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Mortality in a Migrating Mennonite Church Congregation

Joan C. Stevenson
Western Washington University, joan.stevenson@wwu.edu

Phillip Mark Everson
Western Washington University

L. Rogers
Iowa State University

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P.M. EVERSON,[1] J.C. STEVENSON,[1] AND L. ROGERS[2]

Abstract Preston's two-census method of demographic estimation is applied to three pairs of reconstructed censuses from the records of a migrating Mennonite church congregation covering the period 1780–1890. The three pairs of censuses correspond to three periods (1780–1790, 1850–1860, and 1880–1890) and to stays in three settings (Prussia, Russia, and Kansas, respectively). The Mennonites' stay in Prussia was a period of hardship. In Russia they expanded their economic base and developed new farming methods, dramatically increasing their productivity. The Mennonites took these skills to Kansas, where they continued to be successful. The increase in life expectancy at age 5 corroborates this picture. The Prussian period exhibits the shortest life expectancy for both sexes. After the move to Russia, life expectancy increased for both sexes and continued to increase with the move to Kansas. The model also provides limited evidence for fertility depression following the move to Kansas.

The history of mortality for European populations during the late eighteenth and nineteenth centuries is best known for France, Sweden, and other northern European countries, including the British Isles [reviewed thoroughly by Lancaster (1990)]. Mortality data are incomplete or absent for much of the rest of Europe, particularly eastern Europe, and rarely extend earlier than the 1800s. Acsadi and Nemeskeri (1970) note that at the end of the nineteenth and the beginning of the twentieth century crude mortality rates were low for northern and western Europe, high for Russia and Spain, and intermediate at most other locations. Overall, mortality, especially infant mortality, did not drop dramatically until the late 1800s or later in most places. Most of these generalizations apply to nation-state populations [e.g., Caselli and Capocaccia (1989), Gille (1949), Keyfitz and Flieger (1968), and van de Walle (1986)] rather than to the local-level populations typically examined by anthropologists, and they

[1] Department of Anthropology, MS 9083, Western Washington University, Bellingham, WA 98225.
[2] Department of Anthropology, Iowa State University, Ames, IA 50011.

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do not reflect the heterogeneity characteristic of the subnational and local levels [e.g., Lee (1991), Lin and Crawford (1983), Preston and van de Walle (1978), and Woods et al. (1988)]. Our objective here is to apply a demographic technique, the two-census method, to the analysis of mortality in a small local-level population (i.e., a migrating Mennonite church congregation) at three points in time and at three different locations in their migration history.

The development of nonstable population theory (Bennett and Horiuchi 1981; Preston and Coale 1982) and its subsequent application as the two-census method (Fix 1989a,b; Gage 1985; Gage et al. 1984a,b, 1986; Preston 1983) to ethnographically collected data is an important addition to traditional demographic methods [reviewed by Gage (1985) and Weiss (1975)]. The two-census method provides analytical control over the modeling of mortality measures by using observed changes in the composition of the population to shape a standard mortality schedule (i.e., the model life table). In this manner the certainty that the model accurately reflects the population under study is increased. Incomplete registration of vital events and the stochastic variation evident in the rates for this small migrating Mennonite congregation necessitate the use of Preston's (1983) two-census method.

The Population

The Anabaptist movement was characterized by separation of church and state and by adult baptism and began during the Reformation in sixteenth-century Switzerland (Dyck 1981; Smith 1981). The movement later spread to Germany, the Netherlands, and other parts of Europe. Menno Simons was the charismatic leader who united the Dutch Anabaptists, the Mennonites, but oppression was so severe that some migrated to West Prussia and settled in the Danzig area between the Vistula and Nogat rivers (Wedel 1974, p. 7). By 1669, 18 families had founded the Przechowka church, located on the west side of the Vistula River 60 mi south of Danzig (Duerksen 1955). Life was challenging. Families were limited to 40 acres, and much of the land was sandy and unproductive (Wedel 1974, p. 18). Rye and barley were the main crops. Business activities were sometimes restricted (Klippenstein 1989).

Danzig Mennonites controlled 80,000 acres of farmland by the 1774 census, but this success had its price (Klippenstein 1989; Wedel 1974). In order to worship and avoid military service, they had to pay huge fees, which became even more excessive after the Prussians took over West Prussia from the Poles in 1772 (Klippenstein 1989). By 1780 Mennonites could not buy additional land without permission from the government, and paying for their privileges during the Napoleonic Wars (1798–1815) impoverished many families.

