WP 7.3
24 October 2013

UNITED NATIONS STATISTICAL COMMISSION and ECONOMIC COMMISSION FOR EUROPE

STATISTICAL OFFICE OF THE EUROPEAN UNION (EUROSTAT)

Joint Eurostat/UNECE Work Session on Demographic Projections
organised in cooperation with Istat
(29-31 October 2013, Rome, Italy)

Item 7 – National and international population projections out of the EU region

Estimation of the size and vital rates of the Haredi (ultra-orthodox) population in Israel for the purpose of long-range population projections (Isreal)

Ari Paltiel, Israel Central Bureau of Statistics

BACKGROUND

In 2009 the ICBS was asked by the Budget Department of the Ministry of Finance to prepare long-range population projections for the first time.[1] Hitherto the ICBS had never attempted projections for periods longer than 25 years, approximately the length of a single generation. The principal justification for the tradition of preserving a modest forecast horizon was the volatility of Israel's population: its population history has been dominated by large and irregular migration waves from diverse sources, and predicting them has been one of the principal challenges for population projections.[2] Not only was it difficult to predict the volume and period of these waves themselves: long-range projections would have required making long-range forecasts of the fertility and mortality patterns of both the immigrants and of their native-born offspring, a task which appeared completely speculative.

However, despite the inherent difficulties involved, long-range population projections are sought as inputs to aid planning fiscal policy relating to pensions and national social and health insurance programs, where life-time payments and disbursements need to be considered. This was the motivation behind the approach by the Ministry of Finance to the ICBS. Moreover, it was considered desirable that the first long-range population projections for Israel (2009-2059) include component projections for the

[1] Paltiel Ari, Michel Sepulcre, Irene Kornilenko, Martin Maldonado, Long-Range Population Projections for Israel: 2009-2059, Technical Paper Israel Central Bureau of Statistics, March 2012. http://www.cbs.gov.il/www/publications/tec27.pdf

[2] Sofia Phren and Nitzan Peri, Prospective immigration to Israel through 2030: methodological issues and challenges. *ECE-Eurostat Work Session on Demographic Projections*, Lisbon, 28-30 April 2010.

Haredi (ultra-orthodox) population. For financial planning purposes the Ministry and the Bank of Israel wished to be able to assess the long-range impact of rapid growth in this population, as well as among Arab women, and how their proportion of the population as a whole and in different age-groups is likely to change. Both groups are relatively poor, have high population growth rates and low labour force participation rates, and thus present a challenge to long-range fiscal planning. Whereas projections of the Arab population of Israel have been a traditional feature of population projections in Israel, focusing on the Haredi population was a departure from previous ICBS projections, which had comprised groups which could be identified unambiguously and directly by characteristics recorded in the National Population Register (NPR). In order to meet this requirement the long-range projections for the entire population are the sum of projections for each of three population groups: Jews and Others (without the Haredi population), the "Haredi" population and the Arab population.[3] In addition, for these projections the ICBS utilized data-driven probabilistic projections of fertility and mortality for the first time. Since in recent years net migration has been very low, it was assumed to remain at zero for these projections. The present report will outline the methodology used to estimate and project the Haredi population.

WHO ARE THE HAREDIM (pl. of HAREDI.)?

Haredi is the self-designation of a Jewish religious sub-culture, which is sometimes referred to, but not by the members themselves, as “Ultra-Orthodox”[4]. It is far from monolithic, consisting of several groups and streams which are united in their rejection of modern culture and Western life-styles, upholding instead a stringent version of Jewish religious strictures, as interpreted by particular revered and authoritative Rabbis. The latter are consulted as guides in all aspects of daily life. The Haredi code of conduct, their beliefs and social institutions, all serve to protect them from social and cultural assimilation into the wider society. In Israel and elsewhere these groups tend to live in geographically distinct, voluntarily segregated communities, and attend separate networks of educational institutions which play an unusually central social function. A strict delimitation of gender-defined social roles is maintained. Adolescent males before marriage attend a *Yeshiva* –institutions which focus on intensive study of *Torah* in its broadest sense (the literal meaning of the word is “doctrine” or “teachings”, but it usually designates the Hebrew Bible) – encompassing not only the Bible itself but the *Mishnah* and *Talmud* (compendia of Jewish religious law and philosophy) and their commentators over the centuries. After marriage, rather than entering the labour force, young men are encouraged to attend a *Kolel* -- a full-time institution for continuing *Torah* education -- where they receive maintenance stipends[5]. In Israel, men of eligible age

---

[3]The Arab population includes Moslems, Christian Arabs and Druze. The "Others" population includes non-Arab Christians and residents who are not classified by religion in the National Population Registry. This group is composed mainly of family members of persons who immigrated to Israel under the Law of Return, but are not themselves registered as Jews.

[4] Heilman, Samuel C., and Menachem Friedman. *The Haredim in Israel: Who Are They and What Do They Want?*. Institute of American Jewish-Israeli Relations, the American Jewish Committee, 1991 The word Haredi can be loosely translated as “God-fearing”.

[5] The low labour force participation of male Haredim, its relationship to child allowances and to fertility incentives and their wider social implications, has received considerable attention in the economic and social policy literature. See: See Berman E., "Sect, Subsidy and Sacrifice (An Economist's View of Ultra-Orthodox Jews)", *Quarterly*

are exempt from military conscription as long as they continue to attend these educational frameworks. Girls and women study in separate institutions, and unlike males they often receive wider, vocationally-centered education preparing them to enter the labour force, often as teachers or in clerical occupations. Despite their high fertility levels women are typically the sole breadwinners in the family. Thus Haredi society has been called "a society of scholars"[6], centered on all-inclusive male institutions for *Torah* studies, led by Rabbinical authorities who teach in these institutions. Marriage is usually arranged, typically between ages 18 and 21, and large families are encouraged and celebrated. A wide network of voluntary private welfare institutions, underpinned by income maintenance, child allowances and other universal benefits of the welfare state, help to maintain large families in "dignified" poverty, while financially binding the members to their community. In Israel the Haredim back a small number of political parties whose principal function is to protect this way of life in the public sphere by employing political bargaining to maintain policies and sources of social welfare which protect their way of life.

