

Food, alcohol and cigarette availability and consumption in Almaty, Kazakstan: results and appraisal of a rapid assessment

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Submitted 18 March 2003: Accepted 12 June 2003

Abstract

Objectives: (1) To develop a useful tool to measure food, alcohol and tobacco items; (2) to document the availability of these items in Almaty, Kazakstan; (3) to describe the relationship between consumption and availability; and (4) to identify possible relationships between availability and health outcomes in the city and region.

Design: A survey of 648 vendors in Almaty, Kazakstan was conducted over one month from December 1999 to January 2000. Vendors identified which items they sold from a list of 61 food, alcohol and tobacco items.

Setting: Vendors were approached in three of the six regions of Almaty, Kazakstan. Regions canvassed included Auzov, one of the three 'sleeping regions'; Medeo, one of the two downtown regions; and Turksib, a more suburban/rural area of the city.

Results: There was a significant correlation between alcohol and cigarette consumption and availability. The relative availability of items was numerically and spatially consistent throughout the city. Fruits and vegetables occurred infrequently (<20% of sites) and in relative isolation from the rest of the system, while candy and cigarettes occurred with a higher relative frequency (75–80% of sites). Maps of vendors showed clusters around geographical features such as major roads and intersections.

Conclusions: Combining a checklist and mapping tools provides a model of consumer item availability that can help identify priorities for public health and urban planning professionals. The wide availability of cigarettes, alcohol, candy, coffee and tea, and limited availability of fruits, vegetables and whole grains, is likely to support increasing rates of chronic disease in Almaty.

Keywords
Food items
Tobacco
Alcohol
Food availability
Nutrition
Mapping techniques
Kazakstan
Central Asia

Market availability plays a role in consumer choices. While this is common sense, the lack of a model to describe community food availability, which could be used to examine correlations between consumption patterns and health outcomes, has limited research. Without an understanding of what food is available, it is difficult to investigate how availability and consumption might relate. As the nutrition transition continues world-wide^{1,2}, and societies are faced with increasing availability of highly processed, high-fat and high-sugar food items and chronic diseases that come from poor nutrition³, the question of how availability and consumption interact and influence health outcomes becomes more important. The importance of the question has led the present researchers to an initial attempt to describe food availability in Almaty, Kazakstan and to relate that availability to community data on food intake and health outcomes.

The rapid development of a new distribution system for food, alcohol and cigarettes in the republics of the former

Soviet Union, including Kazakstan, represents a moment of intense and often chaotic change towards a market economy, within a longer process of liberalisation and modernisation in the region⁴. The transformation of the landscape for food availability addressed in the present paper is commonly associated with the formal dissolution, in 1992, of the Soviet Union, independence for Kazakstan, and the introduction of a series of political and economic reforms heralding in the new age of market economics and democratic political systems⁵. Primary among these reforms are privatisation and liberalisation of markets and economic sectors formerly managed and regulated by state agencies and ministries. On the street, the effects of these reforms were dramatic. In the period now known as the 'kiosk economy'⁶, kiosks sprang up on street corners while flea markets lined the paths of parks and other public spaces. The kiosk symbolised the times, reflecting social and economic change, as condoms, boot-leg rock and pop cassettes, conversational English tutorials, table

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wine from France and dozens of varieties of domestic and imported cigarettes became widely available to a formerly isolated society.

Rapid change in the distribution and density of stores and kiosks represents a change in the geography of food availability in the city. In one framework of determinants of eating behaviour, the location of food items, alcohol and cigarettes is referred to as an 'enabler of choice', which influences and is influenced by social, cultural and psychobiological factors⁷. Booth *et al.*'s model is the basis for our analytical framework, which places availability as secondary in a hierarchy of influences that range from the family and biological imperatives (primary influences) to global food supply and trade agreements (tertiary influences). For a thorough discussion of the current understanding of factors shaping food preferences, readers are referred to MacBeth and Green's *Food Preference and Taste: Continuity and Change*⁸.

Curtis and Jones⁹ argue that geography plays an important part in the understanding of health inequities. Places and landscapes serve as representations and manifestations of power structures and resource allocations in specific regions. Geographic models have been used to study access to medical care, employment and variations in adolescent health behaviours^{10–12}. Models specifically to assess nutrition and food availability have been used in the USA and the UK to develop indices that measure costs and resources to procure specific food items^{9,13,14}. These models require a significant level of technology and knowledge to use and understand. Thus one of the goals of our study was to see if a relatively simple mapping technique, which could be used alone or in conjunction with Geographic Information Systems (GIS), might help to represent and communicate the dynamics of power and resource allocation in Almaty, Kazakhstan.

In both Kazakhstan and other Eastern European and Eurasian societies, changing patterns of consumption over the last 10 years for meats, fats, dairy products, vegetables, fruits, grains, alcohol and tobacco items are among the factors contributing to dramatic changes in public health and a rapid decline in life expectancy^{15–19}. Research in Eastern Europe and the republics of the former Soviet Union has documented dramatic increases in poverty and concomitant decreases in protein and calorie intakes²⁰.

A demographic and health survey conducted in Kazakhstan in 1995 identified the key problem of anaemia among women and children related to nutritional deficiencies of iron, folate and vitamin B₁₂. From a random sample of 249 pregnant and non-pregnant women in the city, aged 15–49 years, 38% had haemoglobin concentration below 12.0 g dl⁻¹. The prevalence for Almaty is lower than the national figure (49%, $n = 3684$). Almost half of the 29 children aged 3 years and under were characterised as anaemic. Nationally, the figure was significantly higher (69% of children under 3 years of age, $n = 714$)²¹.

In 1997, the National Research Council published a report entitled *Premature Death in the New Independent States*²⁰. The report describes an ongoing pattern of decrease in life expectancy, and indicates that chronic conditions such as lung cancer and cardiovascular diseases are the leading causes of morbidity contributing to premature death. The interventions considered most important are reducing alcohol abuse and tobacco consumption and improving diet. For more background on public health in the region, readers are referred to Garrett's seminal work, *Betrayal of Trust: The Collapse of Global Public Health*²², which describes the catastrophic coincidence of institutional collapse and increasing rates of chronic and infectious diseases in the former Soviet Union.

Available research in Kazakhstan describes a clear pattern of chronic disease that is endemic in the elderly and young^{23–26}. Among newborns and infants there are patterns of insufficient vitamin and mineral intakes, and among adults there is an excess of fats, alcohol and tobacco as manifested by high rates of cardiovascular and respiratory diseases^{27–35}. The decreases in life expectancy are alarming, and represent the extreme of trends in malnutrition and health among industrialised countries³⁶.

