale, 196 9) for Israel are at the upper end of the European distribution, but are considerably below that for Palestine. However, even though a greater proportion of women are married, and therefore at risk of divorce, the level of divorce (I_d)[3] for Israel is in the lower half of the European distribution, and for Palestine considerably below it. The ratio divorced:married too, giving the saliency of divorce relative to that of marriage, in Israel is in the second quartile of the European range, but also considerably above that for Palestine.

Nonetheless, Israeli society is far from homogeneous with respect to fertility and family formation (Friedlander and Feldmann 1993), with some parts of the population considerably closer to the European pattern, well within the norms of second demographic transition, and others closer to the non-transitional pattern exemplified by its Palestinian neighbours. Our analysis will focus on 1,280 statistical areas (SA)[4] using data from the long questionnaire of the 1995 census, administered to 20 percent of households, together with a tabulation of all deaths by sex in each SA for the five years 1993 – 1997, and voting returns from the 1996 elections.[5] SAs range in size from 348 (in Eilat) to 29,010 (Um el-Fahm), with a median of 3,401 and an inter-quartile range of 2570 – 4334. Numbers of deaths, by sex, over the five years range from 1 to 252, with a median of 54 and an inter-quartile range of 33 – 81. On the basis of individual and household census data, we constructed areal measures of standard of living and traditional family structure in each SA; and we used census data together with voting returns to classify the SAs as Jewish or Arab, and the religiosity of the Jewish SAs. Mortality data were summed for each SA, by sex, and indirect standardisation was used as a control for the effects of age distribution on the crude mortality risk.

Table 2 about here

Mortality and Populations

Table 2 summarises the numbers of deaths, the total population and the mean ages, by sex, in the 1,280 SAs in the analysis. There were more male than female deaths, and the male population was smaller, so that even though the overall median age is almost three years younger for men than for women, the crude mortality rate is 0.6/1000 higher for men than it is for women. Life expectancy at birth in Israel in 1995 was 75.5 years for men and 79.5 years for women (Central Bureau of Statistics 1997, Table 3.19). The published crude death rate was 6.6/1000 for men and 6.2/1000 for women (ibid, Table 3.21) and the published median ages were 26.9 and 28.0 for men and women respectively (Central Bureau of Statistics 1996, Table 2.10).

Given the small population sizes and small numbers of deaths in each SA, we measured mortality, for males and females separately, by the Standardised Mortality Ratios (SMR), by sex, for each SA, using as our standard the age-specific mortality rates for Israel as a whole in 1995, in 5-year age groups up to age 75 and above (Central Bureau of Statistics, 1997, Table 3:19). Population counts were taken from the 1995 census (raw data from Central Bureau of Statistics) and mortality counts were the total numbers of deaths, by sex, in each SA over the five years around the census, 1993 – 1997 (data provided by the Central Bureau of Statistics). The male and female SMR for each SA were calculated in the usual way,

multiplying population counts by the national age specific mortality rates for each age group, and dividing the total number of deaths observed by the total number expected based on the national mortality rates. As observed deaths cover five years, 1993 – 1997, we divided the total by five to obtain an annual SMR. The final row of Table 2 presents SMRs for the total male and female populations in our analysis. As is to be expected, there is a clear female mortality advantage, with male mortality 17 percent above the national average, and female mortality 13 percent below this average.

Standard of living indicator

We combined a number of indicators, at the individual and the household level, to create a composite index of the mean standard of living (SOL) in each SA. Our purpose was to create an index that was unequivocally unidimensional, and would reflect the mean level of local residents' access to material resources. At the same time, given the purpose of this study, it was important not to include demographic corollaries of income, such as fertility, and contextual covariates, such as origin group, which, in the Israeli context, are statistically correlated with income (Khattab, 2005) even though there is no necessary intrinsic relationship between the two variables (for an alternative approach see Burck and Feinstein 2000). The calculations were based on individuals aged 25 – 60 and on households in which the identified head of household was aged 25 – 60. The indicators used were:

1. Average number of household amenities (out of: car, video recorder, microwave oven, air conditioner, personal computer, dishwasher and clothes dryer).
2. Mean household income per standard person (logged), computed as total household income divided by (number of people in the household)$^{0.38}$ (Rogers 1995).
3. Mean number of years education in the population
4. Proportion working (logit)
5. Proportion of those working in managerial or professional occupations (logit)

Table 3 about here

The distribution of the raw variables is given in table 3a, which shows the very broad range of values, from areas with very low education, work levels and income, to those in which most adults have university degrees and work in high prestige occupations with a high income. The index was created by summing the standardised values (Cronbach α = 0.934, first eigenvalue = 3.95 (79.4%), second eigenvalue = 0.481). Scale values ranged from –3.87 to 2.09, with mean = 0 and standard deviation = 0.892.

