

Respiratory Tuberculosis Mortality Among the Sephardic Jews of Gibraltar

By L. A. Sawchuk and D. A. Herring¹

ABSTRACT

The existing evidence for a Jewish advantage in terms of lower respiratory tuberculosis mortality is reviewed and criticized. New evidence on Sephardic Jews is presented. Analysis of cause-specific death records for the inhabitants of Gibraltar from 1890 to 1939 revealed that the Sephardic Jews enjoyed a relative advantage over non-Jews in terms of respiratory tuberculosis mortality. Socioeconomic, demographic, and cultural factors appear to have buffered the Jews, particularly those in the post-reproductive age categories, from respiratory tuberculosis.

By the close of the 19th century, mortality statistics collected from a number of urban centers seemed to indicate that Jews were more resistant to respiratory tuberculosis than other ethnic/religious groups (Fishberg, 1901). Early explanations for this repeated observation tended to implicate Jewish cultural practises (Behrend, 1889; Remondino, 1891; Lombroso, 1894; Tostivint and Remlinger, 1901; Fishberg, 1901). Fishberg, however, argued that because tuberculosis mortality had been high among Jews living in medieval European ghettos, this had "had the effect of weeding out a large proportion of those Jews who were excessively predisposed to tuberculosis infection" (1911:293). His explanation, widely cited by subsequent investigators (c.f. McCarthy, 1912; Dublin, 1922; Rolleston, 1928; Bolduan and Weiner, 1933; Perla and Marmorston, 1941; and Rakower, 1953), became entrenched in the literature and has been incorporated into the more recent work of epidemiologists (Damon, 1971) and geneticists (Myrianthopoulos and Aronson, 1966, 1972; Myrianthopoulos and Melnick, 1977; Motulsky, 1979).

Some of the early investigators, however, voiced concern over the validity of the compiled mortality statistics noting the lack of reliable information on the exact size and ethnic homogeneity of the Jewish samples (The Lancet, 1900; Fishberg, 1901, 1908; The British Medical Journal, 1908; Dublin, 1922; Bolduan and Weiner, 1931). A number of other deficiencies in the published studies presented in Table 1 can also be identified.

First, the majority of the Jewish/non-Jewish comparative studies are based on cross-sectional mortality rates. To determine whether ethnic

¹Department of Anthropology, University of Toronto, Scarborough Campus, 1275 Military Trail, West Hill, Ontario M1C 1A4

Table 1
Frequently Cited Comparisons of Tuberculosis Mortality in Jews and Non-Jews

Original Study	Cited In	Period	Location	Mortality Rate per 100,000		Comments
				Non-Jews	Jews	
Billings, 1890	Fishberg, 1901	1880	United States	127.00	35.00	Mean Values
Billings, 1894	Fishberg, 1901	1884-90	New York State	205.14	155.05	"White Americans" vs. Hungarian immigrants—mostly Jews
				205.14	98.21	"White Americans" vs. Russian and Polish immigrants—mostly Jews
			Brooklyn	180.79	120.77	"White Americans" vs. Hungarian immigrants—mostly Jews
				180.79	76.72	"White Americans" vs. Russian and Polish immigrants—mostly Jews
					124.00	
Tostivint & Remlinger, 1900	Lancet, 1900	1895-99	Tunis	113.00	75.00	Musulman Arabs
		1894-1900		513.00	75.00	Europeans
Proca, 1906	Fishberg, 1908	1900	Bucarest	387.00	256.00	

