The second all Russian Sociological Congress

1-3rd October 2003

Professor Lynn Basford- Dean of Health Sciences, University of Lethbridge.
Alyssa Reed: Research Assistant, School of Health Sciences, University of Lethbridge.
Nadine Nowatzki: Research Associate, School of Health Sciences, University of Lethbridge.

Introduction:

The three year European funded Inco-Copernicus study into the relationship of lifestyle and living conditions on health in the Communities of Independent States (CIS) has undertaken a multi-model approach in the recognition that a single focus alone does not provide sufficient scientific evidence or rational explanations through which the scientific communities, health care professionals, epidemiologists and policy makers can be better informed. It is therefore the intention of this paper to draw on the multi-variate analysis undertaken in the final phase of the study with respect to diet and its relationship to health. This will be underpinned by drawing on the economic and environmental factors and the major disease states that affect morbidity and early mortality within the CIS.

The direct relationship between diet and health is well established (Booth et al; 2001; Noakes et al; 1999). Pickard (1986) has demonstrated the correlation between diet and impeding fertility and conceptual ability, whilst Stamler, et al (1993) have found that diet is extrinsically linked to atherosclerosis and hypertension. Other studies have linked diet and health with many disease entities associated with a high level of morbidity and early mortality. Whilst these studies do not necessary specifically relate to the CIS, Parizkova (2000) has established that inadequate nutrition, malnutrition and poor nutrition are prevalent in significant numbers of the CIS population, particularly those with low economic status. Further to this, Parizkova (ibid) has identified that through the period of transition nutritional profiles and dietary practices prevalent in the CIS have been subjected to substantial variation over the last two decades. We have therefore examined the self-reported diet intake, living conditions and economic factors so as to ascertain any co-relationship with prevalence and incidence of major disease states.

METHOD

Individual-level data was collected from nationally representative sample surveys of the populations of eight CIS countries. Cross-sectional surveys asking the same questions were translated into appropriate national languages. Questions were drawn from a series of surveys undertaken by the London School of Hygiene and Tropical Medicine team, as well as pre-existing surveys conducted in other 'in-transition' countries. The survey covered general demographic and socioeconomic characteristics, psycho-social attitudes,

living conditions, health behaviours, health status, and health beliefs. Trained interviewers from national official organisations conducted face-to-face interviews in the respondents' homes in autumn, 2001.

The total sample size was 18428, with 2000 participants from each of the countries of Armenia, Byelorussia, Kazakhstan, and Kyrgizstan, 2022 from Georgia, 2400 from Ukraine, and 4006 from Russia. Samples were selected using multi-stage random sampling with stratification (except Kyrgyzstan) by region and area (rural/urban). Exclusion criteria included being in the military force or in prison, as well as being mentally disabled, institutionalised, hospitalised, homeless, or heavily intoxicated. Households were selected using standardized random route procedures (except in Armenia). Within each household the adult with the nearest coming or last birthday was selected for the interview. If after three visits there was no one at home, the next household on the route was selected. Response rates varied between 71% (Kyrgyszstan) and 88% (Armenia & Georgia).

Two groups of sequential logistic regressions were performed. In the first group of regression analyses, six SPSS direct logistic regressions investigated characteristics each differentiating heart attack from non-heart attack sufferers, stroke from non-stroke sufferers, high blood pressure from non-high blood pressure sufferers, cancer (other than lung) from non-cancer sufferers, diabetes from non-diabetes sufferers, and stomach problem sufferers from non-stomach problem sufferers. Nine predictor variables were used for each regression: amount of meat, fish, fresh vegetables, fruit, animal fat, butter, cheese, milk, and cream/sour cream consumed. A second regression was run after grouping the diet variables considered to be fat, however, the prediction was not improved. The amount of each independent food type consumed was coded as the highest consumption given the numerical equivalent of one and the least consumption coded as four. Given this unusual method of coding, the interpretation of the odds ratios is counterintuitive, whereby a positive odds ratio indicates an increased likelihood of suffering from a disease as the amount of food consumed decreases. Missing data were deemed to be much less than 1% of total sample and, thus, were imputed using SPSS Linear Trend at Point.

Logistic regression was chosen for this first set of regressions because it allows one to predict a discrete outcome (i.e., disease or no disease). Furthermore, given the considerable skewness of the study variables, logistic regression was the optimal choice because it has no assumptions regarding the distribution of the predictor variables.

In the second group of regression analyses, nine SPSS direct logistic regressions investigated characteristics each differentiating frequent from non-frequent consumers of meat, fish, fresh vegetables, fruit, animal fat, butter, cheese, milk, and cream/sour cream Twenty predictor variables were used for each regression: surfacing of road; material living conditions; ownership of a plot of land; present economic state; satisfaction with housing, water quality, air purity, climate, electricity support, public transport, work or studies, education, work conditions, personal income, present financial situation, and life as a whole; the perceived effect of housing, stress and political transformation on health;

and available source of hot water. Again, missing data were deemed to be much less than 1% of total sample and, thus, were imputed using SPSS Linear Trend at Point.

To be consistent with the first group of analyses, logistic regression was again chosen to predict frequency of food consumption. The independent variables of living and economic conditions were a mix of discrete and dichotomous variables, further supporting the choice of logistic regression. Although multiple regression is a more powerful analysis, the power of the analysis was not problematic considering the very large sample size. However, given that multiple regression was also a feasible statistical test, one was performed to verify the results provided by the logistic regression. Both forms of regression indicated the same highly significant predictor variables.

