

Understanding Food Waste and Donation Behavior: A Study in Food Bank of West Java, Indonesia

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Abstract

The quantity of food waste consistently rises annually, which generates a large number from the household level. Therefore, it is imperative to engage in collaboration with all stakeholders to effectively mitigate food waste. Food banks appear to be potential actors in reducing food waste by distributing surplus food. Unfortunately, food banks as non-profit organizations rely significantly on donors for their operations. As a result, research on food banks' impact on the decreased amount of food waste needs to be conducted. This study used Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the responses of 400 respondents in West Java to understand what factors motivated the public to donate and to generate recommendations for strategies to attract people to donate. This study considers factors such as personal norms, food waste behavior, personal experience toward poverty, and external motivation correlated to donation behavior. Based on the PLS-SEM result, unfortunately, there is no significant correlation between food waste behavior and donation behavior. Food waste at the household level is a multifaceted issue that can be influenced by various factors. Based on the recommendation result, it recommends further boosting public awareness by increasing through social media which aligns with the questionnaire result where almost 50% of respondents know food banks from social media.

Keywords

Food bank, Food waste, Donation behavior, Partial Least Square-Structural Equation Modeling (PLS-SEM).

Introduction

Sustainable Development Goals (SDGs) are global action plans developed by the United Nations and expected to be achieved by 2030 to transform the world into a more sustainable one gets more attention recently. One of the SDGs promoted by the UN is zero hunger, which aims to put an end to hunger, achieve food security, improve nutrition, and promote sustainable agriculture (Blesh et al. 2019). According to the findings of the Global Hunger Index 2022 Indonesia has been placed as the third most severely affected country in terms of hunger within the ASEAN (Annur, 2023). Food security has become a significant national priority for the Indonesian government due to its complex nature and the inability of certain provinces to satisfy the minimum calorie intake (Devi et al. 2020; Makbul et al. 2019; Mintarja 2019). As a result, ensuring the continuity of sustainable food security is a crucial factor in fostering economic development, enhancing the welfare of individuals, and fostering social cohesion. Furthermore, the

elimination of hunger and the achievement of Sustainable Development Goals (SDGs) are of utmost importance (Gu et al. 2023).

In contrast, each year, the food and beverage sector in Indonesia wastes approximately 300 kg of food. Furthermore, from 2000 to 2019, the amount of food waste and food loss in Indonesia ranges between 23 and 48 million tons per year (Bappenas 2021). As a result of these circumstances, Indonesia is the world's second-largest producer of food waste. Aside from that, with a population of 4.3 billion people, the Indonesian Statistics Bureau (BPS) predicts that the amount of waste generated in Indonesia will continue to grow by 2.2 billion tons per year in 2025 (Septian 2020). According to a government report in 2022, Bandung produces 1.594,18 tons of waste per day with a population of 2.530.448 people. Therefore, food waste accounts for up to 44,52% of the waste pile (Brilyana 2022). Another reference mentions that food waste reached 63,56% of the waste composition in Bandung (Brigita & Rahardyan, 2013). Unfortunately, food waste in Indonesia is still poorly managed due to insufficient treatment practices, such as insufficient tools and ineffective waste management regulations which may lead to a negative impact on the environment (Suhartini et al. 2022).

Food banks appear to be a socially desirable solution to better-utilizing food waste from the standpoint of waste reduction since it provides a "win-win" solution because salvaging edible foodstuffs from the "surplus" industry aids in "feeding the hungry". Food banks' growth in the world's wealthier countries supports the notion that they provide a good solution to preventing certain types of food waste (Tarasuk & Eakin 2005; van der Horst et al. 2014). As a result, the food bank appears as a high potential agent for Indonesia to achieve the SDGs 2030, specifically zero hunger. Unfortunately, food bank faces a challenge due to the uncertainty of donation amounts and frequency, which may result in insufficient quantity and quality of food as well as operational needs (Middleton et al. 2018; Paul & Davis 2019). This statement is consistent with research conducted by Mensah et al. (2021) which presents funding and support as the main challenges faced by food banks. Consequently, the House of Representatives began to pay attention to this effort as they attempted to develop a constitutional draft titled the Constitutional Draft on Foodbank for Social Welfare, which existed in 2019 (Darmowinoto et al. 2020). Aside from relying on the government and local businesses, food banks must understand why some people give while others do not, as this knowledge will assist them in developing advertisements, creating appropriate content for social, and building appropriate point-of-donation displays which are most likely to attract donations to make food bank more sustain (Paul & Davis 2019).