OBJECTIVE

The paper will present the methods used to estimate the current size of the Haredi population, its age structure, its components of change in recent decades, and it's projected components of change. The results of the projection will be presented as well.

METHODS

Base Population

A variety of methods have been used at the CBS to identify the size and characteristics of the Haredi population. Each of these methods is based on a particular defining characteristic of the population. However, there is no single overarching characteristic that identifies the Haredi population categorically. The Haredi way of life is a collection of characteristics and behaviours, each of which, although typical, is not necessarily exclusive to this population and/or shared by all those who identify themselves as members of the group. There is no official definition of the population, or a formal act which would indicate membership. Because adoption of the Haredi way of life is voluntary, at least formally, membership can change over a person's lifetime.

Journal of Economics, 115 2000, pp. 905-953. Manski, Charles F., and Joram Mayshar. "Private incentives and social interactions: Fertility puzzles in Israel." *Journal of the European Economic Association* 1, no. 1 (2003): 181-211. Cohen, A., Dehejia, R. and Romanov, D. "Do Financial Incentives Affect Fertility?" *NBER Working Paper* 13700, Cambridge, Massachusetts (revised May 2009). Toledano, Esther, Roni Frish, Noam Zussman, and Daniel Gottlieb. "The Effect of Child Allowances on Fertility." *Israel Economic Review* 9, no. 1 (2011).

[6] Friedman, Menachem. *The Haredi (Ultra-Orthodox) Society—Sources, Trends and Processes*. Jerusalem: The Jerusalem Institute for Israel Studies (1991).

In the face of these difficulties, four alternative methods have been used at the CBS to estimate the Haredi population's size and characteristics[7] .

1. Ecological identification of the population in the electoral districts where a majority of the population voted for one or more of the Haredi political parties;
2. Identification in the Labour Force Survey of respondents and their households who reported that the last educational institution they attended was a "Higher Yeshiva".
3. Identification of records of individuals in multi-year national administrative files of educational institutions, targeting persons who are either studying or teaching in the Haredi educational networks and of their first-degree relatives (parents or children), the latter through record linkage by Personal Identity Number (PIN) of these records with data in the NPR.
4. Identification of respondents who identified themselves as "Haredi"in response to a direct question in the Social Survey. The Social Survey is an annual national sample-survey of the non-institutionalised population aged 20 and over, with an overall sample of approximately 7000 individuals[8].

Each of these methods has disadvantages when considered as the basis for estimating a population for projection purposes. The identification of the population by voting patterns excludes those members of the Haredi population who live outside or on the fringes of the electoral districts where a majority voted for Haredi parties, and includes individuals who might live in these districts without being Haredi. Identification by last educational institution in the LFS relies on primary identification of males only, excludes Haredim who may have attended non-Haredi educational institutions, and includes individuals who were raised in the Haredi community but may have left it since they attended their last educational institution. In addition, it is restricted to a subset of a quarterly national sample comprising approximately 26,000 individuals overall, and is subject to sampling error. Identification by administrative records indicating attendance or employment in Haredi educational institutions has the advantage of being population-based, but omits individuals in age groups who are not likely to be attending or teaching in schools, and risks including individuals who may have attended or taught in a Haredi institution without belonging to the group (this is especially true of pre-primary education, where non-Haredi families take advantage of Haredi facilities). Identification of individuals in the Social Survey has the advantage of being based directly on unequivocal self-identification, but it is limited to a relatively small annual sample of individuals aged 20 and over and is subject to sampling error. In addition it excludes the institutional population (a group that includes students at residential Yeshivas and Kolels).

For the Long-Range Projections project a modification of the Social Survey method was used. This method was adopted because, in addition to the advantage of self-identification, a coherent reconstruction of population structure at all ages by age and sex could be made, and medium-range trends of

---

[7] Friedman, Yisraela, Nava Shaul-Mena, Nir Fogel,; Dimitri Romanov, Dan Amedi, Mark Feldman,; Ruth Sechayek Gustavo Shifris and Haim Portnoy,; *Measurement and Estimates of the Population of Ultra-orthodox Jews;* CBS Technical Publications, March 2011. (Hebrew) http://www.cbs.gov.il/www/publications/tec25.pdf

[8] http://www.cbs.gov.il/www/skarim/social_surv/what_survey_e.pdf

fertility rates could be constructed as well. Unlike the other methods, self-identification is unequivocal, and does not require additional assumptions regarding the link between a particular characteristic and membership in the Haredi population. Moreover it is possible to overcome the limitations of the small annual sample size by pooling annual surveys, and to cancel the age restriction by linking the records in the pooled file to the NPR.

First, to overcome the small sample size, respondents from the 8 annual surveys from 2002 to 2009 were pooled into a single dataset. There were 54,500 respondents in the pool, of whom, 3,320 had responded that they were Haredi, 1650 males and 1,670 females. These respondents were matched by PIN with their records in the NPR. Since the Social survey is sampled from the NPR the match was complete. The NPR provided information on lifetime births of women in the sample (sex and date of birth), and of subsequent deaths of respondents (and children). The pool is analogous to a sample of the Haredi population taken over an eight-year period. In order to estimate annual population sizes, the individual weighting factors from the annual surveys were corrected to reflect probabilities of selection. The reconstructed population for each calendar year was calculated on the basis of the dates of birth in the NPR records. In principal members of the population were 'eligible' for interview 8 times, so for persons who were alive and in Israel from 2002 to 2009 survey weight was divided by 8. Adjustments to the weights were done to reflect exposure for persons who died or left the country after being interviewed, and, for persons younger than age 27 (reflecting the fact that the survey is of persons age 20 and over). At the oldest ages, where probabilities of death (and institutionalization) are significant, adjustment of weights alone could not overcome the incomplete nature of the data.

