

Meal Kits and Food Safety in the UK: A Closer Look

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Introduction

Meal-kits have grown in popularity over the last decade, promoting a healthier, less wasteful and more convenient alternative. After meal kit delivery to consumer homes, step-by-step recipe cards and ingredients are provided for domestic meal preparation (see **Figure 1**)¹⁻³.

Given the association of the domestic kitchen with the sporadic incidence of foodborne illness⁴, this current consumer trend may present unique food-safety challenges, offering distinctive opportunities to inform and enable consumers to implement important food-safety practices to reduce the risk of foodborne illness associated with food prepared in the home.

Research suggests that the inclusion of food-safety information in recipes may improve consumer food-safety practices⁵. However, little is currently known regarding providing, understanding and using food-safety information in meal-kit recipe cards.



Figure 1. Example of meal-kit recipe box contents and recipe card

Purpose

To review recipe cards of UK-based meal-kit providers to determine the inclusion of food-safety information.

Methods

- 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.
- An online database was developed using the Partnership for food-safety Education (PFSE) 'Safe Recipe Style Guide' framework to enable a content analysis of recipe cards (see **Figure 2**)⁶.
- A pilot study was carried out using recipe cards ($n=18$) to assess the reliability and validity of the electronic database tool for data collection.
- Ethical approval was obtained from the Cardiff School of Health and Sport Sciences (Ethics Approval Reference Number PGR-5421).

'Safe Recipe Style Guide'

The Partnership for food-safety Education (PFSE) produced a 'Safe Recipe Style Guide' with food-safety experts and recipe writers to improve the incorporation of food-safety communication in recipes with practices highlighted relating to temperature, handwashing, cross-contamination and produce^{6,7} (see **Figure 2**.)

Recommended food-safety practices aid in reducing the risk of foodborne illness by helping to eliminate the spread, slow the growth, and avoid the consumption of harmful bacteria⁸⁻¹⁰.

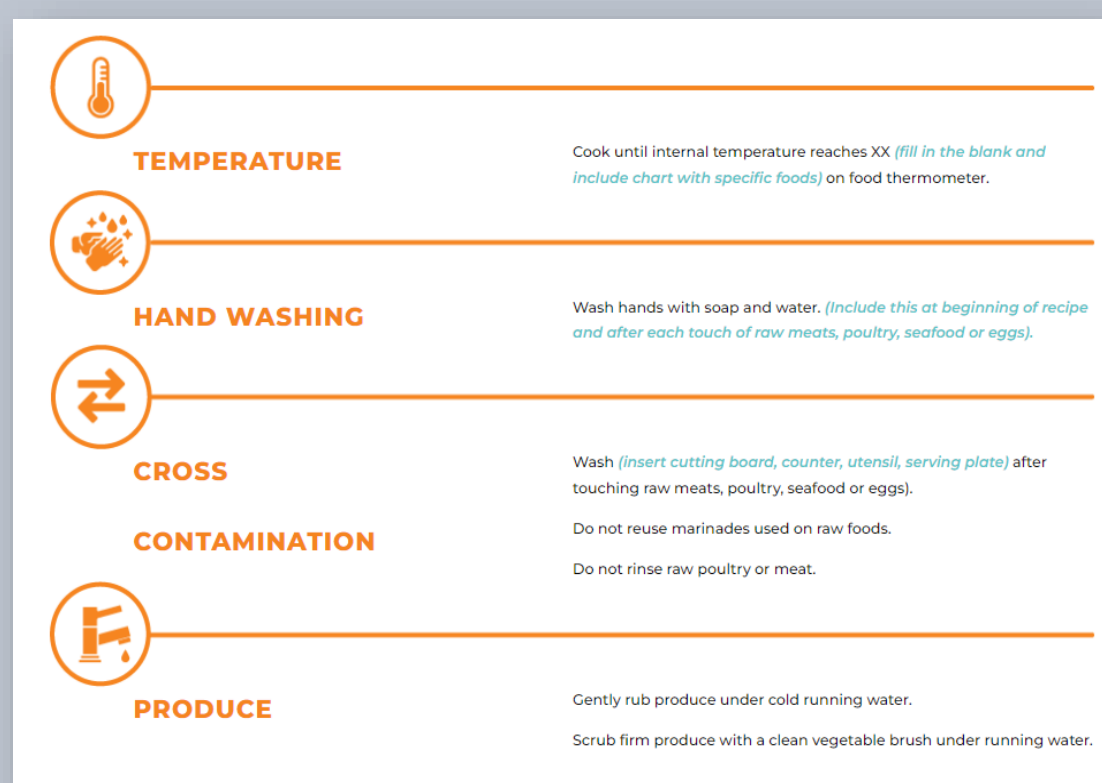


Figure 2. The 'Safe Recipe Style Guide' can be used by cookbook writers or others to incorporate food-safety messages into recipes either in cookbooks, blogs, magazines or newspaper recipes⁶.

