Informational Shocks and Street-Food Safety: A Field Study in Urban India

Informational shocks and street-food safety:

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Abstract

The street food market is a major source of food in developing countries, but is often characterized by unsafe food conditions. We investigate whether improvements in food safety can be achieved by providing information to vendors in the form of a training. Among randomly assigned groups of street-food vendors in Kolkata, India, we find large improvements in knowledge and awareness, but little change in their observed behavior. We provide two main explanations for these findings. First, information acquisition by itself does not make it significantly easier for vendors to provide customers with safer food options. Second, although consumers in this market have a positive willingness to pay for food that is perceived as more hygienic, they struggle to distinguish between safe and contaminated food. We conclude that information to vendors is not the key constraint in this context, and that policies mitigating supply-side constraints as well as improving food safety awareness among consumers are likely to have more impact.

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1 Introduction

The Food and Agricultural Organization (FAO) and the World Health Organization (WHO) regularly report that the consumption of unsafe street food affects the health status of millions of people all over the world (WHO 1996; FAO/WHO 2003; WHO 2006). Since street food accounts for a significant proportion of the daily food consumption of 2.5 billion consumers (FAO 2007), establishing a more reliable and safe food supply chain remains one of the major public health concerns of many governments (Bhowmik 2012). Among the several factors that contribute to this status quo, street vending is an occupation that requires little start-up capital, and therefore draws a large section of the urban poor who lack awareness and adequate training in safe food handling methods (NCEUS 2007; World Bank 2013). As a result, one of the key messages for governments and relevant stakeholders by the FAO and WHO is that food handlers' knowledge and awareness about food safety and hygiene is a necessary pillar for setting up national strategies to control food-related hazards, particularly in urban areas (WHO 2006; FAO 2009ab). Food safety training and certificates are common in developed countries, but less so in many developing countries. Moreover, among the range of interventions, they are possibly the cheapest, but evidence on whether and why they might work is still limited.

In this paper, we aim to fill this gap by designing a training aimed at improving vendors' awareness and reducing street-food safety hazards. The simple hypothesis underlying such an intervention is that information acquisition could enable vendors to offer to consumers a wider array of desirable products and services by removing the knowledge barrier. We verify that this is appropriate in our context by demonstrating both that vendors have low awareness and high perceived costs of providing hygienic services at baseline, and that consumers have a positive willingness to pay for food that is perceived more hygienic. We implement the program by randomly allocating eligibility to the training to 681 street-food vendors in Kolkata, India. We show that the program increases vendors' awareness but it is not sufficient to improve observed food safety behaviors. We provide evidence that this is likely due to the training not sufficiently reducing the difficulty of providing these services, as well as consumers struggling to detect whether street food is contaminated. We suggest that information to vendors is not the key constraint in this context and that policymakers should focus on mitigating the supply-side constraints (Duflo et al. 2012), as well as improving food safety awareness among consumers.

Our project was undertaken from March 2015 to July 2016, with the logistic support of Innoaid, a Denmark-based non-governmental organization (NGO).[1] We collected a sample of street-food vendors, spread out in different areas of the city, and grouped them into 74 blocks of roughly 10 vendors each.[2] We randomized vendors across three conditions: control, training and training with promotional material, allowing them to advertise to customers their participation in the program. The training consisted of 3 workshops and 3 follow-ups, organized over 10 consecutive weeks, and had two main objectives: first, to enhance vendors' awareness of health risks related to food vending, and second, to develop their capacity to make the necessary improvements in food safety practices.

At the beginning and at the end of the study, we collected data on vendors' socio-economic characteristics, business practices, as well as their awareness about food safety and hygiene. Additionally, we monitored vendors' actual behavior between the baseline and the endline surveys for a total of 6 data points on each vendor (once every 8 weeks). The direct monitoring of vendors' daily behavior at their kiosks allows us to have a more comprehensive and accurate evaluation of their practices without relying exclusively on self-reported information. Moreover, at each point of the data collection and training, the take-up rate was always above 70%. This also makes our study novel in terms of the degree of accuracy of the data collected on vendors.

Our design allows us to identify the effect of the program in a simple first-difference framework, comparing outcomes for vendors in treatment and control groups.[3] The parameter we identify is the effect of increased awareness on vendors' behavior such that it is not confounded by the fear of punishment. This is because (i) the eligibility for the training was randomly allocated, (ii) the participation was voluntary, and (iii) there was no mandated penalty for non-compliance to food-safety practices. This would not be the case, for instance, if one were evaluating a government-designed food hygiene monitoring program. In this case, the vendors' observed behavior could be driven by both the improved awareness and the threat of sanctions in case of non-compliance, with the two being difficult to disentangle.[4] In our setup, any effect of the training provides evidence towards a

[1] Innoaid is active in addressing development challenges supported by academic collaborations. They started working on street-food vendors in Kolkata in 2008. Besides Innoaid, the project was implemented jointly with two local organizations active in promoting sustainable development for the poor and marginalized communities: Joygopalpur Gram Vikash Kendra (JGVK) and Gana Unnayan Parshad (GUP). For more details on Innoaid and its partners, see the Online Appendix and: http://www.innoaid.org/partners/existing-partners/.

[2] We explain in more details in Section 3.3 what we mean by "block" of vendors.

[3] Crucially, our results are not going to be driven by spillover effects because we collected precise information about each vendor's network on the street and hence we can control for it. We elaborate on this in Section 4.

[4] In this regard, we relate to the social-dilemma literature on the effectiveness of rewards versus punishments (e.g. Sigmund et al. (2001), Van Lange et al. (2014)).

potential scope of self-regulation by the vendors.[5] This is informative to a policy-maker, because it would make the case for the efficacy of such an intervention due to its low cost of implementation. Indeed, fines and sanctions may provide stronger incentives for vendors to comply with higher food-safety practices, but it would likely be a much more expensive intervention, especially in a weak and complex institutional environment.[6]

The first set of results is twofold. We find a substantial effect of the training on vendors' awareness, knowledge of food safety hazards, and self-reported safety behaviors. Overall, treated vendors' awareness improves by 7.1 percentage points relative to the control group. We also see a significant improvement in terms of self-reported actions that vendors claim to have engaged in, by about 10.8 percentage points.[7] However, we fail to discern a significant impact of the training on actual food safety behavior as measured by the external monitors.

Given the complexity of the sector, there are several reasons that might explain why behavioral improvements in food safety are difficult to undertake. First, vendors may lack the necessary incentives to produce safer foods because, even if they changed their behavior, they know the improved quality would be difficult to observe in practice, and hence they would not be rewarded by the consumers. This would be the case if, for example, food safety improvements were not visible to customers, as in the case of some food storage and preservation processes. Since one treatment arm is given free tools to advertise participation in the program, we are able to test directly whether food safety improvements are prevented because vendors fear that they might go unnoticed by consumers. We do not find a significantly different impact for this group of vendors compared to the basic treatment.[8]

Second, the information acquired from the training might not actually have made it easier for the vendors to provide consumers with a wider array of hygienic products and services. This could be the case because, besides lacking awareness about food safety, vendors continue to be constrained by the lack of several other costly infrastructural facilities. These may include: clean water, waste

[5] "Self-regulation" refers to the set of actions undertaken by the private sector to regulate itself. This might arise for several reasons such as: (i) self-interest, e.g. a firm deciding to sell a "green" product because consumers are willing to pay for it; (ii) to enhance ethical beliefs (Baron 2010); (iii) to deter public regulation (Maxwell et al. 2000; Lyon and Maxwell 2004) or boycotting (Baron 2009; Baron and Diermeier 2007).

[6] Recent experiments document that such threats may not always work positively (e.g. Casaburi and Macchiavello (2015)). Nevertheless, these findings support our argument that sanctions would prevent us to identify the (pure) effect of increased awareness on vendors' behavior such that it is not confounded by other effects. For our specific context, details on the street food sector in Kolkata are provided in the Background section.

[7] Both these results are the average effects across several categories. We report results separately for each outcome variable in Section 5.

[8] A corollary of this finding is the following. If one were to interpret the market failure in the street food market as a standard adverse selection outcome, where the poorer good prevails because of consumers' inability to distinguish between qualities, this problem cannot be mitigated in the context of this sector simply by providing more information to consumers.

disposal, electricity, etc. We validate this hypothesis by collecting direct information on individual perceived cost or difficulty of engaging in safer practices (pre and post intervention). Vendors have a high perceived cost at the baseline, and though the training modestly decreases it, the reduction is not significant. We elicit further information from vendors about the primary problems faced by them, which corroborates the idea that infrastructural, institutional or monetary problems are highly prevalent.[9]

Third, consumers in this sector may not have a sufficiently high demand for hygienic food. We investigate this hypothesis in a follow-up study, conducted between June and August 2019, on 1,480 customers of street food. This study allows us to speak to the factors that determine their consumption choices and to directly elicit their willingness to pay for alternative food options. We find that consumers' stated preferences indicate that they do in fact value safer food and have a positive willingness to pay for it. However, almost 70% of the sample reports that they find it impossible or extremely difficult to detect whether food is contaminated. Moreover, consumers also take into consideration several other attributes, such as taste, price, and location of street food, while making their purchase decisions. For instance, as many as 63% of consumers regard something other than hygiene as the key determinant of their decision. Additionally, compared to their preferences for safer food, they are less willing to pay when vendors simply display a signal of external endorsement (unaccompanied by an actual improvement in their practices). Not surprisingly, our data on vendors shows that they do not exhibit increases in their revenue and profits, given the lack of actual enhancements in their food safety standards. The identical picture that emerges from our vendor and consumer samples lend further credence to our results.

All in all, our findings imply that a training is not sufficient to foster substantial changes in food-safety, suggesting that, information alone to vendors, is not the key constraint in this sector. What is perhaps required is a more active role played by the local authorities, both in terms of providing easier access to infrastructure as well as imposing regulations to mandate safer practices. While our data validates that there is demand for safer street food, increased awareness among consumers would enable them to better distinguish between desirable food options and contaminated or unhygienic alternatives, and generate further incentives for vendors to improve. Indeed, what emerges from our analysis is that the market currently suffers from welfare losses stemming from vendors

[9]Note that, ideally, this channel could be directly tested by randomizing a monetary compensation (cash or in-kind) to vendors. However, since we deal with a complex sector characterized by widespread extortion suffered by street vendors, monetary incentives are difficult to test in our context. This is confirmed both by the information we collected at baseline and also by InnoAid's local partners, who were highly skeptical about providing monetary incentives to street vendors. More details in Section 3.

not being able to capitalize on higher profits and prices that consumers would be willing to pay in exchange for a perceived improvement in food hygiene.

Lastly, our study also has a strong temporal relevance in this context, because the Indian government is currently undertaking a process of formalization of street vendors. Indeed, the Parliament of India enacted to regulate street vendors in public areas and passed a National Act for Urban Street Vendors ("Protection of Livelihood and Regulation of Street Vending") in March 2014. The aim of the Act is to regulate the unorganized street vending sector, providing specific zones to the street vendors, a proper license to run their business and recommendations concerning health and hygienic standards (NPUSV 2009). The implementation of this policy has been so far limited to few urban areas, and, as of 2019, Kolkata is not among them yet. Therefore, much of the business still remains informal throughout India.[10] Our results can inform policy-makers in India as well as similar countries in South-East Asia, who are attempting to undertake a similar formalization of a hitherto unregulated sector, a key component of which is bolstering the quality of the good produced.

The remainder of this paper is organized as follows. In Section 2, we review the relevant literature and highlight our contributions. In Section 3, we describe in detail the context of our study and the design of the experiment. In Section 4, we present our data. We describe our empirical strategy and report our main results in Section 5. We then detail the findings from our choice experiments and consumer survey in Section 6, and conclude in Section 7.

2 Literature Review and Contribution

The paper contributes to a flourishing literature investigating the role of trainings offered to micro-entrepreneurs in developing countries. While they mostly focus on improving business practices to foster profitability and employment,[11] our main goal is to reduce food safety hazards, through an informational training. In this regard, we relate to information experiments aimed at improving health outcomes. Previous studies randomized information on the importance of wearing eye glasses (Ma et al. 2013), on how to avoid intestinal worm infections (Meredith et al. 2013) or

[10] The Municipal Act in the city of Kolkata prevents any type of street vending, and the punishment for the same is rigorous imprisonment for up to three months or a fine. For more details about the Municipal Act, see "Section 371 of Kolkata Municipal Act, 1997". As for the progress in the implementation of the National Act on Street Vending, see: https://nasvinet.org/newsite/progress-in-the-implementation-of-the-street-vendors-act-2014-2.

[11] See e.g. Karlan and Valdivia (2011), Mano et al. (2012), De Mel et al. (2014), Argent et al. (2014), Valdivia (2015), Brooks et al. (2018) for some of the most recent works.

prevent HIV (Dupas 2011; Duflo et al. 2015), and to access to family planning sessions (Ashraf et al. 2014). In a recent review of this literature, Dupas and Miguel (2017) state that "Information is necessary but often not sufficient to generate take-up" (page 41): similar conclusions can be drawn from our experiment. The only previous study that we are aware of that deals with retailers is Banerjee et al. (2015), in which they provide information and financial incentives (higher markups) to retailers selling a specific type of salt aimed at reducing anemia. Differently from this latter paper, we do not rely on direct financial incentives because they are difficult to implement in our context. Additionally, while much of this literature follows only the entrepreneurs comprising the supply side of the market, we combine it with direct evidence from the consumers that they cater to, thereby making our study more comprehensive.

Our study also contributes to broadening our understanding of whether trainings aimed at improving food safety among street vendors might change their behaviors. Although they are often recommended by the FAO and the WHO (FAO/WHO 2003; WHO 2006; FAO 2009b 2013), we lack conclusive evidence on their effectiveness. For example, Soon et al. (2012) run a meta-analysis on several food-safety trainings evaluations, and find a positive effect of the training on both food safety knowledge and self-reported practices. Along the same line, Medeiros et al. (2011) reach a similar conclusion in a review of different food safety training methods. However, both these reviews have several limitations. First, they include also food handlers from very different contexts, such as restaurants or canteens employees, who may face different constraints as compared to street vendors. Second, food safety practices are evaluated through self-reporting only.[12] A third limitation is the small sample size of such studies, which in the case of Soon et al. (2012) is on average 47. Finally, more recent studies report null findings, in which self-reported behaviors are not affected by the training (da Cunha et al. 2014 2015).

With respect to the above cited literature, our work differs in several dimensions: i) we base our inferences on a larger sample of vendors and statistical power; ii) we do not only rely on self-reported behaviors, as we also provide a novel approach to assess and measure food safety standards, based on a multitude of information collected on multiple observations, which could be replicated in similar contexts; iii) we collect precise information about each vendor's network on the street to account for possible spillover effects and spread of information contained in the

[12] Medeiros et al. (2011) takes into account three case studies, in which food safety is measured through bacteriological analysis. However, they concern very different settings, i.e. hospital catering food handlers.

workshops; iv) our intervention allows measuring how lasting the informational shock provided by the training is; and (v) our consumer survey allows us to comment directly on the demand aspect of this market.

3 Background, Motivation and Intervention

3.1 Street-food, health hazards and professional trainings

Street vending is the activity of selling goods and services in the streets without having a permanent built-up structure (Wongtada 2014). This is an important and growing source of employment in developing countries, especially for the urban poor, as it does not require specialized skills or a large start-up capital (FAO 2013). Street vending is mostly conducted in the informal sector, as local authorities are often unable (and/or unwilling) to regulate this sector (Bhowmik 2012). On their side, vendors are often criticized for providing low quality goods, creating congestion and safety risks (Bromley 2000). This precarious position and highly uncertain environment make them ideal victims for harassment such as evictions, confiscation of merchandise, petty offenses and demands for extortion (Bhowmik 2012). Among street vendors, food sellers represent the most visible group as they provide affordable and nutritional food to millions of urban consumers every day, especially to low- and middle- income consumers with limited time and means for shopping and cooking (FAO 2007).