Methods

Study setting

The city of Almaty is located between the steppe (to the north) and the Tien Shen mountains (to the south) in the south-eastern region of Kazakhstan (Fig. 1). With a population of about one million, until 1998 the city was the capital of Kazakhstan. Among the Central Asian republics, Almaty was considered the most ethnically diverse and russified urban centre. Before independence over 50% of the city's population was of Slavic (Russian, Belorussian, Ukrainian) descent, with some of those

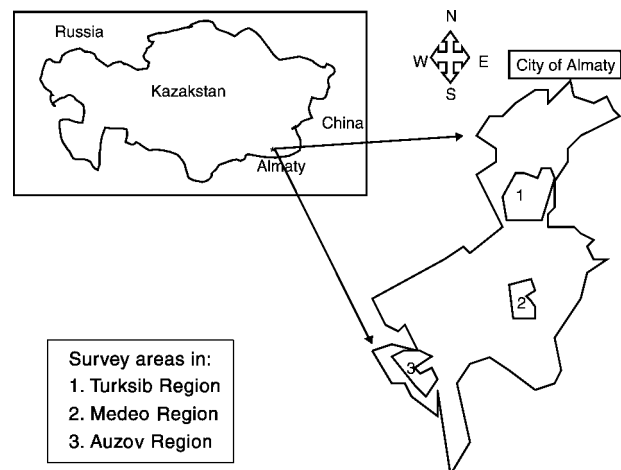


Fig. 1 Location of the study area

residents tracing their roots in the city back to when it was named Vernii, a small and isolated Central Asian outpost of the Russian empire.

The city is divided into six regions. Two of the regions are in downtown Almaty, where government and commercial buildings are located. Three of the six are known as ‘sleeping regions’, and consist of four- to 12-storey housing complexes built in the soviet style of urban architecture. The last, the Turksib region, consists of small, tightly spaced houses and cottages that represent a meeting point between the rural and the urban in south-eastern Kazakstan. The names of the regions (e.g. Turksib) are not necessarily specific to Almaty; i.e. other cities in the country may have regions with the same names.

Three of the six regions were canvassed during the rapid assessment. The maps in Fig. 2 present a sample of the vendors canvassed. The three regions represent, respectively, the ‘sleeping regions’ (Auzov), the downtown area (Medeo) and the more suburban/rural region of the city (Turksib). The regions were selected to represent the different environments (downtown/inner city, ‘sleeping region’ and suburbs) of the city. The Auzov Region (top left) is divided into micro-regions, which are, in turn, divided into housing complexes separated by public spaces used for recreation, socialising and community events. Small access roads that run into the housing complexes link to larger roads that feed into city-wide and regional avenues and highways. The Medeo Region (top right) contains one of the central markets of the city and consists of large municipal and government buildings, spacious apartment buildings and several research institutes. The region also has several large *univermags* (‘universal stores’) that are roughly equivalent to malls. The Turksib Region is characterised by long and wide avenues that run north to south, leading from the city into the rural regions of Southern Kazakstan. The region is home to several factories. Most of the housing in the region consists of tightly spaced, one-storey houses and

cottages. All three regions have large ‘green’ bazaars, where fresh produce is sold wholesale.

Study tools

The primary goal of the study was to collect information on food, alcohol and tobacco availability that could be used to produce relatively accessible numbers, graphs and maps that could, in turn, be used to draw conclusions regarding the role that environment (i.e. food availability) plays in diets and health outcomes of the city’s residents. The sophistication of the technology to collect data was limited by conditions in Almaty and limits on time and other resources of the research team. Storekeepers and other vendors in Almaty are located at the centre of competing interests that include corrupt tax inspectors and other representatives of regulatory agencies, organised crime, and a variety of traders and buyers who move between entry points to the city (bus and train stations, airports and large markets) and the vast network of stores, kiosks, street vendors and smaller markets throughout the city^{37,38}. Given the sensitivity of vendors to strangers asking questions and soliciting information, data were limited to what could be observed directly, without participation of vendors unless they voiced a willingness to do so. Information on diversity and prices of items was not collected owing to the conditions mentioned above and time limits of the research.

Vendors were identified as being a kiosk, store, market/bazaar or street vendor. A kiosk was any enclosed structure into which the client or customer did not enter to select and purchase an item (transactions occur through a small or large window). Conversely, a store was defined as any structure that allowed a person to enter, select and purchase an item. A market/bazaar was defined as an organised area where many individual sellers were located. Street vendors were relatively isolated individuals selling on the street without the protection of a structure. Identifying vendors according to these definitions was

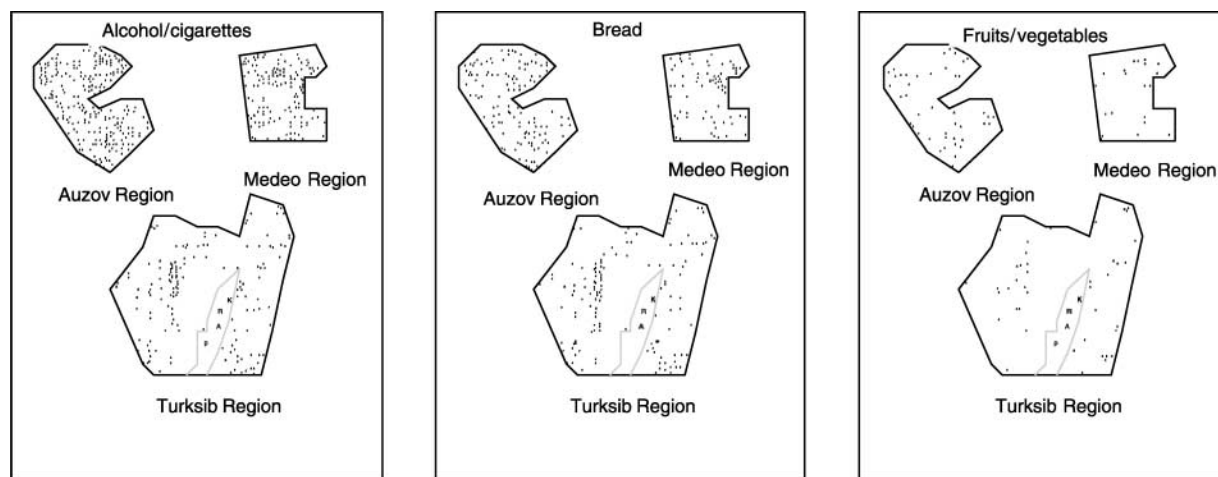


Fig. 2 Availability of alcohol/cigarettes, bread and fruits/vegetables in three regions of Almaty, Kazakstan, December 1999–January 2000

complicated; the boundary between what constituted a market or simply a large concentration of stores, street vendors and kiosks was sometimes blurred. Markets, though, were usually identified and recognised as such by municipal authorities and the community itself. GIS templates (computer drawing boards that allow for the creation of maps in a free-hand manner) were used to produce the maps of food availability.

