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The food environment in cities in eastern Europe and central Asia – Turkmenistan

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FEEDcities project

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Technical report
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Abstract

This technical report presents results from the FEEDcities Project – eastern Europe and central Asia. This cross-sectional survey was conducted in Ashgabat, Turkmenistan in October 2016 to evaluate the local urban food environment. It characterized the vending sites, the food offered and the nutritional composition of the industrial and homemade street foods available in these settings. It also described the nutritional composition of ready-to-eat foods sold in supermarkets and at vending sites in food courts. The policy implications of the findings are outlined.

Keywords

FOOD ANALYSIS
NUTRITIONAL COMPOSITION
READY-TO-EAT FOOD
SODIUM
STREET FOOD
POTASSIUM
TRANS-FATTY ACIDS
TURKMENISTAN

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Laboratory analysis of the food products was conducted at the National Public Health and Nutrition Centre, Turkmenistan under the supervision of Carla Motta (National Institute of Health, Portugal).

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Abbreviations and acronyms

FAO	Food and Agriculture Organization
GPS	global positioning system
NCD	noncommunicable diseases
STEPS	WHO STEPwise approach to surveillance
TFA	*trans*-fatty acids
WHO	World Health Organization

Glossary[1]

Ayran	fermented beverage made from sheep's and cow's milk with salt
Cheburek	fried savoury pastry generally filled with ground or minced meat and onions
Doner kebab	seasoned meat stacked in the shape of an inverted cone turned slowly in front of a heat source
Fitchi	traditional meat pie, usually beef or lamb
Halva	sweet traditional dessert, crumbly and usually made from honey or sugar, butter and *tahini* (sesame paste) or other nut butters, such as sunflower seed butter. It may also contain nuts, such as walnuts, sunflower seeds, almonds, sesame seeds, peanuts
Kefir	fermented milk drink made with a yeast or bacterial fermentation starter of *kefir* grains
Keksy	muffin
Kompot	beverage obtained by cooking fruit in a large volume of water, often with sugar or raisins
Pirog (pie)	baked yeast pastry commonly stuffed with meat (typically beef or mutton) and/or vegetables, usually served in a pie shape
Pirozhki	baked or fried yeast pastry commonly stuffed with meat (typically beef or mutton) and/or vegetables, usually served in small portions
Pirozhnoe	cake
Pryaniki	gingerbread
Somsa	baked puff pastry usually filled with ground meat (lamb, beef or chicken) and vegetables

1 Many of these foods and drinks are illustrated in Appendices 1 and 2.

Executive summary

This report provides an overview of the urban food environment in Ashgabat, Turkmenistan. It documents the findings of a study conducted according to a standardized methodology. While some positive elements were observed, such as vending sites that exclusively sold fruit and vegetables, there were also areas for concern. These included the nutritional composition of many foods and the wide availability of sugary drinks. The findings indicate that healthy diets should be strongly promoted in the country.

The Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) define street food as "ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other similar places". In many settings, especially in urban areas in low- and middle-income countries, street food is diverse and constitutes a widely accessible, inexpensive food source, although it often includes energy-dense foods rich in fat, sugar and sodium. However, previous research on street food has focused primarily on its safety and not on its nutritional contribution to the diet. Furthermore, little or no research on street food has been conducted in the WHO European Region.

The main objective of the FEEDcities Project – eastern Europe and central Asia – is to characterize the street food environment in cities in those regions. This study provides information for achieving the objectives of the WHO European Food and Nutrition Action Plan 2015–2020, such as creation of healthy food and drink environments, and extending surveillance, monitoring, evaluation and research on dietary intake, nutritional status and policy impact. In Ashgabat, the urban food environment is highly mixed, with a visible transition from ready-to-eat food sold in the streets to that offered by fast-food vending sites and supermarkets. For this reason, the study methodology was adapted to conform to the local context in Ashgabat and considered foods from different vending sites: street food in its classical sense (sold in formal and informal street food-vending sites as informal stalls, kiosks) and ready-to-eat foods sold in supermarkets and food courts. This report characterizes the vending sites, the food offered and the nutritional composition (trans-fatty acids [TFA], sodium and potassium) of homemade and industrial street foods and other ready-to-eat foods most commonly available in Ashgabat, the capital city of Turkmenistan.

In October 2016, street food-vending sites, as well as supermarkets and food courts in and around outdoor and indoor markets of Ashgabat, were selected for participation in this study. Vending sites that sold only unprepared fresh fruit were not eligible. Six markets were selected by public authorities, in which 184 eligible vendors were interviewed and 128 food samples collected and analysed. Approximately four samples were collected of each of the 32 most commonly available foods (21 homemade and 11 industrial). Street food products were grouped as fruit (fresh or dried), beverages (any drink, alcoholic or non-alcoholic) and food other than fruit. Foods other than fruit and beverages were classified as homemade (cooked and/or prepared at home or on the street) or industrial (produced by the food industry).

Most eligible vending sites were street food-vending sites (*N*=161, 87.5%), followed by ready-to-eat food vending sites in food courts (*N*=21, 11.4%) and supermarkets (*N*=2, 1.1%). All street food-vending sites were stationary. The vendors were usually women (68.5%) and were mostly located in the Russian Bazaar (33.7%). A wide variety of foods was observed, indicating a rich street food culture. Fruit was sold by only 8.2% of vending sites (street food: 6.8%; food court: 9.5%; supermarket: 100.0%), while food other than fruit was available at 91.9% of sites (street food: 91.9%; supermarket: 100.0%; food court: 90.5%) and beverages at 38.0% (street food: 29.2%; food court: 100.0%; supermarket: 100.0%). Soft drinks, water and fruit juice-based drinks were available at over 50% of vending sites that sold beverages. Most of the eligible vending sites that sold food other than fruit sold only homemade foods (52.7%), followed by those that sold exclusively industrial foods (33.1%) and those that sold both (14.2%). High levels of TFA and sodium were found in the some of the most commonly available foods. The mean TFA content per average serving was highest for industrial (1.4 g) and homemade (0.6 g) wafers, homemade *doner kebab* (0.5 g) and homemade cookies (0.5 g), corresponding to 61.7%, 26.6%, 24.6% and 21.6% of the recommended maximum TFA daily intake, respectively (reference daily intake, 2000 kcal for an average adult). It should be noted that, in many cases, the mean hides outliers with very high values, such as industrial wafers, where the maximum value per average serving was 4.5 g, corresponding to 200.7% of recommended maximum TFA daily intake. The highest mean sodium content per serving was found in homemade *doner kebab* (1284 mg), hamburger (1172 mg), *fitchi* (1115 mg) and hot-dog (1013 mg), corresponding to 64.2%, 58.6%, 55.7% and 50.6% of the recommended

maximum daily intake, respectively. The mean potassium content per serving was highest in homemade fried potatoes (1142 mg), *doner kebab* (837 mg), hamburger (545 mg) and hot-dog (516 mg), corresponding to 32.5%, 23.8.0%, 15.5% and 14.7% of the recommended minimum daily intake, respectively. The highest sodium content was found in a sample of homemade *doner kebab* (2181 mg) corresponding to 109.1% of recommended maximum sodium daily intake.

These results suggest that there is room for improvement in the manufacture/preparation of foods and the ingredients used by street food vendors in Turkmenistan. On the one hand, cooking fats and pastry shortening containing TFA appeared to be widely available, indicating that regulatory action would bring public health benefits. On the other hand, most of the homemade sandwiches, garnishes and savoury pastries analysed had a high sodium content, indicating that excess salt is added. The study also revealed that composition varies significantly within the same food categories; this indicates that it is possible to work closely with the vendors in order to adopt healthier cooking practices.

