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Community Health Environment Scan Survey (CHESS): a novel tool that captures the impact of the built environment on lifestyle factors

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***Background*:** Novel efforts and accompanying tools are needed to tackle the global burden of chronic disease. This paper presents an approach to describe the environments in which people live, work, and play. Community Health Environment Scan Survey (CHESS) is an empirical assessment tool that measures the availability and accessibility, of healthy lifestyle options. CHESS reveals existing community assets as well as opportunities for change, shaping community intervention planning efforts by focusing on community-relevant opportunities to address the three key risk factors for chronic disease (i.e. unhealthy diet, physical inactivity, and tobacco use).

***Methods*:** The CHESS tool was developed following a review of existing auditing tools and in consultation with experts. It is based on the social-ecological model and is adaptable to diverse settings in developed and developing countries throughout the world.

***Results*:** For illustrative purposes, baseline results from the Community Interventions for Health (CIH) Mexico site are used, where the CHESS tool assessed 583 food stores and 168 restaurants. Comparisons between individual-level survey data from schools and community-level CHESS data are made to demonstrate the utility of the tool in strategically guiding intervention activities.

***Conclusion*:** The environments where people live, work, and play are key factors in determining their diet, levels of physical activity, and tobacco use. CHESS is the first tool of its kind that systematically and simultaneously examines how built environments encourage/discourage healthy eating, physical activity, and tobacco use. CHESS can help to design community interventions to prevent chronic disease and guide healthy urban planning.

Keywords: *physical activity*; *nutrition*; *tobacco use*; *chronic disease*; *environmental assessment*; *built environment*

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Chronic diseases such as cardiovascular disease, diabetes, cancer, and chronic respiratory diseases, caused by three main risk factors (unhealthy diet, physical inactivity, and tobacco use), are responsible for 60% of the global burden of diseases (1). This chronic disease burden is escalating, especially in developing countries, and can be largely attributed to changing lifestyles, a result of rapid urbanization and globalization, and the nutrition transition (2–5).

Knowledge gained over the last 30 years has demonstrated that individual behavior is influenced by complex, interconnected social, environmental, and psychological factors. The development of effective chronic disease intervention programs requires that each layer of influence is addressed (6).

Decades of research have demonstrated that targeted behavioral interventions are not sustainable beyond program activities (7, 8). A more comprehensive approach that addresses the environmental factors in addition to individual behaviors change is required to ensure sustainability of change. The new emphasis on prevention

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and intervention science is to target societal factors influencing lifestyles; for example, food pricing policies, built environments, and smoke-free regulations (3, 6, 8–13).

Early successes in tobacco control reinforce the effectiveness of moving from individual behavior change intervention strategies to broader community-wide structural changes, making healthier choices easier ones. In tobacco control, the single most effective intervention has been increasing the unit price of tobacco products via excise taxes (14). However, taxes alone cannot explain population-wide decreases in tobacco consumption, but rather coordinated efforts across all sectors has made tobacco control one of the most successful public health interventions to date (11).

Lessons learned from tobacco control can be translated into efforts to address unhealthy diet and physical inactivity and reduce global obesity rates (11, 15). Obesity is caused by an imbalance in energy intake and expenditure (1, 13). Although seemingly straightforward, societal factors that influence this energy imbalance are extremely complex, as illustrated in the Foresight obesity system map, and require a system-wide, multi-stakeholder approach that involves key players who influence what we eat and how physically active we are – nutrition scientists, agriculture specialists and policy-makers, food companies, urban planners, and architects (16).

Key policy levers and specific levels of influence are not yet well understood; more research that focuses on the exact role of environmental factors in the energy balance equation is needed (17, 18). Furthermore, new innovative research tools are needed to build effective interventions targeting unhealthy diet (energy in) and physical inactivity (energy out) and to improve our understanding of the effects of environmental attributes on individuals, families, communities, and societies.

The interactions between chronic diseases and their associated lifestyle risk factors are complex and go beyond the traditional cause-and-effect models and/or germ theory. A social ecological model has been the preferred theoretical framework used to understand the influences of behavioral risk factors associated with chronic diseases (9). The traditional social ecological model describes different levels of influence on individual behaviors that includes the following factors: (1) individual (biological, psychological), (2) social/cultural, (3) organizational, (4) community, (5) physical environment, and (6) political (19).

