

Are food safety messages on flour packages effective?

Juan Archila¹, Yaohua Feng^{1*}

Department of Food Science, Purdue University, West Lafayette, IN 47907

*Corresponding Author: yhfeng@purdue.edu

Introduction

Flour, a low moisture product, has not been considered a vehicle of pathogenic bacteria over time. However, wheat flour has been identified as a source of pathogenic bacteria, including *Salmonella* and *E. coli*^{2,3}. Some flour and flour product packages have started to include food safety messages regarding the potential risk and how to handle flour properly. However, their impact has not been evaluated. The content and the position of those messages can influence consumers' practices^{1,4}. Understanding these may help improve consumers' flour handling behaviors and prevent the risk of foodborne illness.

Objective

This study reviewed flour packages and utilized an online survey to evaluate three food safety messages' effectiveness in changing consumers' flour handling practices. This study focused only on frequent flour handlers of households in the United States because they commonly prepare baking goods.

Materials and Methods

Pilot Study: The questions of the survey were developed by two food safety experts in consumer research and were distributed to a convenient sample of 194 flour handlers to pilot test validity and reliability.

Participants: Participants were recruited in May 2019, from Qualtrics XM. A total of 4,399 participants answered the survey, in which 1,045 passed the instructional manipulation checks (IMC). Participant inclusion criteria included: (a) the primary food handler of the household; (b) the primary grocery shopper of the household; and (c) use of flour or quick-bread mix at least once a month. Quotas for sociodemographic characteristics were set by the researcher to mirror the U.S. population, however due to challenges recruiting participants the criteria of gender was loosened.

Survey Questions: The survey had a total of 72 questions. The questions consisted of inclusion criteria and sociodemographic, flour knowledge and practices, and the evaluation of food safety messages on flour packages, including the position and content.

Data Analysis: Data were analyzed by using Excel 2016 for descriptive analysis, and SPSS version 9.4 for student t-test and one-way ANOVA.