Data collection consisted of two parts: documenting the location of the vendor and observing what food, alcohol and tobacco items were available. For location, a detailed map of the regions canvassed was divided by an x - y grid. Each square on the grid represented approximately one city block. Numbers on the grid labelled lines of the grid. After determining where within a specific city block a vendor was located, the vendor was assigned to the appropriate point on the grid. Approximately 50–60 city blocks within each of the three regions were canvassed. Before entering the store or approaching the vendor, the observer (A.Y.) would orient himself to the position of the vendor on the grid and note on the survey form the type of vendor and its location on the grid. All the data on availability were collected by the first author (A.Y.) of this paper.

Data on food, alcohol and tobacco items were collected using the following protocol. After noting the position of the vendor on the survey form, the observer approached the vendor, presented credentials, and asked for permission to observe and note available items. The survey form consisted of 61 items (see Appendix A) that included various grains, fruits, vegetables, meats, dairy items, drinks, alcohol, cigarettes and other common items. Items were described as present or not present at a specific vendor. The list was developed with reference to nutrition studies on the availability or presence of specific items in the diet or environment^{39–41} and modified to include local items specific to the city and region.

Data on consumption were collected in 1996 by researchers at the Kazakstan Institute of Nutrition. The study surveyed 3480 individuals in all major regions, rural and urban, of Kazakstan, which included Almaty (458 participants). The survey included demographic information (education, ethnicity, age), body mass index, and information on diet and nutrition (24-hour recall, seasonal food preference and consumption). The data were collected with the use of a detailed survey that was written in Russian. Pictures of traditional meals (Russian and Kazak) were used to help participants understand portion sizes. The questions were both open-ended and closed. Exclusion criteria were women who were pregnant or lactating. We used data that specifically described food preferences during the winter months⁴².

Sample selection

Six hundred and forty-eight vendors were surveyed in three regions of the city from 22 December 1999 to 20 January 2000. Two hundred and seventy-eight vendors

were surveyed in the Auzov Region (four markets/bazaars, 145 kiosks, 102 stores and 27 street vendors). One hundred and eighty-eight vendors were surveyed in the Medeo Region (one market/bazaar, 88 kiosks, 62 stores and 37 street vendors). One hundred and eighty-two vendors were surveyed in the Turksib Region (five markets/bazaars, 47 kiosks, 103 stores and 27 street vendors).

Statistical analysis

Statistics on the data collected were compiled using SAS 6.12 (SAS Institute, Cary, NC, USA). The statistics compared the availability of food items, alcohol and cigarettes across the three regions and four store types.

The variables of analysis are continuous. The initial variable of analysis – food, alcohol and tobacco items – are continuous; they are counted (or not counted) as they occur (or do not occur). The second category of analysis – type of vendor – is also continuous; kiosks, for example, were counted and mapped as they were encountered. Items were counted as they were found in general and then as they appeared in relation to the subgroups ‘vendors’ and ‘food groups’.

Frequency tables on individual items were developed using region and store type as variables. The counts were used to calculate the percentage of all vendors within a region carrying a specific item. The percentages were then graphed together, establishing a line or pattern of availability that served to compare the three regions and produce a representation of general food, alcohol and tobacco availability in the city. Individual items were collapsed into general groups (grains, meats, vegetables, fruits, dairy, cigarettes, alcohol, candy, beverages, cooking oil) and the procedure was repeated. Excel templates were used to produce the graphs.

Using logistic regression, we tested the following hypothesis: Do the groups predict the availability of one another? In asking this question, we hoped to explore the various patterns of availability and interactions between food groups that might influence consumption. Our approach was based on Kleinbaum *et al.*'s assertion that logistic regression analysis allows us to ‘determine how one or more independent variables are related to the probability of the occurrence of one of two possible outcomes’⁴³. Thus, in our model, the availability of alcohol, for example, in a kiosk was used to predict the possible availability of, for example, a dairy product. In the logistic regression, we used SAS 6.12 to create 10 models in which each group (grains, meats, vegetables, fruits, dairy, cigarettes, alcohol, candy, beverages, cooking oil) was the outcome variable while the remaining groups were entered into the model using stepwise regression. $P < 0.05$ was the inclusion criterion for the model. The models help to establish relationships between groups and items as they move through the distribution system.

To compare availability and consumption, 23 of the 61 items from the food availability survey were matched to similar or identical items from the dietary and nutritional assessment conducted by the Kazakstan Institute of Nutrition three years previous to the availability study. Ranks were compared using Spearman's rank correlation coefficient (Appendix B). Owing to differences in time, protocol and intent between the two studies, results of the correlation should be viewed cautiously. For availability, items were ranked according to their relative availability based on the statistics described earlier. For consumption, items were ranked by the number of individuals who reported consuming them regularly. The correlation measures the prevalence of items in the environment with prevalence of items in the diet.

Maps of food availability were composed using x - y grids that corresponded to the grid used to locate the vendors during data collection. Data from the survey form were then mapped on to the new grids, plotting specific food items according to where they were located. GIS templates were used to produce the maps of food availability.

Results

Food availability

Patterns and trends of availability were not random, but operating in some concerted manner in response to conditions present throughout the city and specific to the

city and region (Figs 3 and 4, Tables 1 and 2). Among the items, the following had similar percentages in all regions: butter, cooking oil, potatoes, cabbage, apples, milk, cheese, cigarettes, beer, pasta and eggs. Stores carried perishable items such as potatoes, cabbage, apples, milk and cheese more frequently than kiosks. The patterns comparing availability between regions, vendors and food items indicate that the system of distribution, despite operating under relatively fluid and unregulated conditions, followed consistent patterns across all three regions.

The most available items were non-perishables and, from a public health perspective, the least desirable items: beer, cigarettes, cookies, candy bars, chewing gum, fruit juice, carbonated beverages, coffee and tea. The least available items were perishables and, from a public health perspective, the most desirable items: fish, potatoes, onions, fresh herbs, greens, cabbage, beets, carrots, turnips, tomatoes, apples, bananas, raisins, nuts, oranges, pears and melons. Grain and dairy items such as rice, flour, bread, milk, cheese and eggs were among the items available in approximately 30–50% of all vendors. Butter and cooking oil were available in approximately 50% of all vendors.