Even though vending sites that sold fruits exclusively were excluded from this study, fresh fruits are much less available than other foods or drinks. Increasing the availability of fruit could ensure that urban residents have ready access to an essential part of a healthy diet. The types of drinks offered in Ashgabat could also be improved. The wide availability of sugary soft drinks and fruit juice-based drinks is a cause for concern in light of the increasing rates of overweight and obesity in the country.

Strategic thinking is required to improve the nutritional quality of street foods available in Turkmenistan. Reducing the salt and TFA content of ready-to-eat foods sold at street food-vending sites will require a multipronged approach. Beyond the promotion of healthier practices among street food vendors, awareness should also be raised among the public that foods rich in TFA and sodium may harm their health if eaten in excess. At the government level, maximum limits should be set for salt and TFA in foods, as already adopted by neighbouring countries from the Eurasian Economic Union. Additional measures, such as the continuous monitoring and improvement in labelling of packaged foods could also be valuable. It is of utmost importance to protect the cultural and community role of market vendors in sustaining traditional diets and providing access to whole foods such as fruit and vegetables. Thus, policy options that could result in a healthier street food environment should be integrated into national health policies, in order to strengthen the promotion of healthy diets and prevent diet-related noncommunicable diseases.

1. Introduction

Turkmenistan is a landlocked country in central Asia. It is an upper-middle-income country with an annual gross domestic product of US$ 42.355 billion and an annual growth of 6.3%. The population is about 5.8 million people [1], of whom 810 000 are concentrated in the capital city, Ashgabat. The population of the country is increasing and the most recent data points to a growth rate of approximately 1.7% [1]; 25.7% of the population is under 15 years of age and 4.9% ≥65 years [2]. Life expectancy at birth is estimated at 67.8 years [1].

Cardiovascular diseases are the leading cause of death in Turkmenistan, accounting for 47% of all deaths, followed by communicable, maternal, perinatal and nutritional conditions (17%), cancer (11%) and other noncommunicable diseases (NCDs) (15%) [3]. The prevalence of overweight and obesity among the adult population in 2015 was 51.5% and 20.9% in females, and 52.0% and 15.9% in males, respectively [4]. The risk of premature mortality due to NCDs in Turkmenistan is approximately 22.0% among women and 37.0% among men. Nevertheless, there is an overall downward trend, similar to the rest of the WHO European Region. The prevalence of overweight and obesity among children <19 years in 2015 was 18.0% and 3.6% among girls, and 17.9% and 5.6% among boys, respectively [3].

Central Asian countries in the WHO European Region have experienced a nutritional transition in recent decades, reflecting the growing urbanization and globalization of the processed food supply chain [5]. The associated dietary changes include lower consumption of foods rich in fibre, such as legumes, fruits, vegetables and whole grains, and more frequent intake of processed foods likely to be energy-dense and rich in fat, sugar and salt [6], which are known to be associated with weight gain and the occurrence of NCDs. In particular, there is consistent evidence that sodium and *trans*-fatty acids (TFA) in industrially produced foods increase the risk of cardiovascular diseases [7]. WHO is advocating for complete elimination of TFA from the global food supply [7, 8], and public health authorities in several countries are initiating effective bans or regulations on their use [9]. WHO has also called for a significant reduction in sodium intake [10]. Most dietary intake of sodium is either from addition of salt during preparation and cooking of food or from processed foods. Salt reduction initiatives are based on product reformulation, public awareness and clear rules for (front-of-pack) product labelling [10]. WHO recommends a level of ≤2000 mg of sodium per day for adults, corresponding to <5 g of salt (sodium chloride) per day, in order to reduce blood pressure and the risk of cardiovascular diseases [11]. Nevertheless, in most countries for which recent data are available, dietary sodium intake is much higher [12]. In 2018 in Turkmenistan, the average concentration of salt in spot urine samples of participants in the WHO STEPwise approach to surveillance (STEPS) survey was 9.5 g/day. This is likely to be an underestimate compared with other surrounding countries that used 24-hour urinary sodium excretion and obtained values of between 15 and 19 g (STEPS country report 2018, unpublished report). For potassium, another key nutrient that is inversely associated with blood pressure, WHO recommends a minimum daily intake of 3510 mg to reduce the risk of cardiovascular disease [14].

NCDs are a major threat to the socioeconomic well-being of populations. While there is political commitment to improve health in Turkmenistan, the lack of representative surveys of nutritional status, dietary habits and food composition is a barrier to formulating specific health and nutrition policies [15]. This is a challenge shared with many other countries. The *Global nutrition report* classifies this country as experiencing two forms of malnutrition – overweight and anaemia [4]. The current national health policies are aligned with the "Global Action Plan for the Prevention and Control of NCD, 2013–2020" and address topics such as the promotion of healthy environments, including the reduction of salt intake and mandatory legislation for salt iodization. One of its indicators is a reduction in the use of salt/sodium by an average of 30% [16].

1.1 Street food in Turkmenistan

FAO and WHO define street foods as "ready-to-eat foods and beverages prepared and/or sold by vendors or hawkers especially in the streets and other similar places" [17, 18]. Street food is a cultural, social and economic phenomenon typical of urban areas, where the lifestyle is more sedentary and the time dedicated to cooking at home is dramatically less [19]. Street food may be an important component of the daily diet, particularly in countries where there are few supermarkets and shops [20]. It also has an important community role, by supporting access to high-fibre foods rich in micronutrients (fruits and vegetables) and by protecting traditional foods and diets. Nevertheless, foods purchased from street vendors may also contribute significantly to excess intake of energy and nutrients; however, this aspect has received

little attention [21]. The urban street food environment can be expected to reflect the dietary habits of the population but can also influence dietary patterns. This highlights the importance of characterizing and monitoring the availability and composition of street food and what is purchased in the context of prevention of NCDs. However, research in low- and middle-income countries has focused mainly on hygiene and food security, and little is known about the nutritional characteristics of street food [21, 22].

Street trade is a well-developed activity in this region of the world, with food being commonly sold in typical central Asian bazaars. In Turkmenistan, food preferences and gastronomy reflect the country's nomadic traditions and the multicultural background of people who travelled the Silk Road [23]. As in other street food environments, although traditional foods are likely to be widely available, foods processed by large-scale food manufacturers are becoming important as ingredients and as final products [24]. Unlike in some other countries where research on street food has been conducted [25], in Ashgabat, most street food vendors operate in stationary vending units in city markets or their vicinity. These include, for example, open-air restaurants selling cooked food directly on the street, kiosks and stands where the foods are displayed. It was determined that the usual "street hawker", a mobile vendor commonly found in other parts of the world, is missing in this urban setting and that the urban food environment is highly mixed, with a visible transition from ready-to-eat food sold in the streets to the one offered by fast-food vending sites and supermarkets. For this reason, the study methodology was adapted to conform to the local context in Ashgabat and considered both types of food vending sites: street food in its classical sense (e.g. informal stalls, kiosks) and ready-to-eat foods sold in supermarkets and at vending sites in food courts. Commonly available foods include traditional homemade foods, diverse savoury and sweet pastries, many types of sandwiches, bread and various fermented milk drinks (e.g. *ayran, kefir*).