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Rosenfeld, 1907	Fishberg, 1908	1901-03	Vienna	496.00	179.00	Catholics
				328.00	179.00	Protestants
Thon, 1907	Fishberg, 1908	1896-1900	Cracow	664.00	205.00	
			Lemberg	635.00	306.00	
British Medical Journal, 1908	Br. Med. J., 1908	1891-1900	London	179.00		
		1900			123.00	
		1906			133.00	
Fishberg, 1908	Fishberg, 1908	1901-03	New York City	450.00	180.00	Irish and Italians
Fishberg, 1908	Census of 1906	1905	Budapest	460.00	219.00	
McCarthy, 1912	McCarthy, 1912	1910	United States	210.00	170.00	At ages 10+
Dublin, 1922	Dublin, 1922	1910	New York State	270.00	105.00	At ages 10+
Drolet, 1923	Asserson, 1927	1918-1921	New York City	108.00	86.00	
Bienstok, n.d.	Rakower, 1953	1905-14	Petersburg	370.00	170.00	
Sokolowski, n.d.	Rakower, 1953	1900-02	Warsaw	272.00	144.00	
Rosenfeld, n.d.	Rakower, 1953	1892-1902	Lwow	635.00	306.00	
Auerbach, n.d.	Rakower, 1953	1901-05	Budapest	392.00	206.00	
Kirchner, n.d.	Rakower, 1953	1901-08	Muchen	350.00	111.00	
Haltrecht, n.d.	Rakower, 1953	1906-10	Hesse	225.00	85.00	
Sofer, n.d.	Rakower, 1953	1884-90	New York	205.00	98.00	
Dublin, n.d.	Rakower, 1953	1910	Pennsylvania	177.00	107.00	
Mentchski, n.d.	Rakower, 1953	1926	Krim	206.00	113.00	306 Tartars
Office d'Hygiene, n.d.	Rakower, 1953	1909-32	Tunis	164.00	86.00	562 Moslems

differences in mortality rates for a particular disease are more than short-term responses to changes in local conditions (c.f. Rakower, 1953; McDonald and Springett, 1954; Doege, 1965), secular trends must be investigated. This is particularly important for tuberculosis as the disease spreads through a population in an epidemic wave that takes decades to pass through the various phases of a steep ascent, peak, and then a long gradual decline in mortality (Grigg, 1958; Bates, 1982).

Second, with one exception (see Drolet, 1930), the studies fail to take into account possible differences in the age and sex composition of the ethnic samples under investigation. Age-specific and age-sex specific mortality rates are crucial for understanding the epidemiology of a disease such as tuberculosis where the risks of death vary with age and sex (Comstock, 1973), and where the age selection in mortality changes from decade to decade (Frost, 1939) as the population experiences the tuberculosis wave.

Third, the risks of tuberculosis infection, disease, and death are closely tied to socioeconomic conditions (Guerrin and Borgatta, 1965; Hinman et al. 1976; McKeown, 1976). Socioeconomic factors received scant attention in previous studies. In the only study that controlled for occupation, Ruppin's (1930) comparison of proportionate mortality from tuberculosis in Jewish and non-Jewish garment workers in Warsaw, it was necessary "to assume both had similar standards of living and were at similar risk" (Spyropoulos et al. 1981; 378). This is a rather large assumption since the nature of the family unit (Chapman and Dyerley, 1964), attitudes to and the care of the sick (Fishberg, 1901; McCarthy, 1912; Bogen, 1931; MacMahon and Koller, 1957), and the degree of crowding (Comstock, 1973) can vary ethnically and consequently, affect the risks of tuberculosis.

Fourth, there is virtually no reliable ethnohistorical information on the Jewish and non-Jewish communities to allow interpretation of the available crude mortality rates. Birthplace, for example, has been shown to affect the risk of respiratory tuberculosis morbidity and mortality. Tuberculosis mortality peaks tend to be associated with specific immigration waves because migrants, by and large, exhibit the tuberculosis morbidity and mortality rates of their place of origin (Grigg, 1958; Enarson et al, 1979, 1980).

Finally, apart from the work of Tostivint and Remlinger (1900) and Rakower (1953), there is no historical information on respiratory tuberculosis mortality in non-Ashkenazi communities. This raises the question of whether the apparently lower respiratory tuberculosis mortality rates found by previous investigators are unique to Ashkenazim.

These deficiencies in the data, coupled with Motulsky's (1979) observation that Fishberg (1911) failed to demonstrate that Jews died from tuberculosis at proportionately higher rates at an earlier period, cast doubt on the hypothesis of a "Jewish advantage" vis à vis the disease. A more rigorous evaluation of the hypothesis requires comprehensive re-analysis of the extant data, new data on Ashkenazi communities, and comparative data from Sephardi and Oriental communities.