The Community Intervention for Health (CIH) program of the Oxford Health Alliance is based on the social ecological framework of health promotion and disease prevention. CIH is a combined research and intervention project with an extensive evaluation component. CIH is focused on addressing the three main risk factors for chronic disease in four settings – schools, workplaces, health care facilities, and neighborhoods – using four intervention strategies: (1) community coalition building, (2) structural change, (3) health education, and (4) social marketing. CIH is the first comprehensive community intervention program of its kind, addressing chronic disease risk factor reduction and prevention in developed and developing countries. A 3-year pilot study is currently underway in China, India, Mexico, and the United Kingdom. Lessons learned from the CIH pilot study will help build a roadmap of strategies for effectively addressing chronic disease risk factors in both developing and developed country settings (i.e. determining what works and does not work for chronic disease prevention).

The evaluation of the effectiveness of the CIH interventions includes three components: (1) individual assessments (measured with surveys), (2) assessment of the community context (measured with the CIH Community Profile), and (3) assessment of the process required to implement the activities (measured by CIH Process Evaluation) (Fig. 1).

The CIH Community Profile was developed as a tool to understand the community context and to inform interventions, as well as to measure the effectiveness of the intervention strategies at the 2-year follow-up. The Community Profile includes policy reviews, key informant interviews, facility scans for use in schools, workplaces, and health care facilities, and the environmental scan (the Community Health Environmental Scan Survey – CHESS). The methods presented in this research paper are focused on CHESS, the environmental scan component of the CIH community profile. For a more detailed explanation of the CIH evaluation framework see (O'Connor-Duffany, K. et al. to be published in the *Journal of Prevention and Control*).

The development of CHESS and the analysis strategies presented in this paper focus on understanding the community context for behaviors in a way that is novel, innovative, and easy to understand. This tool has the potential to be utilized by academics, policy-makers, urban planners, non-governmental organizations, government officials, among others. Tackling the multifaceted nature of chronic disease requires major rethinking of the role of the built environment and the factors that influence decision-making at the individual level around the availability, accessibility, and affordability of opportunities to impact unhealthy diet, physical inactivity, and tobacco use.

One of the major challenges in developing an environmental audit tool like CHESS is ensuring the applicability of a tool that can be used in both developed and developing country settings. In the developed world there is access to pre-populated data on some built environment features such as stores, restaurants, and parks. However, even this data is problematic given the infrequency within which information is updated. In the

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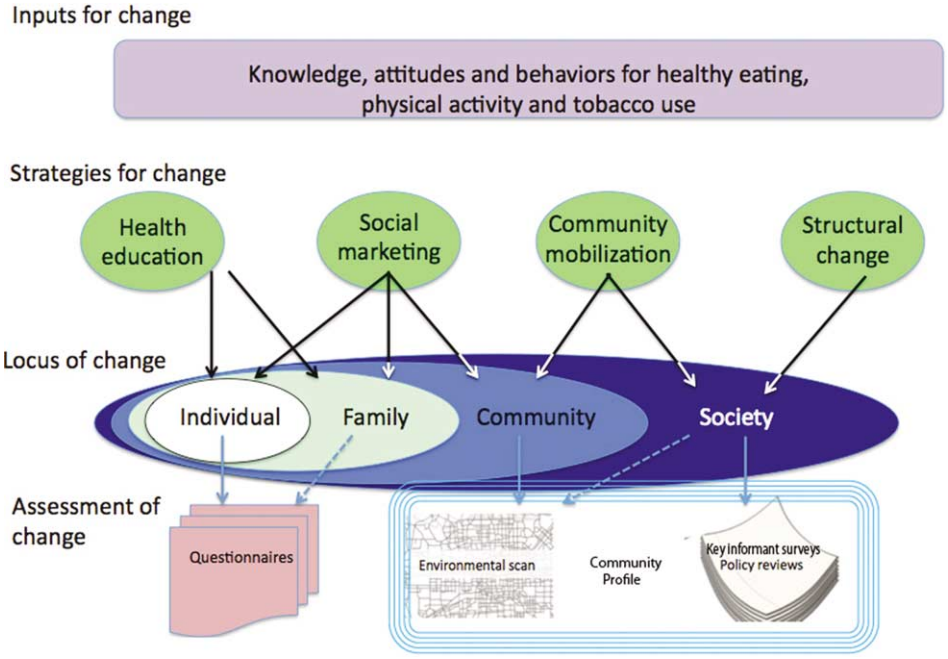