One of the principal factors which supported the decision to use the pooled Social Survey was that recently it had been used successfully to provide the data for an analysis of fertility in Israel's population by degree of "religiosity", including specifically fertility rates for the Haredi population.[9] Estimates of annual age-specific fertility based on the pooled sample were consistent with national population-based estimates to a very high degree. Similarly, annual estimates of population size by age which were based on corrected survey weights in the pooled sample proved to be consistent with National population estimates. In the age groups 20-74 the estimates were approximately 2% lower (consistent with the absent institutional population and the population residing outside localities) and lower at age 75 and over (ranging from 80% of the National estimates in 2002 to 91% in 2009) reflecting the bias created by mortality at these ages. Since for long-range population projections accuracy at younger ages in the base population was the primary consideration, the bias at older ages was not regarded as a major obstacle (Figure 1). Reconstruction of the population aged 0-19 appeared to be complete, increasing our confidence in the estimates for the Haredi population at these ages (Figure 2.)

[9] Ahmad Hlihel, Fertility of Jewish and Moslem Women in Israel, by their Level of Religiosity, during 1979 – 2009, Working Paper No. 60. Central Bureau of Statistics, June 2011. (Hebrew)

Figure 1. Current estimates of the population of Israel at age 20 and over, and estimates of the total recreated population from the pooled Social Survey

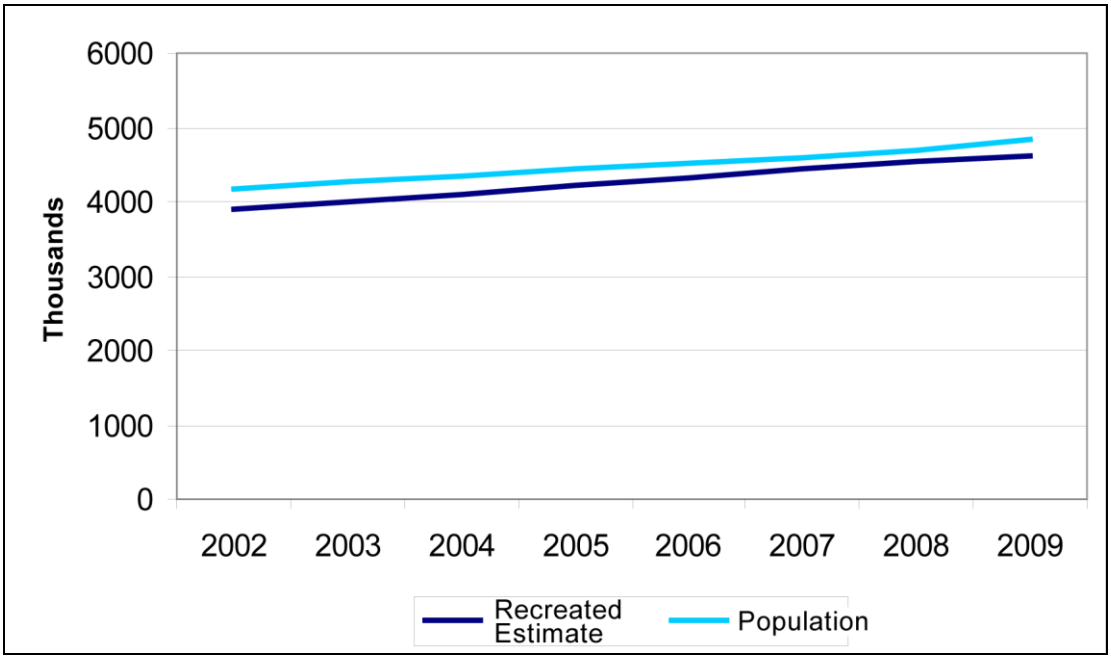
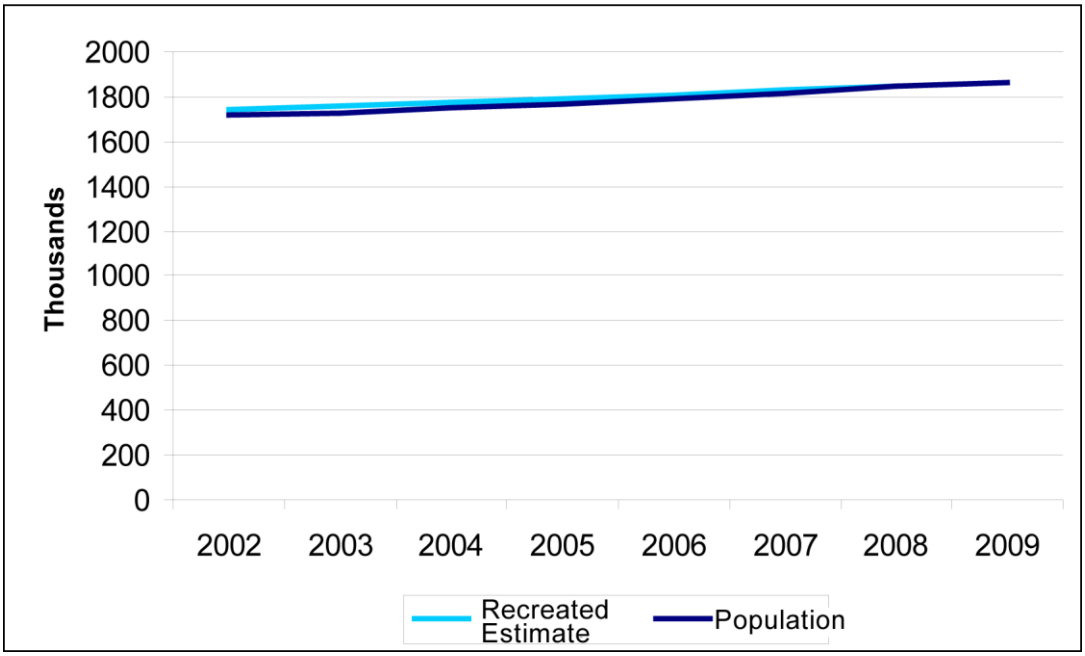


Figure 2. Current estimates of the population of Israel aged 0-19, and estimates of the recreated population from the pooled Social Survey data at these ages