Results

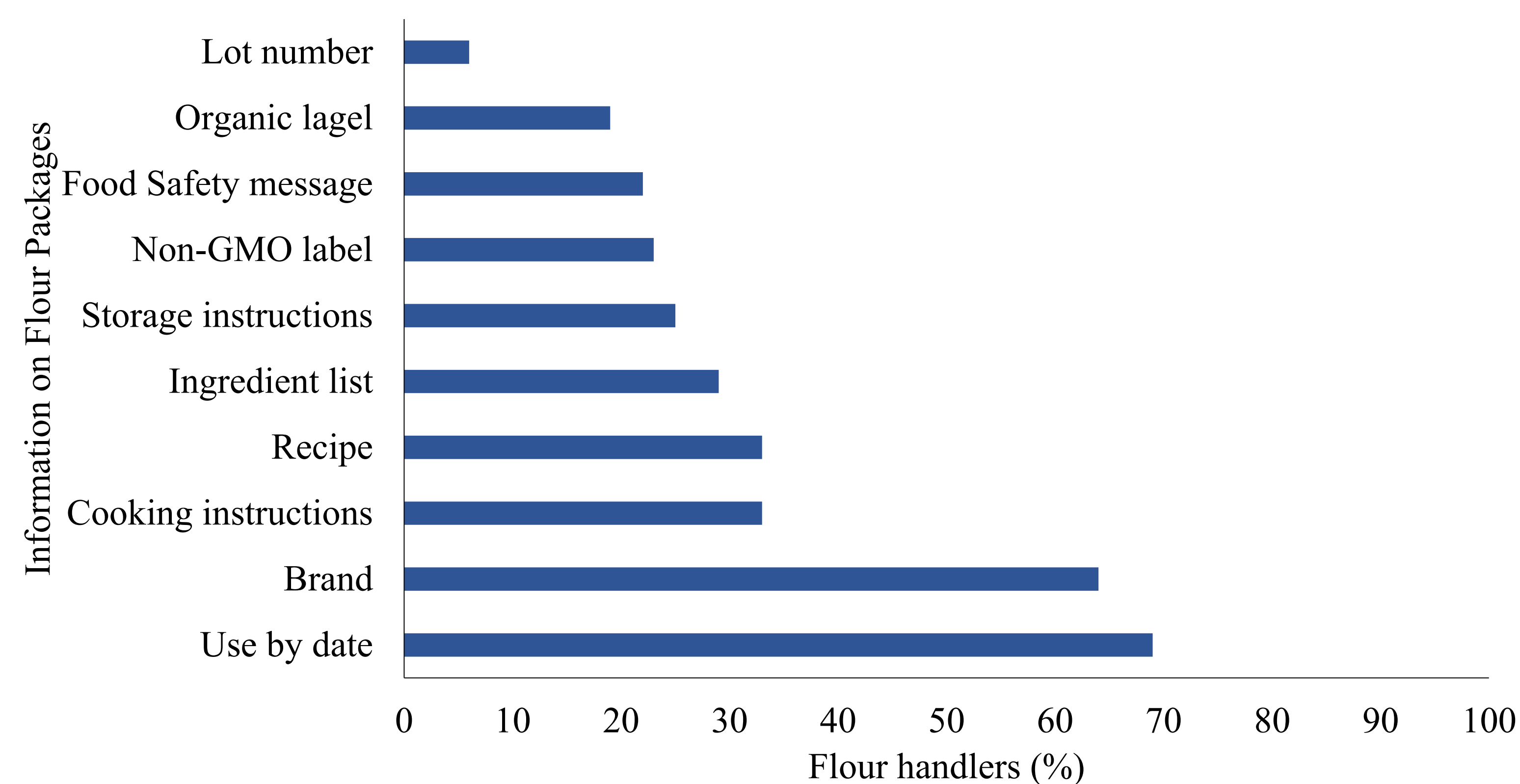


Figure 1. Participants' attention to the information on flour packages when purchasing it.

- Majority of flour handlers pay attention to the Use by date (69%) and Brand (64%) information on flour packages.
- Only 22% of participants reported to pay attention to food safety messages on flour packages.

Table 1. Logistic regression of the attention to flour package information among sociodemographic characteristics.

Variable	Food safety messages OR (95% CI)	Cooking instructions OR (95% CI)	Storage instructions OR (95% CI)
Gender male vs. female	1.26 (0.93; 1.71)	1.17 (0.89; 1.53)	1.37 (1.02; 1.83) ^a
Education level lower than Bachelor vs. Bachelor or higher	0.76 (0.57; 1.03)	1.01 (0.78; 1.32)	0.66 (0.49; 0.89) ^a
Age Between 18-64 years vs. 65 years and above	0.61 (0.43; 0.87) ^a	0.68 (0.49; 0.95) ^a	0.77 (0.54; 1.11)
Do not eat or play with raw dough or batter vs. eat or play with raw dough or batter	1.67 (1.23; 2.27) ^a	1.15 (0.87; 1.52)	1.08 (0.79; 1.46)

CI=95% confidence intervals; OR=odds ratio.

^aP values for the significance of each variable were lower than 0.05.

- Flour handlers aged 65 year-old and above and participants who do not eat or play with raw dough or batter were **more likely** to pay attention to food safety messages on flour packages.
- Flour handlers aged between 18-64 year-old were **less likely** to pay attention to cooking instructions than participants aged 65 year-old and above.
- Males were **more likely** to pay attention to storage instructions, however those with an education level lower than bachelors' degree were **less likely** to pay attention to this information.

Table 2. Preference of flour handlers on the position of food safety messages on flour and flour-product packages compared to current food safety messages on flour and flour-product packages.

Image presented to participants	Flour handlers preferred position of food safety messages (N = 1045) N (%)	Current flour and flour-product packages food safety messages (N = 143) N (%)
Back of the package	Not recorded	105 (74)
Middle of the package (did not specify front or back of the package)	544 (52)	Not recorded
Top of the package	355 (34)	19 (13)
On the side of the package	146 (14)	19 (13)

- Around half of participants will prefer the food safety message to be displayed in the middle of the package.
- Majority of the packages (74%) displayed the food safety message on the back of the package.
- Flour handlers were not asked about the food safety message's position at the back of the package, and the messages in the middle of the package were not recorded on current flour and flour-product packages.

