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Some Fundamentals of Jewish Demographic History

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A fruitful, intriguing relationship exists between population genetics and historical demography. While the former seeks information on the changing size and geographical distribution of populations to draw inference on the odds and timing of observed mutations (Fraikor, 1977; Motulsky, 1995; Risch et al., 1995), the latter may draw notions about the timing and direction of past international migrations from observed patterns of genetic similarity or dissimilarity (Bonné-Tamir et al., 1992). The purpose of this paper is to describe some salient stages and processes in Jewish population history, while trying to keep away from the obvious risk of circular argumentation. More specifically, I search for certain macro-historical and macro-social patterns which may have been underlying the demographic evolution of the Jews and the transmitted experience of Jewish peoplehood in the long run. Discussion of these fundamental issues may enhance the understanding of various associate and dependent processes, including aspects of Jewish population genetics, and of Jewish genetic disease particularly.

The proceedings of the 1990 conference on *Genetic Diversity Among Jews* in memory of Richard Goodman carried a descriptive article on the development of Jewish population in historical perspective, with an emphasis on the last hundred years (DellaPergola, 1992). The present paper complements the previous one by substantially extending the time framework for the assessment of the historical development of Jewish population. In cautiously addressing a span of forty centuries since the origins to the threshold of the 21st century, I am fully aware of the analytic hiatus involved in trying to bridge between solid and documented scholarship, on the one hand, and a mixture of raw data, inference, literary memory, and imagination, on the other.

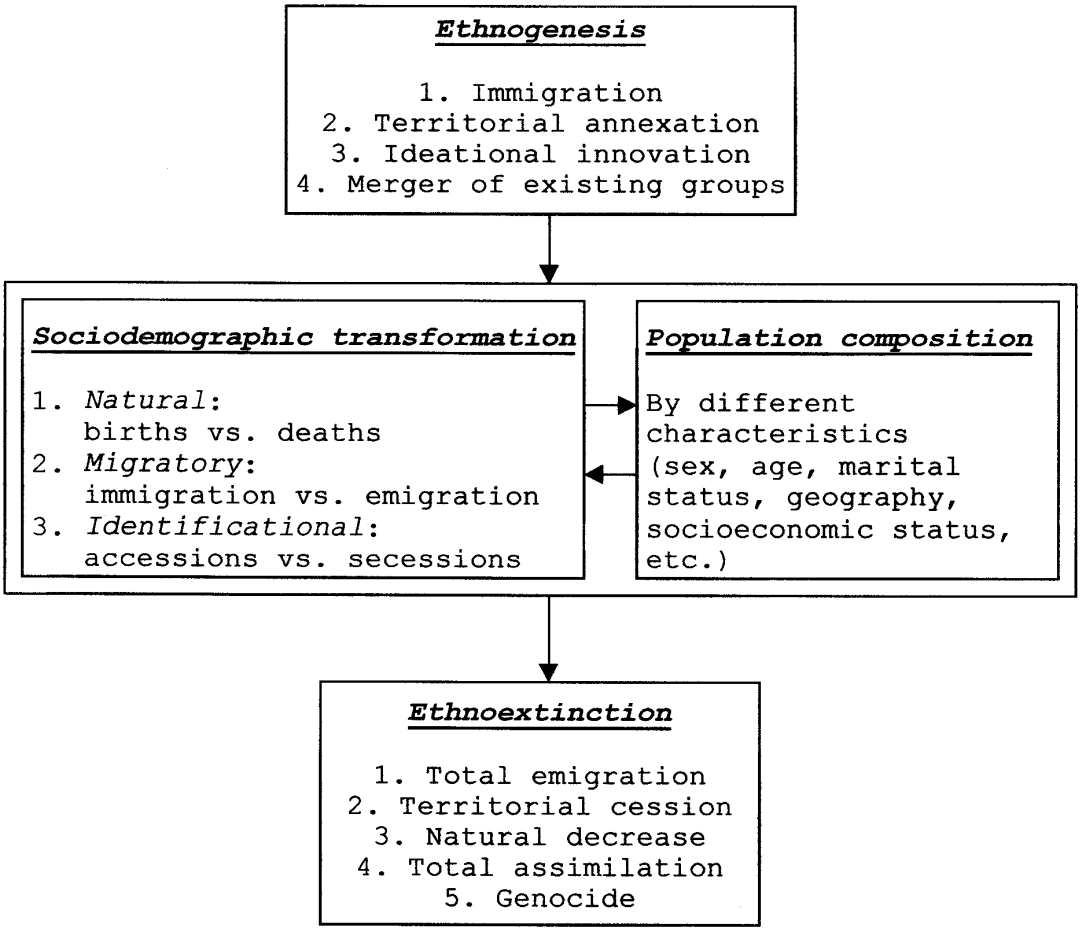
Ethnogenesis, Ethnomaintenance, Ethnoextinction

Before embarking in a discussion of Jewish demographic history, the general mechanisms of the origins and transformation of Jewish populations should be outlined. Jewish communities represent a special case of a group or subpopulation defined by symbolic particularism--be it religious, ethnic, cultural, linguistic, or of any other sort. All along history, countless such subpopulations have come into being, have existed for longer or shorter spans of time, and have disappeared.

The birth, or ethnogenesis, of such a group in a given place may occur because of one of four possible processes (see Figure 1): (a) the initial immigration of the given group to a new territory; (b) the

annexation of a territory where the given group was already present by another territorial entity where it was not; (c) ideational innovation or split out of another existing group; or (d) the merger of two or more existing groups generating a new group with its own durable characteristics. The opposite phenomenon of ethnoextinction in a certain place may occur under any of five possible circumstances: (a) the total emigration of the given group; (b) territorial cession, including all members of the given group; (c) complete assimilation of the group; (d) extinction as the result of an excess of deaths over births; or (e) genocide. Each of these different mechanisms of population change can be assumed to have operated at various points of time in the case of Jewish demographic history.

FIGURE 1. SCHEME OF ETHNOGENESIS, TRANSFORMATION, AND ETHNOEXTINCTION OF GROUP/SUBPOPULATION



Once a subpopulation has been established, its changing size and internal structure will be determined at any moment by a complex of biological, social, and cultural factors: (a) the balance between births and deaths; (b) the balance between immigration and emigration; and (c) the balance between accessions of new members to the group and secessions of old ones from it. The dynamics of these socio-demographic and socio-

cultural events ceaselessly affects the given group's composition according to a variety of relevant characteristics, namely age, sex, marital status, socio-economic status, and cultural characteristics. Each of the latter personal traits, in turn, affects the likelihood of a given socio-demographic or socio-cultural event to occur.

