



FEEDcities project

The food environment description in cities in Eastern Europe and Central Asia - Tajikistan



Technical report
June 2017



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INSTITUTO DE SAÚDE PÚBLICA
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FEEDcities project

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Technical report
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Abstract

This technical report describes the results of a cross-sectional survey conducted in Dushanbe, Tajikistan, between April and May 2016, as part of the FEEDcities Project – Eastern Europe and Central Asia. The aim was to describe the local street food environment: the characteristics of the vending sites, the food offered and the nutritional composition of the industrial and homemade foods usually consumed in these settings.

The study was part of a bilateral partnership between WHO and the Institute of Public Health of the University of Porto, Portugal, in collaboration with the Faculty of Medicine, the Faculty of Nutrition and Food Sciences and the Faculty of Pharmacy of the University of Porto (WHO registration numbers 2015/591370 and 2017/698514).

Keywords

Street food
Ready-to-eat food
Nutritional composition
trans-Fatty acids
Sodium
Potassium
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Contents

Abstract	iv
Authors.....	vii
Contributors.....	vii
Acknowledgements	viii
Abbreviations.....	viii
Executive summary.....	ix
Introduction	1
Street food in Dushanbe.....	1
Objectives	2
Methods.....	2
Street food vending sites and food offered.....	2
Analysis of street foods.....	5
Statistical analysis.....	6
Results.....	6
Distribution of selected markets and vending sites	6
Characteristics of vendors and vending sites	9
Characteristics of street food offered.....	10
Nutritional composition of street foods	13
Conclusions and policy implications.....	16
Building on the findings of this study.....	18
References.....	19
Annex 1.	21
Annex 2.	23

Tables

Table 1. Markets selling ready-to-eat food in Dushanbe	3
Table 2. Definition of food sample sets	5
Table 3. Food sampling randomization scheme	6
Table 4. Characteristics of street food vendors by district, Dushanbe	9
Table 5. Physical characteristics of stationary vending sites in Dushanbe, overall and by district	10
Table 6. Food offered at street food vending sites in Dushanbe, by type of vendor and district	10
Table 7. Characteristics of a sub-sample of the most common homemade foods offered at stationary vending sites in Dushanbe	11
Table 8. Types of fresh fruit offered at stationary vending sites in Dushanbe, overall and by district ...	12
Table 9. Types of beverages offered at stationary vending sites in Dushanbe, overall and by district ..	13
Table 10. Nutritional composition of street food samples evaluated	14

Figures

Fig. 1. Selected markets and street food vending sites in Dushanbe	7
Fig. 2. Varzob market zone and street food vending sites evaluated	7
Fig. 3. Mirzokhuja market zone and street food vending sites evaluated	7
Fig. 4. Zarafshon market zone and street food vending sites evaluated	7
Fig. 5. Kariyai-Bolo market zone and street food vending sites evaluated	7
Fig. 6. Shohmansour market zone and street food vending sites evaluated	8
Fig. 7. Korvon market zone and street food vending sites evaluated	8
Fig. 8. Sakhovat market zone and street food vending sites evaluated	8
Fig. 9. Sulтони Kabir market zone and street food vending sites evaluated	8
Fig. 10. 46th microregion zone and street food vending sites evaluated	8
Fig. 11. Yakkachinor market zone and street food vending sites evaluated	9



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Abbreviations

FAO Food and Agriculture Organization of the United Nations

NCD noncommunicable diseases

TFA *trans*-fatty acids

Executive summary

The Food and Agriculture Organization of the United Nations (FAO) and WHO have defined “street food” as “ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other similar places”. Especially in urban areas of low- and middle-income countries, street food is diverse and constitutes a widely accessible, inexpensive source of food, although they are often high-energy, dense foods, rich in fat, sugar and sodium. Previous research on street food mainly addressed food safety (hygiene and toxicity) and not their nutritional contribution to the diet of the population. Little or no research 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 eastern Europe and Central Asia. This report describes the characteristics of vending sites, the food they offer and the *trans*-fatty acids (TFA), sodium and potassium contents of the street foods most commonly available in Dushanbe, the capital city of Tajikistan.

Between April and May 2016, street food vending sites were identified by random and systematic sampling in public markets in the four districts of Dushanbe (Firdavsi, Sino, Shohmansour and Somoni). Ten markets were selected, in which 913 eligible vendors were interviewed and 140 food samples were collected and analysed. The food samples consisted of four portions of each of the 25 homemade and 10 industrial foods that were most commonly available. The food products were grouped into fruit (fresh or dry), beverages (any alcoholic or non-alcoholic drink) and other food, which was classified as homemade (foods cooked and/or prepared at home or in the street) or industrial (those produced by the food industry).

Both stationary (85.8%) and mobile (14.2%) street food-vending sites were identified. The vendors were mainly women (61.0%) and business owners (69.1%). Generally, food was sold on seven days a week (91.8% of sites) and during all four seasons (72.7% of sites), regardless of the weather (72.3% of sites).

Fruit was sold at 16.9% of the sites and only by stationary vendors. Food other than fruit was available at 77.6% of the sites (mobile: 90.0%; stationary: 75.5%), and beverages were sold by 34.6% of the vendors (mobile: 12.3%; stationary: 38.3%). Vendors who sold foods other than fruit sold only homemade products (overall: 61.9%; mobile: 84.6%; stationary: 57.4%), only industrial products (overall: 20.8%; mobile: 10.3%; stationary: 22.9%) or both homemade and industrial foods (overall: 17.3%; mobile: 5.1%; stationary: 19.7%). Soft drinks were the most commonly sold beverages, in 72.0% of stationary sites.

The mean TFA content per average serving of the most commonly sold foods was highest in industrial wafers (2.47 g), homemade cakes (1.84 g) and homemade soup (1.15 g), corresponding to 111.6%, 82.9% and 51.8% of the maximum recommended TFA daily intake (with a reference intake of 2000 kcal for an average adult), respectively. The highest mean sodium contents were found in homemade soup (2490 mg), homemade *plov* (1708 mg) and industrial sunflower seeds (1511 mg), corresponding to 124.5%, 85.4% and 75.5% of the maximum recommended daily intake, respectively. The mean potassium contents per serving were highest in homemade fried potatoes (1646 mg), homemade *plov* (713 mg) and homemade soup (527 mg), corresponding to 46.9%, 20.3% and 15.0% of the minimum recommended daily potassium intake.

This overview of street food in Dushanbe, Tajikistan, gives both positive and alarming results. Fresh fruit was widely available, helping to ensure that urban residents had ready, convenient access to this type of food, which is an essential part of a healthy diet. The type and nutritional composition of the other foods and drinks on offer, however, could clearly be improved. The wide availability of soft drinks (e.g. soda) is notable, as are the high levels of TFA and sodium found in both industrial and homemade foods.

Various practical policy options could be adopted to ensure healthier street food, including legislation to prohibit the use of hydrogenated fats and oils in food production and encouraging producers (e.g. bakers) and vendors to use less salt and healthier fats and oils in their recipes. Strategic thinking is thus required to improve the nutritional quality of street food in Tajikistan, as the foods are likely to be similar throughout the country, while maintaining the important cultural and community role that market vendors play in sustaining traditional diets and providing access to a diverse range of fresh food.



Introduction

Tajikistan is a landlocked country located in the south-eastern part of Central Asia, with about eight million inhabitants. It is a low–middle-income country with an annual gross domestic product of US\$ 7.85 billion (1). Substantial progress has been made in reducing poverty: between 2003 and 2014, the national poverty rate, which reflects the threshold for a person’s minimum needs for nutrition, clothing and shelter (2, 3) dropped from 73% to 31%. The population is widely dispersed throughout the country, with approximately 73% in rural areas (4). The capital city, Dushanbe, is the largest city in Tajikistan, with an estimated population of more than 770 000 (5). Life expectancy at birth is estimated to be 66.2 years for men and 73.2 years for women (3).