An alternative to Prussia was provided when Russia expanded its holdings south and west after wars with Turkey and Poland (Klippenstein 1989; Wedel 1974). Russia actively recruited citizens from other countries to colonize the new lands. Prussian Mennonites had been moving to southern Russia since 1788–1789, and in 1820 about 30 families of the Przechowka church, most of the congregation, moved to the Molotschna Mennonite settlement, Taurida Province, Russia, on the Molochnaya River and founded the Alexanderwohl church (Duerksen 1955).

The Russian steppe environment was a significant change from the delta lowlands characteristic of Prussia. Government support and business skills led to a much improved quality of life and a rapid increase in population size (Urry 1989a,b). Sheep and wool products were an early export item. Later, the introduction of new farming methods, such as crop rotation and fertilizers, led to marked improvements in agricultural productivity. Barley, rye, and oats were raised for local use, and wheat was exported. In the 1870s spring wheat replaced winter wheat, which sold for even higher prices.

In 1870 the tsarist government planned to introduce universal military service (Urry 1989b). Russian nationalism also threatened the use of the German language and Mennonite control of schools and land (Loewen 1989; Longhofer 1993). Most of the congregation, particularly the conservative members, migrated again to Kansas and established two churches, one of which is named Alexanderwohl, located in Goessel, Kansas. The innovative dryland farming methods and the introduction of winter wheat made the Mennonite farmers competitive (McQuillan 1978). Farms expanded in size through the turn of the century.

To summarize, the quality of life was relatively poor during the Mennonites' years in Prussia (1669–1820). Persecution and difficulties obtaining good farmland took their toll. The changes resulting from adjustment to life in Russia (1821–1874) were made slowly, but the expanded business opportunities and innovations in agriculture led to population expansion. The Mennonites' new skills were transferred successfully to Kansas. Population composition indexes and life expectancy values representing these different periods will provide another perspective on the adaptations made by this congregation.

Methods

Continuous church records for Przechowka and both Alexanderwohl congregations (Russia and Kansas) extend back to 1669 (Duerksen 1955). The records for Przechowka and the Russian Alexanderwohl congregations have been translated and published (Mennonite Immigrant Historical Foundation 1980, 1987), and post-1874 records are available at the Bethel College Archives (in North Newton, Kansas).

The church records contain a linear registry of vital events for the members of the congregation. At any time the membership consisted of adults and their dependent children, if any. Adult members whose parents were members when they were born have their birth dates in these records, whereas adult members born elsewhere have no birth date recorded. Furthermore, adults born within the congregation did not always live out their lives as members of the congregation. Some married other members of the congregation, moved elsewhere, and died elsewhere; others moved elsewhere and married members of other congregations. The former have a marriage recorded but no death date, and the latter have neither vital event recorded. Throughout the period covered by these records, people came and people left the congregation, but there was always a core group that lived their lives as members of the congregation. The members of this core group have complete sets of vital records (birth and death dates), and it is these people and their offspring who were examined for this study.

Families were reconstructed from the vital records, and they provide the base population used in our analysis. Each reconstructed family consists of parents who lived their entire lives within the congregation. All the children of these parents had recorded birth dates and most had recorded death dates. Children without recorded death dates usually had either a marriage date or a baptism date recorded, showing that they were alive at the time of the analysis. If information was incomplete, the family was removed. The set of families selected in this manner, a subset of the total membership, provides a population with a known age-sex structure, and it is closed to migration for the period in question.

Censuses bracketing a 10-year period were taken from each locale in the immigration history: Prussia, 1780–1790; Russia, 1850–1860; and Kansas, 1880–1890. Each census counted the living members of the congregation that had both birth and death dates recorded in the church records. Family members are included at the time of the census. These same families were recensused 10 years later. The results of the six censuses are presented in Tables 1, 2, and 3. Indexes measuring the composition of the population with respect to age and sex were formed from these censuses and include the sex ratio [number of males per 100 females; see Shryock and Siegel (1975, v. I, pp. 191–192)], median age, and the aged and youth dependency ratios {number of dependent [aged (65+) or youthful (<15)] persons per economically active person (15–64); see Shryock and Siegel (1975, v. I, pp. 233–235)}. Together these indexes provide a means of assessing the relative stability of the population age-sex structure through each time period and therefore the applicability of the nonstable model.