While the vital balance of births and deaths and geographical mobility are universal features affecting any population, the boundary of a group defined by symbolic criteria tends to be quite fluid and open. Over long periods in the past, Jewish communities were quite closed and segregated from the surrounding societies, and hence, culturally, demographically, and genetically isolated. On the other hand, at discrete points in time in the past, and with increasing continuity and frequency more recently, varying amounts of people joined the Jewish group or seceded from it. The condition of a closed and isolated population, therefore, tended to apply only to a (probably declining) set of Jewish demographic processes. The frequency of Jews with non-Jewish origins, as well as of non-Jews with Jewish origins tended to grow, making the analytic distinction necessary between a "core Jewish population" of currently Jewish individuals, and an "enlarged Jewish population" also inclusive of current non-Jews with some Jewish ancestry and of non-Jewish members in Jewish households. This trend will conceivably continue in the future.

The Long-Term Historical View

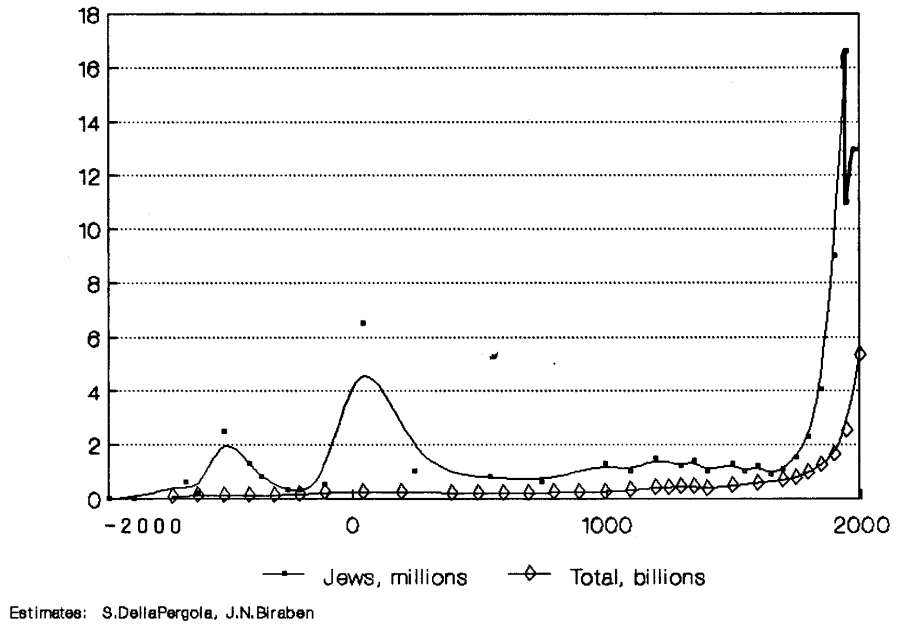
Taking now a very long-term historical look at the known or presumed facts, in Figure 2 we try to compare the development of Jewish population from the very origins to the present day, with that of the world's total population (Biraben, 1979). The emerging profile involves dramatic sequences of expansion and shrinkage in the (assumed) total size of Jewish population. A unique blend of continuity and discontinuity is observed, or at least inferred.

Since the beginnings of Jewish transmitted collective history, relevant textual testimony illustrates the unique demographic saga of the Jews. One of the significant paradigms in Biblical tradition is the growth of the Israelites from one, Abraham's, extended family, into full-scale peoplehood. *Genesis* (46:8-27) specifies the names of fewer than 70 Jewish males--sons and grandsons of Jacob--who migrated to Egypt. *Exodus* (11:37) mentions the over 600,000 Jewish male adults who left Egypt 430 years later. *Numbers* (1:1-50; 26:1-65) suggests an extremely low rate of total Jewish population growth, but substantially different rates of growth for each of the Israelite tribes during the 40 years of wandering in the desert under Moses' leadership.

While we cannot elaborate here on the details and reliability of such early demographic accounts--or, for that matter, on the whole approach to the origin of the Jews--what we do have demonstrated, through ancient textual evidence, are three relevant and fundamental principles that will

affect all the ensuing demographic experience of the Jews: (a) the unequal pace of growth over time of Jewish population as a whole; (b) the differential growth of different sections of the Jewish population at any given point in time, affecting the compositional characteristics of the whole group; and (c) international migration as a large scale process affecting the location and characteristics of the Jews.

FIGURE 2. WORLD JEWISH AND TOTAL POPULATIONS - ROUGH ESTIMATES, 2000 B.C.E. to 2000 C.E.



Estimates: S.DellaPergola, J.N.Biraben

Later literary and archeological sources provide the basis for inference about the continuing development of Jewish population in antiquity. In very synthetic generalization, as against a relatively slow and steady development of total world population until the eve of the 20th century, three periods of major Jewish population expansion stand out (see also Baron 1971; Biraben, 1979):

1. The first corresponds with the period of the Kings, at the height of Israel's political influence in antiquity. King David's censuses can be interpreted to provide a figure around 2-2.5 million people--possibly including non-Jews under Jewish rule--within the extended boundaries of the Kingdom of Israel. After the fall of the First Temple in Jerusalem, during the 8th century B.C.E., and the consequent deportation of Israelites to Babylon, the permanent bases of a Jewish Diaspora were created.
2. The emergence of a second Jewish population peak can be posited toward the time of the construction of the Second Temple in Jerusalem during the Hasmonean period (3rd-2nd century B.C.E.). This new peak, variously estimated, and here cautiously put at around 4.5 million people during the first century B.C.E., has been interpreted by some scholars as reflecting, among other factors, significant numbers of non-Jews around the

Mediterranean basin joining into the fold of Judaism. On the other hand, the Jews' first and second century's struggle against the Roman Empire and their final defeat determined a dramatic Jewish population decline, possibly down to around 1-1.5 million individuals, or less. Most of this decrease was presumably due to the loss of a distinct Jewish identity and the assimilation of large masses of Jews into the surrounding cultures, under the hegemony of Christianity and, later, of Islam.