While communicable diseases, maternal, infant and child mortality and nutritional deficiencies account for a sizeable proportion of the overall number of deaths, noncommunicable diseases (NCDs) are by far the leading cause of death in Tajikistan; cardiovascular diseases account for 38% of all deaths, 8% are attributable to cancer, 4% to respiratory diseases and 1% to diabetes (6). About 31% of the population aged over 20 years are overweight, and 8.6% are obese, with the highest prevalence in the capital, Dushanbe (7). A recent survey showed that, at the national level, 21.2% of participants over 45 years had diabetes (8). The overall burden of NCDs is continuing to grow, in parallel with a decrease in childhood diseases, such as lower respiratory infections and preterm birth complications (9).

The countries in the WHO European Region have experienced a nutritional transition in recent decades as a result of growing urbanization and the globalization of the processed food supply. Associated dietary changes include a decrease in the consumption of foods rich in fibre, such as legumes, fruit, vegetables and whole grains, and more frequent intake of processed foods, which are more likely to be energy-dense and rich in fats, sugar and salt (10) and are known to be associated with a greater frequency of weight gain and NCDs. In particular, it has been shown consistently that industrially produced TFA and sodium increase the risk for cardiovascular diseases (11). WHO is advocating complete elimination of TFA from the global food supply (11), and public authorities in several countries have effectively banned or regulated their use (12). WHO also calls for a significant reduction in sodium intake (13). Most dietary intake of sodium is from salt added during the preparation and cooking of food or from processed foods, and initiatives to reduce intake take three main forms: product reformulation, raising public awareness and clear rules for product labelling. WHO recommends that the adult population take no more than 2 g of sodium per day, which corresponds to 5 g of salt (sodium chloride) per day, in order to lower their blood pressure and reduce their risk for cardiovascular disease (13). In most countries for which recent data are available, however, the dietary sodium intake is much higher (14). The intake of potassium, another key nutrient, is inversely associated with blood pressure, and WHO recommends a minimum daily intake of 3510 mg to reduce the risk for cardiovascular disease (15).

Fewer data on nutritional status, dietary behaviour and food composition are available for Tajikistan than for other countries. Nevertheless, representative surveys indicate a steady increase in overweight and obesity, especially in urban areas (16), while the prevalence of childhood under-nutrition (including wasting and stunting) has been decreasing or stable. The Government therefore adopted the National Health Strategy 2010–2020, which covers the prevention and control of NCDs, including the promotion of healthy diets (17).

Street food in Dushanbe

FAO and WHO have defined “street food” as “ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers especially in streets and other similar places” (18). Globally, street food is a cultural, social and economic phenomenon typical of urbanized areas, where life is becoming more sedentary and the time dedicated to cooking at home has been dramatically reduced (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 plays an important community role, facilitates access to high-fibre foods rich in micronutrients (fruit and vegetables) and may protect traditional foods and diets. Nevertheless, foods purchased from street vendors may also provide significantly more energy and nutrients, although this aspect has not been studied exhaustively. More attention to the nutritional quality of foods available from street vendors and markets is therefore needed.

Dietary changes at population level are likely to be reflected in the urban street food environment, which, in turn, may be expected to influence dietary habits. It is therefore important in the prevention of NCDs to characterize and monitor patterns of street food offers and purchasing. Most research in low- and middle-income countries has been on hygiene and food security (21), and little is known about the nutritional value of street food. In Tajikistan, there is generally no routine surveillance of food composition or dietary habits.

Street trade has always been well developed in this region of the world, commonly in typical Central Asian bazaars. In Tajikistan, food preferences and gastronomy reflect the multicultural background of people who travelled along the Silk Road and contributed to its culinary fabric (22). Unlike in some other countries in which research on street food has been conducted (20), very few vendors (“street hawkers”) operate directly on the streets in Dushanbe, except for vans selling dairy products from nearby farms and sellers of *gazirovka*, a traditional homemade drink. The majority of street food vendors are concentrated in enclosed spaces, such as bazaars, public markets and near the main bus terminals. Especially in central markets, food vendors usually serve clients who have come for other reasons; for example, in a public market for hardware, an entire section was occupied by food vendors. At such sites, street food vendors usually have more space and can sometimes even set up makeshift tables and chairs. An interesting characteristic of the local street food environment is units known as *dukoni*, which are restaurants serving traditional fast-foods (such as *sambusa*, a type of savoury pastry); they usually provide seating inside but also sell directly onto the street through an open window. Customers order from the pavement and eat standing up.

Objectives

The aim of this study was to characterize the street food environment of urban Dushanbe. The specific objectives were:

- to describe the characteristics of the vending sites;
- to characterize the food offered at selected vending sites; and
- to assess the TFA, sodium and potassium contents of ready-to-eat foods other than fruits sold in the street.

Methods

A cross-sectional evaluation of street food vending sites was conducted in Dushanbe between 4 April and 19 May 2016. The study protocol was approved by the Ethics Committee of the Institute of Public Health of the University of Porto and by the Tajikistan National Academy of Science and the Ministry of Health and Social Protection of Population.

Staff from the WHO Regional Office for Europe and project partners from the University of Porto recruited and trained local field researchers in conducting interviews over two weeks. The course was attended by five women and seven men who were staff members of the Republican Centres for Nutrition and Healthy Life Style and from the State Sanitary Epidemiology Surveillance Service. The training included lectures, demonstrations, practice interviews to pre-test the form for data collection and a pilot study in city markets that had not been selected for the study.

Street food vending sites and food offered

Eligibility criteria

We adopted the definition of street food proposed by FAO (18), which includes both prepared (e.g. sandwiches, salads) and cooked (e.g. boiled eggs, traditional dishes) products and raw foods for immediate consumption (e.g. fruit, nuts), even if these products were sometimes bought to be consumed later (e.g. at home or work).

Eligible vending sites were those that sold ready-to-eat food, including beverages and snacks, from any place other than a permanent business or establishment with four walls that did not sell directly to the street, operating in a predefined perimeter. Those eligible included both mobile vendors and sellers with semi-stationary or stationary vending units.

Sampling of vending sites

The vending sites were predominantly in markets and their surroundings. Therefore, for sampling, we first identified all public markets in Dushanbe (Table 1) from information provided by local authorities during the preliminary field visit. Approximately 25% of the markets in each of the four districts of Dushanbe (Shohmansour, Firdavsi, Sino and Somoni) were randomly selected, for a total of 10 markets.

Table 1. Markets in which ready-to-eat food is sold in Dushanbe

Name	District	Address	Types of items sold
Poitakht 90 ¹	Somoni	Surkhob	Food and miscellaneous
Poitakht	Somoni	Tursunzoda	Food and miscellaneous
Varzob	Somoni	m. Sarhadchiyon	Food and miscellaneous
Safariyon	Sino	Sino-110/1	Mainly food
Dehkon	Sino	Giprozem-15	Large food section and miscellaneous
Farovon	Sino	Jabor Rasulov 9-10	Mainly food
Mirzokhuja	Sino	Microrayon 32	Mainly food
Dusti	Sino	Jomi-32	Mainly food
Muroso ²	Sino	Muhamadiev-103	Mainly food
Zarafshon	Sino	Zarafshon M-1	Food and miscellaneous
Shomu sahar	Sino	Somoni	Mainly food
Filiali Dehkon	Sino	Market of 33 micrayon	Mainly food
Kariyai-bolo	Sino	Somoni-5	Mainly food
Balejavon	Sino	Fedina -13	Mainly food
Mahal-103	Sino	Market of 103 microreg.	Mainly food
Shohmansour	Shohmansour	Lohuti 12	Mainly food
Rohi Ohan	Shohmansour	Nesterov 3	Mainly food and miscellaneous
Marshal 2	Shohmansour	Ayni 269	Food
Aviator (old airport)	Shohmansour	Titov 29	Food
Korvon	Firdavsi	Yu. Obkhodnaya	Miscellaneous and food
Sakhovat Market	Firdavsi	Firdavsi 61	Food
Ganjina Market	Firdavsi	N. Karabaev 77	Clothing, miscellaneous and food
Panjsher	Firdavsi	N. Karabaev 78	Clothing, miscellaneous and food
Sultoni Kabir	Firdavsi	Abaya 4	Construction materials and food
Dushanbe-Shanghai	Firdavsi	Matrosov-2	Home miscellaneous and food
46th Microregion	Firdavsi	N. Karabaev 84/3	Food
Yakkachinor	Firdavsi	Mushfiki	Food
K. Fuchik	Firdavsi	Fuchik 4	Food

Name	District	Address	Types of items sold
No name ³	Firdavsi	Borbod 126	Mainly food
No name	Firdavsi	Yakkachinor 10	Mainly food
No name	Firdavsi	N. Karabaev 3rd passage 4	Mainly food
No name	Firdavsi	N. Karabaev 3rd passage 4	Mainly food
No name	Firdavsi	N. Karabaev 110	Mainly food
No name	Firdavsi	Firdavsi 61	Mainly food
No name	Firdavsi	Market of microregion 46	Mainly food
No name ³	Firdavsi	Firdavsi 59/2	Mainly food

Selected markets in bold

¹ This market was randomly selected, but data collection was not allowed by its administration, and the market was therefore replaced by the closest market in the same district (Varzob market).