Fig. 1. CIH evaluation framework. In the CIH multilevel framework, the concentric circles illustrate the ecological model and the various layers that influence behavior. The upper arrows illustrate the CIH intervention strategies influencing both the proximal and distal factors related to behavior. The evaluation framework includes individual assessments and the community profile that informs the impact of the interventions. The environmental scan captures the community environment as well as structural changes and some aspects of health education and social marketing. Key informant interviews and policy review add another layer of analysis and provide a deeper understanding of the community context.

developing world, obtaining information down to the community level is even more problematic as there is limited GIS mapping and almost non-existent data on built environment factors. Therefore, methods and tools that can assess community attributes in 'real-time' are needed.

Methods

The Community Health Environmental Scan Survey (CHESS) is an empirical tool developed by the CIH evaluation team to systematically document, map (via GPS), and assess the environments in which people, shop, live, work, and play as they relate to diet, physical activity, and tobacco use. The main objective of CHESS is to improve our understanding of the environment's that we live in that promote healthy eating, physical activity, and tobacco use and the link between this and a population's health behaviors and resulting health outcomes. The information gathered is also used to guide intervention planning efforts.

We first performed a literature search of available tools that assess community environments related to diet, physical activity, and tobacco use. Prior to CHESS, there were no tools addressing all three risk factors simultaneously; however, separate tools were found that assess stores (20), restaurants (21), farmer's markets, schools, workplaces, and the built environment supporting physical activity (22–24). We also consulted with international experts in the fields of diet, physical activity, and tobacco use in order to develop a framework for assessing each risk factor. Some aspects of accessibility are measured using GIS mapping as well as other key attributes (e.g. hours of operation). Affordability could not be systematically measured, although some aspects of cost data are collected.

CHESS includes eight brief assessment tools that inventory streets, stores, restaurants, street vendors, recreational facilities, parks/gardens, vending machines, and the information environment. Table 1 includes the main items of CHESS that are used in the analysis for this paper (the complete listing of CHESS components can be found in Appendix 1). The assessment of a community assessment using CHESS is conducted via a 'neighborhood walk', which initiates from selected schools within each community and extends in a 400 m radius. We used schools as the main focal point of interest because it is a common urban planning practice to define neighborhood units beginning with schools and other civic facilities (25, 26). Furthermore, schools tend to be more than just places of education for a narrow segment of the population; they are typically integral centers of communities (25, 27), and places of community growth

Table 1. Components of CHESS

Name of assessment tool	Component	Response categories
Store assessment	What kind of store is this?	• Mega supermarket • Small chain grocery • Small non-chain grocery • Chain convenience store • Non-chain convenience • Local store • Market • Kiosk/fixed stall/mobile stall • Bakery
	What does this store MOSTLY sell?	• Fresh fruits and/or vegetables • High-fat/salt/sugar options (such as sweets, chips, and sugar-sweetened drinks) • Low-fat/salt/sugar options • Variety of high-fat/salt/sugar, low- fat/salt/sugar items, fresh fruits, and/or fresh vegetables • Tobacco products • Staple foods
	Does this store sell fresh fruit and/or vegetables?	Y/N
	Does this store sell tobacco products?	Y/N
	Is there a 'no sale to minor' sign?	Y/N
	Are there healthy food options at the register?	Y/N
Restaurant scan	The food service is a ...	• Fast food chain (global) • Fast food chain (country) • Fast food chain (local) • Non-chain fast food • Mixed (fast food and fresh) • Restaurant chain (global) • Restaurant chain (country) • Restaurant chain (local) • Non-chain restaurant
	Are there any smoke-free or no-smoking signs visible?	Y/N
	Are there any people smoking inside?	Y/N/NA
	Is there nutritional information posted on the menu/menu board?	Y/N/NA

and vitality. Using schools also allows for the collection of comparable data across the CIH pilot sites and provides a representative glimpse of the community.

