Journal of Agribusiness in Developing and Emerging Economies

Do environmental awareness and food safety information nudges enhance youth's affinity to safer food consumption? Findings from an experiment in Nepal

Received 17 January 2024
Revised 4 April 2024
Accepted 5 April 2024

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Abstract

Purpose – Unsafe food consumption results in adverse health conditions, foodborne illness and undernutrition among households and communities. The consumption of food contaminated with harmful microorganisms or with harmful pesticide residuals results in adverse health conditions and undernutrition. However, there are a number of challenges to maintaining food safety in the food systems of developing countries, like Nepal, where awareness of food safety is low and research on these issues is lacking.

Design/methodology/approach – We conducted an experiment among youth aged between 20 and 26 years in Nepal to assess their food safety awareness and affinity to safer fresh produce choices. In the classroom setting experimentations with and without information nudges conducted among 224 youth participants, participants chose one fresh produce packet among the four. We analyzed results using multinomial and mixed logit models appropriate for discrete choice modeling.

Findings – We found that the youth's perceived higher importance of sustainable food systems and their knowledge levels on microbial contamination and foodborne illnesses play significantly positive roles. The likelihood of choosing microbial safety-labeled fresh produce or both microbial- and chemical safety-labeled fresh produce increased with nudging among those who have some knowledge of microbial contamination and foodborne illnesses – we found that the interaction of nudging and level of knowledge is significantly positive. Youth belonging to higher income classes do not necessarily have a higher affinity to safer fresh produce but with nudging, the higher income class youth have a higher likelihood of choosing safer fresh produce choices.

This study is the part of the objectives of a sub-award project led by Tennessee State University from the funding support made possible by generous support of the American people through United States Agency for International Development (USAID) under cooperative agreement number 7200AA19LE00003 awarded to Purdue University, in partnership with Cornell University as the management entity for the Feed the Future Innovation Lab for Food Safety. Contents are the responsibilities of the authors and do not necessarily reflect the views of USAID and the United States Government.

Journal of Agribusiness in Developing and Emerging Economies
Emerald Publishing Limited
2044-0839
DOI 10.1108/JADEE-01-2024-0019

Research limitations/implications – Youth engagement and their awareness of food safety could be one of the important strategies to potentially develop them as effective promoters, adopters and educators in enhancing food safety in food systems in Nepal. Our predicted premium for food safety attributes points to the potential scope for the emerging market segment or business opportunities augmenting food safety in Nepal.
Originality/value – We examined the factors influencing the safer fresh produce choices among youth in Nepal. We tested whether awareness levels of microbial contamination and foodborne illness and information nudging affect the likelihood of safer fresh produce choice. Then we predicted the willingness to pay (premium) for safety attributes. To the best of our knowledge, none of the previous studies have examined this aspect in Nepal.

Keywords Information nudge, Youth, Nepal, Food safety, Fruits and vegetables, Fresh produce, Discrete choice models, Choice experiment

Paper type Research paper

Introduction

Unsafe food could create a vicious cycle of disease and malnutrition among children, the elderly and vulnerable populations. A safer food supply is an instrumental factor to support food and nutritional security and sustainable development of the food systems. Food and its associated nutritional quality play a direct role in human health and in meeting food and nutritional security.

However, consuming food contaminated with pathogenic microorganisms (microbial contaminations), or harmful pesticide residuals results in adverse health conditions and potential undernutrition. Jaffee *et al.* (2018) explain that there has been a limited understanding of the costs of unsafe foods and the benefits of preventive measures in developing countries, which often leads to underinvestment in food safety in those countries.

As an integral part of food systems, investment in formal and informal sectors supporting food safety could enhance food modernization and economic development of developing countries (Jaffee *et al.*, 2018; Mergenthaler *et al.*, 2009; GFSP 2019; Grace *et al.*, 2019). With a moderate level of hunger index of 15.0 (Global Hunger Index, 2023) and fallen poverty (World Bank, 2023) in the past decades, Nepal has improved over time. At this stage, food safety is an emerging issue in Nepal. Review and discussions of the National Food Safety Policy 2019 have been initiated towards achieving multifaceted aspects of food security ensuring food safety – the House of Representatives of Nepal has endorsed the proposal to consider the bill to revise the Food Purity and Quality Act (Ghimire, 2023).