² This market was randomly selected but was too small (fewer than 10 eligible vending sites) and was therefore replaced by the closest market in the same district (Zarafshon market).

³ These two markets were randomly selected but were no longer working when data collection started and were therefore replaced by the closest markets in the same district (Yakkachinor and Sakhovat markets).

In each market, we defined a 500-m zone around its centre as the study area. One of the markets (Korvon) was larger than 500 m in diameter, and the study area therefore comprised the whole market, limited by the streets around its perimeter. Only the vending sites on the side of the streets closest to the market were evaluated.

All eligible vendors in the study areas were invited to participate.

Stratified sampling ensured representation of all districts, proportionally to the number of markets. The final sample comprised six markets selling “only or mainly food products” out of a total of 25 and four selling “food and non-foodstuff” out of a total of 11.

The markets were evaluated on consecutive days, in the order in which they are listed in Table 1. Pairs of field researchers canvassed each study area for street food vendors by entering the market through the main entrance and looking for eligible food vending sites. After canvassing the whole market, they moved to the surroundings included in the zone. After registering the GPS coordinates of each vending site, they approached the vendors, explained the study objectives and procedures and asked for their general oral consent to participate in data collection. When the vendor agreed, the interviewers administered the structured questionnaire (approximately 10 min) on food vending activity and the food offered. In order to avoid interviewing the same vendor twice and to 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 vendor’s consent, at the completion of each interview. The researchers were instructed to answer any questions the vendors might have about the purposes of the study, and leaflets describing the study were available.

Of 1166 street food vendors approached, 1100 agreed to participate (94.3% participation rate). Vendors who sold only fruit were excluded from the analysis, leaving 913 vending sites in the final sample.

Characterization of vending sites and food offered

The data collected included certain characteristics of the food vendors (e.g. sex and ownership) and the vending sites. The physical characteristics (e.g. stand, truck or cooler) and business activity (e.g. working days, number of employees, access to clean water and electricity) were recorded by direct observation and face-to-face interviews with the vendors.

Data were also collected on the ready-to-eat foods offered (e.g. type of food products, size of portions, preparation and packaging). The types were grouped as:

- fruit: raw fleshy or dry products;
- foods other than fruit: all foods other than fruit and beverages; and
- beverages: any alcoholic or non-alcoholic drink.

Food other than fruit was further classified as homemade (cooked and/or prepared at home or on the street, even if industrial ingredients were used) or industrial (produced by the food industry and sold without modification). Beverages were classified into: soft drinks, water, fruit juice-based drinks, fresh fruit juice, milk, alcoholic beverages, energy drinks, coffee, tea and other beverages.

Analysis of street foods

Selection, collection and processing of food samples

After characterization of the vending sites and the food offered, four samples each of the 25 most frequently available homemade foods and the 10 most frequently available industrial foods were selected for analysis, for a total of 140 samples. The samples collected corresponded to one unit or the usual dose sold. The samples of food sold in small portions (e.g. small snacks, biscuits) contained more than one portion, corresponding to the usual purchasing or consumption pattern. Examples of each of the foods sampled are shown in the annexes.

For sampling, the selected homemade foods were grouped into sets of five, while industrial foods were grouped into sets of two (Table 2), each food set to be collected from four different vending sites. Food samples from two sets of homemade and two sets of industrial foods were collected (Table 3) in each market for 10 consecutive days, including weekends, in the same order used for initial assessment of the markets. Each day, 14 samples of different foods were collected, until 140 samples had been accrued.

Table 2. Composition of food sample sets

Homemade foods	Set	Industrial foods	Set	Homemade foods	Set	Industrial foods	Set
1	A	1	F	16	D		
2		2		17			
3		3	18				
4		4	19				
5		5	20				
6	B	6	H	21	E		
7		7	I	22			
8		8	J	23			
9		9		24			
10		10		25			
11	C						
12							
13							
14							
15							

Table 3. Food sampling randomization scheme

Day	Market	Name	Homemade foods		Industrial foods	
1	1	Mirzokhuja market	A	B	F	G
2	2	Yakkachinor market	C	D	H	I
3	3	Kariyai-Bolo market	E	A	J	F
4	4	46th Microregion market	B	C	G	H
5	5	Zarafshon market	D	E	I	J
6	6	Varzob market	A	B	F	G
7	7	Sultoni Kabir market	C	D	H	I
8	8	Sakhovat market	E	A	J	F
9	9	Korvon market	B	C	G	H
10	10	Shohmansour market	D	E	I	J

The vending sites at which food samples were selected by the random route procedure, starting with a random selection of GPS coordinates in each study area, from which the researchers moved northwards, then clockwise towards the east, continuing through the south and west to the limits of the study zone or a physical barrier (e.g. a wall or canal), until they reached vending sites at which the selected foods were available. In each market and on each collection day, only one food sample was obtained from the same vendor, the most common foods being selected first.

Four representative aliquots of each sample were homogenized or submitted to mechanical grinding, weighed and packed individually in labelled, rigid plastic containers. After packaging, each container was weighed again and stored in a freezer (at $-18\text{ }^{\circ}\text{C}$) until analysis. Before analysis, the samples were defrosted, and their weight was compared with that before freezing to detect moisture loss during storage and shipping. They were then homogenized and analysed for TFA, sodium and potassium content. For analysis of TFA, the fat fraction was extracted from the food with organic solvents, and a portion was converted to fatty acid methyl esters and separated by gas chromatography, as described elsewhere (23). Sodium and potassium were analysed by flame photometry according to the method of Vieira et al. (24).

Statistical analysis

The street food environment was characterized overall, in the four districts and in the 10 markets by descriptive statistics and spatial analysis. The locations of the vending sites were mapped, and their characteristics and those of the food they sold are presented as proportions.

The nutritional composition of each food is presented as the mean and range per serving and as the mean contribution to the recommended daily intake of each nutrient. Mean serving sizes, calculated as the mean of the individual doses of each food collected, are also presented.

Results

Distribution of selected markets and vending sites

Fig. 1 shows the distribution of the selected markets and street food vending sites in Dushanbe. Figs 2–11 show the 500-m zone of each market and the vending sites identified in each. Within each market, the distribution of the vending sites depended on the configuration and type of the market and ranged from those predominantly concentrated in specific sections, as in the Kariyai-Bolo, Mirzokhuja, Varzob and Zarafshon markets, to those scattered across wider areas, as in the 46th Microregion, Kabir, Korvon, Sakhovat, Shohmansour, Sultoni and Yakkachinor markets. As previously mentioned, the area of Korvon market exceeded the 500-m buffer (Fig. 7).