Fig. 2 depicts the overall strategy for the neighborhood walk, beginning with schools in each neighborhood. It shows how the various components of the scan dovetail in any given community.

The design of the CIH project within each community includes administering surveys to children (approximately 2,000 children between 12 and 14 years of age per intervention community).[1] Maps of the areas to be scanned were created using Google Earth Pro, and the 400 m radii were created using a circular ruler program. CHESS data were collected using a personal digital device (PDA) with integrated GPS and camera (Magellan Mobile Mapper 6). CHESS was programmed using electronic survey software (Snap version 9).

[1]At least 75% of all streets within the 400 m had to be covered in order for the scan to be complete for each radius.

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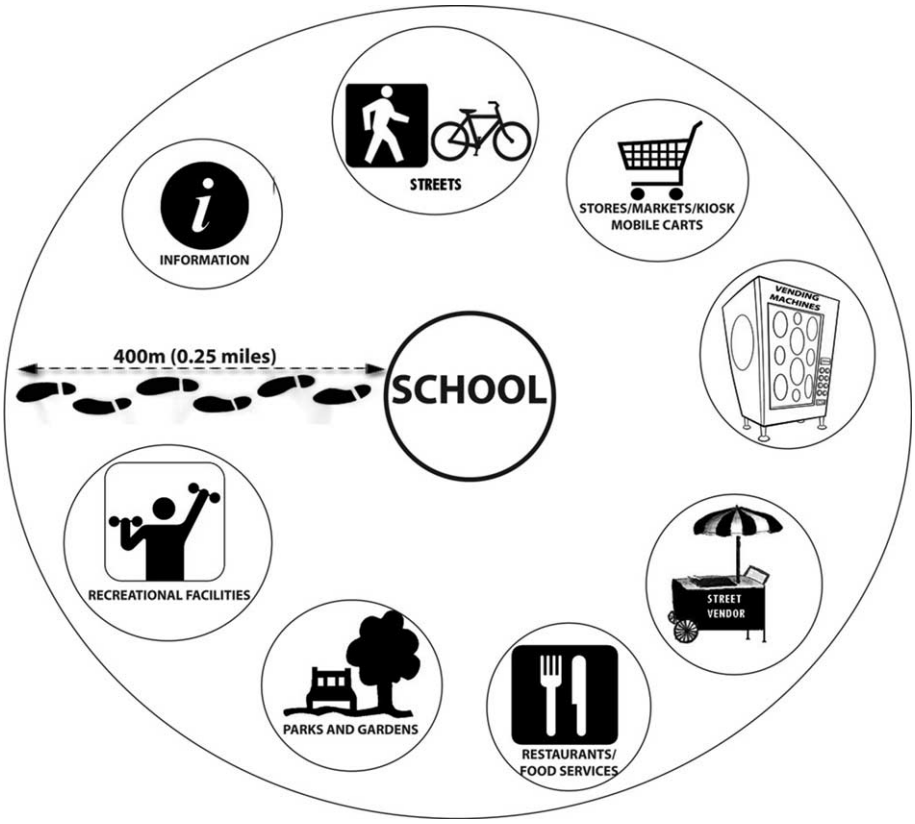

Fig. 2. The neighborhood environmental scan includes walking a 400 m radius around each school and identifying and/or surveying all stores, vending machines, restaurants, recreational facilities, vendors, and so on.

CHESS was conducted around a minimum of 50% and a maximum of 100% of all sampled schools (with a minimum of 10 schools and a maximum of 20 schools in the intervention and control areas). To ensure reliability between raters, standard definitions were developed for categorization of the key features of each of the eight scan components and a training manual was created. Members of the evaluation team went to each site and worked with the local research teams to collect data over a 14–21 day period. For the first 3 days of each visit, the local researchers from each CIH site were trained on the scan and participated in country level adaptations with the evaluation team. Prior to the formal scanning of each community, all raters were trained using the training guidebook, practiced in the field in teams, and then one radius was completed by all raters to ensure reliability.