The World Health Organization (WHO) reports around 600 million cases of foodborne diseases and 420,000 deaths every year. *Salmonella* and *Escherichia coli* are among the common foodborne bacterial pathogens found in fresh fruits, animal products and vegetables (WHO, 2022). Foodborne diseases are preventable; however, it requires attention and actions on different levels, as food safety should be considered at home, workplace, street food vending, traditional food markets, schools and daycare centers (FAO and WHO, 2022).

Though Nepal has relatively improved its hunger index, food and nutritional security challenges are still critical. Nepal's 8% of the population is still in extreme poverty and around 26% is in multidimensional poverty (World Bank, 2023). Moreover, there has been limited enforcement of food safety in the food systems of Nepal, impeding the intended health and nutrition goals and assurance of safer foods (Khanal *et al.*, 2023). While regulatory enforcement and income levels are expected to directly affect the safer food supply and choice decisions, consumer self-awareness could be undeniably crucial in those choice decisions. In that, consumer awareness of food safety could play an important role in the consumption of safer food.

Youth awareness and involvement in behavioral changes in the community

Nearly 1 billion of the 1.2 billion youth reside in developing countries, including 494 to 778 million of those in rural areas (UNDESA, 2017). Seventy-two percent of the rural youth of

developing countries are in countries with low levels of rural transformation, 65% of these rural youth live in Asia and the Pacific region (IFAD, 2019). As marked by the youth stage involving critical decisions affecting the future of individual and the society, youth population is an important component of economic advancement and societal decisions (IFAD, 2019).

In a study examining the food systems transformation and specific roles of youth in policy, research and practice focusing Sub-Saharan Africa, Glover and Sumberg (2020) found that youth people's engagement in food systems is distinctive but overlaps in many ways with non-youth. Youth's connections to food systems in multiple ways should be deliberately and carefully designed considering the context-specific nature of it (Glover and Sumberg, 2020). Huambuchano *et al.* (2022) postulate that the youth across the globe and the knowledge networks they create have important roles in transforming food systems networks emerging as the visible agents of changes through in food systems.

Flores *et al.* (2014) discussed on how youth can contribute to developing a healthy community. In their findings, youth can have powerful influence in changing the habits of people. The influence can have much higher potential in low-income communities to develop both short term and long-term impacts on health and population (Flores *et al.*, 2014). Youths also use technology and digital platforms to learn new practices and preparations in food systems (Romero and Francis, 2020). Chu *et al.*, (2014) finds that youth's involvement in meal preparation and related processes is associated with better diet quality and higher consumption of fruits and vegetables.

In relation to learning and implementing food safety and hygiene and young people's need on education, Syeda *et al.* (2021) examined the cases in Europe. The study found that young people had good understating of personal hygiene but had limited implementation and understanding of risks and consequences of foodborne illnesses. Young people prefer interactive educational methods in addressing their gap in food safety knowledge and foodborne illness. Eley *et al.* (2022) discussed that social influences like family, public health campaigns, social media and celebrity talks could improve young people's awareness on food safety and foodborne illness and trainings can help to optimize knowledge, confidence and skills.

Youth engagement and their awareness of food safety could be one of the important strategies to potentially develop them as effective promoters, adopters and educators in enhancing food safety in food systems in Nepal. As Nepal needs to emphasize awareness on food safety and prioritize the policies for investment in food safety, it is crucial to understand the effective ways, agents and the medium of change to disseminate and promote for intended behavioral changes.

In addressing this, this paper aims to examine whether the involvement of youth and the information and awareness among them is likely to enhance the choice for safer fresh produce. Since salad is consumed raw, it is more sensitive to food safety and contamination. Therefore, we conducted experiments maintaining choices in cucumber, which is one of the main salad vegetables used in Nepal. Based on choice experiment among undergraduate students in Nepal and discrete choice models, we examined the factors influencing the safer fresh produce choices among youth in Nepal. We tested whether awareness levels of microbial contamination and foodborne illness and nudging through information affect the likelihood of safer fresh produce choice and predicted the willingness to pay. To the best of our knowledge, none of the previous studies have examined this aspect in Nepal. In the subsequent sections, we describe our data and method and then present our results and discussion.