However, street vendors are also considered a threat for public health, as street-food is a main determinant of food-borne diseases. According to the last WHO bulletin, the overall burden of such diseases is substantial: "an estimated 600 million – almost 1 in 10 people in the world – fall ill after eating contaminated food and 420,000 die every year, resulting in the loss of 33 million healthy life years".[13] Evidence on the links between street-food and foodborne diseases is provided by microbiological studies, which also highlight that food contamination could be reduced by avoiding common food safety hazards (see e.g. Desenclos et al. (1991), Flint et al. (2005), Bhaskar et al. (2004), Chumber et al. (2007), Ghosh et al. (2007), Greig et al. (2007), Chan and Chan (2008), Sousa (2008), Choudhury et al. (2011), Rane (2011), Feglo and Sakyi (2012), among many others).[14]

[13] https://www.who.int/news-room/fact-sheets/detail/food-safety

[14] This literature documents the high levels of bacterial contamination in street-food across urban areas in developing countries and identify

Moreover, related studies show that street-food vendors often lack food safety knowledge, which further support the idea that lack of food safety awareness is an important determinant of food safety hazards and food-borne illnesses.[15] The FAO and the WHO, in collaboration with microbiologists as well as food experts based at national food safety authorities, have acknowledged the public health literature on this topic and recommended professional trainings targeted at food vendors (e.g. WHO (2008) and FAO (2009a)). For example, in 2003, a joint FAO/WHO commission published the Codex Alimentarius (FAO/WHO 2003), which advocates for trainings on food safety, as they are "fundamentally important to any food hygiene system" (p. 20). More recent reports further recognize the strategic importance of the street-food sector in providing accessible and nutritious food, and recommend food-safety trainings to curb the health threat due to poor food safety knowledge (WHO 2006; FAO 2009b 2013).[16]

3.2 Motivation for our intervention

Professional trainings are recognized as a necessary pillar to address the problem of food-related hazards. However, our knowledge on whether and why they might work is still limited. We posit that such trainings might be an effective tool to bring about food safety improvements if information acquisition can result in higher profits for vendors. This is because the information imparted at the trainings leads to a broadening of their choice set in terms of the products and services that they can offer to their customers. For example, product features that the vendor did not previously know were valuable features to choose over (e.g. clean utensils, uncontaminated water) are now introduced into their set of possibilities.[17] Conditional on consumers valuing these features, adopting such practices could increase vendors' profits either by improving their sales and revenues or by enabling them to sell their fare at a higher price.[18]

Hence, the motivation behind our intervention is that vendors could be currently facing a loss

the Staphylococcus, the Escherichia coli and the Salmonella as the main microorganisms related to foodborne diseases in this sector. Importantly, the most frequent food safety hazards among street-food vendors are related to: i) unhygienic handling, ii) raw material, iii) inadequate cleaning of the machines used to cut the food, contact surfaces, clothes, and iv) airborne contamination.

[15]For instance, in the Indian context, Choudhury et al. (2011) find that only 30% of vendors were aware of hygienic practices related to food handling and only 8% was aware of biological sources of food contamination. Similar studies, which report street vendors' low levels of food safety knowledge, have been run in several developing countries, such as Ghana (Mensah et al. 2002), South Africa (Lues et al. 2006), Haiti (Samapundo et al. 2015), Brazil (Cortese et al. 2016) and Vietnam (Samapundo et al. 2016). As shown in the next Section, we find low levels of food safety awareness also among vendors in our sample.

[16]Over the years, several public institutions around the World have embraced a similar approach, requiring all food handlers to be trained in food handling. Examples are the Brazilian Health Surveillance Agency (de Freitas Saccol et al. 2016), the Dubai Municipality Food Control Department (Mohammed Sharif Al-Awadhi et al. 2011), the Romanian Health Department (Jianu and Goleţ 2014), as well as the European Food Safety Authority (Commission 2004), and many others.

[17]We thank an anonymous referee for helpful suggestions about the interpretation of the mechanism.

[18]A simple conceptual framework is included in Appendix A.1.

of business due to their ignorance of food safety hazards. This hypothesis finds support in some of the reports by the WHO. For instance, WHO (2006) states: "[...] in (street-food) markets, loss of business will result from unclean and poorly managed facilities and unhygienic food handling practices. All these losses are more regrettable because they are preventable with basic investments in training and infrastructure" (p. 6). The vendors in our sample themselves seemed to be aligned, ex ante, with the idea that our program could boost their business. Our baseline data showed that the majority of them (53%) expected that a professional training related to hygiene practices would increase their profits.

We further establish why, ex ante, such a training intervention was appropriate in our context by bringing empirical evidence to bear on both the supply and demand sides of our market. First, in the absence of such a program, acquiring knowledge about food safety is costly and unlikely for several reasons: (i) street vendors have low levels of education (e.g., 29% of vendors in our sample have no formal education at all, and only 11% completed secondary school), which limits their capability for independent knowledge acquisition on food safety; (ii) they operate in an informal sector, and hence they rarely deal with official institutional bodies which could in principle provide guidance and support on food safety matters; and (iii) there are no self-help groups in this market which might help in spreading such information (e.g., only 1.8% of vendors in our sample were part of any such group or association). Moreover, at the baseline, we directly collected data on vendors' perceived cost or difficulty of engaging in desirable practices. A large share of vendors reported a high perceived cost of providing clean drinking water (60%), maintaining clean surroundings at the stall (48%), keeping hands clean (41%), having a clean cooking area (42%), and providing disposable utensils and cutlery (68%). Such costs could stem from both a lack of relevant knowledge or awareness, as well as inadequate infrastructural and other external support. Our informational intervention was designed to alleviate the former, providing them with the capability to make necessary improvements by removing the information barrier.

Second, we supplement the above with direct evidence from the demand side that consumers do in fact value such products and services. Based on a discrete choice experiment that we conducted on customers of street food, as part of a follow-up survey on consumers, we show that the stated preferences of consumers in this market indicate a positive marginal willingness to pay for food that is perceived more hygienic.[19]

[19] We elaborate on this in Section 6.

3.3 Design of the experiment

Our study is based in Kolkata, which is the third largest urban agglomeration in India, with a population of about 14 million inhabitants, and is the main business, commercial and financial hub of Eastern India. The most recent estimates suggest that there are 300,000 street vendors in greater Kolkata, and approximately half of them are street-food vendors (NCEUS 2009), selling rich, diverse and affordable food to millions of customers every day. Similarly to other urban areas, Kolkata is not exempt from public health issues generated by street-food vending.[20]

Our experiment consisted of three initial phases: identification, mobilization, and randomization of vendors. These were followed by the survey collection, workshops, monitoring, and evaluation. During the identification phase, we selected suitable areas for the training based on the presence of a significant cluster of street-food vendors. This process led to the selection of 10 areas distributed across the entire city (see Figure 1). These neighborhoods differ in terms of socio-economic background, including different types of consumers. For instance, some vendors are located in business districts, others are close to schools or public transportation.

The mobilization phase proceeded in the following way. Since street vending is an informal activity and vendors are generally organized in informal groups, we had to first engage "local vendors leaders", who are informal representatives of vendors on the street and often affiliated to vendors' unions. Our team made arrangements with several leaders throughout the city who represented a total of more than 2,000 vendors. Based on their location, we clustered them in 200 blocks of roughly 10 vendors each.[21] From these blocks, we randomly selected 100 blocks that constituted our initial sample. 26 of them were used as pilot to evaluate the workshops, and the remaining 74 constituted our preferred sample for the analysis.[22]

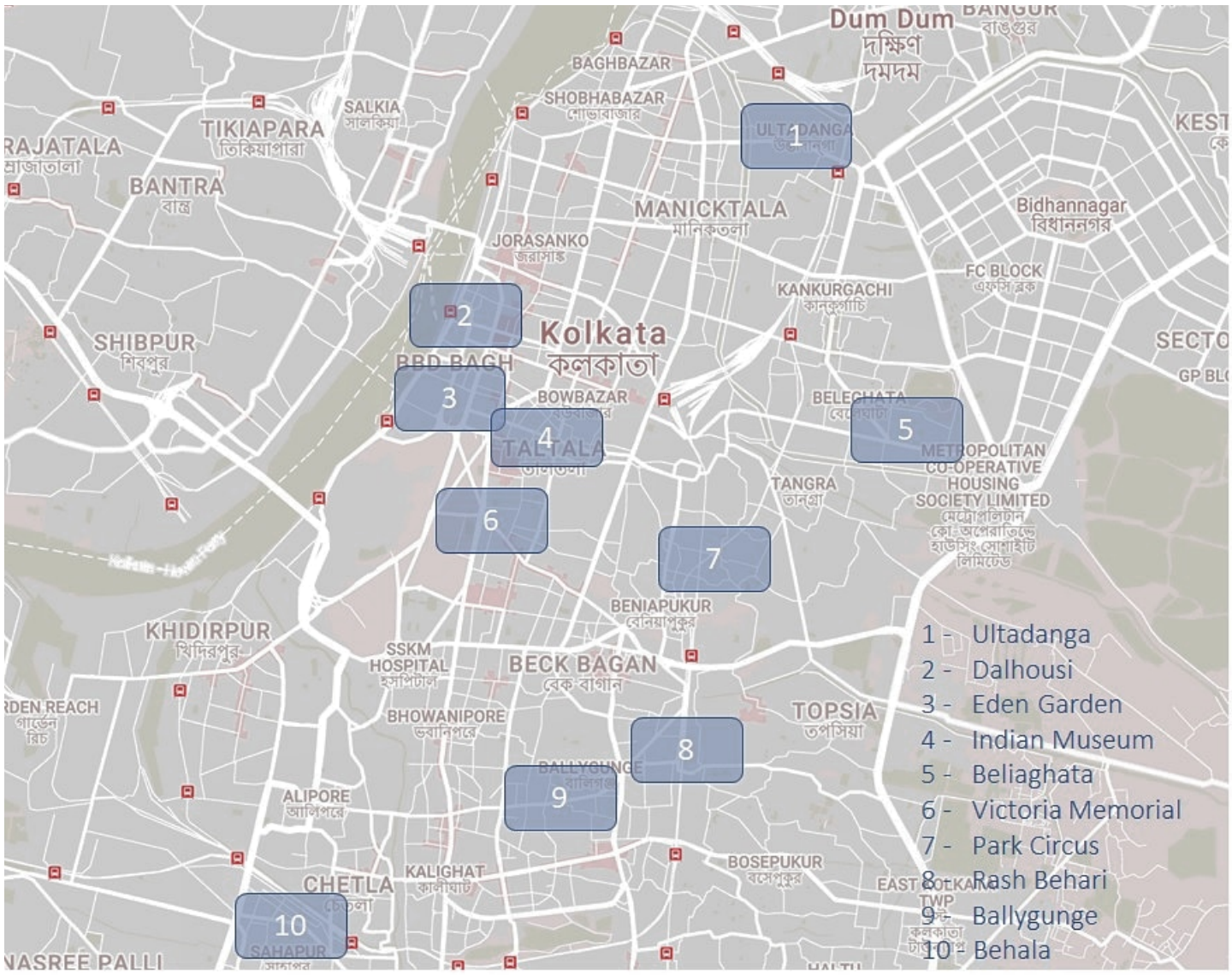
This phase was also aimed at guaranteeing a satisfactory take-up rate. To ensure that, our

[20] One of the first documented research on this city is a study by the All Indian Institute of Hygiene and Public Health (AIIH and PH), with support from FAO (Chakravarty and Canet 1996), which has shown that food safety hazards are prevalent in Kolkata due to limited food hygiene awareness, unclean environments, working practices and food adulteration. A more recent case study reports that 47% of the samples of water used by street-food vendors were contaminated (Walvekar 2017). Importantly, this study highlights that the water was safe at the source, but became contaminated through poor handling practices.

[21] A "block" is arbitrarily defined by us for convenience, on the basis of the presence of vendors and its natural location on the street. For example, a street (or portion of) between 2 large infrastructures that naturally divides vendors, may constitute a block. The definition of a block also facilitated the choice of the optimal time and location for the workshops, and fostered cooperation among vendors in the same block by providing them with a platform to come together. Our choice is sound and motivated also by the fact that vendors do not move across blocks, as they work in permanent built-up stalls.

[22] The selection of the number of blocks and vendors was decided on the basis of a conservative power analysis, assuming an effect size of 0.20 standard deviations. Whereas we assume an intra cluster correlation coefficient of 0.10. Furthermore, the pilot group was evaluated between March 2015 and October 2015. This group was crucial to improve several aspects of the research design, as the length and accuracy of the survey, the reliability of the direct monitoring and the quality of the workshops. We control for the proximity to the pilot blocks, and use them in additional robustness checks.

Figure 1: Map of Kolkata



Notes: This figure shows a map of Kolkata with the 10 selected areas of our intervention. The 74 blocks of vendors that were selected for the analysis are spread out across these 10 areas. Each area is represented by both treated and non treated vendors.

team visited the selected areas to explain to the eligible vendors the benefits of attending a series of workshops focused on food safety. Table 1 provides summary statistics of the most important elements of our experimental design. Overall, we included 681 vendors in the study at the baseline, of which 230 vendors (25 blocks) were assigned to the control group (C), 210 vendors (23 blocks) were assigned to a first treatment group (T1), eligible to the training and the follow-up sessions, whereas 241 vendors (26 blocks) were assigned to a second treatment group (T2), eligible to also receive promotional material endorsing their participation in the program, on top of the training and follow-up. As we discuss below, the purpose of including the second treatment group was to examine whether vendors could be incentivized to alter their practices only if they were assured of being able to communicate such improvements to their customers.

Within each area, we randomly allocated vendors to treatment and control groups, so as to ensure that all areas were represented among all three types of vendors. The treatment was assigned

Table 1: Data Collection and Workshops

	Training (T1)		Training w/Signal (T2)		Control (C)		Full sample	
	N	take-up	N	take-up	N	take-up	N	take-up
	Panel (A): Representation in the City of Kolkata							
# Areas	10		10		10		10	
# Blocks	23		26		25		74	
	Panel (B): Number of observations: pre, during and post intervention							
Baseline	210	1.00	241	1.00	230	1.00	681	1.00
Monitoring #1	171	0.81	183	0.76	189	0.82	543	0.80
Monitoring #2	166	0.79	187	0.78	184	0.80	537	0.79
Monitoring #3	171	0.81	216	0.90	201	0.87	588	0.86
Monitoring #4	172	0.82	204	0.85	192	0.83	568	0.83
Endline	176	0.84	192	0.80	193	0.84	561	0.82
	Panel (C): Attendance of the workshops							
Workshop #1	184	0.79	230	0.73			414	0.76
Workshop #2	184	0.75	224	0.70			408	0.72
Workshop #3	176	0.70	119	0.71			295	0.71

Notes: The table provides summary statistics of the most important elements of our experimental design. We included 681 vendors in the study at the baseline from 10 different areas, of which 230 vendors (25 blocks) were assigned to the control group (C), 210 vendors (23 blocks) were assigned to the first treatment group (T1), whereas 241 vendors (26 blocks) were assigned to the second treatment group (T2). The study had a baseline and endline surveys, together with 4 monitoring surveys in between of vendors behavior. The left (right) column of each panel shows the number of observations (take-up rates). The take up rate is high in all cases.

at the block level; that is, all vendors in the same block were made eligible to attend the workshops together. As one can see from Table 1, all 3 workshops were attended by at least 70% of the eligible vendors.[23] Moreover, we were also successful at keeping the take-up rate of the monitorings and the endline survey high. Notice that, one possible concern from the point of view of the identification is that vendors working in blocks next to each other, but assigned to different treatments, may lead to confounding spillover effects in their behavior, which would be difficult to control. We address this issue by collecting precise information on each vendor's network on the street, as will be explained in details in Section 4.

In order to be able to discern some of the incentives underlying the behavior of the vendors, we differentiated between two treatment arms by providing additional promotional materials to a sub-sample of vendors.[24] Specifically, they received posters, napkins, and certificates, endorsing their participation in the program, and thereby explicitly signaling to customers their attempt to cope with food safety issues. Figure 2, Panel (A), shows a translated version (from Bengali) of

[23] This includes the presence of other stall representatives at the workshops, if the owners themselves could not always attend. In our analysis we can always observe whether the owner of the stall attended all the workshops or not, and who else (like a family member) attended the workshop on his/her behalf. All results that will follow are robust to these controls.

[24] This treatment group attended the workshops only after the conclusion of the workshops for the first treatment group. We further deal with this point in Section 5.

the posters displayed by vendors at their kiosk, whereas Panel (B) shows a sample of the napkins provided by our partners on the right. We designed the treatment together with InnoAid marketing experts and our local partners. Our objective was to maximize the probability that the intervention for this group would not go unnoticed by the customers. Our first goal is to increase the saliency around quality, motivated by evidence that, although consumers declare to be concerned about food safety (WHO 2008; FAO 2013), they might not necessarily recognize food safety hazards, and in turn, food safety improvements. Therefore, the purpose of the promotional material is to explicitly signal vendors' engagement with this problem. Second, we aim at solving a signaling problem: customers might not trust vendors when they simply claim to provide cleaner food, and in turn, vendors do not provide it. Conversely, customers might trust more third party certification (i.e. Innoaid promotional material), making vendors more willing to actually improve hygienic standards.

Figure 2: Posters and Napkins

(A) Posters

(B) Napkins

Notes: The figure shows the promotional materials provided to vendors in the second treatment arm (T2). Panel (A) shows a translated version (from Bengali) of the posters displayed by vendors at their kiosk, whereas Panel (B) shows a sample of napkins provided by our partners on the right. The promotional materials were designed by Innoaid marketing experts (and approved by Innoaid's local partners) as to reassure us that the intervention for this treatment group would not go unnoticed to the customers.