A preliminary inter-rater reliability study of the environmental scan was conducted in one community setting using four raters. In general, the agreement was consistently high overall for the main variables including number of stores, restaurants, and parks (Kappas and AC1 close to 1.0), as well as for the presence of fruits and/or vegetables (Kappa $=0.707$, $p<.049$ and AC1 $=.901$, $p<.00$) (2) and tobacco (Kappa $=1.000$, $p<.008$ and AC1 $=1.000$).

Results: scope and impact of the environmental scan

In order to demonstrate the scope and impact of the CHESS tool, we present the results along with baseline school level data from the CIH Mexico site. This data illustrates two important functions of CHESS: (1) to define the availability and accessibility of healthy food options, and (2) to guide the development and planning of interventions. Similar strategies and analyses can also be conducted to examine physical inactivity and tobacco use, but they are beyond the scope of this illustration.

Figure 3 presents a map of the area assessed by CHESS in both the intervention and control areas. Each of the school radii are mapped, numbered, and noted as intervention or control area. Using the schools as our focal point gives us an understanding of the types of environments in which students interface in their daily lives as well as a representative sample of the entire community as schools are distributed throughout the area, and it allows us to capture the different types of settings – rural, semi-urban, and urban – in both the intervention and control areas.

In addition to the school-centric, community-level data collected with CHESS, the individual-level survey data from students attending each of these schools allows for

Fig. 3. Overview of the control and intervention area and distribution of the selected schools in both areas.

comparisons to be drawn between the community-level data and student-level behavioral data. These comparisons provide a comprehensive picture of the built environment including facilitators and barriers.

In our Mexico CIH site example, 15 neighborhoods were scanned in the intervention and control areas. Examining only the information collected relating to the food environment and the availability of cigarettes, a total of 583 stores/kiosk/fix care/mobile carts, and 168 restaurants were scanned and GIS mapped. The school surveys conducted on students living in the scanned radii included a total of 4,608 youth aged 12–14 years. For the modeling of environmental data and student behavior, student data was merged with environmental data that had 2,733 observations from 16 schools. For a summary of indicators used in this analysis and their descriptive statistics, refer to Table 2. More than half of the students reported eating at a fast food restaurant in the last week. The proportion of students smoking cigarettes was 14% and overall tobacco use was 17%; it was not surprising that the overwhelming majority of tobacco use was cigarette use.

In Table 3, the results of log-linear regression models are presented that explore the association between the types of restaurants scanned and the frequency of students eating at fast food[2] restaurants in the past 7 days. Similar associations were explored between the availability of tobacco products in stores and student's tobacco use behavior.

The number of days of eating at fast food restaurants during the past 7 days was significantly associated with the percentage of restaurants providing fast foods, as was the percentage of restaurants providing both fast foods and healthier items (mixed restaurant) (Table 3). There was not a significant association between the number of days of fast food and the total number of restaurants. When the students were dichotomized into those who had and those who had not eaten in fast food restaurants in the last week, a different pattern of association was observed. There was a significant association between not eating fast food and the total number of restaurants and the proportion of restaurants serving fast foods. These negative associations mean that persons will be more likely to fast food where there are more restaurants and where a higher proportion of them sell fast food.

The relationship between the availability of tobacco products and student tobacco use behaviors is presented in Table 4. The odds of a student being a current cigarette smoker, smoking tobacco user, overall tobacco user, or ever having tried smoking cigarettes was greater in radii with a higher percentage of stores selling tobacco. However, a greater proportion of stores having 'no sales

Table 2. Summary of fast food and tobacco consumption indicators

Indicator	*N*	%
• Number of days eating at a fast food restaurant during the past 7 days	2,733	0.88
• Not eating at a fast food restaurant during the past 7 days	2,733	43.8
• Current cigarettes smokers	2,718	13.6
• Current smoking tobacco users	2,722	15.6
• Current smokeless tobacco users	2,733	5.6
• Current any type of tobacco users	2,723	16.8
• Have ever tried smoking cigarettes	2,733	27.8

[2]In consultation with a local researcher from Mexico City, fast food was defined as Americanized fast food, those outlets selling hamburger, pizza, hot dogs, and so on. Local researchers were not interested in looking at indigenous fast foods.