2. Objectives

The main objective of this study was to characterize the food environment of urban Turkmenistan. The specific objectives addressed in this report are the following:

- to describe the basic characteristics of street food-vending sites
- to characterize the ready-to-eat food offered at selected vending sites;
- to assess the nutritional composition of the ready-to-eat foods other than fruits sold in the street, supermarkets and food courts, namely, their sodium, potassium and TFA content.

3. Methods

A cross-sectional evaluation of street food was conducted in Ashgabat, between 10 and 26 October 2016. The study protocol was developed at the University of Porto with the WHO Regional Office for Europe and approved by the Ethics Committee of the Institute of Public Health of the University of Porto. Staff and consultants from the WHO Regional Office for Europe recruited and trained seven local field researchers in a 3-day workshop. The training included lectures, demonstrations, practice interviews and testing of the form for data collection in the office and in a pilot study in a city market that was not selected for the study.

3.1 Eligibility criteria

Street food-vending sites

The definition of street food used was that proposed by FAO and WHO, "ready-to-eat foods and beverages prepared and/or sold by vendors or hawkers especially in the streets and other similar places" [17, 18]. It includes prepared (e.g. sandwiches, salad) and cooked (e.g. boiled eggs, traditional dishes) products, as well as raw foods for immediate consumption (e.g. fruits, nuts), although these products may be bought to be eaten later.

Eligible vending sites were those selling ready-to-eat food, including beverages and/or snacks, from any venue other than permanent storefront businesses or establishments with four permanent walls not selling directly to the street, operating in a predefined perimeter. They included "street hawkers" or mobile vendors as well as sellers with semi-static or stationary vending units. Vending sites that sold exclusively unprepared fresh fruit were not eligible.

To have a better representation of the food on offer in Ashgabat, and considering the observations of the urban food environment made during the field visit, two additional types of vending places were considered eligible for the current study: supermarkets and ready-to-eat food vending places in indoor food courts. The same foods could be commonly found in these settings, with a similar balance between homemade and industrial foods (e.g. breads, pastries, cookies).

Supermarkets

The definition of supermarket adopted in this study was the one proposed by OpenStreetMap, as "large, full-service grocery shops that often also sell a variety of non-food products".

Food courts

The definition of food court was based on the OpenStreetMap definition, as an "indoor place or area within a facility that is contiguous with the counters of multiple food vendors and provides a common area for self-serve dining".

3.2 Sampling of vending sites

As observed in a field visit prior to the data collection, most street food-vending sites were concentrated in traditional outdoor markets and their surroundings, as well as in indoor markets, which encompass, for example, supermarkets and food courts (areas where only ready-to-eat vending sites are displayed) and their surroundings. Local authorities selected six markets, both outdoors and indoors, from a total of 10 identified in Ashgabat, where this study would be conducted. The markets were a combination of outdoor bazaars, indoor food courts and supermarkets (Table 1). For each of the selected markets, we defined a 500 m buffer zone around its centroid as the study area. The markets were evaluated on consecutive days in the following order: Russian Bazaar, Teke Bazaar, Dashoguz Bazaar, Optovyi, Yimpas and Berkarar.

Table 1. Markets selected for the study in Ashgabat, Turkmenistan

Name	Type of market	Type of vending sites available
Russian Bazaar	Outdoor bazaar	Street food-vending sites
Teke Bazaar	Outdoor bazaar	Street food-vending sites
Dashoguz Bazaar	Outdoor bazaar	Street food-vending sites
Optovyi (Green Bazaar)	Outdoor bazaar Indoor food court	Street food-vending sites Ready-to-eat vending sites
Yimpas[a]	Indoor food court Supermarket	Street food-vending sites at the entrance of the building Ready-to-eat vending sites Supermarket
Berkarar	Indoor food court Supermarket	Street food-vending sites at the entrance of the building Ready-to-eat vending sites Supermarket

a This market was open during the period of the study, but closed later, in November 2016

Field researchers operating in pairs canvassed each study area to find eligible food-vending sites. They accessed the market by the main entrance and walked through any publicly accessible street in the selected area. After canvassing the whole market, they moved to the surroundings of the study area. After registering the global positioning system (GPS) coordinates of each vending site, they approached the vendors and explained the study objectives and procedures. Then, they asked for general consent to participate in data collection. After obtaining the vendor's agreement, the interviewers administered a structured questionnaire (approximately 10 min) on the vending activity and the food offered. All the 184 eligible street food vendors approached agreed to participate (100% participation).

In order to avoid interviewing the same vendor twice and facilitate recognition of vendors who had already been approached, a sticker with the logo of the research project was attached to the vending site with the permission of the vendor. The field researchers were instructed to answer any questions the vendors might have about the purposes of the study and distribute leaflets with the study description.

3.3 Characterization of the vending sites and food offered

The data were collected by direct observation and face-to-face interviews with the vendors. They included the sex of the vendor and characteristics of the street food-vending site, such as the type (mobile versus stationary) and the physical set-up of stationary vending sites (e.g. stand, bench with table board, freezer machine). Data on the foods offered were also collected for every type of vending site (e.g. type of food product, size of portions, preparation and packaging).

Foods were grouped according to their nature into **fruit**: fresh or dry; **food other than fruit**: all other food other than fruit and beverages; and **beverages**: any alcoholic or non-alcoholic drink. Foods other than fruit and beverages were further classified as **homemade** (cooked and/or prepared at home or on the street, even if prepared with industrial ingredients) or **industrial** (produced by the food industry and sold with no further preparation). Beverages were classified into: soft drinks, water, fruit juice-based drinks, fresh fruit juice, milk, alcoholic beverages, energy drinks, coffee, tea, hot chocolate and traditional beverages, and fruit cocktail or slush.

3.4 Collection and analysis of foods

Selection and collection of food samples

In Ashgabat, the 21 most frequently available homemade foods, including traditional beverages of unknown composition, and the 11 most frequently available industrial foods were selected for bromatological analysis.[2] Common drinks of known nutritional composition, such as coffee, tea, milk and soft drinks, were not eligible. A total of 128 samples were collected, corresponding to approximately four samples of each of the 32 foods. The samples collected corresponded to one unit or the usual quantity sold. For any type of food sold in small portions (e.g. small snacks, biscuits), each sample comprised more than one unit of the same food, according to the usual purchasing or consumption pattern. Examples of each of the 32 food samples collected in Ashgabat are shown in the appendices.

Table 2. Foods to be sampled in Ashgabat, Turkmenistan (by group)

Homemade food	Set	Industrial food	Set
Doner kebab	A	Biscuits	E
Cabbage salad		Chocolate	
Somsa		Croutons	
Pirozhnoe		Wafers	F
Boiled corn		Salty sticks/crackers	
Bread (*chorek*)	B	*Keksy* (muffin)	G
Sausage roll		*Pryaniki*	
Pirog (savoury pie)		Ice-cream	
Pizza		Chips	H
Fried potatoes		Black bread	
Cheburek	C	*Halva*	
Fitchi			
Bread (*milk chorek*)			
Biscuits			
Hamburger			
Lentil soup	D		
Wafers			
Keksy (muffin)			
Pirozhki			
Bun			
Hot-dog			

For sampling, the selected homemade foods were grouped into five or six foods in each set – A, B, C and D, while industrial foods were grouped into two or three foods in each set – E, F, G and H (Table 2). Each of these was collected at four different vending sites (Table 3). On four consecutive days, food samples from the four sets of homemade and the four sets of industrial foods were collected each day in two different markets, according to the order shown in Table 3. On each day, one outdoor market and, alternately, one indoor supermarket or food court was selected for sampling. Approximately 32 samples of different foods were collected daily, until 128 samples had been collected.