Fig. 1. Selected markets and street food vending sites in Dushanbe, Tajikistan

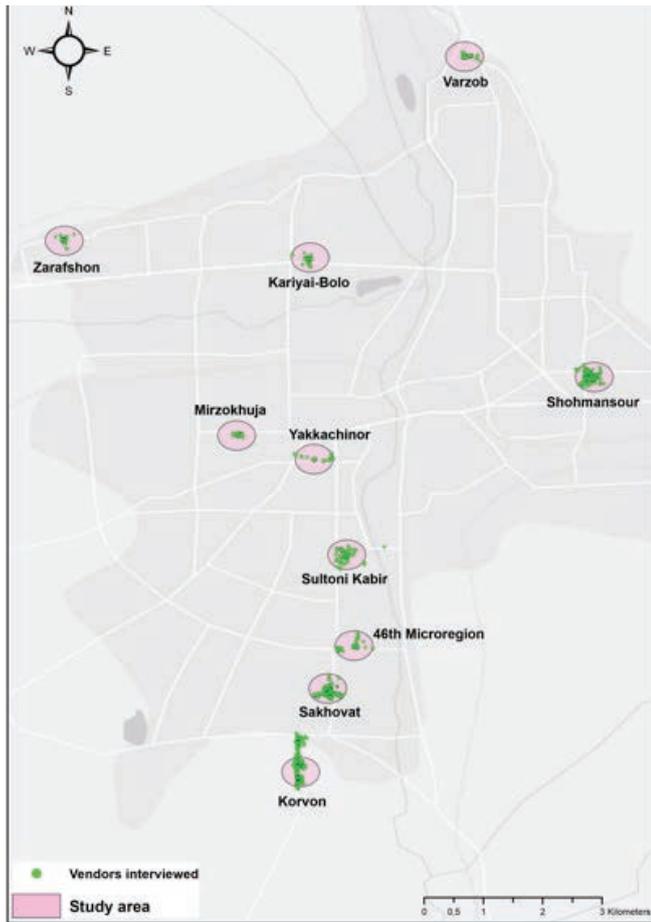


Fig. 2. Varzob market zone and street food vending sites evaluated

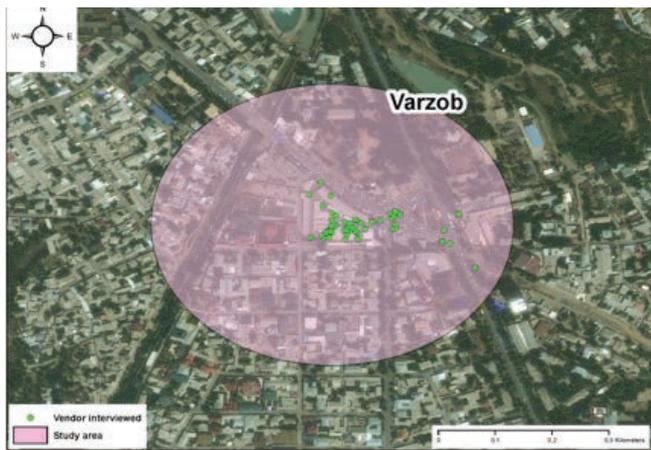


Fig. 3. Mirzokhuja market zone and street food vending sites evaluated



Fig. 4. Zarafshon market zone and street food vending sites evaluated



Fig. 5. Kariyai-Bolo market zone and street food vending sites evaluated

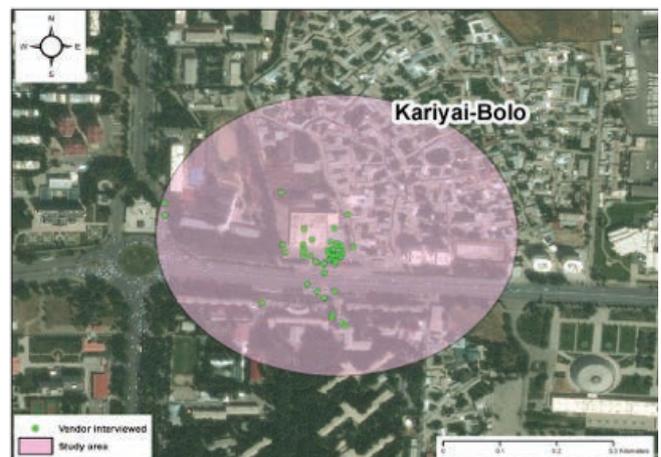


Fig. 6. Shohmansour market zone and street food vending sites evaluated

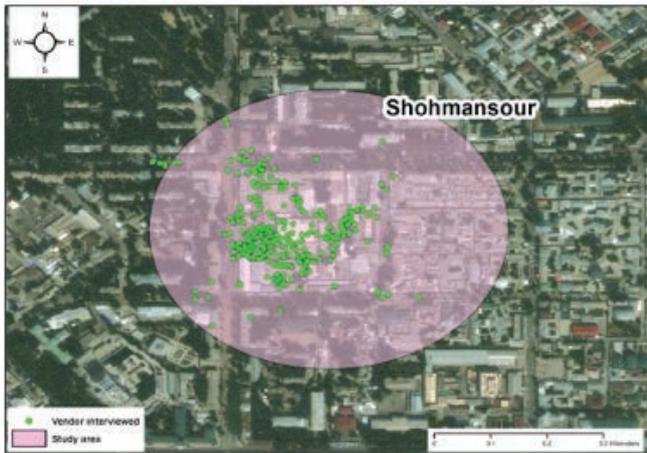


Fig. 8. Sakhovat market zone and street food vending sites evaluated

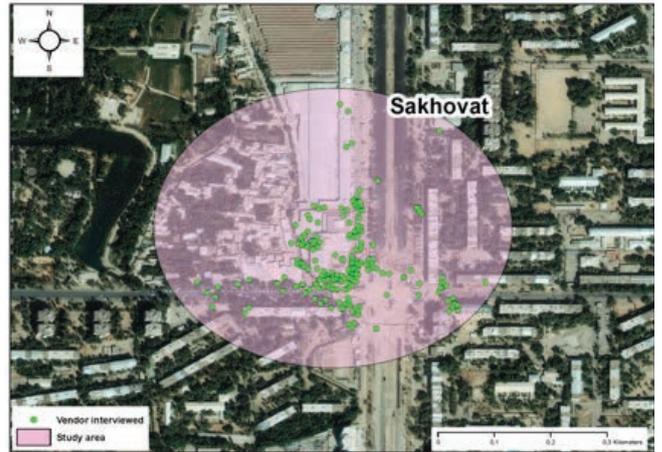


Fig. 7. Korvon market zone and street food vending sites evaluated

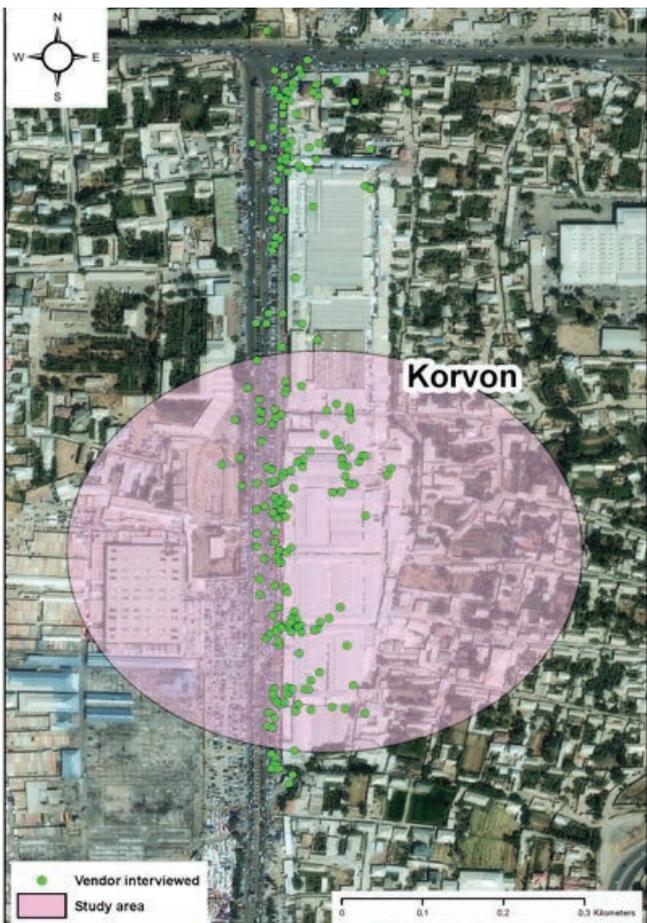


Fig. 9. Sultoni Kabir market zone and street food vending sites evaluated

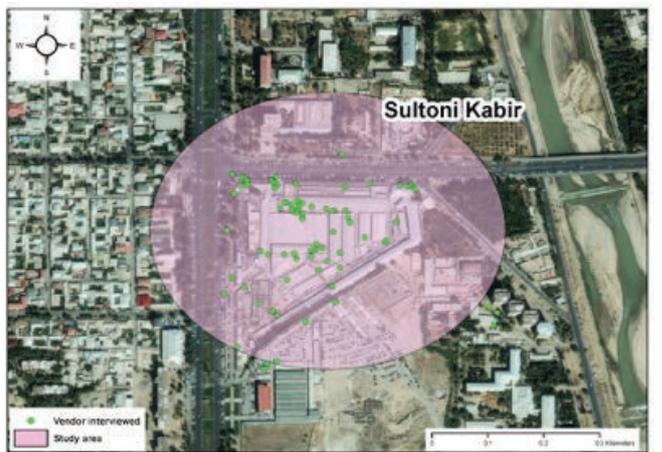


Fig. 10. 46th Microregion market zone and street food vending sites evaluated



Fig. 11. Yakkachinor market zone and street food vending sites evaluated



Characteristics of vendors and vending sites

The characteristics of the street food vendors are shown in Table 4. The majority were women (61.0%), operated a stationary vending site (85.8%) and owned their business (69.1%). Most of the street food vendors interviewed were in the Firdavsi district (57.3%).

Table 4. Characteristics of 913 street food vendors in Dushanbe, overall and by district

Characteristic	Total (%)	By district (%)			
		Firdavsi (n = 523)	Shohmansour (n = 248)	Sino (n = 98)	Somoni (n = 44)
Sex					
Female	61.0	61.2	59.7	54.1	81.8
Male	39.0	38.8	40.3	45.9	18.2
Type of site					
Stationary	85.8	78.0	95.2	98.0	97.7
Mobile	14.2	22.0	4.8	2.0	2.3
Owner					
Yes	69.1	65.0	72.9	65.6	58.1
No	30.9	35.0	27.1	34.4	41.9

The stationary vending sites (85.8%; n = 783) were of several types (Table 5). The most prevalent was a bench with a board on which the foods were displayed (31.7%), followed by the *dukoni* (22.4%). A bench with a board was the most common in three districts (39.5% in Somoni, 43.8% in Sino and 47.0% in Shohmansour), whereas the *dukoni* was more frequent (26.5%) in Firdavsi.

Table 5. Physical characteristics of 783 stationary vending sites in Dushanbe, overall and by district

Physical characteristic	Total (%)	By district (%)			
		Firdavsi (n = 408)	Shohmansour (n = 236)	Sino (n = 96)	Somoni (n = 43)
Bench with board	31.7	19.1	47.0	43.8	39.5
Dukoni	22.4	26.5	17.8	16.7	20.9
Stand, stall or booth	14.4	13.7	14.4	15.6	18.6
Tables with chairs	8.4	8.6	7.2	13.5	2.33
On the floor	8.1	13.0	2.5	2.1	4.7
Others	7.5	11.3	4.7	2.1	0.0
Van	5.1	4.9	4.7	5.2	9.3
Push cart	2.4	2.9	1.7	1.0	4.7

Almost all the stationary vending sites had access to clean water (97.9%). Another important feature of sanitation is access to a toilet, which was reported by 97.5% of the street food vendors at stationary sites. When vendors were asked where they usually washed their hands during the work day, 69.1% replied “bathroom” and 35.9% replied “basin”. Only two vendors reported that they had no place to wash their hands. Three of every five stationary vending sites reported access to electricity. Most vendors reported that they sold food throughout the week (91.8%) and during all four seasons (72.7%), regardless of the weather (72.3%).

Characteristics of street food offered