3.4 Training and Workshops

At the beginning of the program, we administered a baseline survey to all vendors, in order to obtain socio-economic and demographic information, as well as to have a clear picture of their business practices and food safety awareness before the intervention. Consistent with the literature outlined in Section 3.2, in our baseline survey we also find that only a minority of vendors are able to mention possible causes of food contamination. Table 2 reports summary statistics from a set of variables preliminarily investigating vendors' food-safety knowledge.[25] First, we asked whether they know about the ongoing debate on the National Act to formalize street-vending. Only 11% of them reported awareness of it. Second, we asked vendors to list any possible sources of food contamination: only a minority of them were able to do it. The most mentioned one is bacteria (22%), while only 10% of vendors mention water contamination. This preliminary evidence also suggests that the level of food-safety awareness is similarly limited across treatment groups, as there are no significant differences across groups.[26]

Table 2: Pre-Intervention: Food safety knowledge and balancing

	Training (T1)	Training w/Signal (T2)	Control (C)	Full sample	P-value difference T1 = C	T2 = C	T1 = T2
National act	0.11	0.11	0.10	0.11	0.54	0.60	0.94
Contamination is caused by:							
Bacteria	0.27	0.19	0.20	0.22	0.38	0.89	0.27
Kerosene, detergent, etc	0.01	0.02	0.02	0.02	0.81	0.80	0.57
Food colouring	0.08	0.13	0.09	0.10	0.61	0.27	0.11
Insects	0.18	0.20	0.13	0.17	0.30	0.17	0.67
Dirt	0.23	0.23	0.20	0.22	0.70	0.70	0.99
Contaminated water	0.08	0.13	0.10	0.10	0.44	0.56	0.11
Observations	210	241	230	681			

Notes: The table reports summary statistics from a set of variables preliminarily investigating vendors' food-safety knowledge in each of the treatment arm. Each column for T1, T2, C and Total reports the mean value. P-values are based on standard errors clustered by block.

The vendors assigned to treatment were then eligible to attend three workshops of about 1.5 hours each and a series of three follow-ups at the vendor's kiosk. The workshops took place between October 2015 and May 2016 in areas close to the vendors' working place.[27] This was decided in order to facilitate the identification of attending' vendors and to assure a homogeneous environment

[25] These questions are included only in the baseline survey, at the beginning of the project, with the purpose of providing suggestive evidence on the lack of food-safety awareness within our sample. Conversely, in the endline survey, we collect a different and more comprehensive set of questions covering all different aspect of food safety knowledge (see Section 4).

[26] In particular, the vendors who seem more aware of contaminants are not necessarily more likely to exhibit better practices at the baseline, underscoring the need to train them about the importance of basic hygiene and safe food handling.

[27] The locations (e.g. unions offices, building premises) varied depending on the local availability of indoor areas close to the vendors working place.

across vendors' workshops.

Each meeting took place approximately every 2-3 weeks and focused on specific topics. Workshop 1 focused on providing information on the Street Vendors Act 2014, aiming at increasing vendors' awareness of their rights and of the formalization process. This workshop also focused on the importance of cooperation among vendors to achieve common goals. Workshop 2 included a wide range of information about food-safety hazards related to the vendors' daily behaviors. Workshop 3 focused on how to change daily behavior to reduce food-safety hazards. For instance, it stressed on the importance of clean hands, vendors' personal hygiene, use of containers for water, covering food, availability of paper plates and cups, and waste management. The follow-ups consisted of 1-to-1 meetings at the vendor's kiosk, where a trainer could observe the vendor and suggest personalized advice to improve his food-safety practices. More information on each workshop is provided in the Online Appendix.

The workshop phase was accompanied by 4 rounds of monitoring, where data collectors observed and recorded the food safety practices adopted by the vendors (this means that, together with the baseline and endline surveys, we collected a total of 6 data points on behavior). This information was collected by actually observing the vendors at their stalls, instead of asking them questions, so as to minimize reporting errors. Several precautions were taken to ensure that the monitoring captured the vendors' actual food handling practices, and that the vendors were not altering their behavior for the survey: i) The data collectors for the monitoring rounds were not involved with the actual training, so that they were unknown to the vendors; ii) The vendors had no prior knowledge of when their stall would be monitored (while they were obviously aware of being monitored at some point); iii) The monitoring was undertaken by 2 teams of 2 data collectors visiting each block together; they were approaching from either side of the street, so that it would be difficult for vendors to be alerted and to behave differently on seeing the interviewers on either side of the street; iv) For additional accuracy, the data collectors also took pictures of the stalls, which were then cross-checked with the data.

Finally, at the end of the program, we collected an endline survey that repeated the monitoring of the vendors' food handling practices and also collected general information on their business practices. The endline also included detailed questions targeted at understanding whether the vendors had learnt about safer food handling methods or engaged in any of the practices advocated by the training workshops.

4 Data

4.1 Independent Variables and Balancing

One of the novelties of our study is the degree of accuracy of the data collected about street-vendors' information and practices. Table 3 provides socio-economic and demographic information of the vendors in each of the treatment arm. The last column of the table reports the p-value for the means of the two treatment groups and the control group being equal. As one can see, treatment and control blocks are statistically similar in terms of most baseline characteristics. In Panel (A) we can see that around 86% of vendors in our sample are male, which is not surprising given the heavily skewed gender ratio in this sector. Vendors' average age is about 41 years old and they have a remarkably long experience in this sector (19 years). Moreover, 72% of them have some education and approximately 70% of the vendors are associated with a union.

In Panel (B) we can see that roughly 72% of vendors in our sample sell food that is cooked at the stall. The most represented category are vendors selling light snacks[28] (55%), followed by vendors selling meals (20%), heavy snacks (14%), drinks (10%), fruits and vegetables (7%) and sweets (6%). Vendors profit on average 334 Rupees a day, which is well above the poverty threshold line (35 Rupees in 2015). Whereas Panel (C) shows that vendors are concerned with a wide set of problems, such as lack of basic infrastructures (electricity, clean water and toilets), extortion and capital constraints. In Section 5.2, we discuss to what extent this set of obstacles might affect vendors' behaviors.

We also collected data on the network for each vendor. Specifically, we showed each of them a picture of the other vendors on the block, as well as the vendors in the two neighboring blocks, and asked (i) whether they knew this vendor well, (ii) whether this vendor was a family member, and (iii) how often they interacted during the week. This gives us crucial information on the possible flow of information. As we can see in Table 3, Panel (D), on average, vendors from all the treatment arms know a similar number of people from their own blocks (7.7 vendors), as well as their neighboring blocks (4.7 vendors). Finally, Panel (E) provides information about the balance for the variables on observed behavior. These outcomes are explained and discussed in the next subsection.

[28] Examples of light snacks are bread, eggs, samosas and pakoras. Examples of heavy snacks are rolls, momos, dosas, fried rice, and noodles.

Table 3: Pre-Intervention: Summary statistics and balancing

	Training (T1)	Training w/Signal (T2)	Control (C)	Full sample	P-value difference T1 = C	T2 = C	T1 = T2
	Panel (A): Socioeconomic and demographic information						
Male	0.85	0.87	0.87	0.86	0.72	0.96	0.77
Age	40.32	41.41	41.01	40.94	0.60	0.75	0.45
Years of vending	19.21	19.20	19.97	19.47	0.60	0.64	0.99
Some education	0.73	0.72	0.71	0.72	0.37	0.63	0.68
Member of a Union	0.70	0.66	0.74	0.70	0.63	0.38	0.70
	Panel (B): Business information						
Cooked food	0.71	0.68	0.77	0.72	0.23	0.14	0.71
Light snacks	0.59	0.51	0.57	0.55	0.74	0.45	0.33
Heavy snacks	0.13	0.12	0.15	0.14	0.59	0.51	0.92
Meals	0.19	0.23	0.19	0.20	0.94	0.49	0.49
Drinks	0.11	0.07	0.12	0.10	0.72	0.17	0.25
Fruits and vegetables	0.06	0.09	0.05	0.07	0.62	0.37	0.58
Sweets	0.05	0.08	0.06	0.06	0.75	0.57	0.39
Other	0.01	0.01	0.04	0.02	0.35	0.24	0.54
Revenue	1294	1463	1253	1337	0.81	0.45	0.53
Expenditure	954	1125	928	1003	0.84	0.42	0.47
Profits	339	338	326	334	0.76	0.77	0.97
Hours worked	11	11	11	11	0.98	0.73	0.77
	Panel (C): Daily problems faced						
Bribes to police	0.37	0.30	0.37	0.35	0.79	0.41	0.27
Daily problems faced are:							
Lack of electricity connection	0.44	0.49	0.51	0.48	0.35	0.67	0.54
Shortage of capital	0.34	0.32	0.34	0.33	0.94	0.76	0.79
Competition from vendors	0.20	0.19	0.12	0.17	0.18	0.26	0.90
Competition from other	0.06	0.03	0.03	0.04	0.24	0.89	0.37
Lack of toilets	0.48	0.61	0.55	0.55	0.48	0.43	0.16
Lack of drinkable water	0.45	0.58	0.52	0.52	0.44	0.45	0.14
Extortion and bribes from police	0.18	0.11	0.16	0.15	0.79	0.41	0.27
	Panel (D): Network (number of vendors known)						
Own block	7.56	7.77	7.76	7.70	0.68	0.99	0.66
Neighboring blocks	4.65	4.64	4.84	4.71	0.79	0.77	0.99
	Panel (E): Observed behavior						
Facilities index	0.48	0.44	0.46	0.46	0.77	0.19	0.12
Food handling index	0.64	0.60	0.61	0.62	0.44	0.67	0.21
Costumers index	0.69	0.68	0.69	0.69	0.92	0.89	0.76
Total index	0.60	0.56	0.57	0.58	0.55	0.33	0.11
Observations	210	241	230	681			

Notes: The table provides socio-economic and demographic information (Panel A), business information (Panel B), daily problems faced by vendors (Panel C), network information (Panel D) and observed behavioral outcomes (Panel E) in each of the treatment arm. Each column for T1, T2, C and Total reports the mean value. P-values are based on standard errors clustered by block.

4.2 Outcome Variables

We now turn to the first inspection of our outcomes of interest as measured at the endline, after the intervention. This gives us a first overview of the effects which are then measured with precision in Section 5. The variables are divided into 3 groups: (i) *Awareness*, capturing to what extent vendors

are aware of food safety matters; (ii) *Claimed behavior*, capturing vendors' self-reported actions taken to improve their behavior with respect to food safety; and (iii) *Observed behavior*, capturing vendors' behavior as observed by the data collectors. While the data on the latter were collected by observing vendors in all 6 survey rounds, data on the first two categories were collected only at the endline. In what follows, we discuss each category of outcome variables in detail.

First, regarding *Awareness*, the endline survey asked vendors what according to them constitutes personal hygiene and food hygiene, what some common contaminants of food are, and the reasons for using clean utensils.[29] Based on these, we compute a proxy of awareness which takes value 1 if the vendor mentioned any point at all and 0 otherwise.[30] It is worth noting that these outcome variables are based on whether the vendor can clearly enumerate relevant hygienic practices. Vendors who know the answers, but do not say it, are observationally equivalent to those who are not aware. Thus, part of what we are identifying is whether the training makes different aspects of hygienic practices more salient, easier to think about systematically, articulate, and enumerate, for the vendors. Panel (A) of Table 4 reports the proportion of vendors who can provide any answer, for each of the three treatment arms. We see that this proportion is consistently higher for the two treatment arms compared to the control.

Second, regarding *Claimed behavior*, the endline questionnaire included a set of questions directly inquiring whether the vendor had engaged in any of the following activities over the last six months: (i) discussing food safety with other vendors, (ii) trying to obtain more information on food safety, (iii) trying to improve the hygiene and sanitation levels at their stalls, (iv) buying new utensils or investing in community solutions such as a bigger waste bin for multiple vendors on that street, (v) talking about the National Act with other vendors, (vi) trying to find out more information about the National Act, (vii) discussing it with their unions, and (viii) interacting with other vendors about food safety improvements. Vendors could either agree or disagree that they had engaged in each of these actions. Based on their answers, we define a dummy variable corresponding to each action, taking the value 1 if the vendor had participated in that activity and 0 otherwise. This set of measures was based on questionnaires used by public health scholars to evaluate self-

[29]The list of answers was (a) *food hygiene:* covering food, separating cooked and raw food, storing food at the proper temperature, handle food with proper implements, washing ingredients before cooking, using clean water, and using clean utensils; (b) *personal hygiene:* having clean hands, using soap, wearing clean clothes, having clean and short nails, wearing aprons, wearing caps, wearing gloves, taking regular baths, and using clean water; and (c) *possible contaminants:* bacteria in food, kerosene oil or detergent, food coloring, insects, dirt and contaminated water; (d) *utensils:* it is good to use utensils to serve food, to avoid germs and bacteria, to avoid sickness.

[30]In the robustness checks we also calculate an alternative proxy for awareness: we count the number of relevant points the vendor mentioned, and normalize this number. The qualitative results of our analysis do not change.

Table 4: Post-Intervention: Summary of main outcome variables

	Training (T1)	Training w/Signal (T2)	Control (C)	Full sample
	Panel (A): Food safety awareness			
Food hygiene	0.70	0.67	0.58	0.65
Personal hygiene	0.80	0.77	0.75	0.77
Contamination	0.73	0.72	0.69	0.71
Utensiles	0.84	0.86	0.77	0.82
	Panel (B): Claimed Behavior			
Discussions	0.24	0.21	0.05	0.17
Get information	0.16	0.16	0.07	0.13
Improvements	0.47	0.43	0.27	0.39
Investments	0.09	0.05	0.06	0.07
Discuss NA	0.12	0.12	0.03	0.09
Information on NA	0.11	0.08	0.06	0.08
Unionns	0.04	0.05	0.04	0.04
Meetings	0.10	0.12	0.04	0.09
	Panel (C): Observed Behavior			
Facilities index	0.54	0.50	0.51	0.52
Food handling index	0.80	0.80	0.83	0.81
Customers index	0.64	0.60	0.62	0.62
Total index	0.64	0.60	0.64	0.63
Observations	176	192	193	561

Notes: The table provides a first inspection of our outputs of interest as measured at the endline, after the intervention. This gives us a first overview of the effects which are then measured with precision in Section 5. The variables are divided into 3 groups: Panel (A) reports measures of *Awareness*, capturing to what extent vendors are aware of food safety matters; Panel (B) reports measures of *Claimed behavior*, capturing vendors' self-reported actions taken to improve their behavior with respect to food safety; and Panel (C) reports *Observed behavior*, capturing vendors' behavior as observed by the data collectors.

reported food safety behaviors (Soon et al. 2012; da Cunha et al. 2014; Clayton et al. 2002). The proportion of vendors engaging in each of these activities is reported in Panel (B) of Table 4. Again, we see that this proportion is, on average, much higher for the treated vendors compared to the control group. For instance, as many as 24% of the vendors in the first treatment group and 21% of vendors in the second treatment group report that they have engaged in discussions with other vendors about safe food handling, while this proportion is only 5% for the control vendors.

Third, regarding *Observed behavior*, the variables are defined on the basis of the information collected on observed vendors' food safety practices, and can be grouped into three broad categories.[31]

[31] Since these data on behavior are obtained only by observation and not by interacting with the vendors, individual outcomes are missing in the data both when a question is not relevant for a particular vendor as well as when the data collector cannot determine what the vendor's usual behavior is in some particular aspect (e.g. if they happened to visit the stall when there were no customers, they might not be able to ascertain whether the vendors were serving the food on disposable plates). Since our purpose is to have an overall idea about whether the vendors improve their food handling methods, and we should ideally use all of our sample to have enough statistical power, we aggregate the outcome variables for each category so as to maximize the number of observations.

The first category is *Facilities*, and it is applicable to all vendors. We assigned vendors scores based on (i) whether they used an apron and a proper dustbin, (ii) whether there was safe drinking water, (iii) whether the vendor was using a clean cloth to wipe his hands, and (iv) whether there was food debris or waste on the floor of the stall or in the cooking area. We then calculated the percentage of the total score that the vendor received and obtained the final "Facilities index". For instance, a vendor exhibiting perfect behavior on all dimensions would get a score of 1, corresponding to 100%, on this index. The index for the second category, *Handling*, is similarly constructed and based on scores assigned for (i) whether the ingredients are covered and separated from the cooked food, (ii) whether the cooked food is covered, and (iii) whether tongs, spatulas or other implements are used to cook and to serve (as opposed to touching the food with bare hands). This index is relevant only for vendors who are actually cooking food at the stall, and not for vendors who only sell pre-cooked or pre-packaged snacks, cut fruits, beverages etc. The corresponding index for the third category, *Customer*, is calculated based on scores for (i) whether there are food debris on the tables, chairs or benches, (ii) whether the vendor uses disposable plates, cups and cutlery, and (iii) whether the non-disposable utensils (usually made of steel) are washed with soap. This last index is applicable only for those vendors who have accommodations for customers to actually sit and eat at the stall. Finally, the index *Total* is the average of the 3 indices and it is representative of the general (audited) observed vendors' behavior or hygiene practices of the street-food vending sector in Kolkata. The Online Appendix includes further details on how each of these indices was constructed.

As shown in Panel (C) of Table 4, vendors displayed an average score of 52% for the facilities index, around 81% for the food handling index, around 62% for the customer service index, and 63% for the total index. Differently from the other two set of output variables, there seems to be no marked difference between the treatment arms in terms of these observed indices at the time of the endline.[32] We analyse this in the next section.

[32]Notice that these indices are balanced between groups at the time of the baseline survey. Results are reported in Panel (E) of Table 3.