Traditional Family Structure Scale

In a similar manner we created an index of traditional family structure (TFS): the extent to which households were traditional, child bearing, family households. As with the SOL index, our purpose was a unidimensional measure of the absence of the second demographic transition syndrome: large households, high and early levels of nuptiality, low divorce, and high fertility. The index was composed of the following indicators:

1. Child-Women Ratio – number of children relative to women aged 15 to 49[6].
2. Average household size
3. Ratio divorced:married women (square root) (reversed)
4. Marital index (I_m)
5. Mean age at marriage (SMAM) (reversed)

Distributions of the raw values of these variables are presented in Table 3b. Comparison with Table 1 shows that while the lower quartile of SAs (upper quartile of divorce ratio and SMAM) is well within the European pattern of second demographic transition, the centre of the distribution (quartiles 2 and 3) is considerably above the European pattern, and the upper quartile is far more typical of a non-transitional society. As with SOL, the index was created by summing the standardised values (Cronbach α = 0.883, first eigenvalue = 3.43 (68.6%), second eigenvalue = 0.877). Scale values ranged from –3.51 to 2.71 with mean = 0 and sd = 0.826. The TFS scale correlated –0.416 with the Standard of Living scale.

3.4 Religiosity and Population Group

A number of studies (Goldbourt and Yaari, 1993, Friedlander et al. 1995, Hummer et al. 1999, Jaffe et al. 2005) have indicated a negative correlation between religiosity and mortality, and, in the Israeli context, a lower mortality for Jews than for Arabs (Chernichovsky and Anson 2005, Central Bureau of Statistics 2007, Table 3.22). At the same time, both religiosity and population group in Israel have been identified as the major explanation for high fertility in Israel (Kupinsky 1992, Okun 2000, Landau 2003, but see also Anson and Meir 1996, Fargues 2000). Could it be, then, that our measure of family solidarity is merely a reflection of the level of religiosity in the SA?

Population group may easily be identified given the almost total residential segregation between the Jewish and Arab populations in Israel. Of the 1,280 SAs, 1,117 (87.3 percent) have over 95 percent Jewish population; 99 (7.7 percent) have over 95 percent Arab population, and fewer than five percent (63) are in between, with most of these being predominantly (over 75 percent) either Jewish or Arab. Altogether, we identified 1,618 Jewish SAs and 112 Arab SAs.[7]

Jewish religiosity, on the other hand, is not so straightforward. Previous studies have largely focussed on the proportion voting for Jewish religious parties in national elections[8] (Friedlander et al. 1995, Jaffe et al. 2005), but, as they note, this gives no more than a lower bound for the proportion of religious adults in the SA and, we would argue, a fuzzy one at best. Even if most people voting for

religious parties are religiously observant Jews, there are also important cases where non-religious people, or even non-Jews, vote for religious parties. In our sample of 112 Arab SAs, for example, the proportion voting for religious parties in the 1996 elections ranged from less than one percent to over 28 percent[9], and in seven localities (all of them predominantly Druze) there were more than 10 percent of votes for (Jewish) religious parties.

To make our identification of Jewish religiosity more robust, we therefore included a second variable, the proportion of men (aged 25-60) who had studied at a *yeshiva* (religious school or seminary). This variable has its pitfalls too – not all currently orthodox people attended a *yeshiva* in their youth, and of those who did, not all are practising orthodox Jews today. The correlation, in the Jewish SAs, between the logit proportion voting for religious parties and the logit proportion who studied in a *yeshiva* was 0.690. We created a religiosity scale by taking the mean of these two proportions, transformed to logits for symmetry. The bulk of the statistical areas were distributed symmetrically around a median of –1.60, with a long upper tail of 78 ultra-orthodox SAs, mostly in Jerusalem and Bnei Braq. To this score we added 1.60 to centre the main distribution at 0. Unfortunately, we have no comparable data to create religiosity scales for the Arab populations, and these locations were assigned a score of 0 on this scale, together with the identifier dummy variable for the Arab SAs.

