



Development and Validation of a Short Questionnaire Assessing the Behavior of Local Food Procurement in Quebec, Canada

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ABSTRACT

Background: Very few validated instruments, particularly screening tools applicable to large-cohort studies, are available to assess the behavior of local food procurement.

Objective: The aim was to develop and validate a short questionnaire that measures local food procurement in a sample of French-speaking adults from Quebec, Canada, and to assess the association between local food-procurement behavior and diet quality.

Methods: A comprehensive questionnaire developed previously to measure local food procurement [Locavore-Index (Locavore-I)] was simplified through a series of steps that included face-validity, exploratory factor analysis, and reliability testing (internal consistency). Construct validity of the resulting short Locavore-I Short Form (Locavore-I-SF) was examined in a sample of 299 adults (85% women) from the Quebec City metropolitan community.

Results: The Locavore-I-SF comprises 12 questions that measure the frequency of short food supply chain use (self-production, farmers' markets, and community-supported agriculture box scheme) for 3 locally produced foods (carrot, tomato, and lettuce) as well as the geographical origin of those 3 foods. The Locavore-I-SF, which is scored on a 12-point scale, had a high internal consistency (Cronbach α : 0.74). The Locavore-I-SF scores were strongly correlated with the reference scores obtained from the Locavore-I from which it was developed ($r = 0.84$, $P < 0.0001$). Locavore-I-SF scores also correlated ($r = 0.50$, $P < 0.0001$) with the geographical origin of foods measured by pictures of food labels taken by participants. Higher Locavore-I-SF scores were associated with behaviors consistent with eating local foods, such as gardening (vs. not gardening; mean \pm SEM difference: 2.3 ± 0.4 points; $P < 0.0001$) and not being preoccupied by the foods' appearance standards (vs. being preoccupied; 1.4 ± 0.4 points; $P = 0.0002$). Finally, the Locavore-I-SF scores were weakly associated with the Healthy Eating Food Index-2019 score ($B = 0.05 \pm 0.02$; $P = 0.02$).

Conclusions: The Locavore-I-SF, a short questionnaire based on 3 locally produced foods in Quebec, measures the behavior of local food procurement with good reliability and acceptable validity metrics. *Curr Dev Nutr* 2022;6:nzac097.

Keywords: dietary assessment, eating behaviors, local food procurement, screener, short questionnaire, validation

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Supplemental Figure 1 and Supplemental Tables 1 and 2 are available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at <https://academic.oup.com/cdn/>.

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Abbreviations used: CSA, community-supported agriculture; EFA, exploratory factor analysis; HEFI, Healthy Eating Food Index; Locavore-I, Locavore-Index; Locavore-I-SF, Locavore-Index Short Form; SFSC, short food supply chain; SQ, survey question.

Introduction

Poor nutrition is a leading cause of death worldwide and therefore a major public health issue (1). Until now, policies, strategies, and interventions aimed at supporting healthy eating have had small impacts at the population level. For example, adherence to national dietary guidelines among French-speaking adults from the province of Quebec was shown to be low in 2015 (2), despite decades of messaging and interventions aimed at promoting healthy eating. Dietary guidelines are therefore no longer exclusively focusing on recommendations on food choices but also on healthy dietary habits with the hope of having more impact on the population's overall diet quality. To that extent, eating local foods is often perceived as a behavior that impacts diet quality in a favorable way. The definition of local foods varies greatly in the literature and among consumers (3–5). In this study, “local foods” refers to the concept of geographical proximity, represented by political boundaries (e.g., provincial and regional products) as well as to the concept of social proximity, represented by the use of a short food supply chain (SFSC) such as self-growth, farmers' markets, and box schemes, an arrangement through which vegetables, fruit, or other products are delivered to their home regularly, especially ones produced in the local area.

Consumption of local foods is motivated by a broad range of factors, including produce freshness, variety, and supporting the local economy (6). The rapid growth in the number of farmers' markets between 1980 and 2014 in Quebec is a direct consequence of this increased interest in local foods (7). The coronavirus disease 2019 (COVID-19) pandemic has accelerated the local-foods movement through political actions aimed at expanding national food autonomy and encouraging the consumption of locally produced food products to support the economy (8–10).

Yet, the extent to which eating local foods is indeed associated with better overall diet quality remains uncertain. Indirect evidence from ecological studies does suggest that the presence of, and hence exposure to, local food systems [farmers' markets, community-supported agriculture (CSA) box schemes, direct sales from farmers to people] is associated with better diet-related health outcomes (11). Observational studies also reported positive associations between the behavior of consuming local foods and diet quality (12, 13) and psychological well-being (14), and inverse associations with cardiometabolic risk (15). Data from interventional studies are less convincing (16). For example, while providing memberships to a CSA box scheme reduced the frequency of fast-food meal consumption (17), increased the frequency of meals eaten at home (17, 18), and increased the consumption of vegetables and fruits (17–20), such changes did not always translate into meaningful improvements in overall diet quality.