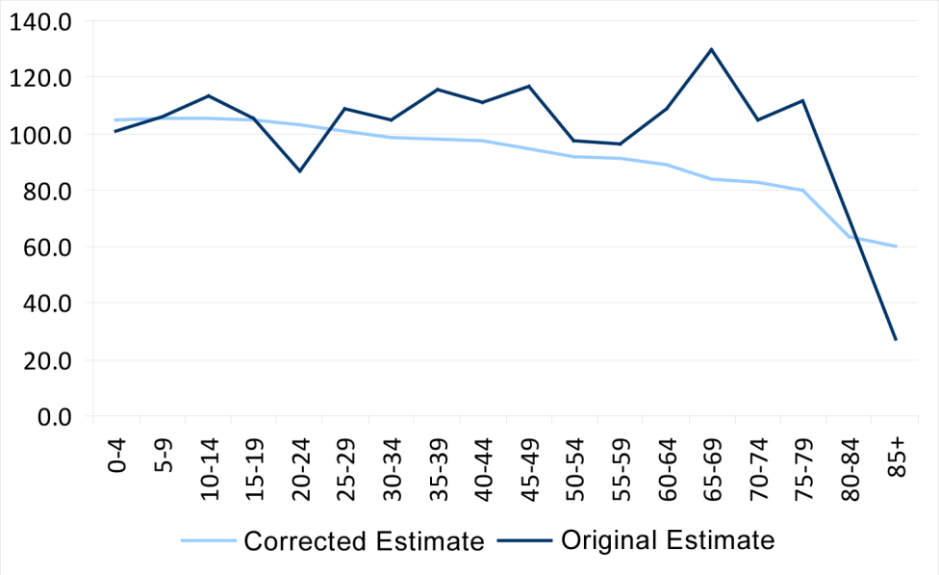


The age structure of the population was consistent with that of a rapidly growing population whose rate of growth had risen over the last 20 years. However examination of the sex ratios showed a peculiar pattern: a "surplus" of males at ages 35–49 and 65–79, and a deficit at the ages of 20–24 and 85 and over. The explanation for the deficit in the younger age groups appeared to be differential residence of males in institutional settings, excluding them from the social survey's population. At older ages the

explanation may lie in greater unwillingness of sampled Haredi to agree to be interviewed by (male) surveyors. This conjecture has not yet been confirmed.[10]

Since the sex-ratios obtained appeared to be a result of survey error and methodology, it was decided to correct the ratios at ages 30 and over using the ratios for the Jewish population as a whole, without changing the total population estimates – see Figure 3. At ages 20–29 sex ratios were used to correct the apparent deficit of males. The size of this age group was adjusted to the total obtained from the linked birth records, using the same methodology as was used for the 0-19 age group. Although at ages 80 and over the reconstructed estimates appeared to be too small (they constituted only 20% of the population aged 65 and over, compared with 28% in the Jewish population as a whole) only a small correction was made, because for the purpose of long-range projections the oldest age group in the base population was not significant (see table 1 below for initial and corrected estimates).

Figure 3. Sex ratios (males per 100 females), in initial and corrected Haredi population estimates



[10] Interestingly, estimates based on voting patterns also found unusual sex-ratios in a similar direction, although the effect was smaller. See Gurevich, N., and E. Cohen-Castro. "Geographical distribution of demographic, social and economic characteristics of the Haredi population in 1996–2001." Jerusalem: Central Statistical Bureau in Israel (2004).Working Papers No. 5, (Hebrew)

Fertility and Mortality Assumptions

The fertility and mortality assumptions of the Long-range Population Projections project were based on probabilistic projection models. However, a complete stochastic projection was not attempted. Traditional cohort-component methods were used for "high", "medium" and "low" projections, with parameters drawn from the probability distributions of the models. For methodological reasons net migration was assumed to be zero (including movement between the three sub-populations), in order to facilitate assessment of the long-term impact of changes in fertility and because in recent years net-migration has been very low. Life expectancy and survival functions were projected using the Booth Maindonald Smith modification of the Lee-Carter model[11], with a single model used for the entire Jewish population (the Haredi population, and Jews and Others without the Haredi population), and a modification of this model was used for the Arab population. The mean trend was used for the "medium" projection, and the values of the upper and lower 95% confidence intervals were used for the "High" and "Low" projections. Results anticipate life expectancy at birth increasing for males from 79.5 in 2008, to 88.7 in 2057 (86.9 - 92.6 years with a 95% confidence interval). For females, the projection anticipates life expectancy increasing from 83.3 years in 2008 to 94.9 years in 2057 (91.9 - 99.3).

The fertility assumptions were arrived at in three stages:

1. errors in past fertility forecasts at the ICBS were analyzed in order to establish a likely range for possible errors in the future. Root mean-square errors (RMSE) of projections of TFR over various periods were calculated.
2. Age-specific fertility trends in recent decades for each of the sub-populations and for the population as a whole were examined and a committee of experts assessed a plausible trend for the future in each sub-population.
3. A random walk with drift (rwd) model was applied to generate 2500 model paths from which the median and 95% confidence intervals were derived. The drift term was derived from the expert-based trend, whereas the random component was derived from a random distribution with standard deviation equivalent to the RMSE derived in stage 1. [12]

Although a discussion of Israel's unique fertility patterns goes beyond the subject of this paper some mentions of it needs to be made to provide the context for Haredi fertility.

From the mid 1950s and until the 1980s rates of TFR In the Jewish population of Israel were falling at a moderate rate, from 3.6 children per woman in 1955–1959 to 2.8 in 1980. Over the following twenty years TFR stabilized at a level of 2.5 to 2.8, with small annual fluctuations. Since the beginning of the present century fertility has been rising at a moderate rate, reaching 2.9 in 2008, a level not previously seen since the end of the 1970s. This level of fertility is unique among OECD countries.

---

[11] Heather Booth, J. Maindonald, and L. Smith. "Applying Lee–Carter under conditions of variable mortality decline". *Population Studies*, Vol. 56 (2002), pp. 325–336.

[12] This technique was based on that reported in Steve Rowan and Emma Wright. *Developing stochastic population forecasts for the United Kingdom: Progress report and plans for future work*. Joint Eurostat/UNECE Work Session on Demographic Projections (28-30 April 2010, Lisbon, Portugal). For a fuller description see Paltiel et al., Ibid.

