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FEEDcities project

A comprehensive characterization of the street food environment in cities

Project protocol
2019

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INSTITUTO DE SAÚDE PÚBLICA
DA UNIVERSIDADE DO PORTO

World Health Organization
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Abstract

Introduction Ready-to-eat food sold in the street represents a global phenomenon, more common in urbanized areas, that constitutes an important dietary source in populations from low- and middle-income countries. However, research on the kind of street food offered and its composition is scarce. The main objective of this study is to characterize the urban street food environment, including vending places, the food offered, its nutritional composition, food purchasing patterns and advertising.

Methods and analysis This protocol provides a framework for a stepwise, standardized characterization of the street food environment; it consists of three steps that are of increasing complexity and demand increasingly great human and technical resources. Step 1 comprises identification of street food vending sites and characterization of the products available; this stage may be complemented with an evaluation of food advertising in the streets. Step 2 comprises description of street food purchasing patterns, by direct observation. Step 3 requires collection of food samples for bromatological analysis. Different levels of data collection may be defined for each step; hereafter, these are presented as core and expanded evaluations. For the most part, data analysis involves descriptive statistics and basic spatial analysis.

Ethics and dissemination This study was approved by the Ethics Committee of the Institute of Public Health of the University of Porto, Portugal. The research presents no risk to vendors or consumers, who will not be identified or identifiable through the information collected. Vendors will be kept informed and are free to refuse to collaborate. The findings of the study will be published on the World Health Organization (WHO) website as country reports, submitted for publication in international peer-reviewed journals, and presented at scientific meetings.

Keywords

STREET FOOD
READY-TO-EAT FOOD
COMMERCE
MARKETING
NUTRITIONAL COMPOSITION

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Authors and contributors

Nuno Lunet EPIUnit, Instituto de Saúde Pública, Universidade do Porto, Porto, Portugal; Departamento de Ciências da Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina, Universidade do Porto

Marcello Gelormini Nutrition, Physical Activity and Obesity Programme, Division of Noncommunicable Diseases and Promoting Health through the Life-course, WHO Regional Office for Europe, Copenhagen, Denmark

Jo Jewell Nutrition, Physical Activity and Obesity Programme, Division of Noncommunicable Diseases and Promoting Health through the Life-course, WHO Regional Office for Europe

Inês Morais Nutrition, Physical Activity and Obesity Programme, Division of Noncommunicable Diseases and Promoting Health through the Life-course, WHO Regional Office for Europe

Gabriela Albuquerque EPIUnit, Instituto de Saúde Pública, Universidade do Porto

Sofia Sousa EPIUnit, Instituto de Saúde Pública, Universidade do Porto; Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto

Albertino Damasceno Departamento de Ciências da Saúde Pública e Forenses e Educação Médica, Faculdade de Medicina, Universidade do Porto; Faculdade de Medicina, Universidade Eduardo Mondlane, Maputo, Mozambique

Susana Casal EPIUnit, Instituto de Saúde Pública, Faculdade de Farmácia, Universidade do Porto & REQUIMTE, Laboratório de Bromatologia e Hidrologia, Universidade do Porto

Olívia Pinho Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto; REQUIMTE, Laboratório de Bromatologia e Hidrologia, Universidade do Porto

Pedro Moreira EPIUnit, Instituto de Saúde Pública, Universidade do Porto; Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto; Centro de Investigação em Actividade Física, Saúde e Lazer, Faculdade de Desporto, Universidade do Porto

João Breda Head, WHO European Office for Prevention and Control of Noncommunicable Diseases, WHO Regional Office for Europe

Patrícia Padrão EPIUnit, Instituto de Saúde Pública, Universidade do Porto; Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto

Contributors

The study was conceived and designed by Marcello Gelormini, Albertino Damasceno, João Breda, Patrícia Padrão and Nuno Lunet. The first version of the manuscript was written by Nuno Lunet, Marcello Gelormini, Jo Jewell and Patrícia Padrão. All authors critically revised the manuscript for relevant intellectual content and approved the final version for submission.

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Competing interests

The authors declare that they have no competing interests.

Ethics approval

Ethics Committee of the Institute of Public Health of the University of Porto (Comissão de Ética do Instituto de Saúde Pública da Universidade do Porto, CE16058).

Correspondence to:

Nuno Lunet
Departamento de Ciências da Saúde Pública e Forenses e Educação Médica
Al. Prof. Hernâni Monteiro
4200-319 Porto
Portugal
Phone: +351 225513652
Fax: +351 225513653
Email: nlunet@med.up.pt

Abbreviations

GPS	Global Positioning System
FAO	Food and Agriculture Organization
NCDs	noncommunicable diseases
TFAs	*trans*-fatty acids
WHO	World Health Organization


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1. Introduction

The Food and Agriculture Organization (FAO) and the World Health Organization (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" *(1, 2)*. At the global level, street food represents a cultural, social and economic phenomenon that is typical of urbanized areas, where the lifestyle is becoming more sedentary and the time dedicated to cooking at home is dramatically reduced *(3)*. Another important characteristic of street food is that it provides a very accessible and inexpensive dietary source for millions of consumers living in urban areas of low- and middle-income countries all over the world *(4)*.

Urbanization and globalization involve dietary changes such as decreases in the consumption of foods rich in fibre (e.g. pulses, fruits, vegetables, whole grains) and more frequent intake of processed foods. The latter are more likely to be energy-dense and high in trans fatty acids (TFAs), salt and free sugars, which are known to be associated with the occurrence of noncommunicable diseases (NCDs) *(5)*.