One of the gaps in this emerging field of research is the availability of valid questionnaires that measure the local food-procurement behavior. We have recently developed a comprehensive questionnaire that yields an index [Locavore-Index (Locavore-I)] that assesses the behavior of procuring local foods by measuring the relational proximity and the geographical proximity of foods purchased. This 89-item questionnaire was used in a mixed-design study conducted previously to examine perceptions, attitudes, and barriers to procuring local foods (21). The median completion time of this 89-item questionnaire, along with the 7 questions on sustainable behaviors, was 29 minutes (IQR: 23–41 min; unpublished data: Fortier J., 2020). The purpose of the present study was

to develop and validate a shorter form of this questionnaire [Locavore-I Short Form (Locavore-I-SF)] for implementation in large-cohort studies to assess how procuring local foods aligns with the healthy eating paradigm. More precisely, 3 specific hypotheses for the construct validation were evaluated. First, Locavore-I-SF scores are expected to correlate positively with scores of other instruments that measure the behavior of local food procurement. Second, Locavore-I-SF scores are expected to demonstrate construct validity through their associations with related variables such as the adoption of other diet-related sustainable behaviors. Finally, we tested the hypothesis that a greater degree of local food procurement correlates positively with overall diet quality.

Methods

Participants

This study used data from 299 participants of the Quebec metropolitan community who were recruited for a project named REPSAQ (*Vers une alimentation territorialisée et durable: une recherche participative pour comprendre le système alimentaire de Québec*). The project details are described elsewhere (21, 22). Participants were recruited between mid-July and mid-October 2017 through voluntary e-mail lists, social media announcements, and social networks. Participants had to be 18 y or older, have access to internet, and be the primary household shopper, as defined by being responsible for >50% of all household food purchases.

The study was approved by the Research Ethics Committee of Université Laval (approval number 2016–141 A-2/21–11-2017). Only the project coordinator had access to the identifiable data. Data were anonymized as soon as the project was completed. The use of anonymized data was authorized by all subjects for future uses. Subjects were not compensated for their participation and had no other direct benefit from study participation. An online website with results from the main REPSAQ study presented in a lay language is available to all participants.

Measures

Sociodemographic data were collected from a web-based questionnaire. Participants also completed 24-h dietary recalls on 3 different days (2 weekdays and 1 weekend day) within a 2-wk period using a web-based 24-h recall (R24W) developed and validated by our group (23–26). Mean dietary intake data from the 3 d were used to calculate the Healthy Eating Food Index (HEFI)-2019, a diet quality index on an 80-point scale that measures adherence to recommendations on healthy food choices in the 2019 Canada's Food Guide (27, 28).

Participants also completed a web-based questionnaire on food-procurement habits from which the Locavore-I is calculated. This questionnaire assesses 9 dimensions related to local foods: 1) self-production, 2) farmers' market use, 3) CSA box scheme use, 4) other place of purchase use, 5) fruit picking, 6 and 7) main place of purchase (in and out of season), and 8 and 9) main geographical origin of food (in and out of season) (21). Each dimension contains questions on a predetermined selection of 11 food items (apple, berry, carrot, tomato, lettuce, bean, corn, egg, pork, bread, honey) available in regional or local markets. An exception is made for the “self-production” dimension, which excluded questions related to pork, and the “fruit picking” dimension, which included questions only on apple and berry. The Locavore-I com-

prises 89 questions and was pre-tested by the research team. Questions were framed to provide information based on the last month (e.g., Last month, how frequently have you purchased your [item] in a farmers' market or a stand?) except for dimensions 7 and 9, which assessed the behavior of local food procurement out of season (October to June). A score based on Locavore-I was developed to reflect the behavior of local food procurement based on these 9 dimensions and 11 food items (**Supplemental Table 1**). To be noted, the "Other place of purchase" dimension is an open-ended question that needed interpretation and hence was scored manually. The score based on the Locavore-I ranges from 0 to 24.7 points. Of note, the final Locavore-I score is calculated based only on food items that were procured by the participant during the last month. Hence, participants are not penalized in the Locavore-I score when not procuring 1 of the 11 foods considered. The Locavore-I-SF was developed using questions from the 89-item Locavore-I questionnaire (see below).

