Mortality trends in a rural Mennonite community from central Kansas

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Introduction:

Epidemiological studies have a long history of investigating biological, nutritional and environmental risk factors for chronic disease mortality. However, the majority of these studies have focussed on heterogeneous urban populations and not on homogenous rural populations. This study investigates mortality in a Mennonite community from central Kansas in order to determine what biological risk factors may be affecting this population.

Objectives:

1. Determine all-cause mortality patterns within a Mennonite community.

2. Determine what biochemical and anthropological factors can be related to all-cause mortality, stratified by age and sex.

Population Background:

Mennonites, an agriculturally oriented ethnic group, are considered culturally and genetically distinct, relative to the general United State population. This population is biologically well defined with a unique immigrant history, as described elsewhere (Crawford 2000).

This study included 556 subjects (256 men and 300 women) from Goessel, in south-central Kansas, who participated in a health fair in 1980 (Figure 1). Mortality data was obtained during the summers of 2001 and 2002.

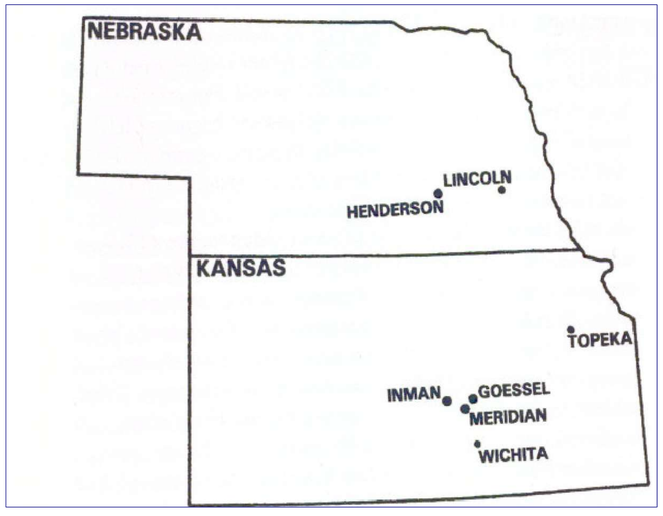

Figure 1:. Geographic location of Goessel Mennonite community in Kansas..

Materials and Methods:

Mortality Sources:

1. Kansas Vital Records Office
2. Social Security Death Index
3. Community Church Directories

Cox Proportional Hazards Analysis (Cox 1972):

- Estimates effects of covariates on mortality using the equation: $h(t) = h_0 \exp(\sum_k \beta_k x_k)$
- Where h(t) is risk of mortality at time *t*, β_k are the sets of unknown parameters to be estimated, and X_k are the covariates (*K*) measured at baseline.
- Individuals who survived to the end of study period were right-censored in months. Total of 270 months in study period

27 Biochemical Markers:

1. Lipid Levels (4)
2. Liver Function (6)
3. Nitrogen Function (5)
4. Protein Function (4)
5. Electrolyte Function (5)
6. Other Functions (3)

3 Anthropometric Markers:

1. Weight (kg)
2. Height (m)
3. Body Mass Index (BMI) kg/m^2

2 Physiological Markers:

1. Systolic Blood Pressure
2. Diastolic Blood Pressure

Results:

Mortality Statistics:

1. 221 (40%) individuals were deceased

2. # of deceased individuals from source are shown in Figure 2

3. Average life span of individuals was 84
   a. 86 for females
   b. 82 for males

Causes of Mortality:

1. Leading causes of death are illustrated in Figure 3.

2. 50 deceased individuals were not classified because death records were not found during Vital Record search.

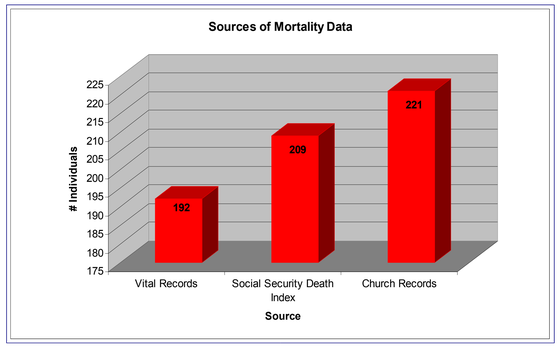

Figure 2: Sources of mortality data.