The two-census method is well described in the human population literature (Bennett and Horiuchi 1981; Fix 1989a,b; Gage et al. 1984a,b;

Table 1. Alexanderwohl Congregation, 1780–1790: Prussia

Age	*N*		*X*	*X*	*Y*	*Y*	
(a)	*1780*	*1790*	*East 8* $q(a)/p(a)$	*East 3* $q(a)/p(a)$	$exp[-5 \Sigma r(a)]$ $C(a)$	*Estimate (exp)*	*Standardized Residual*
Female							
0	5	10	–		–	–	–
5	5	7	0.498		36.907	42.344	−0.930
10	4	5	0.557		39.366	43.039	−0.618
15	4	5	0.591		40.956	43.439	−0.414
20	6	4	0.639		34.876	44.005	−1.508
25	7	3	0.704		41.655	44.771	−0.509
30	8	5	0.785		55.318	45.725	1.553
35	6	7	0.878		60.370	46.820	2.179
40	6	8	0.988		53.525	48.116	0.869
45	4	6	1.111		52.417	49.565	0.462
50	4	6	1.260		51.559	51.320	0.040
55	2	4	1.474		53.122	53.841	−0.127
60	2	4	1.825		50.888	57.976	−1.552
65+	1	2	–		–	–	–
Total	64	76					
Male							
0	10	7		–	–	–	–
5	9	7		1.199	59.613	61.210	−0.609
10	8	9		1.335	67.269	65.207	−0.641
15	6	9		1.400	65.654	67.117	−0.656
20	6	7		1.503	61.339	70.144	−0.681
25	7	5		1.664	63.435	74.876	−0.720
30	8	5		1.839	75.692	80.019	−0.763
35	7	6		2.050	91.704	86.220	−0.816
40	7	6		2.332	98.256	94.508	−0.891
45	6	5		2.716	115.014	105.793	−1.000
50	4	6		3.244	144.792	121.310	−1.171
55	3	5		3.999	139.195	143.499	−1.486
60	1	3		5.186	166.322	178.384	−2.437
65+	1	2		–	–	–	–
Total	83	82					

Preston 1983). It is a simple way of estimating vital rates for the period between two censuses. Preston (1983, pp. 213–214) argued that in a closed population the proportion of persons at any given age is a function of the product of the population birth rate, the growth rate of the population at each age, and the probability of survival to that age. Preston (1983, p. 214) rewrote this equation to express the survivorship term as Brass (1971) did with his linear logit model of mortality change. Brass's model estimates survivorship from a standardized model life table. By pairing the two equations and combining and reorganizing terms, Preston

Table 2. Alexanderwohl Congregation, 1850–1860: Russia

Age *(a)*	*N* *1850*	*N* *1860*	*X* *East 12* *q(a)/p(a)*	*X* *East 9* *q(a)/p(a)*	*Y* *exp[−5 Σ r(a)]* *C(a)*	*Y* *Estimate* *(exp)*	*Standardized* *Residual*
Female							
0	26	33	–		–	–	–
5	23	25	0.294		26.465	25.206	0.186
10	20	23	0.325		29.795	26.614	0.464
15	18	21	0.344		30.855	27.476	0.489
20	15	20	0.371		31.734	28.702	0.434
25	13	17	0.407		31.355	30.336	0.144
30	7	14	0.451		35.403	32.333	0.431
35	5	12	0.502		34.600	34.649	−0.007
40	3	7	0.561		31.780	37.327	−0.773
45	2	4	0.629		34.782	40.414	−0.790
50	2	3	0.714		34.956	44.272	−1.338
55	2	1	0.835		39.076	49.765	−1.633
60	2	1	1.029		74.865	58.572	3.099
65+	1	2	–		–	–	–
Total	139	183					
Male							
0	29	47		–	–	–	–
5	23	31		0.347	22.499	25.377	−0.775
10	20	21		0.379	26.256	26.166	−0.790
15	20	21		0.396	29.565	26.586	−0.798
20	18	19		0.425	30.333	27.302	−0.812
25	14	20		0.468	32.595	28.363	−0.835
30	10	18		0.513	31.649	29.473	−0.860
35	6	14		0.565	31.142	30.756	−0.892
40	4	10		0.631	29.391	32.385	−0.935
45	3	5		0.719	28.407	34.557	−1.001
50	2	3		0.841	36.078	37.568	−1.110
55	4	2		1.022	35.126	42.034	−1.330
60	3	1		1.303	56.494	48.969	−2.030
65+	2	3		–	–	–	–
Total	158	215					

(1983, p. 214) concluded with the linear equation

$$\frac{\exp\left[-\int_0^a r(x)dx\right]}{c(a)} = \frac{1}{b} + \frac{k}{b}\left[\frac{q_s(a)}{p_s(a)}\right], \qquad (1)$$

where b is an estimate of the birth rate; k (the slope) represents the level of mortality in the study population, and q_s and p_s are taken from the model life table for the standard population. The censuses provide the