There are consistent results showing that industrially produced TFAs have serious adverse effects and contribute significantly to increased risk of cardiovascular diseases *(6)*. WHO advocates a complete elimination of TFAs from the global food supply *(7)*, and several public authorities have started to effectively ban or regulate their use *(8)*. Excessive sodium intake is associated with high blood pressure and an increased risk of cardiovascular diseases *(9)*. WHO recommends no more than 2 g of sodium per day – equivalent to 5 g of salt per day – for the adult population, in order to reduce the burden of NCDs *(10)*, though in most countries where recent data are available, dietary sodium intake is much higher *(11)*. Most of the dietary intake of sodium comes either from addition of salt during preparation and cooking of food or from processed foods. Sugar-sweetened beverages are an important source of free sugars *(12)*, and their consumption, which is promoted by aggressive marketing campaigns from multinational beverage companies, is believed to contribute to the obesity epidemic *(8, 13)*.

Exposure to food and beverage marketing can be considered another important aspect of the nutrition environment *(14, 15)*. It has the potential to shape consumers' preferences and dietary habits, and consequently to drive the supply of specific foods.

Worldwide, dietary changes are likely to be reflected in the urban street food environment. Characterization and monitoring of the street foods that are available and the purchasing patterns related to them, as well as food advertising in the streets, are particularly important in the context of efforts to prevent NCDs. However, research in low- and middle-income countries has focused mostly on issues linked to food safety, and there are very little up-to-date data on food availability, consumption and its nutritional composition that include prepared ready-to-eat foods *(16)*. Specifically, in countries in eastern Europe and central Asia, there is a generalized lack of knowledge about food and dietary habits, although, historically, street trade has always been a well-developed activity in this part of the world.

The primary objective of this study is to characterize the urban street food environment, including vending places, the food they offer, and food advertising in public places. Further aims of the study are to describe the nutritional value of the foods most commonly sold in the streets – in particular, their TFA and sodium content – as determined by bromatological analysis of locally obtained food samples; and to assess the patterns of street food purchasing, by direct observation.

A protocol for evaluating the urban street food environment was initially developed for a survey conducted in Mozambique *(17)*. This protocol was then improved and adjusted for use in other settings namely in central Asia, the Caucasus region and South-east European countries. It was expanded to include methods for characterization of customers of street food vending sites and bromatological analysis of industrially produced foods; and it was adapted to take account of different typologies of street food vending sites and patterns of distribution throughout cities.

2. Methods and analysis

This protocol provides a framework for a stepwise, standardized characterization of the street food environment; it consists of three steps that are of increasing complexity and demand increasingly great human and technical resources. Step 1 comprises identification of street food vending sites and characterization of the products available; this stage may be complemented with an evaluation of street food advertising. Step 2 comprises description of street food purchasing patterns, by direct observation. Step 3 requires collection of food samples for bromatological analysis. Different levels of data collection may be defined for each step; hereafter, these are presented as core and expanded evaluations. The steps to be considered in each survey and the levels of detail to be observed in data collection depend on availability of resources.

Data collection started in 2016, in eastern Europe and central Asia. The first surveys, conducted between May and November 2016, were carried out in Tajikistan (Dushanbe), Kyrgyzstan (Bishkek), the Republic of Moldova (Chisinau) and Turkmenistan (Ashgabat). In 2017, studies were conducted in Bosnia and Herzegovina (Sarajevo and Banja Luka) and Kazakhstan (Almaty, Aktau and Kyzylorda). These surveys demonstrated the feasibility of this kind of comprehensive evaluation; the training of interviewers; and the use of standardized procedures for data collection, including use of apps for electronic data collection, which contributed to a low level of missing data.

STEP 1 – Street food environment

Core evaluation: street food vending sites and food offer

Eligibility criteria

We adopted the definition of street food proposed by the 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" *(18)*. This definition includes products that have been prepared in advance (e.g. sandwiches, salads) or cooked (e.g. boiled eggs, traditional dishes), as well as raw foods (e.g. fruits, nuts) that are sold for immediate consumption, even though these products may sometimes be bought to be consumed later (e.g. at home or at work).

Regarding physical setup, eligible vending sites are those that sell ready-to-eat food, including beverages and/or snacks, from any venue other than a permanent storefront business or an establishment with four permanent walls, operating in a predefined perimeter, that does not sell directly on the street. The definition includes "street hawkers", or mobile vendors, as well as sellers with semi-static or stationary vending units.

Even when the physical setup and the foods offered meet the criteria defined above, vending sites are not eligible if they are oriented to selling products that are essentially for household consumption. It may sometimes be difficult to determine the eligibility of a given vending site, and there is some potential for misclassification, but these criteria should allow a clear distinction between foods that are sold in a context where they are expected to be consumed shortly after purchase (e.g. fruit sold by a mobile vending site) and those that are sold mostly to be consumed at home (e.g. fruit sold in a farmers' market where no prepared or cooked foods are also available). Table 1 gives examples and illustrations of eligible and ineligible vending sites, which are illustrated in Fig. 1 and 2, respectively.