Participants also completed a 7-item web-based questionnaire on sustainable consumer behaviors, enquiring about home gardening, appreciation of standard food appearance, baking bread at home, composting, food wasting, and eagerness to purchase imperfect foods at a cheaper price. The questionnaire on sustainable consumer behaviors uses a binary scaling method (e.g., Are you interested in buying imperfect foods if they are cheaper? Yes = 1 point; no = 0 points).

Participants also answered 2 general questions about local food procurement previously asked in a survey commissioned by the City of Quebec in 2013. The answer to the question "During the last year and approximately, how frequently did you procure local foods (produced or processed within 80 km of place of purchase)?" was scored on a 4-point scale based on a 5-item Likert scale [from "Once a week or more" (4 points) to "I never buy local foods" (0 points)], similar to the approach used to score dimensions 2, 3, and 4 for the Locavore-I (Supplemental Table 1). The answer to the question "Generally, where do you procure most of your local foods?" was scored using the approach used to score dimensions 6 and 7 of the Locavore-I (Supplemental Table 1). These 2 questions are hereafter referred to as survey question (SQ) 1 (SQ-1) and survey question 2 (SQ-2).

Finally, 186 participants (62.2%) took part in an optional component of the REPSAQ project, which required taking pictures of the 11 local foods purchased over a 1-wk period. Information on the food labels was used to confirm the geographical origin of the 11 local foods at the time of purchase. The origin of foods was double-coded by the research team. Foods regionally produced (large Quebec metropolitan community) received 2 points, foods produced within the province received 1 point, and all other foods received 0 points.

Development of the Locavore-I-SF

The development process to simplify the 89-item Locavore-I is shown in **Supplemental Figure 1**. First, using a face-validity approach, the research team discussed the relevance of each dimension in reflecting the behavior of local food procurement. Second, structural validity was assessed through exploratory factor analysis (EFA) and Pearson correlations. EFA was used to reduce the number of questions to reveal the structural dimensions of the Locavore-I and also to see which of the food items correlated with each factor. The factor-extraction method used was a principal analysis factors (princ) estimation method with the prior communality estimate for each variable to its squared multiple

correlation with all other variables (smc). In parallel, Pearson correlation analyses were used to identify which foods among the 11 food items contributed the most to the variance of a residual Locavore-I score, which was calculated by excluding the subscore of each specific food from the total score. Scoring rules were also discussed by members of the research team.

Validation of the Locavore-I-SF

The reliability of the Locavore-I-SF was verified using the internal consistency metric generated by Cronbach α coefficients. The construct validity was first evaluated by assessing the correlation (Spearman) with other metrics reflecting the behavior of local food procurement—that is, 1) Locavore-I scores, 2) main place of purchase scores, 3) SQ-1 scores, 4) SQ-2 scores, and 5) scores from geographical origin of foods purchased based on pictures of the food label. Construct validity was further assessed using cross-classification analysis (weighted κ coefficient) to examine the degree of agreement between the Locavore-I scores, scores from geographical origin of foods purchased based on pictures of food labels, and the Locavore-I-SF scores. Construct validity was also examined using mixed-regression analyses comparing the scores derived from the Locavore-I-SF among groups expected to express different degrees of adopting local food-procurement behaviors, such as gardening, not being preoccupied with standard food appearance, cooking, composting, not wasting food after the expiration date, and eagerness to purchase imperfect foods at a cheaper price measured by the questionnaire on sustainable consumer behaviors. Finally, linear regression analyses were used to assess associations between scores derived from the Locavore-I-SF and diet quality as measured by the HEFI-2019. Age, sex, education, and annual household income were added as covariates in all regression models. Analyses were performed using the Statistical Analysis Software (SAS) Studio version 3.8 (SAS Institute).

Results

Participants

Participants' characteristics are shown in **Table 1**. Participants were mostly female (85%) and a relatively high proportion (66%) had a university degree. They were mostly either employed (57%) or students (27%).

Development of the Locavore-I-SF

Face validity.

After discussion, the research team opted to exclude open-ended questions related to the "Other place of purchase" dimension (Q33–43) of the Locavore-I for lack of practicality if used in large-cohort survey. Questions related to the "Fruit picking" dimension (Q44–45) of the Locavore-I were excluded because they concerned only 2 of the 11 food items questioned. Questions on the "Main place of purchase" (Q46–56) of the Locavore-I were also not considered because of redundancy with questions related to the "Farmers' market use" (Q11–21) and of "CSA box scheme use" (Q22–32) dimensions. It was rather decided that questions related to the "Main place of purchase" dimension would serve as a construct validity variable. Questions related to the "Main place of purchase off season" (Q57–67) and "Main geographical origin off season" (Q79–89) were excluded to retain only a 1-mo refer-