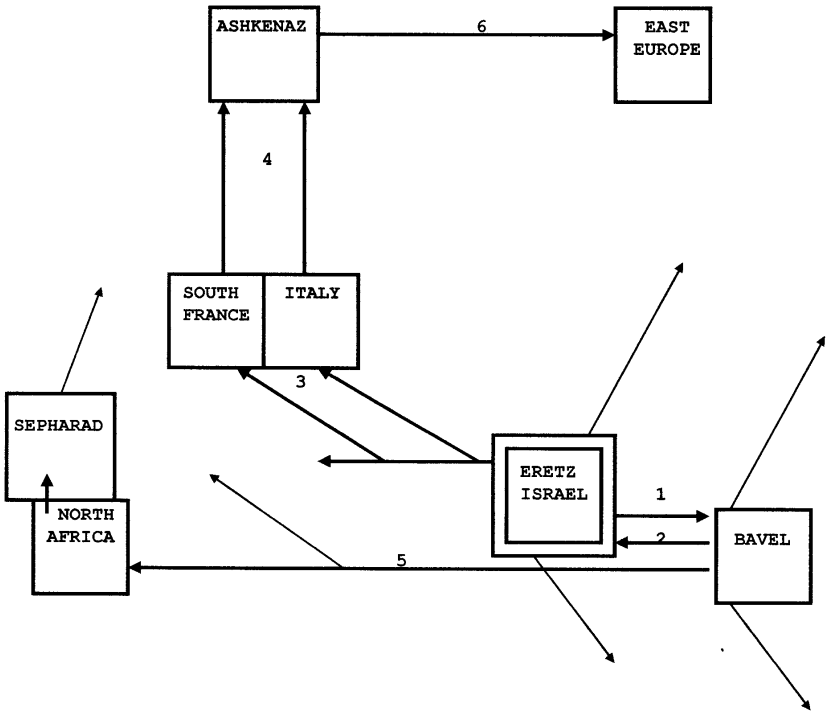
3. The long period of over one thousand years that follows can be defined by "unstable stability": little major Jewish population change in the long run, accompanied by continuous and significant changes in the short run. Operating here is a combination of endogenous and exogenous factors, partly shared with the population at large, partly acting uniquely toward Jewish communities. High mortality due to general epidemics, wars, natural disasters, and more specifically focused expulsions, mass murder, and forced conversions of Jews, periodically wiped out any Jewish population build-up that might have accumulated during more stable times. Most likely the Jewish population at the beginning of the 17th century, here estimated at 1.1 million, was equal to or smaller than that found at the end of the 12th century.
4. The third Jewish population peak reflects the effects of the modern "demographic transition": modernization and its influences on population processes, namely the general declines in mortality and fertility from high or very high to much lower levels. The impressive Jewish population surge during the late 18th, the 19th, and the early 20th centuries--mostly occurring in Eastern Europe--was mostly driven by early improvements in morbidity and mortality levels, possibly linked to socio-cultural and socio-economic differences between Jewish communities and the surrounding populations. The Jewish transition to high rates of population growth clearly preceded similar trends that were to emerge among the total population several tens, if not one or two hundreds of years later.
5. This period of steady demographic expansion, peaking at about 16.5 million, was suddenly terminated by the *Shoah*, the destruction of about 6 million Jews during World War II.
6. The 11 million Jews surviving worldwide after the war are estimated to have grown to 13 million at present. The Jewish population worldwide has currently reached an overall rate of growth approaching zero (DellaPergola, 1997).

Outline of Main Jewish Migrations in Antiquity and the Early Middle Ages

Migrations in ancient eras and during the early Middle Ages crucially shaped the geographic distribution of the Jews. Influences of that distant past until very recently still decisively affected the main patterns of Jewish population distribution. Given the importance of migrations for population genetics, it may be useful to recapitulate the chronology of some of the main steps in population dispersal in the past. Figure 3 shows the main

migration streams and some of the main areas of settlement and resettlement. Six main stages are indicated:

FIGURE 3. SCHEMATIC REPRESENTATION OF MAIN JEWISH MIGRATION FLOWS IN ANTIQUITY AND THE EARLY MIDDLE AGES



1. The first Diaspora, from *Eretz Israel* (the Land of Israel) to *Babel* (Babylon), beginning with the occupation and fall of the First Temple during the 8th century B.C.E.;
2. The *Shivat Zion* (Return to Zion) movement which, according to Biblical sources, brought back to the Land of Israel about 40,000 Jews from the Babylonian exile;
3. The second Diaspora, parallel to the falling of the Second Temple (1st-2nd century C.E.). Among other lands, the southern part of the Italian peninsula, as well as other areas along the Mediterranean coasts of North Africa and southern Europe, housed the development of Jewish communities;
4. The northbound migration from Italy and southern France, possibly since the 4th and through the 10th centuries gave origin to the initial nucleus of Ashkenazic Jewry in the regions around the Rhine Valley, today part of northeast France and northwest Germany;
5. The westbound migration from *Babel*, reaching the north shores of Africa and the south shores of Europe--especially the Iberian Peninsula--reaching its peak in correspondence with the westward expansion of Islam (7th-8th centuries and after);

6. The eastbound expansion of the Ashkenazic settlement, starting after the 11th century and continuing into the 16th.

These main migrations were accompanied by other streams to areas such as Yemen, Central Asia, the Caucasus, the northern shores of the Black Sea, and possibly Ethiopia. If this scheme is fairly accurate, a number of significant implications ensue:

1. The common demographic sources of world Jewish population would be implicit in the ancient stage of settlement in *Eretz Israel*;
2. The first significant partition of Jewish population occurred when the most ancient Diaspora was created in Babylon in the area between today's Syria and Iran;
3. Still in antiquity, yet much later, a Jewish population had experienced a prolonged Mediterranean-Southern European residence. These Jews, originating in the main from *Eretz Israel* and only to a minor extent from *Babel*, would generate the backbone of Ashkenazic Jewry. They had little direct contact with the Jewish community in the Babylonian Diaspora;
4. The same population nucleus had left the Mediterranean-Southern European shores northwards well before these areas--especially the Iberian peninsula--began to attract larger numbers of Jews with a Babylonian background, finally coalescing into the Sephardic Jewish community;
5. It is likely, therefore, that the basic differentiation between what was to become Ashkenazic Jewry and what was to become Sephardic Jewry can be traced to the much different frequency of their ancestral roots in *Eretz Israel* and in *Babel*, respectively. Support for this view comes from an analysis of Jewish religious practices, pointing to different prayer rituals and to a preference for responsa in the respective versions of the Talmud (*Yerushalmi* vs. *Bavli*)(Grossman, 1973; Bonfil, 1983);
6. This interpretation suggests that the same initial Jewish population became subdivided into two quite separate subpopulations (*Ashkenazim* and *Sephardim*) between the 2nd and the 8th centuries.

In each instance of a significant Jewish migration movement, it can be assumed that a minority moved away from the local established Jewish community while the majority remained. The Jewish migrant community settling and developing in a new place therefore probably included a rather limited and self-selected pool of individuals. On the other hand, the communities that remained in the pre-existing locales were exposed to processes of change which possibly often led to serious demographic erosion if not disappearance.

In the more circumscribed context of the discussion about the origins of Ashkenazic Jewry, if the assumptions presented here are correct, namely regarding a relatively closed group of people moving gradually from the Middle East to South Europe, then to North Europe, and finally to East Europe, modern genetic studies should show some degree of similarity between Jews of Eastern European origin and Jews of southern European, Mediterranean, and Middle Eastern origin. On the other hand, research findings and hypotheses by linguists and other scholars who have found substantial Slavic and Turkish influences on the

Yiddish language and literature, would imply that Ashkenazic Jewry emerged from the fusion of Jewish immigrants with substantial numbers of non-Jews in the Eastern European context (Herzog, 1979; King, 1992). The consequence for modern genetic studies would be substantial similarity between Jews and other persons belonging to those regional societies.

Further genetic research is needed here to adjudicate between these conflicting historical, demographic, and philological hypotheses.

World Jewish Population: Middle Ages to Early Modern Period

Turning to a more data-oriented analysis of Jewish demographic history, Benjamin de Tudela's (ca.1170) travel itinerary probably provides the most comprehensive description of the geographical distribution and main characteristics of Jewish population in the world of the Middle Ages. Generally considered authoritative and reliable, withstanding the scrutiny of modern historiography--at least for those locales he unquestionably visited--de Tudela provides plenty of statistical data. Some of these can be accepted at face value, some others surely need some adjustment.