Fruit was available at 14.5% of the vending sites and was sold only by stationary vendors. Beverages were sold by 34.6% of sites (mobile: 12.3%, stationary: 38.3%), whereas food other than fruit was available at 77.6% sites (mobile: 90.0%, stationary: 75.5%). The distribution of each category of food in each district was similar to the overall distribution, except that fruit was sold at 24.6% of vending sites in Shohmansour and beverages at 41.3% of sites in Firdavsi (Table 6).

Table 6. Foods offered at 913 street vending sites and by district in Dushanbe, by type of vendor and district

Food offered	Total (%)			By district (%)			
	Total n = 913	Mobile (n= 130)	Stationary (n=783)	Firdavsi (n = 523)	Shohmansour (n = 248)	Sino (n = 98)	Somoni (n = 44)
Fruit	14.5%	0.0	16.9	10.3	24.6	12.2	11.4
Food other than fruit	77.6%	90.0	75.5	78.6	71.0	88.8	77.3
Industrial		10.3	22.5	14.6	26.1	37.9	17.6
Homemade		84.6	57.3	66.9	59.7	41.4	67.7
Homemade and industrial		5.1	20.0	18.5	14.2	20.7	14.7
Beverages	34.6%	12.3	38.3	41.3	23.8	30.6	25.0

Sites selling only homemade food were more frequent (mobile: 84.6%, stationary: 57.3%) than those selling only industrial foods (mobile: 10.3%, stationary: 22.5%). Both types of food were sold at 5.1% of mobile sites and 20.0% of stationary vending sites in all district except Sino, where only industrial and only homemade foods were sold in similar proportions of vending sites (37.9% and 41.4%, respectively).

The most common homemade foods sold by stationary vendors in the streets of Dushanbe were breads (28.4%), hot dogs (20.9%), *sambusa* (a traditional savoury pastry containing meat) (20.0%) and *piroshky* (a traditional savoury pastry containing meat and/or vegetables) (18.9%). Table 7 shows the preparation, packaging and storage temperature of these foods. Most stationary vendors sold foods prepared on the same day (ranging from 60.0% of breads and 98.9% of hot dogs),

prepared at the vending site (from 6.6% of breads and 98.9% of hot dogs), manufactured by employees (from 75.9% of breads and 94.6% of hot dogs) and unpackaged (from 83.3% of breads and 100% of *sambusa*). Generally, hot dogs (65.6%) were stored in a warm environment, while *sambusa* (64.8%) and *piroshky* (69.8%) were more frequently stored at room temperature.

Table 7. Characteristics of a sub-sample of the most common homemade foods offered at stationary vending sites in Dushanbe

Characteristic	Hot dogs ^a		Sambus ^a		Piroshky		Bread ^a	
	(n = 93)	(%)	(n = 91)	(%)	(n = 86)	(%)	(n = 30)	(%)
Date of preparation								
Same day	92	(98.9)	87	(95.6)	85	(98.8)	18	(60.0)
One day before		-	1	(1.1)	1	(1.2)	5	(16.7)
Two days before	1	(1.1)	3	(3.3)		-	7	(23.3)
More than two days before		-		-		-		-
Place of preparation								
At home	1	(1.1)	10	(11.0)	4	(4.6)	11	(36.6)
At the vending site	92	(98.9)	76	(83.5)	79	(91.9)	2	(6.6)
Both at home and at the vending site		-		-	2	(2.3)		-
Bought from another vendor or shop		-	5	(5.5)		-	17	(56.6)
Restaurant or cafeteria		-		-	1	(1.2)		-
Food preparer								
Employee	88	(94.6)	80	(87.9)	76	(89.4)	22	(75.9)
Owner	1	(1.1)	2	(2.2)	4	(4.7)	1	(3.5)
Relative	4	(4.3)	4	(4.4)	5	(5.9)		-
Factory		-	4	(4.4)		-		-
Bakery		-		-		-	6	(20.7)
Imported		-	1	(1.1)		-		-
Do not know		-		-		-	1	(3.5)
Packaging								
Industrial		-		-	1	(1.1)	2	(6.7)
Manual	1	(1.1)		-	1	(1.1)	3	(10.0)
None	92	(98.9)	91	(100)	84	(97.7)	25	(83.3)
Storage temperature at time of sale								
Cold		-		-		-		-
Warm	61	(65.6)	32	(35.2)	26	(30.2)		-
Room temperature	32	(34.4)	59	(64.8)	60	(69.8)	30	(100.0)

^aInformation was available for only 97.9% of the sample of hot dogs and 18.9% of the sample of bread because of misclassification during data collection.