DESCRIPTION OF SAMPLE

Demographics

The ages ranged from 18 to 99, with a mean age of 45.57 years. Of the total sample, 56.7% (n=10454) were female. 64.3% were married (57.2%) or remarried (7.1%), while 13.7% were single, 7.5% were divorced and not remarried, 12.9% were widowed and not remarried, and 1.6% were living together. With regard to level of education, 16.7% had not completed high school, 62.5% had finished high school (including vocational and non-completed post-secondary), and 20.8% had completed university.

Living conditions

The vast majority of the sample (90.4%) indicated that their home town was accessible via a paved road. In addition, 65.3% reported that they had a plot of land which could be used for growing agricultural products. However, the majority (59.6%) did not have hot water on tap, geyser, or hydrant.

The majority of the sample were satisfied with their housing (70.7%), quality of drinking water (65.8%), air purity (65%), electricity support in home (75.4%), and public transportation in their area (58%). 51.5% were satisfied with their work/main job/study, while 65.6% were satisfied with their education. 43% were satisfied with their work and employment, compared to 39% who were dissatisfied. 45.6% were satisfied with their life as a whole, compared to 51% who were dissatisfied.

The majority of the sample believed that their health was affected by housing and living conditions (83.4%), constant stress in daily life (91.2%), and transformation in their country during the last 10 years (74.2%).

Economic conditions

Overall, the participants indicated that they were not satisfied with the economy. When asked to rank the current state of the economy, the majority (63.3%) gave a mark of 1 (36.1%) or 2 (27.2%), while only 7.4% gave a mark of 4 (6.3%) or 5 (1.1%). When asked to evaluate the level of the material living conditions of their family, participants also indicated that they had barely enough for food and clothes (60%) or not enough money even for nutrition (22.8%).

An overwhelming majority of the sample (76.6%) were dissatisfied with both their personal income, as well as the current financial situation of their household.

Diet

The study participants were asked how often they had consumed various foods during the previous weeks. As can be seen in the table, the majority of the sample consumed meat, fish, cheese, and cream/sour cream 'extremely seldom' (30.7%, 51.4%, 41.6%, and 35.5% respectively). In contrast, the majority of the sample consumed fresh vegetables, animal fat, butter, and milk daily (39.4%, 32.2%, 31.8%, and 38.6%, respectively).

Frequency of consumption

Diet variable	**Daily N (%)**	**2 or 3 times/wk N (%)**	**Occasionally (1/wk) N (%)**	**Extremely seldom N (%)**
Meat	2756 (15)	5166 (28.1)	4828 (26.3)	5638 (30.7)
Fish	332 (1.8)	2740 (14.9)	5863 (31.9)	9441 (51.4)
Fresh vegetables (excl. potatoes)	7251 (39.4)	6852 (37.3)	3097 (16.8)	1186 (6.5)
Fruit	4884 (26.6)	5675 (30.9)	4482 (24.4)	3326 (18.1)
Animal fat	5884 (32.2)	3818 (20.9)	3125 (17.1)	5468 (29.9)
Butter	5836 (31.8)	4139 (22.5)	3727 (20.3)	4656 (25.4)
Cheese	3146 (17.1)	3395 (18.5)	4174 (22.7)	7636 (41.6)
Milk	7090 (38.6)	4609 (25.1)	3103 (16.9)	3564 (19.4)
Cream	3568 (19.4)	4103 (22.4)	4205 (22.9)	6470 (35.3)

When asked about the importance of eating a lot of meat, the vast majority (66.6%) stated that it was not important (36.3% 'rather unimportant', 30.3% 'unimportant'). When asked about the importance of having a healthy diet, an overwhelming majority (95.4%) believed that it was important (73.5% 'important', 21.9% 'quite important').

Disease incidence

2.4% of the sample reported a heart attack, 1.4% reported a stroke, 13.9% reported persisting high blood pressure, 2.2% reported diabetes, 21.1% reported stomach or digestive disorders, and only 0.5% reported cancer other than of the lung.

RESULTS:

Group 1(prediction of disease from diet)

i) *heart attack*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 108.6, $p<0.001$. The variance accounted for was small, however, with Nagelkerke R squared = .030. Overall prediction success was 97.6%. Table 1 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of meat, fish, fresh vegetables, and fruit consumed reliably predicted suffering from a heart

attack (z= 45.80, p<0.001; z= 5.19, p<0.05; z=8.29, p<0.01; z=19.83, p<0.001, respectively). The odds ratios of 1.5 for meat consumption and 1.3 for fruit consumption indicate that the likelihood of having a heart attack increases with decreasing meat and fruit consumption. However, the odds ratios of 0.9 for fish consumption and 0.8 for vegetable consumption indicate that the likelihood of having a heart attack decreases with decreasing fish and vegetable consumption.

ii) *stroke*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 69.5, p<0.001. The variance accounted for was small, however, with Nagelkerke R squared = .027. Overall prediction success was 98.6%. Table 2 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of meat, fish, fruit, and cheese consumed reliably predicted suffering from a stoke (z= 20.85, p<0.001; z= 4.60, p<0.05; z=3.83, p=0.05; z=10.46, p=0.001, respectively). The odds ratios of 1.4 for meat consumption, 1.1 for fruit consumption, and 1.3 for cheese consumption indicate that the likelihood of having a stroke increases with decreasing meat, fruit and cheese consumption. However, the odds ratio of 0.8 for fish consumption indicates that the likelihood of having a stroke decreases with decreasing fish consumption.