TABLE 1. JEWISH POPULATION ESTIMATES BASED ON BENJAMIN DE TUDELA'S ITINERARY - Ca. 1170

Region	Number		Percent
	Original[a]	Adjusted[b]	
Total	**974,454**	**1,200,000**	**100.0**
Europe	**14,613**	**150,000**	**12.5**
West Europe[c]	5,872	102,500	8.5
Balkans[d]	8,741	40,000	3.4
East Europe	0	7,500	0.6
Asia	**946,241**	**979,700**	**81.6**
Near East	22,241	52,900	4.4
Iraq	121,500	121,500	10.1
Arabian Pen.	455,000	455,000	37.9
Iran	193,500	193,500	16.1
Central Asia	50,000	52,300	4.4
India	101,000	101,000	8.4
East Asia	3,000	3,500	0.3
Africa	**13,600**	**70,300**	**5.9**
N.E.Africa	13,600	40,300	3.4
Maghreb	0	30,000	2.5

a. Not including Jews whose presence is reported by de Tudela without a figure being provided. See also text above.
b. Including our estimates for areas where de Tudela reported the presence of Jews without a figure, and areas not reported by him where the presence of Jews is known from other sources. See also text above.
c. Including Germany.
d. Greece and Turkey.

The emerging picture is displayed in Table 1, which includes both the original data and our adjustments for areas where de Tudela reported a Jewish presence without specifying the numbers, as well as for areas he did not touch and where a Jewish presence can be ascertained through other sources. For the areas better documented by Benjamin, such as Western Europe and the Near East, we considered his data as representing households, and multiplied them by a cautious factor of 4.375 persons per household. Data for other areas, whose descriptions appear to be less reliable, were taken as total population figures.

After adjustments of the original figure of about 975,000 Jews, a total estimate of 1.2 million obtains around the year 1170. Over 80% of the adjusted Jewish population were located on the Asian continent. Some of de Tudela's figures, namely the huge Jewish concentrations reported in the Arabian Peninsula, admittedly appear quite unreliable, and occasionally quite fantastic. The same applies to some of his descriptions of India, Central Asia, and the Far East. If we were to dismiss these data or to reduce them drastically, the total Jewish population estimate would be reduced accordingly. On the other hand, the reported information about the large communities in Constantinople or Baghdad appear reliable, as surely is the case for the smaller communities visited in western European countries, or the report of Benjamin's visit to the sparsely inhabited and desolate Holy Land.

We know from other evidence that Jewish population was growing in western Europe during the 12th century. Jews were also beginning to spill into Eastern Europe, although the assumed numbers there were still very small. De Tudela was aware of that presence, as far as the Ukraine's capital city, Kiev, but he did not provide figures; nor did he for Jews who had arrived from the south and probably were sparsely settled in Southeast Europe, from the northern Balkans through Romania. Moreover, de Tudela only partially covered North Africa, which included long-standing Jewish communities. His bare mentioning of Jews in the Upper Nile Valley, south of Egypt, would be consistent with the assumption that the growth of Jewish populations there was a later development.

Overall, the crucial fact provided by de Tudela about the Jewish world in the Middle Ages, confirmed by numerous other observations, is that at this stage the Jews still featured a predominantly Middle Eastern geography, while their presence in Eastern Europe was extremely sparse and scarce. During the successive two or three centuries the demography of world Jewry would be transformed by migrations from the southeastern Mediterranean to Western Europe, and from Western to Eastern Europe. The growth of these regional communities would also be significantly affected by the differential impact of birth and death rates. On the other hand, some of the communities that de Tudela was able to describe or at least to mention in South and Central Asia, would disappear through complete assimilation, thus fueling the myth of the "lost tribes".

The process of geographical and demographic transformation within a world Jewish population of rather stable total size between 1170 and 1700 is outlined in the upper lines of Table 2. The roughly estimated

Jewish population of Europe tended to grow, while--assuming we can accept the figures for the earlier date--the tentatively combined estimates for the communities in Asia and Africa tended to decline. Between 1170 and 1490, while the center of gravity of the Jewish people was transferred westward to Europe, the main Jewish population centers in Western Europe were periodically wiped away by several successive expulsions, most importantly from Spain and Portugal at the turn of the 15th and 16th centuries. But, besides the dispersive effects of emigration, the major Jewish population shift occurred within Eastern Europe. In the course of the 17th century, despite the mid-century Chemelnitzky massacres, Eastern Europe was to become the leading center of Jewish population growth.

The Modern Demographic Transition and the Growth of Ashkenazic Jewry

The crucial process in modern demographic history was the reduction in the levels of mortality and subsequently of natality, usually described as the "demographic transition" (Bachi, 1976; DellaPergola, 1983). Modern Jewish and total population growth reflects the different timing in the modernization of the different factors of population change. Jews generally preceded the non-Jewish population in the same places in undergoing these demographic transitions. Consequently the Jews anticipated the early take-off of rapid population growth, as in due course they would anticipate the modern slowing down of population growth.

TABLE 2. JEWISH POPULATION ESTIMATES, BY MAJOR REGIONS - 1170-1995

Year	Number (Thousands)					Percent	
	Total	West Europe	East Europe, Balkans	Asia[a], Africa	America, Oceania	Europe as % of Total	East Europe as % of Europe
1170	1,200	103	47	1,050	-	12.5	31.3
1300	1,200	385	65	750	-	37.5	14.4
1490	1,300	510	90	700	-	46.2	15.0
1700	1,100	146	573	377	4	65.4	79.7
1825	3,281	458	2,272	540	11	83.2	83.2
1880	7,663	1,044	5,727	630	262	88.4	84.6
1939	16,500	1,350	8,150	1,600	5,400	57.6	85.8
1948	11,500	1,035	2,665	2,000	5,800	32.2	72.0
1995	13,059	1,037	704	4,735	6,583	13.3	40.4

a. Including Palestine/Israel.
Sources: Adapted from de Tudela (ca. 1170), Baron (1971), DellaPergola (1992, 1997).

The major shifts in Jewish population size and geographic distribution by major regions between 1700 and 1939 are outlined in the

mid-portion of Table 2, showing the different rhythm of growth of Jewish populations in East Europe, West Europe, Asia and Africa, and in the newly settled worlds across the Ocean, the Americas and Oceania. The late Jewish population surge in America is obviously explained by international migration.

Viewed in historical perspective, migrations unquestionably had deep consequences in reshaping the social and cultural profile of Jewish communities globally. Not only the geographic center of gravity, but also the predominant focus and character of Jewish society were repeatedly and decisively shifted as a consequence of massive migratory movements. Migration disconnected and reconnected Jewish individuals and organized communities in ways that promoted social and cultural change. Although similar interconnections can be found in the migration experiences of other ethnoreligious or sociocultural groups, the Jewish case appears to extend over a longer time span and is geographically more complex and articulated.