The results were similar when the 61 items were collapsed into 10 groups. Fruits and vegetables were least available. Candy, beverages, cigarettes, grains and alcohol were most available. The trends of availability are similar for each region, which suggests that the pattern was consistent throughout the city.

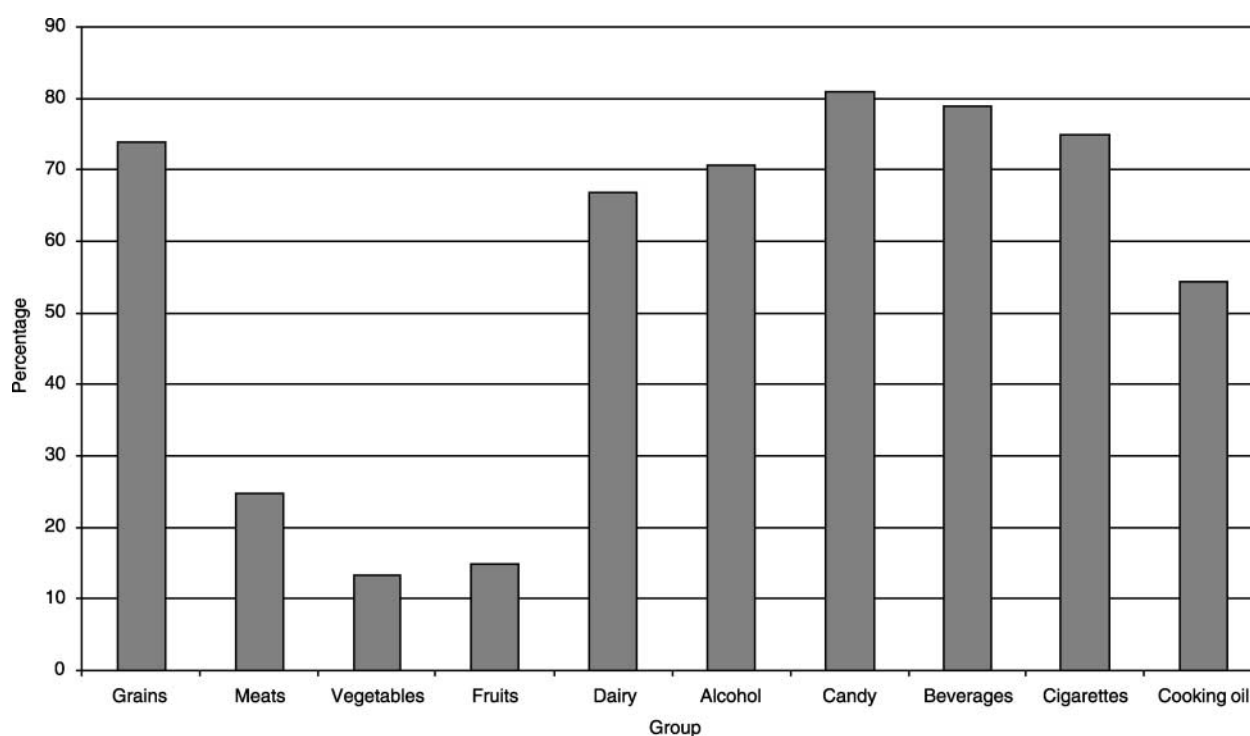


Fig. 3 Percentage of vendors with items from each food group in Almaty, Kazakstan, winter, 1999–2000

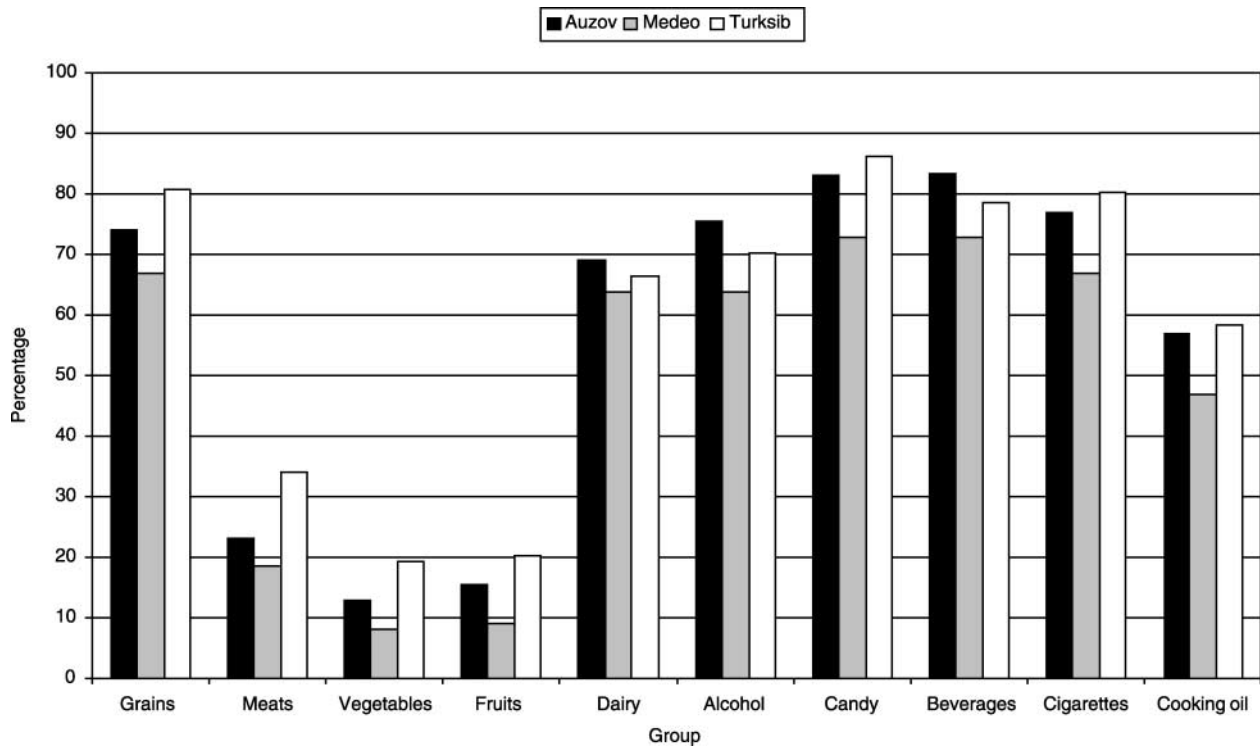


Fig. 4 Percentage of vendors with items from each food group by region in Almaty, Kazakstan, winter, 1999–2000

Group interaction

Figure 5, which represents the results of the logistic regression, depicts how the groups occurred with reference to one another. Of the 10 groups, fruits and vegetables were least integrated into the web of available item groups. Meat was associated with fruits and vegetables, and also with dairy and grains. Dairy and grains, in turn, had a strong relationship with cooking oil. The strongest relationship, as a group, existed between alcohol, beverages, cooking oil and dairy products. The availability of cigarettes was strongly correlated with the availability of many other items (Fig. 5), which suggests that the item is deeply integrated into the market.