iii) *high blood pressure*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 310.7 p<0.001. The variance accounted for was small, however, with Nagelkerke R squared = .031. Overall prediction success was 86.1%. Table 3 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of meat, fresh vegetables, fruit, butter, and cheese consumed reliably predicted suffering from high blood pressure (z= 75.58, p<0.001; z= 36.93, p<0.001; z=57.49, p<0.001; z=6.03, p<0.05; z= 29.33, p<.001, respectively). The odds ratios of 1.3 for meat consumption, 1.2 for fruit consumption, and 1.1 for both butter and cheese consumption indicates that the likelihood of having high blood pressure increases with decreasing meat, fruit, butter and cheese consumption. However, the odds ratio of 0.8 for vegetable consumption indicates that the likelihood of having high blood pressure decreases with decreased vegetable consumption.

iv) *other cancer*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 25.54, p<0.01. The variance accounted for was small, however, with Nagelkerke R squared = .021. Overall prediction success was 99.4%. Table 4 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of fresh vegetables and animal fat consumed reliably predicted suffering from cancer other than lung (z= 4.18, p<0.05; z= 6.3, p<0.05, respectively). The odds ratio of 1.2 for animal fat consumption indicates that the likelihood of having a cancer other than lung increases with decreasing animal fat consumption, whereas the odds ratio of 0.8 for vegetable consumption specifies a decreased risk of cancer with decreased vegetable consumption.

v) *diabetes*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 42.17, p<0.001. The variance accounted for was small, however, with Nagelkerke R squared = .012. Overall prediction success was 97.8%. Table 5 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of meat and animal fat consumed reliably predicted suffering from diabetes (z= 5.94, p<0.05; z= 4.97, p<0.05, respectively). The odds ratios of 1.2 for meat consumption and 1.1 for animal fat consumption indicate that the likelihood of having diabetes increases with decreased meat and animal fat consumption.

vi) *stomach problems*

A test of the full model with all nine predictor variables against a constant-only model was statistically reliable, (9, N = 18 428) = 193.37, p<0.001. The variance accounted for was small, however, with Nagelkerke R squared = .016. Overall prediction success was 78.9%. Table 6 shows regression coefficients, Wald statistics, and odds ratios for each of the nine predictors. According to the Wald criterion, only amount of fresh vegetables, fruit, animal fat, butter, and cheese consumed reliably predicted suffering from stomach or other digestive problems (z= 11.76, p=0.001; z= 47.31, p<0.001; z=41.56, p<0.001; z=4.68, p<0.05, z=45.25, p<.001, respectively). The odds ratios of 1.2 for fruit consumption and 1.1 for both animal fat and cheese consumption indicate that the likelihood of having stomach problems increases with decreasing fruit, animal fat and cheese consumption.

<u>Group 2 (predicting diet from economic and living conditions)</u>

i) *meat consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (21, N=18428) = 1799.8, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent meat consumers. The variance accounted for was small, however, with Nagelkerke R squared = .129. Overall prediction success was 64.2%. Table 7 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, 14 of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was available hot water, z= 871.0, p<0.01. The odds ratio of .36 indicates a very large increased likelihood of being an infrequent meat eater when there is no available source of hot water in the home. The next most reliable predictor of meat consumption frequency was ownership of land, z=192.0, p<0.01. Again, the odds ratio of 1.63 indicates a very large increased likelihood of being an infrequent meat eater when no land is owned.

ii*) fish consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 798.6, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent fish consumers. The variance accounted for was small, however, with Nagelkerke R squared = .074. Overall prediction success was 83.3%. Table 8 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, seven of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was available hot water, z= 523.1, p<0.01. The odds ratio of .37 indicates a very large increased likelihood of being an infrequent fish eater when there is no available source of hot water in the home. The next most reliable predictor of fish consumption frequency was surfacing of the road, z=23.8, p<0.01. The odds ratio of 1.56 indicates a very large increased likelihood of being an infrequent fish eater when the road was not paved.

iii*) fresh vegetable consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 316.1, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent fresh vegetable consumers. The variance accounted for was small, however, with Nagelkerke R squared = .027. Overall prediction success was 76.7%. Table 7 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, nine of the 20 independent variables reliably predicted frequency of consumption (Table 9). Among the reliable predictors, the most significant predictor was ownership of land, z= 91.7, p<0.01. The odds ratio of 1.45 indicates a large increased likelihood of being an infrequent fresh vegetable eater when a plot of land is not owned. The next most reliable predictor of fresh vegetable consumption frequency was availability of hot water, z=91.7, p<0.01. The odds ratio of .71 indicates a large increased likelihood of being an infrequent fresh vegetable eater when there was no available source of hot water in the home.

iv) *fruit consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 305.1, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent fruit consumers. The variance accounted for was small, however, with Nagelkerke R squared = .023. Overall prediction success was 59%. Table 10 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, 12 of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was satisfaction with pubic transport, z= 44.2, p<0.01. However, the odds ratio of .996 indicates very little increased likelihood of being an infrequent fruit eater when people were more satisfied with public transport. The next most reliable predictor of fruit consumption frequency was satisfaction of work conditions, z=41.3, p<0.01. Again, the odds ratio of .997 indicates a very small increased likelihood of being an infrequent fruit eater when people were more satisfied with their work conditions.

