



ELSEVIER

Contents lists available at ScienceDirect

## Food Control

journal homepage: [www.elsevier.com/locate/foodcont](http://www.elsevier.com/locate/foodcont)

# Food business operators' opinions on disclosed food safety inspections and occurrence of disagreements with inspector grading

Jenni Kaskela<sup>a,\*</sup>, Annukka Vainio<sup>b,c</sup>, Sari Ollila<sup>d</sup>, Janne Lundén<sup>a</sup>

<sup>a</sup> Department of Food Hygiene and Environmental Health, Faculty of Veterinary Medicine, P.O. Box 66, FI-00014, University of Helsinki, Finland

<sup>b</sup> Helsinki Institute of Sustainability Science, Faculty of Agriculture and Forestry, P.O. Box 27, FI-00014, University of Helsinki, Finland

<sup>c</sup> Natural Resources Institute Finland (LUKE), P.O. Box 2, FI-00791, Helsinki, Finland

<sup>d</sup> Division of Food and Nutrition Sciences, Faculty of Agriculture and Forestry, P.O. Box 27, FI-00014, University of Helsinki, Finland

## ARTICLE INFO

## Keywords:

Compliance

Disclosure

Food business operator

Grading

Official food safety inspection

Risk perception

## ABSTRACT

Disclosure systems for official food safety inspection results have been introduced in many countries including Finland in order to increase compliance of food business operators (FBOs). Although the disclosure systems are intended to affect FBOs, few studies have been published on FBOs' experiences of these systems. To investigate FBOs' opinions of disclosed food safety inspections in Finland, a questionnaire was distributed in 2016. The questionnaire study also aimed to recognize factors affecting compliance and disagreements about gradings with a special focus on FBOs' risk perception. In total 1277 responses from FBOs in retail (n = 523), service (n = 507) and industry (n = 247) sectors revealed that the majority of FBOs perceived the disclosure to promote correction of non-compliance. However, many FBOs disagreed with the grading of inspection findings. Most common topics of disagreements were maintenance of premises, record-keeping of own-check plan and adequacy and suitability of premises for operations. Logistic regression analysis showed that the likelihood of occurrence of disagreements with grading was higher among those retail and service FBOs with a lower risk perception. Similarly, the occurrence of non-compliance was associated with FBOs' risk perception in all sectors. Thus, FBOs need proper guidance on food safety risks. These results can be used to improve the efficacy of disclosed food safety inspections.

## 1. Introduction

Food business operators (FBOs) are responsible for ensuring compliance in their operations with food safety legislation and for the safety of their food (EC 178/2002). Compliance with food safety legislation is verified by food safety authorities through inspections (EC 882/2004). Several studies have, however, shown that non-compliance is common in food premises (Läikkö-Roto, Mäkelä, Lundén, Heikkilä, & Nevas, 2015; Newbold, McKeary, Hart, & Hall, 2008; Phillips, Elledge, Basara, Lynch, & Boatright, 2006), as is recurrence (Aalto-Araneda, Korkeala, & Lundén, 2018; Luukkanen & Lundén, 2016; Phillips et al., 2006). Consequently, disclosure systems have been introduced to enhance the efficacy of official food control and also to reduce food safety information asymmetry between FBOs and consumers (Filon & Powell, 2009). Disclosure systems for food safety inspections are implemented worldwide in locations such as Los Angeles (Jin & Leslie, 2003), New York (Wong et al., 2015), Toronto (Serapiglia, Kennedy, Thompson, & De Burger, 2007), Singapore (Aik, Newall, Ng, Kirk, & Heywood, 2018),

England, Wales, Northern Ireland (Fleetwood et al., 2019), Denmark (Leisner et al., 2014) and Finland (Food Act, 2011).

The Finnish disclosure system called “Oiva” has been implemented throughout the country since 2013 in food retail (henceforth retail) and food service (henceforth service) sectors and since 2015 in the food industry (henceforth industry) sector with the aim of increasing the efficacy of food control (HE 293/2010). Publication of inspection results in the form of an Oiva report is mandatory for FBOs (FFA, 2016a). In retail and service sectors, Oiva reports are displayed at the entrance of food premises, and in the industry sector on the website of the enterprise. In addition, the three most recent Oiva reports are available at the website [oivahymy.fi](http://oivahymy.fi). The Oiva report includes the grade representing the inspection result overall, grades given for subsections (each consisting of several items), a written description of any non-compliance detected, the date of the last inspection, and the inspection results of the two preceding inspections. The grade representing the inspection result overall is the lowest grade among the inspected subsections and the grade of the subsection is the lowest grade among the

\* Corresponding author.

E-mail address: [jenni.kaskela@helsinki.fi](mailto:jenni.kaskela@helsinki.fi) (J. Kaskela).

<https://doi.org/10.1016/j.foodcont.2019.06.005>

Received 12 April 2019; Received in revised form 31 May 2019; Accepted 4 June 2019

Available online 05 June 2019

0956-7135/© 2019 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license

(<http://creativecommons.org/licenses/by/4.0/>).

inspected items within the subsection. Each inspected item is graded using a 4-point scale of “Excellent”, “Good”, “To be corrected” and “Poor”. The inspection result “Excellent” means that the inspector considered the FBO to be compliant. All other grades indicate some degree of non-compliance. The grades are represented in the Oiva report with smiley faces, and the guidelines for grading are publicly available at the website oivahymy.fi.

Disclosure systems have been demonstrated to have the potential to increase compliance, thereby improving food safety (Jin & Leslie, 2003; Serapiglia et al., 2007). Although the efficacy of disclosure systems has been investigated, few studies on FBOs' experiences of disclosure systems have been published. Since the FBOs are the target group of the disclosed inspections, the FBOs' perceptions of the efficacy and fairness of the disclosure system should be evaluated to identify any areas requiring improvement. In a study by Djekic et al. (2014), FBOs in the cities of Belgrade (Serbia), Porto (Portugal) and Thessaloniki (Greece) believed that the food hygiene rating scheme tested in the study would improve food safety, and they also stated that the ratings should be disclosed. Bavorova, Fietz, and Hirschauer (2017) examined the effects of the disclosure system on compliance of FBOs in Berlin. They showed that FBOs were more compliant if they associated a high level of fairness or embarrassment with the disclosure of inspection results, and if they associated a high risk of sale losses with the negative smiley (Bavorova et al., 2017).

The Finnish Oiva system has previously been studied in its initial phase in 2015 by Kettunen, Lundén, Lääkkö-Roto, and Nevas (2017), who examined the views of a subpopulation of the industry, namely FBOs in establishments handling products of animal origin. Kettunen et al. (2017) found that less than half of the FBOs thought that the Oiva system would increase the efficacy of food control, and some FBOs considered that the issues raised by the inspectors were insignificant. Also, Yapp and Fairman (2006) observed that many FBOs in the UK considered inspectors' requirements irrelevant to food safety.

