

# Observation of hand hygiene behaviour during production at a sandwich-making factory.

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## Introduction

Transmission of pathogens to food remains a significant concern to public health<sup>1</sup>. Inadequate hand hygiene by foodhandlers has been often cited as a contributory factor to the transmission of foodborne diseases<sup>2</sup>. Thus, there is a need to have a clear understanding of foodhandler behavioural practices within the food manufacturing industry<sup>3</sup>, particularly during production.

Unlike cognitive data which is subject to biases and does not equate to behaviour, covert observation method can provide comprehensive data detailing the actual food safety practices of foodhandlers<sup>4</sup>.

Although a few studies have conducted covert observation to assess foodhandler hand hygiene behaviour prior to entering production areas in manufacturing environments, research to observe foodhandlers' compliance with hand hygiene protocols during production, to date, have not been undertaken.

## Purpose

The purpose of this study is to assess foodhandlers' hand hygiene compliance during production at a sandwich-making factory using covert observation.

## Methods

**Observation setting:** Hand hygiene practices of foodhandlers ( $n=12$ ) working in a production area at a UK-based sandwich-making factory were observed utilizing pre-recorded footage captured using closed-circuit television (CCTV) cameras over the course of two production shifts from one working day ( $n=16h$ ).

**Observation checklist:** A Qualtrics database was used to design an observation checklist based upon the company's hand hygiene protocol. The adapted tool for this study was previously used in ZERO2FIVE Food Industry Centre research<sup>5,6</sup>.

**Data entry and analysis:** All entered data were checked against any missing data. Inter- and intra-operator reliability testing was undertaken on footage capture from each hour. All values ( $\alpha \geq 0.80$ ) suggested the obtained data are highly reliable<sup>7</sup>. Furthermore, SPSS Statistics package 28 was used to obtain frequencies of the variables as well as determine significant differences in the implementation of handwashing when entering and exiting the production area.

**Ethics:** Ethical approval for this study was obtained from the Healthcare and Food Ethics committee at Cardiff Metropolitan University (Ethics reference number: PGT-4921). Consent was obtained by the business.

## Acknowledgments

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## References

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## Results

This study has explored the hand hygiene practices of foodhandlers during production in a sandwich manufacturing business based in the UK. The cameras utilised for the purpose of this observational study were utilized throughout the factory, and had been in situ for a prolonged time for the purpose of safety and monitoring work productivity. Foodhandlers were not aware that the observational study was being undertaken.

### Observed hand hygiene compliance during production

A total of 588 occasions that required implementation of hand hygiene practices were observed over a period of 16 hours. On 187 of these occurrences (31% of occasions) hands were not washed in events when handwashing was required (Table 1).

Table 1. Observed occurrences that required handwashing ( $n=588$ ) and percentage of failed attempts.

Occasions requiring implementation of hand hygiene practices (n)	Failure to implement hand hygiene attempt
Upon entry to production	79 (11%)
Before or after any cleaning procedure	109 (15%)
After contact with floor, bin, or trolley wheels	35 (46%)
After touching any part of the body	24 (71%)
During production activities (e.g., whilst assembling sandwiches or between different products)	232 (12%)
Before Line cleaning procedure	58 (100%)
Exiting production	51 (92%)
Total	588 (31%)

Food handlers were observed implementing hand hygiene practices significantly more frequently when entering (89%) than exiting (8%) the production area ( $X^2(1, n=130) = 61.598, p < 0.001, \phi = 0.70$ ).

Of the 401 occasions where hand hygiene practices were observed to be implemented during production, the majority of these attempts were not compliant with the hand hygiene protocol.

For example, as indicated in Table 2, although soap was utilised on the majority of hand hygiene attempts (95%), only 19% of attempts were observed to rub all parts of the hands, palms, fingers and wrists as detailed in the protocol, furthermore, only 38% of attempts utilised sanitizer.

Table 2. Frequencies of observed hand hygiene practices in the production area ( $n=401$ ).

Observed hand hygiene practices	%
Wet hands before applying soap	84%
Dispense soap	95%
Vigorous and various actions when lathering – rubbing all parts of hands, palms, fingers and wrists.	19%
Hands dried using disposable paper towels	99%
Dispense sanitizer	38%
Sanitizer used and rubbed over all parts of the hands	34%

Consequently, the vast majority of observed hand hygiene attempts (99%) were not in line with the hand hygiene protocol of the sandwich-making business.