TABLE 1 Characteristics of 299 primary household shoppers from the Quebec metropolitan community¹

Variable	Values
Sex, %	
Female	85
Male	15
Age, mean ± SD, y	39 ± 15
Occupation, %	
Student	27
Employed	57
Retired	13
Unemployed/disabled/other	3
Education, %	
Secondary	6
CEGEP	28
University	66
Annual household income in Canadian \$, %	
\$0–\$29,999	24
\$30,000–\$56,999	22
\$57,000–\$79,999	12
≥\$80,000	42
Missing values (n = 18)	
BMI (kg/m ²), %	
<18.5	10
18.5–24.9	52
25.0–29.9	26
≥30.0	12
HEFI-2019 score, mean ± SD, points/80	50.3 ± 9.7
Locavore-I scores, mean ± SD, points/24.7	2.9 ± 2.1

¹Primary household shoppers refers to being responsible for >50% of food purchases. CEGEP, Collège d'enseignement général et professionnel, a general and vocational college that occurs between secondary (high) school and university in the province of Québec in Canada; HEFI, Healthy Eating Food Index; Locavore-I, Locavore-Index.

ence period. Thus, the face-validity procedure led to the retainment of 4 dimensions of the original Locavore-I—that is, “Self-production,” “Farmers’ market use,” “CSA box scheme use,” and “Main geographical origin.”

Structural validity analysis.

The EFA of the 4-dimension Locavore-I included 42 items (i.e., questions). Questions included were those related to each of the 4 dimensions retained for each of the 11 food items, minus the questions on self-production of pork (not assessed) and on self-production of honey (variance was zero). The EFA scree plot indicated a solution of 3 or 4 factors. Since 4 dimensions were expected, 4 factors were specified in the code. The EFA revealed 4 latent factors corresponding to the 4 dimensions of interest related to the procurement of foods considered local: 1) procurement from farmers’ markets, 2) procurement from CSA box schemes, 3) procurement from self-production, and 4) geographical origin of foods (Figure 1). Subscores for carrot, tomato, green/yellow bean, and lettuce were the only ones to load in each of the 4 factors. Subscores for questions on apple, berry, corn, egg, honey, bread, and pork either did not load in all factors or loaded in the wrong factor (e.g., CSA box scheme use for berry procurement correlated with the factor “farmers’ market”).

Pearson correlation analyses revealed the 3 food items that showed the strongest correlation with the residual 4-dimension Locavore-I score (4-dimension Locavore-I score minus the subscore of the food

item tested) among the 11 food items: carrot ($r = 0.63$), tomato ($r = 0.64$), and lettuce ($r = 0.62$) ($P < 0.0001$ for all; data not shown). According to these 2 analyses, these 3 foods and the 4 dimensions were retained to create the Locavore-I-SF.

The Locavore-I-SF and scoring rules

As described in Table 2, the resulting short questionnaire generated from the Locavore-I comprised 12 questions related to self-production, farmers’ market use, CSA box scheme use, and main geographical origin of carrots, tomatoes and lettuce, 3 foods available in local regional markets in Quebec. The short questionnaire is available in Supplemental Table 2. Table 2 also shows how the scoring rules used to calculate the Locavore-I-SF were modified from the original Locavore-I scoring method. First, only participants reporting all 3 local food-procurement behaviors (self-production, farmers’ market use, and CSA box scheme use) would receive maximum points in the Locavore-I. Instead, manifesting any 1 of the 3 local food-procurement behaviors for each of the 3 targeted local foods receives a maximum score of 2 points in the Locavore-I-SF. For example, reporting a high frequency of consumption of a self-produced food would yield 2 points for the frequency of use of SFSC, independent of whether or not relying on a farmers’ market or a CSA box scheme to procure that particular food is reported. Another example pertains to reporting procurement from many SFSCs, where receiving a CSA box scheme once every 2 wk and going to a farmers’ market 2–3 times/mo would each be scored 1 point, thus achieving the maximum of 2 points for the dimensions related to SFSC. Second, the original Locavore-I did not penalize a respondent who did not procure one of the targeted local foods. This scoring rule allowed to address different dietary consumption patterns of participants. For instance, vegan participants were not penalized when they did not procure pork or eggs. Because the diversity of local items procured was considered a desired behavior, a participant not reporting procuring one of the local foods was attributed 0 points for that food in the Locavore-I-SF score.

The mean ± SD Locavore-I-SF score on a scale of 0 to 12 points in this population was 4.0 ± 3.1 points, with an IQR of 2.0–6.0 points and minimum and maximum values of 0 and 12 points, respectively.

Validation of the Locavore-I-SF

Internal consistency.