Already in the early 1990s it became apparent that the relative stability of TFR since the early 1980s among Jewish women in Israel in general, and of native Israeli women in particular, was based on two opposing trends: falling fertility rates among the secular population to levels at or near replacement together with rising rates among the religious population, and especially among Haredi women.[13] The rise in TFR in the Jewish population as a whole in recent years is mainly explained compositionally, by the increasing share of religious and Haredi women in the population of Jewish women of reproductive age, along with convergence to Israeli higher fertility norms by the wave of immigrants form the former USSR and their offspring, who had been characterized by Eastern European fertility patterns of approximately 1.6 children per woman.

Although it has become obvious in recent decades that levels of religiosity has been the leading dimension of heterogeneity in the fertility levels of the Jewish population, until the pooled data from the Social Survey was linked to NPR records no consistent time series of sufficient quality was available on which trend-analysis could be based.[14] Analysis of this dataset showed that among women who defined themselves as Haredi, TFR rose from approximately 5.6 children per woman at the beginning of the 1980s, to a peak of approximately 7.5-7.6 in 2002–2005, and subsequently declined to approximately 6.5 in 2007–2009, returning to levels that characterized the late 1980s. This rise as well as the subsequent fall were found in independent studies of fertility rates in the Haredi population, studies that utilized alternative data sources, and many commentators have attributed both the rise and the subsequent fall to rising levels of child-allowances for large families during the 1990s and their sharp curtailment in 2002-3, which eventually reduced the allowances for large families by over 50%.[15] In addition, whereas in the rest of the Jewish population average age at birth has been rising for decades, no sign of this has been observed in the Haredi population and the recent fall in fertility rates was shared by all age groups.

On reviewing these trends the expert committee concluded that the most plausible course for Haredi fertility over the coming decades would be a continuation of present trends: moderately declining TFR so that by the end of the period (2059) rates would reach the level of the religious non-Haredi population today – approximately 4.5 children. The rationale for this was that the present high rates were unsustainable without generous child benefits and social welfare provisions, that political support for such provisions had eroded and that constraints on large Haredi families were likely to rise. However this central forecast was modified by the rwd model, which provided bounds of uncertainty around this central trend.

The model is:

---

[13] Friedlander, D.and C. Feldmann. "The Modern Shift to Below-Replacement Fertility: Has Israel's Population Joined the Process?" *Population Studies* 1993 47(2):295-306.

[14] See Ahmed Hleihel, ibid.

[15] See studies cited in note 5.

$TFR_t = TFR_{t-1} + e_t + d_t$

Where:

d – is the 'drift' value, obtained from the difference between the values of the TFR in the expert-derived central trend between consecutive years.

e – is a random value that was sampled from a normal distribution with an average of zero and a standard deviation derived from an estimate of a forecast error for fertility one year forward. In order to obtain a random value a random number is produced from a normal distribution by the Box-Muller method[16], and the random number is multiplied by the standard deviation for the following year.

2500 simulations were conducted in an EXCEL program, producing alternative trajectories for changing TFR over the 50 year projection period for each of the sub-populations.

The RMSE–derived one-year ahead error for the non-Haredi population was determined as 0.11 children per woman. However, since Haredi TFR is currently more than double that of the rest of the population, this value was adjusted by a factor representing the ratio of Haredi to non-Haredi TFR. This resulted in values of *e* which declined from approximately 0.28 in 2010 to 0.14 in 2059. Thus in absolute terms the uncertainty interval for the TFR of the Haredi population is wider than that of the rest of the population, expressing the greater uncertainty ascribed to future fertility levels of this population.

Following a technique proposed by Goldstein the mean trend was recalculated as the cumulative mean of TFR from the beginning of the forecast to the date of interest, and the 95% confidence intervals were calculated on this basis as well.[17] Goldstein showed that adjustment of the assumptions of the three scenarios in the traditional forecast to these limits provides a reasonable approximation to the values of the mean and a confidence interval of 95% of the results of a full stochastic projection. In a declining TFR trend this recalculation moderates the decrease in the principle trend because of the weighting by earlier, higher, values. This "correction" appeared acceptable since it was found that previous “expert opinion” in Israel had tended to underestimate future fertility values.

Figure 4. shows the mean values and limits of a confidence interval of 95% for TFR in the Haredi population. As expected, uncertainty increases throughout the forecast horizon. In the Haredi population the confidence interval increases from ±0.6 children in the initial 5-year period to approximately ±1.9 children in the final period. While the principle trend forecasts a decline in fertility, the upper limit of the 95% confidence interval (corresponding to the “High” projection) expresses TFRs which remain approximately at the current level. The lower limit of the confidence interval (corresponding to the “low” projection) projects a more rapid decline in TFR, with the fertility in the Haredi population reaching approximately 2.5 children per woman by 2055-2059, a rate identical to the rest of the Jews and Others