2 The original approach was to select the most frequently available 20 homemade and the 10 industrial foods. However, as the frequency of homemade bun and hot-dog, as well as that of industrial black bread and halva were the same, the research team decided to select one additional homemade and industrial food.

Table 3. Framework for random sampling of food products in Ashgabat, Turkmenistan

Day	Market	Homemade		Industrial	
1	Berkarar (supermarket)	A	B	E	F
	Optovyi	C	D	G	H
2	Teke Bazaar	A	B	E	F
	Berkarar (food court)	C	D	G	H
3	Yimpas (supermarket)	A	B	E	F
	Dashoguz Bazaar	C	D	G	H
4	Russian Bazaar	A	B	E	F
	Yimpas (food court)	C	D	G	H

The vending sites at which food samples were collected were selected by random route procedures, starting with random selection of GPS coordinates in each study area. These were used as the starting point for systematic selection, in which the researchers moved north and then clockwise to the east, continuing through the south and the west, to the limits of the study area or a physical barrier (e.g. wall, canal) until a vending site was found at which the selected foods were available. In each market and on each day of collection, only one food sample was obtained from the same vending site, the most common foods being selected first.

Processing of food samples

Each individual sample was photographed and weighed in order to report on portion sizes. All samples, solid and semi-solid, were ground mechanically, homogenized and separated into four aliquots. The aliquots were stored in individually labelled rigid plastic containers with covers and inside closed plastic bags. After preparation, each container was stored in a freezer (at –18 °C) until bromatological analysis. Samples were defrosted and analysed immediately after homogenization. The bromatological analysis comprised determination of total fat, fatty acid profile (included TFA), sodium and potassium content. For TFA analysis, the fat fraction was extracted using organic solvents; a portion of 0.2 g of extracted fat was converted to fatty acid methyl esters and separated by gas chromatography, as described in Albuquerque et al. [26]. Sodium and potassium analyses were performed by an inductively coupled plasma optical emission spectrometer (ICP-OES), after acid digestion in a closed-vessel microwave system, as described by Nascimento et al. [27].

All samples were analysed in duplicate and the analytical results represent the mean of the two determinations, expressed in grams per 100 g of fresh food.

3.5 Statistical analysis

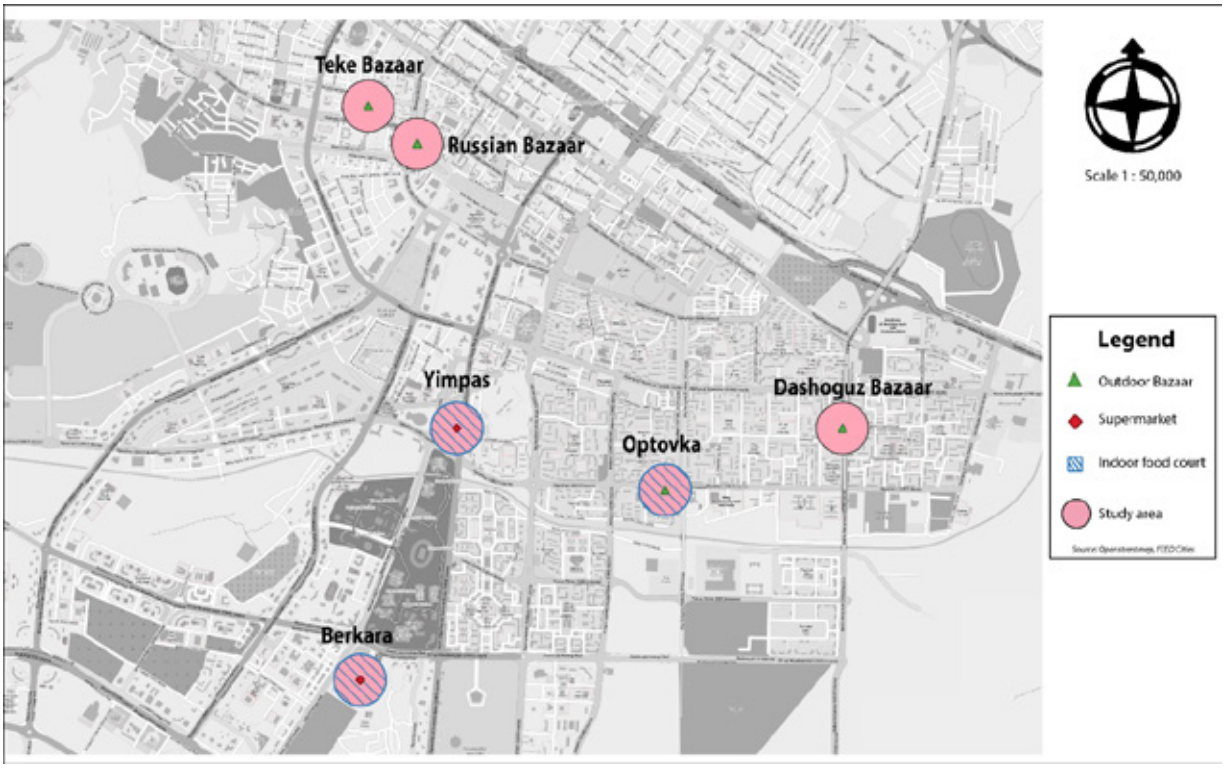
The street food environment in Ashgabat was characterized by descriptive statistics, overall and by type of vending site and market. The location of the vending sites was mapped, and their characteristics and the food they offered are presented as proportions. The results of the nutritional composition of each food are presented as mean and range for TFA, sodium and potassium per serving, and as the mean proportion of the recommended intake. Mean serving sizes, calculated as the mean of the individual portion of each food collected, are also presented.

4. Results

4.1 Distribution of selected markets and vending sites

The selected markets were distributed throughout the city of Ashgabat, as represented in Fig. 1.

Fig. 1. Selected markets in Ashgabat, Turkmenistan



4.2 Characteristics of vendors and vending sites

The characteristics of street food vendors and vending sites in Ashgabat are listed in Table 4. Most vendors were women (68.5%) and operated in the Russian Bazaar (33.7%). Regarding the type of vending site, most were street food-vending sites (87.5%). The proportion of street food-vending sites ranged from 38.5% in Yimpas to 100% in Dashoguz, Russian and Teke Bazaars. Ready-to-eat food vending sites in food courts accounted for 11.4% and supermarkets for 1.1% of the sample.

Table 4. Characteristics of food vendors and vending sites in Ashgabat, Turkmenistan (*N*=184)

	Total (*N*=184)	Market					
		Berkarar (*n*=12)	Dashoguz Bazaar (*n*=27)	Green Bazaar (*n*=17)	Russian Bazaar (*n*=62)	Teke Bazaar (*n*=53)	Yimpas (*n*=13)
Sex (%)							
Women	68.5	83.3	59.3	70.6	67.7	71.7	61.5
Men	31.5	16.7	40.7	29.4	32.3	28.3	38.5
Type of vending site (%)							
Street food	87.5	50.0	100.0	47.1	100.0	100.0	38.5
Food court	11.4	41.7	0.0	52.9	0.0	0.0	53.9
Supermarket	1.1	8.3	0.0	0.0	0.0	0.0	7.7

All street food-vending sites were stationary. Several physical set-ups of street food-vending sites and ready-to-eat vending sites in food courts are displayed in Table 5. The most prevalent, overall and among street food-vending sites, were stands (48.9% and 52.2%, respectively) and showcases (27.5% and 27.3%, respectively). Showcases (28.6%) and refrigerators (28.6%) were the most prevalent set-ups among ready-to-eat vending sites in food courts. Overall, a wider diversity of vending sites was found in Teke Bazaar.