v) *animal fat consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 226.6, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent animal fat consumers. The variance accounted for was small, however, with Nagelkerke R squared = .017. Overall prediction success was 55.2%. Table 11 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, five in (Table 7). Among the reliable predictors, the most significant predictor was ownership of land, z= 73.6, p<0.01. The odds ratio of 1.33 indicates a large increased likelihood of being an infrequent animal fat eater when no land is owned. The next most reliable predictor of animal fat consumption frequency was satisfaction with work or studies, z=39.6, p<0.01. However, the odds ratio of .997 indicates a very small increased likelihood of being an infrequent animal fat eater when people were more satisfied with their work or studies.

vi*) butter consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 1408.0, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent butter consumers. The variance accounted for was small, however, with Nagelkerke R squared = .102. Overall prediction success was 61.5%. Table 12 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, 10 of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was available hot water, z= 895.3, p<0.01. The odds ratio of .36 indicates a very large increased likelihood of being an infrequent butter consumer when there was no available source of hot water in the home. The next most reliable predictor of butter consumption frequency was ownership of land, z=71.4, p<0.01. The odds ratio of 1.34 indicates a large increased likelihood of being an infrequent butter consumer when no land was owned.

vii) *cheese consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 402.4, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent cheese consumers. The variance accounted for was small, however, with Nagelkerke R squared = .031. Overall prediction success was 64.5%. Table 13 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, nine of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was surfacing of the road, z= 147.6, p<0.01. The odds ratio of .52 indicates a very large increased likelihood of being an infrequent cheese eater when the road was paved. The next most reliable predictor of cheese consumption frequency was available hot water, z=83.2, p<0.01. The odds ratio of 0.73 indicates a large increased likelihood of being an infrequent cheese eater when no source of hot water was available in the home.

viii*) milk consumption*

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 786.4, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent milk consumers. The variance accounted for was small, however, with Nagelkerke R squared = .059. Overall prediction success was 67.2%. Table 14 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, 11 of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was ownership of land, z= 538.1, p<0.01. The odds ratio of 2.23 indicates a very large increased likelihood of being an infrequent milk drinker when there land was owned. The next most reliable predictor of milk consumption frequency was available hot water, z=234.8, p<0.01. The odds ratio of .59 indicates a large increased likelihood of being an infrequent milk drinker when there was no hot water source in the home.

ix) cream/sour cream consumption

A test of the full model with all 21 predictors against a constant-only model was statistically reliable, (20, N=18428) = 754.7, p<0.001, indicating that the twenty predictors, as a set, reliably distinguished between frequent and non-frequent cream consumers. The variance accounted for was small, however, with Nagelkerke R squared = .056. Overall prediction success was 59.6%. Table 15 shows regression coefficients, Wald statistics and odds ratios for each of the twenty predictors. According to the Wald criterion, eight of the 20 independent variables reliably predicted frequency of consumption (Table 7). Among the reliable predictors, the most significant predictor was ownership of land, z= 331.2, p<0.01. The odds ratio of 1.88 indicates a very large increased likelihood of being an infrequent cream eater when no land was owned. The next most reliable predictor of cream consumption frequency was available hot water, z=235.4, p<0.01. The odds ratio of .6 indicates a large increased likelihood of being an infrequent cream eater when there was no hot water source in the home.

DISCUSSION

At first glance, the results predicting disease from diet seem surprising. For example, the likelihood of having a heart attack, stroke, high blood pressure, and diabetes increases with decreased meat consumption. Similarly, the likelihood of having a stroke, high blood pressure, or stomach problems increases with decreased cheese consumption, and the likelihood of having cancer other than lung, diabetes, or stomach problems increases with decreased animal fat consumption. These findings seem counterintuitive, as previous research indicates that a diet high in saturated fat (such as that found in meat and cheese) is a risk factor for cardiovascular disease and other health conditions (Thomas, 2001a; DoH 1994; Mann 2000, Thomsen et al 1999). However, the diet frequencies indicate that the majority of the sample is eating most food groups only occasionally or extremely seldom. In other words, as Parizkova (ibid) observed there is a degree of malnutrition prevalent in the population of the CIS and calorific intake per se rather than the specificity of food types is of equal importance here in the understanding of health and the promotion of healthy longevity. It is a hypothesis that has been articulated before in the knowledge that a healthy diet intake alone is one point of the equation and economic

and living conditions are a significant integral part in disease prevention (Noakes et al 1999). Nonetheless, our results do verify other epidemiological studies that the likelihood of having a heart attack, stroke, high blood pressure and stomach problems increases with decreased fruit consumption (DoH, 1994; 2000a; 2001; Noakes et al, ibid; Apel et al. 1997; Bingham, et al. 1991; Daniels, 2002; Savige, 2001). The results suggest that the micro nutrients associated with eating fruit offer immunological protection against major disease incidence.