However, it is the unfolding of demographic processes within Eastern European Jewry that commands special attention. A few thousand Ashkenazic Jewish households in the Middle Ages would multiply into several hundreds of thousands by the 18th century, and into several millions toward the end of the 19th. Here the question has repeatedly been raised: Is it at all possible that the small initial Jewish population in Eastern Europe would grow to become the overwhelming majority of world Jewry, and if so, under what conditions?

The partial demographic evidence that is actually available from censuses and vital records, combined with relatively simple and plausible assumptions about the main factors of population change, i.e. life-expectancy and fertility levels, allows for an attempt to reconstruct this crucial phase of Jewish demographic history (see also: Mahler, 1958; Weinryb, 1972; Baron, 1976; Gieysztorowa, 1976; Bloch, 1980; DellaPergola, 1983; Stampfer, 1987; Jagur-Grodzinski, 1997).

Table 3 illustrates how the development of Eastern European Jewry might be outlined for the period of over seven centuries between the initial stages of settlement and the early stages of mass emigration from East Europe to America and other Western destinations. It should be stressed that the geographical definition of our estimates does not refer only to the central nucleus of the Polish-Lithuanian communities, which were the main centers of Jewish population growth, but also to a much broader territory including the lands from Bohemia eastwards, Galicia, Hungary, Romania, the whole southeastern extensions of Ukraine, and Russia. This is done to take into account the likely existence of a small pre-Ashkenazic Jewish population in Eastern Europe, and more significantly, the geographical mobility from and into each of these areas as an important factor in the coalescence over time of the Jewish population in Eastern Europe.

TABLE 3. JEWISH POPULATION GROWTH IN EASTERN EUROPE - TENTATIVE ESTIMATES OF POPULATION SIZE AND MAIN DEMOGRAPHIC INDICATORS, 1170-1900

Year	Jewish population, thousands	Years span	Yearly growth rate, %	Life expectancy, female	Total fertility rate
1170	7				
		130	0.9-1.0		
1300	25				
		190	0.3-0.4	25	5.8
1490	50				
		160	1.0	27.5/30	6.4/5.9
1650	250				
		115	1.1-1.2	30	5.9
1765	910				
		60	1.5-1.6	35	5.9
1825	2,272[a]				
		55	1.7	40	5.5
1880	5,727[a]				
		20	2.0	45	5.4
1900	8,510[b]				

a. Including Balkans. b. Including emigrants overseas.
Sources: adapted from Baron (1971), Bloch (1980), DellaPergola (1992), Coale and Demeny [West models] (1966), and author's estimates.

The observed (or assumed) Jewish population increase in such an all-inclusive definition of Eastern Europe would possibly correspond to 25,000 persons in 1300, 50,000 in 1490, 250,000 after the mid-17th century Chemelnitzky massacres, 910,000 in 1765 at the time of the major census of Polish Jewry (see Stampfer, 1987), two and a quarter million in 1825, over five and a half million in 1880, and over eight and a half million in 1900. These developments would correspond to annual rates of population growth gradually passing from about 0.3-0.4% during the earlier stages of Jewish settlement (14th-15th centuries), to somewhat above 2% at the end of the 19th century. The higher initial Jewish population growth rates are also meant to account for immigration, although this was relatively small in terms of the absolute numbers involved. One can further assume that the Jewish population growth rates in the central area of Poland/Lithuania would be somewhat higher than the average for the whole region considered here, higher growth setting in at somewhat anticipated dates. These rates of Jewish population growth are generally higher than those for the total population, and imply a gradual increase in the proportion of Jews out of total inhabitants.

The rates of Jewish population growth that we suggest in Table 3 can be compared with standard population models, namely stable population tables (Coale and Demeny, 1966) that mathematically link the different parameters of demographic change and composition under varying assumptions of life-expectancy. These model tables allow for the determination of the level and range of variation of any demographic

parameter once one or more of the other main parameters are known or have been estimated. Specifically, we shall use the Coale-Demeny models to evaluate Jewish total fertility rates (TFR) that would be compatible with estimated rates of Jewish population growth, and with assumed levels of life expectancy among the Jewish population. Coale-Demeny "West" models were preferred, as they better fit populations with relatively low child mortality, as assumedly was the case of the Jews. A further assumption is an average generation length (the average age of women giving birth) around 29, implying a comparatively young age at marriage for Jewish brides, but also an extended period of childbearing.

Complementing our set of estimates of annual growth rates of the Jewish population, we further assume that levels of Jewish female life-expectancy at birth gradually improved from a very low level of 25 years in the period 1300-1490, to 45 years toward the end of the 19th century, as actually estimated on the basis of available data (Bloch, 1980). Two alternative levels of life expectancy were suggested for the period 1490-1650. Under the conditions indicated here, the Jewish average total fertility rate (TFR) would necessarily range most of the time around 5 to 6 children born alive per woman (only some of whom would survive to adulthood). The higher the life expectancy during a certain time interval, the lower would be the fertility level necessary to reach a given population growth rate. Alternatively, a rather constant level of fertility combined with improving life expectancies would produce rising population growth.

Early improvements in the longevity of the Jews, against comparatively lower life-expectancies for contemporary populations, would be facilitated by the adherence of Jewish communities to traditional ritual prescriptions, including quality control over food, personal and family hygienic norms, some input offered by relatively frequent Jewish physicians and, significantly, social assistance traditionally awarded to the Jewish poor. At a later stage, the impact of socioeconomic differences most likely tended to become the main determinant of persisting mortality and fertility differentials between Jews and non-Jews. More widespread urbanization, and significant differences in educational levels and occupational concentrations could translate into relative advantages for Jews in terms of survivorship levels.

Comparatively, though not exceptionally, high Jewish fertility levels would be enhanced by the traditional support for, and active community mobilization to achieve, universal marriage at relatively young ages, and frequent remarriage of widowers in the closed and strictly endogamous cultural context of Jewish communities. It should be noted that average total fertility rates equivalent to 6-7 children have been customarily found among historical populations, not to mention the North American Hutterite community during the 1920s, or Israel's Muslim community during the 1960s, among whom averages of 10 children or more were recorded. Eventually, many of the same social factors responsible for the early decline in Jewish mortality also translated into an earlier beginning and quicker development of the transition toward lower levels of Jewish fertility.

While any claim to accuracy in the speculations just submitted is out of the question, it is important to stress that the demographic parameters postulated here are entirely feasible. They are indeed consistent with measures of Jewish population growth rates independently obtained for various portions of the 18th and 19th centuries. The feasibility and coherence of the figures suggested in Table 3 strongly argue against the need to look for alternative explanations to the rapid growth of Eastern European Jewry, such as continuing mass immigration, or large-scale conversions to Judaism of members of local non-Jewish populations.