The objective of the present study is to provide new data on respiratory tuberculosis mortality for the Sephardic community of Gibraltar from 1890 to 1939. Comparative statistics for the non-Jewish residents of Gibraltar are also examined.

MATERIALS AND METHODS

The Sephardic Jews of Gibraltar

The Jewish community of Gibraltar dates to 1704 and, in large measure, was founded and maintained by the Sephardic Jews of Tetuan and Tangier. Jews from Minorca, Malta, Leghorn and London also contributed to the gene pool. Gibraltar's Jewish community has remained ethnically distinct by virtue of its orthodox religion, endogamous mating pattern, and nearly exclusive participation in commercial activities (Sawchuk, 1980).

Sephardic Jews are defined as "the descendents of Jews who lived in Spain and Portugal until their expulsion in 1492, or their voluntary emigration prior to 1492, or their subsequent escape after a period of existence as Marranos or crypto Jews" (Corre, 1971: 259). The large scale migrations that occurred during the Spanish Diaspora were non-isotropic, with Jewish families gravitating to large urban mercantile centers in non-Christian countries. This preference subjected the Jews to the continued selective pressures of urban dwelling and at the same time allowed them to continue their traditional local customs and religious practises; the adherence to Ladino as the language of speech and literature; the establishment of their own communal institutions (Corre, 1971); and the avoidance of intermarriage with non-Sephardim (Zimmel, 1958; Patai, 1971; Sawchuk and Waks, 1983) served to maintain the cultural and biological distinctiveness of the Sephardim.

Sample

Materials used in this study were compiled by the principal investigator and his co-workers during field trips to Gibraltar in 1974, 1978 and

1982. Information on Jewish deaths in Gibraltar was retrieved from a reconstituted death registry described elsewhere (Sawchuk, 1978; Sawchuk and Flanagan, 1979). Deaths due to respiratory tuberculosis between 1890 and 1939 were extracted from this Jewish register. Definition of the Sephardic community for 1891, 1901, 1921 and 1931 derived from an analysis of a hand transcription of information contained in the respective nominative census rolls.

Comparable mortality information on the total civilian population of Gibraltar originated from: (1) a hand transcription of respiratory tuberculosis deaths retrieved from the death registers kept by the Government's Secretariat Office, and (2) published mortality statistics in the Annual Reports on the Public Health of Gibraltar from 1904 to 1939.

The accuracy of the death records used in this study like those used in other historical epidemiological investigations can be distorted by changing diagnostic fashions, variations in the knowledge of signatory physicians, and by limitations and variations in death certification (Cassell, 1969). Misreporting of tuberculosis due to diagnostic errors and the stigma attached to the disease is a known source of error (Dubos and Dubos, 1953; Smith, 1979). In Gibraltar,

There appears to be an extraordinary stigma attached to this word tubercular in Gibraltar. . . . Some people seem to imagine that the mere proximity of a so-called tubercular person is to be avoided and the poor patient is looked upon as a sort of pariah (Fowler, 1912:10).

Under these circumstances, it is conceivable that under-reporting of tuberculosis morbidity and mortality occurred in Gibraltar. However, at present we do not have any knowledge that such under-reporting would systematically favour one ethnic group over another.

Reports on the Census of Gibraltar (1891, 1901, 1921 and 1931) provided information on the age and sex composition of the total civilian population. Subtraction of the Jewish contribution from the total civilian population statistics permitted reconstruction of the non-Jewish data base.

Standardized mortality rates were computed for the intervals 1890-99, 1900-14, 1915-29, and 1930-39 using the available census points of 1890, 1901, 1921, and 1931, respectively. In order to improve the small sample size for each age and sex category, particularly for the Jewish sample, the standardized mortality rates were computed for three age groups: pre-reproductive (< 15 years); reproductive (15-44 years); and post-reproductive (> 45 years). Evaluation of secular trends was accomplished by col-

lapsing the data into two time intervals; an early period (1890 to 1914) and a late period (1915 to 1939).

