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Cecilia Tomassini
Università del Molise

Douglas A. Wolf
Syracuse University

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SHRINKING KIN NETWORKS IN ITALY DUE TO SUSTAINED LOW FERTILITY

Cecilia Tomassini and Douglas A. Wolf

Center for Policy Research
Maxwell School of Citizenship and Public Affairs
Syracuse University
Syracuse, New York 13244-1020

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Abstract

Among the closely watched demographic trends of the late 20th Century is a pronounced drop in fertility rates throughout much of the world. Italy presents a particularly interesting case for study: in 1960, Italy's total fertility rate (TFR) was 2.41; by 1995 it had fallen to 1.17. According to United Nations projections, by 2050 Italy will be the second oldest country in the world, with 3.4 persons aged 60 or older for each person under age 15. Besides overall population aging, another implication of sustained low fertility is smaller families and kin groups. We investigate the consequences of projected changes in Italy's birth and death rates on the composition of kin groups using microsimulation techniques. Using a starting population taken from the 1994 "Indagine Multiscopo sulle Famiglie" survey and projected rates of mortality and fertility by age and parity produced by the Italian Institute of Statistics, we simulate the path of kin-group patterns in Italy during the period 1994-2050. While we reproduce the aggregate population patterns found in official projections, we conduct our estimates at the "micro" level, keeping track of the relationships between individuals, which underlie kin group patterns. We show the effects of the demographic trends on the existence of daughters and sons for older mothers, on the number of sisters and brothers with whom an adult woman could share the responsibilities of caring for an elderly mother, and the effect of the joint action of the increase in longevity and the mean age at fertility on the proportion of adult women with a living mother.

1. Introduction

Among the closely watched demographic trends of the late 20th Century is a pronounced drop in fertility rates throughout much of the world. According to the 1998 revision of World Population Estimates and Projections produced by the United Nations (UN), during 1995-2000 the estimated total fertility rate (TFR) will be below the replacement level of 2.1 in 61 countries of the world (United Nations 1998, p. 23). As a consequence, the rate of growth in the world's population has declined considerably in comparison to earlier decades; under some arguably "reasonable" assumptions about future levels of fertility and mortality, world population may begin to decline early in the 21st Century.

Italy presents a particularly interesting case for study. In 1960, Italy's TFR was 2.41; by 1995 it had fallen to 1.17. In *World Population Estimates and Projections*, the UN's estimate of Italy's TFR for 1995-2000, 1.20, placed it ahead of only three other countries (the Czech Republic, Romania, and Spain). More recent publications indicate that Italy's TFR has remained stable at around 1.2 children per woman (ISTAT 1999).

One of the most important demographic consequences of sustained low fertility is population aging, whether measured as an increase in the percentage of elderly or in the median age of the population. In this regard, the UN projects that by 2050 Italy will be the second oldest country in the world, with 3.4 persons aged 60 or older for each person under 15 years of age; this is a level exceeded only by Spain (United Nations 1998).

A second demographic implication of sustained low fertility is smaller families and kin groups. Eberstadt (1997) speculates on the political, economic, and social implications of the negative population growth and profound population aging, implied by the UN's 1998 "low variant" projections. He concludes that it is "... almost impossible today to imagine..." the implications of projected changes in family composition, to "... a world in which the only biological relatives for many people—perhaps most people—will be their ancestors" (Eberstadt 1997, pp. 20-21). Using Italy as an example, Eberstadt claims, without describing the methodological basis for his claim, that if Italy's currently low TFR is extended to 2050, "...almost three-fifths of the nation's children will have no siblings, cousins, aunts, or uncles: they will have only parents, grandparents, and perhaps great-grandparents" (Eberstadt 1997, p. 21).

Demographers are well equipped with methodological tools for calculating the size and the distribution by age and sex of the population in the future, given a set of assumptions concerning future levels of fertility, mortality, and migration, the three fundamental processes underlying population change. Recently, Italy's National Institute of Statistics (ISTAT), produced a new set of such projections (ISTAT 1997).