In contrast, our results demonstrate that the likelihood of having a heart attack or stroke decreases with *decreased* fish consumption, and the likelihood of having a heart attack, high blood pressure, and cancer other than lung decreases with *decreased* vegetable consumption. These results are dichotomously opposed to previous studies that have indicated eating fish (Savige ibid; Kromhout et al, 1985) and fresh vegetables (DoH, 1994, 2000a) are protective against cardiovascular disease and cancer. Kromhout et al's study was a significant milestone in understanding the relationship of eating fish and the decreased mortality rate from CHD and whilst the findings have been supported by the Physicians Health Study (Albert, 1998) the final analysis identified that neither dietary fish nor n-3 fatty acid intake had a direct relationship with a reduced risk to total myocardial infarction, non-sudden cardiac death, or total cardiovascular mortality (Albert et al, 1998). What did emerge as a significant finding was the fact that fish consumption was associated with a reduced risk of total mortality.

In order to understand the results that indicate a diet high in fat is seemingly protective against certain disease states, we need to look at the confounding effects of economic and living conditions. With regard to predicting diet from economic and living conditions, the most significant predictors were available hot water, ownership of land, and surfacing of the road. Available hot water was a significant predictor of meat, fish, fresh vegetables, butter, cheese, milk, and cream/sour cream consumption. Ownership of land was a significant predictor of meat, fresh vegetables, animal fat, butter, milk, and cream/sour cream consumption. Surfacing of the road was a significant predictor of fish and cheese consumption. One notable exception was the consumption of fruit, which was significantly predicted by satisfaction with public transport and satisfaction with work conditions. However, the odds ratios indicate a very small and clinically insignificant increased likelihood of being an infrequent fruit eater when people were more satisfied with public transport and work conditions.

Available hot water, ownership of land, and surfacing of the road are indirect measures of socioeconomic status, which affects living conditions. Those households that are more impoverished are less likely to have hot water, land, and surfaced roads. It is therefore not surprising that these households would report less varied nutritional intake in general, including less consumption of most types of food. Hence, we can conclude that economic status and living conditions play a vital part in the availability and accessibility of food types and the consistency of food supplies, and the ability to cook and prepare food fit for consumption.

CONCLUSION

Exploration of the current literature relating to the broad perspective of diet and health demonstrates that there is no shortage of research into this particular field. For the most part emphasis has focused on the direct causal link with certain food types and disease manifestation that leads to morbidity and early mortality. Using such modeling, food types have been labeled good or bad (eg. Animal saturated fats and non-saturated fats), and based on scientific evidence, governments have advised the public of the amount of food to be eaten on a daily basis, the type, and in what quantities to ensure health is maintained throughout the life span. Unfortunately, the research findings to date have provided confounding and sometimes contradictory evidence to support or negate dietary risk factors or preventative elements against major disease entities, often creating confusion rather than clarity with the public at large. Conscious of this phenomenon and that our analysis of the population under study varied from the common scientific view with regards to risky and protective food factors (animal fats and fish eating), we enlarged our analysis to include other confounding variables associated with economic status and living conditions. These concepts have been hypothesized by others as being instrumentally important but have been, as of yet, under investigated.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio

Considering economic and living conditions as confounding variables on diet and health our results have demonstrated that a high percentage of people in the CIS countries are in a poor economic status and unsuitable environments that adds to their impoverished nutritional state. The result is that there is often a poor daily calorific intake that would provide them with the necessary nutrients and micro nutrients to prevent disease, or sustain health.

It is therefore our opinion that there is a further need to investigate the relationship between economic and living conditions, diet and disease in CIS using a more robust enquiry (other than self-report) to ascertain the exact type, quality and amount of daily dietary intake.

Meat	.43	45.8**	1.5
Fish	-.16	5.2*	.9
Fresh Vegetables	-.18	8.3**	.8
Fruit	.24	19.8**	1.3
Animal Fat	.08	3.5	1.1
Butter	.03	.2	1.0
Cheese	-.02	.2	1.0
Milk	-.03	.3	1.0
Cream/sour cream	.06	1.1	1.1
Constant	-5.02	357.3	0.0

Table 1: Logistic regression of diet variables predicting heart attacks.

*p<0.05
**p<0.01

Table 2: Logistic regression of diet variables predicting strokes.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio
Meat	.36	20.9**	1.4
Fish	-.19	4.6*	.8
Fresh Vegetables	-.11	2.0	.9
Fruit	.14	3.8*	1.1
Animal Fat	.06	1.2	1.1
Butter	.05	.6	1.1
Cheese	.23	10.5**	1.3
Milk	-.06	.8	.9
Cream/sour cream	.04	.2	1.0
Constant	-5.73	275.3	0.0

*p<0.05
**p<0.01

Table 3: Logistic regression of diet predicting high blood pressure.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio
Meat	.23	75.6**	1.3
Fish	-.04	1.4	1.0
Fresh Vegetables	-.17	36.9**	.8
Fruit	.18	57.5**	1.2
Animal Fat	.01	.3	1.0
Butter	.06	6.0*	1.1
Cheese	.13	29.**	1.1
Milk	.00	.1	1.0
Cream/sour cream	-.02	.7	1.0
Constant	-2.97	658.1	.1

*p<0.05
**p<0.01

Table 4: Logistic regression of diet predicting cancers other than lung.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio
Meat	.23	3.4	1.3
Fish	-.17	1.3	.8
Fresh Vegetables	-.27	4.2*	.8
Fruit	.06	.3	1.1
Animal Fat	.22	6.3*	1.2
Butter	-.05	.2	1.0
Cheese	.05	.2	1.0
Milk	.03	.1	1.0
Cream/sour cream	.21	2.7	1.2
Constant	-6.19	133.6	.0

*p<0.05
**p<0.01

Table 5: Logistic regression of diet predicting diabetes.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio
Meat	.15	5.9*	1.2
Fish	-.04	.3	1.0
Fresh Vegetables	-.08	1.6	.9
Fruit	.10	2.8	1.1
Animal Fat	.10	5.0*	1.1
Butter	.06	1.3	1.1
Cheese	.04	.6	1.0
Milk	-.09	2.5	.9
Cream/sour cream	.12	3.8	1.1
Constant	-4.84	315.6	.0

*p<0.05
**p<0.01

Table 6: Logistic regression of diet predicting stomach problems.