Table 3. Alexanderwohl Congregation, 1880–1890: Kansas

Age (a)	*N 1880*	*N 1890*	*X East 14 q(a)/p(a)*	*X East 16 q(a)/p(a)*	*Y exp[−5 Σ r(a)] C(a)*	*Y Estimate (exp)*	*Standardized Residual*
Female							
0	39	40	–		–	–	–
5	43	36	0.220		45.970	49.714	−1.930
10	47	37	0.242		48.816	50.655	−0.935
15	45	41	0.256		52.700	51.253	0.729
20	40	46	0.275		54.485	52.065	1.209
25	27	43	0.301		56.451	53.177	1.619
30	21	35	0.333		55.970	54.544	0.698
35	18	25	0.370		54.988	56.126	−0.554
40	17	20	0.413		57.157	57.964	−0.392
45	16	17	0.464		59.953	60.144	−0.094
50	14	17	0.528		63.639	62.880	0.380
55	12	15	0.622		63.849	66.898	−1.628
60	6	12	0.770		74.668	73.224	0.967
65+	3	8	–		–	–	–
Total	348	392					
Male							
0	51	48		–	–	–	–
5	41	42		0.190	43.654	52.148	−0.894
10	40	35		0.206	49.710	52.746	−0.896
15	47	38		0.216	52.581	53.120	−0.897
20	41	36		0.233	57.752	53.755	−0.901
25	33	46		0.258	64.174	54.690	−0.908
30	22	40		0.284	60.899	55.661	−0.917
35	19	32		0.313	56.817	56.745	−0.929
40	16	22		0.350	55.048	58.128	−0.948
45	17	18		0.400	56.561	59.996	−0.981
50	16	15		0.474	60.543	62.762	−1.046
55	12	16		0.587	70.166	66.985	−1.198
60	8	14		0.767	72.543	73.712	−1.776
65+	3	9		–	–	–	–
Total	366	411					

data for elements from the left-hand side of Eq. (1). Preston (1983, pp. 216–217) implemented this procedure by estimating age-specific growth rates $r(x)$ and the ratio of ath birthdays to total person years lived during the intercensal period. These estimates allow the calculation of the left-hand-side values of Eq. (1). Then, a standard mortality schedule is chosen, providing the $[q_s(a)/p_s(a)]$ values for the right-hand side of Eq. (1). Once the values for the left- and right-hand-side variables are known, a line is fitted to the relationship between the two sides by regression, the equation parameters (b and k) are examined, standardized residuals are calculated and examined to identify anomalous (i.e., standardized residuals greater than 2 and less than −2) age category observations, and life expectancy at age 5 is calculated.

To implement this procedure, one must choose a standard mortality schedule. We selected the East model life tables of Coale and Demeny (1966, p. 12) for this analysis for two reasons. First, these tables are constructed from real data representing Austria, Germany, Czechoslovakia, north and central Italy, Hungary, and Poland; Germany and Poland are the populations from which the greater part of the Alexanderwohl membership is derived. These tables exhibit relatively high mortality for infants and for adults over 50 years of age. The second reason is more practical; the East tables provide higher r^2 values than do the West tables, with all but the 1780–1790 female data being significantly linear for the ages in question.

The expected length of life (in years) for a person of age x is represented by e_x. The age of interest is 5 years old, providing a view of life expectancy at childhood and after the challenges of early infancy. The values are calculated by identifying the best fitting model life table and solving the regression equation with the standard values [see Preston (1983, pp. 225–226, note 1) and Gage et al. (1984a, pp. 492–493)].

Results

The age and sex structures of the Alexanderwohl population are portrayed in Tables 1–3 (columns labeled "Age" and "N"). Each period exhibits a unique configuration. The Prussian period (1780 and 1790) displays the highest median age for males and females (28.8 and 30.5 years, respectively), the highest ratio of aged to youth dependency ratios (0.05 and 0.09, respectively), the lowest growth rate (0.72%), and both the greatest sex ratio (129.7 in 1780) and the greatest variability in sex ratio in a 10-year period (21.8 per 1000, a 17% reduction). By contrast, the Russian period (1850 and 1860) presents the lowest median age (16.0 and 17.4 years, respectively), the lowest ratio of aged to youth dependency ratios (0.02 and 0.03, respectively), and the highest growth rate (2.98%). The sex ratio during the Russian period is still high (113.7 and 117.5) and varies little (3.8 per 1000, a 3% increase). Except for the sex ratio, the remaining indexes for the Kansas period (1880 and 1890) tend to lie between these two extremes. The sex ratio is lowest in this period and has the least variability (0.4 per 1000, a 0.3% decrease).

The variation in the sex ratio is problematic. It is difficult to determine whether this variation is a product of the familial reconstruction or simply a function of small population size. Clearly, the variation in population composition within and between periods requires the use of nonstable population theory and the two-census method.

The values for the variables in the two-census model [see Eq. (1)] are presented in Tables 1–3 for both males and females. The results of the linear regressions for each time period and each sex are presented in Figures 1–3 and in Table 4.