Analysis

Figure 1 about here

Before presenting our full analysis of the relation of mortality to the material and social conditions in the SAs, we consider the relations among the standardised mortality ratios (logged) and the three predictor variables, Standard of Living, Traditional Family Structure and Religiosity (Figure 1). The main bodies of the distributions are symmetrically distributed, though each one does have a small proportion of cases located in an extended tail. We note in particular the spike at zero of the Religiosity scale, reflecting the artificial concentration of Arab SAs at this value, and that the lower tails of the mortality distributions are composed of SAs with small populations and very small numbers of expected deaths (details not shown). As explained below, we shall control for possible biases by weighting the analysis on the total number of expected deaths in each SA. In general, mortality declines with SOL, in particular for males, but there is no direct relation between TFS and mortality. For Religiosity, both male and female mortality would appear to increase slightly as Religiosity rises, at the low end of the Religiosity distribution, but both then level off. There is no collinearity between the three predictor scales, though at low levels of SOL, TFS does tend to decline as SOL increases. For the ultra-orthodox SAs, those with a very high level of Religiosity, this scale is negatively correlated with SOL and positively correlated with TFS.

Taken overall, however, Religiosity and TFS are clearly not two expressions of the same phenomenon. There is a close relation between male and female mortality in the SAs, but they are not identical: the correlation between them is 0.72, and in the main body of the distribution (log male SMR > -1.5 and log female SMR > -2.0), the correlation between them is 0.68. We thus cannot treat them as one phenomenon, and our analysis will consider the effects of the predictor values on the male and female SMR values separately.

Multivariate analysis

As we are analysing deaths for males and females within the same SAs, we use a Seemingly Unrelated Regression model (Felmlee & Hargens, 1988; Henningsen & Hamann, 2007; R Development Core Team, 2008) to control for correlated errors. Our dependent variables are the log(SMR) for males and females in each SA. In view of the diversity in population size and the number of deaths in the SAs, and hence the reliability of the indicators and the SMRs, the analysis was weighted by the expected number of deaths for each sex[10].

Table 4 about here

Table 4 presents the SUR regressions for male and female mortality in the 1280 SAs in the years 2003 – 2007. At the baseline (Jewish population with mean levels of standard of living, traditional family structure and religiosity) male

mortality is three and a half times the national average and female mortality about a sixth the average. Arab baseline mortality does not differ significantly from Jewish mortality, for men or for women. As Standard of Living rises, mortality declines, and the same is true for Traditional Family Structure and Religiosity, in decreasoing order of importance For males the effect of SOL and THS are both significantly greater than for females, though for Religiosity they are about the same.

Our analysis shows, therefore, that, using indirect standardisation to control for the age distribution of the population, all three social characteristics of Statistical Areas have a significant mortality reducing effect, for men and for women. Nonetheless, the correlation between the residuals remains high, 0.614, compared with a weighted correlation of 0.707 between male and female log(SMR), so clearly there is much that remains unexplained in the levels of mortality in the Statistical Areas.

Conclusion

There is no simple relationship between the development of industrial, and post-industrial society, levels of mortality, of fertility, of migration and patterns of household formation. Clearly, however, a relationship exists. A population's demographic characteristics form a set of interrelated processes, and these in turn are embedded within, and form part and parcel of, the set of broader social

relations (Gregory and Piché 1985). Mortality declines open the road to a decline in fertility (Caldwell and Caldwell 1997, Mason 1997) as well as in the extension of time spent studying and the growth in human capital (Goldscheider 1971). Declining fertility, rising real incomes, and the growth of non-physical occupations enable a growing integration of women into the labour market, on an ever-more equal footing with men (a process which is still far from complete) and this in turn leads to a breakdown in traditional male and female roles, in the household and beyond. Declining mortality, and a growing dependency on individual earnings as the source of life's necessities leads (or at least enables) a breakdown in extended-family interdependencies (godfather arrangements) and a growing sense that the household is a meeting of individuals, based on personal choice and convenience, rather than a necessity tying extended families into a web of inter-relationships. And the extension of education into the late 20's and even beyond can lead to the postponement of official couple formation and the growth of the single-person household as an acceptable living arrangement.

