

Introduction

Meal-kit subscription boxes enable consumers to receive pre-measured ingredients delivered straight to the front door. The meal-kit includes a step-by-step recipe card for the consumer to prepare a specific meal within the domestic kitchen^{1,2}.

The trend of home cooking, and opting for meal-kit services, is expected to continue beyond the pandemic^{3,4}. Given the association of the domestic kitchen with the sporadic incidence of foodborne illness⁵, this current consumer trend presents unique food-safety challenges, offering distinctive opportunities to inform and enable consumers to implement recommended food-safety practices to reduce the risk of foodborne illness associated with food prepared in the home. The food-safety practices evaluated in this study are all essential aspects of food preparation as it helps to eliminate and reduce the spread of harmful bacteria and lower the risk of foodborne illness⁶.

Data suggests that the inclusion of food-safety information in recipes improves consumer food-safety practices⁷. Consequently, there is a need to review and evaluate recipe cards provided in meal-kit subscription boxes to determine the inclusion of food-safety information.

Methodology

- Ethical approval was obtained from the Health Care and Food Ethics Committee at Cardiff Metropolitan University (Ethics Approval Reference Number PGR-5421).
- Members of the public, from the UK, were invited via social media platforms to share images of meal-kit recipe cards from the last 12 months via email and picture messaging.
- Images and physical copies of recipe cards ($n=555$) from ten meal-kit providers were obtained, these included carnivore, pescatarian, vegetarian, and vegan recipe cards ($n=174$). For this pilot study, recipe cards ($n=18$) were selected from eight providers.
- An online Qualtrics database was developed using the Partnership for Food Safety Educations (PFSE) 'Safe Recipe Style Guide'⁸ to enable a content analysis of recipe cards according to the four predefined categories, 'Temperature', 'Cross-Contamination', 'Produce' and 'Hand Washing'.
- The PFSE 'Safe Recipe Style Guide' was useful in establishing the key practices that should be included in a printed recipe. However, one critical food-safety practice – refrigeration – was not referred to. The database took this into consideration and was amended to include this important practice during evaluation.



Figure 1. The Partnership for Food Safety Educations 'Safe Recipe Style Guide'⁸.

Results

Produce

Of the recipe cards that involved an element of produce that was to be consumed raw (e.g., salad or herbs) ($n=13$):

- 84% referred to washing fruit and vegetables but only 53% of recipe cards referred to washing herbs.
- 30% of guidance for washing produce was cited on the front of the recipe card (opposite side of the recipe instructions).
- 53% of guidance for washing produce was in a separate section (adjacent to the recipe instructions) (as illustrated in Fig. 2).
- Only one recipe card stated to wash produce within the recipe instructions (see Fig. 3).

Hand Washing

For the recipes that included the preparation of raw meat, poultry and/or fish ($n=14$):

- 40% referred to handwashing during recipe preparation and stated to "wash hands" with no further advice regarding the process.
- When referred to, 40% of handwashing guidance was provided adjacent to the recipe instructions and 13% was provided within the recipe instructions (see Fig. 4).
- No recipe card mentioned the application of soap, duration, or hand drying.

Chilling

Of the meal-kits that provided consumers with ingredients that required chilled storage ($n=14$):

- Only 50% of recipe cards referred to storing ingredients in the fridge.
- Only one recipe card referred to the recommended temperature ($\leq 5^{\circ}\text{C}$).

Cross-Contamination

Of the recipe cards that referred to the preparation of raw meat, poultry and/or fish ($n=14$):

- 36% of recipes referred to not washing raw meat but none stated 'why' it should not be washed.
- Although 43% of recipes referred to washing equipment in-between uses or using different chopping boards and utensils, only one recipe card specifically referred to washing equipment after handling raw meat (see Fig. 4).
- 57% of recipes provided no cross-contamination advice after handling high-risk ingredients.

Temperature

Within the recipes that required the cooking of raw meat, poultry and/or fish ($n=14$):

- 93% of recipes refer to cooking duration in minutes only.
- All cooking adequacy advice was provided within the recipe instructions (see Fig. 5).
- The advice on cooking adequacy referred to changes in sensory characteristics including "until no longer pink in the middle", "until golden/browned" and "until opaque".
- Only one recipe card referred to using a temperature probe and gave a correct endpoint temperature (see Fig. 5).

Examples of food safety guidance in reviewed meal-kit recipe cards

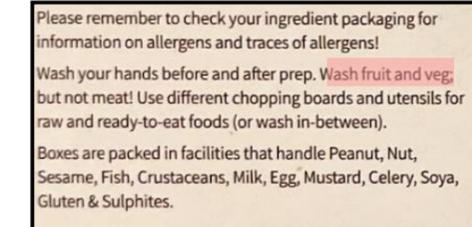


Figure 2. Highlighted advice relating to washing produce adjacent to the recipe instructions.

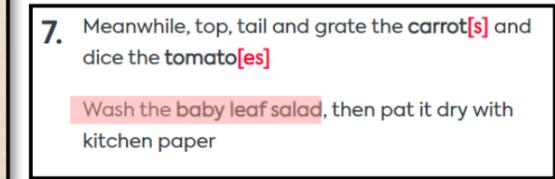


Figure 3. Highlighted advice relating to washing produce included within the recipe instructions.

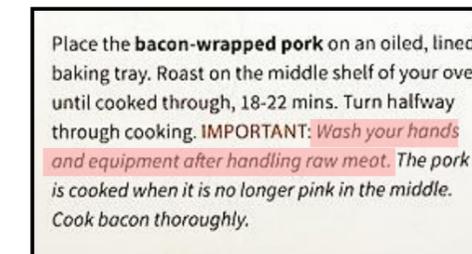


Figure 4. Highlighted handwashing advice that was found within recipe instructions.

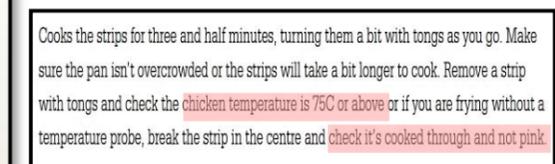


Figure 5. Highlighted cooking adequacy advice related to temperature and sensory characteristics ("not pink").

Conclusions

- This pilot study has addressed a research gap detailing the inclusion of food-safety information in meal-kit recipe cards.
- Although all recipes provided some form of food-safety practice, none of the recipes expanded upon why this information was relevant or important for the consumer to reduce the risk of foodborne illness.
- Future observational research is required to establish if the inclusion of food-safety information in meal-kit subscription box recipe cards has an impact on the food-safety behaviours of consumers in the domestic kitchen.

Literature cited

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Further information

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