Table 1. Examples of eligible and ineligible vending sites selling products compatible with the FAO/WHO definition of street food

Eligible [Fig. 1, A–J]	**Ineligible** [Fig. 2, A–F]
• Kiosk [1A] • On the ground [1B] • Push cart [1C] • Refrigerator/freezer/cooler [1D] • On-street window from a permanent storefront business or establishment with four permanent walls [1E] • Soft ice-cream vending machine [1F] • Stall [1G] • Stand [1H] • Car boot [1I] • Van, truck, trailer [1J]	• Food stall or cart that is part of a permanent store or licensed establishment [2A] • Vending site exclusively selling fruit and vegetables (unless it sells ready-to-eat fruit and vegetable salads) [2B, C] • Vending site selling raw or processed meat, fish or dairy products (unless it sells other types of ready-to-eat products, such as confectionery, beverages, bread and sandwiches) [2D–F]

Fig. 1. Examples of eligible vending sites

[1A] Kiosk

[1B] On the ground

[1C] Push cart

[1D] Refrigerator/freezer/cooler

[1E] On-street window from a permanent storefront business with four permanent walls

[1F] Soft ice-cream vending machine

Fig. 1. Examples of eligible vending sites *(cont.)*

[1G] Stall

[1H] Stand

[1I] Car boot

[1J] Van, truck, trailer

Fig. 2. Examples of ineligible vending sites

[2A] Food stall or cart that is part of a permanent store or licensed establishment

[2B] Informal vending site exclusively selling fruit and vegetables, without selling other types of ready-to-eat products

[2C] Vending site exclusively selling fruit and vegetables, without selling other types of ready-to-eat products (market hall)

[2D] Informal vending site selling raw meat and fruit, without selling other types of ready-to-eat products

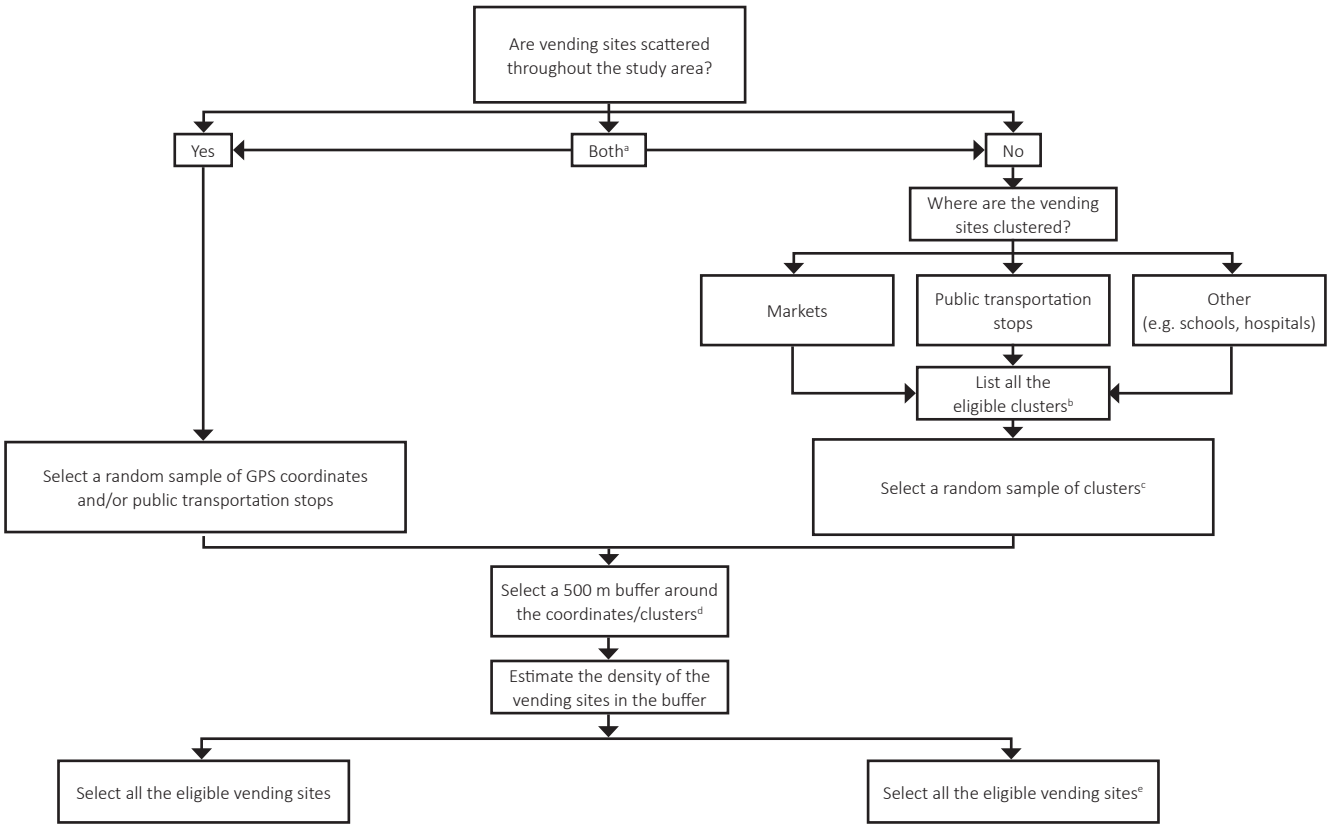
[2E] Vending site selling raw or processed meat, without selling other types of ready-to-eat products

[2F] Vending site selling raw or processed meat, without selling other types of ready-to-eat products

Selection of vending sites

Street food vendors may operate in different locations within a city, either concentrated in places where there is a great flow of people (for instance, around main bus terminals, in enclosed spaces such as bazaars and public markets, in various kinds of commercial area, and in places of entertainment) or scattered across broader areas. Sampling procedures therefore need to be adjusted to the specificities of the particular street food offer in the study area; in this respect, both the distribution of vendors across the city and their estimated overall numbers are relevant (a proposed selection scheme is given in Fig. 3.

Fig. 3. Decision rules for selection of vending sites



[a] In this case, follow both left-hand and right-hand arms.
b Samples of one or more types of cluster may be considered; exclusion criteria may be defined according to the characteristics of each cluster (e.g. restriction to major public transportation hubs).
[c] A stratified sample may be appropriate to ensure equitable representation of specific places (e.g. districts, markets of different sizes).
[d] The proposed buffer dimension is based on our previous experience, but it may have to be adjusted to the density of vending sites or the size of clusters (for example, when vendors concentrate in places that occupy a larger area, such as markets, buffers with a larger area may be more appropriate).
[e] Define the number of vending sites to be invited to participate (e.g. all, every two, every five) according to the density of vending sites and the intended sample size.