These processes, in particular those of changing households and living arrangements, may or may not be reversible (Coleman 2004), they certainly cannot be turned around at will, nor by religious or governmental decree. They are immanent social developments, a social reality which imposes itself on individuals no less forcefully than the laws of physical nature (Durkheim, [1895] 1964). Caught in the constant tension between the security of a strong family environment, and

the freedom of individual self-expression (Bauman, 2001), society members reproduce and recreate, but also alter and transform, this reality through the decisions they make and the actions they undertake. Market capitalism engenders an ever-growing standard of living, at least for those who are part of this market economy, and thus reduces the risk of mortality. At the same time, however, the market economy gives rise to a process of individuation in which marriage comes to be viewed as a trade or employment contract (McCrate 1987), and children are evaluated in the same manner as consumer goods (Becker 1960, Easterlin & Crimmens 1985). Family formation focusses on individual utility considerations, rather than being social behaviour, a response to a social command whose "utility" is in the joy of parenthood and in the social bonds it creates (Blake 1968, Schoen et al. 1997). As van Krieken (1997) notes, there is a basic contradiction between family and children on the one hand, representing unexchangeable primary relationships, and market capitalism on the other. This contradiction expresses itself in married women's growing participation in the (paid) labour force, while still undertaking the bulk of domestic labour (Sullivan 2000). A variety of household living arrangements are created, substituting the elation, but also the anomie, of choice for the solidarity inherent in the stable union, and without creating any viable alternative. Yet this solidarity, the reality of attachment to an enduring, close network of significant others, is a basic human need, and its loss results is an increase (or a lesser decrease) in mortality. At what ages this increase occurs, and

whether it can be attributed to any specific cause or set of causes, is something we must leave for further inquiry.

This analysis also brings out a number of important differences between the conditioning of Jewish and Arab mortality in Israel. Overall, there is a consistent difference of about two years in life expectancy between these two populations (Central Bureau of Statistics 1997, Table 3.19). Our analysis suggests that this disadvantage is a result of the lower SOL in Arab localities, offset by the more traditional family structure. The population-weighted average SOL in Arab SAs is –1.352 and in Jewish SAs is 0.110 ($t_{1277} = 24.4$, $p < 0.001$), a difference of 1.46 points which should make Arab mortality 16 percent higher than Jewish mortality for men ($0.903^{-1.462} = 1.16$) and 14 percent higher for women. On the other hand, however, the population-weighted average TFS scale is 1.23 in Arab areas and –0.017 in Jewish areas ($t_{1277} = 25.8$, $p < 0.001$), a difference of 1.25 points, which should make Jewish mortality 7.5 percent higher than Arab mortality, for men and for women (we ignore for the moment the effects of covariation between the two scales). As a result, the Arab – Jewish mortality gap is much smaller than it might otherwise be. Doubtless, the differences between these two groups go considerably beyond their different levels of affluence and patterns of social organisation. However, in order to understand these differences, and their relation to levels of mortality, we must go beyond the Israeli cross-section and look at the mortality

patterns and responses of other marginalised minorities, and of culturally similar groups in the Middle East and beyond.

The current work has been limited to a cross-sectional analysis of mortality at the population level within one country. We have shown that, net of the well-known effects of material standard of living and religiosity, local areas with non-traditional family structures, those household patterns typically associated with the Second Demographic Transition, have significantly higher mortality than those areas with a more traditional family pattern. Subsequent work will need to look at these effects to see if they are reproduced historically, in national and regional historical declines, as well as considering how much of this is a sum of individual effects – with those in traditional households having lower mortality than others – and how much can be attributed to the different pattern of social relationships in populations with a familial, as opposed to a more individualistic, pattern of household living arrangements.

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Endnotes

1. The Singulate Mean Age at Marriage (SMAM) is a life-table like measure of the expected age at marriage, based on the average number of years spent single by women who eventually marry (Hinde, 1998: 89-91).