Table 5. Physical set-up of the street food- and food court-vending sites in Ashgabat, Turkmenistan (*N*=182)

	Total (*N*=182)	Type of vending site		Market					
		Street food (*n*=161)	Food court (*n*=21)	Berkarar (*n*=11)	Dashoguz Bazaar (*n*=27)	Green Bazaar (*n*=17)	Russian Bazaar (*n*=62)	Teke Bazaar (*n*=53)	Yimpas (*n*=12)
Physical set-up (%)									
Stand	48.9	52.2	23.8	100.0	59.3	35.3	46.8	45.3	25.0
Showcase	27.5	27.3	28.6	0.0	18.5	17.7	419	22.6	33.3
Bench with table board	6.6	7.5	0.0	0.0	11.1	11.8	48	7.6	0.0
Refrigerator	6.0	3.1	28.6	0.0	7.4	17.7	48	0.0	25.0
Cafeteria	5.0	5.0	4.8	0.0	0.0	5.9	00	15.1	0.0
Vending machine	2.8	1.9	9.5	0.0	0.0	11.8	1.6	3.8	0.0
Kiosk	2.2	2.5	0.0	0.0	3.7	0.0	0.0	3.8	8.3
Ice-cream or popcorn machine	0.6	0.6	0.0	0.0	0.0	0.0	0.0	1.9	0.0
Counter	0.6	0.0	4.8	0.0	0.0	0.0	0.0	0.0	8.3

4.3 Characteristics of the ready-to-eat food offered

Fruit was available in 8.2% (street food: 6.8%; food court: 9.5%; supermarket: 100.0%) and beverages in 38.0% of vending sites (street food: 29.2%; food court: 100.0%; supermarket: 100.0%). Food other than fruit was sold at 91.9% of the vending sites (street food: 91.9%; food court: 90.5%; supermarket: 100.0%). The distribution of different categories of street food on offer was broadly the same in each of the markets surveyed. However, a higher proportion of fruit was available in Yimpas (23.1%) and a higher proportion of beverages were available in Berkarar (83.3%), Yimpas (76.9%), Green Bazaar (64.7%) and Russian Bazaar (45.2%) (Table 6).

Among the vending sites selling food other than fruit, those selling only homemade foods were more frequent (52.7%) than vending sites selling exclusively industrial foods (33.1%) or those selling both homemade and industrial foods (14.2%). Across markets, the offer of food other than fruit was similar to the overall figure, except in Dashoguz Bazaar, in which vending sites selling only industrial foods were the most frequent (52.0%) and in Green Bazaar, where vending places selling only industrial food were not available (Table 6).

The most common homemade foods sold in the streets of Ashgabat were prepared salads (37.2%), *somsa* (19.5%), *doner kebab* (18.6%) and *pirozhnoe* (16.8%). Table 7 lists the packaging and storage arrangement for the foods.

Table 6. Food offered, by market and by type of vending site, in Ashgabat, Turkmenistan (*N*=184)

	Total (*N*=184)	Type vending site			Market					
		Street food (*n*=161)	Food court (*n*=21)	Supermarket (*n*=2)	Berkarar (*n*=12)	Dashoguz Bazaar (*n*=27)	Green Bazaar (*n*=17)	Russian Bazaar (*n*=62)	Teke Bazaar (*n*=53)	Yimpas (*n*=13)
Food offered (%)										
Fruit	8.2	6.8	9.5	100.0	8.3	7.4	0.0	11.3	3.8	23.1
Food other than fruit	91.9	91.9	90.5	100.0	100.0	92.6	82.4	87.1	98.1	92.3
Industrial	33.1	37.2	5.3	0.0	25.0	52.0	0.0	40.7	32.7	25.0
Homemade	52.7	52.7	57.9	0.0	50.0	40.0	64.3	51.9	51.9	75.0
Homemade and industrial	14.2	10.1	36.8	100.0	25.0	8.0	35.7	7.4	15.4	16.7
Beverages	38.0	29.2	100.0	100.0	83.3	18.5	64.7	45.2	11.3	76.9

Table 7. Characteristics of a subsample of the most common homemade foods available in Ashgabat, Turkmenistan

	Prepared salads		*Somsa*		*Doner kebab*		*Pirozhnoe (cake)*	
	(*n*=42) *n* (%)		(*n*=22) *n* (%)		(*n*=21) *n* (%)		(*n*=19) *n* (%)	
Packaging								
Industrially packaged	-	-	-	-	-	-	2	(10.5)
Manually packaged	4	(9.5)	3	(13.6)	1	(4.8)	-	-
No package	38	(90.5)	19	(86.4)	20	(95.2)	17	(89.5)
Storage temperature at the time of selling								
Cold	35	(83.3)	-	-	-	-	14	(73.7)
Warm	1	(2.4)	3	(13.6)	3	(14.3)	-	-
Room temperature	6	(14.3)	19	(86.4)	18	(85.7)	5	(26.3)

Many kinds of beverages were available in the urban food environment in Ashgabat (Table 8). Those most commonly sold were soft drinks (84.3%), water (81.4%) and fruit juice-based drinks (60.0%). Generally, the offer of beverages was wider among street food-vending sites. Supermarkets and ready-to-eat food vending sites in food courts sold mostly soft drinks (food courts: 95.2%; supermarkets: 100.0%), water (food courts: 90.5%; supermarkets: 100.0%), fruit juice-based drinks (food courts: 85.7%; supermarkets: 100.0%) and traditional beverages (food courts: 57.1%; supermarkets: 100.0%). Ready-to-eat food vending sites in food courts sold tea (street food: 17.0%; food courts: 76.2%; supermarkets: 0.0%), coffee (street food: 10.6%; food courts: 71.4%; supermarkets: 50.0%) and fresh fruit juice-based drinks (street food: 10.6%; food courts: 23.8%; supermarkets: 0.0%) in a higher proportion compared with the remaining types of vending sites.

Overall, the offer of beverages among street food-vending sites was similar in the six markets. Fruit juice-based drinks were, however, the most frequently available drinks in Dashoguz Bazaar (100.0%). Energy drinks were also available in a high proportion in this market (40.0%). Alcoholic drinks were available only in street food-vending sites, specifically in Dashoguz Bazaar (20.0%), Berkarar (10.0%) and Russian Bazaar (7.1%) (Table 8).

4.4 Nutritional composition of foods

The nutritional composition of the 32 most commonly available foods, other than fruit, collected in the streets of Ashgabat are shown in Table 9. The TFA, sodium and potassium content varied considerably among the products analysed.

The mean TFA content per serving was highest in industrial (mean: 1.4 g; range: 0.0 g–4.5 g) and homemade wafers (mean: 0.6 g; range: 0.0 g–1.1 g), homemade doner kebab (mean: 0.5 g; range: 0.2–1.1 g) and homemade biscuits (mean: 0.5 g; range: 0.0–1.2 g), corresponding to an average of 61.7% (range: 1.8–200.7%), 26.6% (range: 2.0–49.5%), 24.6% (range: 0.1–53.0%) and 21.6% (range: 9.5–51.3%) of the recommended maximum daily TFA intake, respectively. The mean TFA content per serving was lowest in homemade milk chorek bread, industrial black bread, homemade chorek bread and homemade boiled corn, corresponding to an average of 1.4%, 0.7%, 0.6% and 0.4% of the maximum daily recommended, respectively.