FIGURE 4. DEMOGRAPHIC TRANSITION AMONG JEWISH AND TOTAL POPULATIONS IN FOUR COUNTRIES - 1800-1990

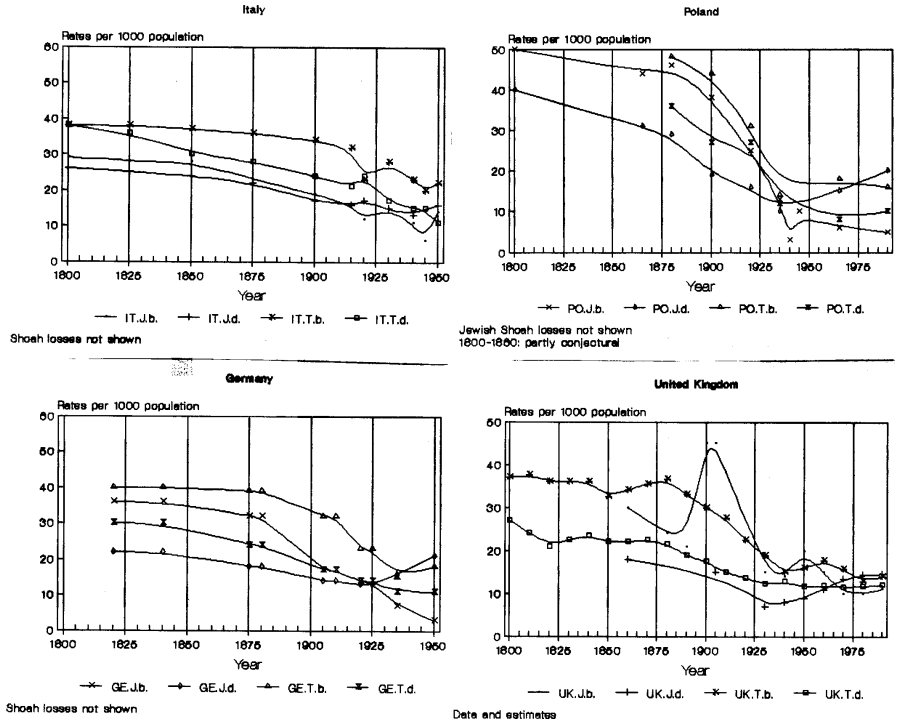
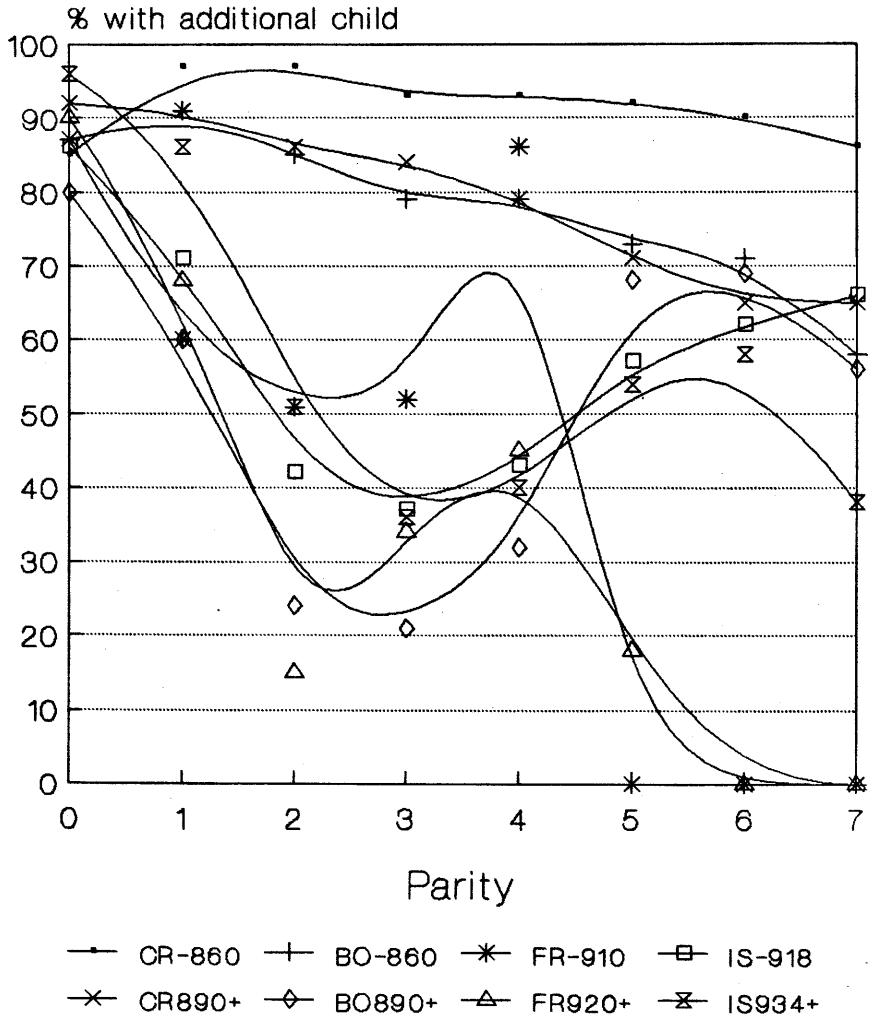


Figure 4 illustrates these trends by providing four series of birth and death rates during the 19th and 20th centuries: for two West European countries (Italy and Germany); a country in Eastern Europe (Poland); and a Western country where the Jewish population grew rapidly under the impact of large-scale international migration (the United Kingdom). In spite of substantial differences in the timing and modes of diffusion, differences in demographic transition between Jews and non-Jews quite consistently followed the same rules. In each instance, death rates declined earlier among Jews than among the general population; and the same happened later with regard to birth rates. The East-West differential is evident for Jews and non-Jews alike in terms of the levels, timing and speed of demographic transition. The Jews in England offer an interesting case of a passage from a Western to an East European pattern, as

appropriate to a Jewish community whose composition changed under the impact of immigration from predominantly German to mostly East European stock. A similar process affected the Jewish population in the United States between the 1880s and the First World War.

Fundamental features of the Jewish fertility transition are further clarified through a measure of the pace of family formation, as reflected by parity progression ratios. Parity progression ratios measure a given population's average likelihood to expand a family of a given size through an additional birth of higher rank. Figure 5 shows parity progression ratios for selected age cohorts of Jewish women in four countries: Carpatho-Russia--the easternmost province of Czechoslovakia during the interwar period; Bohemia--a more Westernized province in the same country--in 1930; France in the 1970s; and Israel in the 1980s (Blau, 1953; Bensimon and DellaPergola, 1984; Israel, 1996).