2. I_m is an index of the proportion of her fecund life during which the average woman is married (Coale, 1969). If $f(h)_i$ is the fertility schedule of Hutterite women, effectively the highest level of fertility reliably observed in any human society, and x_i the number of women in each age group from 15-19 to 45-49, then $\Sigma f(h)_i \cdot x_i$ is the maximum number of children which could be born to women in the population X. Let x_i^m be the number of married women in each age group, and x_i the total number of women in each group, then

$$I_m = \frac{\sum_i x_i^m \cdot f(h)_i}{\sum_i x_i \cdot f(h)_i}$$

is the maximum number of children which all married women could bear relative to the maximum number of children which all women in the population could bear, or, in other words, the proportion of married women in the population, weighted by their age-specific fecundity, or ability to give birth.

3. We define I_d in a manner analogous to the definition of I_m. If f_i are the age specific marital fertility rates for the Hutterite population in each 5-year age

group from 15-19 to 45-49; d_i the number of women currently divorced in each age group and p_i the total number of women in each age group, then I_d is defined as:

$$I_d = \frac{\sum f_i d_i}{\sum f_i p_i}$$

and represents the proportion of her fecund life that the average woman will spend in the divorced state.

4. Our analysis excludes Arab SAs in East Jerusalem and the Golan Heights and Jewish settlements in the Palestinian areas occupied by Israel in 1967.

5. All data were provided by the Central Bureau of Statistics, Jerusalem and the Israel Social Science Data Center (ISDC), Hebrew University, Jerusalem.

6. CWR is childbirth over the past 5 years, while Total Fertility is childbirth over the lifetime, so 7*CWR gives a *very* approximate estimate of TF.

7. In 19 of the Arab local authorities, the mortality data provided were not broken down by SA, and these authorities were analysed as whole units. We compensate for this reduction in the number of Arab areas by weighting the analysis, relative to the number of deaths in each unit.

8. Israeli elections are based on direct proportional representation, in which each party presents a slate of candidates, and the number of Members of *Knesset* (Parliament) elected is directly proportional to the number of votes cast for each party.

9. Almost enough to be classified by Jaffe et al. (2005) as a (Jewish) religious community!

10. The system of equations to be estimated is:

$$\log SMR_i^m = b_0^m + b_A^m A_i + b_S^m SOL_i + b_T^m TFS_i + b_R^m R_i$$

and $$\log SMR_i^f = b_0^f + b_A^f A_i + b_S^f SOL_i + b_T^f TFS_i + b_R^f R_i$$

where

$_i$ indicates the values for the ith Statistical Area
SMR is the Standardised Mortality ratio for males (SMR^m) and females (SMR^f) respectively;
A_i is a dummy variable, 1 for Arab SAs and 0 for Jewish SAs
SOL_i is the measure of Standard of Living in SA_i
TFS_i is the measure of Traditional Family Structure in SA_i

R_i is the measure of Religiosity in SA_i and
ED_i is the total annual expected number of deaths in SA_i for males and females combined.
This is equivalent to estimating:

$$\log SMR_i^m \cdot ed_i = b_0^m \cdot ed_i + b_A^m A_i \cdot ed_i + b_S^m SOL_i \cdot ed_i + b_T^m TFS_i \cdot ed_i + b_R^m R_i \cdot ed_i$$
$$\log SMR_i^f \cdot ed_i = b_0^f \cdot ed_i + b_A^f A_i \cdot ed_i + b_S^f SOL_i \cdot ed_i + b_T^f TFS_i \cdot ed_i + b_R^f R_i \cdot ed_i$$

where $ed_i = \sqrt{ED_i}$

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Table 1: Comparative Fertility and Nuptiality Indicators: Europe, Israel and Palestinian Aurhority circa 2001

Indicator	Europe[1]	Lower Quartile Median Upper Quartile	Israel	Occupied Palestinian Territory
TFR[2]	1.3 1.4 1.8		2.9	5.1
SMAM[3]	25 26 30		25	22
I_m [4]	0.391 0.485 0.518		0.565	0.686
I_d [5]	0.0286 0.0486 0.0623		0.0396	0.0113
Divorce: Married ratio [6]	0.0716 0.130 0.194		0.0911	0.0200

1 27 states of European Union, plus Norway and Switzerland

2 Source: United Nations Department of Economic and Social Affairs, Statistics and indicators on women and men, http://unstats.un.org/unsd/demographic/products/indwm/tab2c.htm, accessed 18 November 2007.