Like the United Nations, ISTAT assumes that cohort fertility will remain low; their main variant assumes that recent cohort fertility trends will continue in the future and the cohorts of women born after 1980 will exhibit a childlessness prevalence of 25 percent. A further assumption is that the process of postponing the beginning of childbearing for the actual cohorts will continue; in other words, the mean age of childbearing will increase. However, a partial recovery of fertility after age 30 is expected. As a result, the cohort fertility rate for women born after 1980 is projected to be 1.45; the period TFR will rise to the same level in 2020.

Regarding survivorship, the ISTAT projections assume a continuation of trends recorded during the 1970s and the 1980s; according to the main variant, in 2020 life expectancy will be

78.3 years for males and 84.7 for females. After 2020 the mortality trends are assumed to remain constant (ISTAT 1997).

These projected changes in Italy's population are an aggregation of diverse changes at the individual and family level. In the population of 2050, whose aggregate features were described above, there will be some childless women, as well as women who are the mothers of several children. Some middle-aged persons will have no living parents, while others will have one or both parents still alive, and may or may not share the potential for receiving support from, or providing support to, those parents with one or more siblings. Projections of family patterns—of the age and sex composition of kin groups—require techniques that go well beyond conventional demographic projection methods. Most attempts to project kin structures use some type of microsimulation approach. The essence of microsimulation is the representation of the population at the individual level and the use of probabilistic rules to assign the values of otherwise unknown attributes.

Our paper uses microsimulation to study the path of kin-group patterns in Italy during the period 1994-2050. While we attempt to reproduce the aggregate population patterns found in the recent ISTAT projections, we conduct our projections at the individual, "micro" level, and keep track of the relationships between individuals that give rise to various kin-group patterns. Our results provide a rather more optimistic view of Italy's future with respect to the size and composition of families than Eberstadt's (1997), although we confirm the more general expectation that kin groups in Italy will be much smaller in the future than they are at present.

2. Microsimulation in Demography

As noted above, the two key features of a microsimulation are the use of the individual as the fundamental unit of analysis and the use of probabilistic rules or algorithms to assign otherwise unknown, or unrecorded, variable values to those individuals. The usual justification of the microsimulation approach is a desire to analyze phenomena for which data are unavailable: either the data has not been collected, or cannot be collected, directly. For any attempt to project populations into the future, direct measures of the variables of interest are of course unavailable. Microsimulation has, in fact, been used to conduct an otherwise conventional population projection (Nakamura and Nakamura 1978). An extended discussion of issues relating to the use of microsimulation in population projections can be found in Wolf (1997).

Microsimulation has been used to analyze the dynamics of complex models of human reproductive behavior, taking into account unobservable, or incompletely observed, underlying phenomena such as coital frequency, temporary sterility, and spontaneous abortion (Ridley and Sheps 1966; Barrett 1971). Microsimulation may also be appropriate when investigating a hypothetical demographic situation: reproductive behavior in the presence of a proposed family-planning program, for example (see Inoue 1977 for an example of this use of microsimulation). For a more thorough discussion of demographic applications of microsimulation, see Post and van Imhoff (1998).

Two broad classes of probabilistic variable-assignment approaches can be identified. The first is a “Monte Carlo” approach, in which the probability distribution for the outcome of interest is computed, and then a particular value of the outcome variable is assigned through random sampling from the outcome space using the computed probabilities. For example, in a microsimulation an individual of a given age and sex might face the events "die during the next year" (D) with probability p and "survive to the end of next year" (S) with probability $1–p$. The computer can be programmed to, in effect, "flip a coin" one time, such that the chances of the events "D" and "S" are p and $1–p$, respectively. The microsimulation program will assign the randomly selected event to the individual accordingly.

A second approach to assigning values in a microsimulation is the use of random matching or imputation techniques. Here, data from two different samples provide different sets of observed variable values, with some variables appearing in both sources. Variables not measured in one source can be imputed, by randomly selecting from the other file a record judged to be a "suitable" match, on the basis of some specified matching criterion, and adding to the first data record the values found in the randomly-selected record from the second data source. The random-matching variety of microsimulation is, necessarily, confined to studies of existing populations, and thus has a limited role in population projections.