FIGURE 5. PARITY PROGRESSION RATIOS AMONG EUROPEAN JEWISH WOMEN IN SELECTED COUNTRIES - BORN BEFORE 1860 TO 1938; OBSERVED 1930-1983



Data: Carpatho-Russia and Bohemia: 1930;
France: 1975; Israel: 1983
Data processing: S. DellaPergola

Four principal patterns of demographic behavior emerge: (a) the persistently high and unchecked level of natural fertility, typical of Jewish women in Carpatho-Russia born before 1860; (b) the beginning of fertility control among Bohemian Jewish women born before 1860 and among their peers born 30 years later in Carpatho-Russia; (c) a more moderate, controlled, and bi-modal profile for the later Bohemian cohorts, and for contemporary Israeli women; (d) and the much lower, down to extremely low, yet still bi-modal fertility profile of contemporary Jewish women in France. Bi-modal distributions imply a largely diffused propensity to reduce the likelihood of an additional child as a function of the number of children already born. At the same time, women reaching a certain threshold--here around 6 births in the earlier data and around 4 in the more recent ones--appear to be making lesser efforts to avoid births of a higher rank.

Apparently while the diffusion of demographic modernization during the 19th century implied a general lowering of fertility rates, modernization trends by no means synchronically involved the whole Jewish population, not even in the same place. Within each Jewish community, side by side and along with the modernizing majority, a minority was resilient in its more traditional family behaviors. Similar differentials in fertility patterns characterized different social strata as well. Significantly, what most likely characterized the East European Jewish context in an earlier past was an overlap between the higher social classes and the more religiously observant strata of the Jewish population. These trends consistently imply differential Jewish population growth between communities, as well as between different sectors within the same community. Even if not necessarily the same communities or sectors all the time, in all instances the burden of Jewish population growth was carried disproportionately by a relatively small minority of the total Jewish population. This is true of the role of the quite small initial Eastern European Jewry *vis-à-vis* the rest of world Jewry; and of the minority of more traditional Jewish families *vis-à-vis* the poorer, and later the more rapidly modernizing majority within any given locale, in Eastern Europe or elsewhere.

Demographic Implications of the Holocaust

While we have dealt so far with Jewish population growth and its differential impact in the past, one question which looms large in more recent Jewish demographic history and crucially affects the present status of world Jewry is: What would have been the demographic profile of the Jewish people if there had been no *Shoah* (Holocaust) of European Jewry? This surely is a most intractable question, as it involves a huge array of hypotheses and speculation, if not fiction (DellaPergola, 1996). Indeed, one cannot delete one major portion of history without asking what the implications would be for other interrelated historical developments. One main related issue is whether or not the State of Israel would have been

born without the *Shoah.* While historians have debated this question for years, there obviously is no answer to it. However, the boosting influence of an independent State of Israel on the later demographic development of Jewish population cannot be undervalued (see below).

Putting aside these major and other excruciating conceptual problems, it is nevertheless possible to assess the size, age composition, and demographic dynamics that prevailed among world Jewish population before World War II. One may then try to figure out some more likely scenarios about what could have been the demographic development of Jewish populations in the ensuing years. Some computational, albeit purely speculative, results can thus be obtained. These are demonstrated in Table 4.

TABLE 4. JEWISH POPULATION PROJECTIONS, ASSUMING THE SHOAH HAD NOT OCCURRED, MILLIONS, 1940-2000

Year	Actual estimate	Model A Low fertility	Model B: Very low fertility	Model C: Actual growth rate
1940	16.5	16.5	16.5	16.5
1950	11.4	18.5	18.5	17.9
1960	12.2	21.9	20.9	19.2
1970	12.6	25.2	22.8	19.8
1980	12.8	28.1	24.6	20.1
1990	12.9	31.0	25.9	20.3
2000	13.2	32.8	26.5	20.8

Source: Adapted from DellaPergola (1996). See text for explanations.

We projected the 1940 Jewish population under three alternative and extremely conservative assumptions: (a) moderate to low fertility levels after World War II; (b) extremely low fertility levels; and for the sake of establishing a minimum estimate, (c) simply applying to the pre-war Jewish population estimate the actual post-war growth rates--thus incorporating the prominent after-effects of the *Shoah*. The results clearly reflect the relatively young age structure of Jewish populations, namely in Eastern Europe, and the demographic momentum such young population composition could be expected to generate. The more interesting finding is not that without the *Shoah* the Jewish population would have been larger, but by how much. As against today's 13 million Jews worldwide, the more likely projections (A and B) indicate an expected population ranging between 26 and 31 million in 1990. Moreover, while the present world Jewish population clearly tends toward "zero population growth" and substantial aging, according to our tentative projection Jewish population in the 1990s still would have been in the process of growth.

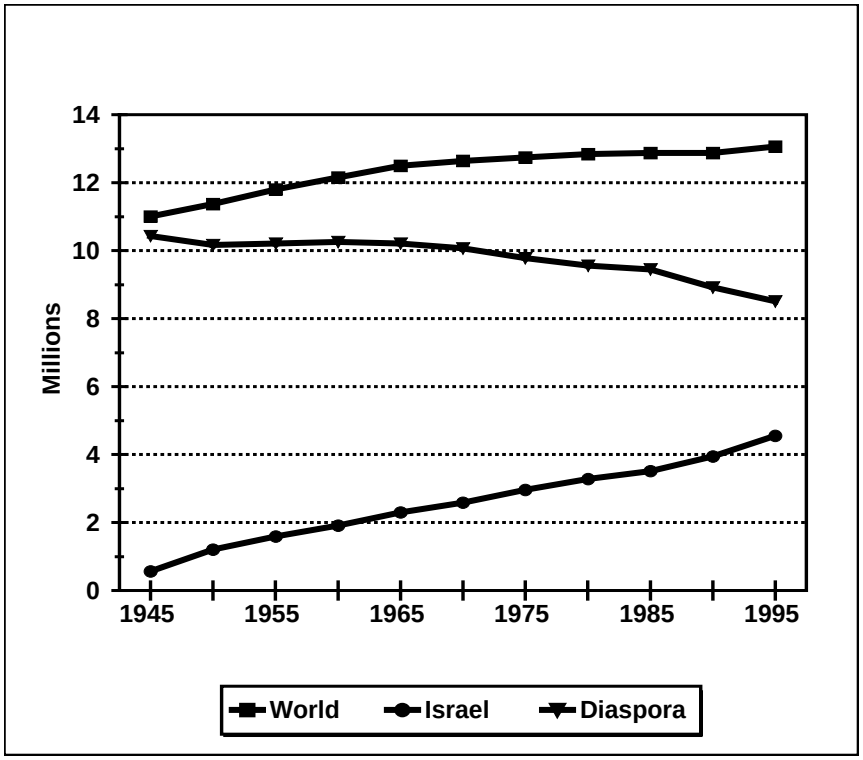
The selective geographical impact implicit in this fictional yet intriguing exercise is also of great significance. Eastern European Jewry would have been the recipient of most of the potential population growth that was terminated through the irreversible effects of the *Shoah*. In the

real, post-*Shoah* world, the main reservoir of the Ashkenazic Jewish community was now to be found in the United States of America.