3 Source: United Nations Department of Economic and Social Affairs, Statistics and indicators on women and men, http://unstats.un.org/unsd/demographic/products/indwm/tab2b.htm, accessed 18 November 2007. European data do not include Germany.

4 Coale's marital index (approximate proportion of fecund life the average woman spends married) (Coale, 1969). Source: United Nations Department of Economic and Social Affairs, Demographic Yearbook Special Census Topics, Table 3: Population by marital status, age, sex, urban/rural residence: each census, 1985-2004, (released: 30 June 2006) http://unstats.un.org/unsd/demographic/products/dyb/dybcens.htm, accessed 18 November 2007. European data do not include Belgium and Malta.

5 Adaptation of Coale's marital index to divorce, see text. Source: as I_m

6 Ratio number divorced:number married

Table 2: Population and Mortality Data

	Males	Females
Deaths (5 years)	78,675	74,650
Population	2,296,487	2,391,833
CDR (annual)	6.85/1000	6.24/1000
SMR	1.169	0.868

Data refer to 1280 statistical areas included in the analysis.
Source: Author's calculations from raw data.

Table 3a: Variables in Standard of Living Indicator

Variable	10th percentile	Lower Quartile	Median	Upper Quartile	90th percentile
Household Amenities[1]	1.63	2.24	3.09	4.01	4.81
Mean Income Per person[2]	3114	3862	5179	6718	8039
Mean Years' Education	10.5	11.7	13.0	14.3	15.4
Percent Working[3]	59.4	71.5	80.3	85.8	89.2
Managerial / Professional[4]	3.69	6.59	11.7	19.9	30.3
Standard of Living Scale	–1.17	–0.679	0.00366	0.689	1.19

Notes: 1. Average number out of car, video, microwave, air conditioner, personal computer, dishwasher and clothes dryer
2. Total household income, September 1995, in Israeli Shekels, divided by (Household size)$^{0.38}$. US$1 ≈ ILS3.05
3. Percent of population aged 25 – 60 in labour force or studying.
4. Percent of working population in managerial or professional occupations (as defined by census returns)

Author's calculations. For data source and variable definitions, see text.

Table 3b: Variables in Family Solidarity Indicator

Variable	10th percentile	Lower Quartile	Median	Upper Quartile	90th percentile
Child - Woman Ratio[1]	21.3	26.4	34.0	46.5	72.9
Household Size	2.12	2.66	3.15	3.64	4.33
Ratio Divorced: Married[2]	2.24	5.79	9.66	14.2	19.2
I_m	0.420	0.492	0.558	0.627	0.693
SMAM[3]	21.8	23.4	24.9	26.4	27.8
Family Soldarity Scale	–0.823	-0.443	-0.077	0.399	1.10