The G statistic (Sokal and Rohlf, 1969; Feinberg, 1980) was used for analysis of the relationships between respiratory tuberculosis mortality, sex and ethnicity. This log-linear test statistic was selected because of its comparability to the Mantel-Haenszel test (Mantel and Haenszel, 1959) in two-way comparisons and because it permits three-way independence and interaction analysis.

RESULTS

The results of the analysis of respiratory tuberculosis mortality, sex and ethnicity for pre-reproductive, reproductive and post-reproductive age groups are shown in Tables 2 to 4, respectively.

Table 2

Comparison of Respiratory Tuberculosis Mortality by Ethnic Status Over Time Among Pre-Reproductive Individuals

Period ^a	Ethnic Group	Died from Respiratory Tuberculosis		
		Yes	No	Total
Early	Jews	1	7,554	7,555
	<u>non-Jews</u>	<u>35</u>	<u>104,407</u>	<u>104,442</u>
	Both	36	111,961	111,997
Late	Jews	0	4,750	4,750
	<u>non-Jews</u>	<u>24</u>	<u>111,441</u>	<u>111,465</u>
	Both	24	116,191	116,215
Total	Jews	1	12,304	12,305
	<u>non-Jews</u>	<u>59</u>	<u>215,848</u>	<u>215,907</u>
	Both	60	228,152	228,212
Hypothesis Tested ^b		df	G	
Early:	E × M independence	1	1.11	
Late:	E × M independence	1	2.00	
Total:	E × M independence	1	2.20	

^aWhere early equals 1890-1914, and late equals 1915-39.

^bWhere E equals ethnic status, and M equals death from respiratory tuberculosis.

Table 3
**Comparison of Respiratory Tuberculosis Mortality,
 Sex and Ethnicity Over Time Among Reproductive
 Individuals**

Period ^a	Ethnic Group	Sex	Died from Respiratory Tuberculosis		
			Yes	No	Total
Early	Jews	Male	9	7,276	7,285
		Female	9	8,136	8,145
		Both	18	15,412	15,430
Early	non-Jews	Male	242	112,813	113,055
		Female	220	131,795	132,015
		Both	462	244,608	245,070
Late	Jews	Male	5	4,645	4,650
		Female	5	5,480	5,485
		Both	10	10,125	10,135
Late	non-Jews	Male	199	95,246	95,445
		Female	152	115,118	115,270
		Both	351	210,364	210,715
Total			841	480,509	481,350
Hypothesis Tested ^b			df	G	
E × M independence			3	10.78*	
Early: J × nJ			1	4.63*	
Late: J × nJ			1	3.16	
Early (J + nJ) vs Late (J + nJ)			1	2.99	
E × S independence			3	44.88***	
Early: J × nJ			1	6.81**	
Late: J × nJ			1	1.33	
Early (J + nJ) vs Late (J + nJ)			1	36.74***	
M × S independence			1	23.32***	
E × M × S interaction			3	2.39	
E × M × S independence			10	81.38	

^aWhere Early equals 1890–1914, and Late equals 1915–39.

^bWhere E equals ethnic status, M equals death from respiratory tuberculosis, S equals Sex, J equals Jews, and nJ equals non-Jews.

Table 4

Comparison of Respiratory Tuberculosis Mortality, Sex and Ethnic Status Over Time Among Reproductive Individuals

Period ^a	Ethnic Group	Sex	Died from Respiratory Tuberculosis		
			Yes	No	Total
Early	Jews	Male	3	3,837	3,840
		<u>Female</u>	<u>3</u>	<u>4,167</u>	<u>4,170</u>
		Both	6	8,004	8,010
Early	non-Jews	Male	157	37,078	37,235
		<u>Female</u>	<u>72</u>	<u>55,298</u>	<u>55,370</u>
		Both	229	92,376	92,605
Late	Jews	Male	2	3,273	3,275
		<u>Female</u>	<u>1</u>	<u>4,464</u>	<u>4,465</u>
		Both	3	7,737	7,740
Late	non-Jews	Male	180	41,750	41,930
		<u>Female</u>	<u>59</u>	<u>58,261</u>	<u>58,320</u>
		Both	239	100,011	100,250
Total			477	208,128	208,605

Hypothesis Tested ^b	df	G
E × M independence	3	31.81***
Early: J × nJ	1	12.58***
Late: J × nJ	1	19.02***
Early (J + nJ) vs Late (J + nJ)	1	0.21
E × S independence	3	203.58***
Early: J × nJ	1	180.03***
Late: J × nJ	1	0.50
Early (J + nJ) vs Late (J + nJ)	1	23.05***
M × S independence	1	180.02***
E × M × S interaction	3	6.88
E × M × S independence	10	422.24

^aWhere Early equals 1890–1914, and Late equals 1915–39.

