Proactively asking about allergens: Discussion

In this in-business cluster randomised trial, we found that FBO staff proactively asking customers about their food hypersensitivities improved customers' confidence that they can identify ingredients in their order and their comfort in asking about allergens. On a five-item Likert-scale response variable, almost 83.2% in the treatment group were either 'very' or 'somewhat' confident they could identify ingredients, compared to 77.2% in the control group (? = 0.26, $p < 0.01$). The proportion who were 'very' comfortable asking about ingredients increased from 50.8% to a 69.5% (? = 0.36, $p < 0.001$). In addition, the intervention had a pronounced positive effect on the odds of declaring one's (self-reported) allergy or intolerance ($OR = 8.58$, $p < 0.001$). This effect was large: to put its magnitude in perspective, its observed effect was similar to the impact of having a hypersensitivity on declaration ($OR = 9.19$, $p < 0.001$). However, we did not observe an effect of the intervention on customer perceptions of food safety at the food business, with a majority (65.3%) being 'very' or 'fairly' unconcerned about the quality of food that is sold in the FBO, compared to 68.1% in the control (? = -0.02, $p = 0.920$).

It is perhaps unsurprising that proactively asking consumers about allergens would increase their confidence that they can identify product ingredients, their comfort in asking, and the likelihood of reporting that they declared an allergy or intolerance. Our finding that proactively asking increased confidence is also consistent with the numerical direction of results in the feasibility study that preceded this trial (McPhedran et al., 2021). However, the feasibility study also had numerical effects in the direction of increasing perception of food safety, whereas we did not find a difference between groups.
This null result on food safety may be a result of allergen information's relatively weak influence on perceptions of food safety, compared to other factors. Previous research suggests that the most important determinant of the perception of food safety in restaurants is the cleanliness of the kitchen and, after that, chemical issues such as pesticides (Kidd, 2000; Brewer and Prestat, 2002; Henson et al., 2006; Lee et al., 2012). Admittedly, some of these surveys did not include questions about allergens, but at least one study did and found that they were less influential on perceptions of food safety than food hygiene and chemicals (Brewer and Prestat, 2002). Alternatively, it may be possible that this null effect was the result of a selection bias, since the sample in this trial only included customers who had decided to visit and order from this particular restaurant, and were presumably less concerned about food safety there. Previous research has found that consumers tend to eat at restaurants where they trust the food (Lee et al., 2012).

Our findings do not suggest the intervention had a greater impact on the perceptions of confidence, comfort or safety of people with allergies or hypersensitivities: sensitivity analyses with an interaction term found null effects of the interaction. Given the greater importance of allergen and ingredient information for these customers, we might have expected to see a greater effect among this subgroup. However, our sample of customers who reported having an allergy or food intolerance was low (n = 89, or 16.8%, in the per-protocol analysis) and we were not powered to detect this effect. In general, it should be noted that the underlying motivation for allergens prompts in FBOs is to improve confidence of consumers with food hypersensitivities; nevertheless, our participants were not restricted to this group. Unfortunately, it might be impractical to run a sufficiently large trial to be powered to detect effects solely amongst those with food hypersensitivities.
The intervention additionally improved key customer satisfaction metrics: customer satisfaction (?

= 0.33, p < 0.01) and trust in the FBO (? = 0.33, *p* < 0.001). Businesses are not currently mandated to ask consumers about the food hypersensitivities proactively (Food Standards Agency, 2022), and while some do so already, others do not (Smeaton and IFF Research, 2013). However, our research suggests that the intervention would be beneficial to business as well as customers, which is a win-win situation; on this basis, businesses should strongly consider implementing such an approach.

We did not find any effect of our intervention in intention-to-treat models, likely because intervention fidelity was poor. Overall, in the treatment arm, only 39.0% of participants said they were asked whether they had a food allergy or intolerance, compared to 30.5% in the control arm (which was business as usual, so staff were not dissuaded from asking about allergens). Given this low level of compliance, if businesses wish to implement the intervention, then further research on measures to support employees' implementation would be beneficial. In this trial, we provided a briefing document and had a call with managers. However, additional protocols for managers on how to implement this via their staff—and materials to support managers having conversations with their staff—would likely have improved fidelity. Fidelity in the treatment arm showed a wide variation between branches, ranging from 20.8% to 75.9%. This result is consistent with there being a strong influence of the branch manager or with the idea that there are network effects in implementing food safety (Verwaart and Valeeva, 2011; Abdirahman et al., 2018). It is plausible that the behaviour of staff within the branch influences that of the other staff. Other research has found that food safety culture depends on norms, practices, and standards (Bolanos, 2020); this is often discussed in the context of the whole organisation, but similar points could be made about the importance of culture of individual branches or units within a larger organisation.