Microsimulation has been extensively used in demographic studies of kin groups (see De Vos and Palloni 1989; Smith 1987; Wachter 1987), since it is rare for a Census or household-survey to collect much information on the existence and attributes of relatives outside the enumerated, or surveyed, households. Consequently, it is difficult or impossible to compute indicators of kin-group size and composition using available data. Existing approaches to the microsimulation of kin groups can be placed into four categories. The first is "static" simulations, in which cross-sectional representations of kin structures are simulated. Examples of this type of simulation are Ruggles (1987), who recreates kin networks for a historical period using probabilistic assignment rules, or Goldstein (1996), who creates simulated kin networks for the contemporary United States using random record-matching techniques.

The other three types of kin microsimulations are "dynamic" rather than static—that is, the simulation algorithm involves the passage of simulated time. One such type is the "stable" kin simulation found in Wolf (1988) or Tu, Freedman, and Wolf (1993), in which fixed schedules of mortality and fertility rates are maintained throughout the simulated period; this approach produces kin distributions for hypothetical populations, and are analogous to the stable-equivalent populations implied by period life tables. Finally, there are two classes of kin microsimulations that attempt to accurately reflect the dynamics of real populations. "Historical" dynamic microsimulations begin with a birth cohort from far in the past, and simulate the lines of descent from the original cohort for many decades of simulated time, using as input data the actual birth and death rates for the time periods covered by the simulation. The leading examples of this category of microsimulation are found in the work of Wachter and his colleagues (Hammel, Wachter, and McDaniel 1981; Wachter 1997). In contrast, "prospective" microsimulations take as their starting point a cross-sectional micro-sample of kin groups from a real population, and project forward the lines of descent, and therefore the dynamics of those kin groups, from that starting point. A recent paper by Goldstein and Wachter (1999) outlines such an approach. We have also adopted the prospective approach in the present study. A shortcoming of the prospective approach is that the degree of detail with which the kin groups can be represented is limited by the detail found in the cross-sectional sample that serves as the starting point for the simulation. As will be discussed below, our simulations of Italian kin networks are limited in this way.

3. Methods

The key ingredients of a microsimulation are a starting population, which takes the form of a sample of individual-level data records, and a set of rules for assigning future life events to the individual members of the starting population. The special needs of studying kin groups necessitate that the data base containing the starting population includes codes that indicate the relationships between individual members of the population, such as ties of blood and marriage. It is also necessary to implement these rules for assigning simulated data values in some sort of algorithm, generally in the form of a computer program.

In this section we discuss each of these elements of our microsimulation methodology in turn. We note, at the outset, that the scope of our simulation is modest in comparison to the work of others, such as Wachter (1997). In particular, we have confined our depiction of kin groups to the mother, siblings, and children of the individuals whose lives are simulated. This restriction reflects limitations imposed by the survey data we use to create our starting population. We do not attempt to simulate marriage, divorce, and widowhood, and are therefore unable to simulate the survivorship of fathers and the offspring of men. Consequently, we discuss changes in kin patterns from the perspective of women when presenting our results.

Starting Population

Our starting population comes from the 1994 “Multiscopo” survey conducted by ISTAT. The sampling unit is the de facto household associated with households selected from the country’s Register of Population, not including the institutionalised population. A wide variety of topics are covered by the survey, including household structure, demographic variables, living and health conditions, and leisure time. The 1994 survey collected data from 61,053 respondents.

The source data contains data records for individuals, grouped into households. However, our simulation of kin groups requires that we have records on individuals grouped into families. We have created family groupings as follows: for each member of the family nucleus—that is, parent[s] plus child[ren]—we have checked the position inside the family (isolated members, fathers, mothers, and children). Every mother has an identification number (ID) and a variable indicating her number of living children. Each child has an ID number as well as the ID of his or her mother, except that individuals who are not living with their mother do not have a mother's identification number.