5 Empirical Strategy and Results

5.1 Specifications

We now empirically estimate the effects of the intervention. Our identification strategy exploits the random assignment of blocks of vendors to the different treatment groups, to recover the effect of being assigned to the training on each of the three categories of outcome variables.

Our empirical specification is:

$$y_{it} = \alpha + \beta T_i + \mathbf{X}_i\gamma + \delta_t + \varepsilon_{it} \tag{1}$$

where y_{it} is the outcome variable for vendor i in period t, T_i is a dummy variable indicating the treatment status of vendor i, X_{it} is a vector of several controls such as the vendors' age, gender and years of experience, the area of the city where the stall is located, whether the stall sells cooked food, the number of pilot blocks within a 1 km radius, and δ_t is a period fixed effect. In this specification, as well as in those that follows, standard errors are robust and clustered at the block level. The randomization of treatment implies that the coefficient β yields an unbiased effect of the intervention. It is worth noting here that we consider the Intention-To-Treat (ITT) estimate as the policy relevant parameter for our purpose, since the broad question that we are interested in is to identify the effect of this intervention were it to be replicated exactly on a larger scale.[33]

In order to separately identify the effects of the two different treatments, and to compare their effects, we estimate an identical specification with a dummy for each treatment, as follows:

$$y_{it} = \alpha + \beta_1 T_{1,i} + \beta_2 T_{2,i} + \mathbf{X}_i\gamma + \delta_t + \varepsilon_{it} \tag{2}$$

where $T_{1,i}$ refers to the treatment group with only the training, whereas $T_{2,i}$ refers to the treatment group with both training and signal.

The difference specification is our preferred specification: the treatment being randomized, a simple comparison of treatment and control group vendors does not suffer from endogeneity due to differences in pre-treatment trends. The staggered nature of the training and the multiple rounds

[33] On the other hand, if we were interested in estimating whether the information provided changes the behavior of the vendors, a more appropriate parameter to recover would be LATE, using treatment status as an instrument for actual workshop attendance . We report these estimates in Appendix tables A.9, A.10, and A.11. The results are qualitatively identical.

of monitoring further enables us to estimate a difference-in-difference specification, exploiting the difference in timing of the training administered to different blocks, as follows:

$$y_{it} = \alpha + \beta_1 T^* \text{After}_{it} + \beta_2 T_i + \mathbf{X}_i \gamma + \delta_t + \varepsilon_{it} \tag{3}$$

where After_{it} is a dummy variable for whether the data was collected after the workshop. Our coefficient of interest here is β_1, which measures the difference in pre and post training outcomes for the treatment groups, compared to the difference for the control group, and gives a more precise estimate of the training effect.[34] The results from this latter specification are qualitatively identical, and are reported in Appendix A.2.

5.2 Main Results

In this section we report the results we obtained for each outcome variable. First, Table 5 reports the coefficients for the effects of the training program on vendors' *Awareness*. Panel (A) outlines the effects of belonging to any treatment group, i.e. β in equation (1). As one can see, during the endline survey, vendors assigned to the training were on average more likely to recall a relevant issue about food hygiene (8.2 percentage points, or $8.2/58 = 14.1\%$ of mean control group), personal hygiene (2.6 p.p.), contamination of food (8 p.p.), and cleanliness of utensils (9.7 p.p.), as compared to the control group. Panel (B) shows the effects of the two treatment groups separately, i.e. β_1 and β_2 from equation (2). Notice that, even though the vendors in T2 were provided with the means of signaling to customers their participation in the training program, we do not see a larger improvement as compared to T1.

Second, Table 6 reports identical coefficients for *Claimed behavior*, or actions that vendors claim to have taken, based on the endline data. According to Panel (A), vendors assigned to treatment are significantly more likely to have taken part in most of the activities they were asked about. Coefficients range from as large as 23 p.p. more for having tried to improve sanitation levels at their stalls, to a modest 6 p.p. more for trying to obtain more information on the National Act.

[34] Since the random assignment implies that the pre-training trends in outcome should be identical for treatment and control groups, the diff-in-diff estimate essentially measures the difference in treatment and control after the training. The β coefficient in Equation (1) would then be β_1 in Equation (3) weighted by the probability of being observed after the workshop. One caveat with the diff-in-diff specification is the following. If the effect of the treatment is not stable over time, then the coefficient of interest would be biased because "treated" units would serve as "control" units in subsequent periods. Hence, changing effects of treatment in combination with parallel trends in the pre-treatment implies a failure of parallel trends in these subsequent periods Goodman-Bacon (2018). We would like to thank an anonymous referee for pointing this out.

Table 5: Awareness about food safety: Difference specification

	(1) Food Hygiene	(2) Personal Hygiene	(3) Contamination	(4) Utensils
	Panel (A): Pooled Treatment			
Training (T1 or T2)	0.082***	0.026*	0.080**	0.097***
	(0.030)	(0.013)	(0.040)	(0.035)
Observations	561	561	561	561
R-squared	0.571	0.782	0.405	0.299
Mean Dep. Var. (C)	0.580	0.746	0.694	0.767
	Panel (B): Separate Treatments			
Training (T1)	0.075**	0.025	0.072*	0.094**
	(0.033)	(0.018)	(0.043)	(0.039)
Training w/Signal (T2)	0.088**	0.027	0.085*	0.099**
	(0.035)	(0.018)	(0.045)	(0.039)
p-value (T1 = T2)	0.70	0.95	0.73	0.90
Observations	561	561	561	561
R-squared	0.571	0.782	0.406	0.299
Mean Dep. Var. (C)	0.580	0.746	0.694	0.767

Notes: The table reports the coefficients for the effects of the training program on vendors' *Awareness*. Panel (A) reports the effects of belonging to any treatment group, i.e. β in equation (1). Panel (B) shows the effects of the two treatment groups separately, i.e. β_1 and β_2 from equation (2). All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated only for the endline sample. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Similar to the results on awareness, Panel (B) shows that the effect for the two treatment arms are statistically indistinguishable from each other for all outcomes, with the exception of investing in stall equipment, for which vendors in the first treatment group in fact claim to have done *more* than those in the second group.

Third, regarding *Observed behavior*, we estimate specification (1) on all six rounds of actual behavioral data as observed by the data collectors. Table 7 presents these results. Panel (A) reports the effect of the training on each of the behavior indices, pooling the treatments together. We do not find a significant difference in the observed behavior of the vendors who were eligible to attend the training, compared to those who were not. In particular, this is also the case for disaggregated individual outcomes which do not require any investments or monetary outlay and where information alone should have been the primary constraint, such as keeping the cooking area and the stall clean, storing raw ingredients separately from cooked food, and keeping ingredients and cooked food covered (results in Table A.2 in Appendix) The only individual outcome for which we observe an improvement in the treatment vendors compared to the control vendors is in wearing an apron,

Table 6: Claimed Behaviors: Difference specification

	(1) Discussions	(2) Get info	(3) Improvements	(4) investments	(5) Discuss NA	(6) Info on NA	(7) Unions	(8) Meetings
				Panel (A): Pooled Treatment				
Training (T1 or T2)	0.204***	0.132***	0.230***	0.028	0.120***	0.060**	0.002	0.090***
	(0.037)	(0.038)	(0.052)	(0.023)	(0.032)	(0.029)	(0.020)	(0.030)
Observations	518	519	517	517	518	516	517	518
R-squared	0.219	0.188	0.466	0.261	0.215	0.179	0.124	0.158
Mean Dep. Var. (C)	0.049	0.068	0.270	0.062	0.031	0.062	0.043	0.037
				Panel (B): Separate Treatments				
Training (T1)	0.225***	0.142***	0.213***	0.075***	0.135***	0.077**	-0.007	0.086**
	(0.047)	(0.048)	(0.065)	(0.025)	(0.038)	(0.038)	(0.025)	(0.035)
Training w/Signal (T2)	0.187***	0.124***	0.244***	-0.008	0.108***	0.047	0.008	0.094**
	(0.044)	(0.044)	(0.054)	(0.027)	(0.037)	(0.033)	(0.025)	(0.037)
p-value (T1=T2)	0.49	0.72	0.58	0.00	0.46	0.44	0.60	0.84
Observations	518	519	517	517	518	516	517	518
R-squared	0.220	0.188	0.467	0.276	0.216	0.181	0.125	0.158
Mean Dep. Var. (C)	0.049	0.068	0.270	0.062	0.031	0.062	0.043	0.037

Notes: The table reports the coefficients for the effects of the training program on vendors' *Claimed Behavior*. Panel (A) reports the effects of belonging to any treatment group, i.e. β in equation (1). Panel (B) shows the effects of the two treatment groups separately, i.e. β_1 and β_2 from equation (2). All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated only for the endline sample. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

which in fact requires the purchase of one – a possible explanation is that wearing an apron is a behavior which vendors know would definitely be perceived by the consumers, while the same may not be true for some of the other outcomes.

Panel (B) further reports the results for the 2 treatments separately. As one can see, contrary to expectations, the estimated effect is in fact marginally higher for the T1 group. We see a modest positive effect of the training on the facilities index (2.6 p.p., or 5.8% of the mean control group). Moreover, the point estimates for the second treatment group are sometimes negative (though not significant). One may argue that there seems to be a substitution between effort and advertising: when vendors are provided with promotional material, they may feel that they already signaled their quality to consumers, and therefore make less effort to prove through their food handling that their product is safe. We show later that such a substitution possibly contributed to vendors not earning greater revenues or profits despite signaling their engagement with food safety.

Overall, there is a very small effect of the training on behavior, despite the absence of any direct monetary incentives or repercussions. However, since this is only modest in magnitude, it does not allow us to conclude that a cheap intervention such as ours can alone sustain a marked improvement in food safety.

We run several robustness checks to further explore the effects of the training on actual behavior.

Table 7: Observed Behavior: Difference specification

	(1) Facilities Index	(2) Food handling Index	(3) Customer care Index	(4) Total Index
	Panel (A): Pooled Treatment			
Training (T1 or T2)	0.013	-0.000	-0.000	0.003
	(0.013)	(0.014)	(0.016)	(0.012)
Observations	3,478	2,648	3,201	3,478
R-squared	0.174	0.189	0.354	0.227
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581
	Panel (B): Separate Treatments			
Training (T1)	0.026*	0.011	-0.004	0.016
	(0.014)	(0.015)	(0.018)	(0.012)
Training w/Signal (T2)	0.003	-0.010	0.003	-0.007
	(0.016)	(0.016)	(0.018)	(0.015)
p-value (T1 = T2)	0.12	0.09	0.68	0.09
Observations	3,478	2,648	3,201	3,478
R-squared	0.175	0.190	0.354	0.229
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581

Notes: The table reports the coefficients for the effects of the training program on vendors' *Observed Behavior*. Panel (A) reports the effects of belonging to any treatment group, i.e. β in equation (1). Panel (B) shows the effects of the two treatment groups separately, i.e. β_1 and β_2 from equation (2). All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated using all the 6 survey rounds. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

First, in order to explore the possible heterogeneity over time, we estimate the difference specification further splitting the vendors by the amount of time elapsed since each the start of the program. Appendix Table A.6 reports these results. We do not observe any clear pattern over time.[35] Second, in order to explore the possible heterogeneity of the training with respect to the type of business run, we restrict the analysis to the group of vendors that might benefit the most from the workshops: vendors selling cooked food on the street. The results are qualitatively similar to the ones reported in the text and are available upon request. Third, we use the information of the networks that the vendors operate in, to explore whether the effects of the training are exacerbated by peer effects. From the location of each block, we know which two blocks are its closest neighbors in terms of geographical distance. We do not find a significant difference in the behavior of treated versus control vendors, either in terms of how many other treated vendors they are acquainted with, or in

[35]Notice that we observe some swinging in the time that the effect of the training takes shape, with the training sometimes only taking effect once the vendors have had more time to absorb the new information and implement it. In order to deal with this, in our comparison of the effects on the two treatment groups, we rerun specification (1) for all three outcomes controlling for the amount of time elapsed since the vendor had their first workshop. Since our aim here is to only get a comparison between the two treatment groups, we estimate these regressions only off the treated sample. The results are reported in Table A.7 of the Appendix. We find that while the vendors who were provided with the opportunity to signal do in fact perform better on the awareness front, the first treatment group exhibits statistically similar, or even marginally better, outcomes in terms of both claimed and actual behavior.

terms of the density of treated blocks in their proximity. Since this analysis does not lead to any new insight, we report the results in the Appendix A.3. Finally, we estimate some alternative specifications as additional robustness tests. We estimate the effect of the training by using the assignment of vendors to a treatment group as an instrument for receiving the training. We also estimate a specification identical to (1), but controlling for the baseline levels of the outcome variables, off the data collected from the first monitoring period onwards. In both cases, the results are qualitatively identical to the Diff-in-Diff specifications and available upon request.[36]

5.3 Why are behavioral improvements difficult to undertake?

As discussed thus far, the training had only a modest effect on vendors' actual behavior, despite the marked improvement in awareness and claimed actions taken. In this and the following section, we aim to explore some of the reasons why the vendors' improved awareness may not have translated into actions.

First, concerning the supply side of the market, it may be the case that relaxing the information constraint did not necessarily make it easier for the vendors to potentially pursue the courses that the workshops advocated and offer a broader array of more hygienic choices to consumers. In order to directly test for this, we included in the questionnaire a set of questions aimed at capturing the vendors' own assessment of the resources needed to adopt these behavioral practices. During the baseline and the endline surveys, vendors were asked how "costly" they thought it was for them to provide the following services at their stalls: (i) provide clean drinking water, (ii) maintain a dustbin that was emptied regularly, (iii) use a clean cloth to wipe their hands, (iv) keep the cooking area clean and free of food debris, and (v) use disposable plates and cups. The vendors could rate the difficulty level of making these improvements, on an ordinal scale of very easy (1) to very difficult (5). Note that since we are only comparing the answers of the same vendors from the baseline and the endline, it is not a problem for our purposes if all vendors did not have the same interpretation of the difficulty levels, as long as the interpretation was consistent over time.

Table 8 shows that the training has the expected negative sign most of the time, but the effect is almost never significant. That is, the workshops does not significantly reduce how difficult the

[36] Interestingly, we observe an increase in the observed behavioral outcomes from the baseline to the endline across both treated and control groups. For instance, the Total Index goes up to from 0.58 (in Table 3) to 0.63 (in Table 4). A possible explanation would be that vendors changed their behavior because of the monitoring, which could explain the improvement also among vendors in the control group. This improvement should therefore depend upon the frequency of the monitoring. To discard this hypothesis, we test whether vendors monitored more times show better performances. The results, available upon request, do not highlight any evidence in favor of this hypothesis.

Table 8: How "costly" is it to make the following changes in the stalls?

	(1) Clean water	(2) Dustbin	(3) Clean cloths	(4) Cooking area	(5) Disposable cups
			Panel (A): Unique Treatment		
Training (T1 or T2)	-0.044	-0.022	0.005	0.057	-0.089
	(0.093)	(0.054)	(0.042)	(0.052)	(0.063)
Observations	1,242	1,242	1,242	1,242	1,242
R-squared	0.274	0.408	0.413	0.380	0.330
Mean Dep. Var. (C)	2.981	3.394	3.565	3.472	2.924
			Panel (B): Separate Treatments		
Training (T1)	-0.157	-0.057	0.018	0.051	-0.171*
	(0.109)	(0.068)	(0.051)	(0.057)	(0.080)
Training w/Signal (T2)	0.041	0.004	-0.005	0.062	-0.027
	(0.104)	(0.061)	(0.048)	(0.061)	(0.072)
p-value (T1=T2)	0.051	0.391	0.664	0.857	0.096
Observations	1,242	1,242	1,242	1,242	1,242
R-squared	0.278	0.409	0.413	0.380	0.333
Mean Dep. Var. (C)	2.981	3.394	3.565	3.472	2.924
			Panel (C): Vendors Reporting Problems		
Training (T1 or T2)	-0.088	-0.018	-0.034	0.059	-0.133**
	(0.093)	(0.055)	(0.043)	(0.057)	(0.065)
Observations	1,049	1,049	1,049	1,049	1,049
R-squared	0.283	0.404	0.423	0.387	0.361
Mean Dep. Var. (C)	2.928	3.376	3.521	3.467	2.829
			Panel D: Vendors Reporting No Problems		
Training (T1 or T2)	0.231	-0.126	0.149	-0.005	0.376*
	(0.226)	(0.178)	(0.120)	(0.149)	(0.208)
Observations	193	193	193	193	193
R-squared	0.423	0.578	0.498	0.458	0.455
Mean Dep. Var. (C)	3.254	3.459	3.795	3.533	3.000

Notes: During the baseline and the endline surveys, vendors were asked how "costly" they thought it was for them to make the following changes in their stalls: (i) Provide clean drinking water; (ii) Maintain a dustbin that was emptied regularly; (iii) Use a clean cloth to wipe their hands; (iv) To keep the cooking area clean and free of food debris; and (v) To use disposable plates and cups. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated only for the baseline and endline sample. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

vendors think it is to follow these practices, despite improving their awareness about them.[37] As discussed earlier, a possible explanation for this is that many of the constraints that vendors identify as the major problems in their daily business operations have to do with the lack of basic infrastructure, which our intervention did not directly help mitigate since it did not involve any monetary

[37] A series of questions in the baseline had sought to identify what the vendors considered the greatest problems in running their business (such as unavailability of running water, persecution by the local authorities etc) which hinted at different non-economic costs of altering their behavior. As a further robustness test, we separately examine how the perceived cost changed for vendors who identified no threats to their business and those that identified multiple threats, and find no significant improvement for either group.

transfers or other financial benefits.[38] We conclude, therefore, that providing information is not a sufficient condition to substantially decrease the perceived cost of tackling food safety hazards.[39]

Second, concerning the demand side of the market, it may be the case that consumers are unable to distinguish between hygienically prepared food and contaminated fare, which would imply that vendors may not have enough incentives to alter their practices in order to retain their customer base. In the following section, we elaborate on our consumer survey, and shed light on why vendors may not have been prompted to improve their behavior despite the presence of demand for safer street food.