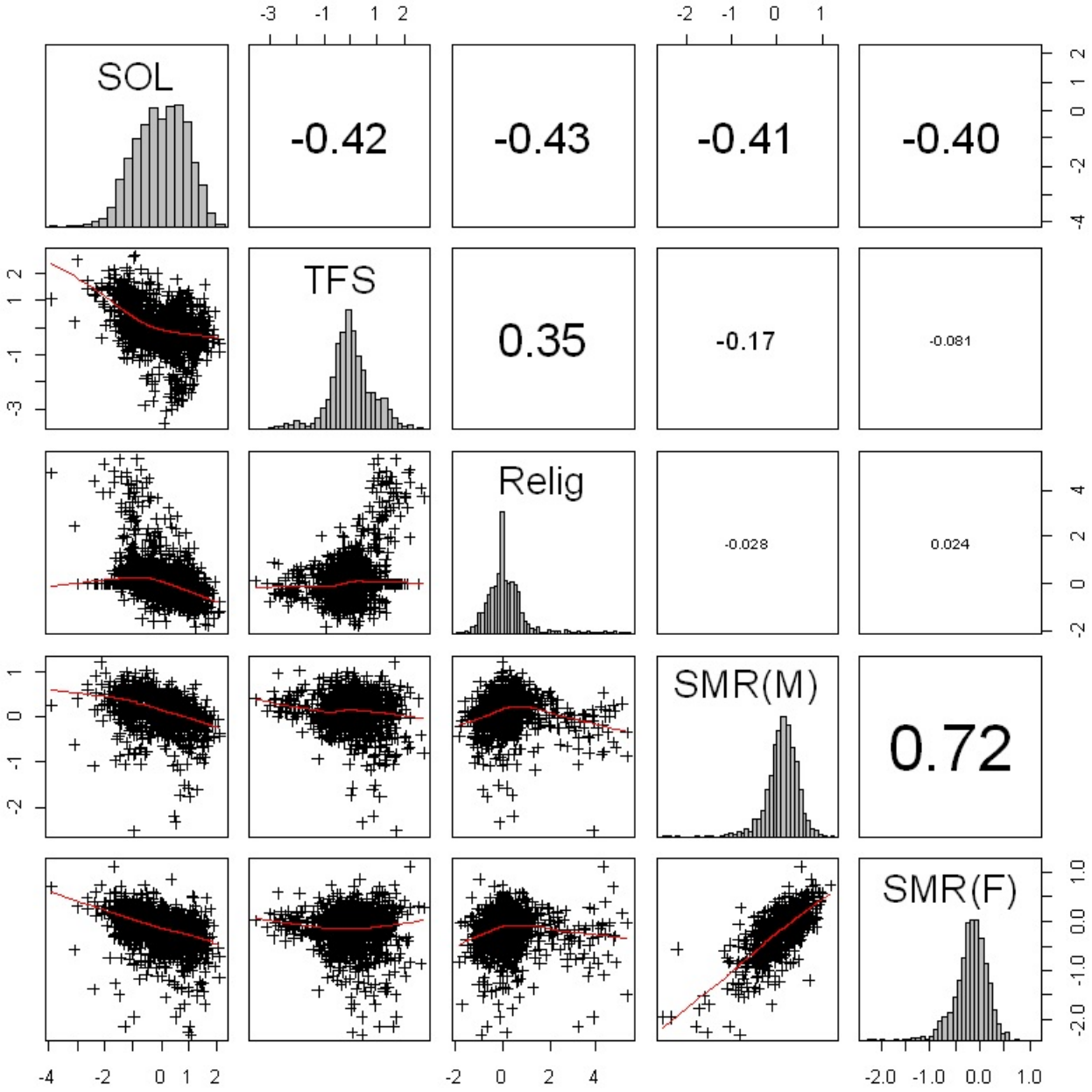
Notes: 1. Children aged 0 – 4 per 100 women aged 15 – 49
2. Total number of women divorced in the population, per 100 married women in the population
3. Calculated from proportions single at each age group.

Author's calculations. For data source and variable definitions, see text.

Table 4: Seemingly Unrelated Regression Models, Male and Female log(SMR) in 1280 Israeli Statistical Areas

Variables	Male Model		Female Model	
	Coefficients (Std. Errors)	Rel. Risks (95% CI)	Coefficients (Std. Errors)	Rel. Risks (95% CI)
Intercept	1.275 (0.0840)	3.577 (3.033, 4.218)	–1.877 (0.0992)	0.153 (0.126, 0.186)
Standard of Living (SOL)	–0.252 (0.0106)	0.778 (0.762, 0.794)	–0.214 (0.0126)	0.807 (0.788, 0.827)
Traditional Family Structure (TFS)	–0.139 (0.0102)	0.871 (0.853, 0.888)	–0.0806 (0.0120)	0.923 (0.901, 0.945)
Religiosity (R)	–0.0587 (0.00927)	0.943 (0.926, 0.960)	–0.0482 (0.0109)	0.953 (0.933, 0.974)
Arab SA	–0.00500 (0.0350)	0.995 (0.929, 1.066)	0.0692 (0.0413e)	1.072 (0.988, 1.162)
Equation R^2	0.347		0.225	
Correlation between residuals	0.614			

Figure 1: Standard of Living, Family Solidarity, Religiosity and (log)Mortality in 1,280 Israeli Statistical Areas (SA)



Data from census, 1995, 20% sample; voting returns 1996 elections and mortality data by SA provided by Central Bureau of statistics. Scales are Standard of living (SOL), Traditional Family Structure (TFS), Religiosity (Relig), and logged SMR for males and females (SMR(M) and SMR(F)). For description of scales and details of construction, see text.