Support for regulations aiming to control hazards has been observed to be associated with risk perception (Gerber & Neeley, 2005), which is an intuitive and subjective judgement of risk (Slovic, 1987). Risk perception of FBOs has been suggested to be associated with food safety behaviour (Griffith, Livesey, & Clayton, 2010; Kouabenan & Ngueutsa, 2016), and thus, risk perception can be hypothesized to be associated

with compliance with food safety requirements. In the Oiva system, occurrence of non-compliance leads to assignment of a lower grade (FFA, 2019a; 2019b), which in turn may cause disagreements between the FBO and the inspector. The lack of acceptance of decisions has been shown to be associated with perceived unfairness and distrust (Schroeder & Fulton, 2017; Tyler & Huo, 2002). Furthermore, perceived fairness has been found to be strongly associated with compliance (Nagin & Telep, 2017), and thus, disagreement with grading decisions may decrease the efficacy of food control. To our knowledge, no studies have explored the disagreements between FBOs and inspectors on grading or the reasons for the disagreements, although they may affect compliance.

This study aimed to investigate FBOs' opinions of Oiva inspections and the perceived fairness of the disclosure system. Additional aims were to identify any disagreements between FBOs and inspectors regarding grading and reasons for these disagreements with a special focus on FBOs' risk perception. The results can be used to improve the efficacy and acceptability of the disclosure system among FBOs.

## 2. Materials and methods

### 2.1. Questionnaire for food business operators

A questionnaire was developed to assess FBOs' opinions of Oiva inspections and risk perceptions. Also enquired about were disagreements with the inspector about the Oiva grading and occurrence of non-compliance in the most recent inspection. The questionnaire was targeted to FBOs in the industry, service and retail sectors, and some of the questions were modified to suit each sector.

The inspection result grade received by the FBO in the latest inspection was asked in the questionnaire using the scale A = excellent, B = good, C = to be corrected, D = poor. In further analysis, grade A indicated compliance and grades B-D occurrence of non-compliance.

FBO's opinion of the determination method of the inspection result was assessed with the question: “How good do you consider the determination method of the overall grade?” (1 = very poor, 2 = quite poor, 3 = quite good, 4 = very good). In addition, the reasons for this opinion were enquired with an open-ended question. FBO's opinion of the inspection result was enquired with the question: “What kind of

**Table 1**

Topics of disagreement between food business operators (FBOs) and inspectors regarding Oiva grading (n = 1277).

Topic of disagreement	Proportion of FBOs disagreeing with inspectors about assessment % (n)
Maintenance of premises	14.3 (183)
Record-keeping of own-check plan	11.7 (149)
Adequacy and suitability of premises for operations	11.3 (144)
Management of equipment and surfaces	7.6 (97)
Temperature control of stored food	6.9 (88)
General cleanliness of premises	6.8 (87)
Adequacy of equipment or machines	6.4 (82)
Package labels	6.3 (81)
Own-check plan	5.5 (70)
Displaying of Oiva report	5.4 (69)
Own-check control samples	4.6 (59)
Documents of food/traceability	4.1 (52)
Allergen control	4.0 (51)
Package material	3.8 (48)
Cleanliness of equipment and surfaces	3.5 (45)
Shelf-life of food	2.1 (27)
Waste management	2.0 (25)
Hygiene of food handling	1.8 (23)
Hygiene proficiency certificate	1.6 (20)
Pest control	1.0 (13)

**Table 2**

Scenarios to assess risk perception of food business operators (FBOs), means (M), medians (MD), 5th percentile to 95th percentile (P<sub>5</sub>-P<sub>95</sub>), and significant differences of risk perception between sectors (Kruskal-Wallis test with adjusted p-values). The FBOs were requested to evaluate the magnitude of the food safety risk in 13 different situations in the respondent's own field of operations on a scale from 1 = “no risk at all” to 5 = “very high risk”.

Described situation	Industry (n = 225-242)		Service (n = 471-502)		Retail (n = 437-521)	
	M	MD <sup>a</sup> (P <sub>5</sub> -P <sub>95</sub> )	M	MD <sup>a</sup> (P <sub>5</sub> -P <sub>95</sub> )	M	MD <sup>a</sup> (P <sub>5</sub> -P <sub>95</sub> )
<b>Risk perception variable</b>	3.9	4.0 <sup>A</sup> (2.5–4.8)	3.6	3.6 <sup>B</sup> (2.5–4.6)	4.0	4.2 <sup>A</sup> (2.8–4.9)
Worker who is suffering from acute gastrointestinal symptoms is handling unpacked food	4.7	5 <sup>AB</sup> (3-5)	4.6	5 <sup>A</sup> (3-5)	4.7	5 <sup>B</sup> (3-5)
Same cleaning equipment is used for cleaning surfaces for unpacked foods and other surfaces	4.4	5 <sup>A</sup> (2-5)	4.1	4 <sup>B</sup> (2-5)	4.6	5 <sup>C</sup> (3-5)
Temperature monitoring of cold-stored food is not carried out	4.5	5 <sup>A</sup> (3-5)	4.3	5 <sup>B</sup> (3-5)	4.6	5 <sup>A</sup> (3-5)
Cooling heated food which requires cold storage to 6 °C takes 8 h	4.2	4 <sup>A</sup> (2-5)	4.3	5 <sup>A</sup> (2-5)	4.4	5 <sup>B</sup> (2-5)
There is expired food in the cold-storage room	4.1	4 <sup>A</sup> (2-5)	4.4	5 <sup>B</sup> (3-5)	4.1	4 <sup>A</sup> (2-5)
A clearly scraped cutting board is used for perishable food	4.0	4 <sup>A</sup> (2-5)	3.7	4 <sup>B</sup> (2-5)	4.2	4 <sup>C</sup> (2-5)
There is no own-check plan	3.9	4 <sup>A</sup> (2-5)	3.5	4 <sup>B</sup> (1-5)	4.0	4 <sup>A</sup> (2-5)
Soap of the hand washing point has run out in the area where unpacked food is handled	3.7	4 <sup>A</sup> (1-5)	3.6	4 <sup>A</sup> (2-5)	4.0	4 <sup>B</sup> (2-5)
A person who is handling unpacked food has no head cover	4.0	4 <sup>A</sup> (2-5)	3.1	3 <sup>B</sup> (1-5)	3.7	4 <sup>C</sup> (1-5)
Documentation of temperature monitoring has not been done	3.7	4 <sup>A</sup> (1-5)	3.5	4 <sup>B</sup> (1-5)	3.9	4 <sup>A</sup> (1-5)
Documentation of cleaning routines has not been done	3.3	3 <sup>A</sup> (1-5)	3.0	3 <sup>B</sup> (1-5)	3.5	4 <sup>A</sup> (1-5)
Adequate trade documents are not available for all foods in the food premises	3.4	4 <sup>A</sup> (1-5)	2.7	3 <sup>B</sup> (1-5)	3.1	3 <sup>C</sup> (1-5)
Cleaning equipment is kept on the floor in the cleaning equipment storage room	2.7	3 <sup>A</sup> (1-5)	2.3	2 <sup>B</sup> (1-4)	2.9	3 <sup>A</sup> (1-5)

<sup>a</sup> Different capital letter indicates statistically significant difference between groups, Kruskal-Wallis test,  $p < 0.05$ , pairwise comparisons with adjusted p-values.

impression does the most recent overall Oiva grade give about the food safety of the premises?” (1 = clearly too poor, 2 = somewhat too poor, 3 = correct impression, 4 = somewhat too good, 5 = clearly too good).