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Table 3. Food environment and food behavior

	Total number of restaurants		Percentage of fast food restaurants		Percentage of mixed restaurants	
Student indicators	Est./OR	*p*-Value	Est./OR	*p*-Value	Est./OR	*p*-Value
• Number of days eating at a fast food restaurant during the past 7 days	0.0023	0.133	0.0088	<0.001	0.0030	0.005
• Not eating at a fast food restaurant during the past 7 days	0.9915	0.012	0.9793	<0.001	0.9998	0.943

to minor' signs was significantly negatively associated with current smokeless tobacco use but not any other type of tobacco use.

By comparing and contrasting the results from the environmental scan (CHESS) with student food consumption patterns and tobacco use behaviors from their surveys, we have a better understanding of the environments in which they are living. We observe that the types of restaurants and the availability of tobacco products does influence their consumption behavior. Moreover, we can accurately identify the specific communities to design targeted interventions to address tobacco use and unhealthy diet.

Discussion

Results from the CHESS tool highlight the importance of capturing data about the community environment. As additional layers of data are added, a more complete picture of the community can be developed in order to improve the understanding of the environmental determinates for unhealthy diet, physical inactivity, and tobacco use. The results of the information presented here can serve as a guideline for intervention development around healthy eating and tobacco use among youth. Specific examples include but are not limited to: (1) improving availability of fruits/vegetables by working with local food vendors including school canteens, creating farmers markets, encouraging fast food restaurants to provide fruits and vegetables; (2) providing educational interventions for youth about healthy food choices in restaurants and/or unhealthy aspects of tobacco use; and (3) instituting fines/penalties for selling tobacco to minors.

This is one example of many to illustrate the contribution of CHESS to understanding how a community's attributes affect health behaviors in order to design effective intervention programs. Other examples include but are not limited to: (1) locations of parks and recreational centers and reported physical activity, (2) types of retailers selling single cigarettes and tobacco use and (3) availability of low fat/salt/sugar food options and eating habits.

There are few empirical tools available that systematically and simultaneously assess opportunities for healthy eating, physical activity, or reduced tobacco use in neighborhood environments. Tools that do exist focus on physical activity levels (22, 24, 28) or specific aspects of food habits (20, 21) and have been developed for use in developed countries. CHESS is the first tool to address all three risk factors for chronic disease simultaneously. The multifactorial nature of chronic disease and its risk factors warrants the development of tools to address proximal factors that influence unhealthy diet, physical inactivity, and tobacco use. Many of the components of these tools are context specific and do not easily translate to non-western and developing country settings.

The CHESS tool and overall methodology was created to address the gap in our current knowledge regarding community context. It is possible to identify secondary data sources and map some information about commu-

Table 4. Tobacco use and tobacco environment

	Total number of stores		Percentage of stores selling tobacco products		Percentage of stores having 'no sale to minor' signs	
Tobacco use indicators	OR	*p*-Value	OR	*p*-Value	OR	*p*-Value
Current cigarettes smokers	0.9939	0.161	1.0251	0.0072	0.9919	0.288
Current smoking tobacco users	1.0068	0.110	1.0214	0.0211	0.9897	0.142
Current smokeless tobacco users	0.9984	0.784	1.0119	0.334	0.9789	0.003
Current any type of tobacco users	1.0055	0.154	1.0198	0.030	0.9908	0.150
Have ever tried smoking cigarettes	0.9999	0.989	1.0135	0.048	0.9932	0.397

nities such as parks, stores, and restaurants. However, it is not possible to obtain reliable data on what stores sell, what restaurants sell, what vendors are selling surrounding schools, and/or type of recreational facilities available without actually physically walking and assessing the community. Moreover, the availability of community GIS data is limited to developing countries and they do not take into consideration the sometimes rapid changes in communities (e.g. closing of stores, restaurants). One of the advantages of applying CHESS in the community is that it enriches one's understanding and engagement of the community environment, which is an important factor in developing successful interventions.