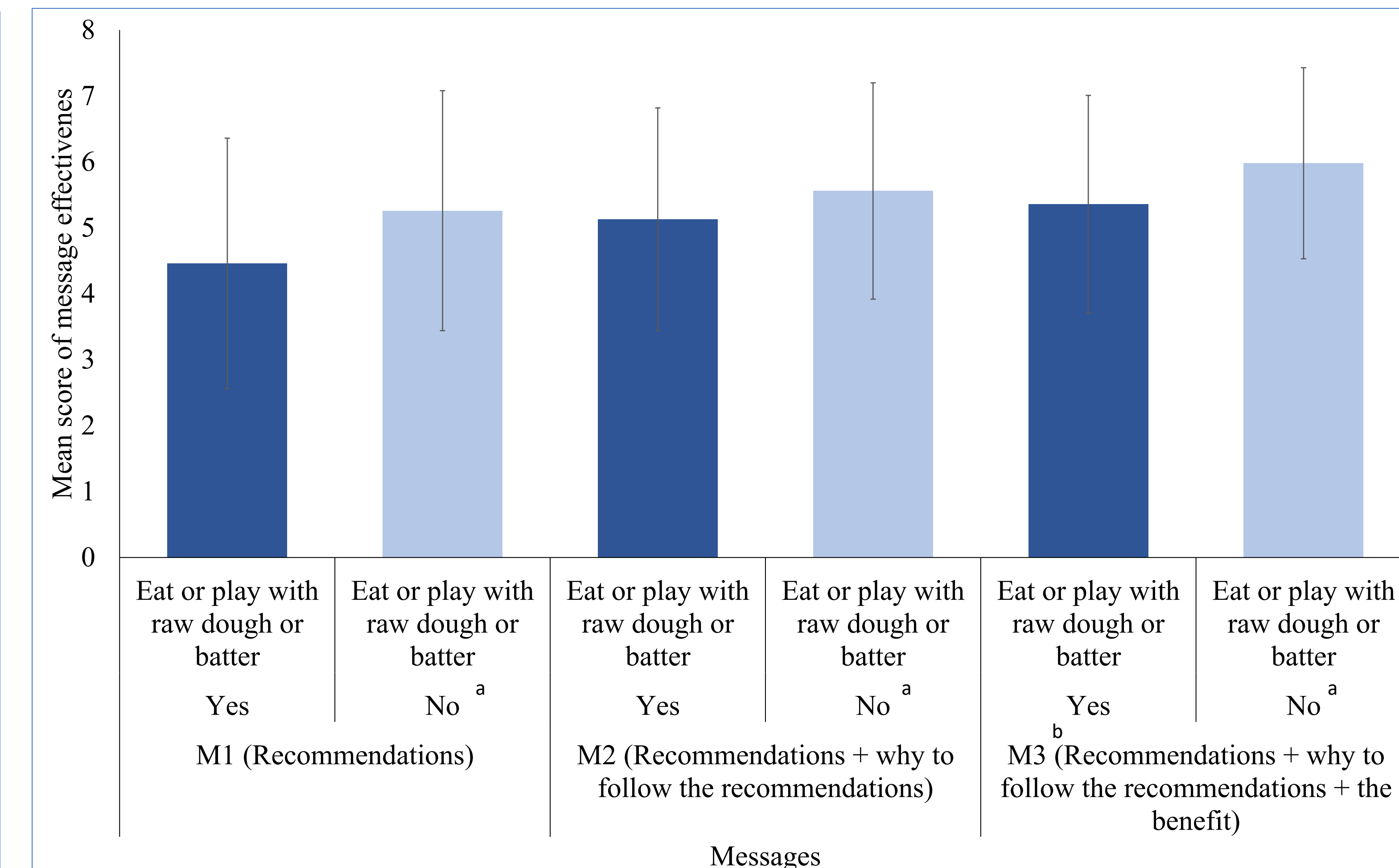


Figure 2. Effectiveness of three food safety messages on flour packages presented to flour handlers with improper and proper flour handling practices (N = 999)*

^aThe mean score of the message for who do not eat or play with raw dough or batter was significantly higher than for those with that behavior.

^bThe mean score of the message for both groups, was significantly higher than M1 and M2; by student t-test.

*Only those who use flour to make dough or batter were asked to assess the effectiveness of the three food safety messages.

- Flour handlers who do not eat or play with raw dough or batter perceived all messages to be significantly more effective than those who eat or play with raw dough or batter.

Conclusions

- Most flour handlers do not pay attention to food safety messages on flour packages.
- The content and position of the food safety message showed that it could be an influencing factor for flour handlers' attention.
- Those who have improper flour handling practices are less likely to follow food safety messages.

Next Steps

- Food safety educators need to develop food safety educational materials for flour handlers, using different approaches, such as food safety messages.
- There is a need for food safety educators to provide more information about the risk associated with low moisture products.
- Get insights into how to approach those who have improper flour handling practices to improve their behavior.

Acknowledgements

We thank the following individuals for their expertise and assistance: Dr. Christine Bruh, Han Chen, Tressie Barrett. This material is partially supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, Hatch project 1016049, 2020-68012-31822, and 2017-67012-26119.

References

- Becker, M. W., Bello, N. M., Sundar, R. P., Peltier, C., & Bix, L. (2015). Front of pack labels enhance attention to nutrition information in novel and commercial brands. *Food Policy*, 56, 76-86.
- Forghani, F., M. den Bakker, J.-Y. Liao, A. S. Payton, A. N. Futral, and F. Diez-Gonzalez. 2019. Salmonella and enterohemorrhagic Escherichia coli serogroups O45, O121, O145 in wheat flour: effects of long-term storage and thermal treatments. *Front. Microbiol.* 10:323.
- Harris, L. J., and S. Yada. 2019. Flour and cereal grains-outbreaks and recalls: foodborne illness outbreaks and product recalls [Tables and references]. Available at: <https://ucfoodsafety.ucdavis.edu/sites/g/files/dgvnsg7366/files/inline-files/271162.pdf>. Accessed 24 October 2019.
- Wigg, S., & Stafford, L. D. (2016). Health warnings on alcoholic beverages: Perception of the health risks and intentions towards alcohol consumption. *PLOS ONE*, 11(4), e0153027.