6 Evidence on Consumers

In order to provide direct evidence regarding the demand side of the market, we conducted a follow-up survey on 1,480 street food consumers across Kolkata. The purpose of the survey was twofold. First, we gathered extensive information on their street food habits, thereby giving us both a holistic picture of their stated preferences and beliefs, as well as a means of analyzing such preferences as a function of the street vendor's or stall's characteristics. Second, we administered a comprehensive series of choice scenarios, in the spirit of a discrete choice experiment. This allows us to obtain quantitative information on the relative importance of different attributes that influence their choice of street food, as well as the trade-offs between price and vendor characteristics and the probability of take-up of pricier but "better" options. The survey was conducted between June and August of 2019, across our original blocks.[40] In this Section, we first discuss the patterns that emerge from the consumer survey about self-reported habits and preferences, and then discuss the discrete choice experiment in detail.

[38] Though vendors expected that the workshops would improve their business outcomes ex ante, it may be the case that providing these hygienic services appeared more expensive than they had anticipated since they did not receive any financial help.

[39] Notice that one could interpret these results as showing that the training just provided a clearer idea about the costs. However, the negative sign of most of these effects suggests that the training worked in the expected direction, but it was not sufficiently strong to lower the other "costs of production" for the vendors.

[40] While surveying customers who are consumers of street food at the same locations where we studied the vendors ensures that they are representative of the kind of demand that those vendors cater too, the time lag makes it unlikely that the attitudes of the consumers are influenced by the behavior of the vendors immediately pre or post training. Since our intervention was only on the supply side and did not include any workshops for the customers themselves, our consumer survey is intended to reflect their inherent opinions and preferences without any regard to our vendor training program and consequent vendor compliance. Indeed, as Table A.12 shows, the consumers across the treatment and control blocks look almost identical in all dimensions.

6.1 Consumer Survey

Table 9 reports summary statistics from the consumer survey. The sample is divided in four groups, depending on the popular street food "items" that was used in the choice scenarios.[41] The Table reports means for customers in each group, as well as overall averages. Column (5) of Panel B gives an idea of the overall demographics of the street food customers we interviewed. Slightly more than half of the consumers were male, the average age is around 36 years and around 25% of them reported earning more than Rs. 20,000 per month.[42]

Table 9: Consumer Survey: Summary Statistics

	(1) Veg Meal (Item 1)	(2) Chicken Biriyani (Item 2)	(3) Rice and Fish (Item 3)	(4) Chicken Chowmein (Item 4)	(5) Full Sample
	Panel (A): Prices in the choice scenarios				
Baseline	25	80	40	40	
1^{st} Alternative	30	90	50	50	
2^{nd} Alternative	35	100	60	60	
	Panel (B): Consumer Demographics				
Male	0.56	0.51	0.52	0.51	0.53
Age	34.4	36.2	38.5	37.7	36.7
Finished School	0.85	0.74	0.50	0.62	0.67
Income > 20,000	0.30	0.29	0.16	0.22	0.24
	Panel (C): Street Food Habits				
Frequent	0.62	0.70	0.64	0.69	0.65
Regular vendor	0.35	0.31	0.29	0.28	0.31
Been sick	0.36	0.52	0.43	0.48	0.44
Identify source	0.46	0.33	0.64	0.39	0.47
Changed vendor	0.32	0.40	0.38	0.49	0.38
	Panel (D): Important Factors and Awareness				
Taste	0.93	0.97	0.96	0.97	0.96
Price	0.73	0.80	0.87	0.93	0.82
Location	0.45	0.49	0.58	0.52	0.51
Hygiene	0.76	0.68	0.75	0.83	0.75
Health	0.58	0.30	0.34	0.36	0.40
Relation with vendor	0.23	0.16	0.08	0.10	0.14
Hygiene most imp	0.39	0.35	0.36	0.41	0.37
Can detect contaminants	0.37	0.39	0.23	0.22	0.31
Observations	409	368	495	208	1,480

Notes: The table provides summary statistics from the consumer survey: Baseline and alternative prices designed for the respective items (Panel A), demographic information on consumers (Panel B), street food habits (Panel C), and important factors considered in choosing a food item and awareness regarding the ability to detect contaminants (Panel D).

[41] Consumers were asked about the different items sequentially through the survey, and the samples are not balanced across item. There is also substantial variation within the consumers in each item category, allowing us to explore heterogeneity in consumer choices.

[42] While there is some variation in terms of these socio-economic factors in aggregate among consumers who were offered different items for their choice experiment, there is also substantial variation among the consumers in each item category. This allows us to explore whether consumers with different attributes make different choices.

In Panel C, we document the usual street food habits of these consumers. Street food consumption is common, with 65% of them consuming it more than once a week, as is having a regular vendor that one buys from. Getting ill from street food is pervasive even among these extremely frequent customers, and consumers make an effort to identify the cause or source of such food-borne illnesses, illustrating some scope for accountability among the food vendors. 44% of the consumers report having fallen sick at some point from consuming unsafe street food. Among these consumers, 47% of them claim to have definitely been able to identify the source of the contaminated food ex post. Changing the regular vendor is also quite common as a result. 38% of the consumers have a regular stall they visit which is different from a previous regular vendor.[43]

In Panel D, we document the factors that determine consumers' street food choices. Consumers care about several factors such as the taste of food, price, location, whether the food is healthy, and whether the stall is hygienic. In order to get a more precise idea about the relative importance of these attributes, we specifically asked consumers what they considered the single most important factor in their decision. Though almost 75% seem to be influenced to some extent by the consideration of hygiene, a modest 37% report that it is in fact the most crucial factor, highlighting the role of other attributes in their decision-making process.

Finally, we examine whether customers believe that they are capable of distinguishing between safe and unsafe food.[44] We find that only 31% of the sample report that it is easy or possible for them to detect whether food is contaminated. Consumers' decision of whether and where to consume street food may therefore be guided more by ex post considerations as a result of contracting some food-borne illness rather than ex ante informed decisions about whether a particular stall appears safe. Since these numbers are self-reported, the actual number of consumers who can realistically tell safe food apart from unsafe food is likely to be even lower. Coupled with the fact that less than half of them believe that they can trace the source of food-borne illnesses, this suggests that there may not be sufficient demand side pressures to cause vendors to undertake a change in their behavior.

[43] Besides having fallen ill form the food, other reasons include an increase in price, finding a better option, and not visiting that area any longer.

[44] Despite the undeniable importance that consumers seem to attach to food hygiene, it is necessary for our purposes to understand how exactly it is that customers perceive and judge the level of hygiene. For instance, vendors should be more likely to improve their behavior if it is indeed the case that consumers believe that they are at all capable of discerning whether food is contaminated.

6.2 Discrete Choice Experiment

We now provide a quantitative assessment from our discrete choice experiment setup,[45] and show that consumers' stated preferences indicate a positive willingness to pay for food that is perceived safer.

Discrete choice experiments are an established approach to elicit consumers preferences (World Health Organization 2012). Specifically, they are a commonly advocated quantitative method to assess different factors determining consumers' choices, as it provides information on the relative importance of various products' characteristics that influence consumers' choices. This method has been used in several contexts, including also in the choice of food and health items in developing countries (see e.g. Lancsar and Louviere (2008), Otieno (2011), Mühlbacher and Johnson (2016), among others). The key advantage of choice experiments is that they measure willingness to pay from stated preferences when reliable measures of revealed preferences are not available (de Bekker-Grob et al. 2012). This makes them ideal in our setting, where we want to evaluate the relevance of each attribute (e.g. hygiene, price, etc) from a series of hypothetical choices. The underlying idea is that stated preferences represent the expected utility from each combination of attributes, and thus we can evaluate the utility of each attribute level as well as the overall utility of each alternative.

We follow a standard design, where each customer was asked to make a series of choices under a set of hypothetical scenarios, between a baseline good and an alternative good. Table 10 summarizes the main features of the design. The options were characterized by four attributes: (1) *Known*, meaning whether the vendor is known to the consumer;[46] (2) *Hygiene*, meaning whether the vendor and the stall appear hygienic;[47] (3) *Poster*, meaning whether the vendor displays some poster or certification of training in food handling methods; and finally (4) *Price*. As mentioned before, the choices offered to each customer pertained to one out of four different items,[48] to allow us to check that the results were not simply true for one narrow food category or price range. We included both variation in terms of kind of food for the same price range (Items 3 and 4), as well as variation in price ranges for the same kind of food (Items 2 and 4).[49]

[45] We would like to thank Erwin Bulte for suggesting this approach.

[46] We framed this question as someone from whose stall they have consumed food with some regularity in the past.

[47] In the program sense.

[48] Specifically: Veggie Meal (Item 1), Chicken Biriyani (Item 2), Rice and Fish (Item 3), and Chicken Chowmein (Item 4).

[49] It is worth mentioning that we administered the choice experiments at the beginning of the survey, so as to prevent (as much as possible) priming the consumers about food hygiene considerations with the follow-up questions relating to their street food habits and safety awareness.

Table 10: Design of our discrete choice experiment

	(1) Known	(2) Hygiene	(3) Poster	(4) Prices
Baseline:				
Option K	✓	×	×	B
Alternatives:				
Option K,H	✓	✓	×	A1, A2
Option K,P	✓	×	✓	A1, A2
Option K, H, P	✓	✓	✓	A1, A2
Option U, H	×	✓	×	B, A1, A2
Option U, P	×	×	✓	B, A1, A2
Option U, H, P	×	✓	✓	B, A1, A2

Notes: The table provides a scheme of our design for the discrete choice experiment. There are four characteristics: (1) *Known*, meaning whether the vendor is known to the consumer; (2) *Hygiene*, meaning whether the vendor and the stall appear hygienic; (3) *Poster*, meaning whether the vendor displays some poster or certification of training in food handling methods; and finally (4) *Price*. K and U refer to knonw and unknown vendor. H refers to hygienic vendor. P refers to vendor with a poster or certificate. B, A1, and A2 refer to the baseline and 2 alternative prices (B<A1<A2). The default vendor is a known vendor who has bad hygiene, no poster, and is selling at a baseline price.

The set of choices are as follows. Consumers were asked to choose between two hypothetical vendors selling the respective food (e.g., a vegetarian meal for Item 1): a default vendor, and an alternative option. The default vendor remained the same across all choices: it was a *known* vendor, selling the food at the *baseline price* (as reported in Panel A of Table 9), who *did not* seem to have very good hygiene, and *did not* display a poster or certification of training. The alternative options varied each of the attributes, individually as well as together, as well as the price. There were six types of alternative vendors, enumerated in Table 10. B, A1, and A2 indicate the baseline price and the two alternative prices (as listed in Panel A of Table 9 with the B being the lowest price and A2 being the highest price). As borne out by the survey, consumers tend to favor regular vendors and value a relationship with the vendors: the first three alternatives, therefore, strictly dominate the default option, and were therefore characterized only by each of the two alternative prices. On the other hand, the last three alternatives involve a trade-off between better facilities and knowing the vendor, and are therefore characterized by the baseline price as well as the alternative prices, in order to allow for the possibility of a relationship with the vendor offsetting the improved stall conditions.[50]

[50]More precisely, given our design, there are 24 ($2 \times 2 \times 2 \times 3$) possible combinations of characteristics. In our questionnaire, we included the 15 combinations that were not strictly dominated by the baseline option. The optimal length and design of the survey were drawn up based on (i) an orthogonal design, as recommended by World Health Organization (2012), as well as (ii) piloting. In order to check that consumers were in fact answering in a rational manner, we also included two "test scenarios", where the default option strictly dominated the alternatives but the alternatives were characterized by higher prices. Following their guidelines, we do not include the two choices for consistency checks in our econometric analysis.

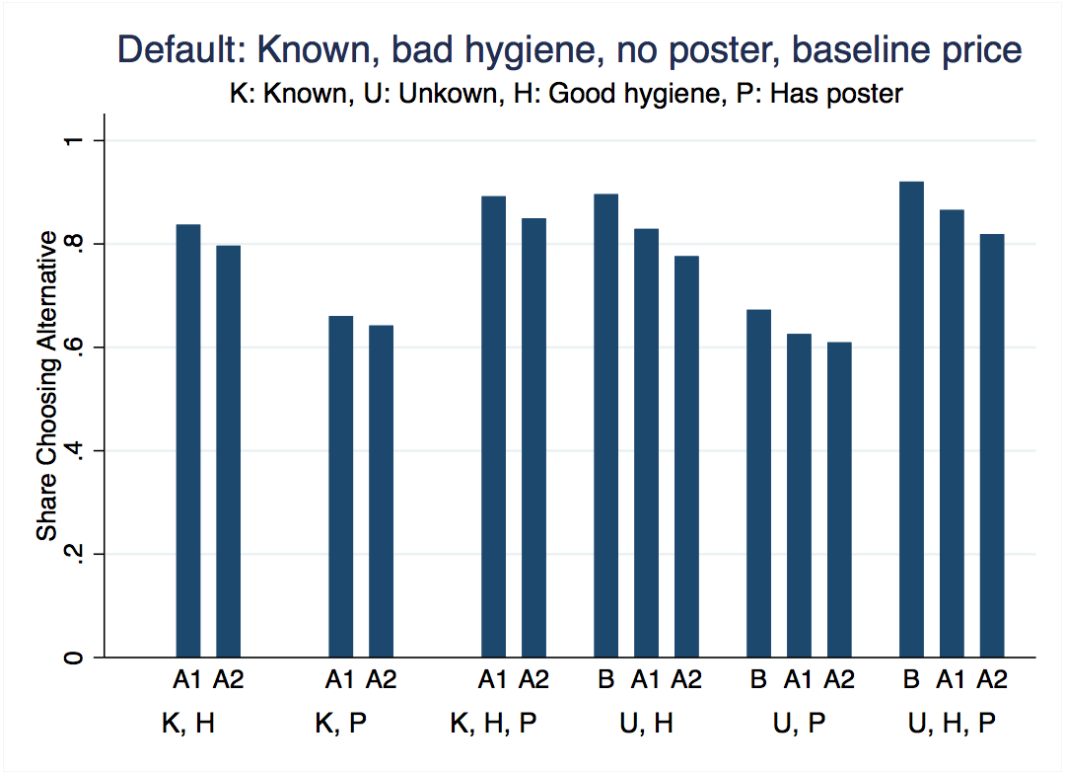
The idea of good hygiene was communicated to the consumers in terms of our behavioral outcomes. Moreover, since the hygienic condition of the stall was explicitly described to all consumers instead of having them infer it, our approach allows us to gauge the intrinsic preferences of all consumers irrespective of their actual ability to detect stall conditions. One caveat is that survey participants may have been able to gauge that these are "desirable" practices from the questions, so their answers may reflect experimenter-demand effects to some extent. However, as we shall show later, the valuation of perceived food safety is indeed higher for those consumers who are more engaged with hygiene (either considering it the key determinant of their street food purchase decisions or being able to distinguish between safe and contaminated fare), thus suggesting that this should not be a major concern.

Figure 3 documents the proportion of consumers who opted for the alternative over the default vendor, for different combinations of characteristics, across the four items. A few patterns emerge from this picture. First, as one would expect, for each set of alternative options the share of customers who choose the alternative declines with an increase in price. The decline is however fairly modest, and the share of customers who claim they would prefer the alternative is consistently high (between 65% and 90%), indicative of a positive willingness to pay for improved hygiene, and a relatively flat demand curve. Second, the share of customers who state a preference for the alternative bundles are much smaller in the hypothetical scenarios where the vendor displays a poster or certification of training unaccompanied by an actual improvement in hygiene, compared to the choices involving better hygiene. This suggests that vendors should not experience an improvement in their business outcomes simply by displaying the poster without in fact improving behavior, and we show evidence for this in the next Section.

We also specifically examine differences in demand responses by a number of consumer attributes, by reproducing the picture for different sub-samples (Figure A2 in Appendix A.5). An important takeaway is that consumers who consider hygiene the most important factor and those who believe they can detect whether food is contaminated are in fact also more likely to opt for food that appears safer (Panels C and D). Finally, these patterns also hold when we examine demand separately by item (Figure A3 in Appendix A.5).