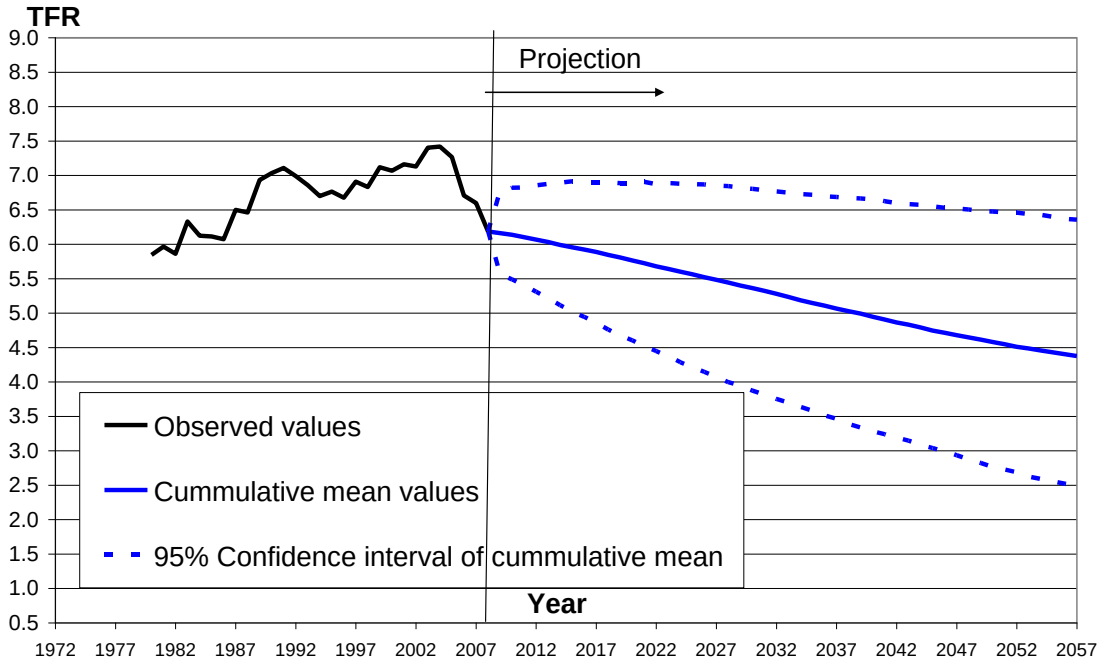
---

[16] E Golder and J Settle. The Box-Muller Method for Generating Pseudo-Random Normal Deviates. *Applied Statistics* (1976), Vol. 25, No. 1, pp. 12-20

[17] Goldstein, Joshua R. Simpler Probabilistic Population Forecasts: Making Scenarios Work *International Statistical Review* (2004), 72, 1, 93-106

population today. Thus the uncertainty interval covers a range of TFR values spanning a continuation of the very high fertility rates of the Haredi population at present to their convergence with the rest of the Jewish population, over a 50 year period.

Figure 4. Observed and projected values of TFR in the Haredi population 1980 – 2057



RESULTS

Table 1 shows the initial and corrected estimates of the Haredi population. The reconstructed population for 2009 (year end) which was used as the base population for the projections estimated the Haredi population at 750 thousand (9.9% of the population of Israel as a whole), of which 441.6 thousand were under 20 years of age (16.3% of the total population under 20 years of age).[18] These results clearly show that the Haredi population is a significant proportion of the Israeli population today, and that its high growth rates are rapidly increasing its share in the youngest age groups.

Table 1. Original and Corrected Estimates of the Haredi Population for the End of 2009

Age	Males		Females		Total		
	Original	Corrected	Original	Corrected	Original	Corrected	Percentage of Total Israeli Population
Total	378,500	378,200	362,200	371,800	740,600	750,000	9.9%
0-4	68,900	70,300	68,300	66,900	137,200	137,200	18.0%
5-9	65,500	65,300	61,900	62,100	127,400	127,400	18.0%
10-14	50,500	48,700	44,500	46,300	95,000	95,000	14.9%
15-19	42,100	42,000	39,900	40,000	82,000	82,000	13.8%
20-24	28,300	32,900	32,600	31,900	60,900	64,800	11.2%
25-29	25,100	26,800	23,100	26,500	48,200	53,300	9.4%
30-34	22,700	22,100	21,700	22,400	44,500	44,500	8.1%
35-39	17,100	15,800	14,800	16,100	31,900	31,900	6.3%
40-44	13,000	12,200	11,700	12,500	24,700	24,700	5.8%
45-49	13,200	11,900	11,300	12,600	24,500	24,500	6.2%
50-54	10,700	10,400	11,000	11,300	21,700	21,700	5.7%
55-59	7,600	7,400	7,900	8,100	15,500	15,500	4.2%
60-64	6,100	5,500	5,600	6,200	11,700	11,700	3.7%
65-69	2,600	2,100	2,000	2,500	4,600	4,600	2.4%
70-74	2,200	1,900	2,100	2,300	4,200	4,200	2.2%
75-79	1,900	1,600	1,700	2,000	3,600	3,600	2.5%
80-84	700	700	1,000	1,100	1,600	1,800	1.6%
85+	300	600	1,100	1,000	1,400	1,600	1.7%

The Long-Range Projection project calculated that the population of Israel, which numbered 7.6 million at the end of 2009, is projected by the end of 2019 (10 years), to reach 8.8 million according to the medium projection (with a gap of 8.6 to 9.1 million between the Low and High projection); 11.0 million

[18] The estimate was 4.5% less overall than estimates of the total Haredi population based on Haredi educational records for the same year (a method with is more likely to over-estimate the population), and at ages 0-19 (where educational records are more complete) the present estimate was 3.5% smaller.

(9.9 – 12.1) by the end of 2034 (25 years); and 15.6 million (11.6 – 20.4) by the end of 2059 – an increase of 54 to 170 percent within 50 years.

All the projections show that if the assumptions of the projection are realized, the Haredi population will increase remarkably both in size and in its share of the population, even if the course of the lowest alternative projection is followed. In the short term (by the end of 2019) it will number 1.05-1.15 million (1.10 million in the medium projection), in the medium term (by 2034) 1.63-2.16 million (1.89 million in the medium projection), and in the long term (by 2059) it will reach 2.73-5.84 million persons (4.15 million in the medium projection), a cumulative increase of 264-686 percent. As can be seen in figure 5 below, by 2019 the Haredi populations share is forecast to increase to 11.6 - 13.3 percent of the population of Israel as a whole (12.4 percent in the medium projection), by 2034 to 14.2 - 20.6 percent (17.2 percent in the medium projection) and by 2059 it may reach 15.9 - 39.9 percent (26.6 percent in the medium projection)[19]. Projected Haredi population growth is partially explained by the significant contribution of age structure to growth. A projection designed to measure this contribution, holding mortality constant at 2009 levels and reducing TFR to replacement level, showed that the Haredi population would grow by 86 percent until 2009, entirely due to population momentum.