The perceived fairness of the inspection result was measured with the question: “How fair do you consider the overall grades assigned to your premises in 2016? (1 = totally unfair, 2 = quite unfair, 3 = quite fair, 4 = totally fair). Further disagreements with grading were measured with the question: “How much disagreement (assessment conflicts) with grading of your premises in 2016 did you experience? (1 = not at all, 2 = little, 3 = moderate amount, 4 = very much). If there was no inspection in 2016, the FBO was instructed to answer the question by considering the last inspection. Topics of disagreements were probed with a multiple-choice question with the response options shown in Table 1.

Risk perception was measured with 13 statements of situations where some safety measure had not been carried out. The respondents evaluated the associated food safety risk relative to their field of activity on a 5-point scale (1 = no risk at all, 5 = very high risk) (Table 2). Thus, the risk perception was measured framed by uncompleted safety behaviour as Taylor and Snyder (2017) recommended based on their study investigating the relationship between safety behaviour compliance and diversely measured risk perception.

Opinions about consistency of Oiva grading, and efficacy of disclosure were assessed with the following statements using a 4-point Likert scale (completely disagree, partly disagree, partly agree, completely agree). Consistency of grading was explored with the following statements: “Grading of Oiva inspection has been consistent across the municipality” and “Grading of Oiva inspection has been consistent over different parts of Finland”. Further opinions on the efficacy of disclosure were measured with the statement: “Disclosure of Oiva inspection results enhances the correction of non-compliance”.

Moreover, the following background information on food premises and respondents were derived: size of premises, establishment of third-party certified food safety management system (FSMS) such as ISO 22000, chain, gender, age and education level of respondents. An “I don't know” option was included in the response alternatives to all questions, but it was coded as a missing value in the dataset.

## 2.2. Data collection

Representatives from the Finnish Grocery Trade Association (PTY), the Finnish Food and Drink Industries' Federation (ETL) and the Finnish Hospitality Association (MaRa) piloted the questionnaire, and small modifications to the questionnaire were made based on their feedback.

The study was conducted between November and December 2016 with a web-based questionnaire (e-lomake, Eduix Oy) or a mailed paper questionnaire if an e-mail address was unavailable. The questionnaire was sent to members of ETL (n = 587), PTY (n = 2912) and MaRa (n = 5638) and to all approved food establishments (FFA, 2016b) whose contact information was available (n = 872). A reminder was sent two weeks later. We requested one completed questionnaire per food premises, and that the person responding was familiar with the Oiva inspections of the premises. Respondents answered the questionnaire anonymously.

## 2.3. Statistical analyses

Statistical analyses were conducted using IBM SPSS software 25. FBOs were divided into micro- (under 10), small- (10-49), and medium- (50-249) or large-sized (at least 250) food premises according to the number of employees based on the European Commission Recommendation (EC 361/2003). Further, FBOs were divided according to whether or not the premises had an FSMS and whether or not the premises belonged to a chain. FBOs who were part of an enterprise with two or more food premises were considered to be chain FBOs.

The mean score variable measuring risk perception was constructed (Table 2). Internal consistency of the risk perception variable was assessed with Cronbach's  $\alpha$  (Cronbach's  $\alpha = 0.89$ ), which exceeded the recommended minimum value of 0.7 (Nunnally, 1978). Differences between the groups (sector, size, establishment of FSMS or belonging to a chain) in risk perception and perceptions of the Oiva system were analysed with non-parametric tests (Kruskal-Wallis test with adjusted p-values and Mann-Whitney *U*-test) as the variables were not normally distributed. Significance level of 0.05 was applied in all statistical tests.

The associations of the respondent-related (risk perception, gender, age, education) and the premises-related variables (size, chain and FSMS) with the occurrence of non-compliance and the occurrence of disagreements were analysed separately for each sector by Pearson's Chi-square test with Bonferroni correction in case of pairwise comparisons or Mann-Whitney *U*-test. Variables with a significant association with the occurrence of non-compliance or disagreements were further included in the logistic regression analysis. Logistic regression analysis was conducted separately for each sector for the occurrence of non-compliance and the occurrence of disagreements to evaluate associated factors. Logistic regression analysis for the occurrence of disagreements was conducted only for FBOs with non-compliance in the latest Oiva inspection. Selection of a logistic regression model was based on a backward selection method with a likelihood ratio test.

**Table 3**  
Response rate and categorization of food business operators (FBOs).

Category	Food sector % (n)			
	Industry	Service	Retail	All FBOs
<b>Response rate</b>	16.9 (247)	9.0 (507)	18.0 (523)	12.8 (1277)
<b>Size</b>				
Micro	42.1 (96)	76.7 (382)	60.3 (310)	63.5 (788)
Small	25.4 (58)	22.3 (111)	36.0 (185)	28.5 (354)
Medium	25.4 (58)	1.0 (5)	3.7 (19)	6.6 (82)
Large	7.0 (16)	-	-	1.3 (16)
<b>Premises part of a chain</b>	39.2 (94)	44.9 (219)	88.4 (450)	61.7 (763)
<b>Latest inspection result</b>				
A Excellent	51.0 (122)	51.8 (259)	57.2 (297)	53.9 (678)
B Good	41.8 (100)	45.4 (227)	40.5 (210)	42.7 (537)
C/D To be corrected/Poor	7.1 (17)	2.8 (14)	2.3 (12)	3.4 (43)
<b>Premises with score C/D in the past</b>	35.6 (74)	32.6 (130)	21.1 (94)	28.3 (298)

**3. Results**

*3.1. Characteristics of respondents*

A total of 1277 (response rate 12.8%) FBOs responded to the questionnaire (Table 3). Of the respondents, 41.0% (523/1277) were from retail, 39.7% (507/1277) from service and 19.3% (247/1277) from industry (Table 3). Information related to premises is shown in Table 3. Over half of the respondents (55.7%, 684/1228) were females and 86.1% (1077/1251) were between the ages of 30 and 60 years. Of the respondents, 93.4% (1145/1226) had a degree after basic education, and 48.5% (595/1226) had a degree from a higher education institution (university or polytechnic). Respondents had been working on average for 21.3 years (n = 1241) in food business. Only 4.4% (55/1241) had less than 5 years of working experience. Almost all respondents (96.1%, 1215/1264) had participated in the Oiva inspection or discussed the results with the inspector at least once.

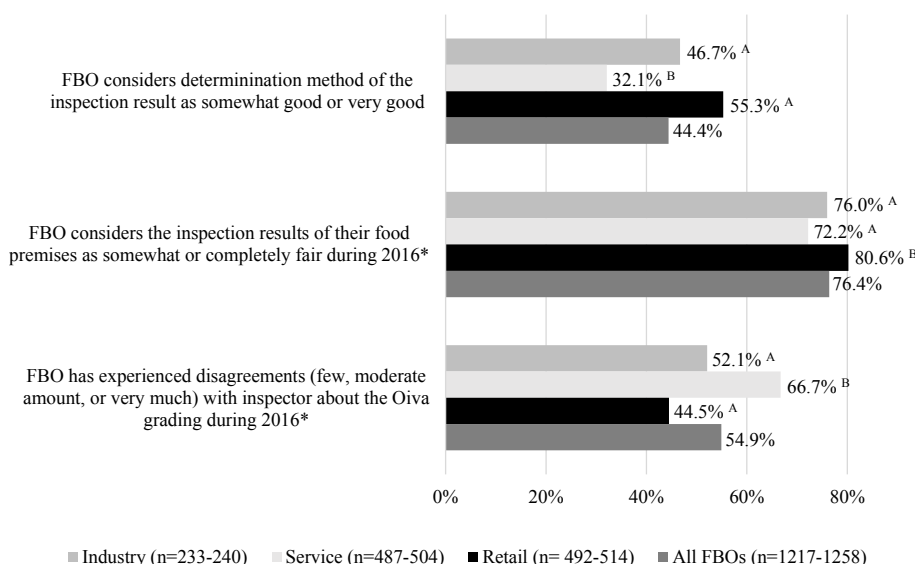
*3.2. FBOs' risk perception*

FBOs perceived the risks of described situations to food safety to be high (mean [M] = 3.8, median [MD] = 3.9, 5th percentile [P<sub>5</sub>] = 2.5, 95th percentile [P<sub>95</sub>] = 4.8, n = 1265, on a scale 1-5). FBOs in all sectors perceived that the highest risk to food safety was associated with the situation where a worker with acute gastrointestinal symptoms was potentially contaminating food and that the lowest risk was associated with the situation where cleaning equipment was kept on the

