Work environment factors and respiratory complaints in Norwegian Cooks

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Abstract

Purpose

Norwegian cooks exhibit relatively high mortality, particularly from respiratory diseases. Both occupational hazards and lifestyle factors have been suggested as possible explanations. Negative health effects from exposure to cooking fumes are well documented in non-Western populations, and it has been claimed that cooking fumes in Western style cooking might be substantially different. We hypothesise that exposure to cooking fumes contributes to respiratory diseases also in professional cooks in Western countries.

The aim of this study was to elucidate if specific work environment factors related to cooking fume exposure are determinants for respiratory morbidity in Norwegian cooks.

Methods

We surveyed specific work environment factors and respiratory complaints in 553 subjects that were currently working as skilled cooks. Inclusion was based on the register of people that had graduated as skilled cooks in central Norway between 1988 and 2008. Determinants for the occurrence of respiratory complaints were explored by logistic regression.

Results

Overall, 17.2 % of subjects reported respiratory complaints at work, while 8.1 % had chronic bronchitis. Those who performed frying for over half of their workday exhibited an increased odds ratio for having chronic bronchitis of 2.5 (95 % C.I.: 1.2 – 5.3). Using gas for frying and using a fryer in the kitchen were also related to the occurrence of respiratory complaints.

Conclusions

This study in Norwegian cooks demonstrates a relationship between the extent of frying and the occurrence of work-related respiratory complaints. Therefore, reducing exposure to cooking fumes could reduce respiratory complaints in cooks, and potentially help alleviate excess morbidity and mortality in this occupation.

Keywords: occupational health, air pollution, exposure, cooking fumes, respiratory symptoms, respiratory morbidity, chronic bronchitis, work related, hospitality industry.

Introduction

Worldwide, respiratory symptoms and alterations in lung function have been observed in cooks (Adewole et al. 2013; Arbex et al. 2007; Juntarawijit and Juntarawijit 2017; Svendsen et al. 2003; Wong et al. 2011). Furthermore, several investigations have reported increased mortality and work disability (Borgan 2009; Coggon et al. 2010; Coggon et al. 1986; Coggon and Wield 1993; Coggon and Wield 1995; Foppa and Minder 1992; Johnson et al. 1999; Lund and Borgan 1987). A Norwegian report on mortality by occupation showed that cooks had one of the lowest life expectancies of all occupations nationwide, and exhibited a particularly high mortality from respiratory disease (Borgan 2009). In 2006, exposure to cooking fumes from high-temperature frying was categorized by the International Agency for Research on Cancer (IARC) as probably carcinogenic to humans (IARC 2010). However, this IARC statement is primarily based on investigations from non-Western countries. In fact, it has been claimed that the type of cooking fumes in Asian kitchens are substantially different from that of Western kitchens (Wong et al. 2011; Zhao et al. 2007a; Zhao et al. 2007b). Furthermore, some authors claim that the observed high mortality rate in Western cooks is rather caused by lifestyle factors (Coggon and Wield 1995; Kjaerheim and Andersen 1993; Kjaerheim et al. 2010).

In both Western and Asian style cooking, high-temperature food preparation generates air pollution that consists of ultrafine aerosols of fatty acids, aldehydes, and other harmful substances (Sjaastad et al. 2010; Sjaastad and Svendsen 2008; Sjaastad and Svendsen 2009; Svendsen et al. 2002; Thiebaud et al. 1995; Vainiotalo and Matveinen 1993). Previous investigations in Asia have indicated that exposure to cooking fumes at work is associated with rhinitis (Ng and Tan 1994), respiratory symptoms (Juntarawijit and Juntarawijit 2017),

impaired pulmonary function (Wong et al. 2011), and increased urinary excretion of 8-hydroxydeoxyguanosine, a marker for oxidative DNA damage (Ke et al. 2009). A previous study from Norway observed an increased occurrence of dyspnoea and work-related respiratory symptoms in cooks (Svendsen et al. 2003). An increased occurrence of both respiratory symptoms and altered pulmonary function were observed in a recent study from Nigeria (Adewole et al. 2013).

We hypothesise that exposure to cooking fumes contributes to respiratory diseases also in professional cooks in Western countries.

The aim of this study was to elucidate whether specific work environment factors related to the extent and intensity of cooking fume exposure are determinants for work-related respiratory symptoms and chronic respiratory morbidity in Norwegian cooks.