Most of the research on food banks is focused on operations to achieve the effectiveness of the supply chain (Azevedo et al. 2022; LeBleu & Landry 2022; Mensah et al. 2021; Rao et al. 2022). While there are still few studies conducted on understanding factors that motivate people to donate to food banks (Bennett et al. 2023; Verpy et al. 2003). However, there have been limited studies into understanding donor behavior, particularly in the context of food banks in developing countries where the concept of food banks is relatively uncommon. This study aims to fill this gap by exploring the conditions in West Java, Indonesia. To accomplish this, a quantitative methodology will be utilized, specifically employing Partial Least Squares Structural Equation Modeling (PLS-SEM) for data analysis.

1.1 Objectives

This study aims to comprehend the behavior of individuals who have made donations to a food bank. The expected outcome of this study is a guideline for food banks to map out or create strategies to attract people to donate.

2. Literature Review

2.1 Food Bank

The term "food bank" originally referred to a central collection and distribution center that provided bulk food to local food relief programs; the local food depot or food pantry then provided food assistance to those in need directly (Starkey et al. 1998). Food banks not only alleviate hunger but also mitigate food waste by distributing food that is still suitable for consumption but would otherwise be discarded. Food banks also contribute to increasing awareness about food inequality concerns and promoting community involvement in assisting people who are in need. The primary objective of food banks is to alleviate hunger and prevent the wastage of edible food (Arsil et al. 2023). Therefore, food banks appear to be a socially desirable solution to better-utilizing food waste from the standpoint of waste reduction since they serve as a link between surplus food and those in need (Darmowinoto et al. 2020; Tarasuk & Eakin 2005; van der Horst et al. 2014).

In Indonesia, food banks provide a crucial function by acting as a conduit between surplus food supplies from stores and homes, and the food requirements of individuals in need. This helps address the issue of food waste and ensures that those who require food can access it. Food waste redistribution initiatives in Indonesia began in 2016 with the formation of the Foodbank of Indonesia and Food Cycle Indonesia in Jakarta. In the same year, the Indonesia Foodbank was established in Banten, and in 2017, Garda Pangan was established in Surabaya. These non-profit organizations offer surplus food to those who are in need. These organizations gather food from final consumers, such as those from weddings, corporate parties, and hotels. The food will thereafter be provided to the elderly, children in orphanages, homeless children, and other individuals in need. Similar to food banks in other nations, food banks in Indonesia may have comparable obstacles in achieving long-term viability (Syalianda & Kusumastuti 2023).

Over the past few years, food banks in Indonesia have significantly reduced the quantity of food waste. According to its annual report, the Foodbank of Indonesia successfully distributed 622 million tons of food and 33.512 portions of food to 292.552 beneficiaries in 2021 (FOI 2021). According to the 2023 Annual Report of Food Cycle, they successfully distributed 140.332 kg of food to 46.599 beneficiaries (FoodCycle 2023). To attain this number, they are involved in certain activities such as rescuing surplus food from agricultural production as well as rescuing surplus food from hotels, restaurants, and retail. They gather the excess food and distribute it to other groups, including providing food help to schools, addressing emergencies, and supporting expecting mothers.

2.2 Donation Behavior

Donation behavior is influenced by the theory of planned behavior, in which attitude, subjective norm, self-efficacy, and moral norm contribute to an individual's intention to donate, ultimately resulting in actual donation behavior (Veldhuizen et al. 2011). According to Lee et al. (2015) and Noor et al. (2015), the motivation behind donation behavior could be classified into external motivations and internal motivations. By understanding both internal and external motivation, food banks could develop effective strategies to encourage donations. The internal motivations of charitable giving pertain to the fundamental individual motivations behind choosing to assist a charitable cause. The primary factors influencing philanthropic behavior are the psychological motivations for giving and opting to support a non-profit organization (Noor et al. 2015). The internal motivation consists of altruism, empathy, and the emotional satisfaction derived from giving (Bennett et al. 2023). Therefore, the hypothesis of this study is established as follows:

- H1a:** Personal norms are significant correlate with donation behavior
- H1b:** Food waste behavior is significantly correlated with donation behavior
- H1c:** Personal experience toward poverty is significantly correlated with donation behavior