In the 1994 Multiscopo survey women were asked to provide details about their living children—that is, the number of living children, and sex of each child (up to three). However, women under age 45 were not asked those questions. For the younger women we simply determined the number of children by counting those children living in the family nucleus. Due to the fact that Italian children tend to leave their parental household at relatively late ages (Billari and Ongaro 1998), the number of children lost because they are not coresiding with parents is negligible. In particular, among individuals 0-19 years old in our starting population, 98.7 percent are living with their mother. Among those 20-24 years old, 85.1 percent are living with their mother. The information included in the survey also allows us to calculate the number of siblings for each child in the family.

Thus the data base that represents our starting population contains 61,053 individuals grouped into 21,462 families. The records in this file are quite simple, containing an identifying number, sex, age in 1994, and (except as noted above) the identifying number of the person's mother.

Population Dynamics

Our microsimulation requires that we simulate, for each individual in the starting population, their continued survivorship in each simulated year, as well as, for women, the births of all children. We simulate the occurrence, or non-occurrence, of births and deaths year by year, using a discrete-time transition probability approach. The transition probabilities, however, are derived from conventional continuos time demographic parameters representing the rates at which births and deaths occur. Therefore, a necessary data input for the simulation is a series representing the future levels of mortality rates and fertility rates. We use single-year age-specific and sex-specific death rates, and single-year age-specific and parity-specific fertility rates. Each of these elements of the microsimulation methodology is explained below.

Vital Rates: Levels and Future Trends

Our assumptions about future trends in mortality and fertility are the same, insofar as possible, as those used in the main variant of ISTAT's recent population projections. ISTAT provides a complete set of mortality rates by age for the years 1994, 2000, 2005, 2010, 2015, and 2020; mortality is assumed to remain constant during the 5-year intervals between those years and after 2020. Regarding fertility trends, ISTAT has provided the rates for single ages and parity for each year between 1994 and 2020, after which time the values are assumed to remain constant. ISTAT's projections were disaggregated by region; in our simulation we use the rates for Latium (Central Italy), since it has the values closest to the national average.

Event Probabilities

Our microsimulation proceeds by simulating a set of events on a year-by-year basis. In any year, a woman might give birth to a child, or might die, or, she might first give birth to a child and then die, both in the same year. A man, on the other hand, faces only a probability of dying. Although the simulation assigns outcomes on an annual basis, the probabilities underlying those assignments reflect an underlying continuous-time process. In particular, events are assumed to occur in accordance with the assumptions underlying an age-dependent Markov process (Çinlar 1975). In such a process the rate, or "risk," of an event is assumed to be a constant within a one-year time period, and to depend only on attributes that are fixed at the beginning of that time period, including age, sex, and for women, current parity.

For women, three distinct "events" can happen in a year: death (*D*), childbirth (*B*), or the sequence of events childbirth followed by death (*BD*). The instantaneous vital rates underlying these events, $d_f(a)$ for death and $b(a)$ for birth, each specific to age a, are arranged in the following matrix:

$$\Lambda_a = \begin{bmatrix} -d_f(a)-b(a) & b(a) & 0 & d_f(a) \\ 0 & -d_f(a) & d_f(a) & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} \qquad (1)$$

In (1), the rows of the matrix denote the most recent event, denoted, ∅, *B*, *BD*, and *D*, respectively, with "∅" indicating that no event has taken place in the interval. The columns, arranged in the same order, indicate the range of possible events that could occur next in the interval, given that the most recent event to have occurred in the interval is the one indicated by the row index.

In order to compute the probabilities that each event will occur during a finite interval—in our case, a one-year period—we evaluate the expression:

$$P\ (a) = \exp(\Lambda_a) = I + \frac{\Lambda_a^1}{1!} + \frac{\Lambda_a^2}{2!} + \frac{\Lambda_a^3}{3!} + ... \qquad (2)$$

(Çinlar 1975, p. 368). Although equation (2) depicts an infinite series, we evaluate the series only to the point at which the largest element to be added to the cumulative sum is no larger than 10^{-8}. The resulting matrix, $P(a)$, contains in its first row the desired transition probabilities, which are $P_{\varnothing,\varnothing}(a)$, $P_{\varnothing,B}(a)$, $P_{\varnothing,BD}(a)$, and $P_{\varnothing,D}(a)$.