In addition to investigating how to improve implementation and to investigating effects on those with food hypersensitivities, another interesting extension to this trial would be an examination of the effect of the intervention on children and their carers. Our sample was restricted to people who were 16 or over (entering a younger age led to the survey immediately ending). However, the fastest increase in hospital admissions for food anaphylaxis is in children under 15 years. From 1998 to 2018 their hospital admissions increased from 2.1 to 9.2 admissions per 100 000 population, an annual increase of 6.6% (Baseggio Conrado et al., 2021). Therefore, this is an important group to address.

The key limitation in the design of the trial is possible bias due to low coverage, self-selection of customers into the survey and due to any differential (biased or non-random) attrition of customers during the survey. We ran the trial in a national FBO, in branches both inside and outside London. Nevertheless, all branches were in cities and, of course, the type of people who go to a particular FBO is not random. In particular, the sample tended to be quite young, the modal age group being between 16 and 25. This sample composition is consistent with a national UK survey's finding that the group that eats out most often is 19-29 year olds (41.0% eat out 1-2 a week or more) (Adams et al., 2015). However, the survey found that all age groups tended to eat out regularly: 25.7% of 50-59 year olds ate out 1-2 times a week or more, whereas only 4.5% of our trial sample was over 50 years old. It is likely that the demographic of the trial's FBO is different from the demographics of the population of people who eat out, but it is also possible that young people were more likely to self-select into a survey with a prize draw. We do not know the footfall in the branches during the trial, so we do not know the percentage of customers who responded to the survey (and therefore the ultimate extent of selection bias). We also note that attrition was higher in the treatment branch than in the control; we have no explanation for this.

The trial is further limited by the small sample of respondents with (self-declared) allergies and intolerances, which meant we were not powered to detect any impacts within this group. However, we had covariates indicating self-reported food hypersensitivities in our models and none of them were statistically significant; we did not find any evidence that those with food hypersensitivities gave different answers from those without. We also note that we did not

measure severity of reported allergies and intolerances, which could contribute to a selection bias. It is possible that those with the most severe, life-threatening allergies are less likely to eat out due to safety concerns, so the sample may only represent those with milder conditions.

Another limitation of this trial is that it was only conducted in one FBO: as such, we cannot be sure that the results generalise to other types of food business. Specifically, in this trial, we partnered with a national FBO; in the feasibility study we partnered with an international FBO. Future research should seek to run a similar trial in small, independent FBOs, which may be less likely to have a policy on asking about allergens. The FSA has previously found that larger FBOs are more likely to give staff formal allergen management training (FSA, 2021). Additionally, anecdotally, during recruitment we found that many chains are already implementing a policy of asking proactively about food hypersensitivities.

At the outset of this trial, we planned to recruit a selection of different types of FBO. Recruitment was not successful primarily due to general pressures on FBOs and FBO staff in the current economic environment, but also many of the chains that we approached had already implemented a policy. Because of difficulties in recruitment, we had fewer branches in each arm than we had planned for, but this did not have a detrimental impact on our ability to detect treatment effects, because our pre-trial power calculations conservatively assumed an intraclass correlation coefficient of ? = 0.03, whereas—as in the feasibility study—our ICC was lower, at ? = 0.01 for comfort and perceptions of food safety, while for confidence in identifying ingredients a fixed effect models (without the clusters) had the best fit. This means that the behaviour of consumers within specific branches was variable, suggesting little branch-specific dependence in terms of the chosen outcomes, which implies that we were more highly powered than the power calculations would suggest.

Future research should seek to investigate whether this trial's intervention is effective in other types of business and for other types of consumers, in particular among those with allergies and/or hypersensitivities. However, given its effectiveness in this population (and in the preceding feasibility study); the low chance of adverse effects; and the positive observed effects on a range of consumer outcomes, implementation of the intervention, with iterative intervention optimisation and fidelity support measures is recommended.