Availability and consumption

Comparison of the consumption and availability of items that have a significant influence on individual and population health indicates that availability was not only consistent throughout the different regions, but may also influence consumption (Appendix B). Sixty per cent of the male adult population (>15 years old) smokes³⁹, and cigarettes were available in 87–89% of the stores in the three regions canvassed. It should be noted that only 7% of the adult female population smokes. Seventy-five per cent of the male adult population drinks regularly³⁹ and 76–86% of the stores canvassed sold some form of alcohol (beer, liquor, wine or vodka). Forty-six per cent of the female adult population drinks alcohol regularly.

There is a statistically significant correlation between availability and consumption with a probability of 99.95%

(Spearman's rank = +0.6619; 1 or -1 signifies total correlation). In general terms, availability and consumption mirrored one another. Among those items whose availability and consumption ranks were closest are pasta, cooking oil, coffee, tea, butter, flour, milk, eggs, melons and *kumis* (horse milk). In general, perishables were ranked higher in consumption than availability, and non-perishables were ranked higher in availability than consumption. In particular, bread, potatoes, carrots, cabbage and meats are perishables whose consumption ranking was significantly higher than their availability ranking. All are traditional food items for Slavic and Soviet peoples. Among non-perishables with significantly higher availability rankings were fruit juice, flour and candy (Appendix B).

High rates of consumption of relatively unavailable food items such as meats and potatoes speak to various issues. Home gardens are found throughout the outskirts and suburbs of the city and, although their production has not been studied, they most likely play a significant role in the food supply of the city. Economies of scarcity during several recent historical periods may increase hoarding of staples such as meat and potatoes. In addition, items such as meat may be purchased preferentially, in bulk, at large markets that specialise in freshly processed livestock.

Maps of food availability

The relative spatial distribution of vendors was consistent for all items. Each region had specific major and minor shopping or vendor zones. These zones contained all

Table 1 Percentage of vendors with specific food items

| Product/item | % | | |
|--------------|----------------------|----------|-------|
| Grains | Bread | 51.23 | |
| | Flour | 36.11 | |
| | <i>Kasha</i> | 36.11 | |
| | Rice | 38.58 | |
| | Pasta | 61.27 | |
| | Beans | 15.43 | |
| Meats | Beef | 6.17 | |
| | Pork | 1.54 | |
| | Lamb | 1.54 | |
| | Chicken | 8.18 | |
| | Horse sausage | 1.54 | |
| | <i>Kolbasa</i> | 18.67 | |
| | Smoked meat | 2.78 | |
| | Fish | 3.09 | |
| | Smoked fish | 8.02 | |
| | Vegetables | Potatoes | 10.49 |
| Onions | | 11.42 | |
| Cucumbers | | 2.31 | |
| Fresh herbs | | 0.46 | |
| Carrots | | 8.8 | |
| Greens | | 0.31 | |
| Peppers | | 0.31 | |
| Cabbage | | 8.64 | |
| Beets | | 3.09 | |
| Turnip | | 3.86 | |
| Tomatoes | | 2.47 | |
| Fruits | | Apples | 11.11 |
| | | Bananas | 1.54 |
| | Strawberries | 0.15 | |
| | Cherries | 0.31 | |
| | Raisins | 1.08 | |
| | Nuts | 2.93 | |
| | Oranges | 9.1 | |
| | Pears | 1.39 | |
| | Peaches | 0.31 | |
| | Melons | 1.08 | |
| | Dairy | Milk | 32.41 |
| | | Cheese | 28.24 |
| | | Yoghurt | 35.8 |
| Butter | | 53.09 | |
| <i>Kumis</i> | | 0.62 | |
| Mayonnaise | | 49.23 | |
| Ice cream | | 24.69 | |
| Eggs | | 22.22 | |
| <i>Kefir</i> | | 28.24 | |
| Cooking oil | 54.32 | | |
| Cigarettes | 75 | | |
| Alcohol | Wine | 31.48 | |
| | Liquor | 15.28 | |
| | Beer | 64.81 | |
| | Vodka | 30.25 | |
| Candy | Cookies | 78.86 | |
| | Candy bars | 74.69 | |
| | Gum | 75.23 | |
| Beverages | Fruit juice | 69.29 | |
| | Carbonated beverages | 74.85 | |
| | Mineral water | 73.3 | |
| Other | Condoms | 41.36 | |
| | Coffee | 71.6 | |
| | Tea | 73.77 | |
| | Canned fish | 61.57 | |