For men, who face only the risk of dying during any year, the relationship between the instantaneous vital rates and the one-year event probabilities is simpler:

$$\text{Pr [death during } t, t\text{+1] = 1 – exp}[d_m(a)]. \qquad (3)$$

All of the probabilities derived in this way are specific to single years of age.

Microsimulation Algorithm

Our microsimulation algorithm is very simple. For each individual contained in the starting-population data base, we simulate possible life-cycle events year by year, until either (a) the person is simulated to die or (b) the algorithm reaches simulated year 2050. Events are randomly assigned according to probabilities obtained using equation (2) for women and (3) for men, using probabilities appropriate to the combination of age, sex, calendar year, and (for women) parity that applies at each step in the sequence. If childbirth is simulated to occur, then a new data record is created in which the year of birth, a new identifying number, and the mother's identifying number are all recorded. The newborn's sex is assigned randomly, using probabilities derived from the sex ratio at birth (0.5122 is the probability that the child is a boy). Children are assigned the sampling weight of their mother. The future lives of the newly-created children are then simulated, using the procedures just described, including the creation of still more newborn children's records as necessary, until there are no remaining children's records to process. The algorithm ends when every individual's lifetime, to either the year of death or the year 2050, whichever comes first, has been simulated. Particularly noteworthy, in view of the very complex computer programs that have been written for most previous demographic microsimulation exercises, is the fact that our algorithm is implemented as a SAS™ program.

4. Results

Comparison to ISTAT Projections

Table 1 presents several population indicators for the populations projected by ISTAT and the simulated populations of 2010-2050, as well as the actual population represented in the starting-population sample. In each future year shown our simulated population is smaller than ISTAT's projected population; in 2010 the difference between the two is 2.5 percent, but by 2050 the difference amounts to 10.4 percent of the ISTAT figure. There are several reasons why the two series might differ. One is sampling error in the starting population: although sampling weights can reproduce the total size of the population from which the sample is drawn, there may still be errors for particular combinations of age and sex. Such errors may influence the numbers of simulated births, by affecting the number of women at risk of childbirth and the fertility rates applied to them. Furthermore, the starting population does not represent the full Italian population: it omits residents of jails, hospitals, and nursing homes. Finally, and importantly, the simulation does not account for immigration, while ISTAT's projections do; for example ISTAT assumes a constant inflow of 55000 people per year after 2020.

However, while the absolute sizes of the simulated and projected populations are noticeably different, relative compositional indicators in the two populations are quite similar. There are small differences in the percentage of the population young (aged 0 to 14), old (aged 65 or older), and oldest-old (aged 80 and older), but the simulation systematically underestimates the percentage young while overestimating the percentage old. Yet, somewhat paradoxically, there is no systematic pattern of differences in the mean ages of the two populations. Finally, our microsimulation produces a population in which the effective TFR is generally lower, while the mean age of childbearing is somewhat higher, than in the ISTAT projections.

Shrinking Kin Networks: The Mother's Perspective

Table 2 shows the frequency distribution and the average number of children by age of the mother for the starting population and the simulated one. In Tables 2 and 3 we are unable to provide values for the oldest generations, since in the 1994 survey the age of children was not collected for children outside the household. For example, women under age 45 in 1994 are under 81 in 2030, 91 in 2040, and so on. Consequently, the surviving-children distributions for future years shown in Tables 2 and 3 pertain only to women whose offspring were either fully observed in the starting population or simulated. For the youngest women shown in these tables, specifically women aged 5 to 70 in 2050, their fertility experience, and the survivorship of their children, is entirely simulated.