The model life tables that provide the best fit to the female mortality data are the East 8, East 12, and East 14 tables for the three time periods for Prussia, Russia, and Kansas, respectively. Individually, the Prussian female data provide the weakest relation ($r^2 = 0.335$; $F_{1,10} = 5.040$, $0.025 < p < 0.50$) for the 12 age groups (5–60), with progressively stronger relations for the same age groups in Russia ($r^2 = 0.671$; $F_{1,10} = 20.398$, $0.001 < p < 0.0005$) and Kansas ($r^2 = 0.918$; $F_{1,10} = 111.247$, $p < 0.0005$).

The male mortality data, on the other hand, show progressively weaker relations for the three periods, although they are still highly linear. The model life tables with the closest fit for the 12 age groups (5–60) in Prussia, Russia, and Kansas are East 3 ($r^2 = 0.929$; $F_{1,10} = 131.621$, $p < 0.0005$), East 9 ($r^2 = 0.740$; $F_{1,10} = 28.398$, $p < 0.0005$), and East 16 ($r^2 = 0.652$; $F_{1,10} = 18.700$, $0.0025 < p < 0.001$), respectively.

Although the relationship between the survivorship ratio from the standard population and the model value derived from the observed age structure is significantly linear, the residuals are of some interest. Standardized residuals were calculated for males and females for each age category during each historical period and are presented in Tables 1–3. The standardized residuals were greater than 2 during the Prussian (−2.437) and Russian (−2.030) periods for the 60–64-year age category in males. For females only one age category has a residual over 2 for the Prussian and Russian periods: 2.179 for the 35–39-year age group in Prussia and 3.099 for the 60–64-year age group in Russia. There are no standardized residuals greater than 2 for any male or female age category during the Kansas period.

The expectation of life at age 5 provides an easily understood and comparative measure of mortality from one period to the next. Among males these values increase consistently from Prussia (27.1 years) to Russia (42.2 years) to Kansas (57.3 years). This is not the case among females, where values fluctuate from Prussia (55.1 years) to Russia (33.2 years) to Kansas (54.0 years).

The b values in the model provide an estimate of the birth rate for each sex during each period. For both sexes the birth rate was high (27.4 and 38.5 per 1000 for females and males, respectively) in the Prussian period and increased dramatically during the Russian period (to 84.2 and 59.5 per 1000 for females and males, respectively) before decreasing significantly in the Kansas period (to 24.8 and 22.2 per 1000 for females and males, respectively).