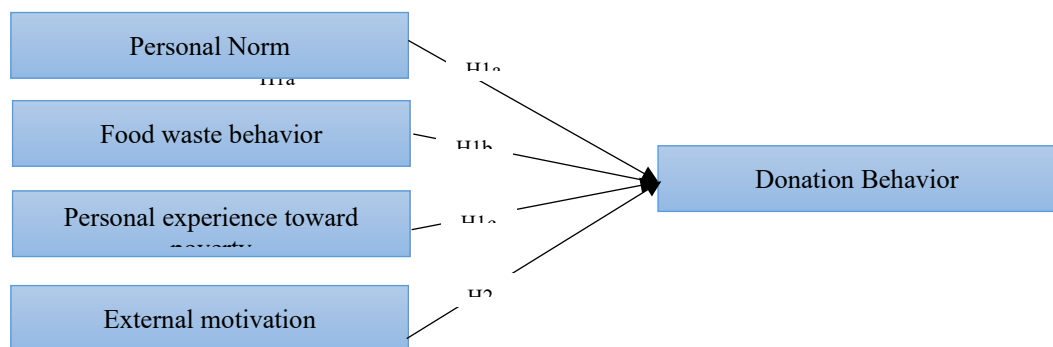


Figure 1. Research Framework

External motivations primarily refer to demographic aspects that influence the perception of charity appeals and the decision-making process (Noor et al. 2015). The external motivation is related to 1) the support of other individuals or groups to which they belong, 2) transparent management as an important point particularly in a context of distrust in public institutions, and 3) influence from well-known celebrities (Mainardes et al. 2017). Demographic factors such

as age, income, education level, and cultural background also play significant roles in shaping donation behavior (Garratt 2017; Noor et al. 2015). Therefore, the hypothesis of this study is established as follows:

H2: External motivation is significantly correlated with donation behavior

3. Methods

The research approach of this study is using quantitative approaches. The measurement items used in this study were adapted from the existing literature. Five measuring items are taken from Bennett et al. (2023) for personal norms, attitudes toward poverty, and willingness to donate to food banks. The question regarding food waste behavior was adapted from Gil & Diaz-ruiz (2018) and Richter (2017). Finally, attitudes toward charitable giving scale were adopted from Roberts & Roberts (2012). The minimum number of respondent samples will be calculated with Slovin formula.

$$n = \frac{N}{1+N(e)^2}$$
$$n = \frac{49.935.858}{1+49.935.858(0,05)^2}$$
$$n = 399,99 \sim 400 \text{ sample}$$

Information:

n = minimum number of samples

N = the total number of the sample population (Statistics of Jawa Barat, 2020)

e = margin of error (0,05)

Table 1. (APPENDIX-A) represents a questionnaire design constructed from the literature review

The questionnaire then will be analyzed using the PLS-SEM. A factor weight of 0.50 or above is generally regarded as having sufficient validation to account for the underlying concept in most sources (Etiawan et al. 2018). Another source states that the loading factor is considered favorable if it is >0.7 (Hair et al. 2019; Narimawati et al. 2022). In addition to loading factors, a model appropriateness test or "goodness of fit" (GOF) is conducted with the primary variables to assess are Chi-Square, GFI, RMSEA, RMR, and SRMR, with Chi-Square (Narimawati et al. 2022).

4. Data Collection

The research employs an online questionnaire distributed through e-mail and social media. The measurement used a 5-point Likert scale, with a score of 5 indicating strong agreement and 1 indicating strong disagreement. On the other hand, several questions are presented as a mini-essay on recommendations for food banks. The questionnaire items are translated into Indonesian languages. The data collection procedure was conducted over one month in October 2023. The questionnaire was disseminated with Slovin sampling procedures, targeting respondents residing in the region of West Java.

5. Results and Discussion

This study was limited to people who live in West Java and are over 18 years old. There are 400 respondents that willing to fill out the questionnaire completely. Table 2 represents the demographic profile of the respondents.