The Cronbach α coefficients of the Locavore-I-SF was 0.74, with individual correlations between each question and the residual Locavore-I-SF ranging from 0.71 and 0.74 (data not shown).

Construct validity.

As shown in Table 3, the Locavore-I-SF scores correlated with other measures of local food-procurement behaviors. The Locavore-I-SF scores correlated particularly strongly with the main place of purchase ($r = 0.69$, $P < 0.0001$) and the geographical origin of foods measured by pictures of food labels taken by participants ($r = 0.50$, $P < 0.0001$). The Locavore-I-SF scores also correlated strongly with the Locavore-I ($r = 0.84$, $P < 0.0001$). As shown in Table 4, the weighted κ (0.66) reflected substantial agreement between the Locavore-I-SF scores and the Locavore-I score in cross-classification analyses. Specifically, most participants were classified in the same quartiles (60.9%) or in adjacent quartiles (30.1%) using both indices. Only 0.3% of participants were grossly misclassified (first vs. fourth quartiles). Relatively similar val-

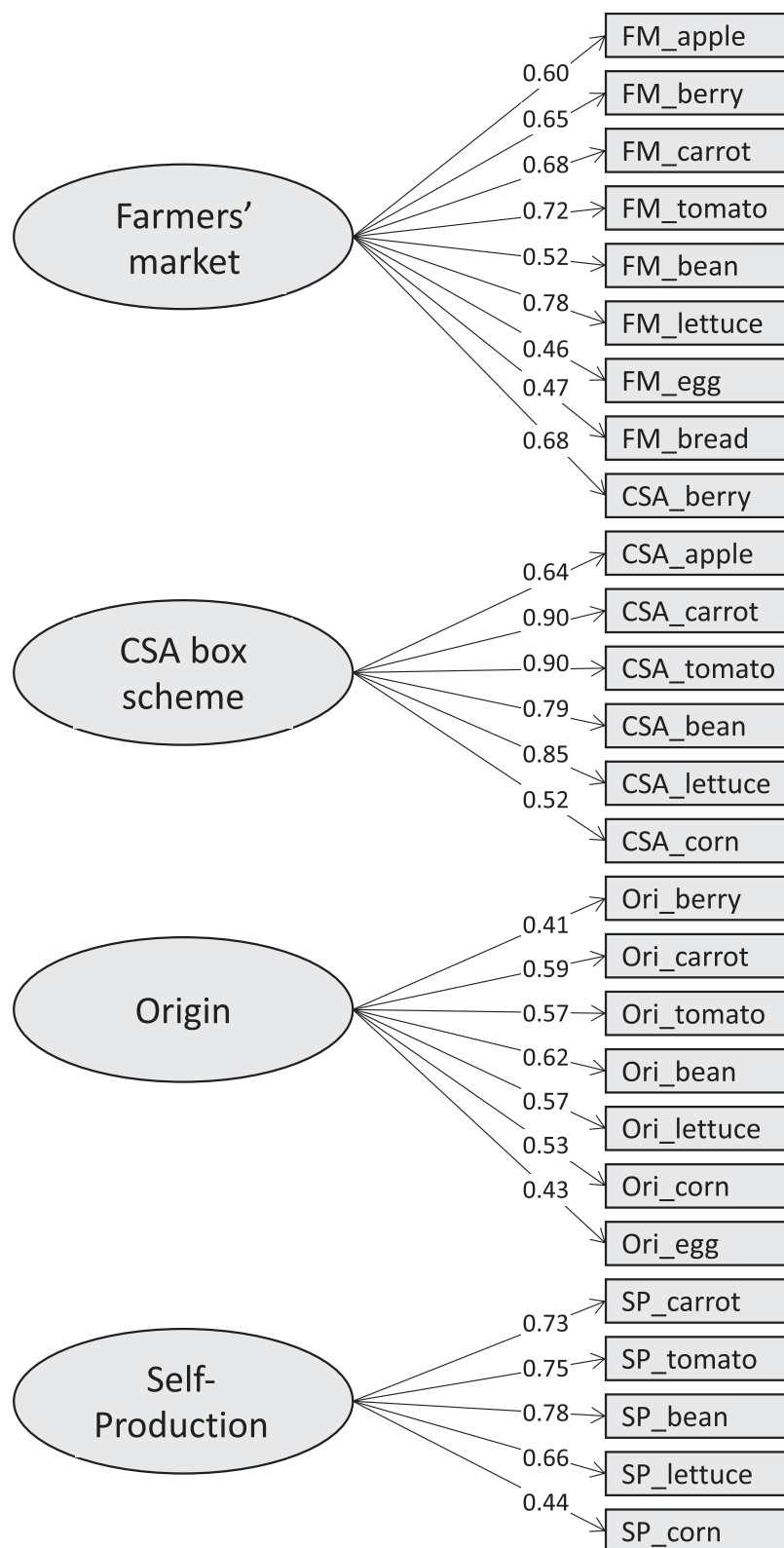


FIGURE 1 EFA and loadings of the intermediate Locavore-I (42 questions) with the 4 dimensions retained after the face-validity step: self-production (SP), farmers' market use (FM), CSA box scheme use (CSA), main geographical origin (Ori). CSA, community-supported agriculture; EFA, exploratory factor analysis; Locavore-I, Locavore-Index.