Fruit

Of the 132 vending sites selling fruit (14.5%), most sold fresh fruit (90.9%); the remainder sold dried fruit. A wide variety of fresh fruit was available (Table 8), the most common being apples (64.2%), berries (50.0%), pears (44.2%) and mandarins (43.3%).

Table 8. Types of fresh fruit offered at 120 stationary vending sites in Dushanbe, overall and by district

Type of fruit	All vending sites (%)	By district (%)			
		Firdavsi (n = 51)	Shohmansour (n = 54)	Sino (n = 10)	Somoni (n = 5)
Apples	64.2	39.2	85.2	60.0	100.0
Berries	50.0	62.8	42.6	40.0	20.0
Pears	44.2	19.6	68.5	40.0	40.0
Mandarins	43.3	27.4	53.7	70.0	40.0
Oranges	37.5	21.6	59.3	10.0	20.0
Bananas	35.0	39.2	27.8	40.0	60.0
Kiwis	33.3	21.6	46.3	20.0	40.0
Other fruit ^a	28.3	35.3	27.8	10.0	0.0
Lemons	27.5	39.2	13.0	30.0	60.0
Cherries	26.7	31.4	27.8	10.0	0.0

^a Pineapples, grapes, apricots, coconuts, melons, grapefruit and pomegranates

Beverages

Various beverages were available at stationary street food vending sites (Table 9). The most common were soft drinks (72.0%), water (42.0%), coffee (34.0%) and tea (31.3%); bottled water represented 97.6% of the water sold. The proportions were similar, except in Sino, where coffee accounted for 16.7% and milk for 20.0% of the beverages sold, and Somoni, where soft drinks accounted for 90.9% and energy drinks for 18.2% of the beverages sold (alcoholic beverages were not sold) (Table 9).

Table 9. Types of beverages offered at 300 stationary vending sites in Dushanbe, overall and by district

Type of beverage	All vending sites (%)	By district (%)			
		Firdavsi (n = 201)	Shohmansour (n = 58)	Sino (n = 30)	Somoni (n = 11)
Soft drinks	72.0	70.7	74.1	70.0	90.9
Water	42.0	46.3	31.0	43.3	18.2
Coffee	34.0	37.3	29.3	16.7	45.5
Tea	31.3	34.3	24.1	26.7	27.3
Other beverages	27.3	30.4	20.7	20.0	27.3
Compot ^a	24.0	26.4	19.0	16.7	27.3
Fruit juice-based drinks	19.7	19.4	19.0	20.0	27.3
Alcoholic beverages	8.7	8.5	10.3	10.0	0.0
Energy drinks	5.3	5.5	1.7	6.7	18.2
Milk	4.3	2.0	5.2	20.0	0.0
Fresh fruit juices	1.3	1.0	1.7	3.3	0.0

^a A traditional homemade fruit beverage

Nutritional composition of street foods

The nutritional composition of the 35 most commonly available foods other than fruit collected in the streets of Dushanbe is shown in Table 10. A wide variety of food products was analysed, including traditional foods, various types of bread, cakes, pastries and snacks. The TFA, sodium and potassium contents varied substantially among the products analysed, with high TFA and sodium contents in both industrial and homemade foods.



Table 10. Nutritional composition of street food samples

Food	N	Mean serving size (g)	Nutrient					
			Trans-fatty acids (TFA)		Sodium		Potassium	
			Mean (min-max) (g/serving)	% of recommended ^a	Mean (min-max) (mg/serving)	% of recommended ^a	Mean (min-max) (mg/serving)	% of recommended ^a
Industrial foods								
Biscuits ("cookies")	4	33	0.32 (0.03–0.80)	14.3	56 (29.5–88)	2.8	36 (21–72)	1.0
Biscuit rolls	3	57	0.37 (0.06–0.96)	16.8	154 (138–170)	7.7	90 (56–103)	2.6
Bread	3	50	0.01 (0.00–0.02)	0.4	240 (234–243)	12.0	75 (56–87)	2.1
Crisps	3	20	0.05 (0.02–0.08)	2.6	314 (69–717)	15.7	93 (18–233)	2.6
Chocolate	4	54	0.04 (0.01–0.08)	2.2	76 (11–193)	3.8	120 (54–236)	3.4
Corn snacks	4	38	0.02 (0.01–0.04)	1.0	1 (0–5)	0.1	22 (17–28)	0.6
Dried bread	3	39	0.01 (0.01–0.01)	0.4	566 (521–601)	28.3	74 (41–96)	2.1
Sunflower seeds	4	51	0.02 (0.01–0.03)	1.0	151105 (812–2218)	75.5	305 (226–447)	8.7
Sweet pastries	4	53	0.78 (0.52–1.37)	35.2	85 (30–133)	4.2	51 (29–84)	1.4
Wafers	3	107	2.47 (1.79–3.44)	111.6	141 (70–238)	7.0	100 (67–133)	2.9
Homemade foods								
<i>Baklava</i>	4	88	0.35 (0.30–0.39)	15.6	97 (71–122)	4.9	147 (119–169)	4.2
<i>Belyashi</i>	4	81	0.10 (0.05–0.21)	4.5	371 (243–463)	18.5	76 (71–85)	2.2
Bread (<i>chapoti</i>)	4	120	0.00 (0.00–0.00)	0.1	745 (685–780)	37.2	140 (115–163)	4.0
Bread (e.g. buckwheat)	4	120	0.00 (0.00–0.00)	0.1	557 (470–620)	27.9	231 (182–279)	6.6
Bread (<i>fatir</i>)	4	120	0.09 (0.02–0.16)	4.4	482 (325–606)	24.1	125 (95–141)	3.6
Bread (<i>girdacha</i>)	4	120	0.00 (0.00–0.01)	0.2	567 (429–703)	28.3	154 (121–194)	4.4
Bread (<i>kulcha</i>)	4	137	0.02 (0.01–0.04)	1.1	723 (522–839)	36.1	156 (135–189)	4.4
Bread (<i>lepyoshka</i>)	4	120	0.00 (0.00–0.00)	0.1	560 (456–656)	28.0	121 (108–141)	3.4
Bread (<i>samarkand</i>)	4	120	0.01 (0.00–0.02)	0.4	737 (699–772)	36.9	134 (126–146)	3.8

Food	Nutrient									
	N	Mean serving size (g)	Trans-fatty acids (TFA)		Sodium		Potassium		Mean (min-max) (mg/serving)	% of recommended ^a
			Mean (min-max) (g/serving)	% of recommended ^a	Mean (min-max) (mg/serving)	% of recommended ^a	Mean (min-max) (mg/serving)	% of recommended ^a		
Buns	4	60	0.43 (0.01–0.10)	2.2	50 (0–97)	2.5	68 (51–94)	1.9		
Cakes	4	125	1.84 (0.43–2.70)	82.9	144 (45–275)	7.2	117 (62–139)	3.3		
Chebureki	4	91	0.13 (0.07–0.16)	5.8	500 (402–606)	25.0	97 (73–121)	2.8		
Fried fish	4	96	0.15 (0.04–0.27)	7.1	633 (109–872)	31.6	264 (55–535)	7.5		
Fried potatoes	4	226	0.17 (0.07–0.40)	7.9	1108 (708–1483)	55.4	1646 (1373–1922)	46.9		
Hamburgers	4	204	0.13 (0.08–0.25)	6.0	871 (510–1322)	43.5	309 (266–349)	8.8		
Hot dogs	4	186	0.07 (0.02–0.18)	3.4	757 (442–1152)	37.9	278 (168–366)	7.9		
Ice cream	4	48	0.05 (0.03–0.09)	2.1	47 (30–86)	2.3	54 (45–71)	1.5		
<i>Kurut</i>	4	18	0.08 (0.01–0.12)	4.0	559 (50–1324)	28.0	44 (24–80)	1.2		
<i>Piroshky</i>	4	59	0.05 (0.02–0.13)	2.8	194 (158–228)	9.7	75 (50–102)	2.1		
<i>Plov</i>	4	491	0.38 (0.14–0.77)	17.2	1708 (1176–2364)	85.4	713 (440–989)	20.3		
<i>Sambusa</i>	4	94	0.12 (0.07–0.20)	5.4	454 (338–619)	22.7	117 (110–123)	3.3		
Sausage buns	4	50	0.04 (0.02–0.06)	2.1	298 (254–331)	14.9	61 (37–88)	1.7		
<i>Shawarma</i>	4	277	0.13 (0.09–0.15)	5.9	1257 (796–1588)	62.9	421 (128–632)	12.0		
Soup	4	632	1.15 (0.43–2.64)	51.8	2490 (1101–3724)	124.5	527 (261–861)	15.0		
Sweet pastries	3	39	0.3 (0.08–0.55)	17.4	89 (51–110)	4.4	35 (31–38)	1.0		