Table 2. Projection of Sources of Population Growth in the Short, Medium and Long Range

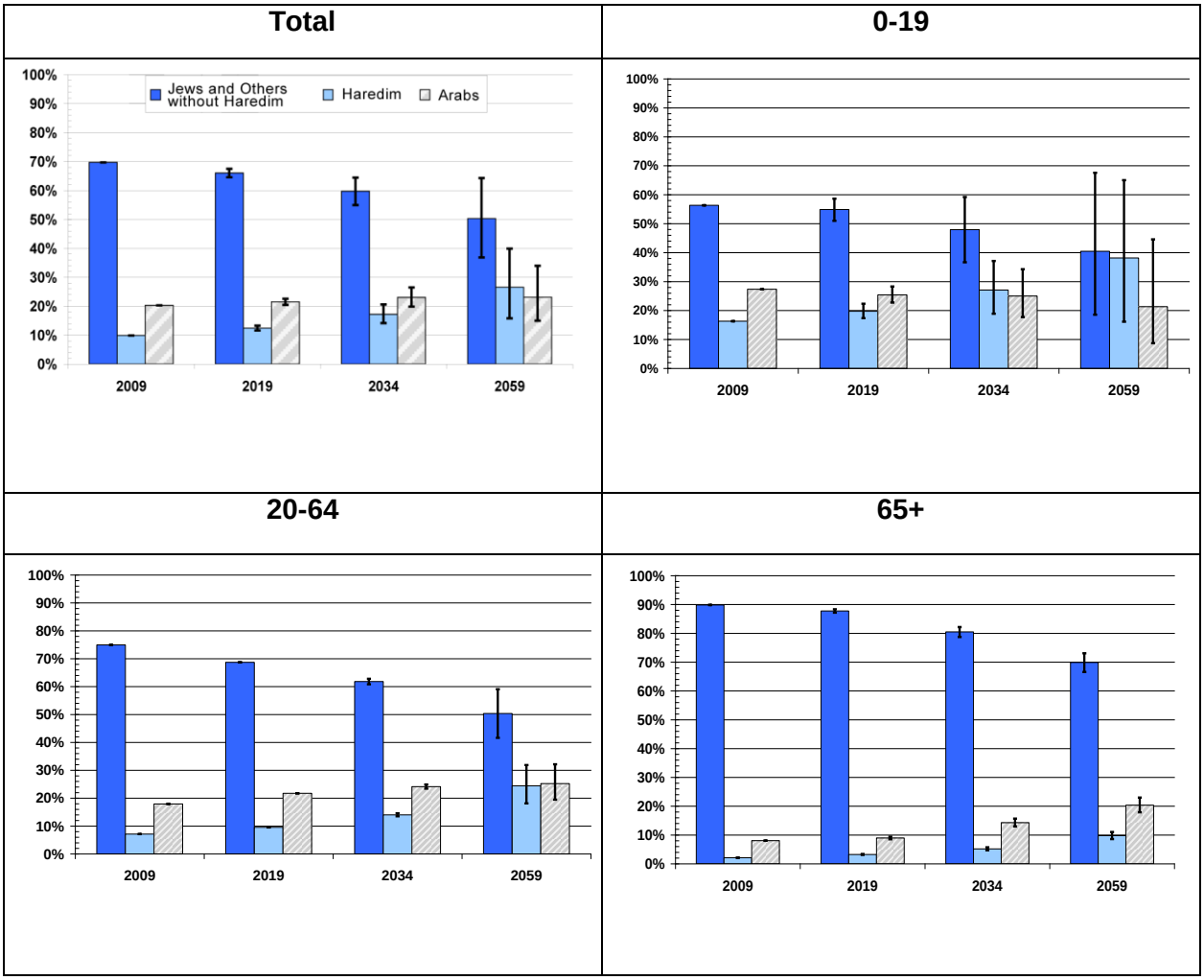
	Low Projection			**Medium Projection**			**High Projection**		
	2010-2019	2020-2034	2035-2059	2010-2019	2020-2034	2035-2059	2010-2019	2020-2034	2035-2059
Birth rate per 1000									
Total Population	18	16	13	21	19	19	24	23	25
Haredim	35	31	23	40	37	33	41	43	44
Death rate per 1000									
Total Population	6	6	7	5	5	5	5	4	4
Haredim	2	2	2	1	1	1	1	1	1
Average Growth rate %									
Total Population	1.3	1.0	0.6	1.6	1.4	1.4	1.9	1.9	2.1
Haredim	3.4	2.9	2.1	3.8	3.6	3.1	4.3	4.2	4.0
Share of Haredim in total population growth rate - %	30	42	92	27	37	48	25	34	44

[19] Alternative scenarios were constructed in order to calculate the maximum and minimum share of the Haredi population. The relevant alternative scenarios are those in which the Haredi population grows at a minimum or maximum rate relative to the other two groups. Thus in the minimum scenario the Haredi population grows according to the “Low” projection, whereas the other two groups grow according to the “High” projection, and vice versa for the maximum scenario.

Table 2 shows the considerable contribution of prospective growth in the Haredi population to overall population growth in Israel. Over a quarter of Israel's population growth in the short term, between 34 and 42 percent in the medium term, and 44 to 92 percent in the long term will be contributed by the rapid growth of the Haredi population.

As we stated earlier, one of the purposes of these projections was to estimate the future composition of age-groups by sub-population. Figure 5 shows projections for the share of the three population groups in broad age groups over the short, medium, and long term. Vertical bars show uncertainty intervals, as calculated from the maximum and minimum scenarios. These show clearly, as expected, that overall shares of the population will change principally through changes in the youngest age groups, and that the range of uncertainty in the long term is very great – thus the share of the Haredi population at ages

Figure 5. Share of subgroups in the population of Israel by age, in the short, medium, and long term, with uncertainty intervals.



under 20 in the long run (2059) which will reach 38 percent according to the medium projection, may fall anywhere from as little as 16 percent to as much as 68 percent – clearly a very wide range! Fortunately at older ages the uncertainty is much smaller, except in the long range, where fertility differences are able to influence the relative size of the 20 to 64 age group.

Male Haredim of working age (20-64) were a particular concern of the planners, due to their current low labour force participation rates. In 2009 they constituted 4 percent of the working age population of both sexes. In the short term their share was forecast to rise to 5 percent, in the medium term to 7 percent, and over 50 years to 12 (10 - 14) percent of the working age population, triple their current share.