Data and method

We conducted discrete choice experiments among students aged between 20 and 26 years in Nepal. We maintained sections with and without information nudges in classroom setting

choice experiments. The undergraduate students of Agriculture and Forestry University (AFU) in Nepal participated in the choice experiments in four occasions/sessions in 2022. The AFU in Nepal is a public university with Nepal Government's support to emphasize education, research and outreach in Nepal and has a number of affiliated campuses and resource centers in different regions of Nepal. Among the four sessions in different colleges, three were among undergraduate students currently pursuing their degree while one session was among recently graduated undergraduate students with continued enrollment in the first year Masters-level courses. In each session, experiments were done randomly splitting the class into two groups – one of that group received information sheet (information nudges) to see before they start the choice experiment. Information sheet (nudge) maintained a few food-safety related information and facts in Nepal (detail explained below).

In the survey questionnaire loaded in tablets maintained using off-line Qualtrics, each participant first filled out their general information and level of awareness on some food safety related questions and then proceeded to the choice of fresh produce packages. Specifically, participants needed to choose one package of fresh produce based on the information and labels provided in each. Following are the specifics of our experiment:

Discrete choices: in each choice occasion, participants faced discrete choices with choice set containing alternatives.

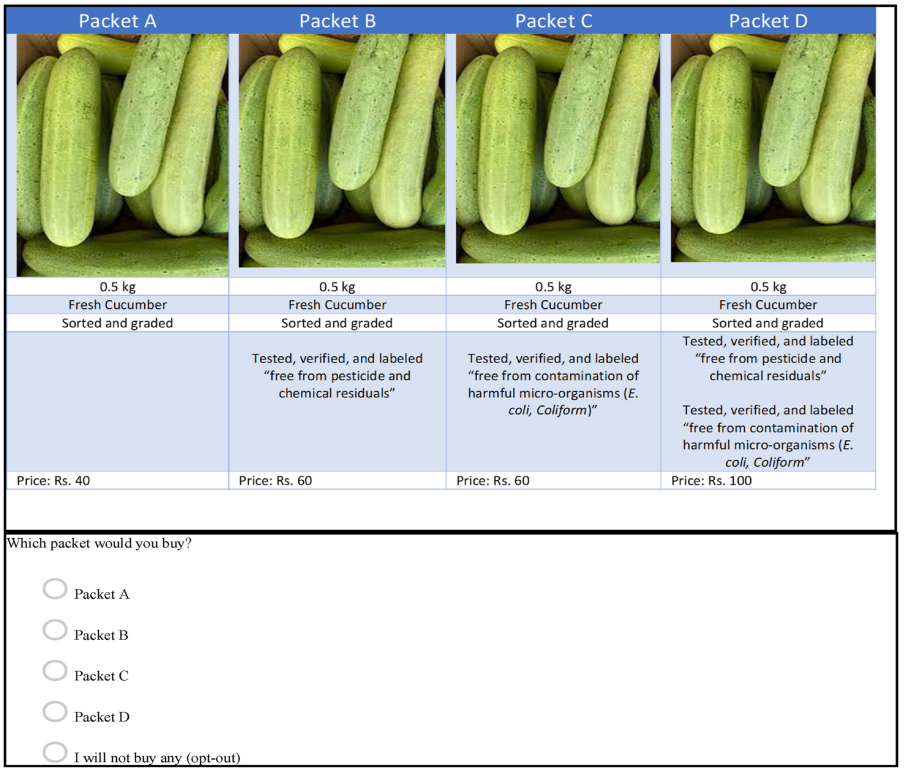
Choice set: Choice set is a set of alternatives. We had four alternatives. Participants faced a choice set containing discrete or mutually exclusive alternatives and had to choose one among those. Figure 1 shows the choice set of cucumber packet experiment. Four packets named packet A, Packet B, Packet C and Packet D have different attributes described in their labels.

Alternatives defined by attributes: our alternatives were defined by a set of attributes. As shown in Figure 1 and Table 1, experiment maintains four levels on food safety label attribute: no food safety label (packet A), labeled pesticide and chemical residual free (packet B), labeled free from contamination of harmful microorganisms (*E. coli, Coliform*) [packet C], and labeled pesticide and chemical residual free and labeled free from contamination of harmful microorganisms (*E. coli, Coliform*) [packet D]. Regarding prices, it maintains three levels: Rs. 40, Rs. 60, Rs. 100 for each 0.5 kilogram of cucumber packet.