All western countries have recognized that the strain on health systems attributed to chronic diseases cannot be sustained if the rates of chronic disease remain unabated. One of the most cost-effective investments is to implement effective prevention programs (29). The environments in which people live, play, and work are important agents in determining their diet, physical activity, and tobacco use. In order to develop effective interventions for the future and scaling up of successful programs, an improved understanding of the complex interplay between environmental determinates and individual behavior is needed.

Limitations

A potential limitation of the environmental scan is that it provides a community snapshot and may not capture the dynamic nature of communities. The street markets and mobile vendors are important sources for where people buy their foods in some communities and may not be captured at the time or on the day the scan is conducted. Another limitation is the ability to measure affordability, given the variability of units in how fruits and vegetables were sold, it was difficult to collect cost data that can be compared across different types of food vendors. However, the pricing data collected is informative in understanding cost of fruits and vegetable for communities where the CHESS was applied. The process of conducting the neighborhood walk is labor intensive; however, once completed it serves as an important resource to the community as long as data sharing strategies are presented and discussed. Although CHESS has face validity, it is clear that it will need to be tested in a variety of settings and further reliability and validity studies are needed.

Conclusion

CHESS is the first environmental assessment tool of its kind to simultaneously assess the three key primary risk factors for chronic disease. The results of the CIH research project using the CHESS will provide the first set of evidence of its kind on the complex interplay between behavior and environmental determinants on food consumption patterns, tobacco use, and physical activity levels.

Chronic disease is emerging as the greatest public health challenge of the twenty-first century. Although much of the burden could be prevented through known interventions – eating a healthy diet and increasing physical activity (30) – little is known about how to address the causes within a complex web of behavioral and societal factors. Despite some successes in intervention programs, there remains limited evidence available on how to translate best and promising practices for chronic disease prevention into different settings. Research in North America and Europe has demonstrated the correlation between environmental determinants and physical activity levels and food consumption patterns (13). The evidence generated by this research is now being translated into the development of policies around urban planning, education, health care, and social services. However, research on environmental determinants of physical activity levels and food consumption patterns in developing countries is absent.

Finite resources for tackling today's pressing global health challenges mean that it is important for policy- and decision-makers to be armed with the most up-to-date data in order to efficiently and effectively allocate resources. As developing countries continue rapid modernization, a greater understanding of how the health and well-being of their citizens are affected by these changes is required. CHESS is one tool that can help.

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Appendix 1. Full CHESS tool

Name of assessment tool	Component	Response categories
Street assessment	Cycling path/trail	1–5
	Bike lanes	1–5
	Side walk	1–5
	Safety	1–5
	Lack of pollution	1–5
	Trees along sidewalk	1–3
	Neighborhood is generally free from litter	1–3
Store assessment	What kind of store is this?	• Mega supermarket • Small chain grocery • Small non-chain grocery • Chain convenience store • Non-chain convenience • Local store • Market • Kiosk/fixed stall/mobile stall • Bakery
	What does this store MOSTLY sell?	• Fresh fruits and/or vegetables • High-fat/salt/sugar options (such as sweets, chips, and sugar-sweetened drinks) • Low-fat/salt/sugar options • Variety of high-fat/salt/sugar, low-fat/salt/sugar items, fresh fruits, and/or fresh vegetables • Tobacco products • Staple foods
	Does this store sell fresh fruit and/or vegetables?	Y/N
	Does this store sell tobacco products?	Y/N
	Is there a 'no sale to minor' sign?	Y/N
	Are there healthy food options at the register?	Y/N
Restaurant scan	The food service is a ...	• Fast food chain (global) • Fast food chain (country) • Fast food chain (local) • Non-chain fast food • Mixed (fast food and fresh) • Restaurant chain (global) • Restaurant chain (country) • Restaurant chain (local) • Non-chain restaurant
	Are there any smoke-free or no-smoking signs visible?	Y/N
	Are there any people smoking inside?	Y/N/NA
	Is there nutritional information posted on the menu/menu board?	Y/N/NA
Street vendor assessment	Number of other street vendor in view	#
	What foods are available at this food stall/street vendor? [Check all that apply.]	• Fresh fruits • Fresh vegetables • Fried fruits and/or vegetables • Sugar-sweetened beverages