TFA, *trans*-fatty acids

^a Percentages of WHO daily recommendations were computed for an average adult, assuming a daily intake of 2000 kcal: TFA, < 1% total energy (11); Na, < 2000 mg (13); K, ≥ 3510 mg (15)

The mean TFA content per serving was highest in industrial wafers (2.47 g), homemade cakes (1.84 g), homemade soup (1.15 g) and industrial sweet pastries (0.78 g), corresponding to 111.6%, 82.9%, 51.8% and 35.2% of the recommended maximum daily intake (with a reference daily intake of 2000 kcal for an average adult). The mean TFA content per serving was lowest in certain types of homemade bread, such as *chapoti*, buckwheat and *lepyoshka*, corresponding to 0.1% of the recommended intake, and *girdacha*, corresponding to 0.2%.

The highest mean sodium contents per serving were observed in homemade soup (2490 mg), homemade *plov* (1708 mg), industrial sunflower seeds (1511 mg) and homemade *shawarma* (1257 mg), corresponding to 124.5%, 85.4%, 75.5% and 62.9% of the recommended maximum daily intake, respectively. The lowest mean sodium contents per serving were observed in industrial biscuits (56 mg), homemade buns (50 mg), homemade ice-cream (47 mg) and industrial corn snacks (1 mg), corresponding to 2.8%, 2.5%, 2.3% and 0.1% of the recommended maximum daily intake, respectively.

The mean potassium contents per serving were highest in fried potatoes (1646 mg), *plov* (713 mg), soup (527 mg) and *shawarma* (421 mg), corresponding to 46.9%, 20.3%, 15.0% and 12.0% of the recommended minimum daily intake. The mean potassium contents per serving were lowest in homemade kurut (44 mg), industrial biscuits (36 mg), homemade sweet pastries (35 mg), industrial corn snacks (22 mg), corresponding to 1.2%, 1.0%, 1.0% and 0.6% of the daily recommendations for minimum potassium intake.

The results show that a number of street foods available in Dushanbe are nutritionally inadequate. A single portion of sweet snacks, homemade or industrial sweet pastries, homemade cakes, wafers or biscuit rolls would provide an individual with an amount of TFA close to exceeding the daily maximum recommended. A serving of soup, for example, would provide 51.8% of the daily TFA intake and 124.5% of the maximum daily sodium intake. Main dishes and their components had particularly high sodium contents, homemade fried potatoes, *plov* or *shawarma* providing over 50% of the recommended maximum daily intake. Despite their high sodium content, these foods provide a considerable proportion of the recommended daily potassium intake.

Conclusions and policy implications

Street food is abundant in Dushanbe, Tajikistan, and was available on all the markets in the city that were evaluated. Of the 913 eligible vendors interviewed, most were women, worked at stationary vending sites and owned their business. Most of the vendors had access to basic sanitary facilities.

Fruit was sold at 14.5% of the eligible street food vending sites, while food other than fruit was sold at 77.6% and beverages at 34.6%. A variety of fresh fruit was available, those most commonly offered being apples, berries and pears. Street food may therefore be an important source of these foods for urban populations, providing, for example, good sources of fibre and essential micronutrients. Any policy on street food should take this finding into consideration, to ensure that urban residents continue to have ready access to fruit and vegetables, rather than encouraging a shift to non-core processed foods that are potentially high in calories, saturated fats, TFA, free sugars or salt, with little dietary fibre.

Many types of beverages were sold on the street, although soft drinks were the most frequently available, at almost three of every four sites selling beverages. This is a highly relevant finding, particularly in view of the increasing overweight and obesity in urban areas. In many countries, soft drinks are the main source of added sugar in the diet, contributing to excess energy intake (25). This situation should be monitored carefully to ensure that consumption does not increase exponentially.

Homemade foods were the most common foods other than fruit, although industrial foods were also sold frequently, mainly at stationary vending sites. The 35 most commonly available foods other than fruit in the streets of Dushanbe were traditional dishes, many types of bread, cakes, pastries and snacks. The TFA, sodium and potassium contents varied substantially, with high TFA and sodium contents in both industrial and homemade foods.

This study shows that the nutritional value of street foods available in Dushanbe could be improved. It underscores the need for policies to enhance the nutritional quality of food in order to prevent the occurrence of diet-related NCDs in this country. A common policy response is to introduce restrictions on informal street vending and to upgrade or build new marketplaces that are under greater scrutiny and control. This might improve food hygiene and safety (20), but it is not immediately clear whether such a policy would be desirable from the perspective of nutrition and food access, not to mention cultural protection and community building. Shifting consumers from markets to supermarkets or more formal markets might not improve the nutritional quality of the foods purchased nor the overall balance of diets. New markets are often located far from the consumers they are intended to serve, and the fees for stalls in upgraded markets are often high, which inevitably changes the types of food offered, consumer access to healthy foods (e.g. fruit) and their prices (20). Furthermore, frequent shopping at supermarkets in some parts of the world is associated with greater consumption of soft drinks, snack foods, processed meats, western-style bakery items, instant foods and deep-fried food (26). Careful consideration should therefore be given to applying a policy that would encourage the population to stop buying street food and using informal markets and instead to shop at supermarkets or shops. Governments might provide incentives to vendors to use healthier ingredients, educate and train them to limit the amount of salt in the food they prepare and encourage them to use healthier fats for cooking.

The Government of Tajikistan could play a strong regulatory role in reducing the amount of TFA in food. A number of countries in the WHO European Region have passed regulations to limit the TFA content of food to 2 g per 100 g of fat, in practice eliminating the use of industrially produced TFA in cooking and food manufacture (27). The Eurasian Economic Union recently adopted similar legislation, which will be in force by 2018; this will ensure that Tajikistan aligns its practices with those of its regional economic partners (28). The approach would apply to all fats and oils used in the manufacture or preparation of foods and thus affect not only street food but all foods equally, benefitting the population at large.

A further step would be to encourage manufacturers and vendors to use healthier fats and less salt in preparing food. Thus, they would be encouraged not to replace TFAs with saturated fats but prefer *cis*-unsaturated fats, which are more resistant to high temperatures, and to reduce the amount of salt in cooking. Street vendors and small-scale manufacturers are extremely price conscious, given the nominal profit they make, and their choice of cooking fat is likely to be strongly influenced by price. Governments should increase the affordability of healthier oils for use by street vendors and manufacturers (e.g. in frying or pastry preparation) so as to significantly improve dietary intake (29). For example, the “*Healthier Hawker Food Programme*” in Singapore encouraged vendors to change from palm oil to healthier vegetable oils and provided financial incentives for doing so.