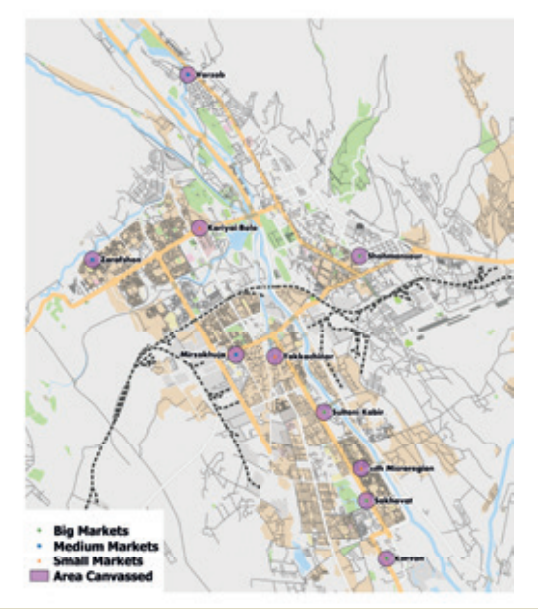
Examples of different strategies for sampling street food vending sites are given below, based on surveys conducted in Tajikistan (Box 1) and Mozambique (Box 2).

These sampling frames are expected to allow for selection of vending sites that represent the diversity of the street food offer within the selected city (Dushanbe) or neighbourhood (Maputo), which may vary according to the population density and socioeconomic characteristics of the study area concerned.

Box 1. Selection of street food vending sites in Dushanbe (Tajikistan)

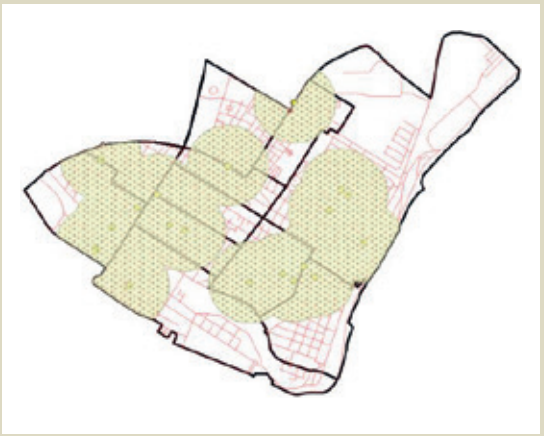
The survey started with a site visit for preliminary assessment of the pattern of distribution and density of street food vending sites across the city. We encountered very few vendors operating directly on the streets, except for trucks selling dairy products from nearby farms and sellers of a traditional homemade soda. The usual "street hawker" – a mobile vendor commonly found in other parts of the world – was missing from Dushanbe. The great majority of street food vending sites were semi-static or fixed, and concentrated in enclosed spaces such as bazaars or public markets, which are general trading places where many different kinds of goods, other than just foodstuff, are sold. Vending units selling directly onto the street through an open window (whether or not seating options were provided inside) were also common.

Our final assessment was that vending sites were predominantly concentrated in markets and their surroundings. Our sampling procedure therefore started with identification of all public markets present in Dushanbe; this phase was supported by information provided by local authorities and gathered during the preliminary field visit. We randomly selected a fixed proportion (approximately 25%) of the markets from each district. For each of the markets selected, we defined a 500-meter diameter buffer around its centre point, to represent the study area, as shown on the map. Taking into account the intended sample size and the estimated number of vending sites in the areas to be studied, we opted to invite all eligible vendors to participate.



Box 2. Selection of street food vending sites in Maputo (Mozambique)

The survey was limited to the wealthiest and most urbanized of the seven municipal districts, which was considered to represent the area with the highest concentration and variety of street food vendors. In this setting, there were both fixed and mobile vending sites scattered throughout the area. We therefore opted to select a random sample of public transport stops. After identifying all the stops in the selected district, as shown on the map, we randomly selected approximately 20% of them. A 500-meter buffer was drawn around each of these to define the study area, which was canvassed by field researchers to identify all eligible vendors.