Participant characteristics: participants were students between the ages of 20 and 26. Altogether, 224 students participated in the experiment. We asked brief demographic and socio-economic characteristics of the participants along with their level of awareness on microbial contamination risks, knowledge on foodborne illnesses, and value to the sustainable systems and environment. Context: After the project background and providing overview of why the participation is important and receiving participant's verbal consent and incorporating strategies on mitigating hypothetical bias [1], we divided each class (session) into two sections randomly dividing students in almost equal numbers. The participants in these two sections took part in the experiment independently. One of the sections was nudged with information – which means that the participants of the nudged section received a 1-page information fact sheet while those in other section did not. Table 2 shows the main points included in the 1-page information sheet used as information nudge. In 1–2 bullet points for each topic, the sheet provided chemical and microbial contamination brief, situation fact in Nepal and potential human and public health effects of unsafe fresh produce.

Econometric specification of the discrete choice model

In a choice experiment under the assumption of utility maximization based on attributes of the product described, a random-utility framework (McFadden, 1974) explains the decision-making process of a decision maker.



Source(s): Authors' own creation/work

Figure 1.
Discrete choice experiment choice set

Participant consumer *i*'s utility from choosing alternative j in choice situation c is given by:

$$U_{icj} = V_{icj} + \varepsilon_{icj;}\ i = 1, 2, \ldots .N;\ c = 1, 2, \ldots ..C;\ j = 1, 2, \ldots .J$$

Where there are N decision makers choosing among J alternatives across C choice situations. V_{icj} is the predictable component of utility of choosing alternative j while ε_{icj} is the error term unobservable. The individual decision maker chooses the alternative j if it provides the highest utility to the decision maker in comparison with the utilities associated with all other available alternatives in the choice set. Therefore, the probability of this choice, what we observe, $y_{ic} = j$ regarding choice of j can be represented as:

$$P_{icj} = Prob(y_{ic} = j) = Prob(U_{icj} - U_{ick} > 0)\ \forall k \neq j$$

From equation above, overall scale of utility is irrelevant because multiplying both U_{icj} and V_{icj} by positive constant does not change the choice (Lancsar *et al.*, 2017) but it requires normalization of scaling. However, with different assumptions of the error term, the probability of choosing j takes different forms. For example, with assumption of independent and identically distributed extreme values, the probability has the following multinomial logit form (Lancsar *et al.*, 2017):

$$P_{icj} = \frac{\exp(\lambda V_{icj})}{\sum_{i=1}^{j} \exp(\lambda V_{icj})} \text{ where } \lambda \text{ is a scale parameter.}$$

Variable/attributes	Description/levels	Mean	Range
Safety label	No safety labeled	% chosen: 4.91	
	Labeled pesticide and chemical residual free	% chosen: 18.30	
	Labeled free from contamination of harmful microorganisms (*E. coli, Coliform*)	% chosen: 32.14	
	Labeled pesticide and chemical residual-free and labeled free from contamination of harmful microorganisms (*E. coli, Coliform*)	% chosen: 44.64	
Price	Rs. 40	% chosen: 5	
	Rs. 60	% chosen: 50.45	
	Rs. 100	% chosen: 44.64	
Variables (socio-demographic characteristics of participants)			
Education	Undergraduate-level ongoing (undergrad)	93.3%	
	Undergraduate-level completed or first-year MS-level (grad)	6.70%	
Age	Age of participant (youth between 20–26 years)		
Information nudge	(=1 if received 1-page information page)	0.43	0 to 1
Income	Estimated monthly income of the family (Rs.)	117,522	25,000–250,000
High income class	(=1 whether participant's family belongs to upper middle to high income class (>100,000 Nepali Rupees monthly income)	29.46%	
Value to environment	Participant's self-rating: value to environmental sustainability and safe production systems (5 highest)	4.07	1 to 5
Awareness on climate	Participant's self-rating: awareness level on issues of climate change (5 highest)	4.09	1 to 5
Awareness on foodborne illness	Participant's self-rating: awareness level on health concerns of foodborne illness (5 highest)	4.26	1 to 5
Knowledge on microbial contamination	Agreement/disagreement level: "Fresh produces in the market are free from contaminations if they look clean" (1-slightly agree, 2-slightly disagree, to 5-strongly disagree)	3.93	1 to 5
Number of observations		896	
Number of participants		224	