TABLE 2 Dimensions of local food procurement covered by the Locavore-I-SF for the 3 food items retained (i.e., tomato, carrot, lettuce) and scoring rules¹

Dimensions	Question number	Scoring rules
SFSC proxy ²		
1. Self-production	Q1–3	Proportion of self-produced food consumed: <10%: 0 points ≥10% to <25%: 0.5 points ≥25% to <50%: 1 point ≥50% to <75%: 1.5 points ≥75%: 2 points
2. Farmers' market	Q4–6	Frequency of use: Never: 0 points Once/month: 0.5 points 2–3 times/mo: 1 point Once/week: 1.5 points More than once/week: 2 points
3. CSA box scheme	Q7–9	Same as #2 Farmers' market
4. Main geographical origin	Q10–12	Canada and abroad: 0 points Provincial product: 1 point Regional product: 2 points
Total (/12 points)		The total was calculated as the sum of the 3 food items retained (i.e., tomato, carrot, lettuce)

¹CSA, community-supported agriculture; Locavore-I-SF, Locavore-Index Short Form; SFSC, short food supply chain.

²SFSCs are weighed equally in the Locavore-I-SF, meaning that a maximum of 2 points is attributed for each of the 3 foods (tomatoes, carrots, lettuce) across the 3 SFSC dimensions (see Results for details). For example, reporting a high frequency of consumption of a self-produced food would yield 2 points for the frequency of use of an SFSC, independent of whether or not relying on a farmers' market or a CSA box scheme to procure that particular food is reported. Another example pertains to reporting procurement from many SFSCs, where receiving a CSA box scheme once every 2 wk and going to farmers' markets 2–3 times/mo would each be scored 1 point, thus achieving the maximum of 2 points for the dimensions related to SFSC.

ues were observed when using the origin of foods measured by scores according to pictures of food labels as reference in cross-classification analyses (Table 4).

The average differences in Locavore-I-SF scores between participants categorized as having versus not having sustainable behaviors are presented in Figure 2. Gardening (vs. not gardening; mean ± SEM difference: +2.3 ± 0.4 points; $P < 0.0001$), not being preoccupied by the foods' appearance standards (vs. being preoccupied; +1.4 ± 0.4 points; $P = 0.0002$), baking bread at home (vs. not baking at home; +0.78 ± 0.4 points; $P = 0.04$), and wanting to buy imperfect food at a lower price (vs. not wanting; +1.18 ± 0.6 points; $P = 0.04$) were associated with higher Locavore-I-SF scores. Finally, in multivariable analyses adjusting for sex, age, education, and annual household income, the Locavore-I-SF was weakly but significantly associated with the HEFI-2019 score ($B \pm SEM$: 0.05 ± 0.02; $P = 0.02$).

Discussion

The objective of the study was to develop and validate a short questionnaire that assesses the behavior of local food procurement for use in larger cohort studies and to assess the association between local food-procurement behavior and diet quality. The Locavore-I-SF simplified from a comprehensive 89-item questionnaire is based on 4 dimensions—that is, 1) frequency of consumption of self-produced foods, 2) frequency of use of farmers' markets, 3) frequency or use of CSA box schemes, and 4) main geographical origin of foods purchased. Each dimension is assessed for 3 foods that are locally produced in Quebec (i.e., carrot, tomato, and lettuce). The Locavore-I-SF is therefore based on a total of 12 questions. Validation analyses indicated that the Locavore-I-SF has acceptable psychometric properties, including acceptable variability and internal consistency and adequate construct validity.

TABLE 3 Spearman correlations between Locavore-I-SF scores and scores based on corresponding variables reflecting the behavior of local food procurement¹

	Locavore-I-SF	
	Spearman's rho	P
Locavore-I	0.84	<0.0001
Main place of purchase (SFSC)	0.69	<0.0001
SQ-1: Frequency of consuming local food products	0.39	<0.0001
SQ-2: Main place of purchase (SFSC) of local food products	0.24	<0.0001
Geographical origin of foods based on food labels	0.50	<0.0001

¹Total sample for this analysis is $n = 299$, except for the analysis of geographical origin of foods, where $n = 186$. Locavore-I, Locavore-Index; Locavore-I-SF, Locavore-Index Short Form; SFSC, short food supply chain; SQ, survey question.