Data collection

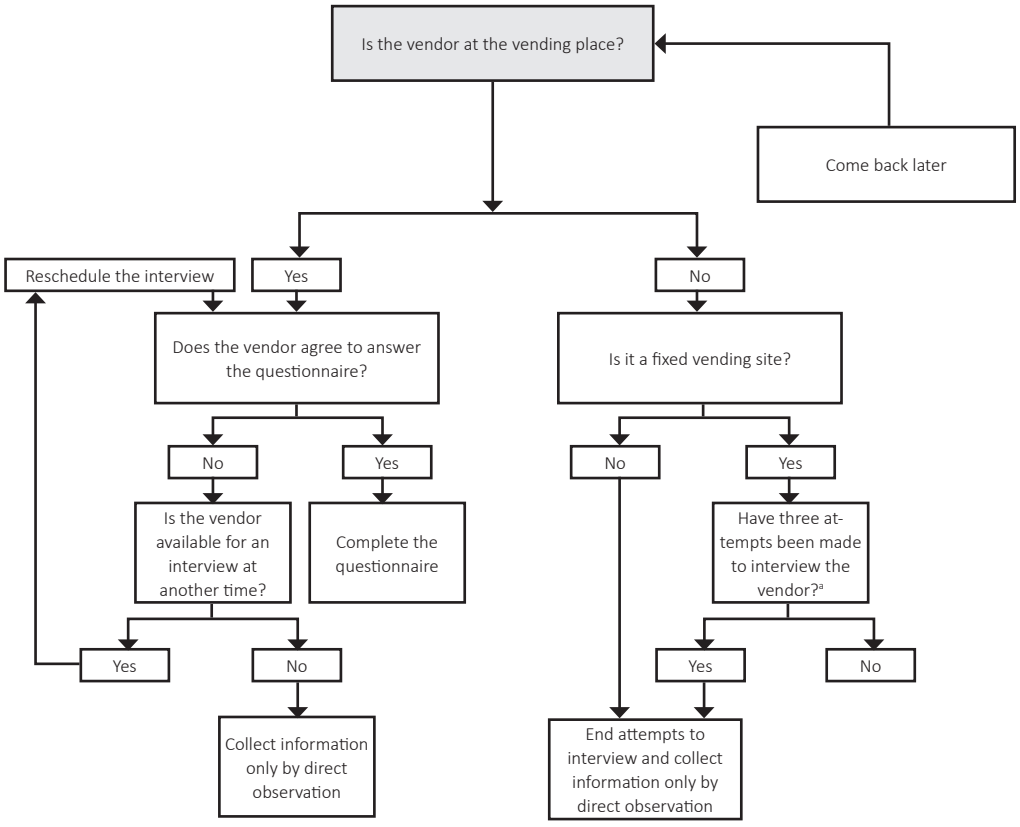
The period selected for evaluation of the vending sites should include both weekdays and weekends. Each study area may be evaluated in a single day or on consecutive days, depending on the number of eligible vending sites, and data collection should take place during the whole day, to ensure that usual mealtimes are covered. Evaluations on specific holiday periods when activity or the food offer may be different to normal should be avoided.

Field researchers should operate in pairs, walking through every publicly accessible street in the study area, in search of street food vending sites. When evaluating public markets, researchers should access the venue through the main entrance, and only after the market itself has been completely canvassed should they move on to areas surrounding the market that are included in the study area. In the case of larger markets that are not completely contained within the 500-meter buffer, the study area may be redefined so that it is circumscribed by the streets that limit its perimeter; in these streets, only vending sites that are on the side of the street closest to the market should be evaluated.

For vending places considered eligible for inclusion in the study, field researchers should register their typology along with the corresponding Global Positioning System (GPS) coordinates. Researchers should then approach each vendor and present the study objectives and procedures; leaflets including a description of the study should be made available (an example of a study description is provided in Annex 1).

Face-to-face interviews with vendors who agree to participate are used to collect data on the following: mobility of vending site; physical setup (e.g. stand, push cart, cooler); operating periods (working days and hours); number of employees; ownership; access to clean water and electricity; and offer of ready-to-eat foods (type of food products available, portion size, method of preparation, type of packaging, price, etc.). If vendors are unwilling to collaborate, researchers should still record their geographical location and any other relevant information on their activity that can be gathered by observing their vending site and the products available. Details of procedures and forms/questionnaires for data collection are provided in Fig. 4 and Annex 2, respectively.

Fig. 4. Decision rules for defining procedures for evaluation of vending sites



[a] Attempts should preferably be made at different times of day, or on different days, to maximize the possibility of collecting data by interview.

In order that field researchers may avoid interviewing the same vendor twice, once each interview has been completed, a sticker with the research project logo should be attached (with the vendor's permission) to the vending site (an example is provided in Annex 3).

Expanded evaluation: food advertising and brand marketing in public spaces

Eligibility criteria

Permanent outdoor product advertising or brand marketing media located in public spaces should be targeted; examples include billboards, banners, posters, painted walls and electronic screens, regardless of size. Non-permanent media, such as mobile advertising (e.g. on vans or push carts), sponsored equipment (e.g. umbrellas/parasols, coolers, tables, chairs, ashtrays) or printed promotional material (e.g. flyers, menus) are not eligible.

Selection of advertisements

All eligible advertisements located in any of the streets canvassed by field researchers in the course of identifying street food vending sites should be selected. Additionally, when vending sites are clustered in confined spaces such as markets, the main routes of urban public transport (e.g. buses, trams) should be selected and both sides of the streets evaluated for the presence of advertising.

Data collection

All eligible outdoor advertisements visible in the study area that refer to foods or drinks, as well as non-alimentary products, should be photographed or filmed, to allow for subsequent analysis.

STEP 2 – Characterization of street food purchasing patterns

Eligibility criteria

Sales of the street food vending sites identified in Step 1 should be assessed by direct observation of their regular activity; this assessment will be complementary to characterization of the street food they offer. All vending sites and their customers buying ready-to-eat products are eligible.

Selection of customers of street food vending sites

Data should be collected by direct observation of people buying street food at the selected vending sites. The observation period should start at the first multiple of five minutes after evaluation of the food offer and end either when four customers have been observed or after 10 minutes (this predefined period may be longer if the expected number of customers is small), whichever comes first.

Customers should be observed either in all vending sites or in a subsample that has been systematically selected (e.g. every second site, every fifth site), depending on the expected overall number of vending sites and customers. For example, if the survey is designed to evaluate 300 vending sites and an average of four customers is expected in each observation period, in order to evaluate a total of 300 customers it will be necessary to select 75 out of the 300 vending sites; this corresponds to a systematic selection of every fourth vending site.

Data collection

Data collection should be done by two independent observers, standing as close as possible to the vending site but at a sufficient distance that they do not disturb the vendor's regular activity. Vendors should be informed that field researchers are going to observe their customers for a few minutes, but no specific consent needs to be requested.