Table 1. Demographic profile (n=400)

Category	Percentage
Age	18-25
	26-35
	36-45
	46-50
	>50
Gender	Male
	Female
Monthly income range (Rp)	< 1.000.000
	1.000.000 – 3.000.000
	3.000.000 – 5.000.000
	> 5.000.000
Education	High school diploma
	Bachelor's degree
	Master's degree
	PhD
	Others
Occupation	Students
	Housewife
	Entrepreneur
	Civil servant/Employee
	Others
Food bank knowledge	Know
	Do not know
Food bank donation history	Already donate
	Never donate

This questionnaire is subsequently analyzed using PLS-SEM to assess the correlation between each variable. Once the PLS path model estimation reaches convergence, it is needed to do report the evaluation for the reflective model; 1) Outer loadings; 2) Composite reliability; 3) Cronbach's Alpha; 4) AVE; and 5) Discriminant validity. After ensuring the construct measures are both trustworthy and valid, the last stage involves evaluating the outcome of the structural model; 1) Collinearity issues; 2) Structural model path coefficients (VIF and goodness-of-fit index or GoF); 3) Coefficient of determination (R^2 value); 4) Effect size f^2 , and 5) Blindfolding and predictive relevance Q^2 , (Hair et al. 2017; Narimawati et al. 2022). After eliminating constructs with outer loading below 0,6, author modified the variable constructs as shown in Figure 2.

Initial assessment of the reflective measurement methodology entails analyzing the indicator loadings. The next stage involves evaluating the internal consistency reliability. The third stage of the reflective measurement model assessment focuses on evaluating the convergent validity of each measure of the concept. Convergent validity refers to the degree to which a construct effectively explains the variability of its individual items. The average variance extracted (AVE) is the metric employed to assess the convergent validity of a construct. It is calculated by determining the average variance extracted from all items within each construct (Hair et al. 2019)

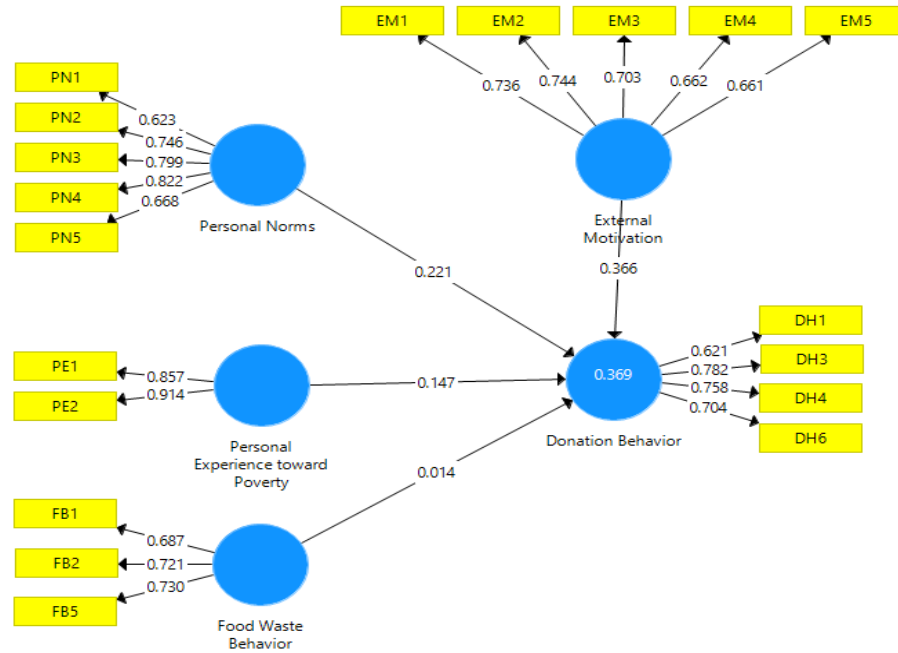


Figure 2. Modified outer loading

Table 2. Reflective Measurement Models

Construct	Internal Consistency		Convergent Validity	
	Cronbach's alpha	Composite Reliability	Outer Loading	AVE
Internal Motivation				
Food Waste Behavior	0,526	0,756		0,508
FB1			0,687	
FB2			0,721	
FB5			0,730	
Personal experience toward poverty	0,730	0,880		0,785
PE1			0,857	
PE2			0,914	
Personal norms	0,792	0,854		0,514
PN1			0,623	
PN2			0,746	
PN3			0,799	
PN4			0,822	
PN5			0,668	
External Motivation	0,743	0,829		0,493
EM1			0,736	
EM2			0,744	
EM3			0,703	
EM4			0,662	
EM5			0,661	
Donation Behavior	0,714	0,810		0,517
DH1			0,621	
DH3			0,782	
DH4			0,758	
DH6			0,704	

The last stage is conducted discriminant analysis to determine the empirical distinctiveness of a construct compared to other constructs in the structural model. This analysis is done using the HTMT analysis, as presented in Table 4 (Hair et al. 2019).