^bWhere E equals ethnic status, M equals death from respiratory tuberculosis, S equals Sex, J equals Jews, and nJ equals non-Jews.

Pre-reproductive Age Group

Given the extremely small number of pre-reproductive deaths, male and female deaths were pooled to facilitate hypothesis testing. As the results indicate while fewer Jews succumbed to death from respiratory tuberculosis than non-Jews, the difference was not statistically significant (See Table 2).

Reproductive Age Group

The test results on the reproductive age group show that the three criteria were jointly dependent ($G = 81.38, 10df$). There was no significant interaction between respiratory tuberculosis mortality, ethnicity and sex. Approximately one-half of the pooled G value is derived from the association between sex and ethnicity. When the relationship between sex and ethnicity is examined over time, a significant excess of Jewish males at risk of dying is found in the early period. This finding is consistent with the fact that until the 20th century, relatively more foreign-born males entered the Jewish community because of trade opportunities (Sawchuk, 1978). The removal of ethnicity as a factor indicates a significant excess of males at risk in the early period relative to the late period. Analysis of the relationship between mortality and sex reveals that males clearly experienced a higher death rate due to respiratory tuberculosis than did females. This finding is consistent with the known pattern of higher male mortality from tuberculosis in older age categories (Grigg, 1958; Comstock, 1973; Bates, 1982).

Finally, an examination of mortality and ethnicity demonstrates that the Jews enjoyed a modest, but significant at the .05 level, overall advantage over non-Jews in terms of death due to respiratory tuberculosis. Partitioning this G value by time indicates that while the disparity between the two groups persisted over time, it was only statistically significant during the early time period.

Post-Reproductive Age Group

The null hypothesis that the three factors were independent for the post-reproductive age group was rejected with a pooled G value of 422.24, with 10 degrees of freedom. The association between ethnicity and sex contributed nearly fifty percent to the overall G . Closer examination of this relationship over time revealed that, as in the reproductive age category, there was an excess of Jewish males at risk relative to non-Jews during the early period with a G value of 180.03. A further significant association was detected in the overall deficiency of males observed

in the early period relative to that found in the late period. Analysis of the relationship between sex and mortality demonstrated that, again, males died at a significantly higher rate than females regardless of ethnic status. Finally, the relationship between mortality and ethnicity proved to be statistically significant with Jews dying less frequently of respiratory tuberculosis than their non-Jewish counterparts. As Table 4 indicates this mortality differential favouring Jews persisted over both periods.

DISCUSSION

The paucity of historical information on the occurrence of respiratory tuberculosis in Gibraltar precludes a clear-cut explanation, if one indeed exists, for the observed mortality differential between Jews and non-Jews. While there is strong evidence for a genetic basis for tuberculosis susceptibility (Kallman and Reisner, 1948; Comstock, 1978; Bates, 1982), the present data-base does not allow the assessment of underlying biological differences between the two groups. The available evidence suggests, however, that socio-economic, demographic, and cultural factors played an important role in buffering the Jews, and particularly the older ones, from respiratory tuberculosis.

The relationship between respiratory tuberculosis and socio-economic status is well-known (Guerrin and Borgatta, 1965). Gibraltar's Jewish community historically enjoyed a relatively higher socio-economic position than the majority of the civilian population owing to its predominance in the lucrative western Mediterranean trade system from the early 1700s to the 20th century (Sawchuk, 1978). The higher standard of living among the Jews may have provided a relative advantage against respiratory tuberculosis morbidity and mortality.