Table 2 Percentage of vendors with specific food items, by region

| Product/item | Region | | | | |
|--------------|----------------------|-----------|-------------|-------|-------|
| | Auzov (%) | Medeo (%) | Turksib (%) | | |
| Grains | Bread | 44.6 | 40.43 | 75.23 | |
| | Flour | 30.58 | 28.19 | 52.75 | |
| | <i>Kasha</i> | 34.89 | 26.6 | 47.8 | |
| | Rice | 38.85 | 25 | 52.2 | |
| | Pasta | 66.55 | 52.13 | 62.64 | |
| | Beans | 13.67 | 9.04 | 24.73 | |
| Meats | Beef | 6.12 | 4.26 | 8.24 | |
| | Pork | 1.44 | 0.53 | 2.75 | |
| | Lamb | 1.44 | 1.6 | 1.65 | |
| | Chicken | 7.19 | 5.32 | 12.64 | |
| | Horse sausage | 1.08 | 1.6 | 0.62 | |
| | <i>Kolbasa</i> | 16.55 | 12.77 | 28.02 | |
| | Smoked meat | 1.8 | 2.13 | 4.95 | |
| | Fish | 1.8 | 2.66 | 5.49 | |
| | Smoked fish | 6.47 | 3.72 | 14.84 | |
| | Vegetables | Potatoes | 10.79 | 5.32 | 15.38 |
| Onions | | 10.07 | 7.45 | 17.58 | |
| Cucumbers | | 2.16 | 2.66 | 2.2 | |
| Fresh herbs | | 0 | 1.06 | 0.55 | |
| Carrots | | 8.27 | 5.32 | 13.19 | |
| Greens | | 0 | 1.06 | 0.55 | |
| Peppers | | 0 | 0.53 | 0.55 | |
| Cabbage | | 7.91 | 5.85 | 12.64 | |
| Beets | | 3.6 | 1.6 | 3.85 | |
| Turnip | | 2.52 | 1.06 | 8.79 | |
| Tomatoes | | 2.52 | 2.13 | 2.75 | |
| Fruits | | Apples | 10.43 | 6.91 | 16.48 |
| | | Bananas | 1.44 | 2.13 | 1.1 |
| | Strawberries | 0 | 0.53 | 0 | |
| | Cherries | 0 | 0.53 | 0.55 | |
| | Raisins | 1.08 | 1.06 | 1.1 | |
| | Nuts | 3.24 | 2.66 | 2.75 | |
| | Oranges | 8.99 | 5.85 | 12.64 | |
| | Pears | 0.72 | 1.06 | 2.75 | |
| | Peaches | 0 | 0.53 | 0.55 | |
| | Melons | 0.62 | 0.53 | 2.2 | |
| | Dairy | Milk | 29.14 | 34.04 | 35.71 |
| | | Cheese | 27.34 | 22.87 | 35.16 |
| | | Yoghurt | 36.33 | 29.79 | 41.21 |
| Butter | | 51.8 | 51.6 | 56.59 | |
| <i>Kumis</i> | | 0 | 0.53 | 1.65 | |
| Mayonnaise | | 51.08 | 45.21 | 50.55 | |
| Ice cream | | 21.94 | 26.06 | 27.47 | |
| Eggs | | 21.58 | 14.89 | 30.77 | |
| <i>Kefir</i> | | 25.18 | 29.79 | 31.32 | |
| Cooking oil | 56.83 | 46.81 | 58.24 | | |
| Cigarettes | 76.98 | 67.02 | 80.22 | | |
| Alcohol | Wine | 34.53 | 19.15 | 39.56 | |
| | Liquor | 16.91 | 10.64 | 17.58 | |
| | Beer | 70.14 | 59.57 | 62.09 | |
| | Vodka | 30.22 | 19.68 | 41.21 | |
| Candy | Cookies | 81.65 | 71.81 | 81.87 | |
| | Candy bars | 78.42 | 63.83 | 80.22 | |
| | Gum | 78.42 | 61.7 | 75.27 | |
| Beverages | Fruit juice | 74.1 | 61.7 | 69.78 | |
| | Carbonated beverages | 81.29 | 64.89 | 75.27 | |
| | Mineral water | 79.5 | 63.83 | 73.63 | |
| Other | Condoms | 48.92 | 36.7 | 34.62 | |
| | Coffee | 77.7 | 60.11 | 74.18 | |
| | Tea | 78.06 | 64.89 | 76.37 | |
| | Canned fish | 66.91 | 54.79 | 60.44 | |

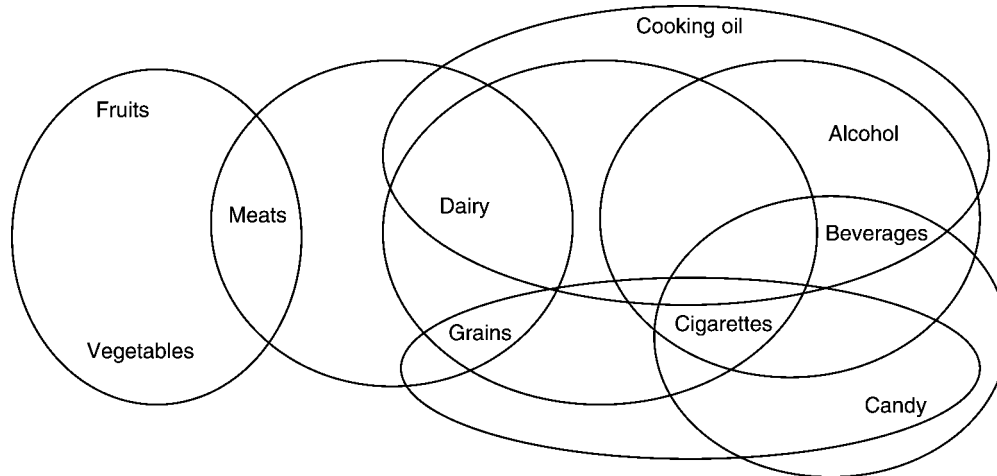


Fig. 5 Logistic regression results. Circles represent two-way relationships between all groups in the circle. The availability of a group in the circle predicts and is predicted by all other groups in the circle; e.g. the availability of fruit at a specific vendor predicts and is predicted by vegetable and meat items

major items, but to varying degrees. For example, a four-way intersection near bus stops may have four or five cigarette vendors and one fruit or vegetable vendor. In this way, food availability in each region can be broken down into sub-units or smaller combinations of vendors and food items in economically viable locations. While no spatial statistics were performed, the maps seemed to indicate that the density of vendors in a region is positively correlated with population density.

The maps (Fig. 2) can be placed into categories according to density of availability. High-density (e.g. cigarettes/alcohol) products are carried in 80–100% of all vendors. Moderate-density products (e.g. bread) are carried in 50–70% of the vendors mapped. Low-density products (e.g. fruits/vegetables) are found in less than 10% of all vendors.

Discussion

Our study of food, alcohol and tobacco availability suggests several conclusions. Availability patterns of essential items, cigarettes and alcohol in the city are consistent in the three regions canvassed: perishables are less available than non-perishables; cooking oil, candies, carbonated beverages, alcohol and cigarettes are among the most available products; dairy products, rice, bread, flour and other grains occupy the middle niche in the availability ranking; and fresh fruits, vegetables and meats are least available. Patterns of availability correlate with consumption, especially for alcohol and cigarettes. The results of the logistic regression and frequency models present an interesting pattern. Vegetables and fruits occur infrequently and in relative isolation from the rest of the system while cigarettes occur with relative frequency and are associated with many items. The timing of the survey (the winter months) may influence the data as fresh produce is typically more prevalent in the summer.