Field researchers should record the start and end time of the observation, and for each customer buying street food, they should describe the type and quantity of food items purchased; the customer's sex and estimated age, height, weight and body mass index status should also be recorded (using broad categories).

STEP 3 – Street food collection and bromatological analysis

Selection of food samples

After characterization of vending sites with respect to their food offer has been completed, the 20 most frequently available homemade foods and the 10 most frequently available industrial foods should be selected for bromatological analysis.

Samples should be collected over consecutive days, including both weekdays and weekends. On each collection day, only one sample of homemade food and one sample of industrial food should be obtained from a single vending site.

For each type of food, a sample should be bought from four different vending sites; these should be selected by a random route procedure, starting with random selection of GPS coordinates within each study area. If no vendor is working at the selected coordinates (i.e. if the vending site is closed or the vendor is mobile), these coordinates should be used as the starting point for a systematic selection procedure in which field researchers start moving north and change direction clockwise (first east, then south, then west, then north again) whenever the limits of the study area or a physical barrier (such as a wall or a canal) are met, until they reach vending sites where the selected foods are available.

Collection and processing of samples

No consent is required to acquire the food samples as they are bought by investigators as part of a regular transaction.

The food samples should correspond to the usual serving/portion, or one unit, if the item is prepacked. For any type of food sold in small portions (e.g. small snacks, biscuits), each sample may include more than one portion of the same food.

Each sample should be photographed and weighed, and then divided into four homogeneous subsamples and packed individually in rigid plastic containers; solid and semi-solid foods should first be subjected to mechanical grinding. After packaging, each container should be weighed again and stored in a freezer (at −18 °C) until bromatological analysis is conducted.

Bromatological analysis

On each working day, samples should be moved from −18 °C to 4 °C in the evening, left to defrost slowly overnight, and then homogenized. Two aliquots of each food sample should be collected immediately after homogenization and analysed separately. When the variation coefficient between duplicates is greater than 5%, analysis should be repeated.

Proximate analysis and TFA evaluation should be performed in accordance with the most recent standard AOAC International methods *(20)* – namely, in the case of (a) moisture, by oven drying at 103 °C until constant weight; (b) protein, by the Kjeldahl method; (c) fat, by the Soxhlet method; (d) ash, by calcination; (e) fatty acids, by gas chromatography for the fatty acid ethyl esters, according to a validated method *(19)*; and (f) sodium and potassium, by inductively coupled plasma optical emission spectrometry (ICP-OES) *(21)* or flame photometry *(22)*. Total carbohydrates plus fibre should be estimated by difference *(20)*. The caloric value of samples should be estimated after proximate analysis of the food components has been carried out.

Data analysis and sample size

The street food environment should be characterized, overall and according to the socioeconomic and physical characteristics of the neighbourhood, using descriptive statistics and spatial analysis.

Vending sites should be described with respect to their mobility, physical setup, operating periods, number of employees, ownership, and access to clean water and electricity.

Food products sold should be identified and classified into three groups: fruit, beverages, and food other than fruit. Ready-to-eat food products, which fall into the category of food other than fruit, should be classified as homemade or industrial. For the purposes of this study, homemade foods are defined as foods cooked and/or prepared at home or on the street, regardless of the origin of their ingredients; and industrial foods as food products produced by the food industry and sold as they are, without further preparation and/or cooking. Homemade foods should also be grouped as “cooked”, “prepared but uncooked” and “uncooked and unprepared”. Beverages should be classified according to similarities of composition into the following groups: soft drinks, water, fruit juices, milk, yogurt, alcoholic beverages, energy drinks, coffee/tea, traditional beverages, and other beverages.

Foods purchased should be described according to their typology, as described above, and according to the characteristics of their purchasers (sex, estimated age and body mass index).

With respect to advertising, data analysis should comprise description of an advertisement’s location, including its relation to specific places such as schools, and of its physical characteristics, including size, format and content.

With respect to food’s proximate composition, the average of two determinations of each sample should be considered for data analysis, and results should be presented as the mean and range of each component by food item or food group, expressed on a fresh mass basis, both per 100 g and per average serving size. The mean and range of individual portions should also be presented.

Sample size

The studies should aim for a minimum sample size of 300 vending sites and 300 customers in each city. Assuming a design effect up to 1.5, sample sizes of approximately 300 vending places and 300 customers will yield 95% confidence intervals up to 15% wide for observed proportions ranging between approximately 30% and 70%, and 95% confidence intervals for means with a width of approximately 30% of the observed standard deviation.

No minimum sample size was defined for characterization of advertising, since its assessment in the same areas where street food vendors are identified is expected to result in a relatively small number of advertisements. For this reason, this aspect should be seen as a secondary objective – one that is complementary to assessment of street food vending sites and their food offer – which allows a more comprehensive evaluation of the street food environment with virtually no increase in resources above those already allocated to data collection.

No statistical analysis requiring a specific sample size was defined in advance for food samples, as this is essentially an exploratory analysis whose main purpose is to provide descriptive data to complement those already available on food composition. However, food sampling was defined in such a way as to take account of the expected diversity and variability of homemade and industrial foods. The larger number of samples of homemade foods is justified because their composition is often completely unknown.

3. Ethics and dissemination

Informed consent

The information collected as part of the present study relates only to the products sold by street food vendors, the characteristics of their vending sites, and the street food consumption of urban residents in the selected areas. A waiver to the requirements for informed consent is considered necessary, given the particular conditions of the present study:

(a) although food vendors will be asked to collaborate in data collection, this type of information can be obtained just by observing the vending site, and vendors will not be identified or identifiable through the information collected;

(b) the only human data collected will be obtained by direct observation of customers (sex and estimated age, height, weight and body mass index), and subjects will not be identified or identifiable on the basis of the information recorded;

(c) the research involves no risk to vendors or their customers;

(d) the waiver will not adversely affect the rights and welfare of vendors or their customers;

(e) the research could not practically be carried out without the waiver;

(f) vendors will be informed about the research objectives and asked to collaborate in data collection, but are free to refuse their collaboration at any time.