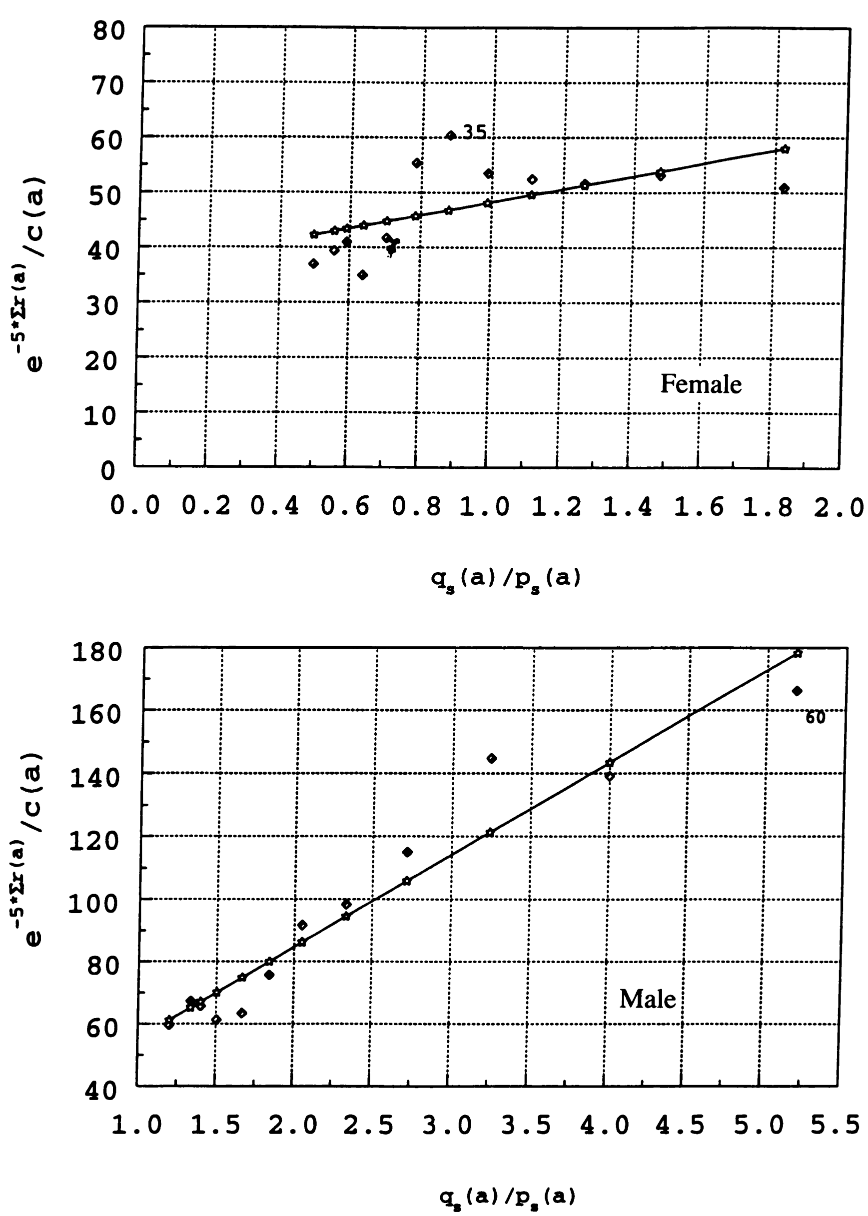

Figure 1. Regression by sex, 1780–1790.

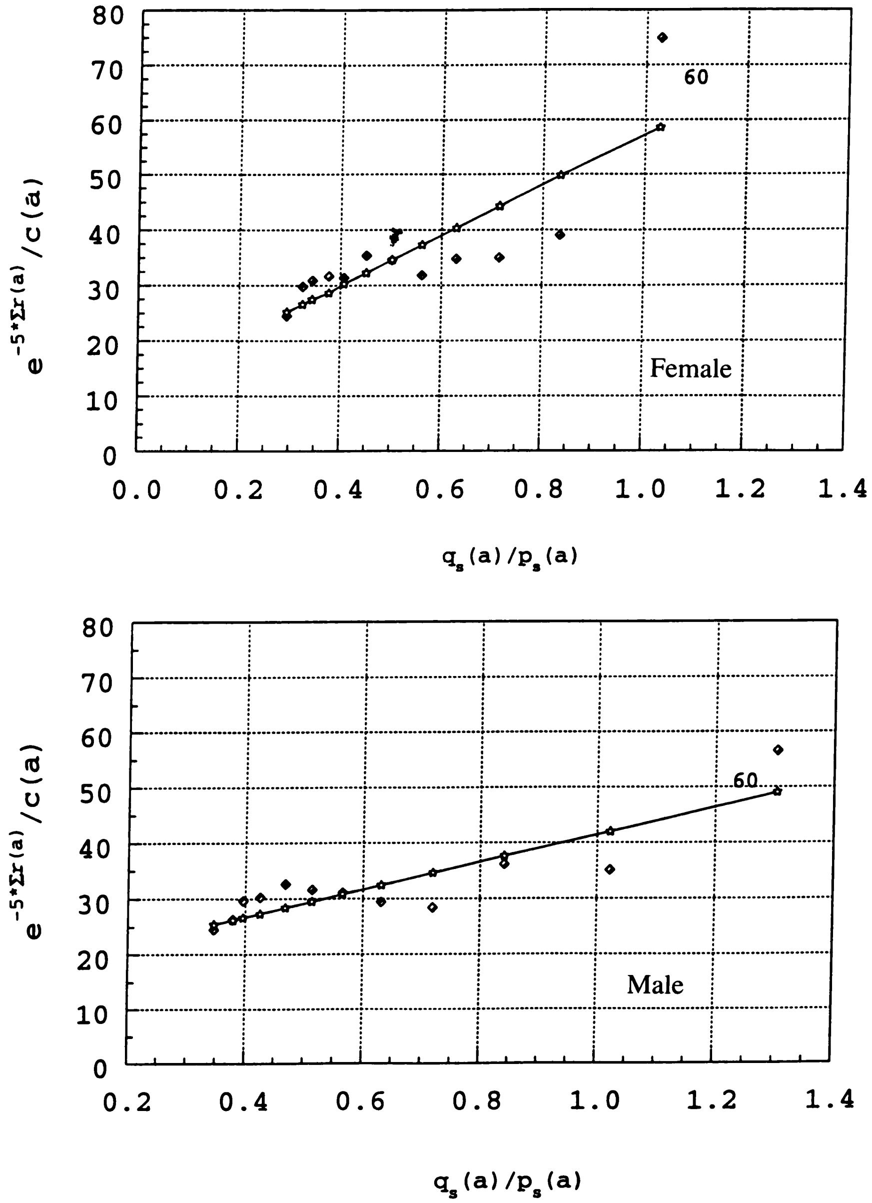

Figure 2. Regression by sex, 1850–1860.