floor in the cleaning equipment storage room (Table 2). Also failing to document cleaning routines and unavailability of adequate trade documents for all foods were perceived to be associated with lower risk than other situations by FBOs of all sectors (Table 2). Kruskal-Wallis test indicated that in most situations FBOs in the service sector assigned a significantly lower risk to given situations than other FBOs (Table 2). Consequently, overall risk perception of FBOs in the service sector (M = 3.6, MD = 3.6, P<sub>5</sub> = 2.5, P<sub>95</sub> = 4.6) was significantly lower than FBOs in industry (M = 3.9, MD = 4.0, P<sub>5</sub> = 2.5, P<sub>95</sub> = 4.8) and retail sectors (M = 4.0, MD = 4.2, P<sub>5</sub> = 2.8, P<sub>95</sub> = 4.9) (p < 0.001) (Table 2). Mann-Whitney U-test indicated that among industry FBOs with an FSMS, (M = 4.1, MD = 4.2, P<sub>5</sub> = 2.8, P<sub>95</sub> = 4.8, n = 91) risk perception was significantly higher than among FBOs without an FSMS (M = 3.7, MD = 3.7, P<sub>5</sub> = 2.5, P<sub>95</sub> = 4.7, n = 110) (p < 0.001). In addition, retail chain FBOs had significantly higher risk perception (M = 4.1, MD = 4.2, P<sub>5</sub> = 2.8, P<sub>95</sub> = 4.9, n = 450) than non-chain FBOs (M = 3.5, MD = 3.5, P<sub>5</sub> = 2.0, P<sub>95</sub> = 4.8, n = 59) (p < 0.001). Also, female respondents (M = 4.0, MD = 4.2, P<sub>5</sub> = 2.8, P<sub>95</sub> = 4.8, n = 681) had a significantly higher risk perception than males (M = 3.6, MD = 3.6, P<sub>5</sub> = 2.4, P<sub>95</sub> = 4.7, n = 540) (p < 0.001).

*3.3. FBOs' opinions on Oiva grading*

The result of Oiva inspection is determined by the lowest grade received in the inspection. Under half of the FBOs (44.4%, 558/1258) considered the determination of the inspection result to be somewhat good or very good (Fig. 1). Kruskal-Wallis test indicated that FBOs'



**Fig. 1.** Opinion of food business operators (FBOs) regarding the Oiva grading. The proportions of FBOs agreeing with the statements are presented. Different capital letters indicate statistically significant differences between groups within statements (Kruskal-Wallis test, p < 0.05).

\* If an inspection was not conducted in the FBO's food premises in 2016, the FBO was instructed to answer based on the last inspection.



**Table 4a**  
Logistic regression model for the occurrence of non-compliance.

Sector	Predictor	Exp(B)	SE	Odds ratio	p	95% CI
Retail	Risk perception	-0.417	0.128	0.659	0.001	0.512-0.847
	Constant	1.366	0.517	3.921	0.008	
Service	Risk perception	-0.300	0.142	0.741	0.034	0.561-0.978
	Constant	1.009	0.521	2.742	0.053	
Industry	Risk perception	-1.041	0.255	0.353	< 0.001	0.214-0.582
	Micro-sized	0.674	0.344	1.962	0.050	0.999-3.854
	Small-sized	0.898	0.377	2.454	0.017	1.172-5.135
	Constant	3.493	1.044	32.895	0.001	

Retail: n = 519; Hosmer and Lemeshow test: p = 0.353

Service: n = 497; Hosmer and Lemeshow test: p = 0.320

Industry: n = 219; Hosmer and Lemeshow test: p = 0.481

opinions about the determination of the inspection result differed significantly between sectors ( $p < 0.001$ ); in retail 55.3% (284/514) and in industry 46.7% (112/240) of the FBOs considered the determination of the overall grade to be somewhat good or very good, while only 32.1% (162/504) of the FBOs in the service sector thought the same (Fig. 1). Many FBOs (51.3%, 655/1277) elaborated their views on the determination of the inspection result in open-ended question responses. The most common criticism was that one non-compliance is sufficient to decrease the inspection result (27.8%, 355/1277). Furthermore, many FBOs mentioned that the non-compliance might have only minor relevance (17.8%, 227/1277). Some FBOs also thought that the inspection result gives an incorrect impression of the food premises (7.8%, 100/1277), and the determination method was deemed unfair (9.7%, 124/1277). In addition, some FBOs criticized the inconsistency of inspections (4.6%, 59/1277) and claimed inspections to sometimes be arbitrary (4.0%, 51/1277).

Nevertheless, 76.4% (943/1235) of FBOs considered the overall grades received for their food premises to be somewhat or totally fair (Fig. 1). The opinion on fairness varied by size group in the industry sector (Kruskal-Wallis test,  $p = 0.016$ ), as 88.9% (64/72) of the FBOs in medium- or large-sized food premises considered the grades received as completely or totally fair compared with small-sized food premises, where only 57.9% (33/57) of the FBOs were of this opinion. In the retail sector, the opinion on fairness of the grades varied somewhat between chain and non-chain FBOs (Mann-Whitney  $U$ -test,  $p = 0.001$ ); 82.7% (359/434) of chain FBOs and 70.7% (41/58) of non-chain FBOs considered the grades received as fair.

Correspondingly 70.3% (860/1224) of the FBOs considered that the most recent inspection result gave the correct impression of food safety in their food premises. Among the FBOs who considered that the inspection result gave an incorrect impression of food safety in their food premises, 75.5% (275/364) deemed the impression to be slightly too poor, 17.6% (64/364) clearly too poor and 6.9% (25/364) either slightly or clearly too good. Furthermore, FBOs were rather critical about the consistency of inspections. Most FBOs totally or somewhat disagreed with the following statements concerning regional consistency of the grading: Oiva grading is consistent in the municipality (59.7% disagreed, 509/852) and Oiva grading is consistent regionally in Finland (80.2% disagreed, 622/776).

### 3.4. Non-compliance and disagreements with inspectors regarding Oiva grading

Of the FBOs, 77.6% (964/1242) totally or somewhat agreed that disclosure of the Oiva inspection results promotes correction of the non-compliance. Responses to this statement varied significantly by sector (Kruskal-Wallis  $p < 0.001$ ); 85.5% (442/517) of FBOs in retail totally or somewhat agreed with this statement compared with 73.7% (358/486) of FBOs in service and 68.6% (164/239) of FBOs in industry. In the retail sector, responses differed between chain and non-chain FBOs

(Mann-Whitney  $U$ -test,  $p < 0.001$ ); up to 87.7% (391/446) of chain FBOs totally or somewhat agreed, while only 67.8% (40/59) of non-chain FBOs agreed with this statement.