Source(s): Authors' own creation/work

Table 1. Attributes/variables and characteristics of participants in this study

Information on pesticide residual and harmful microbial contamination in fresh produce (Information sheet contains 1–2 bullet point briefs on each of the following)	
Content	
Chemical contamination information	Microbial contamination information
What are the pesticide/chemical residuals in fresh produce?	What are microbial contaminations?
Facts/situation in Nepal?	Facts/situation in Nepal?
Health effect facts of these residuals	Potential health effect facts due to the consumption of harmful microbial-contaminated food

Source(s): Authors' own creation/work

Table 2. Information nudge: 1-page information sheet with bullet points of brief/facts

Extending further on V_{icj}, the predictable component, we assume that it is a function of vector of attributes describing alternative j, A_{icj}, and the vector representing characteristics of individual decision maker i, Z_i. Therefore, in parameterization considering linear specification, we can represent it as (Lancsar *et al.*, 2017):

$$V_{icj} = \alpha_j + \Gamma A'_{icj} + \beta_j Z'_i$$

In a random parameter logit or mixed logit models, which relaxes the assumption of independence of irrelevant alternatives (IIA), the parameter β varies among individuals.

In our estimation of alternative specific discrete choice models in conditional or mixed logit framework, marginal Willingness to Pay (WTP) for a food safety attribute s of the fresh produce packet can be estimated by the marginal rate of substitution between specific attribute s and price which is a negative ratio of attribute coefficient and price coefficient.

$$WTP_a = \frac{MU_{z^s}}{MU_P} = -\frac{\beta_s}{\beta_P}$$

Results and discussion

Table 1 presents the description of attributes and levels and then participant characteristics. The experiment included three levels of prices: Nepalese Rs. 40, Rs. 60 and Rs. 100. Food safety label and price were the two main attributes that varied across alternatives. Packets A to D used in the experiment represent fresh produce with four distinct features: no food safety labeled, chemical/pesticide residual free, harmful microbial contamination free and both pesticide residual and microbial contamination free, respectively. Table 1 shows that 4.91% of participants chose packet A, 18.30 chose packet B, 32.14% chose packet C and 44.64% chose packet D. On the education level, 93.3% participants were actively pursuing undergraduate degrees while 6.7% completed undergraduate degree and enrolled in the Masters-level courses. Altogether, 43% (96 students) were information nudged while 57% (128 students) were not – which means that 43% (96 students) received and read food safety related sheet before choosing the packet.

Among demographic variables [2], income variable in this study is based on the participant's selection of the monthly income category that their family would belong to. We were aware that the youth may not directly earn for the family but the income class they belong to could influence their choice. Around 29.5% of the participants indicated that they belong to high income class family. The average monthly income was around Nepalese Rs. 117,552 (equivalent to around $980/month).

Participants have diverse levels of understanding and awareness on environment, climate, foodborne illness and microbial contamination on a scale of 1–5 (Table 1). Along with Table 1, Figure 2 shows the distribution of participants on the awareness questions. Though the average level of awareness related to foodborne illness, climate and value of environment and sustainable systems were around 4, Figure 2 shows that the awareness levels of 13%, 17% and 24% participants on these aspects were 3 or below, respectively. Additionally, 56% of participants indicated their knowledge level on microbial contamination 4 or below (Figure 2).