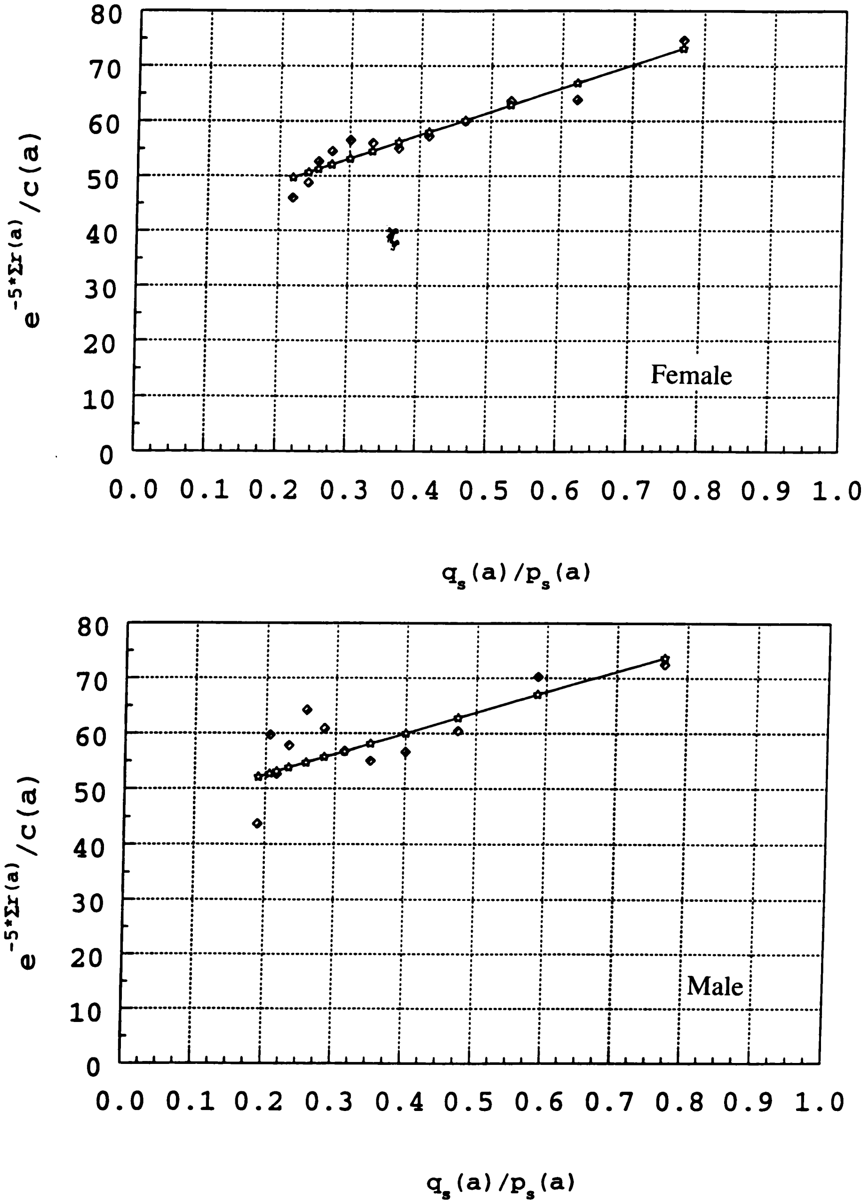

Figure 3. Regression by sex, 1880–1890.

Table 4. Regression Parameters by Period

Period	*Intercept*	*Regression Coefficient*	*Standard Error of Estimate*
1780–90, Prussia			
Female	36.478	11.780	7.114
Male	25.972	29.389	10.395
1850–60, Russia			
Female	11.860	45.395	7.562
Male	16.814	24.678	4.500
1880–90, Kansas			
Female	40.310	42.746	2.281
Male	45.048	37.371	5.027

Discussion

The initial founders of the Alexanderwohl congregation settled and lived for many years in the Danzig region of Prussia. Their way of life was most likely culturally similar to the populations represented by the East model life tables. It is not surprising that these tables provide the best fit.

Life expectancy is lowest during the Prussian period (1780–1790) for males. It is relatively high for females, which may be an artifact of small sample size. Few causes of death are reported for this period, but the most commonly cited causes are childhood maladies and smallpox. The only other period of time for which the cause of death is listed consistently is during the period 1800–1815. The most commonly given reasons for death at this time are fevers (particularly scarlet fever), consumption, typhus, smallpox, and childhood diseases. There is no evidence of a pattern or of epidemics, which is probably an artifact of the incomplete data, but Gille (1949, p. 48) noted that certain diseases, such as smallpox and typhoid fever, were "fairly widespread at all times" throughout Swedish demographic history [see Mielke et al. (1984)].

