

Meal-Kits in the United Kingdom: A Recipe for Food-Safety?

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Introduction

Meal-kits have grown in popularity over the last decade, promoting a healthier, less wasteful and more convenient alternative. Subsequent to 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 the provision, understanding and use of food-safety information in meal-kit recipe cards and on meal-kit providers' websites.



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

Purpose

This study aimed to review recipe cards and websites 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.
- Market research identified thirteen meal-kit provider websites for content analysis to determine the provision of food-safety information through Qualitative analysis.
- An online database was developed using a framework from the Partnership for food-safety Education (PFSE) 'Safe Recipe Style Guide' to enable a content analysis of recipe cards and websites (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.

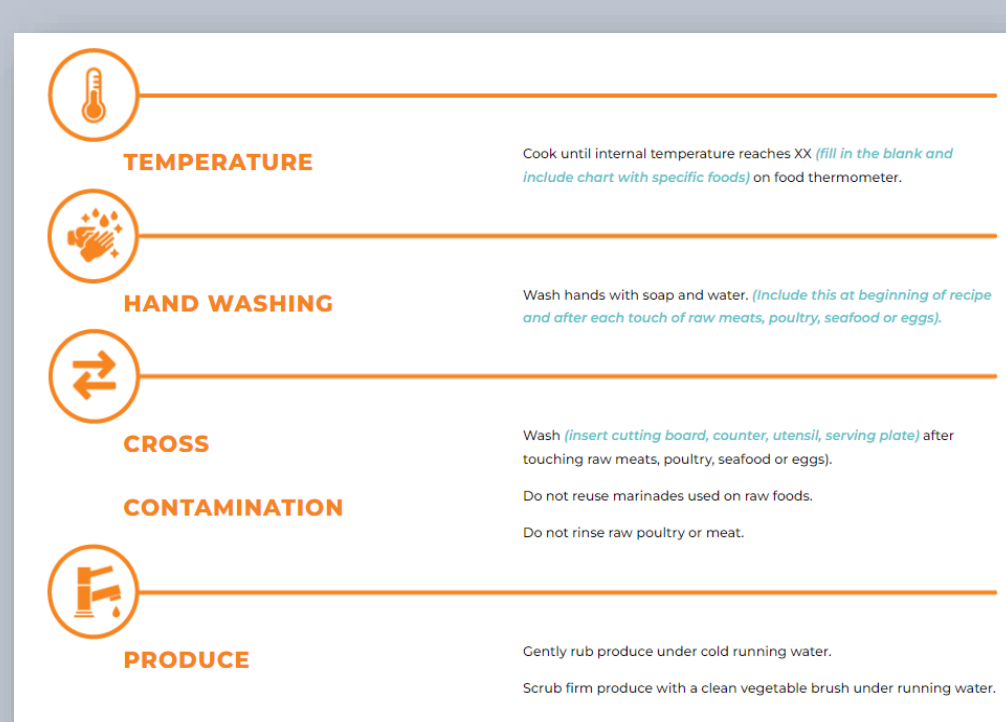


Figure 2. The 'Safe Recipe Style Guide' can be used by cookbook writers or others to incorporate food-safety messages into recipes either in cookbooks, blogs, magazines or newspaper recipes⁶.

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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 information related to chilled storage 'refrigeration'. Overall, content analysis was performed on UK meal-kit provider recipes ($n=359$) from eight providers and inclusion/exclusion criteria determined seven meal-kit provider websites were applicable for the website review.

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. The provider subsequently expanded 'why' this practice is important (see **Figure 4**).

Figure 3. Subjective indicator of doneness found on recipe cards

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 (0.3%) referred to recommended temperatures ($\leq 5^{\circ}\text{C}$) (see **Figure 5**).
- Most of the 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.

Handwashing

- 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**).

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.

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.

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

Website Review

Meal-kit providers' websites were assessed for food-safety information relating to 'refrigeration', 'temperature', 'produce', 'handwashing', and 'cross-contamination' (see **Table 1**). Occasionally, some food-safety advice could be found either in an FAQ ($n=4$) or through a 'Help' section ($n=3$) with some meal-kit providers ($n=3$) offering more descriptive detail on dedicated blog posts ($n=3$).

'Safe Recipe Style Guide'	Food-safety Practice	All recipe cards ($n=359$)	Meal-Kit providers ($n=8$): Recipes Cards	Meal-Kit providers ($n=7$): Websites
Refrigeration	Refrigerated storage	50%	43%	83%
	Handwashing (Start)	46%	38%	0%
Handwashing	Handwashing (During)	48%	50%	29%
	Produce (Washing)	88%	75%	43%
Cross-Contamination	Cross-Contamination (Clean and/or separate)	51%	50%	29%
	Cross-Contamination (Do not wash meat)	36%	25%	14%
Temperature	Temperature (Thermometer and/or end-point temperature)	<1%	13%	43%
	Temperature (Subjective Indicators)	>99%	100%	100%

Significance of study

- Although all meal-kit providers provided some form of food-safety-related information in reviewed recipes, 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 information with further exploration required through observational research to understand the optimum positioning and messaging of communicated food-safety advice on recipe cards.
- Occasionally, some form of food-safety advice could be found on the meal-kit providers' websites but was also found to be insufficient. It is currently unclear if consumers engage with the websites for the purpose of seeking out food-safety information. There is an opportunity to explore how consumers engage with such information through Qualitative Consumer research to determine consumer engagement with the websites.