According to ISTAT's hypothesized fertility trends, the percentage of older women who are childless will rise, from 20.6 in 1994 to 24.2 in 2050. The percentage of older women with exactly one living child will rise substantially, while the percentage of older women with exactly two living children will rise dramatically. Compensating for these increases are substantial declines in the prevalence of large families; the percentage with three or more children will be reduced by about one-half, from 19.6 to 9.7. The trends for narrower age groups, to the extent that they can be studied with these results, are broadly similar. However, note that among women aged 65 to 74 years old, the trends are not always unidirectional. The percentage childless and the percentage with exactly two children first rise and then fall slightly. Overall, these values are quite similar to the percentages produced by ISTAT.

Table 2 also provides limited data on life-cycle patterns. In particular, the women who are aged 65 to 74 in 2030 appear as women who are aged 75 to 84 in 2040, and their survivors, in turn, dominate the 85-and-older group of 2050. It is possible to trace out the steadily diminishing mean numbers of children for these survivors as they age; this is a reflection of the forces of mortality operating on their children. The downward trend in the mean number of children is accompanied by steady increases in the percentages with zero or one living child, and decreases in the percentage of women with two or more living children.

Table 3 presents the frequency distribution and mean of the number of living sons in the simulated population. The layout of this table is similar to that of Table 2, except that the information is not available for 1994 since the Multiscopo survey asked older women the number of the living children, but sex for just the three closest of them. Nearly half of the women in each age group and year have no living sons, and over a third have only one living son. These patterns are useful for purposes of projecting the living arrangements of older women, since living arrangements are strongly affected by the number and sexes of living children. For example, in Italy men normally leave the parental home later than women (Billari 1999; Tomassini 1998).

Shrinking Kin Networks: The Child's Perspective

In Table 4 we present information on the size and composition of sibling groups, which is relevant to the issue of the potential burden of providing care for an older parent. The table indicates the percentage distribution of the number and sex distribution of siblings, among women aged 25 to 45, whose mothers are alive. We do not show the corresponding figures for the baseline year, 1994, since they are not available in the Multiscopo data. Shown in bold are the percentages for the number of siblings, while the composition by sex is written in italics. About 20 percent of women in this age group are the only living offspring of their surviving mother, and thus are potentially fully responsible for their mother's care. The majority of women have just one sibling with whom they could share the duties of parent care; this proportion increases throughout the period simulated, from 49.9 percent in 2010 to 58.1 percent in 2050. Reflecting the higher proportion of males at birth, these women are slightly more likely to have a brother than a sister. The growing percentage of women with no, or only one, sibling is accompanied by a downward trend in the percentage with two or more siblings.

Another interesting result for women younger than 65 years old is shown in Table 5, which presents by age and year the percentage of women with a living mother. In each age group the chances of having a living mother rise in comparison to the baseline year, 1994; these trends especially show a reversal at older ages. The explanation for this phenomenon is a rising age at childbirth; this is large enough to outweigh the effect of the mother's improved chances of survival to old age. This explanation is illustrated in Table 6, where the mean age of the mother at the time of the daughter's birth is shown, for the same age groups and times shown in Table 5. For example, for those aged 35 to 44 the mean age at birth of their mother in 2020 is 28.1, while for the same age group in 2050 the mean age rises to 31.6.

5. Discussion

Our results present a picture of kin networks that expands considerably on the information found in conventional population projections, such as ISTAT’s recent projections, to which our microsimulation conforms. We adopt the same assumptions concerning the future paths of mortality and fertility as are used in ISTAT’s projections, and show the effects of those trends on the existence of daughters and sons for older mothers, on the number of sisters and brothers with whom an adult woman could share the responsibilities of caring for an elderly mother, and the effect of the joint action of the increase in longevity and the mean age at fertility on the proportion of adult women with a living mother. Comparing our findings with the corresponding figures from the 1994 survey, which forms our starting population, we have emphasised the small increase in the proportion of childless women, the dramatic drop in the percentage of women with more than two children, and the increase in the proportion of adult women with a living mother.