TABLE 4 Cross-classification and weighted κ between Locavore-I-SF scores and Locavore-I and geographical origin of foods based on food label scores¹

	Locavore-I-SF			Weighted κ
	Same quartile	Adjacent quartiles	Opposite quartiles (first vs. fourth)	
Locavore-I	60.9%	30.1%	0.3%	0.66
Geographical origin of foods based on food labels	41.4%	41.4%	4.3%	0.36

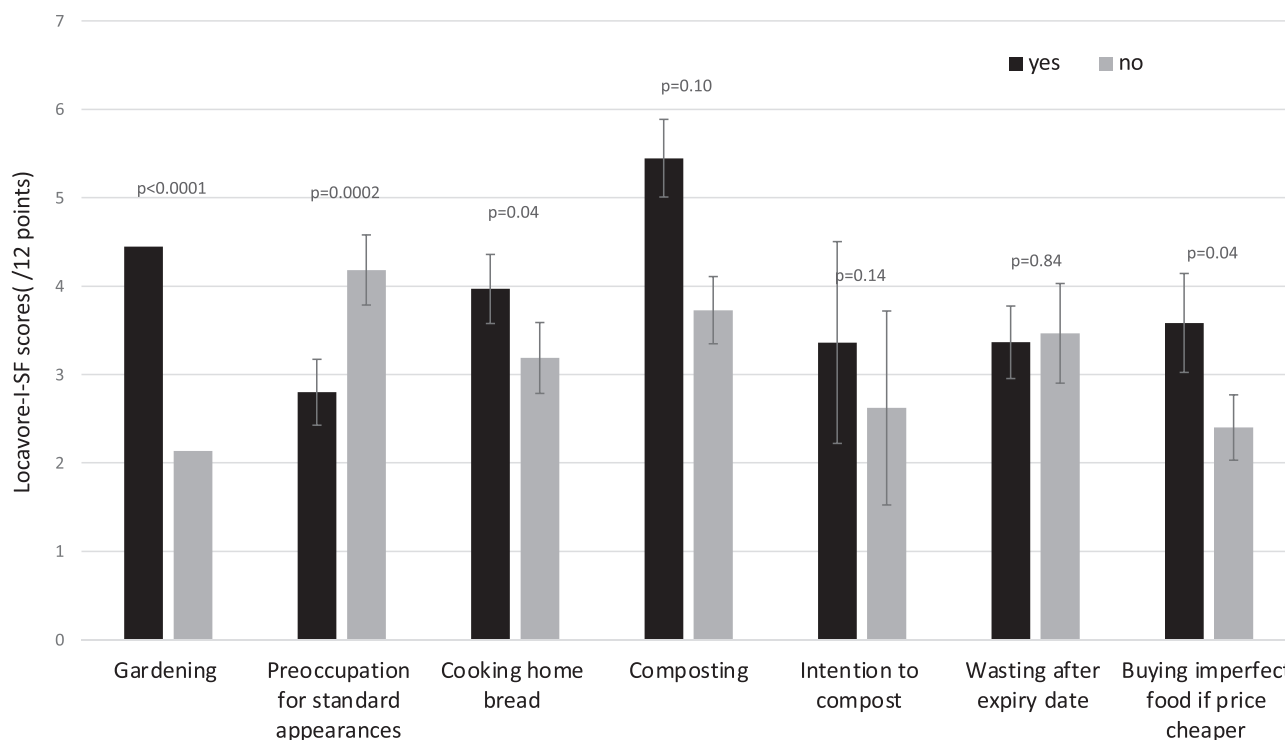
¹Total sample is $n = 299$ for Locavore-I analysis and $n = 186$ for geographical origin of foods analysis. Locavore-I, Locavore-Index; Locavore-I-SF, Locavore-Index Short Form.

In 2017, the Locavore-I reflecting local food procurement properly discriminated high from low local food consumers by illustrating differences in salient beliefs identified among focus groups (21). Developed using a combination of mixed face-validity and statistical approaches, the Locavore-I-SF scores were strongly correlated with the original Locavore-I scores and the degree of agreement between the 2 scores was good (29). The weighted κ coefficient (0.66) also indicated a good degree of reliability between the Locavore-I-SF scores and Locavore-I scores (29), reflecting the fact that the simplified Locavore-I adequately measures the behavior of local food procurement. This relatively high degree of agreement is not surprising since the Locavore-I-SF was developed using the questions and responses from the more comprehensive Locavore-I questionnaire. Further validation is needed to explore how completing both questionnaires separately influences the reliability between the 2 measures of local food procurement.