With regard to salt reduction, a two-pronged effort might be required in Tajikistan. One would be to encourage local producers and manufacturers (e.g. large bakeries that supply bread throughout the city and producers of processed meat and dairy products) gradually to reduce the amount of salt used in food preparation. Quantified targets for the salt content of different product categories might be required, and mandatory maximum limits on the salt content by product category might be considered. A second approach would be to increase the awareness of vendors who prepare ready-to-eat foods of the association between salt and health and to encourage them to use less salt and to replace it with flavourings such as herbs and spices. Consideration should also be given to improving the labelling requirements for industrial (often packaged) foods that are sold by vendors, to ensure that consumers are aware of the nutritional content and can make more informed choices. This would also allow the Tajikistan authorities to fill their international obligations and requirements under World Trade Organization membership agreements and global food standards, such as those of the Codex Alimentarius.



Building on the findings of this study

The priorities that the Government of Tajikistan might consider on the basis of this study are to:

- introduce statutory legislation for a mandatory limit on the TFA content of foods, based on models of good practice from European Union Member States and the Eurasian Economic Union;
- prepare a national salt reduction strategy that includes either targets for salt reduction or mandatory maximum limits by product category;
- explore the possibility of supporting manufacturers and vendors in shifting to healthier fats in cooking and manufacture, including by cooperating with Government authorities responsible for food and agriculture;
- develop an outreach programme for vendors to raise their awareness about the risks of too much salt in foods and to provide tips on easy alternatives;
- monitor the nutritional composition of foods again in the next four to six years to evaluate progress; and
- In addition, consider the importance of other nutrients, such as sugar and saturated fat, in all activities to promote healthier diets such as public awareness, product reformulation and labelling.

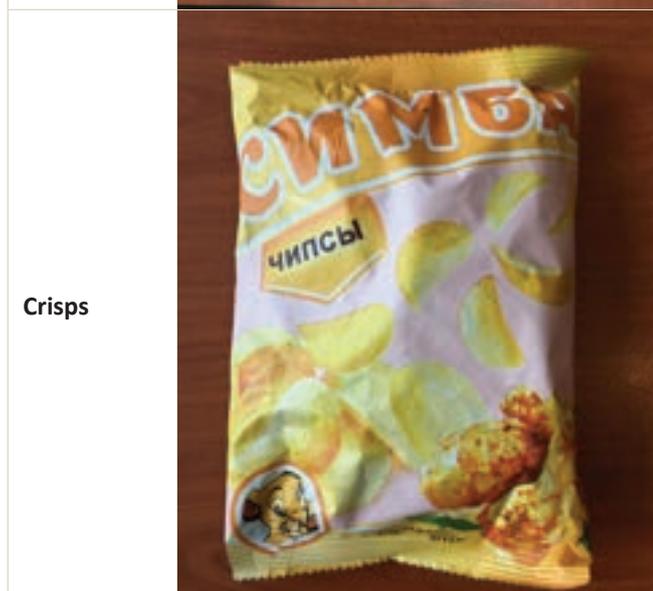
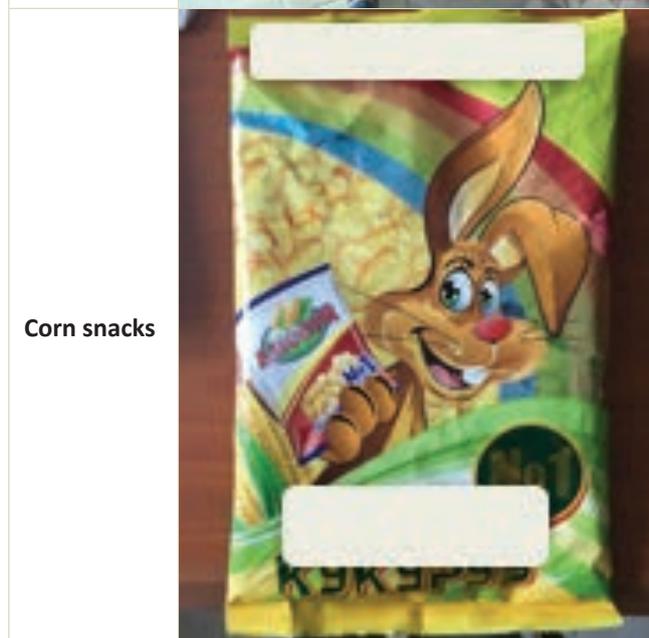
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Annex 1.

Industrial foods collected at street food vending sites in Dushanbe



Sweet pastries



Wafers

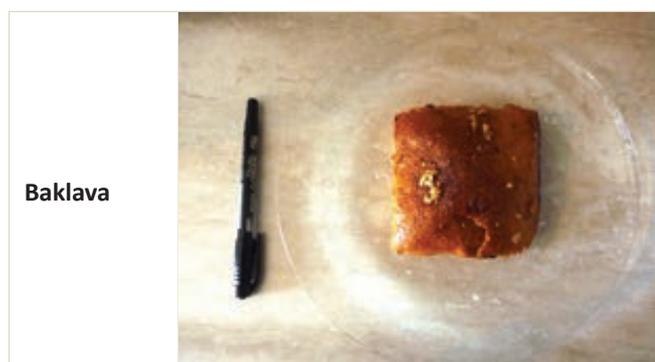


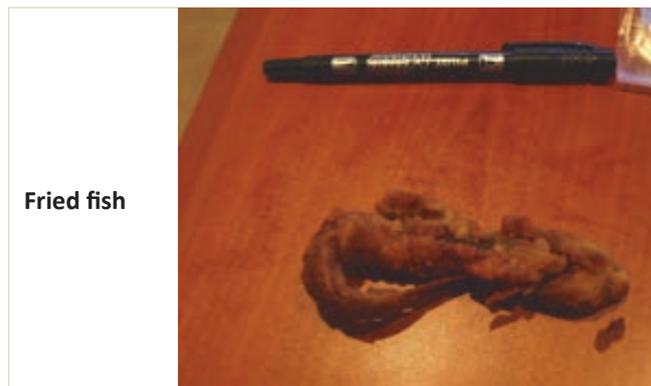
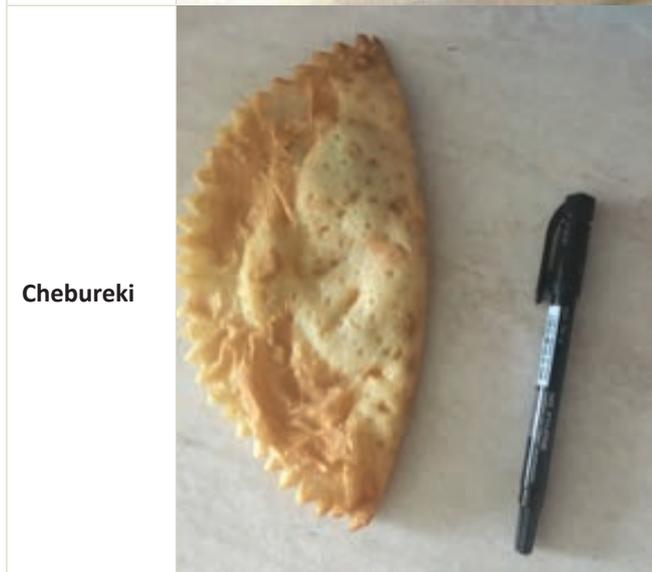
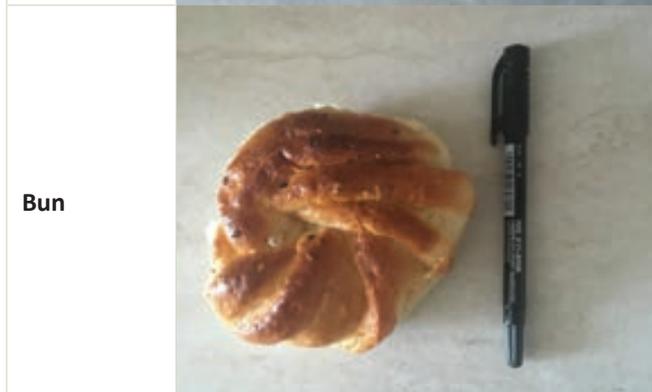
Sunflower seeds



Annex 2.

Homemade foods collected at street food vending sites in Dushanbe





Kurut



Pirozhok



Plov



Sausage bun



Shawarma



Soup



Sweet pastry



Sambusa



The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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