We further supplement these graphs with an analysis of the the take-up rates of the alternative option, by regressing whether the consumer chooses the alternative option on each of the attributes

Figure 3: Demand for Alternative Options



Notes: This figure shows the proportions of consumers who report that they would choose the alternative option over the default vendor, for different combinations of characteristics. B, A1, and A2 refer to the baseline and 2 alternative prices (B<A1<A2). The default vendor is a known vendor who has bad hygiene and no poster. The alternative options correspond to those listed in the table above.

characterizing it. The results are reported in Table 11.[51] Consumers do exhibit willingness to pay for each of the attributes, and unsurprisingly, demand declines in price. Comparing among the attributes, the probability to opt for a hygienic vendor is the highest, followed by a known vendor, but consumers do not seem to assign much intrinsic valuation to external certifications or endorsements of vendor quality. Again, this supports the idea that vendors should not encounter better business outcomes in the absence of an actual improvement in hygiene.[52]

6.3 Effect on Business Outcomes

As described above, the consumer survey indicates that vendors should not have experienced higher profits or been able to charge higher prices following the treatment, given that they did not actually seem to improve their practices. We now directly test this with business outcomes of vendors from our original survey, to confirm that the prediction from our follow-up consumer data is corroborated by our vendor survey. We had obtained business information such as profits, revenues and prices of the main dish sold, both during the baseline and the endline, and we explore whether there was

[51] We report results and graphs based on our most conservative sample: consumers who made rational choices, and whose interview durations were between 5 minutes and 20 minutes. Using the entire sample yields similar results.

[52] As a complementary approach, as is standard for such choice experiment setups, we also use the survey data to estimate consumers' willingness to pay. This is described in detail in Section A.5.2.

Table 11: Consumer Survey: Demand by Attribute

	(1) Item 1	(2) Item 2	(3) Item 3	(4) Item 4	(5) Full Sample
Price	-0.026*	-0.051***	-.030***	-0.124***	-0.060***
	(0.015)	(0.015)	(0.010)	(0.013)	(0.007)
Known	0.106***	0.081***	0.103***	0.040**	0.098***
	(0.018)	(0.010)	(0.013)	(0.018)	(0.008)
Hygiene	0.414***	0.139***	0.122***	0.222***	0.221***
	(0.015)	(0.030)	(0.029)	(0.031)	(0.021)
Poster	0.104***	0.008	0.018	0.030	0.036
	(0.021)	(0.013)	(0.013)	(0.014)	(0.009)
Observations	2,260	2,603	2,299	1,976	9,138
R-squared	0.398	0.461	0.474	0.467	0.415

Notes: The table reports the proportions of consumers opting for the alternative option, by different attributes of the options – price, whether the vendor is known, whether the vendor is hygienic, and whether the vendor displays a poster. All regressions include consumer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

an improvement in these variables for treated vendors compared to the control vendors. Table A.8 in Appendix A.4 reports the results. The treated vendors exhibit no change in their total revenue or in their profits, including the subgroup that can signal their participation to the workshops. Given that even the T2 vendors appeared to not be engaging in the recommended safer practices, this is aligned with the finding that consumers seem to value actual vendor behavior and cleanliness rather than an external endorsement of vendor skills or practices. Simply displaying the poster, while not in fact improving behavior, may therefore have been interpreted by the consumers as cheap talk. This seems particularly likely when combined with the fact that consumers are often unable and therefore unwilling to gauge the safety of street food that they purchase, and additionally often make their choices based on other attributes of food besides hygiene, such as location and taste.

7 Conclusion and Policy Implications

In this paper, we implement a randomized control trial to test whether a cheap intervention aimed at increasing food safety awareness among street vendors can improve food safety behavior. We also conduct a survey on consumers of street-food in this market and elicit their stated preferences for food attributes using a discrete choice experiment. Although we find substantial improvements in vendors' knowledge about food safety hazards and actions that they claim to have undertaken, we observe limited effects on vendors' actual practices. Our design allows us to investigate some possible explanations regarding the small effect on food safety behavior. We provide evidence that

this is likely due to the training not significantly reducing vendors' perceived difficulty of providing more hygienic services to customers. We also show that, though consumers exhibit a positive marginal willingness to pay for higher perceived hygiene, they struggle to detect whether street food is contaminated.

Our results highlight that information alone to the vendors is not sufficient to alter hygienic practices in this sector. This is a useful, evidence-based, policy conclusion for those organizations and institutions whose job is to provide guidance to governments on setting up long-term strategies to control food safety. For instance, the ongoing formalization processes in India are uniquely focusing on licensing and delimiting vending areas. Conversely, we point out that future research, as well as policymakers, should focus on mitigating especially the supply-side constraints, as well as improving food safety awareness among consumers, in order to achieve improvements in the street-food vending sector. Lack of basic facilities, such as clean water, waste disposal and electricity, are all factors that hinder self-improvement in food safety, and should be at the core of investigation in future studies. Governments interested in formalizing this sector should seriously take into account the supply side constraints when drafting street-food vending regulations and when designing vending areas.

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Appendix

This Appendix contains six sections with additional material and analysis. We preferred to leave this here to minimize the length of the manuscript. The information in this Appendix are organized as follows. Appendix A.1 contains a theoretical model that rationalizes our intervention. Appendix A.2 contains additional tables regarding the analysis on actual behavior. Appendix A.3 contains additional tables regarding the analysis on network effects. Appendix A.4 contains additional tables of robustness checks regarding the analysis on the three outcome variables related to vendors. Appendix A.5 contains additional tables and figures regarding the analysis on consumers.

A.1 Conceptual Framework

In order to better understand the mechanisms through which our training can influence vendors' behavior, we outline a framework that serves the dual purpose of systematizing our thinking and helping us summarize the main channels.

We describe a stylized optimization problem of vendors' behavior within a simple model of profit maximization under uncertainty. Assume there is a continuum of street-food vendors operating in a market of differentiated goods. For simplicity, vendors have to choose whether to produce a good of quality H(igh) or L(ow). In order to produce L, costs and revenues are known and the expected profits are set to $E[\pi_L] = 1$ as benchmark. In order to produce H, vendors face uncertainty about both costs and revenues. For each vendor, the expected profits are $E[\pi_H] = E[R - C]$, where, for simplicity, $C \sim N(\mu_C, \sigma_C^2)$ and $R \sim N(\mu_R, \sigma_R^2)$.[53] Assume further that C and R are independernt, and $E[R - C] = \mu_R - \mu_C > 1$. The latter can be thought as consumers having a larger taste for H over L because it is more healthy and therefore yields higher utility. The random variable C captures the ex-ante uncertainty about investing in H. The uncertainty comes from two sources: (i) vendors may have different ("hard") costs of production and (ii) vendors' awareness about food quality, safety and its production, is a ("soft") costly information. In particular, a vendor with high awareness has less cost to produce H than a vendor with low awareness, conditional on the same

[53] Note that the assumption of normality is not crucial here. A more realistic assumption of, e.g., truncated normal would yield the same qualitative equilibrium condition, but at the cost of a much more tedious derivation (see Hanson et al. (1991) for a formal derivation).

lack of basic infrastructure and costs on the street. R captures the idea that vendors are uncertain about the consumers' willingness to pay for H (which implies that vendors are uncertain about the aggregate demand).[54] Uncertainty is further exacerbated by consumers finding difficult to detect whether a vendor is selling a good of quality H or L.

Assume vendors are risk adverse with respect to profits from the high-quality good, and they differ in the degree of risk aversion. Risk aversion is captured by the standard Arrow-Pratt measure of constant absolute risk-aversion (CARA), which is distributed over the interval $[0, x]$. Hence vendors producing H have utility $U_H = -e^{-\lambda \pi_H}$ (versus a known $U_L = 1$). The problem they solve can be restated as follows:

$$\max \left\{ \mu_R - \mu_C - \lambda \frac{\sigma_R^2 + \sigma_C^2}{2} \right\} \tag{A.1}$$

Vendors produce H if $U_H > U_L$, that is, under the condition that:

$$\lambda < \frac{2(\mu_R - \mu_C - 1)}{\sigma_R^2 + \sigma_C^2}. \tag{A.2}$$

In the absence of an intervention in the market, the share of vendors producing H can be represented by the colored area in Figure A1.

Inequality (A.2) leads us to formulate two simple (cheap) interventions and testable hypotheses to increase the expected utility of vendors to produce H and hence to increase the share of high-quality food in the market.

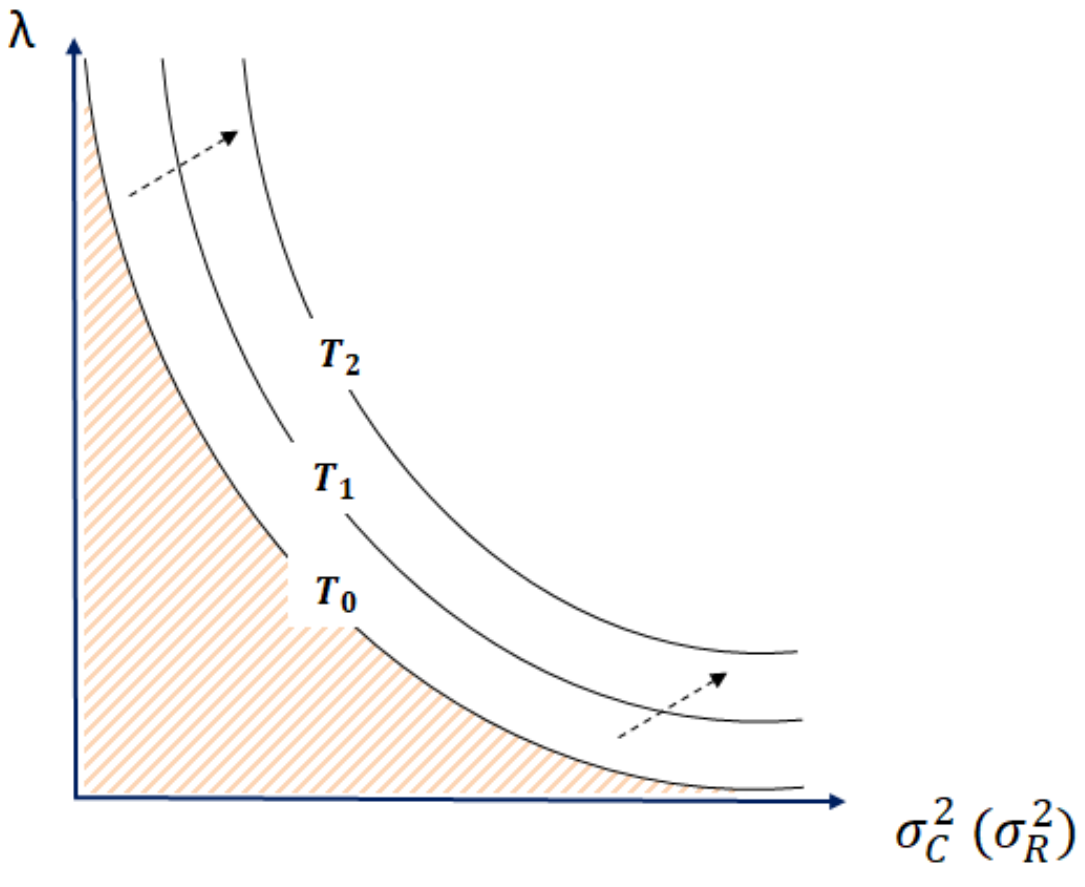
Hypothesis 1. *An informational training aimed at increasing awareness about food quality and safety, leads to (i) A decrease in the expected costs μ_C and costs uncertainty σ_C^2 to produce H, and (ii) An increase in the share of vendors producing H.*

Hypothesis 2. *Providing vendors with promotional material, specifically tailored posters, napkins and certificates, allowing them to advertise to customers their participation in the informational training (on top of providing the training itself), leads to (i) An increase in the expected revenues μ_R and a decrease in the uncertainty σ_R^2 of these revenues (on top of a decrease in μ_C and σ_C^2) and (ii) A further increase in the share of vendors producing H.*

According to Hypothesis 1, the (ex ante) share of vendors producing H is depicted under the curve T1 in Figure A1 and that according to Hypothesis 2 is depicted under the curve T2. Both

[54] This is a reasonable assumption to make in large metropolitan areas with very heterogeneous groups of consumers.

Figure A1: Share of vendors producing *H*



hypotheses are brought to data in this paper. It is worth pointing out that our primary purpose is not going to separately estimate the parameters μ_R, μ_c, σ_R^2, σ_C^2, or λ, of our model. The primary aim is to test whether, and to what extent, simple interventions acting on what we labeled "soft" costs (like awareness of food quality and safety), or on advertising the quality to consumers, are sufficient to boost a change in the share of vendors producing H. Indeed it is very likely that such hypothesized interventions are going to affect these parameters altogether. However, the conceptual framework is still useful to summarize the main incentives at play and to formulate interventions that can be implemented and replicated elsewhere.

A.2 Additional results on actual behavior

Table A.1: Actual Behavior: Difference-in-Difference

	(1) Facilities Index	(2) Food handling Index	(3) Customer care Index	(4) Total Index
		Panel (A): Workshop 1		
Training (T1) × post workshop	0.033**	-0.009	0.024	0.015
	(0.016)	(0.018)	(0.027)	(0.012)
Training w/Signal (T2) × post workshop	-0.007	-0.002	-0.025	-0.020
	(0.012)	(0.015)	(0.026)	(0.013)
Observations	3,478	2,648	3,201	3,478
R-squared	0.177	0.191	0.355	0.231
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581
		Panel (B): Workshop 2		
Training (T1) × post workshop	0.034**	-0.026	0.029	0.012
	(0.016)	(0.017)	(0.026)	(0.012)
Training w/Signal (T2) × post workshop	0.003	0.002	-0.020	-0.015
	(0.016)	(0.015)	(0.024)	(0.017)
Observations	3,478	2,648	3,201	3,478
R-squared	0.177	0.191	0.355	0.230
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581
		Panel (C): Workshop 3		
Training (T1) × post workshop	0.034**	-0.032**	0.040	0.023*
	(0.015)	(0.015)	(0.028)	(0.013)
Training w/Signal (T2) × post workshop	0.029	-0.041*	0.003	0.010
	(0.026)	(0.024)	(0.029)	(0.023)
Observations	3,478	2,648	3,201	3,478
R-squared	0.176	0.190	0.355	0.229
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581

Notes: The table reports the coefficients for the effects of the training program on vendors' *Observed Behavior*. We estimate specification (3), which gives us the difference-in-difference estimate of the effect of training on treatment blocks, comparing their outcomes before and after they have attended the workshops to those with control blocks at the same point of time. The three panels correspond to the three workshops, and $T \times$ post workshop is an indicator for the vendor being assigned to treatment and monitoring occurring post the intended (or scheduled) date of each workshop, irrespective of whether they actually attended. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated using all the 6 survey rounds. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table A.2: Observed Behavior: Disaggregated

	Panel (A)						
	(1) water distribution	(2) dustbin at stall	(3) dustbin full	(4) wearing apron	(5) clean floor	(6) clean surface	(7) clean cloth
T	0.000	0.030	0.001	0.015***	0.016	0.003	0.001
	(0.003)	(0.028)	(0.011)	(0.005)	(0.028)	(0.025)	(0.015)
Observations	2,686	3,478	2,381	3,441	3,101	3,130	2,941
R-squared	0.311	0.169	0.059	0.043	0.146	0.183	0.140
	Panel (B)						
	(1) raw food separated	(2) raw food covered	(3) cooked food separated	(4) cook with implements	(5) serve with implements		
T	-0.002	0.054	0.014	-0.036***	-0.021		
	(0.006)	(0.036)	(0.027)	(0.011)	(0.020)		
Observations	2,346	2,290	2,471	2,497	2,428		
R-squared	0.218	0.218	0.205	0.170	0.214		
	Panel (C)						
	(1) clean table	(2) disposable plates	(3) disposable cutlery	(4) disposable glasses	(5) clean with soap	(6) use clean water	
T	0.002	-0.013	-0.042*	0.025	-0.027	0.001	
	(0.006)	(0.032)	(0.024)	(0.033)	(0.030)	(0.035)	
Observations	1,994	2,503	2,003	2,307	1,767	1,227	
R-squared	0.068	0.427	0.474	0.465	0.368	0.236	

Notes: Panel A reports the coefficients for the effect of the treatment on each component of the Facilities index. Panel B reports the coefficients for the effect of the treatment on each component of the Food Handling index. Panel C reports the coefficients for the effect of the treatment on each component of the Customer Service index. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

A.3 Spillovers and Network Effects

In this section, we use the information of the networks that the vendors operate in, to explore whether the effects of the training are diluted by peer effects for the control vendors. From the location of each block, we know which two blocks are its closest neighbors in terms of geographical distance. We study whether there is an effect of the training on control blocks if at least one of their neighboring blocks is also assigned to treatment, using the difference specification

$$y_{it} = \alpha + \beta_1 C \times N_{it} + \beta_2 C_{it} + \beta_3 N_{it} + \mathbf{X}_{it}\gamma + \delta_t + \varepsilon_{it} \tag{A.3}$$

where N_{it} is a dummy variable for whether at least one of the two neighboring blocks is treated. If β_1 in this specification is estimated to be positive and significant, it would point towards the presence of spillovers which appear to dilute the treatment effect for the trained vendors. In a similar vein, we also estimate different specifications to examine whether there is an effect on control group vendors who are (i) closer to a larger number of treated blocks, and (ii) acquainted with a larger number of treated vendors.