Potential discomfort and impact on vendors' businesses

The risks associated with participation in this study are minimal; they do not constitute a threat to confidentiality, and all efforts will be made to minimize potential disruption of vendors' businesses and any discomfort they might feel while participating in the research. Observation of customers will be carried out for short periods only and at a distance considered appropriate to avoid disturbing vendors' regular activity.

Vendors may experience discomfort and nervousness about participating caused by concerns over investigations performed by regulatory authorities (23). Such anxiety will be minimized by providing simple and clear information on the study objectives and, whenever possible, by involving residents of the neighbourhoods being evaluated in the process of data collection, as well as younger university students who are expected to be perceived as less of a threat.

To reduce the risk of interfering with vendors' businesses, interviews may be conducted at convenient moments – for instance, at relatively quiet times of the day – as long as this does not conflict with the research objectives. The questionnaire used for field data collection is estimated to take about 10 minutes to complete; most of the information will be gathered by simply observing the vending site, without the need to constantly interact with the vendor.

Confidentiality

Subjects' names will not be used to identify their vending sites on any study records. Instead, a unique study number will be assigned to each vending site; only this number will be used on study documents that relate to the vending site.

Potential benefits to vendors from participation

There are no direct benefits to vendors. They will not receive any compensation for collaborating in data collection.

Potential benefits to society

Knowledge and insights emanating from this study will potentially advance research efforts into nutrition in urban contexts, and may ultimately lead to better prevention of diet-related diseases (such as obesity, cardiovascular diseases and malnutrition) and more suitable interventions (such as improved food regulations and dietary guidelines).

Data deposition

No data will be destroyed. Data collected during the study will be retained for record-keeping purposes and for future research use – namely, tracking changes that may occur to the parameters evaluated in the present study.

All physical records related to the study will be kept in closed cabinets inside the WHO country office of the country concerned. Electronic data curation will be the responsibility of the Institute of Public Health of the University of Porto, Portugal.

Dissemination of results

The project description and its results will be made available on the WHO website. In addition, they will be submitted for publication in international peer-reviewed journals and presented at scientific meetings.

For each country involved, reports of the main study findings will be prepared for presentation to local authorities.

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Annex 1. Study description

What is FEEDcities?

FEEDcities stands for “Food environment description in cities in eastern Europe and central Asia”. It is a research project with the principal aim of characterizing the street food environment in some main cities of eastern Europe and central Asia; it includes both the available street food and food advertisements. The research project is funded by the World Health Organization (WHO) through its Regional Office for Europe. The research will be carried out by the WHO local office in **[Country name]** and by the University of Porto.

What are the main objectives?

- To describe the characteristics of the food offered at selected street vending places; to map their location; and to describe the customers present and the street foods purchased.
- To assess the nutritional composition of the ready-to-eat foods sold on the street.
- To map the spatial distribution of food advertisements and to describe the typology and content of food advertisements.

Who is eligible for this study?

Any street food vendor selling ready-to-eat foods, including beverages and snacks, and food establishments/permanent storefront businesses with four permanent walls selling ready-to-eat foods through a window onto the pavement, operating within the perimeter of selected public markets.

What type of data will be collected?

No human data (name, age, telephone number) will be collectßed. Food vendors cannot be identified in any way. The only information to be collected and recorded relate to the vending site (operating hours, location, food offer).

For further information, please get in touch with **[Team Member name]** (WHO **[Country name]**) at **[institutional telephone number]** or at **[institutional email]**.

Annex 2. Model questionnaire

SECTION 1 - Vending Activity			
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**
101	**What is the sex of the vendor?**	MALE 1	
		FEMALE 2	
		NOT AVAILABLE 99	
102	**What type of food products are being sold?**	FOOD (Industrial/Home-cooked) 1	
		FRUIT 2	
		DRINKS 3	
		NON-FOOD PRODUCTS 4	
103	**Is the vendor available for the interview?**	YES 1	→ 105
		NO 2	
104	**Specify why the vendor is not available for the interview**		
	_____		→ 109
105	Hello, I am (*Insert name*) from the World Health Organization. Our team is working on a project related to what foods people have available to them on the streets. This activity is part of a research project whose main goal is to improve the dietary and health conditions of the urban population, particularly its poorest sections. We are independent from any regulatory entity, both at municipal and governmental level. We do not collect any personal information that can make you identifiable. I am just making a few notes, and I'll be out of your way in a short time. Is that okay?		
	YES ☐	NO ☐ →	END
106	**Are you the owner of this food vending activity?**	YES 1	108
		NO 2	
107	**What is your relationship with the owner?**	EMPLOYEE 1	
		RELATIVE 2	
		FRIEND 3	
		OTHER 8	
		Specify _____	
108	**Have you already taken part, in the previous weeks, in any questionnaire/research from the World Health Organization about street food?**	YES 1	→ END
		NO 2	
109	**Are you able to answer questions regarding the vending activity? (i.e. food preparation, business schedule)**	YES 1	→ 111
		NO 2	
110	**IF NOBODY IS AVAILABLE OR CAPABLE OF ANSWERING, SCHEDULE A SECOND VISIT**		
	Second visit due on: (date)_____	(time)_____	→ END