The highest mean sodium content per serving was found in homemade doner kebab (mean: 1284 mg; range: 799–2181 mg), hamburger (mean: 1172 mg; range: 768–1889 mg), fitchi (mean: 1115 mg; range: 756–1470 mg) and hot-dog (mean: 1013 mg; range: 902–1169 mg), corresponding to an average of 64.2% (range: 40.0–109.1%), 58.6% (range: 38.4–94.5%), 55.7% (range: 37.8–73.5%) and 50.6% (range: 45.1–58.5%) of the recommended maximum daily intake, respectively. Homemade biscuits (77 mg), industrial ice-cream (44 mg), chocolate (42 mg) and halva (21 mg) had the lowest mean sodium content per serving, corresponding to an average of 3.8%, 2.2%, 2.1% and 1.0% of the maximum daily recommended, respectively.

Table 8. Types of beverages offered in Ashgabat, Turkmenistan, by type of vending site and by market (*N*=70)

	Total	Type vending site			Market					
	(*N*=70) (%)	Street food (*n*=47) (%)	Food court (*n*=21) (%)	Supermarket (*n*=2) (%)	Berkarar (*n*=10) (%)	Dashoguz Bazaar (*n*=5) (%)	Green Bazaar (*n*=11) (%)	Russian Bazaar (*n*=28) (%)	Teke Bazaar (*n*=6) (%)	Yimpas (*n*=10) (%)
Soft drinks	84.3	78.7	95.2	100.0	90.0	60.0	90.9	82.1	100.0	80.0
Water	81.4	76.6	90.5	100.0	90.0	60.0	81.8	78.6	100.0	80.0
Fruit juice-based drinks	60.0	46.8	85.7	100.0	70.0	100.0	63.6	39.3	83.3	70.0
Traditional beverages*	41.4	31.9	57.1	100.0	20.0	20.0	45.5	50.0	0.0	70.0
Tea	34.3	17.0	76.2	0.0	50.0	20.0	72.7	17.9	0.0	50.0
Coffee	30.0	10.6	71.4	50.0	60.0	20.0	72.7	7.1	0.0	40.0
Fresh fruit juice-based drinks	14.3	10.6	23.8	0.0	50.0	0.0	18.2	0.0	0.0	30.0
Energy drinks	10.0	6.4	9.5	100.0	10.0	40.0	18.2	0.0	0.0	20.0
Milk	10.0	8.5	4.8	100.0	20.0	0.0	0.0	14.3	0.0	10.0
Alcoholic beverages	5.7	8.5	0.0	0.0	10.0	20.0	0.0	7.1	0.0	0.0
Fruit cocktail	5.7	2.1	14.3	0.0	30.0	0.0	9.1	0.0	0.0	0.0
Hot chocolate	2.9	0.0	9.5	0.0	20.0	0.0	0.0	0.0	0.0	0.0

*Traditional beverages: *ayran* (*n*=22), yoghurt (*n*=16), *kefir* (n=7), *kompot* (*n*=1)

The mean potassium content per serving was highest in homemade fried potatoes (mean: 1142 mg; range: 672–1504 mg), *doner kebab* (mean: 837 mg; range: 570–1213 mg), hamburger (mean: 545 mg; range: 475–620 mg) and hot-dog (mean: 516 mg; range: 255–1252 mg), corresponding to an average of 32.5% (range: 19.1–42.8%), 23.8.0% (range: 16.2–34.6%), 15.5% (range: 13.5–17.7%) and 14.7% (range: 7.3–35.7%) of the recommended minimum daily intake, respectively. The mean potassium content per serving was lowest in industrial *pryaniki* (90 mg), *halva* (77 mg), homemade (66 mg) and industrial biscuits (62 mg), corresponding to an average of 2.5%, 2.2%, 1.9% and 1.8% of the minimum daily recommended, respectively.

These results show that many foods available in Ashgabat contain high values of sodium and/or TFA. Regarding TFA, the highest mean content per serving was found in industrial wafers, but TFA content was also high in a number of homemade foods, such as some savoury and sweet snacks and sandwiches. When analysing these results, it is important to consider not only the mean content, but also the range of values found in each sample of a determined food. For example, regarding industrial wafers, despite a mean TFA content of 1.4 g, corresponding to 61.7% of the daily recommended intake for this nutrient, one of the collected samples contained 4.5 g of TFA, which is much higher than the daily recommended intake for this nutrient (200.7%). Given these findings, cooking fats and pastry shortening containing TFA seem to be widely used in the preparation of such foods. It would be important to take into account the daily consumption of these foods when analysing the contribution of each nutrient to the daily intake.

One concern with regard to the sodium content of street food in Turkmenistan is that most of the foods with the highest content were homemade, both traditional (e.g. *doner kebab* and *ficthi*) and otherwise (e.g. hamburger, hot-dog), usually eaten at the main meals. One portion of some of these foods accounted, on average, for over half the 2000 mg recommended by WHO as the maximum daily intake. Again, some of the food samples collected presented a sodium content much higher than the average. For example, the mean sodium content of one serving of *doner kebab*, 1284 mg, corresponded to 64.2% of the maximum daily recommendation. However, one of the *doner kebab* samples collected contained 2181 mg of sodium, which is far more than the daily maximum recommended intake for this nutrient (109.1%). Therefore, less salt should be added during cooking and preparing foods at vending sites. The high sodium content of traditional foods has been attributed to the "Silk Road" pattern, in which the use of salt for food preservation remains strong in the food culture *(31)*. For some of these foods, the sodium content varied considerably from vending place to vending place, which illustrates that culinary practices could be modified.

Generally, the potassium content of street foods analysed was below the minimum recommended value. Some homemade foods with a higher content of this nutrient, such as *doner kebab*, were, however, rich in sodium and/or in TFA. The industrial street foods analysed generally had the lowest potassium content.

Table 9. Nutritional composition of the food samples evaluated by bromatological analysis in Ashgabat, Turkmenistan

			TFA			Na			K		
	N	Mean serving size (g)	TFA (g) /serving Mean (min–max)		% Recomendation Mean (min–max)	Na (mg) /serving Mean (min–max)		% Recomendation Mean (min–max)	K (mg) /serving Mean (min–max)		% Recomendation Mean (min–max)
Industrial foods											
Biscuits[c]	**4**	31	0.1	(0.0 –0.2)	4.1 (0.4 –9.0)	87	(44 –150)	4.3 (2.2 –7.5)	62	(44 –100)	1.8 (1.2 –2.9)
Bread (black)[c]	**4**	50	0.0	(0.0 -0.0)	0.7 (0.2 -1.4)	261	(168 -330)	13.0 (8.4 -16.5)	111	(103 -125)	3.1 (2.9 -3.6)
Chips[c]	**4**	20	0.1	(0.0 -0.1)	2.7 (0.9 -4.2)	171	(74 -346)	8.5 (3.7 -17.3)	122	(29 -230)	3.5 (0.8 -6.6)
Chocolate[c]	**4**	48	0.1	(0.0 -0.3)	4.9 (0.9 -14.6)	42	(11 -74)	2.1 (0.6 -3.7)	372	(145 -693)	10.6 (4.1 -19.7)
Croutons[c]	**4**	38	0.1	(0.0 -0.2)	4.4 (0.4 -8.5)	316	(144 -713)	15.8 (7.2 -35.6)	112	(80 -156)	3.2 (2.3 -4.4)