Methods

Study design

This study was performed within a cohort of skilled cooks in the central region of Norway. Information on work environment, lifestyle factors, and health issues (including respiratory complaints), was obtained via a mailed self-administered questionnaire.

Study population

The educational authorities of three counties in central Norway provided the names and 11-digit personal identification numbers of 2,082 subjects that had qualified as cooks between the years 1988 and 2008. We aimed to invite these individuals to join a cohort of cooks for the purpose of elucidating work environment factors, work sustainability, and occupational health in the profession. Since postal addresses could not be found for 155 subjects, 11 had emigrated, and 4 were deceased, a total of 1,912 people were invited to participate in the present study. Among these, 894 (46.8 %; 540 females and 354 males) agreed to participate and answered the mailed questionnaire. Additional background data on the cohort, including recruitment year and specific education level, is available in another publication (Svedahl et al. 2016). In the present study, we included all those who were still working as cooks when answering the questionnaire, yielding a study sample of 553 respondents (330 females and 223 males), of whom 21.5 % were current smokers, and 5.6 % stated to drink more than 10 units of alcoholic beverages per week. The mean age of participants when they qualified as cooks was 22.1 years (SD 0.5), and was 33.2 years (SD 7.8) when answering the questionnaire.

Independent variables

The independent variables were different exposure categories from the section of the questionnaire that inquired about work environment factors that are considered to influence the individual exposure to cooking fumes at the subjects' current workplaces. These included "frying for more than half of the workday", "use of gas for frying", "use of gas in the kitchen", "use of butter for frying", and "use of fryer in the kitchen". The term frying refers to performing frying using a plate, frying pan, or grill, and the subjects were instructed to report the time they spent frying in average during a month's work. While an increased length of time with such frying activity evidently increases the occupational exposure to cooking fumes, the use of gas for frying, and having a fryer in the kitchen are two other work environment factors presumed to entail the highest increase in occupational exposure to cooking fumes. The use of gas in the kitchen was also included, as it has also been used in other studies. Furthermore, the use of butter for frying was included since we have previously in an experimental study found somewhat higher levels of air pollutants when using solid fat compared to other oils for frying (Sjaastad and Svendsen 2008). To explore how the occurrence of respiratory complaints were related to both the use gas for frying and the extent of frying, the subjects were divided into the following four groups: 1) those who performed frying for less than half of the workday without gas, 2) those who performed frying less than half the workday with gas, 3) those who performed frying more than half the workday without gas, and 4) those who performed frying more than half the workday with gas.

Dependent variables

The dependent variables used were "chronic bronchitis", defined by the Medical Research Council as having had daily productive cough for over three months for at least two

consecutive years (Stuart-Harris et al. 1965), and “work-related respiratory complaints”, when respondents reported to have had respiratory complaints at work. Subgroups of different types of work-related respiratory complaints included: “Dry cough”, “Phlegm”, “Heavy breath”, and “Wheezing”. The final subgroup of respiratory complaints was respiratory complaints at work that show improvement during vacations and weekends, which will be referred to as “improvement when off work”.

Statistical analysis

All statistical analyses were performed with IBM SPSS Statistics version 23. Determinants for respiratory complaints were investigated with logistic regression adjusted for age, sex, alcohol and smoking. Those reporting to have a specific work environment factor was analysed with those not having the factor as reference. When comparing groups 1 – 4, group 1 was chosen as the reference, as it was expected to exhibit the lowest accumulated exposure to cooking fumes. Smoking status was divided in four categories: 1) never smokers, 2) quitted smoking more than 1 year ago, 2 quitted smoking more than 3 months, but less than 1 year ago, 4 currently smoking or quitted within last 3 months. Alcohol consumption was divided in following four categories: 1) abstainers. 2) drinking less than 1 unit per week. 3) drinking 1 – 10 units per week, 4) drinking more than 10 units per week. There were 31 subjects (5.6 %) reported to have been diagnosed with a respiratory disease by a physician prior to graduating as a cook. Of them, 26 subjects reported asthma, 2 reported chronic bronchitis, and 3 reported “other respiratory disease”. They were excluded from the statistical analyses, alongside 15 subjects who had not responded to the question regarding previous airway disease.