Evidence from census returns and in particular, from 1891, indicates that the Jews did not participate in substantial numbers in high risk occupations (see Table 5). Fifty-nine percent of the non-Jewish labourers worked at coal, tobacco and stone masonry jobs, all of which involved exposure to particles known to cause bronchial changes (Kilburn, 1980) that could aggravate established tubercular foci or reactivate healed lesions. None of the Jews were engaged in this kind of work.

As stated earlier, census returns and marriage registers indicate that a substantial proportion of the Sephardic community originated from the Moroccan cities of Tetuan and Tangier. Hennen (1830) noted that the pattern of tuberculosis mortality in Gibraltar was at variance with that of the neighbouring Barbary States:

Table 5
Major Occupational Groupings Among the Jews and Non-Jews of Gibraltar, Based on the Census of 1891

Occupational Grouping	Jews		Non-Jews	
	n	%	n	%
Trading/Commercial				
General traders	77	19.0	70	1.2
Merchants	34	8.4	72	1.3
Dealers	<u>21</u>	<u>5.2</u>	<u>65</u>	<u>1.1</u>
Total	132	32.6	207	3.6
Retail				
Drapers	32	7.9	287	5.0
Commercial Clerk	<u>37</u>	<u>9.1</u>	<u>32</u>	<u>.6</u>
Total	69	17.0	319	5.6
Labourers				
General	6	1.5	498	8.8
Coal	0	—	546	9.6
Tobacco	0	—	137	2.4
Masons	<u>0</u>	<u>—</u>	<u>40</u>	<u>0.7</u>
Total	6	1.5	1221	21.5
Servants/Drivers/Shipping				
Servants	16	4.0	408	7.2
Cart drivers	3	0.7	242	4.3
Boatmen	<u>3</u>	<u>0.7</u>	<u>227</u>	<u>4.0</u>
Total	22	5.4	509	15.5
TOTAL NUMBER EMPLOYED	<u>405</u>		<u>5694</u>	

Genuine phthisical cases [in Gibraltar] are very frequent, and run rapidly to their inevitably fatal termination; but it is a very curious fact, that on the opposite coast of Barbary they are almost unknown (page 119).

Since tuberculosis mortality rates in migrants tend to reflect the rates in their place of origin, the observed mortality differential may reflect a migration effect.

The incidence of contagious disease has been shown to be positively correlated with increasing family size (Ewbank and Wray, 1980). An analysis of reconstituted family histories revealed that the Jews of Gibraltar practised family planning, limiting family size by the latter part of the 19th century (Sawchuk, 1980). While there are presently no comparative

data available for the non-Jews, it is conceivable that if differences in family size did exist, such differences coupled with over-crowding, might have contributed to the observed mortality differential.

The Sephardic tradition of health care in Gibraltar with its pattern of hierarchical welfare, positive attitude to the poor, sick and aged, and its separate hospital ward may have played a role in lessening the impact of tuberculosis in the Jewish community. In 1866, for example, the Jews established a charitable institution for the sick and aged in their community, reputedly owing to the shame over a rumour that an old Jew had died from lack of care and food. As Serfaty (1958:30) relates the incident,

The Jews considered this a *hillul aschem*, a disgrace to the community, as a lash of a whip across the face and a blot of ignominy that fell over one and all and one which it was necessary to take all possible steps to avoid its repetition.

On the other hand, the situation for the non-Jews was such that it required a government institution, the Sanitary Commission of Gibraltar, to establish a home for the old, unemployed, and sick in 1912. While there were charitable institutions for non-Jews before this, we suspect that their inadequacy in the face of declining economic and social conditions in Gibraltar prompted the Sanitary Commissioners to found another. Significantly, this institution also housed the active tuberculosis patients and was known locally as the "Casa de los Tuberculosis" (Smales, 1921)!

In summary, our findings are in general agreement with those studies that demonstrated a Jewish respiratory tuberculosis mortality advantage. However, the advantage in Gibraltarian Jews is seen to have operated largely in the post-reproductive age category. The major factors that appear to have contributed to the mortality differential are: a higher standard of living, lower occupational risk, a migration effect, possible family size differences, and the Sephardic tradition of health care delivery.

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