Variable	Regression Coefficient (B)	Wald Statistic (z)	Odds Ratio
Meat	-.02	.61	1.0
Fish	.04	2.4	1.0
Fresh Vegetables	.08	11.8**	.9
Fruit	.14	47.3**	1.2
Animal Fat	.10	41.6**	1.1
Butter	-.04	4.7*	1.0
Cheese	.13	45.2**	1.1
Milk	-.03	1.6	1.0
Cream/sour cream	-.03	1.5	1.0
Constant	-2.00	444.9	.1

*p<0.05
**p<0.01

Table 7: Logistic regression of characteristics differentiating frequent meat eaters from non-frequent meat eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	.45	58.8**	1.57
Material Living Conditions	-.00	7.9**	1.00
Plot of Land	.49	192.0**	1.63
Present state of economy	-.00	4.3*	1.00
Satisfaction with housing	.00	4.7*	1.00
Satisfaction with water quality	.00	.0	1.00
Satisfaction with air purity	-.00	.2	1.00
Satisfaction with climate	-.01	9.6**	1.00
Satisfaction with electricity support	.00	1.7	1.00
Satisfaction with public transport	.00	6.8**	1.00
Satisfaction with work/studies	-.00	92.8**	1.00
Satisfaction with education	-.00	33.2**	1.00
Satisfaction with conditions of work	-.00	70.6**	1.00
Satisfaction with personal income	.00	30.1**	1.00
Satisfaction with present financial situation	.01	23.8**	1.00
Satisfaction with life as a whole	.00	3.1	1.00
Perceived effect of housing on health	.00	.1	1.00
Perceived effect of stress on health	-.00	1.0	1.00
Perceived effect of political transformation on health	.00	19.2**	1.00
Hot Water available	-1.01	871.0**	.36
Constant	-.60	49.8	.55

*$p<0.05$
**$p<0.01$

Table 8: Logistic regression of characteristics differentiating frequent fish eaters from non-frequent fish eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	.45	23.8**	1.56
Material Living Conditions	.00	1.8	1.00
Plot of Land	.13	8.2**	1.14
Present state of economy	.00	.1	1.00
Satisfaction with housing	.00	.4	1.00
Satisfaction with water quality	-.00	2.2	1.00
Satisfaction with air purity	-.00	.1	1.00
Satisfaction with climate	.00	.0	1.00
Satisfaction with electricity support	.00	.0	1.00
Satisfaction with public transport	.00	15.9**	1.00
Satisfaction with work/studies	-.00	14.3**	1.00
Satisfaction with education	-.00	15.8**	1.00
Satisfaction with conditions of work	-.00	10.0**	1.00
Satisfaction with personal income	.00	.5	1.00
Satisfaction with present financial situation	.00	3.6	1.00
Satisfaction with life as a whole	-.00	1.0	1.00
Perceived effect of housing on health	-.00	.5	1.00
Perceived effect of stress on health	-.00	1.7	1.00
Perceived effect of political transformation on health	.00	2.9	1.00
Hot Water available	-1.00	523.1**	.37
Constant	1.38	125.3	3.96

*$p<0.05$
**$p<0.01$

Table 9: Logistic regression of characteristics differentiating frequent fresh vegetable eaters from non-frequent fresh vegetable eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	.41	49.0**	1.50
Material Living Conditions	-.00	16.7**	1.0
Plot of Land	.37	91.7**	1.45
Present state of economy	-.00	14.5**	1.00
Satisfaction with housing	.00	.2	1.00
Satisfaction with water quality	.00	.0	1.00
Satisfaction with air purity	.00	.0	1.00
Satisfaction with climate	.00	.1	1.00
Satisfaction with electricity support	-.00	.1	1.00
Satisfaction with public transport	-.00	4.7*	1.00
Satisfaction with work/studies	-.00	7.4**	1.00
Satisfaction with education	.00	.0	1.00
Satisfaction with conditions of work	-.00	11.0**	1.00
Satisfaction with personal income	.00	5.4*	1.00
Satisfaction with present financial situation	.00	.0	1.00
Satisfaction with life as a whole	.00	.2	1.00
Perceived effect of housing on health	-.00	2.2	1.00
Perceived effect of stress on health	-.00	.8	1.00
Perceived effect of political transformation on health	.00	6	1.00
Hot Water available	-.34	76.0**	.71
Constant	-2.10	526.9	.12