### Observed hand hygiene malpractices

Table 3 provides a summary of the observed hand hygiene malpractices by foodhandlers after implementing hand hygiene practices.

Foodhandlers were observed readjusting their hairnet after completing handwashing on 22 occasions and touching their face/hair on 34 occasions, equating to 5% and 8% of

Although sanitizer was used after handwashing, on 66% of attempts sanitizer were not rubbed all over the hands.

Table 3. Observed malpractices of all hand hygiene attempts ( $n=401$ )

Malpractices	%
Hands dried on PPE	1%
Touched face/hair	8%
Touched floor	1%
Touched footwear	1%
Readjusted hairnet after handwashing attempt	5%
Sanitizer wiped on PPE	1%
Sanitizer used but not rubbed all over the hands	66%

### Duration of handwashing practices

Washing hands for a period of 20 seconds or longer is required to reduce microbiological contamination and is a step specified on the manufacturing business' hand hygiene protocol. The duration of observed hand hygiene attempts ranged from 1 to 29 seconds as presented in Figure 1, only 5% of handwashing attempts were determined to be compliant with the recommended duration ( $\geq 20$  seconds) for hand hygiene practices (Figure 1).

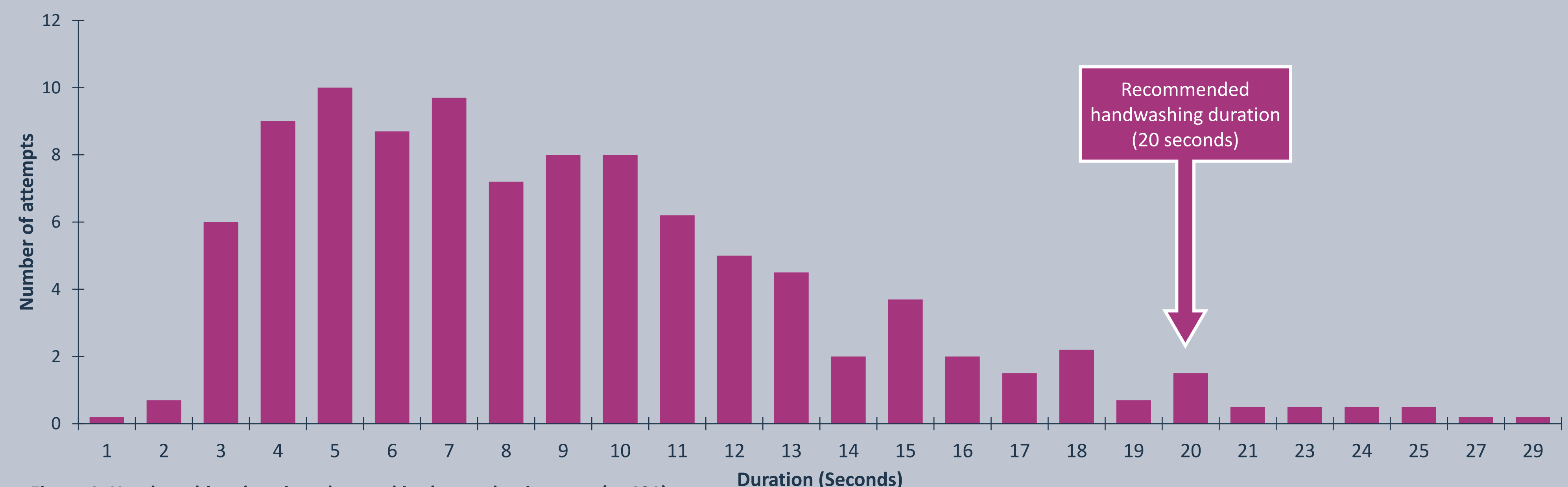


Figure 1. Hand washing duration observed in the production area ( $n=401$ )

### Significance of study

- Covert observation data provided valuable insight into hand hygiene compliance during production and thus illustrated an important resource for the food manufacturer to review company policy and improve the hand hygiene training/ education programs.
- The results from this study have identified a number of hand hygiene process malpractices during production that could have significant consequences for food safety in the food manufacturing business.
- Triangulation of findings with cognitive data from questionnaires and interviews are required to obtain an in-depth understanding of foodhandler hand hygiene practices and to explore the barriers that exist for implementing appropriate hand hygiene practices.