Halva[c]	**4**	20	0.1	(0.0 -0.2)	3.3	(0.2 -10.9)	21	(8 -40)	1.0	(0.4 -2.0)	77	(39 -102)	2.2	(1.1 -2.9)
Ice-cream[c]	**4**	68	0.1	(0.0 -0.2)	3.3	(0.2 -6.9)	44	(24 -81)	2.2	(1.2 -4.0)	165	(71 -273)	4.7	(2.0 -7.8)
Keksy (muffin)[c]	**4**	51	0.4	(0.3 -0.5)	17.0	(11.9 -23.4)	202	(129 -282)	10.1	(6.4 -14.1)	97	(65 -129)	2.8	(1.9 -3.7)
Pryaniki[c]	**4**	60	0.1	(0.0 -0.3)	4.2	(0.3 -15.1)	117	(57 -233)	5.9	(2.9 -11.6)	90	(47 -114)	2.5	(1.3 -3.3)
Salty sticks/ crackers[c]	**4**	46	0.1	(0.1 -0.0)	2.4	(0.2 -6.3)	911	(673 -1202)	45.6	(33.7 -60.1)	103	(60 -130)	2.9	(1.7 -3.7)
Wafers[c]	**4**	94	1.4	(0.0 -4.5)	61.7	(1.8 -200.7)	81	(47 -111)	4.1	(2.3 -5.6)	419	(115 -725)	11.9	(3.3 -20.7)
Homemade foods														
Biscuits[c]	**4**	41	0.5	(0.0 -1.2)	21.6	(0.1 -53.0)	77	(41 -137)	3.8	(2.0 -6.9)	66	(31 -167)	1.9	(0.9 -4.8)
Boiled corn[c]	**4**	165	0.0	(0.0 -0.0)	0.4	(0.0 -1.5)	86	(21 -195)	4.3	(1.0 -9.7)	467	(326 -665)	13.3	(9.3 -18.9)
Bread *(chorek)*[a]	**4**	120	0.0	(0.0 -0.0)	0.6	(0.2 -1.0)	560	(411 -713)	28.0	(20.6 -35.7)	180	(149 -211)	5.1	(4.3 -6.0)
Bread *(milk chorek)*[c]	**4**	120	0.0	(0.0 -0.1)	1.4	(0.0 -5.4)	612	(447 -767)	30.6	(22.4 -38.3)	202	(164 -274)	5.8	(4.7 -7.8)
Bun[c]	**4**	108	0.1	(0.0 -0.2)	2.6	(0.5 -7.2)	235	(79 -579)	11.8	(3.9 -28.9)	122	(89 -163)	3.5	(2.5 -4.6)
Cheburek[a]	**4**	99	0.1	(0.0 -0.2)	6.2	(1.9 -9.3)	487	(267 -650)	24.3	(13.4 -32.5)	177	(146 -232)	5.0	(4.2 -6.6)
Doner kebab[c]	**4**	265	0.5	(0.2 -1.1)	24.6	(9.5 -51.3)	1284	(799 -2181)	64.2	(40.0 -109.1)	837	(570 -1213)	23.8	(16.2 -34.6)
Fitchi[c]	**4**	188	0.4	(0.1 -0.9)	17.8	(3.5 -38.7)	1115	(756 -1470)	55.7	(37.8 -73.5)	298	(242 -447)	8.5	(6.9 -12.7)
Fried potatoes[b]	**4**	169	0.3	(0.1 -0.5)	12.0	(2.4 -21.9)	272	(64 -568)	13.6	(3.2 -28.4)	1142	(672 -1504)	32.5	(19.1 -42.8)
Hamburger[d]	**4**	235	0.2	(0.0 -0.5)	9.6	(1.1 -21.9)	1172	(768 -1889)	58.6	(38.4 -94.5)	545	(475 -620)	15.5	(13.5 -17.7)
Hot-dog[c]	**4**	204	0.1	(0.0 -0.3)	5.3	(1.4 -11.5)	1013	(902 -1169)	50.6	(45.1 -58.5)	516	(255 -1252)	14.7	(7.3 -35.7)
Keksy (muffin)[c]	**4**	103	0.3	(0.0 -0.6)	13.6	(1.0 -26.5)	295	(191 -357)	14.7	(9.6 -17.9)	133	(106 -155)	3.8	(3.0 -4.4)
Pirog (savoury pie)[a]	**4**	158	0.2	(0.0 -0.4)	8.5	(1.3 -16.1)	983	(541 -1454)	49.2	(27.0 -72.7)	263	(169 -355)	7.5	(4.8 -10.1)
Pirozhki[a]	**4**	100	0.3	(0.0 -0.7)	11.7	(1.7 -33.0)	355	(100 -554)	17.7	(5.0 -27.7)	165	(108 -206)	4.7	(3.1 -5.9)
Pirozhnoe (cake)[c]	**4**	110	0.4	(0.2 -0.6)	18.1	(7.1 -27.1)	255	(59 -407)	12.7	(2.9 -20.3)	204	(135 -266)	5.8	(3.8 -7.6)
Pizza[d]	**4**	153	0.2	(0.2 -0.3)	10.1	(7.2 -12.3)	888	(383 -1172)	44.4	(19.2 -58.6)	292	(141 -391)	8.3	(4.0 -11.2)
Salad (cabbage)[c]	**4**	100	0.1	(0.1 -0.2)	4.6	(2.5 -10.0)	754	(682 -896)	37.7	(34.1 -44.8)	225	(214 -239)	6.4	(6.1 -6.8)
Somsa[d]	**4**	117	0.1	(0.1 -0.2)	6.0	(2.7 -8.6)	722	(373 -1372)	36.1	(18.6 -68.6)	195	(135 -282)	5.5	(3.9 -8.0)
Sausage roll[c]	**4**	96	0.1	(0.0 -0.3)	5.6	(0.6 -12.2)	533	(209 -999)	26.6	(10.4 -50.0)	152	(95 -190)	4.3	(2.7 -5.4)
Soup (lentil [b]	**4**	321	0.3	(0.2 -0.4)	13.2	(7.5 -17.6)	912	(688 -1189)	45.6	(34.4 -59.4)	515	(407 -695)	14.7	(11.6 -19.8)
Wafers[c]	**4**	89	0.6	(0.0 -1.1)	26.6	(2.0 -49.5)	93	(36 -168)	4.7	(1.8 -8.4)	106	(40 -181)	3.0	(1.1 -5.2)

K: potassium; Na: sodium; TFA: *trans*-fatty acids; % recom:* % of WHO recommendations were computed for an average adult, considering an intake of 2000 kcal. WHO recommendations: TFA: <1% total energy value/day [7]; Na: <2000 mg/day [28]; K: ≥3510 mg/day [14]

[a] Foods collected at street food-vending sites; [b] foods collected at street food-vending sites and food courts; [c] foods collected at street food-vending sites and supermarkets; [d] foods collected at street food-vending sites food courts and supermarkets

5. Conclusions and policy implications

The study reported here was conducted to provide an overview of the urban food context in Ashgabat following a standard methodology. Most of the vending sites assessed (*N*=184) were street food-vending sites (87.5%), followed by ready-to-eat food vending sites in food courts (11.4%) and supermarkets (1.1%). All street food-vending sites were stationary. All eligible vendors accepted to participate, and most were women (68.5%).

The six markets assessed throughout the city offered a wide choice of foods. Fruit was available in 8.1% and beverages in 38.4% of the vending sites. Food other than fruit was sold at 91.9% of the vending sites. Although the availability of fruit might be underrepresented, given that sites selling only unprepared fresh fruit were not included, the availability of nutritionally dense foods rich in fibre and sources of potassium such as fruit and vegetables should be increased for the urban population of Ashgabat.