*p<0.05
**p<0.01

Table 10: Logistic regression of characteristics differentiating frequent fruit eaters from non-frequent fruit eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	-.15	7.7**	.86
Material Living Conditions	-.00	.5	1.00
Plot of Land	.10	7.8**	1.10
Present state of economy	-.00	7.2**	1.00
Satisfaction with housing	.00	4.2*	1.00
Satisfaction with water quality	-.00	5.8*	1.00
Satisfaction with air purity	.00	2.9	1.00
Satisfaction with climate	-.00	.2	1.00
Satisfaction with electricity support	-.00	1.3	1.00
Satisfaction with public transport	-.00	44.2**	1.00
Satisfaction with work/studies	-.00	1.0	1.00
Satisfaction with education	-.00	6.1	1.00
Satisfaction with conditions of work	-.00	41.3**	1.00
Satisfaction with personal income	-.00	15.9**	1.00
Satisfaction with present financial situation	.00	8.7**	1.00
Satisfaction with life as a whole	.00	.0	1.00
Perceived effect of housing on health	.00	4.9*	1.00
Perceived effect of stress on health	-.00	2.4	1.00
Perceived effect of political transformation on health	-.00	10.2**	1.00
Hot Water available	.08	5.9*	1.08
Constant	-.43	28.9	.65

*$p<0.05$
**$p<0.01$

Table 11: Logistic regression of characteristics differentiating frequent animal fat eaters from non-frequent animal fat eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	-.28	27.8**	.75
Material Living Conditions	-.00	.2	1.00
Plot of Land	.28	73.6**	1.33
Present state of economy	.00	.7	1.00
Satisfaction with housing	.00	.4	1.00
Satisfaction with water quality	.00	.0	1.00
Satisfaction with air purity	-.00	.4	1.00
Satisfaction with climate	.00	.6	1.00
Satisfaction with electricity support	.00	.7	1.00
Satisfaction with public transport	.00	1.1	1.00
Satisfaction with work/studies	-.00	39.6**	1.00
Satisfaction with education	.00	.1	1.00
Satisfaction with conditions of work	.00	.8	1.00
Satisfaction with personal income	.00	.0	1.00
Satisfaction with present financial situation	.00	2.4	1.00
Satisfaction with life as a whole	.00	7.6**	1.00
Perceived effect of housing on health	.00	2.7	1.00
Perceived effect of stress on health	-.00	.8	1.00
Perceived effect of political transformation on health	-.00	4.2*	1.00
Hot Water available	.04	1.3	1.04
Constant	-.28	11.9	.76

*$p<0.05$
**$p<0.01$

Table 12: Logistic regression of characteristics differentiating frequent butter eaters from non-frequent butter eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	.09	2.9	1.10
Material Living Conditions	-.00	3.1	1.00
Plot of Land	.29	71.4**	1.34
Present state of economy	.00	.9	1.00
Satisfaction with housing	.00	1.7	1.00
Satisfaction with water quality	.00	.0	1.00
Satisfaction with air purity	-.00	3.9*	1.00
Satisfaction with climate	-.00	6.2*	1.00
Satisfaction with electricity support	.00	1.1	1.00
Satisfaction with public transport	.00	.0	1.00
Satisfaction with work/studies	-.00	62.9**	1.00
Satisfaction with education	-.00	20.2**	1.00
Satisfaction with conditions of work	-.00	31.1**	1.00
Satisfaction with personal income	.00	9.6**	1.00
Satisfaction with present financial situation	.00	3.8	1.00
Satisfaction with life as a whole	.00	9.0**	1.00
Perceived effect of housing on health	.00	.5	1.00
Perceived effect of stress on health	-.00	3.3	1.00
Perceived effect of political transformation on health	.00	6.7*	1.00
Hot Water available	-1.03	895.3**	.36
Constant	-.39	22.6	.68

*$p<0.05$
**$p<0.01$

Table 13: Logistic regression of characteristics differentiating frequent cheese eaters from non-frequent cheese eaters.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	-.65	147.6**	.52
Material Living Conditions	.00	1.2	1.00
Plot of Land	-.03	.8	1.00
Present state of economy	-.00	6.1*	1.00
Satisfaction with housing	-.00	.08	1.00
Satisfaction with water quality	-.00	1.0	1.00
Satisfaction with air purity	.00	.1	1.00
Satisfaction with climate	.00	.1	1.00
Satisfaction with electricity support	-.00	.6	1.00
Satisfaction with public transport	-.00	7.2**	1.00
Satisfaction with work/studies	.00	1.0	1.00
Satisfaction with education	-.00	25.6**	1.00
Satisfaction with conditions of work	-.00	35.4**	1.00
Satisfaction with personal income	.00	7.4**	1.00
Satisfaction with present financial situation	.00	3.5	1.00
Satisfaction with life as a whole	-.00	.6	1.00
Perceived effect of housing on health	.00	.3	1.00
Perceived effect of stress on health	-.00	4.5*	1.00
Perceived effect of political transformation on health	-.00	19.0**	1.00
Hot Water available	-.31	83.2**	.73
Constant	1.37	278.8	3.9