The construct validity assessment was partly based on an objective measure reflecting the concept of local food procurement—that is, the origin of foods measured by pictures of food labels taken by partici-

pants. The correlation between the Locavore-I-SF scores and the objective measurement of the origin of foods ($r = 0.50$, $P < 0.0001$) is considered acceptable (29). The weighted κ coefficient between these 2 measures (0.36) also suggests acceptable agreement (29). Although only 62.2% of participants took part in this optional section of the project, the characteristics of this subsample were not different from those of the full sample (data not shown). The discrepancy may be partly explained by the fact that the measurement of the origin of food only covered 1 of the 4 dimensions (main geographical origin) included in the Locavore-I-SF.

The construct validation strategy revealed good reliability of the Locavore-I-SF score to assess the behavior of local foods procurement. For example, there was a strong correlation between the Locavore-I-SF scores and the main place of purchase ($r = 0.69$, $P < 0.0001$). This association was expected since the procurement of foods from SFSCs represents 3 dimensions out of 4 on the Locavore-I-SF and weighs half of total points. Interestingly, the responses to the 2 questions “SQ-1, During the last year, and approximately, how frequently did you procure local foods?” and “SQ-2, Generally, where do you procure most

**FIGURE 2** Locavore-I-SF scores according to 7 sustainable consumers' behaviors using mixed regressions. Values are means \pm SEMs and are adjusted for age, sex, education, and annual household income. Locavore-I-SF, Locavore-Index Short Form

of your local foods?” were correlated only weakly with the Locavore-I-SF scores. Similar results were observed with Locavore-I scores in 2017 (21). Because the conception and definition of local foods vary greatly among consumers, people may overestimate or underestimate the perceived behavior of local food procurement when questioned in such a generic way. We can hypothesize that questions on specific behaviors such as purchasing foods at farmers’ markets and cultivating vegetables in the backyard, without reference to the terms “local foods,” may have provided less-biased estimates of the behavior of local food procurement.

The construct validity analyses showed that the Locavore-I-SF score is associated with characteristics of consumers that are coherent with the purchase of local food products. First, higher Locavore-I-SF scores were seen in participants who were gardening, not preoccupied by the foods’ appearance standards, baking bread at home, and wanting to buy imperfect food at a lower price. This is consistent with data from other studies where local food consumers were also more likely to garden and to cook from fresh ingredients (30, 31).

Locavore-I-SF scores correlated weakly but significantly with the HEFI-2019 score, a measure of how dietary patterns align with recommendations on healthy food choices in the 2019 Canada’s Food Guide, and hence a measure of diet quality (27, 28). Interestingly, subscribing to a CSA box scheme was associated with overall high diet quality in a large Canadian cohort study, while purchasing local food products at farmers’ markets was not (12). Machado et al. (13) also reported a weak inverse correlation between the use of an SFSC and the consumption of ultra-processed food, the measure used to assess the overall diet quality in their study. Finally, Santulli et al. (15) reported no difference in overall diet quality as measured by adherence to a Mediterranean diet pattern between people who used and those who did not use SFSCs. In sum, it remains unclear if local food procurement is associated with better overall diet quality.

Strengths and limitations

To our knowledge, this is the first study to develop and validate a short questionnaire to measure the behavior of local food procurement in Quebec. Where other indices have traditionally used information on SFSC only, the Locavore-I-SF uses information on both the use of an SFSC and geographical origin of foods (3). The use of pictures of food labels taken by participants as an objective measure to validate the Locavore-I-SF is also a strength. Some limitations in this study should also be noted. The French-Canadian context of the study, the unbalanced gender proportions and of educational levels, as well as the relatively high socioeconomic status of participants suggest caution in extrapolating the use of the Locavore-I-SF to other populations. Nevertheless, the development process of this short screening tool is relevant to other populations. The Locavore-I-SF does not collect information related to access to gardening spaces, which is essential for self-production, as well as on information on how local food procurement affects the costs of one’s overall daily diet. These are barriers to local food procurement and further research is needed to examine the extent to which gardening capacity at home or close to home and potentially higher costs of local foods found in farmers’ markets and in CSA box schemes influence the behavior of local food procurement.

Conclusions

Results of this study demonstrate that the Locavore-I-SF measures the behavior of local food procurement with adequate reliability and relative validity among a French-Canadian population. This tool can be a useful to assess the behavior of local food procurement in large-cohort studies to establish the alignment between local food procurement and diet quality and the association with long-term health.

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Data Availability

Data described in the manuscript, code book, and analytic code will be made available upon request.

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