The inspector had detected some degree of non-compliance (inspection result “Good”, “To be corrected” or “Poor”) during the last Oiva inspection among 46.1% (580/1258) of all FBOs (Table 3). Correspondingly, more than half of all FBOs (54.9%, 668/1217) had experienced disagreements about Oiva grading with the inspector during 2016 or earlier in the event that inspections were not conducted in 2016 (Fig. 1). The sectors significantly differed in their experiences of disagreements (Kruskal-Wallis,  $p < 0.001$ ); 66.7% (325/487) of FBOs in the service sector reported disagreements with the inspector about grading, while only 44.5% (219/492) of retail FBOs reported these disagreements (Fig. 1). In the retail sector, experiences of disagreements varied, however, between chain and non-chain FBOs (Mann-Whitney  $U$ -test,  $p < 0.001$ ); 69.0% (40/58) of non-chain and 40.4% (170/421) of chain FBOs had experienced disagreements.

The three most common topics of disagreements among all FBOs were maintenance of the premises (14.3% of all FBOs), record-keeping of own-check plan (11.7%) and adequacy and suitability of the premises for operations (11.3%) (Table 1), except in the industry sector, where one of the three topics was package labels (12.6%, 31/247) instead of adequacy and suitability of the premises. In addition, in the retail sector the general cleanliness of the premises (8.0%, 42/523) was as commonly reported as record-keeping of own-check plan (8.0%, 42/523). In the industry sector, record-keeping of own-check plan was more often reported as a topic of disagreement among micro- (11.5%, 11/96) and small-sized (15.5%, 9/58) FBOs and among FBOs without FSMS (16.2%, 18/111) than among medium- or large-sized FBOs (1.4%, 1/74) and FBOs with FSMS (4.4%, 4/91) (Pearson's Chi-square test,  $p < 0.05$ ). In the retail sector, general cleanliness of the premises was reported more often as a topic of disagreement among non-chain FBOs (20.3%, 12/59) than among chain FBOs (6.2%, 28/450) (Pearson's Chi-square test,  $p < 0.05$ ).

To recognize factors associated with the occurrence of non-compliance at the last inspection and the occurrence of disagreements with grading in 2016, logistic regression analyses were conducted. These analyses were preceded by bivariate analyses testing the associations between the occurrence of non-compliance and the occurrence of disagreements with factors related to the respondent (gender, age, education level, risk perception) and to the food premises (size group, FSMS, chain) using Pearson's Chi-square test or Mann-Whitney  $U$ -test.

Bivariate analyses showed significant associations between the occurrence of non-compliance and the following factors: risk perception among FBOs in all sectors ( $p < 0.05$ ), gender ( $p = 0.006$ ), size of premises ( $p = 0.007$ ) and establishment of FSMS ( $p = 0.001$ ) in the industry sector. Further bivariate analyses revealed significant associations between the occurrence of disagreements and the following factors: risk perception variable among FBOs in service ( $p = 0.02$ ) and retail ( $p = 0.005$ ); gender in service ( $p = 0.01$ ) and belonging to a

**Table 4b**

Logistic regression model for the occurrence of disagreement with Oiva grading between food business operators (FBOs) and inspectors. Only FBOs with non-compliance in the last inspection were included.

Sector	Predictor	Exp(B)	SE	Odds ratio	p	95% CI
Retail	Risk perception	-0.564	0.236	0.569	0.017	0.358-0.904
	Chain	-1,070	0.525	0.343	0.042	0.122-0.960
	Constant	3.643	0.988	38,194	<0.001	
Service	Risk perception	-0,686	0.304	0.504	0.024	0.277-0.915
	Female	-0.782	0.363	0.457	0.031	0.225-0.932
	Constant	4.342	1.141	76.881	<0.001	

Retail: n = 201; Hosmer and Lemeshow test: p = 0.951

Service: N = 223; Hosmer and Lemeshow test: p = 0.393

chain in retail ( $p = 0.007$ ). These variables were included in the logistic regression analyses, which were conducted separately for each sector to determine 1) factors associated with the occurrence of non-compliance and 2) factors associated with FBOs disagreeing with Oiva grading, but only among FBOs with non-compliance in the last inspection.

FBO's risk perception remained a significant explanatory factor in the logistic regression analysis for the occurrence of non-compliance in all sectors. A higher risk perception was associated with a decreased likelihood of non-compliance (Table 4 a). The size of the FBO was also a significant explanatory factor in industry, with small size increasing the likelihood of non-compliance (Table 4 a). Likewise, in the logistic regression model for the occurrence of disagreements, risk perception remained significant in the service and retail sectors. The FBOs with higher risk perception were less likely to have disagreements about the Oiva grading with the inspector (Table 4 b). Furthermore, in the retail sector the FBO's premises being part of a chain decreased the likelihood of occurrence of disagreements (Table 4 b).

#### 4. Discussion

This study shows that the introduction of a disclosure system in Finland has led to the desired results, but still entails some developmental challenges. According to the FBOs, the disclosure system has increased the efficacy of the inspections, as the majority of the FBOs perceived the disclosure to enhance correction of non-compliance. Correspondingly, in the UK the majority of FBOs without the highest rating reported aiming to improve their rating (BMG research, 2018). In Finland, also the majority of FBOs in industry, although a smaller proportion than in retail and service, perceived that disclosure enhances correction of non-compliance. The smaller proportion of FBOs in industry perceiving that the disclosure enhances correction of non-compliance might be due to the fact that consumers are usually not in direct contact with the industry sector, leading to a decreased consumer pressure compared with the retail and service sectors. In the business-to-business environment, certified FSMS is often required (Fulponi, 2006) and this might diminish the importance of disclosed official inspection results to FBOs in industry. In addition, the disclosure system Oiva was implemented in industry later than in service and retail, which might explain why the perceived effect on compliance was lower among industry FBOs.

Although FBOs considered that the efficacy of inspections has improved, the determination of the inspection result by the lowest grade was widely opposed by FBOs in all sectors for the reason that only one non-compliance can lead to a decreased inspection result. Consequently, food premises with only one non-compliance and those with several non-compliances can have the same inspection result. This may discourage some FBOs from correcting non-compliances since the inspection result will remain the same until all of the non-compliances are corrected. On the other hand, highlighting the lowest grade instead of median or mean grade as the inspection result prompts an FBO even with only one non-compliance to make the corrections and enables

consumers to easily check whether the FBO has been compliant with food legislation. However, it is noteworthy that situations where only one non-compliance is detected using the lowest grade as an inspection result will lead to a considerably lower inspection result than using median or mean grade. Furthermore, some FBOs stated that some of the non-compliances have only minor relevance, nonetheless leading to a less satisfactory inspection result, creating dissatisfaction among the FBOs. This is an important observation because the perception of requirements as insignificant has been recognized as a barrier to compliance (Yapp & Fairman, 2006).