Table 3. HTMT Analysis

	DH	EM	FB	PE	PN
Donation behavior (DH)					
External motivation (EM)	0,653				
Food waste behavior (FB)	0,436	0,602			
Personal experience toward poverty (PE)	0,483	0,530	0,623		
Personal norms (PN)	0,538	0,668	0,661	0,517	

Table 5 displays the p-value for each variable, which indicates the level of significance for the relationship of the variable. In most research projects, researchers typically use a significance level of 5% or a p-value less than 0,05 as the threshold (Hair et al. 2017). Regrettably, there is no discernible association between individuals' food waste behavior and their history of making donations. Food waste at the household level is a complex problem that can be affected by multiple causes. The factors that influence food waste generation in households include demographic variables (such as the tendency for younger people to generate more food waste than older people), household income, household size and composition, cultural variables, and the overall process of managing food within the household (such as excessive purchasing, mismanagement of food storage, and preparing larger portions than what is consumed) (Lanfranchi et al. 2016). The author's research solely concentrated on evaluating participants' inclination to acquire food and the amount of food they ingested. Therefore, this variable is inadequately represented as a "food waste behavior" variable.

Table 4. p-value of variables

Construct	p-value
External motivation -> Donation behavior	0.000
Food waste behavior -> Donation behavior	0.767
Personal experience toward poverty -> Donation behavior	0.003
Personal norms -> Donation behavior	0.000

According to Figure 2, external factors such as peer influence, transparency of food bank, and food bank location are the main factors that motivate individuals. This discovery aligns with the research conducted by Xu & Zhang (2023), which shows that trust plays a crucial role in forecasting persons' inclination to contribute and participate as volunteers. When individuals hold a favorable perception and trust in an institution, they are more inclined to allocate a larger sum of money. Personal norms or altruism are the secondary factors that drive individuals to have a desire to donate. These results align with the findings of a study conducted by Verpy et al. (2003), which shows that those who donate money experience emotions of satisfaction or a "warm glow". The phenomena can be correlated by the impact from participating in any pro-social endeavor, including engaging in pro-environmental actions, which exerts a beneficial influence on an individual's norms and behavior.

In addition to comprehending the factors that encourage individuals to donate, the author also uncovers the preferences of respondents regarding donation methods. The findings reveal that 46% of the respondents expressed a preference for donating money, while 45% indicated a preference for donating food. Only 9% of the respondents expressed a willingness to become volunteers. Verpy et al. (2003) found that individuals are more likely to donate money to food banks with the belief that it will enable them to get a greater quantity of food or purchase culturally suitable food items. Verpy et al. (2003) also stated that had a strong belief that money would be spent prudently to fulfill the necessary requirements. For certain individuals, money was perceived as a convenient alternative to personally delivering meals to a designated place, while others expressed apprehension regarding the allocation of contributed funds.

Furthermore, respondents provided various recommendations to boost public awareness of food banks, summarized in Table 6. A majority of respondents recommend increasing awareness through social media, which aligns with the questionnaire results indicating that almost 50% of respondents discovered food banks from social media.

Implementing these recommendations can significantly enhance public engagement. For instance, social media campaigns can leverage influencers and targeted advertisements to reach a broader audience. Collaborating with influencers who have a strong following and are trusted by their audience can amplify the message and encourage more people to donate which also aligns with research conducted by Mainardes et al. (2017).

Table 5. Thematic Recommendation to Increase Public Awareness

Recommendation	n	Quote
Increase awareness through social media 1. Use Instagram and TikTok as channel 2. Collaborate with influencer	141	“Food banks can increase exposure and effectiveness through social media campaigns, collaborations with influencers, local businesses, and non-profit organizations. Holding fundraising events and using technology such as mobile applications to increase participation” – Respondent 27 “Promote more often on social media such as TikTok and IG” – Respondent 38
Offline campaign 1. Campaign at public space on holiday 2. Collaborate with Neighborhood Head 3. Distribute flyer	30	“Collaborate with Family Welfare Empowerment (PKK)” – Respondent 199 “Do campaign at car-free-day” – Respondent 370 “Collaborate with the local regional chairman to ensure that the donation target is right” – Respondent 142
Increase branch of food bank	6	“More food banks must be provided and there must also be more benefits from food banks to the community so that people care more about food banks” – Respondent 128 “Having a place close to industrial areas or residents is easy to find and people who want to donate don't have to worry about choosing a place to donate” – Respondent 187 “Provide food bank that located in mall or food court” – Respondent 25 “Pick-up service for food bank donations throughout the region so that they are easier to reach” – Respondent 326
Increase trust 1. Transparency	3	“Building trust through food safety controls (by provide expiration date on food label)” – Respondent 293 “Provide daily reports about recipients and number of donors” – Respondent 15