We proceed in reverse order: first we look at observed behavior, then awareness and claimed behavior. We first test for the simplest kind of peer effect: whether the neighboring vendors' treatment assignment matters, by estimating specification (A.3). Panel (A) of Table A.3 reports the results for observed behavior. We see that a neighbor being treated does lead to the control group vendors exhibiting an improvement in behavior, by as much as 7.5 percentage points for the customer care index. There is a smaller positive effect on the other behavioral categories.

Panel (B) and (C) of Table A.3 further explore possible mechanisms for any potential peer effects. One possible explanation is that vendors exchange information with other vendors they know. To check this, we calculate the number of "treated" vendors that each vendor knows, which is simply the sum of the vendors that each vendor knows in his own block and the two neighboring blocks if these blocks are treated.[55] We then create a binary variable denoting whether the vendor has more than the median number of treated acquaintances by this definition, which is 8, and re-estimate specification (A.3) replacing the dummy for a treated neighbor with this dummy for knowing more than the median number of treated vendors. The coefficients are reported in Panel (B) of Table A.3.

[55] By this measure, not knowing any vendor in one's own block or a neighboring block is observationally equivalent to the same or neighboring block not being assigned to treatment.

We find no effect on the behavior of the control vendors, of being acquainted with a larger number of vendors assigned to training.[56] Finally, we examine the effect of proximity to a larger number of treated blocks. We calculate the number of blocks assigned to treatment which are within a radius of 1 kilometer from each block. The median number of such blocks is 4, and we define a similar binary variable denoting whether there are more than 4 blocks[57] within a kilometer of each block. Then we estimate an identical specification, this time studying the effect of being a control block interacted with having a large number of other treated blocks close by. Results are in Panel (C) where, again, we find no significant benefit from being located near a larger density of treated blocks.

Finally, in Tables A.4 and A.5, we replicate this approach focusing on awareness and claimed actions. In the first case, we find that, having a neighboring block be a treatment block, has negligible effect on variables capturing control vendors' awareness. Conversely, we find a substantial spill-over effect when looking at claimed actions, for *treatment* vendors – vendors assigned to the training seem to benefit much more from being next to other treated blocks, compared to the control vendors. This is true for most of the proxies for claimed actions, suggesting that interactions among vendors might be a powerful channel to spread business related skills in this market.

[56] The results are robust to alternative definitions of the cutoff for the dummy, besides the median number of 8.

[57] As before, the results are robust to alternative definitions. The results are also robust to restricting the number of "close" blocks to only those which have at least one vendor who sells the same kind of food.

Table A.3: Actual Behavior: Spillover and Network Effects

	(1)	(2)	(3)	(4)
	facilities	food handling	customer care	total
Neighboring Block Treated				
Control × Treated nbr	0.011	0.052*	0.075**	0.035
	(0.029)	(0.029)	(0.037)	(0.025)
Control	-0.021	-0.039	-0.058*	-0.030
	(0.024)	(0.026)	(0.033)	(0.020)
Treated nbr	-0.009	-0.023	-0.018	-0.004
	(0.024)	(0.017)	(0.026)	(0.022)
Observations	3,478	2,648	3,201	3,478
Knowing More Vendors				
Control × network	0.031	0.012	-0.033	0.020
	(0.027)	(0.031)	(0.033)	(0.024)
Control	-0.019	0.000	0.019	-0.003
	(0.016)	(0.021)	(0.024)	(0.014)
Network	0.010	0.011	0.023	0.016
	(0.015)	(0.015)	(0.022)	(0.013)
Observations	3,478	2,648	3,201	3,478
Close to More Treated Blocks				
Control × proximity	0.003	-0.001	-0.018	0.008
	(0.026)	(0.029)	(0.032)	(0.023)
Control	-0.015	0.001	0.012	-0.007
	(0.015)	(0.024)	(0.023)	(0.016)
Proximity	-0.001	0.006	0.025	0.011
	(0.024)	(0.037)	(0.045)	(0.024)
Observations	3,478	2,648	3,201	3,478

Notes: The table reports the coefficients for the effects of the training program on vendors' Observed Behavior, depending on vendors' networks. We estimate specification (A.1). In panel (A), the interaction considers whether a neighbor block is being treated; in Panel (B), whether a vendor has more than the median number of treated acquaintances; in Panel (C), whether a vendor has more than the median number of other treated blocks close by. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated using all the 6 survey rounds. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A.4: Awareness: Network Effects

	(1) Food	(2) Personal	(3) Contamination	(4) Utensils
Control × Treated Nbr	0.001	-0.026	0.081	-0.048
	(0.061)	(0.041)	(0.097)	(0.067)
Control	-0.081	-0.008	-.134	-0.060
	(0.055)	(0.033)	(0.087)	(0.046)
Treated Nbr	-0.035	0.020	-0.084	-0.033
	(0.056)	(0.044)	(0.060)	(0.049)
Observations	561	561	561	561
R-squared	0.572	0.782	0.408	0.301

Notes: The table reports the coefficients for the effects of the training program on vendors' Awareness, depending on vendors' networks. The interaction considers whether a neighbor block is being treated. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A.5: Claimed Actions: Network Effects

	(1) discussions	(2) get info	(3) improvements	(4) investments	(5) discuss NA	(6) info on NA	(7) unions	(8) meetings
Control × Treated Nbr	-0.204**	-0.016	-0.240**	-0.119**	-0.190**	-0.046	-0.108**	-0.108
	(0.092)	(0.088)	(0.093)	(0.065)	(0.074)	(0.075)	(0.053)	(0.074)
Control	-0.060	-0.119	-0.061	0.056	0.014	-0.027	0.074	-0.013
	(0.078)	(0.079)	(0.083)	(0.058)	(0.062)	(0.067)	(0.047)	(0.064)
Treated Nbr	0.042	-0.051	0.027	0.000	0.030	-0.015	0.042	-0.015
	(0.071)	(0.067)	(0.070)	(0.047)	(0.044)	(0.043)	(0.028)	(0.057)
Observations	518	519	517	517	518	516	517	518
R-squared	0.229	0.191	0.476	0.271	0.232	0.181	0.134	0.167

Notes: The table reports the coefficients for the effects of the training program on vendors' Claimed Behavior, depending on vendors' networks. The interaction considers whether a neighbor block is being treated. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

A.4 Additional results: Robustness Checks

Table A.6: Observed Behavior: Effect by Time Lag

	(1) Facilities Index	(2) Food handling Index	(3) Customer care Index	(4) Total Index
T × months 4 or below	0.006	0.006	0.001	0.006
	(0.017)	(0.024)	(0.026)	(0.016)
T × months 5 to 8	0.017	0.018	-0.016	0.001
	(0.017)	(0.018)	(0.022)	(0.014)
T × months 9 or above	0.016	-0.023	0.016	0.003
	(0.015)	(0.016)	(0.018)	(0.013)
Observations	3,478	2,648	3,201	3,478
R-squared	0.174	0.191	0.355	0.228

Notes: The table reports the coefficients for the effect of the training program on vendors' observed behavior, interacted with the number of months elapsed since the baseline. The variables 'months 4 or below', 'months 5 to 8', and 'months 9 or above' are respectively indicators for the vendor being monitored within the first 4 months since the baseline, between months 5 and 8, and month 9 onwards. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table A.7: Comparing T1 with T2

	(1)	(2)	(3)	(4)
	Panel A: Awareness			
	food	personal	contamination	utensils
Training (T1)	-0.209***	-0.083	-0.018	-0.078*
	(0.053)	(0.054)	(0.079)	(0.046)
Observations	341	341	341	341
R-squared	0.624	0.739	0.416	0.343
	Panel B: Claimed Actions			
	discussions	get info	improvements	investments
Training (T1)	-0.036	-0.008	-0.079	0.098**
	(0.097)	(0.080)	(0.102)	(0.046)
Observations	329	329	327	328
R-squared	0.202	0.197	0.420	0.291
	Panel C: Behavior			
	facilities	food handling	customer care	total
Training (T1)	0.022	0.029**	0.013	0.037*
	(0.022)	(0.014)	(0.019)	(0.019)
Observations	2,142	1,606	1,958	2,142
R-squared	0.179	0.240	0.365	0.248

Notes: The table reports the coefficients for the effects of the training program on all our outcomes (Awareness, Claimed Behaviour and Behaviour) restricting the sample to the treated vendors, therefore comparing vendors in T1 with vendors in T2 (similarly to specification (1)). In this case we also control for the amount of time elapsed since the vendor had their first workshop. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table A.8: Business information

	(1) Revenues	(2) Profits	(3) Expenditures	(4) Price
	Panel (A): Unique Treatment			
Training (T1 or T2)	20.1	-7.9	28.1	-0.6
	(105.7)	(20.5)	(92.7)	(1.0)
Observations	1,108	1,108	1,108	1,228
R-squared	0.266	0.148	0.264	0.420
Mean Dep. Var. (C)	1378	334	1044	16
	Panel (B): Separate Treatments			
Training (T1)	-25.5	6.1	-31.6	-2.1*
	(96.2)	(23.5)	(80.6)	(1.1)
Training w/Signal (T2)	56.3	-19.1	75.4	0.5
	(156.1)	(22.5)	(140.1)	(1.3)
Observations	1,108	1,108	1,108	1,228
R-squared	0.266	0.149	0.265	0.426
Mean Dep. Var. (C)	1378	334	1044	16

Notes: The table reports the coefficients for the effects of the training program on vendors' profits and revenues. We estimate a difference specification, based on observed profits/revenues at the baseline and at the endline surveys. Panel (A) reports the effects of belonging to any treatment group. Panel (B) shows the effects of the two treatment groups separately. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01

Table A.9: Awareness about food safety: IV

	(1) Food Hygiene	(2) Personal Hygiene	(3) Contamination	(4) Utensils
Training (T1 or T2)	0.103***	0.032**	0.099**	0.121***
	(0.035)	(0.016)	(0.047)	(0.041)
Observations	561	561	561	561
R-squared	0.576	0.781	0.413	0.302
Mean Dep. Var. (C)	0.580	0.746	0.694	0.767

Notes: The table reports the coefficients for the effects of the training program on vendors' *Awareness* using an IV approach. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated only for the endline sample. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

Table A.10: Claimed Behaviors: IV

	(1) Discussions	(2) Get info	(3) Improvements	(4) investments	(5) Discuss NA	(6) Info on NA	(7) Unions	(8) Meetings
Training (T1 or T2)	0.251***	0.162***	0.283***	0.035	0.148***	0.074**	0.002	0.111***
	(0.044)	(0.044)	(0.059)	(0.027)	(0.037)	(0.034)	(0.024)	(0.030)
Observations	518	519	517	517	518	516	517	518
R-squared	0.228	0.196	0.482	0.261	0.212	0.182	0.124	0.157
Mean Dep. Var. (C)	0.049	0.068	0.270	0.062	0.031	0.062	0.043	0.037

Notes: The table reports the coefficients for the effects of the training program on vendors' *Claimed Behavior* using an IV approach. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated only for the endline sample. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Table A.11: Observed Behavior: IV

	(1) Facilities Index	(2) Food handling Index	(3) Customer care Index	(4) Total Index
Training (T1 or T2)	0.011	-0.006	0.001	-0.001
	(0.017)	(0.016)	(0.021)	(0.015)
Observations	3,478	2,648	3,201	3,478
R-squared	0.190	0.209	0.357	0.247
Mean Dep. Var. (C)	0.447	0.694	0.689	0.581

Notes: The table reports the coefficients for the effects of the training program on vendors' *Observed Behavior* using an IV approach. All regressions control for vendors' age, gender, education level, a binary indicator for stall ownership, years vending, area of vending, a binary indicator for food cooked at the stall, and the type of food, and include interviewer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. These regressions are estimated using all the 6 survey rounds. $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

A.5 Additional results: Consumer survey

Table A.12: Consumer Survey: Summary Statistics by Block

	T1	T2	C
Panel (A): Consumer Demographics			
Male	0.52	0.54	0.52
Age	36.5	37.5	36.0
Income > 20,000	0.25	0.22	0.26
Complete School	0.70	0.65	0.68
Panel (B): Street Food Habits			
Frequent	0.64	0.66	0.66
Regular vendor	0.27	0.34	0.32
Been sick	0.45	0.42	0.45
Identify source	0.46	0.33	0.64
0.39	0.47		
Changed vendor	0.42	0.38	0.35
Panel (C): Important Factors			
Taste	0.94	0.96	0.96
Price	0.78	0.82	0.85
Location	0.48	0.52	0.53
Hygiene	0.71	0.77	0.77
Health	0.39	0.42	0.39
Relation with vendor	0.13	0.15	0.16
Hygiene most imp	0.36	0.36	0.40
Panel (D): Awareness and Habits			
Can detect contaminants	0.31	0.30	0.31
Checks food stall for			
Clean water	0.88	0.86	0.83
Clean dustbin	0.72	0.78	0.75
Vendor's hygiene	0.74	0.79	0.77
Clean cooking area	0.71	0.76	0.71
Disposable utensils	0.57	0.64	0.64
Certificates/Posters	0.05	0.04	0.04
Observations	404	554	506
Blocks	23	26	25

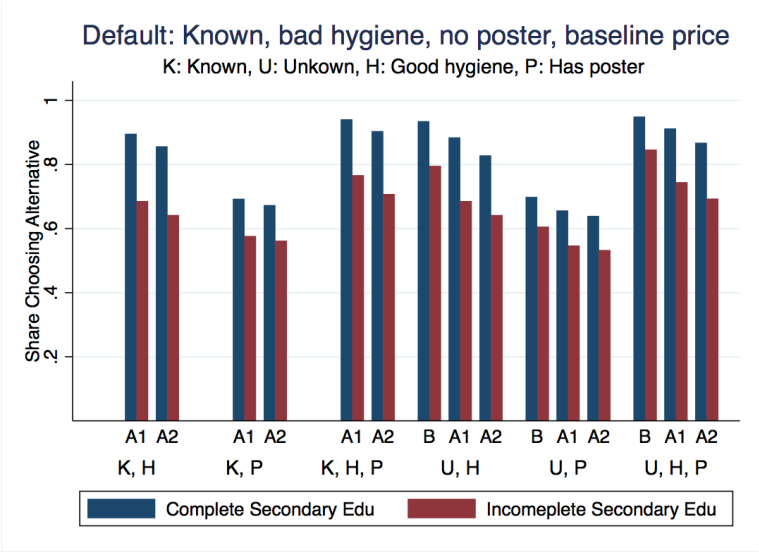
Notes: The table provides summary statistics of consumers by treatment status of the block.

A.5.1 Heterogeneity in Demand

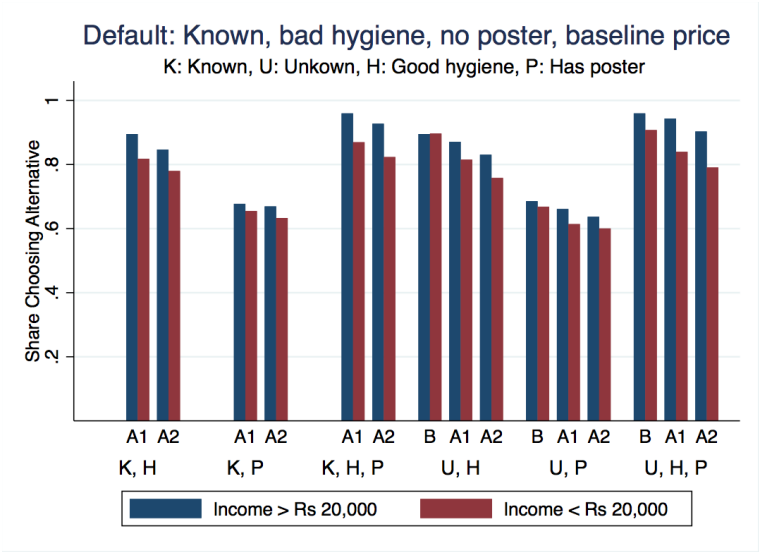
While Figure 3 in Section 6 provides an overall picture of consumer demand as a function of vendor characteristics, we now specifically examine differences in demand responses by a number of key consumer attributes. First, as shown in Figure A2-(A), consumers with higher education levels seem to exhibit a higher willingness to pay for safer food. This might be because education entails a higher income and therefore a higher ability to pay, or because education proxies of greater awareness

about food safety and health hazards. The following panels illustrate these ideas in turn. First, Panel (B) shows that willingness to pay for more hygienic food increases in income level, but the income elasticity is fairly modest. Panel (C) breaks down the sample into those who consider hygiene the most important factor in their decision to consume street food and those who do not, and depicts that consumers who value hygiene more are indeed more willing to pay for that attribute. Finally, according to Panel (D), consumers who believe they can detect whether food is contaminated are also consequently more likely to opt for food that appears safer, compared to those who report that they are unable to identify contaminants.