DISCUSSION AND CONCLUSIONS

The Long-Range Projections project showed that if the projection assumptions are realized the population of Israel will undergo significant growth in the short range, but even more so in the long range. With an overall growth rate of 1.4-1.5 percent in the medium projection the population will be doubling every 50 years or so. Concurrently, its composition by subgroup would change, principally because the contribution of the Haredi population to overall growth will be very great. If the projection assumptions are realized, the population of Israel faces significant challenges, which stem from the processes described in the projections. These include, alongside high growth rates within a small and already densely populated territory and changing population composition, increasing dependency ratios due to both increased population aging (mainly due to significant cohort flow of large cohorts born in the late 1940 and early 1950s) and high fertility levels – issues described in the full projection report.[20]

The Long-range Projections project was the first attempt at the ICBS to use data-based stochastic methods to project the components of growth, and to begin to introduce quantitative assessments of uncertainty in our projection results. There is still great scope to continue improving the methods we used. There is still a need to improve the model for forecasting fertility, and to examine in depth the reliability of the model we used to forecast mortality. Moreover, a full stochastic projection has not yet been conducted. Notably, such a projection would also require a calculation of the correlations between the growth components of the population groups in Israel.

This last point requires amplification. The methodology we adopted treats each of the subpopulations as independent entities, as if each lived on its own closed demographic island, with the population of Israel an archipelago of all three. With regards to the Arab population, although there is currently little or no movement between the two population groups, one cannot predict with certainty that this state of affairs will persist fifty years into the future. Moreover since the Arab population shares the same economy, health and social services as the rest of the population there is no reason to suppose that trends in the components of demographic change between it and the other two groups should not be correlated. What is true of the Arab population is even more true of the Haredi population. Our methodology assumes that the Haredi population remains closed and that their adherence to relative self-segregation will remain intact over the coming fifty years. But just as during the past 50 years there has been both movement into and out of the Haredi population, it is reasonable to assume that there will be such movements in the future as well, even though it may not be possible to predict at present their dimensions, directions or timing. Moreover, the zero net migration assumption we have adopted for

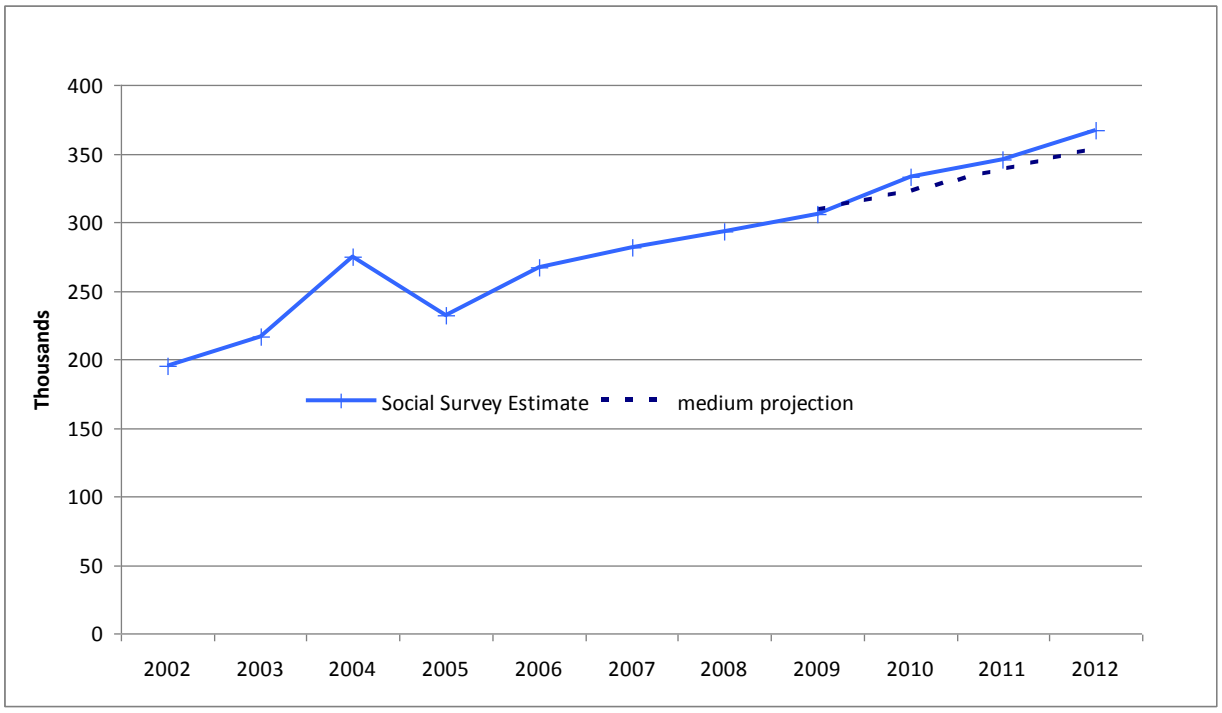
[20] See footnote 1.

methodological purposes does not seem reasonable when we consider the rapid growth that we project. It seems likely, given these high growth rates, that migratory "push" factors will generate some measure of out migration. But once again it is not possible at present to predict their volume or timing.

POSTSCRIPT

The pooled Social Survey file on which estimates of Haredi population size and fertility was based covered the period from 2002 to 2009. However, we now have three more years of data with which to assess our assumptions and forecasts. Figure 6 compares the estimates of the Haredi population at ages 20 and above as reported by the Social Survey for the years 2002-2012 with our forecast for the population aged 20 and above as estimated by our medium projection for the years 2010-2012. The comparison shows that the medium projection underestimates the size of the Haredi population by 3 – 4 percent, but more importantly, it appears that the trajectory of population growth for the Haredi population in the medium projection was lower than that which it is following. Whereas the medium projection estimated that the population aged 20 and over was growing by 4.7 percent annually, the new data show that it has been growing at rates of approximately 6 percent.

Figure 6 Estimates of the Haredi population aged 20 and over from the Social Survey and from the Long-Range Population Projections project, 2002-2012.



In addition, preliminary analysis of linked birth data from the NPR seem to show that fertility rates in the Haredi population after 2009 stabilized rather than continuing their decline. If confirmed this would imply that over the short term this population is following a trajectory closer to that of the High projection.