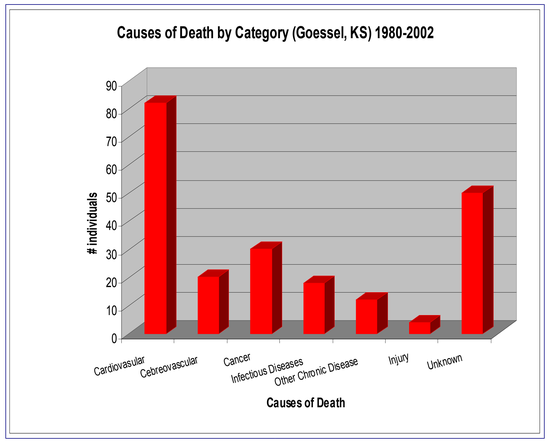

Figure 3: Leading causes of death.

Results (continued):

Cox Proportional Hazards Model:

1. Table 1 shows the results of three different models (Unadjusted, Sex Adjusted, Age Adjusted) used for these data.

2. Age at entry is significantly associated with mortality in all models.

3. Enzymes associated with liver function (SGOT, SGPT, GGT) are also found in all 3 models.

4. Other than Age, males with higher levels of Albumin have 2.47 likelihood of fatal event than survivors.

5. Figure 4 shows the relationship between Albumin levels and age in 5 age cohorts for all participants, cases (deceased individuals), and non- cases (survivors).

Covariate	Parameter (β)	Risk	95% CI Hazard Ratio	p-value
Unadjusted				
Age at Entry	0.09043	1.095	1.081-1.108	<0.0001
Hgb	0.10627	1.112	1.004-1.232	0.042
GGT	-0.00699	0.993	0.988-0.998	0.0116
SGOT	0.00723	1.007	1.003-1.011	0.0007
Total Cholesterol	-0.00485	0.995	0.992-0.999	0.0049
Glucose	0.00513	1.005	1.001-1.009	0.0164
Sex Adjusted				
Males				
Age at entry	0.09137	1.096	1.076-1.116	<0.0001
HDL	0.025	1.021	1.005-1.037	0.0107
GGT	-0.01437	0.986	0.977-0.994	0.0012
Albumin	0.90572	2.474	1.0256-5.962	0.0436
Glucose	0.00747	1.007	1.002-1.013	0.0093
Females				
Age at Entry	0.10622	1.112	1.092-1.133	<0.0001
SGPT	0.00558	1.006	1.001-1.006	0.0274
Total Cholesterol	-0.00597	0.994	0.990-0.998	0.0043
Age Adjusted				
Age > 65	1.28468	3.614	3.31-3.92	<0.0001
Glucose	0.00614	1.006	1.002-1.006	0.0086
SGOT	0.0389	1.04	1.01-1.07	0.0285
SGPT	-0.03495	0.966	0.964-0.968	0.0017

Table 1: Cox Proportional Hazard Model Results.

Key Points:

1. A relationship between liver function and mortality in this population.

2. In an aging population, this relationship may point to declining liver function as part of the biological ageing process, and this process may have more important implications for older individuals than those who are younger. However, further work is needed to confirm these findings.

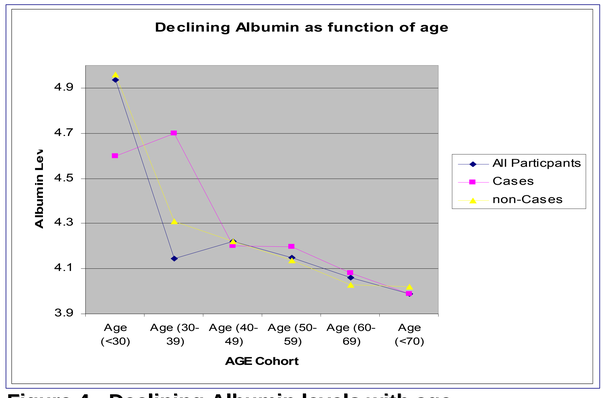

Figure 4: Declining Albumin levels with age.

References Cited:

Cox, DR. (1972) Regression models and life tables. J. Roy. Statist Soc Ser B. 34:187-220

Crawford, MH. ed. (2000) Different Seasons: Biological Aging among the Mennonites of the Midwestern United States. Publications in Anthropology (21). University of Kansas, Lawrence.

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