Our results suggest a situation quite different from that depicted by Eberstadt (1997): rather than a world in which almost three-fifths of the nation’s children will have no siblings, cousins, aunts or uncles, we find that only about 20 percent of adult women will be without living siblings. Our methods rule out the representation of cousins, aunts or uncles, but the percentage of adult women having either a sibling or one of these relatives must necessarily be considerably lower than 20 percent. It is not possible to determine the extent to which these divergent findings result from differences in assumptions—Eberstadt (1997) assumes that Italy’s TFR will remain at the low levels reported in the UN’s recent World Population Estimates and

Projections, while we adopt the more moderate assumption used in ISTAT's recent projections—and how much reflects differences of methodology.

Our conclusions about kin groups in the future could, however, be much different under an assumption that future fertility levels will continue to exhibit their current low levels. In this regard, Golini (1998) has recently speculated on the question "how low can fertility be?" Some provinces of Italy have already shown a considerable drop in fertility; for example, in the province of Ferrara the period TFR dropped from 1.75 in 1975 to 0.80 in 1987, and remained quite stable until 1994. The cohort fertility rate is assumed by ISTAT to reach 1.5 in Italy as a whole, given a partial recovery of fertility at older ages. However, other methods that assume no such recovery produce a cohort TFR of only 0.95 (Giorgi 1995). An implication of these more dramatic hypotheses is that the size of Italian family networks will be greatly reduced in the future.

Wachter (1997) suggests that the shrinking of close nuclear-family kin networks (that is, parents, full siblings, own children, and their children) in the United States will be compensated for by growth in less traditionally common types of relatives, such as step- and half-siblings, step-children, and so on, as a result of the "blending" of families through remarriage. Whether this type of broadening of the kin group will translate into equivalent levels of familial interaction and support is not clear. In Italy and other countries in which divorce is rare, remarriage is even rarer and childbearing outside of marriage is low (about 8 percent; see Council of Europe 1998), the type of broadening of kin groups envisioned by Wachter cannot occur. Other strategies for achieving the types of social interaction otherwise provided by family members might, instead, emerge. One such strategy is the recruitment of neighbors, friends, or charitable organisations to provide social supports and informal care to those elders who need them. Another, possibly more likely, strategy is to turn to new forms of formal, publicly funded social supports for an increasingly elderly population.

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Table 1. Comparisons between ISTAT Projections and Simulated Population

Year and Source	Population Indicator						
	Population Size	Percent Aged 0 to 14	Percent Aged 65+	Percent Aged 80+	Mean Age	TFR	Mean Age at Childbirth
1994							
Multiscopo		15.4	15.8	3.4	38.0	1.22	29.6
2010							
ISTAT	57,494,517	14.3	20.4	5.8	43.5	1.46	30.0
Simulated	56,028,509	14.0	21.5	6.0	42.8	1.40	30.2
2020							
ISTAT	55,939,123	12.9	23.2	7.1	45.7	1.46	30.0
Simulated	53,745,424	12.7	24.3	7.1	45.4	1.48	30.1
2030							
ISTAT	53,421,824	11.7	27.0	8.3	47.6	1.37	30.8
Simulated	50,902,232	11.4	28.5	9.0	47.6	1.37	30.8
2040							
ISTAT	50,153,264	11.9	31.7	9.3	48.8	1.39	30.4
Simulated	46,164,172	11.6	33.3	10.3	48.8	1.39	30.4
2050							
ISTAT	45,997,387	11.7	32.3	10.5	49.4	1.46	30.0
Simulated	41,217,679	11.6	33.4	12.5	49.3	1.38	30.6

Table 2. Elderly Women by Age and Number of Children: Indagine Multiscopo 1994 and Simulated Populations of 2030-2050