Table 3 shows our multinomial logit results examining the factors influencing the choice of alternative packet. With the first packet (no labeled) choice as a base in our model, packet B, packet C and packet D indicate the choices for chemical/pesticide free, pathogenic microbial contamination free, and both chemical and pathogenic microbial contamination free, respectively. Note that each packet had a different price attached to it. Participant evaluated each packet as an alternative and chose one among them. We also maintained an opt-out

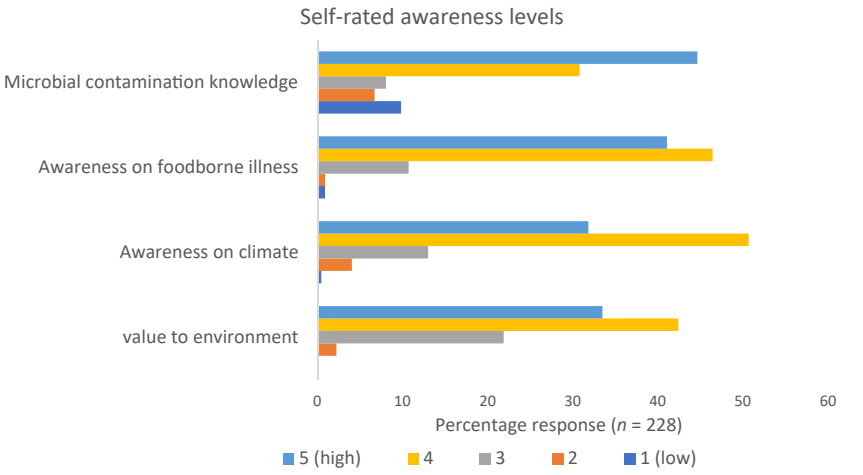


Figure 2.
Self-rated awareness levels among participants

Source(s): Authors' own creation/work

option ("do not buy any") in the experiment question. However, since only one participant chose to opt out, we have not considered opt-out response in the analysis.

We present multinomial logit results as model 1 and model 2. The distinction of model 2 over model 1 is that the model 2 adds interaction terms to test the effects of interaction of nudging with income and food safety related knowledge and awareness levels. Overall, our results show two distinct factors remarkably affecting the choice decisions. Firstly, the consistent significant positive effect of "value to environment" across model 1 and 2 on the packet D choice indicate that youth's likelihood of choosing both pesticide residual free and pathogenic microbial contamination free packet increases with their higher perceived value for environmental sustainability and safe production systems. Marginal effects of 0.10–0.11 in the model 1 and model 2 on Packet D equation suggest that with each value level increase on the scale of 1–5 on environment and safe food systems among youth, the likelihood of choosing packet D increases by 10–11%. This is quite a remarkable effect.

Secondly, a significantly positive coefficient and marginal effect of information nudge on the likelihood of choosing packet D in model (1) suggests that the participants who were nudged with information were significantly more likely to choose microbial and chemical safe packet, despite its higher price. Average marginal effect of 0.11 suggests that the information nudging increases the likelihood of choosing chemical and microbial safer food by 11%. More interestingly, model 2 facilitates further understanding of the interaction effects of information nudging with awareness levels and incomes among youth. Specifically, we added three interaction terms of nudging: nudging and high-income class, nudging interaction with microbial knowledge levels and nudging interaction with foodborne illness knowledge levels. Our results show that the youth belonging to high income class do not necessarily choose the safer product, perhaps go with observable physical attributes like sorted graded without the labels. In that, higher income alone may not necessarily enhance the affinity to safer food choices. However, when this group is nudged with chemical and microbial safety information/facts, they are significantly more likely to choose packet B – pesticide residual free fresh produce.

Our results show the significantly positive coefficients of foodborne illness awareness and the level of knowledge of microbial contamination on choosing packet C – a microbial

Table 3. Multinomial logit regression on factors influencing the decision on choosing safer fresh produce among youth (choice of packet with no labels (Packet A) used as the base)