Many types of beverages were sold, although soft drinks were the most frequently available at almost 85% of sites selling beverages, followed by water and fruit juice-based drinks. Traditional beverages were available in approximately two out of every five vending places that sold beverages. This suggests that traditional food habits persist, with additional non-traditional options. The wide availability of soft drinks is a cause for concern, given their high sugar content, which is known to be the main source of added sugar in the diet [29]. This probably contributes to excess energy intake and weight gain. WHO recommends a reduced intake of free sugars throughout the life-course [29].

In Ashgabat, homemade foods were more frequently available than industrial foods. The 32 foods most commonly found included savoury snacks, sandwiches and garnishes, as well as bread and sweet snacks. With regard to the nutritional composition of these common street foods, the highest levels of TFA were found among homemade and industrial wafers, homemade biscuits and savoury snacks, which can also be consumed at main meals, such as *doner kebab*. In some of these foods, the mean TFA content surpassed half the recommended daily maximum intake, but the individual TFA content surpassed even the daily recommendations. Differences among samples of the same foods collected from different vending sites may be due to the ingredients used, especially the type of fat, and preparation and food-processing methods [21, 30, 31].

Although the overall mean potassium content of the street foods analysed in Turkmenistan was low, some garnishes and sandwiches, including potato or vegetables, such as fried potatoes and *doner kebab*, had the highest content of this nutrient, representing 23.8–32.5% of the minimum daily intake recommended. However, unfortunately, some of these foods were also the richest sources of sodium per serving. For some foods, a single portion reached or surpassed, on average, 50% of the recommended maximum daily intake of sodium (2000 mg). Again, the sodium content of some individual food samples surpassed even the recommended daily intake. Such variability could be explained by the addition of salt or salty ingredients during food preparation.

The results of this report show that the promotion of healthy diets should be a national priority, with both salt and TFA being strategic points of intervention. Practical policies can be used to make the street food environment healthier and these should be incorporated into existing programmes or policies, such as the national “Health” programme [16].

Reducing the salt and TFA content of ready-to-eat foods will probably require a multisectoral approach [32]. It could include educating and instructing street food vendors to use less salt and healthier fats, while maintaining tradition, demonstrating that it is feasible, given that the range of TFA and sodium varied considerably for many foods. An additional strategy to complement the former would be to raise awareness among consumers that foods rich in these nutrients may be harmful if consumed in excess. However, the most important component of changing the food context in Turkmenistan would be the leadership and regulatory role of the government. The government could adopt salt reduction targets for industrially produced foods (e.g. savoury snacks, bread and drinks), perhaps by regulating maximum limits, as has been done in many

countries, including Finland, Greece and Turkey, but perhaps most comprehensively in Argentina and South Africa [33]. Such legislation would be consistent with and complementary to other legislation for food security and nutrition, and would not undermine initiatives such as salt iodization, which has been successfully implemented in the country.

It is necessary for the government to also consider introducing a regulation setting legal limits for industrial TFA in foods. WHO has prepared guidance for the elimination of industrially produced TFA from the global food supply at national level, the "REPLACE trans-fat free by 2023" action package [8]. The package consists of six activities: **re**view dietary sources of industrially produced TFA; **p**romote replacement with healthier fats and oils; **l**egislate or enact regulations to eliminate industrially produced TFA; **a**ssess and monitor the TFA content of the food supply and changes in TFA consumption by the population; **c**reate awareness among policy-makers, producers, suppliers and the public of the negative effects of TFA on health; and **e**nforce compliance with policies and regulations.

Some Member States of the Eurasian Economic Union have implemented a technical regulation on fats and oils in food products, which prohibits a TFA content >2 g/100 g of fat by 2018. This regulation was introduced to limit the availability and use of TFA in food products. This study demonstrates that the Government of Turkmenistan could start by introducing a similar regulation in the country. Afterwards, monitoring should be continued in order to assess the TFA content of foods and the move towards their replacement with healthier options. A good example of monitoring to ensure compliance with legislation is that of Denmark, which introduced a ban on TFA in food in 2003 [34].

The government might consider additional measures to encourage processors, manufacturers and vendors to change to healthier oils. As street vendors and small-scale manufacturers are extremely price conscious, given the small profits they make, their choice of cooking fat is likely to be strongly influenced by price. Increased availability and affordability of healthier oils for use by street vendors and manufacturers could result in significant changes in dietary intake, as observed in other contexts [35]. For example, the "Healthier Hawker Programme" in Singapore improved the availability of and access to healthier oils by bulk purchasing and improving the logistics and supply to street vendors. This reduced the price and encouraged vendors to change to healthier vegetable oils [35]. Dialogue with producers of fats and oils could ensure compliance with the legislation. A final aspect is improving the nutritional information on packaged foods in Turkmenistan to ensure that all products bear a nutrient declaration (including for sodium) in addition to an ingredients list.

Such policies require government leadership and regular monitoring. For both salt reduction and TFA elimination, local food suppliers (e.g. manufacturers of oils and fats used in freshly prepared products, wholesale producers, manufacturers of breads, pastries and confectionary, savoury snacks, drinks and processed meats) should be engaged to monitor their compliance with regulations and guidance. Such mapping has been conducted in India, for example, in a study of the barriers and opportunities to reduce the use of TFA in order to comply with government policy [36]. Contact with international food suppliers will also be important. Together, these activities would contribute significantly to the promotion of healthy diets and prevention of obesity in Turkmenistan. The National Health Program and the draft National Strategy on Healthy Nutrition of the Population of Turkmenistan for 2018–2025 represent excellent entry points for such policies to involve all agencies implementing similar strategies. The goal of the National Health Program is to improve the health of the population and increase its well-being, as well as the average healthy life expectancy, to provide all-round equal opportunities and conditions for health protection to citizens.

This study shows that there is considerable room for improvement in the nutritional adequacy of street foods sold in Turkmenistan. It reinforces the need for intersectoral health policies to prevent the occurrence of diet-related NCDs in the country, while protecting the cultural and community role of street food. Regulation of production and promotion of the population's access to safe, affordable, nutritious street food is imperative to address NCDs and associated health disparities in the urban context.

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Appendix 1. Examples of industrial foods collected in Ashgabat

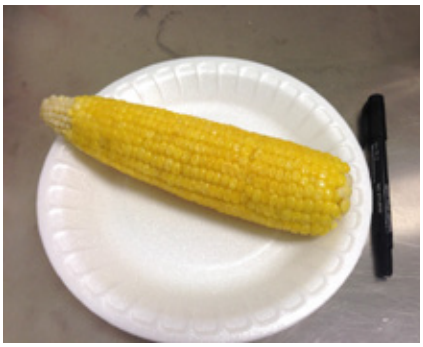
Biscuits	
Bread (black)	
Chips	
Chocolate	

Croutons	
Halva	
Ice-cream	
Keksy (muffin)	

Pryaniki	

Salty sticks	
Wafers	

Appendix 2. Examples of homemade foods collected in Ashgabat

Boiled corn	
Bread *(chorek)*	

Bread *(milk chorek)*	
Bun	

Cheburek	
Biscuits	
Doner kebab	
Fitchi	
Fried potatoes	

Hamburger	
Hot-dog	
Keksy (muffin)	
Pirog (savoury pie)	
Piroshky	
Pirozhnoe (cake)	

Pizza	
Salad (cabbage)	
Somsa	

Sausage roll	
Soup (lentil)	
Wafers	

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