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Results

Images and physical copies of recipe cards ($n=689$) from ten meal-kit providers were obtained through citizen science methods. After the pilot study, RTH, vegetarian, and vegan recipes ($n=221$) were excluded from the final analysis, along with duplicates ($n=64$), older formats ($n=5$) and illegible cards ($n=26$). Post-pilot amendments were made to the database tool to capture chilled storage 'refrigeration' information. Overall, content analysis was performed on UK meal-kit provider recipes ($n=359$) from eight providers.

Temperature

- Statements on the recipe cards regarding the cooking adequacy of high-risk foods ($n=1306$) included subjective cooking indicators with 35% relating to the visual assessment of colour (see **Figure 3**) and 26% referring to cooking duration.
- There was one best practice statement for using a meat thermometer to determine cooking adequacy.
- There were two recommendations for cooking to an internal temperature of 75°C. One provider subsequently expanded 'why' this practice is important (see **Figure 4**).

b) **IMPORTANT:** The chicken is cooked when no longer pink in the middle.

Figure 3. Subjective indicator of doneness found on recipe cards

The FSA recommend cooking burgers thoroughly to well done. Burgers served under may contain harmful bacteria that could cause food poisoning.

Figure 4. One provider gave advice on end-point temperature and further discussed the reasons why the practice is important.

Refrigeration

- Of the applicable recipes ($n=332$), 50% referred to storing ingredients in the fridge, but only one recipe referred to recommended temperatures ($\leq 5^{\circ}\text{C}$) (see **Figure 5**).
- Most refrigeration storage advice (47%) was found on the back of the recipe card, adjacent to the recipe instructions (see **Figure 6**).

Storage: Keep refrigerated below 5°C.

Figure 5. Best practice example of refrigerated storage advice. Observed on only one recipe card.

***Not Included **Store in the Fridge**

Figure 6. The more commonly observed refrigeration advice related to storing in the refrigerator but without recommended temperatures stated.

Hand Hygiene

- Although 46% of recipes referred to handwashing at the start of recipe preparation, these stated 'wash hands' with no further advice regarding hand hygiene such as the use of soap or drying.
- 48% of recipe cards did not refer to handwashing during recipe preparation.
- When statements regarding handwashing were included, the information was located within the recipes' cooking instructions ($n=109$) or in a separate section adjacent to the recipe ($n=162$).
- When the handwashing statement was located within the recipe instructions ($n=104$), it was highlighted with an 'important' disclaimer with different text formatting distinguishing it from the rest of the recipe instructions (see **Figure 7**).

pieces to the bowl and toss to coat completely in the cornflour. **IMPORTANT: Wash your hands after handling raw chicken.**

Figure 7. Handwashing advice observed within the recipe instructions

Cross-Contamination

- When applicable ($n=346$), cross-contamination prevention advice was present in 51% of recipes.
- The most frequently included advice (47%) was 'wash equipment in-between uses' (see **Figure 8**).
- There was no advice to reduce the risk of cross-contamination after handling ingredients such as raw meat and poultry in 49% of recipe cards.
- Advice relating to 'not washing meat' was included in 36% of recipe cards, with this advice being found in a separate section adjacent to the recipe instructions. However, there was no further advice on 'why' this practice is important.

Use separate equipment to handle raw and cooked meat (or wash between uses). Missing or replaced ingredients, as well as any recipe step changes, will be communicated where possible via email.

Figure 8. Advice related to the prevention of cross-contamination

Produce

- Fruit, vegetables, and herbs were included in nearly all the recipe cards (99%).
- Most recipes (88%) referred to washing fruit and vegetables but were not observed as frequently for herbs (51%) (see **Figure 9**).
- The consumption of a raw element such as a salad, herb or produce garnish was observed in 248 recipes, of which 11% made no reference to washing produce.

Remember to wash your fresh fruit, herbs and vegetables! See your delivery email for use-by dates and other details.

Figure 9. Example of guidance for washing fruit, vegetables and herbs.

Safe Recipe Style Guide	Table 1. Cumulative total of food-safety practices as recorded from meal-kit provider recipe cards		
	Food-safety Practice	All recipe cards ($n=359$)	Meal-Kit providers ($n=8$): Recipes Cards
Refrigeration	Refrigerated storage	50%	43%
	Handwashing (Start)	46%	38%
Handwashing	Handwashing (During)	48%	50%
	Produce (Washing)	88%	75%
Cross-Contamination	Cross-Contamination (Clean and/or separate)	51%	50%
	Cross-Contamination (Do not wash meat)	36%	25%
Temperature	Temperature (Thermometer and/or end-point temperature)	<1%	13%
	Temperature (Subjective Indicators)	>99%	100%

Significance of study

- All meal-kit providers provided some form of food-safety-related information in reviewed recipes. However, the information was often not deemed sufficient to enable consumers to ensure food-safety in the domestic setting.
- There is a need to understand how consumers engage with such food safety information.
- Observational research is required to understand the optimum positioning and messaging of communicated food-safety advice on recipe cards.