Variables	Pesticide residual free (packet B)				Harmful microbial contamination free (packet C)				Both pesticide residual and harmful microbial contamination free (packet D)			
	(1)		(2)		(1)		(2)		(1)		(2)	
	Coef	ME[!]	Coef	ME[!]	Coef	ME[!]	Coef	ME[!]	Coef	ME[!]	Coef	ME[!]
Information Nudge	−0.75	−0.10**	−3.07	−0.09**	−0.26	−0.02	−3.14	−0.19**	0.07	0.11**	2.11	0.16
Value to Environment	−0.01	−0.02	0.20	0.01	−0.16	−0.08**	0.19	−0.07	0.37	0.11**	0.68	0.10**
Awareness level on foodborne illness	0.17	−0.03*	−0.20	−0.013	0.59	0.08**	−0.03	0.02	0.21	−0.04*	−0.17	−0.02
Knowledge level about microbial contamination	0.42	0.02*	0.32	0.02**	0.43	0.03**	0.40	0.05**	0.24	−0.03**	0.06	0.06
Graduate level education	12.3	0.13**	13.9	0.14**	10.9	−0.21*	12.6	−0.16**	13.3	0.66**	14.86	0.68**
Estimated monthly income of the family (log)	−0.06	0.01			−0.12	−0.01			−0.10	−0.002		
High income class family			−0.89	−0.04**			−0.71	−0.01*			−0.67	0.01
highIncomeClassXinfo			1.69	0.16**			0.56	0.07			0.68	−0.05
microbialKnowXinfo			0.28	0.01			0.07	0.05			0.39	0.06**
foodborneillKnowXinfo			0.22	0.02			0.63	0.06**			0.17	0.06
Wald chi^2	13,473		11,589.5		13,473		11,589.5		13,473		11,589.5	
(Prob > chi^2)	(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)		(0.0000)	
Number of observations	896		896		896		896		896		896	

Note(s): [!]MEs represent average marginal effects dydx predicted for each variable using Delta method and robust standard errors; *indicates significance at 10%, **indicates significance at 5% or higher level

Source(s): Authors' own creation/work

contamination free packet. These results are consistent with our expectations as youth with knowledge and awareness of risks and potential costs associated with adversities of contamination and foodborne illness are expected to be more cautious in making food choice decisions. Additionally, significantly positive coefficient of the interaction term of foodborne illness awareness and nudging on the packet C choice indicates that when youth with some level of awareness on foodborne illness are nudged or reminded, their affinity to choose microbial contamination free food further increases. Our marginal effect of 0.06 shows that the youth aware of foodborne illness when nudged with food safety related information and facts is 6% more likely to choose microbial contamination free product than the counterfactual youth which is not nudged. Finally, a significantly positive coefficient and 0.06 marginal effect of the interaction of microbial contamination knowledge and nudging on packet D choice indicates that when youth with some level of knowledge on microbial contamination risks are nudged with food safety related information and facts, the likelihood of choosing both chemical and microbial safe fresh produce significantly increases – the higher likelihood of 6% than the counterfactual not-nudged youth can be attributable to the effect of nudging on this youth group.

In addition to multinomial logit models, we analyzed data using more advanced alternative-specific discrete choice models like conditional logit and mixed logit models. We have presented the results in Table 4. Particularly, mixed logit model relaxes the strict assumption of IIA and allows alternatives to be related. The models we use accommodate attribute specific random and case-specific (participant characteristics) socio-economic and demographic (SDC) variables in the models. Controlling for SDC, in both conditional logit and mixed logit models with SDC, we found the positive effects of safety label attributes while negative effects of price on the choice of chemical- and microbial-safe fresh produce (Table 4). Note that the magnitude of the coefficient on Table 4 is not commonly interpreted in mixed logit model but the prediction from these models (relative coefficient estimations). Therefore, based on the estimated effects of safety-label attributes and price attributes, we calculated the marginal willingness to pay (WTP) for safer fresh produce in Table 5. Based on our estimation, we found that the WTP for pesticide residual free fresh produce is around 34 to 39 – which indicates that around 34 to 39 Nepalese rupees, higher than not labeled packet, is the

Table 4.
Alternative-specific conditional logit and mixed logit models[#] with attributes- and socio-demographic characteristics (SDC)

		Conditional logit model			Mixed logit model		
Variables	Base: choice 1	Alter. choice 2	Alter. choice 3	Alter. choice 4	Alter. choice 2	Alter. choice 3	Alter. choice 4
Safety label attribute		220.32	339.56	256.53	219.54	339.83	254.32
Price attribute		−5.56	−11.49	−3.648	−6.44	−11.72	−4.56
Information Nudge		0.128	0.739	−2.599	1.035	1.510	−3.637
Other SDCs included							
Value to Environment		Yes	Yes	Yes	Yes	Yes	Yes
Aware level on foodborne illness		Yes	Yes	Yes	Yes	Yes	Yes
Microbial contamination knowledge level		Yes	Yes	Yes	Yes	Yes	Yes
Income of the family (in log)		Yes	Yes	Yes	Yes	Yes	Yes
Graduate level education		Yes	Yes	Yes	Yes	Yes	Yes
Number of observations				896			
Number of cases				224			