Results

Table 1 presents the distribution of the independent variables across the different workplaces, which are divided into four types of kitchens; i) Institution cantina, ii) A la carte / ethnic, iii) Hotel, and iv) Other. It is evident that the extent of frying time varied between different kitchen types. Over 50 % of cooks in a la carte restaurants performed frying for over half of their workday, while such extensive frying was reported by less than 10 % of cooks in institutions and cantinas.

[Please insert table 1 here]

In the group of 553 respondents included in the present study, 95 (17.2 %) reported respiratory symptoms at work. Among them, 27.7 % had daily or almost daily symptoms, while 60 % had symptoms that improved when off work. Overall, 45 subjects (8.1 %) had chronic bronchitis. The unadjusted occurrences of respiratory complaints at work, improvements when off work, and chronic bronchitis in relation to the surveyed work environment factors for the 553 cooks who were included in the present study are shown in Table 2. As demonstrated at the end of table 2, the share that stated to have had respiratory complaints at work, improvements when off work, and chronic bronchitis did not change substantially when looking at all the 894 cooks in the original cohort, (thus including those who had quit work as cook before responding to the survey,).

[Please insert table 2 here]

The group of cooks that performed frying for over half of their workday displayed the highest shares of both “respiratory complaints at work”, “improvement when off work”, and chronic bronchitis. For some specific subgroups of respiratory complaints, the highest shares were observed among those working in kitchens where a fryer was used. Those who used gas when frying displayed the second highest share of chronic bronchitis. The occurrence of chronic bronchitis in groups 1 – 4 is presented in Figure 1, and here the highest share of chronic bronchitis is found among those who both used gas when frying and performed frying for over half of their workday (group 4).

Figure 2 presents odds ratios for the prevalence of different respiratory complaints in relation to the independent variables, as determined by logistic regression adjusted for age, sex, alcohol consumption, and smoking in the 509 subjects without previous airway disease. Cooks who spent over half of their workday frying food using a plate, frying pan, or grill, showed an increased odds ratio for having chronic bronchitis of 2.2 (95 % C.I.: 1.1 – 4.8) and for heavy breath at work of 2.3 (95 % C.I.: 1,0 – 5.5) and an odds ratio for improvement when off work of 1.6 (95 % C.I.: 0.8-3.3) compared to those who spent less than half of their workday performing such activities. Those who used gas for frying exhibited an increased odds ratio for having chronic bronchitis of 2.4 (95 % C.I.: 1.1-5.2) compared to those using electricity for frying; however, no significant differences were observed in the occurrence of other respiratory symptoms. Furthermore, those working in kitchens using a fryer exhibited an increased risk for respiratory complaints at work compared to those working in kitchens without fryers, with odds ratios of 2.7 (95 % C.I.: 1.2 – 6.4) for heavy breath, 2.9 (95 % C.I.: 1.1 – 7.3) for phlegm, and 1.9 (95 % C.I.:1.1 – 3.3) for any type of respiratory complaint at work.

The odds ratio of respiratory complaints in groups 2, 3 and 4 as compared to group 1, is also presented in figure 2. Group 4 exhibited an increased odds ratio for chronic bronchitis of 4.9 (95 % C.I.: 1.7 – 13.8) and an odds ratio for having had respiratory symptoms at work of 2.05 (95 % C.I.: 1.04 – 4.04). The odds ratio for chronic bronchitis was 2.3 (95 % C.I.: 0.9 – 6.1) in group 2, and 2.8 (95 % C.I.: 0.9 – 8.8) in group 3.

Discussion

To our knowledge, this is the first study to demonstrate a positive relationship between the extent of frying and respiratory complaints in professional cooks from a Western country. Upon analysing Figure 2, it is evident that work environment factors that in our study were presumed to entail the highest increase in occupational exposure to cooking fumes also exhibited the strongest associations with increased occurrence of respiratory complaints. As such, adverse effects from exposure to cooking fumes in professional kitchens seem to be the most likely explanation for these observations. The use of gas for frying has been shown to increase the level of air pollution in kitchens, and performing frying for over half of the workday also inevitably increases accumulated workday exposure to cooking fumes, and based on the pattern observed in Figure 1, a dose-response relationship could be assumed between the accumulated exposure to cooking fumes and the occurrence of chronic bronchitis; however, these are unadjusted numbers, and the available data are not sufficient to confirm this point. Notably, the estimated odds ratio for chronic bronchitis follows a similar pattern, with the highest odds ratios being observed in those presumed to have the highest accumulated exposure to cooking fumes (group 4). While moderately increased odds ratios were observed in group 2 and 3, the increase did not reach statistical significance in the two latter groups. For some of the categories, the analysis is based on few cases, which make the results uncertain, as reflected by the relatively large confidence intervals shown in figure 2.