Although opposition to the determination method of the inspection result was common among FBOs, according to the majority of FBOs the inspection results received had been at least somewhat fair and the latest inspection result had given a correct impression of the food safety in their premises. This discrepancy in opinions might arise from of a widespread fear of receiving a less satisfactory result unfairly as a result of a single minor non-compliance. However, if only one minor non-compliance is detected, the inspector has the possibility to take the overall situation of the premises into consideration in the grading (FFA, 2016c). Compared with the observation of Shahid and Whisson (2012) that only 55.4% of FBOs considered that the star rating correctly represented the hygiene level of their premises, FBOs were more content with the Oiva inspection results (70.3% of FBOs). Interestingly, in another study conducted in the UK almost 90% of FBOs were satisfied with the rating received (BMG research, 2018), indicating higher satisfaction than among FBOs in the Oiva system. In the disclosure system of the UK, the proportion of the highest grading of all received gradings is higher than that in the Finnish Oiva system, which hinders direct comparison of these results since FBOs with better grading are more satisfied with the grade (BMG research, 2018). Moreover, cultural context may influence risk perceptions and food business operators' relationship with inspectors. Thus, cultural differences should be kept in mind when comparing results of studies conducted in different countries. Furthermore, disclosure systems are not identical which also makes the comparison of the results between different systems challenging.

This study showed that the FBOs' risk perception was on average high among all three sectors (MD = 3.6–4.1 on a scale 1–5). This is important because FBOs' perception of food safety risks influences the food safety culture in food business (Griffith et al., 2010). However, FBOs in the service sector (MD = 3.6) had a significantly lower risk perception than FBOs in the sectors of industry (MD = 4.0) or retail (MD = 4.1). The study does not reveal the reasons for this, but it could be at least partly explained by differences in food safety knowledge since food safety risk perception has been observed to be associated positively with food safety knowledge (Zanin, da Cunha, Stedefeldt, & Capriles, 2015). Further, the risk perception was significantly higher among FBOs in industry with a certified FSMS and among FBOs in retail that belonged to a chain, which can be explained by many factors. We argue that FBOs with an FSMS have acquired food safety knowledge while implementing and maintaining the FSMS and chain retailers probably receive more guidance through the chain organization, increasing their awareness of risks. Furthermore, female respondents perceived risks as higher than males, in line with earlier studies of food safety risk perceptions (Dosman, Adamowicz, & Hrudehy, 2001; Fein, Lando, Levy, Teisl, & Noblet, 2011).

Although the average risk perception was high among FBOs (MD = 3.9), distinct differences in the risk perception between the described situations were observed, highlighting the capability of FBOs to rank different situations according to attributed risk. FBOs perceived the food safety risk to be the lowest in situations where food products were not likely to be adversely affected at least directly, i.e. non-compliance in the requirements of documentation and storage of cleaning equipment. On the other hand, situations commonly known to be risk factors for food poisoning, i.e. situations where food products were likely to be contaminated or exposed to improper temperatures (FFA,

2019c), were assessed by FBOs as high-risk situations. Partly similar differences in perceived risks were observed in Brazil among seafood handlers in the study of Zanin et al. (2015) and among school food handlers in the study of da Cunha, Stedefeldt, and De Rosso (2012). Seafood handlers associated the highest risks in situations where food items were at risk of being directly contaminated by dirt (Zanin et al., 2015), and school food handlers considered the risk to be highest in situations with an ill worker, improperly cooked meat or temperature abuse in storage of perishable food (da Cunha et al., 2012).

This study revealed that remarkably many food businesses had non-compliances in their premises during the last inspection and that many FBOs disagreed with the inspector's grading. This is of concern because such disagreements may have consequences on the credibility of food control and could negatively influence the willingness to correct non-compliance. Many of the topics where disagreements occurred regarding grading can be considered as important for food safety such as maintenance of premises and adequacy and suitability of the premises. In addition, many other topics where disagreements were observed, such as temperature and allergen control, can have considerable effects on food safety. It is important that non-compliance in these areas is corrected.

To elucidate possible factors associated with the occurrence of non-compliance and disagreements with grading, a logistic regression analysis was performed. The analysis showed that risk perception of FBOs was associated with the occurrence of non-compliance and with the occurrence of disagreements. This finding highlights the importance of providing FBOs with guidance on food safety risks and an explanation for how the non-compliance may affect food safety since it has been suggested that a lack of food safety knowledge prevents the FBO from identifying risks (de Freitas, da Cunha, & Stedefeldt, 2019). In fact, FBOs themselves have stated in an earlier study that proper justification of requirements impacts positively on the correction of non-compliances (Läikkö-Roto & Nevas, 2014). These results also emphasize the importance of food safety knowledge of the inspector and the value of constructive communication with FBOs, consistent with the findings of Aalto-Araneda et al. (2018). The analysis also revealed that the size of the food business was associated with the occurrence of non-compliance, which was hardly a surprise. FBOs from micro-sized and small-sized food businesses might not have the same knowledge or resources as FBOs in larger businesses. Higher knowledge of the FBO has been demonstrated to be associated negatively with the occurrence of non-compliance (de Andrade, Rodrigues, Antongiovanni, & da Cunha, 2019).

Contrary to our results, the association between food handlers' risk perception and compliance level of the establishment was insignificant in the study of de Andrade et al. (2019). The discrepant study results might be explained by the difference in risk perception measurement. Risk perception should be measured conditional on safety behaviour when studying the association of risk perception with safety behaviour compliance to obtain interpretable results (Ronis, 1992; Taylor & Snyder, 2017; Van Der Pligt, 1998). In the field of occupational health, Taylor and Snyder (2017) demonstrated in their laboratory study that observed safety compliance was significantly associated with risk perception measured with non-compliance-framed questions, but not with compliance-framed questions. de Andrade et al. (2019) did not measure risk perception of FBOs conditional on safety behaviour as we did. Therefore, the compliant FBOs in the study of de Andrade et al. (2019) might have perceived the food safety risk related to their own action as low since they complied with safety guidelines. Consequently, risk perception measurement that is not conditional on safety behaviour might not predict compliance.

Many FBOs considered that the grading was regionally inconsistent in Finland, despite the Oiva system including detailed grading guidelines. This is an alarming but not completely surprising finding since food control has also been described as inconsistent by FBOs of approved establishments in the previous study of Kettunen et al. (2017)

and by environmental health officers in the study of Läikkö-Roto et al. (2015) in Finland. Consistency in food control is a legal requirement (EC 882/2004) and perception of consistency is associated with perceived fairness and compliance (Son & Park, 2016). In addition, the disclosed grading results need to be consistent to be trustworthy and effective. Increased consistency could be assumed to increase the acceptability of the Oiva system among FBOs. In general, when the perceived fairness of processes is low it can increase opposition to negative outcomes of these processes (Brockner & Wiesenfeld, 1996). This kind of opposition should be avoided by increasing the fairness of the system. In the case of Oiva inspections, where the determination method is not supported by the majority of the FBOs, disagreements with grading are common and grading is perceived as inconsistent, there is a need to improve the perceived fairness of the system. Thus, solutions should be sought that increase the acceptability of the determination method of the inspection result without losing information relevant to consumers and that increase the perceived consistency of grading.