For public health practitioners and policy-makers, the availability maps raise profound and difficult questions that plot economic considerations against regulation in protection of the public's health. Those items that are most widely available are also items known to cause the chronic diseases that have contributed to the unprecedented drop in life expectancy. Given the fragile state of the economy and the potential for social unrest, the local and national governments are, for good reason, hesitant to enact policies that might have a real impact on the production, consumption and availability of alcohol and cigarettes. Other policy options should be considered. The promotion and support of 'green' markets, public areas where farmers and gardeners can sell their produce, in accessible areas in the city is one such innovation.

The availability of food, cigarettes and alcohol represents the end product of many complex systems and cultures working simultaneously. The maps and graphs allow us to view and analyse the situation from a new perspective. By looking at where items are available, we can step back and question why cigarettes and alcohol are more widely available than fresh foods and how, with some creativity and commitment, patterns of availability might be changed.

Conclusions

Combining a simple checklist and mapping tools helps to create accessible models of consumer item availability that may identify priorities for public health and urban planning professionals. Further research is needed on how best to encourage distribution of items that would support public health priorities. Specifically, more information is needed on the role that kiosks and markets play in the lives of Almaty residents – how are these resources utilised and to what ends (social, economic, etc.) – in order to facilitate the development of practical interventions.

The effect of market reforms on the post-Soviet Kazakhstan economy can be seen in the maps and graphs. While consumers experience greater and wider availability of many common items, the effects of these changes are of concern to public health practitioners. Specifically, the wide availability of cigarettes, alcohol, candy, coffee and tea may exacerbate existing trends in chronic disease and malnutrition.

References

- Drewnowski A, Popkin BM. The nutrition transition: new trends in the global diet. *Nutrition Reviews* 1997; **55**(2): 31–43.
- Cornia A. Poverty, food consumption, and nutrition during the transition to the market economy in Eastern Europe. *American Economic Review* 1994; **82**(2): 293–302.
- Porth CM. *Pathophysiology: Concepts of Altered Health States*. Philadelphia, PA: Lippincott, 1998.
- Brill Olcott M. *The Kazakhs*. Stanford, CA: The Hoover Institute, Stanford University Press, 1995.
- United States Agency for International Development (USAID). *USAID Country Profile – October 1996* [online]. Available at <http://www.usaid.gov/countries/kz/kaz.htm>, 1996.
- US Congress, Office of Technology Assessment. The political, economic and social context of reform. In: *Fueling Reform: Energy Technologies for the Former East Bloc*. Washington, DC: US Government Printing Office, 1994; Chapter 6.
- Booth S, Mayer J, Sallis J, Ritenbaugh C, Hill J, Birch L, *et al*. Environmental and social factors that affect food choice and physical activity: rationale, influences, and leverage points. *Nutrition Reviews* 2001; **59**(3): S21–36.
- Macbeth H, Green A. *Food Preferences and Taste: Continuity and Change*. Oxford: Berghahn Books, 1997.
- Curtis S, Jones I. Is there a place for geography in the analysis of health inequality? *Sociology of Health and Illness* 1998; **20**(5): 645–72.
- Thouez J, Bodson P, Joseph A. Some methods for measuring the geographic accessibility of medical services in rural regions. *Medical Care* 1988; **26**(1): 34–44.
- Shen Q. Location characteristics of inner-city neighborhoods and employment accessibility of low-wage workers. *Environment and Planning B: Planning and Design* 1998; **25**: 345–65.
- Karvonen S, Rimpela A. Urban small area variation in adolescents health behavior. *Social Science & Medicine* 1997; **45**(7): 1089–98.
- Guy CM. The assessment of access to local shopping opportunities: a comparison of accessibility measures. *Environment and Planning B: Planning and Design* 1983; **10**: 219–38.
- Donkin A, Dowler E, Stevenson S, Turner S. Mapping access to food in a deprived area: the development of price and availability indices. *Public Health Nutrition* 2000; **3**(1): 31–8.
- Reamy J, Oreskovic S. Life expectancy in Central and Eastern European countries and newly independent states of the former Soviet Union: changes by gender. *Croatian Medical Journal* 1999; **40**(2): 237–43.
- Chen LC, Rohde JE, Jolly R. A looming crisis: health in the Central Asian republics. *Lancet* 1992; **339**(8807): 1465–7.
- Leon D, Shkolnikov V. Social stress and the Russian mortality crisis. *Journal of the American Medical Association* 1998; **279**(10): 790–1.
- Notzon F, Komarov Y, Ermakov S, Sempos C, Marks J, Sempos E. Causes of declining life expectancy in Russia. *Journal of the American Medical Association* 1998; **279**(10): 793–800.
- Chenet L, McKee M, Fulop N, Bojan F, Brand H, Hort A, *et al*. Changing life expectancy in Central Europe: is there a single reason? *Journal of Public Health Medicine* 1996; **18**(3): 329–36.
- National Research Council, Committee on Population/Commission on Social Sciences. Bobadilla JL, Costello C, Mitchell F, eds. *Premature Death in the New Independent States*. Washington, DC: National Academy Press, 1997.
- Kazakhstan Institute of Nutrition/Kazakhstan Academy of Preventive Medicine/Demographic and Health Surveys Macro International Inc.. *Kazakhstan Demographic and Health Survey*. Calverton, MD: Macro International, Inc., 1996.
- Garrett L. *Betrayal of Trust: The Collapse of Global Public Health*. New York: Hyperion, 2001.
- Sharmanov TS, Kursybekova NM, Bekbosynov TK, Sarsembaeva AP, Kudalbergenova ZK. Nutritional status of early age children in Kazakhstan. *Voprosy Pitaniia* 1997; **4**: 23–5.
- Musabekov SM, Bekbosynov TK, Tkach NZ, Baimagambetova MV, Zhumabaeva GG. The status of actual nutrition in pregnant women in an epidemically unfavorable region of Kazakhstan. *Voprosy Pitaniia* 1992; **4**: 36–8.
- Veenema TG. Health systems and maternal and child survival in the Central Asian republics. *Journal of Nursing Scholarship* 2000; **32**(3): 301–6.
- Zel'tser ME, Mezinova NN, Kobzar NN, Bazarbekova RB, Nazyrov AT, Kim GG, *et al*. Thyroid status in anemic pregnant women under conditions of endemic goiter. *Problemy Endokrinologii* 1994; **40**(5): 20–2.
- United Nations Development Project – Kazakhstan. *Kazakhstan: The Challenge of Transition* [online]. Human Development Report. Available at <http://www.undp.org/rbec/nhrd/kazakhstan>, 1995.
- World Health Organization. *Highlights on Health in Kazakhstan* [online]. Available at <http://www.who.uk/country.htm>, 1999.
- Vikhert AM, Zhdanov VS, Sternby NH, Duskova J, Galakhov I. A comparative study of the evolution of atherosclerosis in men over a 25 year period in 11 European and Asiatic cities. *Arkhiv Patologii* 1998; **60**(6): 3–8.
- Home P, Day J, Elphick T. Diabetes on the Old Silk Road. *Diabetic Medicine* 1996; **13**(3): 207–8.
- Seisebekova GT, Kozlova II. Chronic non-specific lung diseases in workers in the gold mining industry. *Terapevticheski Arkhiv* 1998; **70**(3): 56–60.
- Khanadamova GT, Bekmutarov EB, Dzhaisheva KT. Diagnosis of tuberculosis in patients of pulmonological hospitals. *Problemy Tuberkuleza* 1998; **1**: 16–7.
- Uteпов II. Prevalence of atherosclerosis of the aorta and major arteries in female inhabitants of Tashkent. *Arkhiv Patologii* 1992; **54**(7): 34–7.
- Pozdniakova AP, Kolycheva NI, Adil'gireeva SKh, Abdramkhimov BE. The dynamics of esophageal cancer morbidity in Kazakhstan. *Voprosy Onkologii* 1992; **38**(9): 1055–61.
- Aldiyarova NT. *A hygienic assessment of risk factors in development of ischaemic heart disease among the population of Western Kazakhstan*. Doctoral dissertation, Institute of Nutrition of the Republic of Kazakhstan, Almaty, 1998.
- Schneider D. International trends in adolescent nutrition. *Social Science & Medicine*. 2000; **51**: 966–7.
- Organization for Security and Co-operation in Europe. *Resolution of the Conference Legal Framework for Small Businesses in the Republic of Kazakhstan* [online]. Available at <http://www.osce.org/almaty/documents/files/small-bus-en.pdf>, 2003.