Source(s): Authors' own creation/work

potential premium for pesticide free fresh produce. Table 5 further shows the WTP for microbial contamination free fresh produce is around 39 to 40, and WTP for fresh produce with both chemical and microbial contamination free is 56–77. These indicate that around 40 Nepalese rupees higher than the ones not labeled fresh produce packet, is the potential premium price for microbial contamination free labeled fresh produce while up to 77 Rupees higher price is the potential expected premium for fresh produce labeled with both chemical and microbial contamination free. Overall, these estimates can be considered as a positive signal for the potential development of the food safety labeled fresh produce product in Nepal. This could also include the scope for development of food safety augmented fresh produce systems in Nepal.

Table 5. Selected estimates of marginal willingness to pay for safety attributes

Attributes	Conditional logit model estimates	Mixed logit model estimates
Pesticide residual free labeled fresh produce	39.63	34.09
Harmful microbial contamination free labeled fresh produce	29.55	29.00
Pesticide residual free and harmful microbial contamination free labeled fresh produce	70.32	55.77

Source(s): Authors' own creation/work

Conclusion

Using data from choice experiments among youth in Nepal, our study provides some meaningful insights on food safety efforts in Nepal. First, our overall results with significant effects of awareness and information nudges indicate the role of these, particularly on youth, can have on safer food choices in Nepal. Second, we found that perceived value of environmental and sustainable food systems and the knowledge of foodborne illnesses and microbial contamination play significant roles in safer food choices. Third, the positive and estimated WTP for food safety labeled product from our estimations suggested for the potential consumer demand as the driver for safer food in Nepal, at least on the market segments targeting relatively more educated consumers. Consumers in low- and middle-income countries balance priorities on food type, quantity and quality, including food safety.

Given the Nepal Government's priority on agriculture and food security for few decades and the emerging emphasis of discussion on food safety, we suggest for awareness and educational programs in food safety related areas in Nepal. Nepal has achieved steady improvements in global hunger index in the past decades. To build on this improvement with broader goals ensuring nutritious and safer food, Nepal should prioritize the design and enforcement of food safety policies as well as educational and awareness programs. Rapid expansion of awareness and educational efforts, particularly engaging youth, could enhance the effectiveness of food safety outreach programs in developing countries like Nepal.

Our assessment of WTP and factors influencing WTP among youth provides an important foundation for developing outreach and educational programs that not only target knowledge gaps but also consider the perspectives of different sectors of consumers. Our findings provide some insights into the awareness programs in Nepal and developing countries. While youth are potentially the means of behavioral change in food safety, our finding suggests that their education and awareness play a vital role. For example, their perceived value to the environment and sustainable food systems, awareness of foodborne illnesses and knowledge of the risks of microbial contaminations increases their affinity to safer foods and hence their potential for outreach efforts on food safety. Therefore,

developing countries could benefit from including food safety and environmental sustainability related discussions, chapters or courses in educational programs and in the curriculum of high school and universities.

We found that nudging with facts and information reminds the importance of food safety among youth, particularly those with some level of knowledge on these aspects. In that, dissemination of information and facts is important for an effective outreach. Finally, our findings indicate a potential scope for food safety augmented fresh produce products – this could be a signal for new market development or the new segment of the food-safety augmented business opportunities for entrepreneurs.

Notes

1. In maintaining and executing the experiments, we incorporated the following strategies to mitigate hypothetical bias: (a) proper instruction and description of the context were discussed so that over valuation/expression of WTP is prevented, (b) experiments done in nearly realistic market set-up in the classroom by paying attention to the size of the packet, quantity of the produce packaged, variety of the produce and labels on it as relatable to the market situation and (c) the individual decision maker has individual separate space/place to indicate their choice, not seen or influenced by other's choices.
2. We also collected information on the gender of the participants (the number of male and female respondents was around the same proportion). We could not find the gender variable significant in any of the models used in this study for this specific data. Therefore, we chose to select and present models without gender variables.

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