The response rate of the questionnaire study was low, which is not unusual (Kettunen et al., 2017; Mortlock, Peters, & Griffith, 1999). The lowest response rate was among service FBOs, which is surprising as disclosure of inspection results could be argued to affect service sector FBOs more than e.g. industry sector FBOs, with a clearly higher response rate. The total number of respondents was, however, high and represented widely different-sized food businesses. Most respondents' premises were small or medium-sized, representing the Finnish food sector, which is dominated by small and medium-sized enterprises (Official statistics of Finland, 2016). All of the respondents in the service and retail sectors and many respondents in the industry sector were members of interest organizations. Members of these organizations have access to guidelines compiled by the interest organizations and may thus have more knowledge and higher risk perception than non-members. Thus, the results should be generalized with caution.

In conclusion, this study shows that based on FBOs' opinions the disclosure system increases the correction of non-compliance. Many FBOs had, however, disagreed with the grading, which may decrease the acceptability of the disclosure system and possibly affect compliance. Our results show that FBOs' risk perception was associated with compliance and with the occurrence of disagreements, highlighting the importance of providing guidance to FBOs regarding food safety requirements. These results also demonstrate the relevance of proper justification from a food safety viewpoint of why a non-compliance should be corrected.

## Declarations of interest

None.

## Acknowledgements

The authors thank the FBOs for answering the questionnaire. This work was supported by the Ministry of Agriculture and Forestry of Finland (Makera grant number 1455/312/2015) and the Finnish Foundation of Veterinary Research.

## References

- Aalto-Araneda, M., Korkeala, H., & Lundén, J. (2018). Strengthening the efficacy of official food control improves *Listeria monocytogenes* prevention in fish-processing plants. *Scientific Reports*, 8(1), <https://doi.org/10.1038/s41598-018-31410-9>.
- Aik, J., Newall, A. T., Ng, L.-C., Kirk, M. D., & Heywood, A. E. (2018). Use of the letter-based grading information disclosure system and its influence on dining establishment choice in Singapore: A cross-sectional study. *Food Control*, 90, 105–112. <https://doi.org/10.1016/j.foodcont.2018.02.038>.
- Bavorova, M., Fietz, A. V., & Hirschauer, N. (2017). Does disclosure of food inspections affect business compliance? The case of Berlin, Germany. *British Food Journal*, 119(1), 143–163. <https://doi.org/10.1108/BFJ-02-2016-0061>.
- BMG research. *Display of food hygiene ratings in England, Northern Ireland and Wales*.