	Number of Children (percentage distribution)			
	1994	**2030**	**2040**	**2050**
Aged 65 to 74	(n=2,940)	(n=4,310)	(n=4,352)	(n=3,298)
0	19.8	20.5	24.0	23.8
1	22.6	24.0	25.8	27.1
2	29.1	41.2	40.3	39.5
3+	29.5	14.3	9.9	9.6
Mean	**1.96**	**1.55**	**1.39**	**1.38**
Aged 75 to 84	(n=1.423)		(n=3,522)	(n=3,523)
0	21.2		21.3	24.5
1	22.3		24.4	27.1
2	25.4		40.5	39.3
3+	31.1		14.1	9.1
Mean	**2.09**		**1.52**	**1.35**
Aged 85+	(n=473)			(n=1,992)
0	24.1			24.4
1	20.1			28.2
2	23.9			36.5
3+	31.9			10.9
Mean	**2.11**			**1.38**
All Ages	(n=4,836)			(n=8,813)
0	20.6			24.2
1	22.3			27.4
2	27.5			38.7
3+	19.6			9.7
Mean	**2.00**			**1.36**

Table 3. Elderly Women by Age and Number of Sons: Indagine Multiscopo 1994 and Simulated Populations of 2030-2050

	Number of Sons (percentage distribution)		
	2030	**2040**	**2050**
Aged 65 to 74			
0	43.8	46.4	48.0
1	36.4	38.4	36.6
2	16.2	13.1	13.2
3+	3.6	2.1	2.2
Mean	**0.8**	**0.71**	**0.70**
Aged 75 to 84			
0		44.2	47.0
1		36.8	39.2
2		15.7	12.1
3+		3.3	1.6
Mean		**0.79**	**0.69**
Age 85+			
0			48.4
1			37.0
2			12.5
3+			2.1
Mean			**0.68**

Table 4. Women Aged 25 to 45 with Living Mother, by Number of Siblings and Number of Brothers; Simulated Populations of 2010-2050

	Percentage with Indicated Number of Siblings				
	2010	**2020**	**2030**	**2040**	**2050**
0 Siblings	**20.3**	**15.3**	**16.4**	**18.6**	**19.4**
1 Sibling	**49.9**	**53.6**	**56.0**	**57.4**	**58.1**
No brothers	*48.6*	*49.0*	*48.5*	*48.1*	*49.4*
One brother	*51.4*	*51.0*	*51.5*	*51.9*	*50.6*
2 Siblings	**20.2**	**21.4**	**19.0**	**17.2**	**16.2**
No brothers	*22.7*	*21.7*	*20.5*	*20.2*	*22.6*
One brother	*50.2*	*51.8*	*54.8*	*55.3*	*51.9*
Two brothers	*27.1*	*26.5*	*24.8*	*24.6*	*25.5*
3+ Siblings	**9.6**	**9.7**	**8.6**	**6.7**	**6.4**
No brothers	*9.7*	*8.9*	*8.1*	*7.7*	*11.7*
One brother	*31.7*	*35.2*	*34.0*	*30.4*	*22.4*
Two brothers	*36.0*	*36.8*	*36.6*	*37.6*	*42.6*
Three or more brothers	*22.5*	*19.1*	*21.3*	*24.2*	*23.4*

Table 5. Percentage of Women Under Age 65 with Living Mother, By Age: Indagine Multiscopo 1994 and Simulated Populations of 2010-2050

	Percentage with Mother Alive					
Age	**1994**	**2010**	**2020**	**2030**	**2040**	**2050**
0 to 14	99.1	99.6	99.6	99.3	99.7	99.7
15 to 24	98.2	98.4	98.4	97.2	98.2	98.5
25 to 34	92.5	96.7	95.6	95.6	94.2	94.7
35 to 44	82.1		90.5	89.5	88.6	87.0
45 to 54	55.7			74.9	72.4	69.7
55 to 64	23.2				45.8	40.4

Table 6. Mean Age Difference between Women and their Mother, by Daughter's Age and Year: Simulated Populations of 2010-2050

	Mean of Mother's Age at Daughter's Birth				
Age	**2010**	**2020**	**2030**	**2040**	**2050**
0 to 14	30.7	31.4	30.8	31.0	30.9
15 to 24	29.3	30.4	31.6	30.8	31.0
25 to 34	28.1	29.3	30.5	31.6	30.8
35 to 44		28.1	29.3	30.5	31.6
45 to 54			28.1	9.3	30.5
55 to64				28.1	29.3

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