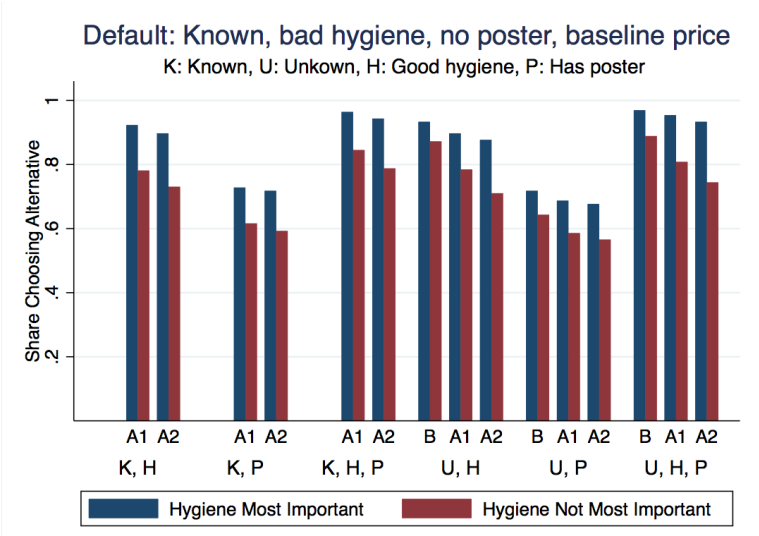
Figure A2: Heterogeneity in Demand



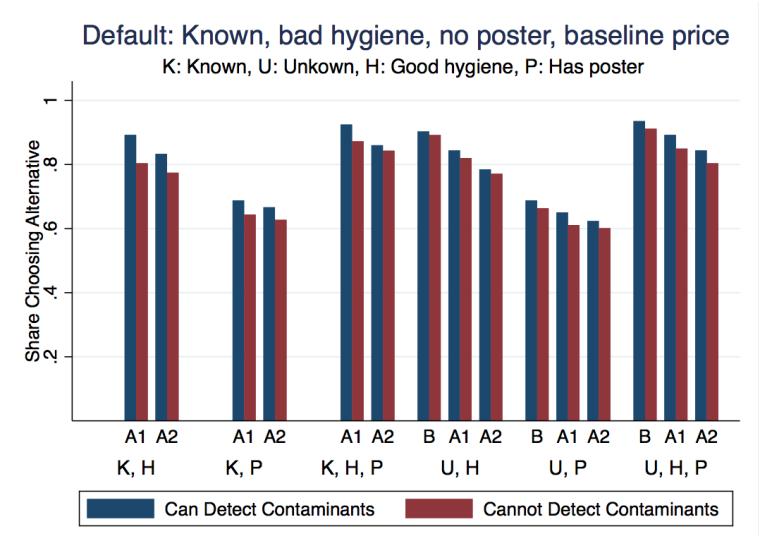
(A) Education Level



(B) Income Level



(C) Importance of Hygiene



(D) Ability to Detect Contaminants

Notes: This figure shows the proportions of consumers who report that they would choose the alternative option over the default vendor, for different combinations of characteristics. B, A1, and A2 refer to the baseline and 2 alternative prices (B<A1<A2). The default vendor is a known vendor who has bad hygiene and no poster. There are 6 kinds of alternative options: (i) a known vendor with good hygiene but no poster, (ii) a known vendor with bad hygiene but displaying a poster, (iii) a known vendor with good hygiene and a poster, (iv) an unknown vendor with good hygiene but no poster, (v) an unknown vendor with bad hygiene but displaying a poster, and (vi) an unknown vendor with good hygiene and a poster.

These patterns also hold when we examine demand separately by item. Figure A3 depicts the

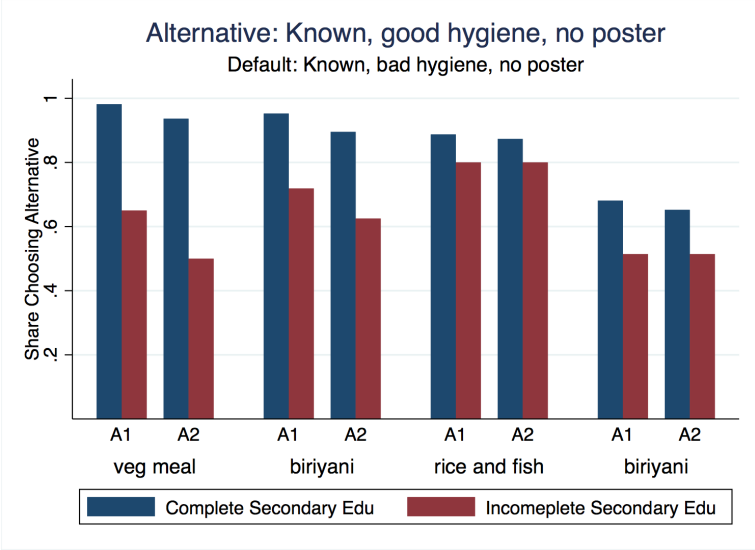
shares of consumers with and without secondary education who prefer the alternative option, by item, for each combination of attributes. Consumers seem to be more sensitive to a price increase when the baseline price is lower. For example, from Panels (A) and (E), we see that the shares of customers who are willing to go for the pricier alternative for the same item, chicken biriyani, are higher when the item is priced at Rs 80 by default rather than when the baseline price is Rs 40, such that a difference of Rs 10 amounts to only half the percentage increase in price. The specific item under consideration also seems to matter. For instance, item 3 (rice and fish) and item 4 (chicken chowmein) had the same price schemes, but consumers are often more willing to pay for the safer option in the context of rice and fish. This may be because of a common perception that fish spoils more easily and needs to cooked and maintained under the right conditions, relative to chicken. Finally, it is also interesting to note that the demand curve is in most cases flatter for the more educated consumers, while demand seems to taper off more quickly with a price increase for the less educated consumers.

A.5.2 Conditional Logit Estimation

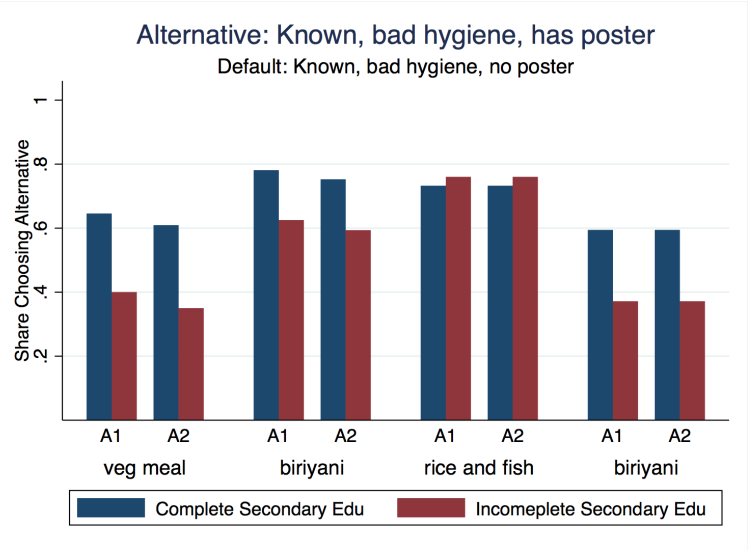
Following standard choice experiment setups, we model consumers' preferences with conditional logit models, which allow for multiple observations being obtained from the same individuals (World Health Organization 2012).[58] The dependent variable in this case is a dummy equaling 1 for the preferred choice within each pair of alternatives. Table A.13 reports the estimated coefficients for the four different items. At the bottom of each column, we report the willingness to pay, i.e. the ratio of the hygiene coefficient to the negative of the price, which measures how much consumers would be willing to pay to switch to a more hygienic option. The sign of the coefficients are intuitive: price is always negative, while hygiene and knowing the vendor are always positive and significant. In line with our discussion earlier, the poster/certificate coefficients are positive but smaller, and mostly not statistically significant. The estimated willingness to pay for hygiene varies from 1.9 to 9 rupees. Finally, in Table A.14, we interact the hygiene indicator with the four variables used to analyze heterogeneity in our sample in Figure 3. This yields similar findings, i.e. a higher willingness to pay for hygiene from those with high education or income, high ability to detect contaminated food and high preferences for hygiene.

[58] The larger sample size in this case is explained by the analysis being based on the pairs of default and alternative options, instead of the set of alternative options only.

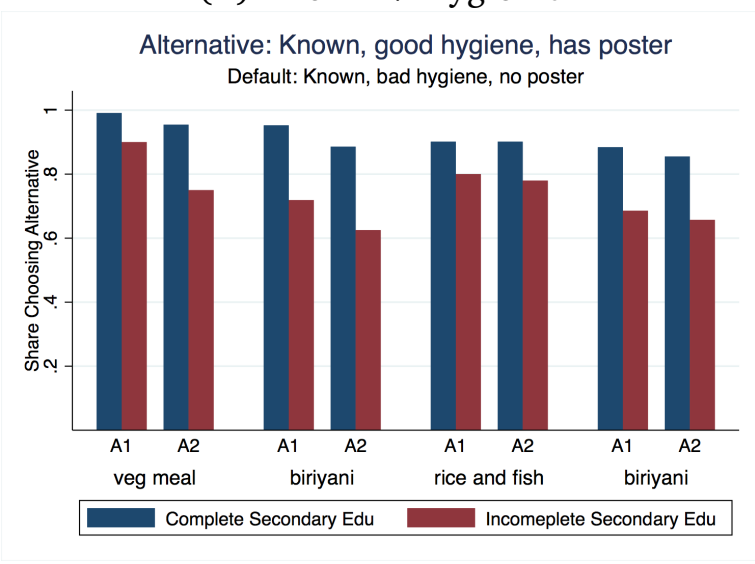
Figure A3: Heterogeneity in Demand by Education



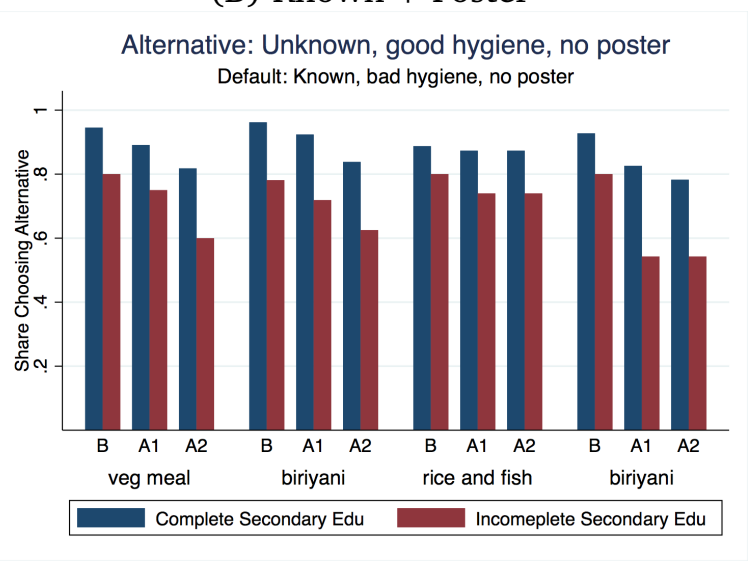
(A) Known + Hygienic



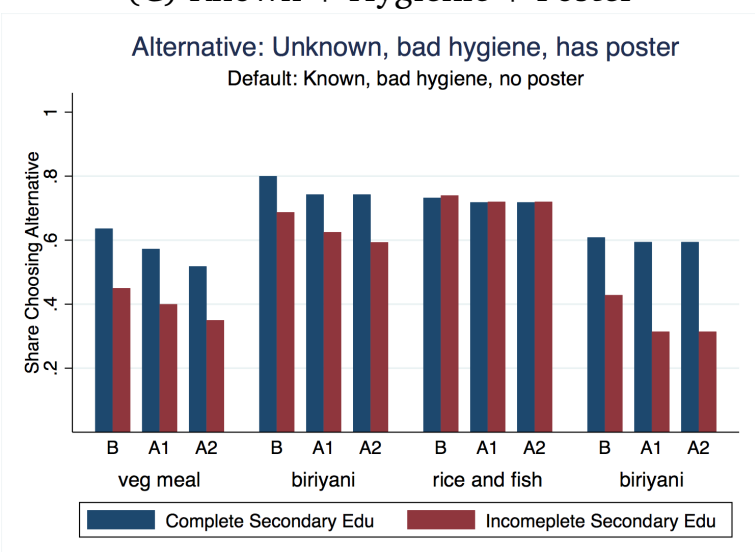
(B) Known + Poster



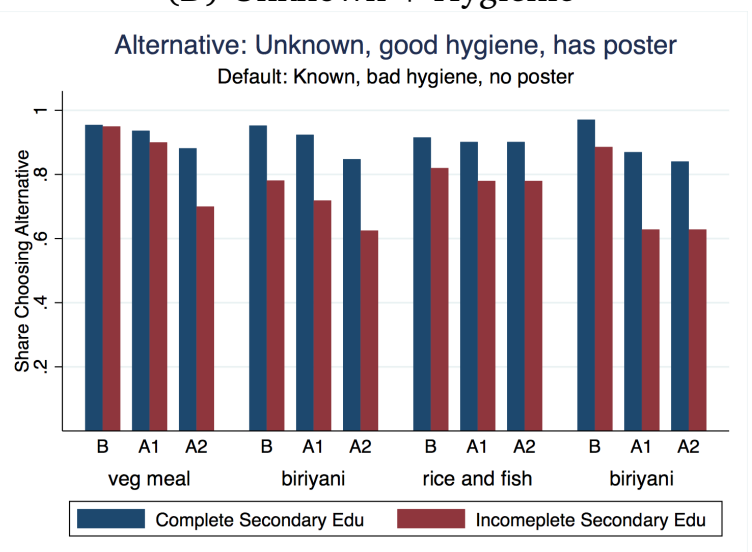
(C) Known + Hygienic + Poster



(D) Unknown + Hygienic



(E) Unknown + Poster



(F) Unknown + Hygienic + Poster

Notes: This figure shows the proportions of consumers who report that they would choose the alternative option over the default vendor, for each of the four items, by different levels of education. B, A1, and A2 refer to the baseline and 2 alternative prices (B<A1<A2). The default vendor is a known vendor who has bad hygiene and no poster. There are 6 kinds of alternative options: (i) a known vendor with good hygiene but no poster, (ii) a known vendor with bad hygiene but displaying a poster, (iii) a known vendor with good hygiene and a poster, (iv) an unknown vendor with good hygiene but no poster, (v) an unknown vendor with bad hygiene but displaying a poster, and (vi) an unknown vendor with good hygiene and a poster.

Table A.13: Conditional Logit: willingness to pay

	(1) Item 1	(2) Item 2	(3) Item 3	(4) Item 4	(5) Full Sample
Price	-0.293***	-0.344***	-0.187***	-0.677***	-0.360***
	(0.0613)	(0.0559)	(0.0562)	(0.0592)	(0.0279)
Known	0.787***	0.587***	0.699***	0.216**	0.615***
	(0.124)	(0.112)	(0.116)	(0.110)	(0.0558)
Hygiene	2.627***	0.918***	0.780***	1.085***	1.307***
	(0.156)	(0.127)	(0.131)	(0.130)	(0.0652)
Poster	0.958***	0.0853	0.140	0.174	0.298***
	(0.159)	(0.135)	(0.137)	(0.132)	(0.0680)
Willingness To Pay	8.968***	2.664***	4.167***	1.602***	3.631***
	(1.601)	(0.396)	(1.050)	(0.165)	(0.233)
Observations	4,520	5,206	4,598	3,952	18,276

Notes: The table reports the estimates of conditional logit models for different alternative options, by different attributes of the options – price, whether the vendor is known, whether the vendor is hygienic, and whether the vendor displays a poster. At the bottom of each column, we report the willingness to pay, i.e. the ratio of the hygiene coefficient to the negative of the price. All regressions include consumer fixed effects. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.

Table A.14: Conditional Logit: heterogeneity

	(1)	(2)	(3)	(4)
Hygiene	0.528***	0.938***	0.942***	1.200***
	(0.0791)	(0.0853)	(0.0688)	(0.0709)
Hygiene*High Education	1.245***			
	(0.0828)			
Hygiene*High Income		0.536***		
		(0.0847)		
Hygiene*Most Import			1.237***	
			(0.100)	
Hygiene*Detect				0.303***
				(0.0854)
Observations	18,276	18,276	18,276	18,276

Notes: The table reports the estimates of conditional logit models for different alternative options, by different attributes of the options – price, whether the vendor is known, whether the vendor is hygienic, and whether the vendor displays a poster. The four set of dummies take value 1 for: i) individuals completing secondary education (High Education); ii) individuals with an income above Rs 20,000 (High Income); iii) individuals declaring hygiene is the most important when buying street-food; iv) individuals declaring being able to detect contaminated food. All regressions include consumer fixed effects and control for price, knowing the vendor and displaying a poster/certificate. Robust standard errors, clustered at the block level, are in parentheses. *p < 0.10, **p < 0.05, ***p < 0.01.