- (2018). [https://www.food.gov.uk/sites/default/files/media/document/Display%20of%20Food%20Hygiene%20Ratings%20in%20England%2C%20Wales%20%26%20Northern%20Ireland\\_0.pdf](https://www.food.gov.uk/sites/default/files/media/document/Display%20of%20Food%20Hygiene%20Ratings%20in%20England%2C%20Wales%20%26%20Northern%20Ireland_0.pdf) Accessed 25 February 2019.
- Brockner, J., & Wiesenfeld, B. M. (1996). An integrative framework for explaining reactions to decisions: Interactive effects of outcomes and procedures. *Psychological Bulletin*, 120(2), 189–208. <https://doi.org/10.1037/0033-2909.120.2.189>.
- da Cunha, D. T., Stedefeldt, E., & De Rosso, V. V. (2012). Perceived risk of foodborne disease by school food handlers and principals: The influence of frequent training. *Journal of Food Safety*, 32(2), 219–225. <https://doi.org/10.1111/j.1745-4565.2012.00371.x>.
- de Andrade, M. L., Rodrigues, R. R., Antongiovanni, N., & da Cunha, D. T. (2019). Knowledge and risk perceptions of foodborne disease by consumers and food handlers at restaurants with different food safety profiles. *Food Research International*, 121, 845–853. <https://doi.org/10.1016/j.foodres.2019.01.006>.
- de Freitas, R. S. G., da Cunha, D. T., & Stedefeldt, E. (2019). Food safety knowledge as gateway to cognitive illusions of food handlers and the different degrees of risk perception. *Food Research International*, 116, 126–134. <https://doi.org/10.1016/j.foodres.2018.12.058>.
- Djekic, I., Smigic, N., Kalogianni, E. P., Rocha, A., Zamioudi, L., & Pacheco, R. (2014). Food hygiene practices in different food establishments. *Food Control*, 39(1), 34–40. <https://doi.org/10.1016/j.foodcont.2013.10.035>.
- Dosman, D. M., Adamowicz, W. L., & Hrudefy, S. E. (2001). Socioeconomic determinants of health- and food safety-related risk perceptions. *Risk Analysis*, 21(2), 307–317. <https://doi.org/10.1111/0272-4332.212113>.
- EC 178/2002. Regulation (EC) No 178/2002 of the European Parliament and of the Council of 29 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. (2002). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32002R0178> Accessed 5 January 2019.
- EC 361/2003. Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises. (2003). <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:124:0036:0041:EN:PDF> EN:PDF Accessed 5 January 2019.
- EC 882/2004. Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules. (2004). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02004R0882-20190101> Accessed 5 January 2019.
- Fein, S. B., Lando, A. M., Levy, A. S., Teisl, M. F., & Noblet, C. (2011). Trends in U.S. consumers' safe handling and consumption of food and their risk perceptions, 1988 through 2010. *Journal of Food Protection*, 74(9), 1513–1523. <https://doi.org/10.4315/0362-028X.JFP-11-017>.
- FFA. Finnish Food Authority. The Finnish food safety authority Evira's order on obligation of the control authority to notify and provide information and publishing of the inspection results. (2016). <https://www.finlex.fi/fi/viranomaiset/normi/440002/42493> Accessed 5 February 2019.
- FFA. Finnish Food Authority. Approved establishment list. (2016). <https://www.evira.fi/elintarvikkeet/valmistus-ja-myynti/elintarvikehuoneistot/hyvaksytyt-elintarvikehuoneistot/laitokset/> Accessed 2 November 2016.
- FFA. Finnish Food Authority. Food safety control disclosure system Oiva. Evira guideline 10504/1. (2016). <https://www.ruokavirasto.fi/globalassets/yriytykset/elintarvikeala/elintarvikealan-yhteiset-vaatimukset/eviran-ohje-10504.pdf> Accessed 1 March 2019.
- FFA. Finnish food authority. Oiva evaluation guidelines for registered food premises. (2019). <https://www.oivahymy.fi/wp-content/uploads/2019/01/ieh-2019-eng-kooste-07012019.pdf> Accessed 15 January 2019.
- FFA. Finnish food authority. Oiva evaluation guidelines for approved food establishments. (2019). <https://www.oivahymy.fi/wp-content/uploads/2019/01/heh-2019-eng-kooste-7.1.2019.pdf> Accessed 15 January 2019.
- FFA. Finnish Food Authority. Zoonosis Centre. Statistics on reasons leading to food borne outbreaks. (2019). <https://www.ruokavirasto.fi/teemat/zoonosikeskus/ruokamyrkytykset/epidemioidin-johtaneet-kasittelyvirheet/> Accessed 5 February 2019.
- Filion, K., & Powell, D. A. (2009). The use of restaurant inspection disclosure systems as a means of communicating food safety information. *Journal of Foodservice*, 20, 287–297. <https://doi.org/10.1111/j.1748-0159.2009.00151.x>.
- Fleetwood, J., Rahman, S., Holland, D., Millson, D., Thomson, L., & Poppy, G. (2019). As clean as they look? Food hygiene inspection scores, microbiological contamination, and foodborne illness. *Food Control*, 96, 76–86. <https://doi.org/10.1016/j.foodcont.2018.08.034>.
- Food Act. Finnish food Act 23/2006, amendment 352/2011. (2011). [https://www.finlex.fi/en/laki/kaannokset/2006/en20060023\\_20110352.pdf](https://www.finlex.fi/en/laki/kaannokset/2006/en20060023_20110352.pdf) Accessed 4 February 2018.
- Fulponi, L. (2006). Private voluntary standards in the food system: The perspective of major food retailers in OECD countries. *Food Policy*, 31(1), 1–13. <https://doi.org/10.1016/j.foodpol.2005.06.006>.
- Gerber, B. J., & Neeley, G. W. (2005). Perceived risk and citizen preferences for governmental management of routine hazards. *Policy Studies Journal*, 33(3), 395–418. <https://doi.org/10.1111/j.1541-0072.2005.00122.x>.
- Griffith, C. J., Livesey, K. M., & Clayton, D. (2010). The assessment of food safety culture. *British Food Journal*, 112, 439–456. <https://doi.org/10.1108/00070701011034448>.
- HE 293. Government's proposal for the parliament for the amendments of the food act and veterinary act's sections 15 and 23. (2010). [https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Documents/he\\_293+2010.pdf](https://www.eduskunta.fi/FI/vaski/HallituksenEsitys/Documents/he_293+2010.pdf) Accessed 12 October 2018.
- Jin, G. Z., & Leslie, P. (2003). The effect of information on product quality: Evidence from restaurant hygiene grade cards. *Quarterly Journal of Economics*, 118(2), 409–451. <https://doi.org/10.1162/003355303321675428>.
- Kettunen, K., Lundén, J., Lääkkö-Roto, T., & Nevas, M. (2017). Towards more consistent and effective food control: Learning from the views of food business operators. *International Journal of Environmental Health Research*, 27(3), 215–229. <https://doi.org/10.1080/09603123.2017.1332351>.
- Kouabenan, D. R., & Nguetsa, R. (2016). Control beliefs and engagement in hygienic and safety behaviours: The case of foodborne illness. *International Journal of Environmental Health Research*, 26(4), 381–395. <https://doi.org/10.1080/09603123.2015.1119807>.
- Leisner, J. J., Lund, T. B., Frandsen, E. A., Andersen, N. B. E., Fredslund, L., Nguyen, V. P. T., & Kristiansen, T. (2014). What consumers expect from food control and what they get - a case study of the microbial quality of sushi bars in Denmark. *Food Control*, 45, 76–80. <https://doi.org/10.1016/j.foodcont.2014.04.017>.
- Luukkanen, J., & Lundén, J. (2016). Compliance in slaughterhouses and control measures applied by official veterinarians. *Food Control*, 68, 133–138. <https://doi.org/10.1016/j.foodcont.2016.03.033>.
- Lääkkö-Roto, T., Mäkelä, S., Lundén, J., Heikkilä, J., & Nevas, M. (2015). Consistency in inspection processes of food control officials and efficacy of official controls in restaurants in Finland. *Food Control*, 57, 341–350. <https://doi.org/10.1016/j.foodcont.2015.03.053>.
- Lääkkö-Roto, T., & Nevas, M. (2014). Restaurant business operators' knowledge of food hygiene and their attitudes toward official food control affect the hygiene in their restaurants. *Food Control*, 43, 65–73. <https://doi.org/10.1016/j.foodcont.2014.02.043>.
- Mortlock, M. P., Peters, A. C., & Griffith, C. J. (1999). Food hygiene and hazard analysis critical control point in United Kingdom food industry: Practices, perceptions, and attitudes. *Journal of Food Protection*, 62(7), 786–792. <https://doi.org/10.4315/0362-028X-62.7.786>.
- Nagin, D. S., & Telep, C. W. (2017). Procedural justice and legal compliance. *Annual Review of Law and Social Science*, 13(1), 5–28. <https://doi.org/10.1146/annurev-lawsoeci-110316-113310>.
- Newbold, K. B., McKeary, M., Hart, R., & Hall, R. (2008). Restaurant inspection frequency and food safety compliance. *Journal of Environmental Health*, 71(4), 56–61.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Official statistics of Finland. Regional statistics on entrepreneurial activity. (2016). [http://www.stat.fi/til/alyr/index\\_en.html](http://www.stat.fi/til/alyr/index_en.html) Accessed 4 March 2019.
- Phillips, M. L., Elledge, B. L., Basara, H. G., Lynch, R. A., & Boatright, D. T. (2006). Recurrent critical violations of the food code in retail food service establishments. *Journal of Environmental Health*, 68, 24–30.
- Ronis, D. L. (1992). Conditional health threats: Health beliefs, decisions, and behaviors among adults. *Health Psychology: Off. J. Div. Health Psychol. Am. Psychol. Assoc.* 11(2), 127–134. <https://doi.org/10.1037/0278-6133.11.2.127>.
- Schroeder, S. A., & Fulton, D. C. (2017). Voice, perceived fairness, agency trust, and acceptance of management decisions among Minnesota anglers. *Society & Natural Resources*, 30(5), 569–584. <https://doi.org/10.1080/08941920.2016.1238987>.
- Serapiglia, T., Kennedy, E., Thompson, S., & De Burger, R. (2007). Association of food premises inspection and disclosure program with retail-acquired foodborne illness and operator noncompliance in Toronto. *Journal of Environmental Health*, 70(1), 54–59.
- Shahid, N. S. M., & Whisson, J. (2012). Effectiveness of the Tees Valley food hygiene award scheme towards food business operators and consumers in the middleborough district. *Procedia Soc. Behav. Sci.* 49(C), 368–380.
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280–285. <https://doi.org/10.1126/science.3563507>.
- Son, J.-Y., & Park, J. (2016). Procedural justice to enhance compliance with non-work-related computing (NWRC) rules: Its determinants and interaction with privacy concerns. *International Journal of Information Management*, 36(3), 309–321. <https://doi.org/10.1016/j.ijinfomgt.2015.12.005>.
- Taylor, W. D., & Snyder, L. A. (2017). The influence of risk perception on safety: A laboratory study. *Safety Science*, 95, 116–124. <https://doi.org/10.1016/j.ssci.2017.02.011>.
- Tyler, T. R., & Huo, Y. J. (2002). *Trust in the law: Encouraging public cooperation with the police and courts*. New York: Russell Sage Foundation.
- Van Der Pligt, J. (1998). Perceived risk and vulnerability as predictors of precautionary behaviour. *British Journal of Health Psychology*, 3(1), 1–14. <https://doi.org/10.1111/j.2044-8287.1998.tb00551.x>.
- Wong, M. R., McKelvey, W., Ito, K., Schiff, C., Jacobson, J. B., & Kass, D. (2015). Impact of a letter-grade program on restaurant sanitary conditions and diner behavior in New York city. *American Journal of Public Health*, 105(3), 81–87. <https://doi.org/10.2105/AJPH.2014.302404>.
- Yapp, C., & Fairman, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: Implications for regulatory and enforcement strategies. *Food Control*, 17(1), 42–51. <https://doi.org/10.1016/j.foodcont.2004.08.007>.
- Zanin, L. M., da Cunha, D. T., Stedefeldt, E., & Capriles, V. D. (2015). Seafood safety: Knowledge, attitudes, self-reported practices and risk perceptions of seafood workers. *Food Research International*, 67, 19–24. <https://doi.org/10.1016/j.foodres.2014.10.013>.