Gille (1949) also noted that crop failures and epidemics were good predictors of increased mortality and that times of poor nutrition clearly amplified the mortality effects of epidemics. Pitkanen and Mielke (1993) also document the interaction of war, famine, and disease in nineteenth-century Finland and found that mortality increased during times of stress and was proportional to levels during normal times. The Prussian period was a difficult time for the Mennonite farmers. Their economic base was narrow, and they were probably more vulnerable to crop failures, which would have exacerbated the effects of disease.

After the move to Russia, the Mennonites expanded their economic base and developed a new variety of wheat, which increased their productivity (Urry 1989a,b). By 1850 and 1860 the population was much younger (median ages of 16.0 and 17.4 years, respectively) and the growth rate was high. This growth put pressure on other sectors of Mennonite life, and problems developed over the control of land.

The marked improvement in the standard of living resulted in increased longevity for males. Life expectancy increased 55.7% after the move from Prussia to Russia. Among females it decreased by 40%. This apparent decline is an artifact of the inflated Prussian life expectancy, which is probably distorted by the small sample size and the irregular age structure. The relatively high mortality during the Russian period may also be partly due to age structure. For example, the genealogical reconstruction performed here may have undersampled young adult females (i.e., discrepant sex ratios), perhaps as a result of higher outmigration. The lower life expectancies of females relative to males both in Russia and to a lesser extent in Kansas contrast with other European populations where females usually outlive males (Keyfitz and Flieger 1968, pp. 312, 314–318, 320–324, 462, 464–468, 470–474, 476–480, 482–486, and 488–489; Retherford 1975). Perhaps the stress of having extremely large families during the Russian period contributed to higher mortality in women (Friedlander 1993). Further historical demographic research on eastern European populations will be necessary to resolve this question.

After the move to Kansas growth slowed to about one-half of what it was in Russia, but that is almost twice what it was in Prussia. The dependency ratio also decreases relative to Russia, and the median age is higher. Evidently, either a greater proportion of older people moved or fertility slowed. The birth rate estimator shows that lower fertility is more likely and is in agreement with earlier work on fertility among Kansas Mennonites (Stevenson and Everson 1989, 1990; Stevenson et al. 1989, 1994).

Life expectancy continued to increase after the move to Kansas but at a lower rate. Life expectancy at age 5 increased from 42.2 to 57.3 years (35.8%) for males and from 33.2 to 54.0 years (62.7%) for females. Thus life expectancy continued to increase throughout the entire time period (1780–1890), although at different rates for males and females. This difference may be a function of the varying sex ratios. Still, the improving standard of living, evident from the Mennonites' continuing economic success after their arrival in the United States, was certainly a contributing factor (McQuillan 1978). Their farming methods and principal resource (winter wheat) made them competitive economically, and the high value they placed on education may also have increased their access to medical innovations. Males and females had relatively equal life expectancies by the time they were established in Kansas, a pattern that is typical of most of western Europe (Lancaster 1990).

This gradual reduction in mortality is also typical for northern and western Europe in the late nineteenth century and is also likely due to an improvement in the standard of living. However, in any specific setting stresses such as famine or war could produce a different pattern.

The congregation also grew in numbers during each period (Tables 1–3) and at varying rates, slowest in Prussia (0.72%) and greater in Russia (2.98%) and Kansas (1.31%). Over the whole period (1780–1890) the congregation grew by 453.7%, a growth rate of 1.56% per year. The combination of this growing population and successful agricultural adaptation is mirrored by an increased life expectancy.

Overall the two-census method, as judged by linearity and variance explained, provides the most plausible results for males in all periods and for females during their stays in Russia and Kansas. The less satisfactory results for Prussia (low linearity and a low r^2 value) are due to small sample size and the resulting irregular age structure.

Conclusions

The increasing expectation of life corroborates the slowly improving quality of life derived from the Mennonites' migration history. The East model life tables provide the best fit in the application of the two-census method, suggesting that Mennonite mortality was similar to that of eastern European populations to whom they were most alike culturally. Mortality was relatively higher for the very young and the elderly. However, the Mennonites' increasing success as farmers after they moved out of Prussia led to a reduction in mortality at all ages.

These changes are also reflected in the Mennonites' rates of growth and composition indexes. The congregation grew in numbers during each period, between periods, and over the whole period. The congregation grew at varying rates, slowest in Prussia and fastest in Russia. Median ages were highest and dependency ratios were lowest in Prussia, whereas median ages were lowest and dependency ratios were highest in Russia. Kansas Mennonites had a lower dependency ratio and a higher median age, probably reflecting an overall decrease in fertility by members immediately after the last migration, a fact supported by the estimate of the birth rate supplied by the model.

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