Alongside associations with specific work patterns, the large proportion who experienced improvements when off work provide further reasons to suspect that work environment factors contribute to their morbidity. A previous study on the usefulness of questionnaire items in identifying subjects with occupational asthma determined that reporting

improvements of symptoms when off work was a good indicator of work-relatedness (Vandenplas et al. 2005).

In some publications from Europe it has been claimed that lifestyle factors such as high alcohol intake and smoking represent alternative explanations for the observed increase in morbidity of cooks (Coggon and Wield 1995; Kjaerheim et al. 2010). However, information on such factors has often been scarce or missing. Two studies from Norway have indicated that alcohol intake among cooks is similar to the average population (Kjaerheim and Andersen 1993). Our statistical analyses were adjusted for smoking and alcohol, and we doubt that other lifestyle factors have decisively biased the observed association between the extent of frying and respiratory complaints.

In our study, specific work environment factors related to individual exposure to cooking fumes showed substantial variation between individual cooks and workplaces. This implies a need to retrieve information on specific work environment factors when attempting to elucidate occupational health issues.

In lack of a dedicated control group for our cooks, we compared our results with an investigation of the general working population in Norway. Based on a 2009 investigation by Statistics Norway, we estimate that approximately 2 % of all respondents in that study experienced work-related respiratory complaints within the last year (Aagestad et al. 2011). Despite some methodological differences, we find it fair to say that our cooks exhibited more work-related respiratory symptoms than the general working population.

Our data are prone to both systematic and random errors associated with the applied epidemiological methods, including selection bias, and a risk of information bias associated with the use of a questionnaire to obtain data on both independent and dependent variables. We attempted to reduce the risk of selection bias by including all those who graduated as cooks over a certain period. To explore the possibility of selection bias, we conducted a non-responder survey. Of the 46 non-respondents who we reached by phone, only half were still working as cooks – compared to 62 % of respondents who were working as cooks. Although the differences seem minor, it is possible that subjects who were content with their vocation as a cook were more prone to respond to the survey than those who were less content. Despite this point, we do not find reason to assume that respondents experience elevated respiratory complaints compared to non-respondents; therefore we do not believe that selection mechanisms decisively biased the observed risk estimates.

In order to assess their appreciation of and current complaints at their current workplaces, we restricted our study sample to those still working as cooks. This exclusion of all subjects who had left the profession at the time of the survey may result in another source of selection bias. However, based on our previous investigation on work sustainability in the same cohort, it seemed that few subjects had quit their profession due to respiratory complaints (Svedahl et al. 2016). The prevalence of respiratory complaints in our restricted study sample of 553 cooks were also quite similar to that of the original cohort of all 894 cooks. However, it remains possible that our data suffered from such biases that, in case, would lead to an underestimation of the observed associations between the specific work environment factors and the occurrence of respiratory complaints.

The risk of information bias could represent a more insidious source of error, entailing the risk that the subjects' own perceptions of possible association have an impact on their responses. Since those included in the study were still working as cooks, and the questions regarding work environment factors were concrete and comprehensible, we assume that the subjects were able to answer these questions correctly. The distribution of the different work environment factors show an expected variation by type of kitchen, which further indicate that these data have a high validity. However, there is still a risk that some subjects might be prone to choose more extreme options when answering surveys, and they might thus be prone to overreport both their symptoms and their work environment factors, while those subjects who are more prone to choose less extreme options when answering surveys might tend to underreport both their own symptoms and their working environment factors. Such mechanisms might bias the results towards false associations (Kristensen 2005). Considering the different sources of potential errors, our findings regarding associations between specific work environment factors and respiratory complaints needs to be confirmed by further investigations on this topic.

All outcome variables applied were related to respiratory complaints; therefore, it might have been appropriate to fit a multivariate statistic model to this data. However, we chose to separately test each outcome variable, as it is likely easier to comprehend. Additionally, we have not included any corrections for multiple testing; thus, the possibility of random findings is not ruled out. It is hoped that the forest plot (Figure 2) could aid in sound data visualisation and interpretation, taking into account the aspects of multiple testing, statistical power, and the magnitude and direction of the estimates.