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Appendix 1 (*Continued*)

Name of assessment tool	Component	Response categories
		• Low calorie drinks • Water • High-fat foods (convenient noodle, fried meats, etc.) • Sweets (desserts, cookies, etc.) • Salty snacks (chips, others, etc.) • Low-fat/salt/sugar options • Tobacco products
Recreational facility	Type of facility	
	Hours of operation Days of operation	
	Is the facility in use?	Y/N
	Is the facility less than 0.5 km from public transportation?	Y/N
	Is there a food vendor on premises?	Y/N
	What foods are available at this food stall/street vendor? [Check all that apply.]	• Fresh fruits • Fresh vegetables • Fried fruits and/or vegetables • Sugar-sweetened beverages • Low calorie drinks • Water • High-fat foods (convenient noodle, fried meats, etc.) • Sweets (desserts, cookies, etc.) • Salty snacks (chips, others, etc.) • Low-fat/salt/sugar options • Tobacco products
	Does it have indoor facilities?	Y/N
	Is this open to the public year around?	Y/N
	Is this facility free to the public?	Y/N
	What type of facilities are available? [Check all that apply.]	• Swimming pool • Multipurpose courts • Football/soccer field • Baseball field • Tennis courts • Gym equipment • Running track • Sports field • Ice skating or roller skating arena • Open green spaces • Ponds • Yoga • Martial arts • Dance • Others • Country specific options
	Is the facility designated as smoke-free?	Y/N
	Is part of the facility smoke-free with restricted smoking areas indoors?	Y/N
	Are there any smoke-free or no-smoking signs visible?	Y/N
	Are there any people smoking inside?	Y/N

Appendix 1 (*Continued*)

Name of assessment tool	Component	Response categories
	If you observed smokers inside, was he or she smoking in an area designated as 'smoke-free'?	Y/N
Park/garden assessment	Please check what type of facility is being scanned	Park/Garden
	Hours of operation Days of operation	
	Is the park/garden free for use by the public?	Y/N
	Is the park/garden in use?	Y/N
	Is the facility less than 0.5 km from public transportation?	Y/N
	Does the park have exercise equipment for the public to use that is free?	Y/N
	Does the park have space or grassy area large enough for physical activity?	Y/N
	Is there a food vendor on premises?	Y/N
	What foods are available at this food stall/street vendor? [Check all that apply.]	• Fresh fruits • Fresh vegetables • Fried fruits and/or vegetables • Sugar-sweetened beverages • Low calorie drinks • Water • High-fat foods (convenient noodle, fried meats, etc.) • Sweets (desserts, cookies, etc.) • Salty snacks (chips, others, etc. • Low-fat/salt/sugar options • Tobacco products
Vending machine assessment	Where is the vending machine located?	• On the street • In front of a store • In/around a restaurant/food service • In/around a street vendor/food stall • In/around a recreational facility • In/around a park/garden • In/around a public transportation station • In/around a school • In/around a workplace • In/around a health care facility
	Which options are available in this vending machine? [Check all that apply.]	• Fresh fruits • Fresh vegetables • Fried fruits and/or vegetables • Sugar-sweetened beverages • Low calorie drinks • Water • High-fat foods (convenient noodle, fried meats, etc.) • Sweets (desserts, cookies, etc.) • Salty snacks (chips, others, etc.) • Low-fat/salt/sugar options • Tobacco products
	Are healthy options identified as healthy?	Y/N

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Appendix 1 (*Continued*)

Name of assessment tool	Component	Response categories
Information assessment	What do you see?	• Message • Advertisement • Point of decision prompt • Regulation
	For which risk factors?	• Tobacco • Diet • Physical inactivity
	Is the message positive or negative?	• Positive • Negative
	What kind of message/advertisement/point of decision prompt/regulation?	• Billboard • Poster • Flyer • Smoke-free or no-smoking sign • No sales to minors sign • Tobacco sale in establishment • Coupons/special prices • Sponsorship • Logo on clothing • Others
	Is a brand mentioned?	Y/N