SECTION 1 - Vending Activity			
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**
111	**During which day is your cart/truck/stand usually here?**	MONDAY 1	
		TUESDAY 2	
		WEDNESDAY 3	
		THURSDAY 4	
		FRIDAY 5	
		MONDAY to FRIDAY 6	
		MONDAY to SATURDAY 7	
		THE WHOLE WEEK 96	
112	**During which hours is your cart/truck/stand usually here?**	hours min	
		FROM ☐☐ ☐☐	
		TO ☐☐ ☐☐	
113	**During which period of the year is your cart/truck/stall usually here?**	SUMMER 1	
		WINTER 2	
		THE WHOLE YEAR 96	
		OPERATING FOR LESS THAN A YEAR..... 99	
114	**Is your cart/truck/stand here no matter what the weather?**	YES 1	
		NO 2	
		DON'T KNOW 99	
115	**When did you start your vending activity?** GIVE AN APPROXIMATE DATE	MONTH ☐☐	
		DON'T KNOW MONTH 99	
		YEAR ☐☐	
		DON'T KNOW YEAR 99	
116	**Do you live in the same neighborhood in which you operate?**	YES 1	→ 118
		NO 2	
117	**Specify distance from workplace** CHOOSE ONE OF THE MEANS MENTIONED"	minutes	
		WALKING ☐☐	
		PUBLIC TRANSPORT ☐☐	
		PRIVATE CAR ☐☐	
		BICYCLE ☐☐	
		DON'T KNOW 99	
118	**Are you a mobile vendor?**	YES 1	
		NO 2	→ 121
119	Do you follow a fixed itinerary to sell?	YES 1	→ 124
		NO 2	
120	**Explain the reasons why**		

_____

SECTION 1 - Vending Activity					
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**			**SKIP**
121	**When did you first start bringing your cart/truck/stand to this location?** GIVE AN APPROXIMATE DATE	MONTH		☐	
		DON'T KNOW MONTH 99			
		YEAR		☐	
		DON'T KNOW YEAR 99			
122	**Do you take your cart/truck/stand anywhere else?**	YES 1			
		NO 2			→ 124
		DON'T KNOW 99			
123	**Explain the reasons why** _____				
124	**Are there other people employed/involved in this food vending activity who assist you, for example, preparing and/or selling the food products?**		YES	NO	
		RELATIVE	1	0	
		FRIEND	2	0	
		EMPLOYEE	3	0	
		OTHER	8	0	
		Specify _____			
		NONE	9	0	→ 127
125	**SPECIFY THE NUMBER**	RELATIVE		☐	
		FRIEND		☐	
		EMPLOYEE		☐	
		OTHER		☐	
126	**SUM ANSWERS FROM QUESTION 125 AND ENTER TOTAL**	TOTAL PEOPLE		☐	
127	**CHECK 126:** Just to make sure that I have this right: there is a TOTAL of _____ people working in this food vending activity. Is that correct? YES ☐ NO ☐ → PROBE AND CORRECT Q124-126				
128	**Do you have access to electricity?**	YES 1			
		NO 2			
129	**Do you have access to drinking water?**	YES 1			
	NO 2	NO 2			→ 132

SECTION 1 - Vending Activity			
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**
130	**What is the main source of drinking water?**	PIPED WATER	
		PIPED INTO VENDING SITE 1	
		PIPED TO MARKET 2	
		PUBLIC TAP/STANDPIPE 3	
		TUBE WELL OR BOREHOLE 4	
		DUG WELL 5	
		WATER FROM SPRING 6	
		RAINWATER 7	
		TANKER TRUCK 8	
		CART WITH SMALL TANK 9	
		SURFACE WATER ..... 10 *(RIVER/DAM/LAKE/POND/STREAM)*	
		BOTTLED WATER 11	
		OTHER 98	
		Specify _____	
131	**Do you do anything to the water to make it safer to drink/use for cooking?**	BOIL 1	
		ADD BLEACH/CHLORINE 2	
		STRAIN THROUGH A CLOTH 3	
		USE WATER FILTER ..... 4 *(CERAMIC/SAND, ETC)*	
		SOLAR DISINFECTION 5	
		LET IT STAND AND SETTLE 6	
		OTHER 98	
		Specify _____	
		DON'T KNOW 99	
132	**Do you have access to a toilet facility when at work?**	YES 1	
		NO 2	→ 135
133	**Including yourself, how many people use this toilet facility?**	TOTAL NUMBER [0] *If less than 10*	
		MORE THAN 10 95	
		DON'T KNOW 99	
134	**Where is the toilet facility located?**	INSIDE THE MARKET 1	
		ELSEWHERE 2	

SECTION 1 - Vending Activity			
NO.	**QUESTIONS AND FILTERS**	**CODING CATEGORIES**	**SKIP**
135	**What type of fuel do you use to cook?**	ELECTRICITY 1	
		LPG 2	
		NATURAL GAS 3	
		BIOGAS 4	
		KEROSENE 5	
		COAL, LIGNITE 6	
		CHARCOAL 7	
		WOOD 8	
		STRAW/SHRUB/GRASS 9	
		OTHER 98	
		Specify _____	
136	**In which place do you usually wash your hands?**	AT THE VENDING SITE 1	
		TOILET/BATHROOM 2	
		OTHER 98	
		Specify _____	
		NONE 99	

Annex 3. Project sticker

Fig. A3.1. FEEDcities project sticker

Fig. A3.2. A vending site displaying the FEEDcities project sticker

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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World Health Organization Regional Office for Europe
UN City, Marmorvej 51, DK-2100 Copenhagen Ø, Denmark
Tel.: +45 45 33 70 00 Fax: +45 45 33 70 01
Email: euwhocontact@who.int
Website: www.euro.who.int