By linking the extent of exposure to cooking fumes with the occurrence of respiratory complaints in cooks, our findings substantiate a connection between existing knowledge regarding the hazardous contents of cooking fumes and the reported respiratory morbidity in cooks. All in all, our results lend support to the hypothesis that exposure to cooking fumes negatively affects the health of cooks, and underline the need for preventive measures.

Conclusions

This study of Norwegian cooks demonstrates a relationship between the extent of frying and the occurrence of work-related respiratory complaints. Our findings also indicate that work-related respiratory complaints are likely prevalent in Norwegian cooks. When considered alongside previous studies, our results raise further awareness regarding the importance of preventive measures in professional kitchens also in the western part of the world.

Compliance with Ethical Standards

Funding

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Conflict of interest

The authors declare that they have no conflicts of interests

Ethics

The study protocol was approved by the Regional Committee for Medical Research Ethics in central Norway (approval No. 2008/2527). Signed informed consents were obtained from each participant.

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Table 1. Kitchen types and work environment factors at the workplaces of 553 Norwegian cooks.

Kitchen type		Work environment factor				
		Frying more than half the workday	Use of gas for frying	Use of gas in the kitchen	Use of butter for frying	A fryer is being used in the kitchen
	N	%	%	%	%	%
Institution / cantina	310	8.8	14.5	28.4	39.7	24.1
A la carte / ethnic	117	56.4	64.3	70.2	53.0	80.2
Hotel	94	26.6	65.9	72.5	63.8	72.3
Others	32	22.6	16.7	23.3	32.3	38.7
All	553	22.6	32.2	42.0	46.1	44.7

Table 2. An overview of the proportion of subjects with respiratory complaints at work, those with improvement from respiratory complaints during weekends and vacations, and those with chronic bronchitis, both in relation to various work environment factors and in total for the 553 cooks included in the study, and in total for all 894 cooks in the original cohort.

			Respiratory symptoms at work					Improvement during weekends/ vacations	Chronic bronchitis	
			Any type	Dry cough	Phlegm	Heavy breath	Wheezing			
		n	%	%	%	%	%	%	%	(m)
Frying > half day	Yes	**125**	**22.4**	**9.6**	**7.2**	**9.6**	**3.2**	**15.2**	**12.8**	
	No	**426**	**15.7**	**9.6**	**4.9**	**5.6**	**3.1**	**8.9**	**6.9**	**(8)**
Gas for frying	Yes	**178**	**18.0**	**7.3**	**6.2**	**7.3**	**1.7**	**10.1**	**11.2**	**(2)**
	No	**339**	**17.1**	**10.6**	**5.0**	**6.5**	**3.5**	**10.9**	**6.3**	**(6)**
Gas in the kitchen	Yes	**232**	**16.8**	**6.9**	**5.6**	**7.3**	**1.7**	**9.9**	**9.9**	**(2)**
	No	**282**	**18.1**	**11.3**	**5.3**	**6.0**	**3.9**	**11.3**	**6.5**	**(4)**
Butter for frying	Yes	**256**	**19.5**	**9.4**	**5.9**	**7.0**	**3.1**	**11.3**	**8.8**	**(6)**
	No	**297**	**15.2**	**9.8**	**5.1**	**6.1**	**3.0**	**9.4**	**7.8**	**(2)**
Use of fryer	Yes	**248**	**21.8**	**11.7**	**8.5**	**8.5**	**4.0**	**13.3**	**9.3**	**(3)**
	No	**301**	**13.6**	**8.0**	**3.0**	**5.0**	**2.3**	**8.0**	**7.4**	**(5)**
All subjects		**553**	**17.2**	**9.6**	**5.4**	**6.5**	**3.1**	**10.3**	**8.1**	**(8)**
Original cohort		**894**	**16.7**	**9.3**	**5.2**	**5.9**	**3.4**	**9.2**	**8.8**	**(35)**

(n) = Number of subjects reporting to have (Yes) or not have (No) the specific work environment factor.

(m) = Number of subjects with missing data for the question regarding chronic bronchitis.

Figure legends

Figure 1. Occurrence of chronic bronchitis in 553 Norwegian cooks in relation to the extent of frying and the use of gas for frying.

Figure 2. Odds ratios for respiratory complaints in relation to specific work environment factors in 509 Norwegian cooks, as determined by logistic regression analysis.

Appendix

Table of variables (Supplementary online material?)