*$p<0.05$
**$p<0.01$

Table 14: Logistic regression of characteristics differentiating frequent milk drinkers from non-frequent milk drinkers.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	-.12	4.2*	.89
Material Living Conditions	.00	.1	1.0
Plot of Land	.80	538.1**	2.23
Present state of economy	-.00	1.8	1.00
Satisfaction with housing	.00	.0	1.00
Satisfaction with water quality	.00	.0	1.00
Satisfaction with air purity	-.00	4.3*	1.00
Satisfaction with climate	-.01	12.7**	1.00
Satisfaction with electricity support	-.00	.3	1.00
Satisfaction with public transport	.00	.6	1.00
Satisfaction with work/studies	.00	.0	1.00
Satisfaction with education	-.00	6.4*	1.00
Satisfaction with conditions of work	-.00	10.4**	1.00
Satisfaction with personal income	.00	1.6	1.00
Satisfaction with present financial situation	.00	11.8**	1.01
Satisfaction with life as a whole	.00	2.3	1.00
Perceived effect of housing on health	-.00	6.1*	1.00
Perceived effect of stress on health	-.00	7.1**	1.00
Perceived effect of political transformation on health	.00	29.0**	1.00
Hot Water available	-.54	234.8**	.59
Constant	-1.35	258.3	.26

*$p<0.05$
**$p<0.01$

Table 15: Logistic regression of characteristics differentiating frequent cream/sour cream consumers non-frequent cream/sour cream consumers.

Variable	**Regression Coefficient (B)**	**Wald Statistic (z)**	**Odds Ratio**
Surfacing of Road	.03	.4	1.03
Material Living Conditions	.00	.0	1.00
Plot of Land	.63	331.2**	1.88
Present state of economy	.00	.1	1.00
Satisfaction with housing	-.00	.1	1.00
Satisfaction with water quality	-.00	2.9	1.00
Satisfaction with air purity	-.0	3.8	1.00
Satisfaction with climate	-.00	2.3	1.00
Satisfaction with electricity support	.01	3.9	1.01
Satisfaction with public transport	.00	1.6	1.00
Satisfaction with work/studies	-.00	22.2*	1.00
Satisfaction with education	.00	.2	1.00
Satisfaction with conditions of work	-.00	54.8**	1.00
Satisfaction with personal income	.00	9.6**	1.00
Satisfaction with present financial situation	.00	7.9**	1.00
Satisfaction with life as a whole	.00	4.3*	1.00
Perceived effect of housing on health	.00	.1	1.00
Perceived effect of stress on health	-.00	.9	1.00
Perceived effect of political transformation on health	.00	15.2**	1.00
Hot Water available	-.51	235.4**	.60
Constant	-.42	26.5	.66

*$p<0.05$
**$p<0.01$

References:

Booth, S.; Mayer, J.; Sallis, J.; Ritenbaugh, C.; Hill, J.; Birch, L.; Frank, L.; Glanz, K.; Himmelgreen DA.; Mudd, M.; Popkin B.; Rickard K.; Hays NP.; Mayer, J.(2001) Environmental and societal factors affect food choice and physical activity: Rationale, influences and leverage points. Nutrition Reviews, Vol 59(3) pp s21-s39

Noakes M.; Clifton, P.; McMurchie, T. (1999) The role of diet in cardiovascular health: A review of the evidence. American Journal of Nutrition and Dietetics, Vol 56(3) pp s3-s22.

Pickard, BM. (1986) Feeding children: In the beginning-nutrition and pregnancy. Nutrition and Health, Vol 4 (3) pp155-166.

Stamler, J.; Stamler, R.; and Neaton JD. (1993) Blood pressure, systolic and diastolic and cardiovascular risks: US population data. Archives of Internal Medicine, Vol 153, pp 598-615.

Parizkova, J. (2000) Dietary habits and nutritional status in adolencents in Central and Eastern Europe. European Journal of Clinical Nutrition, Vol 54(1) pp26-40.

Thomas, B. (2001a) Coronary Heart Disease. In Thomas B. ed. *Manual of Dietetic Practice*. Blackwell Science.

Department of Health (1994) Committee on medical aspects of food policy, nutritional aspects of cardiovascular disease. (Reports on Health and Social Subjects 46) HMSO. London.

Mann J. (2000) Diseases of the heart and circulation. In Garrow JS James WPT Ralf A eds. *Human Nutrition and Dietetics* . 10th ed. Churchill Livingstone London.

Noakes et al ibid

Department of Health Ibid

Department of Health (2000a) National Service Framework for Coronary Heart Disease. Modern Standards and Modern Service Models. DoH HMSO, London.

Department of Health (2001) Five a day up date. DoH HMSO, London.

Appel LJ.; Moore TJ.; Obarzanek E.; Vollmer, WM.; Svetkey LP,; Sacks FM,; Bray,GA,; Vogt TM,; Cutler JA,; Windhauser MM,; Lin PH,; Karanja N. (1997) A clinical trial of the effects of dietary patterns on blood pressure. DASH collaborative research Group. N. Engl. Journal Medicine. 336 1117-1124.

Bingham, S. (1991) Dietary aspects of a health strategy for England. The Health Nation Response, British Medical Journal, Vol 303, pp 353-355

Daniels, L. (2002) Diet and coronary heart disease: Advice on cardioprotective diet. British Journal of Community Nursing, Vol 7 no 7 pp 346-350.

Savige G. (2001) Candidate foods in the Asia-Pacific region for cardiovascular protection: Fish, fruit and vegetables. Asia Pacific Journal Clinical Nutrition, Vol 10(2) pp134-137.

Kromhout, D.; Bosschieter EB; de Lezanne Coulander C. (1985) The inverse relationship between fish consumption and 20 year mortality from coronary heart disease. N Engl J. Medicine 312: 1205-9.

Albert CM.; Hennkens CH.; O'Donnell CJ.; Carey, VJ.; Willet WC. Fish consumption and sudden cardiac death. JAMA 279:23-81998

Booth et al ibid