Israel's Impact on Jewish Demography

What actually happened since World War II is demonstrated in the bottom lines of Table 2, and Figure 6. Under the impact of international migration, namely *aliyah* to Israel and of internal demographic developments locally, the Jewish subpopulations in Israel and in the aggregate of Diaspora Jewries developed according to two quite different courses. Jewish population growth in Israel--especially rapid during the late 1940s and the early 1990s--was more or less matched by stability or, more typically, decline in the rest of world Jewry. At the end of 1995, the total world Jewish population estimate of 13.1 million included 4.6 million in Israel (35%) and 8.5 million in the rest of the world, 65% (over 5.7 million) of whom lived in the United States (DellaPergola, 1997).

FIGURE 6. JEWISH POPULATION ESTIMATES - WORLD, ISRAEL, DIASPORA, 1945-1995



Underlying these trends were very different patterns of family formation in Israel versus the majority of other Jewish communities, namely higher marriage propensities, younger ages at marriage and persistently higher fertility rates. This resulted in a younger Jewish population composition in Israel, and comparatively fewer deaths which in

any healthy contemporary population are concentrated at the oldest end of the age distribution. The product was a moderate rate of natural increase in Israel, as against a growing demographic deficit among Jewish populations elsewhere. These trends were enhanced by impressive processes of social mobility, and a consistent tendency to converge geographically towards the economically and culturally more developed national and urban centers of the world.

FIGURE 7. INDICATORS OF JEWISH HETEROGAMY - ISRAEL AND UNITED STATES, 1940s-1990s

One momentous implication of changes in Jewish marriage patterns is illustrated in Figure 7, which juxtaposes the trends in choice of partner in two different contexts: of Jewish majority in Israel, and of Jewish minority in the United States. The Israeli data are based on Benini indexes--a statistical measure of the propensity to marry within one's own group independent of group size--based on a dichotomous classification of European-American and Asian-African origins. They point to the growing tendency of Jews in Israel to marry a partner of different ethnic background (Israel Central Bureau of Statistics). The US data report the percentage of Jews who married a non-Jewish partner who did not convert to Judaism. They point to an even faster developing trend to heterogamy (Kosmin et al., 1991; Phillips, 1996). These are two distinct yet parallel aspects of the growing interaction and assimilation of Jewish sub-populations within a broader societal context (whether Jewish or non-Jewish). The implications for the future continuity of Jewish populations are obviously different in Israel and in the Diaspora. Both trends,

however, point to the expansion of relevant pools underlying the search for marital partners, which is of sure interest for the future development of Jewish genetics.

One significant consequence of the different growth of Jewish populations in Israel and in the Diaspora through the combined effect of the *Shoah*, international migration, differential birth and death rates, and assimilation, is presented in Table 5. It shows the deep geographic compositional difference by countries of origin for Jews who live in Israel and elsewhere. Today most of the Jews of Asian and African origin live in Israel, while the largest concentration of Jews of Eastern European origin live in the United States.

TABLE 5. JEWS IN ISRAEL BY BIRTHPLACE AND COUNTRY OF ORIGIN, AND WORLD JEWISH POPULATION BY COUNTRY OF RESIDENCE, 1995

Country	In Israel, by origin[a]		Jewish population in country[b]
	Born abroad	Total[c]	
Grand total	**1,747,800**	**4,495,100**	**13,059,000**
Europe	**1,053,000**	**1,636,300**	**1,781,200**
Former USSR[d]	651,400	792,800	660,000
Poland	102,800	253,900	3,500
Romania	135,700	252,300	14,000
Germany, Austria	35,400	83,800	70,500
Bulgaria, Greece	25,900	58,400	6,700
Hungary	18,700	41,200	54,000
Czech, Slovakia	15,800	36,700	5,900
Other	67,300	117,200	966,600
Asia	**255,600**	**732,600**	**39,800**
Iraq	83,200	254,100	100
Yemen	42,300	156,200	200
Iran	54,800	135,600	13,000
Turkey[e]	34,400	85,700	19,200
India	18,600	42,900	4,300
Other	22,100	58,100	3,000
Africa	**330,000**	**842,700**	**105,700**
Morocco	181,800	504,400	6,300
Algeria, Tunisia	44,600	126,400	1,700
Libya	21,900	73,900	0
Egypt	24,000	62,300	200
Ethiopia	46,100	58,300	200
Other	11,400	17,300	97,300
America, Oceania	**108,700**	**170,800**	**6,582,800**
N. America, Oceania	60,800	93,100	6,148,600
Latin America	47,900	77,000	434,200
Israel / Israel	**=**	**1,112,700**	**4,549,500**

a. Mid-year estimates.
b. End of year estimates.
c. Including Israel-born, by country of birth of father.
d. Including Asian territory.
e. Including European territory.
Sources: Israel Central Bureau of Statistics (1996); DellaPergola (1997).

According to an ongoing reevaluation of current Jewish population trends, carried out at the Hebrew University, it is likely that Israel's weight within total world Jewry will continue to increase. At some date around the first decade of the 21st century, there might be more Jews living in Israel than in the United States, and at some later date in the third or fourth decade of the century, Israeli Jewry might constitute more than one half of the total world Jewish population. These projections, evidently, presume the absence of any dramatic deviation from the main evolutionary patterns of Jewish population that have been observed in recent decades. The continuing growth of Israel on the world Jewish population scene also implies a changing predominance in the types and incidence of genetic profiles and diseases that can be expected in the future among Jews globally.

Conclusions

From the broad illustrations brought here, we learn that certain basic mechanisms indeed repeatedly and deeply influenced the size and composition of Jewish populations locally and globally.

1. The reconstruction submitted here clearly suggests that the demographic history of the Jews never did unfold as a straight-line. Rather, sudden growths and declines in Jewish population size alternated over time globally, and to an even more dramatic extent within the circumscribed context of specific geographic regions, countries, or locales.
2. Implicit in the preceding feature, and evidently fundamental in its implications for human genetics, was the repeated substitution of large sections of the total Jewish population stock. Now and then, entire sections assimilated out and disappeared (the "lost tribes"), and to a lesser extent, and especially in the more distant past, new members joined.
3. Through the ceaseless influence of differential Jewish population growth, some sections grew more rapidly than others, mostly through higher levels of fertility. This produced wide diffusion and predominance of certain characteristics, at one and the same time physical and cultural, and the dilution or disappearance of others.
4. International migration constantly represented a major factor of global change and adaptation, determining from time to time under what environmental circumstances Jewish population processes would unfold--more or less culturally and socially segregated.

   Minority status, which prevailed most of the time, exposed Jewish populations in the Diaspora to manifold legal, political, economic, and cultural influences. Bottlenecks in the orderly demographic development of Jewish population in a given locale repeatedly occurred through mass emigration, large scale withdrawal from belonging to the Jewish community, or violent persecutions and mass victimization. The symmetric process of interaction and intermingling of Jews with non-Jewish populations now and then brought about some expansions in the

Jewish population, though more often the balance was negative. Continuity of the Jews as a collective did not, nor will it, necessarily imply continuity at the level of individual genealogy. Yet cultural, demographic, and physical continuity in a broader sense and in the very long term is a feature on which the Jewish population uniquely stands out in the comparative study of human society worldwide over the last 40 centuries.

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