Variable (number) and name	Frequencies Number (%)	Definition, by its relation to the appropriate question in the questionnaire. *Further explanation.*	Question (number) text and reply options.*
Independent variables			
Currently working as a cook		Responding [yes] to question 1.	(1) Are you working as a cook? ☐ Yes ☐ No
Current workplace (1,1) Institution / Cantina (1,2) A la carte / ethnic (1,3) Hotel (1,4) Others		Responding [yes] to question 1, and made following specifications of workplace in question 6: (1,1) = All who selected [Institution] or [Cantina] (1,2) = All who selected [A la carte] or [Ethnic] (1,3) = All who selected both [Hotel] (1,4) = All who selected [Fastfood], [Pizza restaurant] or [ethnic restaurant].	(6) What type of kitchen are you currently working at? ☐ A la carte ☐ Fastfood ☐ Pizza restaurant ☐ Institutional kitchen ☐ Hotel kitchen ☐ Cantina

			☐ Ethnic restaurant (Chinese, Indian etc)
(2) Frying more than half the work day		Responding [more than half the workday] to question 12.	(12) How much of your work day do you perform frying on plate/grill/frying pan? (In average through one month's work) ☐ More than half of the time ☐ Less than half the time ☐ I do not perform frying on plate/grill/frying pan.
(3) Using gas for frying		Responding [yes] to question 16.	(16) Are gas used when frying? ☐ Yes ☐ No
(4) Using gas in the kitchen		Responding [yes] to question 16 and/or 19.	(19) Are gas used as a source of energy for

			cooking other than frying? ☐ Yes ☐ No
(5) Using butter for frying		Responding [butter] or [combination of oil and butter] on question 15.	(15) What kind of cooking fat are used the most? (Tag one option) ☐ Vegetable oil ☐ Butter ☐ Margarine ☐ Combination of oil and butter
(6) Use of fryer		Responding [yes] to question 20.	(20) Is a fryer used in the kitchen? ☐ Yes ☐ No
Dependent variables			

(1) Any type of respiratory symptoms at work		Responding [yes] to question 35.	(35) Have you experienced airway complaints in relation to the work? ☐ Yes ☐ No ☐ Do not know
(1,1) Dry cough (1,2) Phlegm (1,3) Heavy breath (1,4) Wheezing		Responding [yes] to question 35, and made following specifications of symptoms in question 36: (1,1) = All who selected [Dry cough] (1,2) = All who selected [Phlegm] (1,3) = All who selected [Heavy breath] (1,4) = All who selected [Wheezing] *Subgroups of work related respiratory complaints. Those who responded that they had experienced airway complaints in relation to work, were asked which specific airway symptoms*	(36) If yes, what kind of airway complaints? ☐ Productive cough ☐ Dry cough ☐ Heavy breath ☐ Wheezing ☐ Other
(1,5) Daily/almost daily (1,6) Every week		Responding [yes] to question 35, and made following specifications on the frequency of such symptoms in question 37: (1,4) = All who selected [Daily/almost daily]. (1,5) = All who selected [Every week].	(37) How often do you experience such complaints? ☐ Daily or almost daily ☐ Every week ☐ 1-2 times per month ☐ More seldom

(1,7) Improvements during weekends and vacation		Responding [yes] to question 35, and question 38.	(38) Do you get better from your respiratory distress during weekends / holidays? ☐ Yes ☐ No ☐ Do not know:
(2) Chronic bronchitis		Responding [yes] to question 39, regardless of the answers to other questions.	(39) Have you experienced daily productive cough for more than 3 months per year in at least two consecutive years? ☐ Yes ☐ No
(3) Pre-existing respiratory disease.		Responding [yes] to question 40, regardless of the answers to other questions.	(40) Have you been diagnosed with a disease in the airways by a doctor before you started working as a cook? ☐ Yes ☐ No ☐ Do not know

(4) Specification of previous respiratory disease (4,1) Pre-existing asthma	26	Responding [yes] to question 40, and specifying which disease by answering question 41. (4.1) = Selecting [asthma] on question 41.	(41) If yes, what kind of disease? (Tag one or more options) ☐ Asthma ☐ Chronic bronchitis ☐ COPD ☐ Other
(4) Exacerbation at work		Responding [yes] to question 40, and question 42.	(42) Have you experienced any aggravation of airway disease(s) related to work as cook? ☐ Yes ☐ No ☐ Do not know

Translated versions, questionnaire is in Norwegian.

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