- 38 Krushelnycky A. *East: Corruption Takes Varied Forms* [online]. Available at <http://www.rferl.org/nca/features/2000/09/FRU.00901130409>. Radio Free Europe/Radio Liberty, 2000.
- 39 Chussy JP, Van Ween AG, Young FW. The application of social science research methods to the study of food habits and food consumption in an industrializing area. *American Journal of Clinical Nutrition* 1967; **20**(1): 56–64.
- 40 Pekkarinen M. Methodology in the collection of food consumption data. *World Review of Nutrition and Dietetics* 1970; **12**: 145–71.
- 41 Story M, Hayes M, Kalina B. Availability of foods in high schools: is there cause for concern? *Journal of the American Dietetic Association* 1996; **96**(2): 123–6.
- 42 Abuova G. *Obschche natsional'noe issledovaniye sostoyaniye pitaniye naseleniya Respubliki Kazakstan* [Multi-ethnic Study of the Nutritional Status of the General Population in the Republic of Kazakstan]. Almaty: National Institute of Nutrition of the Republic of Kazakstan, 1996.
- 43 Kleinbaum D, Kupper L, Muller K, Azhar N. *Applied Regression Analysis and Other Multivariate Methods*. Pacific Grove, CA: Duxbury Press, 1998.

Appendix A – Survey instrument

Vendor type: kiosk, store, market/bazaar, street vendor

Location: Region (Turksib, Auzov, Medeo), within region (x , y coordinates)

Products/items:

Grains: bread; flour; *kasha*; rice; pasta; beans

Meats: beef; pork; lamb; chicken; horse sausage; *kolbasa*; smoked meat; fish; smoked fish

Vegetables: potatoes; onions; cucumbers; fresh herbs; beets; carrots; greens; peppers; cabbage; turnip; tomatoes

Fruits: apples; bananas; strawberries; cherries; raisins; nuts; oranges; pears; peaches; melons

Dairy: milk; cheese; yoghurt; butter; *kumis*; mayonnaise; ice cream; eggs; *kefir*

Cooking oil

Cigarettes

Alcohol: wine; liquor; beer; vodka

Candy: cookies; candy bars; gum

Beverages: fruit juice; carbonated beverages; mineral water

Other items: condoms; coffee; tea; canned fish

Appendix B – Availability and consumption

Consumption based on 1996 nutritional survey, seasonal consumption comparison. Rankings are based on the number of subjects who answered yes to consuming a specific item twice or more in the course of a week during the winter months. Spearman's rank correlation coefficient is based on the equation:

$$R = 1 - \left(\frac{6(\sum \text{rank differences}^2)}{N(N^2 - 1)} \right),$$

where R is Spearman's rank correlation coefficient and N is the number of items. Beginning with the null hypothesis – is there a correlation between availability and consumption? Ties in rank within a category are settled by using the average of the two ranks¹.

| Product/item | Consumption rank | Availability rank | Difference | Difference ² |
|----------------|------------------|-------------------|------------|-------------------------|
| Coffee/tea | 1 | 2 | 1 | 1 |
| Bread | 1 | 7 | 6 | 36 |
| Potatoes | 3 | 10 | 7 | 49 |
| Cooking oil | 4 | 5 | 1 | 1 |
| Meat | 5 | 17 | 8 | 64 |
| Pasta | 6 | 4 | -2 | 4 |
| Butter | 7 | 6 | 1 | 1 |
| Carrots | 8 | 15.5 | 7.5 | 56.25 |
| Cabbage | 9 | 15.5 | 6.5 | 42.25 |
| Milk | 10 | 9 | 1 | 1 |
| Eggs | 11 | 11 | 0 | 0 |
| <i>Kefir</i> | 12 | 10 | 2 | 4 |
| Candy | 13 | 1 | 12 | 144 |
| Flour | 14 | 8 | 6 | 36 |
| <i>Kolbasa</i> | 15 | 12 | 3 | 9 |
| Nuts | 16 | 18.5 | 2.5 | 6.25 |
| Fruit juice | 17 | 3 | 14 | 196 |
| Beans | 18 | 13 | 5 | 25 |
| Tomatoes | 19.5 | 20 | 0.5 | 0.25 |
| Bananas | 19.5 | 21 | 1.5 | 2.25 |
| Fish | 21 | 18.5 | 2.5 | 6.25 |
| Melons | 22 | 22 | 0 | 0 |
| <i>Kumis</i> | 23 | 23 | 0 | 0 |
| Sum | | | | 684.5 |

Reference

- 1 McClave J. *Statistics*. Englewood Cliffs, NJ: Prentice Hall, 1997.