Conclusion

External motivation is identified as the most significant driver for public donations. This means that external factors such as social influence, transparent management, and celebrity endorsements play a crucial role in encouraging individuals to contribute. For instance, the support and encouragement from social groups or communities can significantly boost one's likelihood to donate, as people often follow the behavior of those around them. Transparent management practices, which ensure that the donated resources are used effectively and responsibly, build trust and confidence among potential donors, making them more willing to contribute. Additionally, endorsements and appeals from well-known celebrities can attract attention and lend credibility to charitable causes, further motivating the public to donate. Nevertheless, this research has certain limitations. Firstly, it was conducted exclusively in West Java, Indonesia, which may restrict its applicability to food banks in other regions. Secondly, the study did not take into account other potential factors that could influence the results, such as economic conditions, seasonal variations, and competing institutions similar to food banks.

As a result, future research needs to be conducted:

1. Comparative studies across different regions or countries could reveal how cultural, economic, and policy differences impact food donation behaviours and the effectiveness of food banks.
2. Experiment with different campaign methods to understand which campaign is effective in increasing awareness of food bank
3. Investigate the efficacy of influencers in increasing public donations

4. Examine public behaviour in areas where there is no food bank branch to understand potential barriers and motivations for establishing new branches

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APPENDIX -A

Table 6. Questionnaire Design

Code	Items	Source	Response
Demographic information			
DM1	Name		Short answer
DM2	Age		a. 18-25 b. 26-35 c. 36-45 d. 46-50 e. >50
DM3	Gender		a. Male b. Female
DM4	Income		a. <1.000.000 b. 1.000.000-3.000.000 c. 3.000.000-5.000.000 d. >5.000.000
DM5	Job		a. Student b. Civil servant/ Employee c. Entrepreneur d. Housewife e. Others
DM6	Education		a. Civil servant/ Employee
Internal motivation			
Personal norms			
PN1	From an ethical standpoint, providing assistance to individuals who are experiencing hardship is considered morally justifiable	Bennett et al. (2023)	5-point Likert scale
PN2	I am happy and willing to go the extra mile to help those in need		
PN3	I would feel guilty if I did not donate to charity		
PN4	My values cause me to feel a strong obligation to give to people in need		
PN5	The government and society in general have a responsibility to help people living in poverty		

PN6	Poor people should not be blamed for their misfortunes		
PN7	The government should introduce more programs to help the poor		
Personal experience toward poverty			
PE1	I certainly know what it's like to live in poverty	Bennett et al. (2023)	5-point Likert scale
PE2	I have personal experience of having almost no necessities of life		
Food waste behavior			
FB1	I never leave food on my plate when I finish eating	Gil & Diaz-ruiz, (2018); Richter (2017)	5-point Likert scale
FB2	I never cook/buy more food than I need		
FB3	I often throw away food that has expired		
FB4	If the food is not finished, it will be thrown straight into the trash		
FB5	I understand that when food is thrown away, it can have a big impact on the environment		
External motivation			
EM1	I will donate if my friends also donate	Bennett et al. (2023); Roberts & Roberts (2012)	5-point Likert scale
EM2	If someone I admire invited me to donate, I will donate		
EM3	I will donate if I trust the food bank		
EM4	I will donate if the distance is not far away		
EM5	If I am satisfied with food bank service, I would like to invite my friend to make donation		
Donation behavior			
DH1	Do you know a food bank?	Bennett et al. (2023)	Yes/No
DH2	Is there any food bank near your place?		Yes/No/Do not know
DH3	After reading the description, I would like to donate		5-point Likert scale
DH4	Have you already made a donation?		Yes/No
DH5	From where did you acquired knowledge about the food bank?		Short answer
DH6	I donate to the food bank every...		5: Every time I shop 4: At least one every two weeks 3: At least once every three months 2: At least once a year 1: Never
DH7	What kind of donation would you give?		Money/resource/food
Recommendation			
Are there any recommendations or suggestions that can be given to food banks so that food bank activities can be given more exposure?			