



## “Corona Cooking”: The interrelation between emotional response to the first lockdown during the COVID-19 pandemic and cooking attitudes and behaviour in Denmark

Klaus G. Grunert<sup>a,b,\*</sup>, Meike Janssen<sup>c</sup>, Rikke Nyland Christensen<sup>a</sup>, Lauranna Teunissen<sup>d</sup>, Isabelle Cuykx<sup>d</sup>, Paulien Decorte<sup>d</sup>, Lucia A. Reisch<sup>c,e</sup>

<sup>a</sup> MAPP Centre, Department of Management, Aarhus University, Denmark

<sup>b</sup> School of Marketing and Communication, University of Vaasa, Finland

<sup>c</sup> Consumer and Behavioural Insights Group at the Department of Management, Society and Communication, Copenhagen Business School, Denmark

<sup>d</sup> Department of Communication Sciences, University of Antwerp, Belgium

<sup>e</sup> EL-Erian Institute of Behavioural Economics and Public Policy, University of Cambridge, POLIS, United Kingdom

### ARTICLE INFO

#### Keywords:

Attitudes toward cooking  
Cooking behaviour  
Behavioural change  
Emotional response  
COVID-19 pandemic

### ABSTRACT

For this study, the authors measured attitudes toward shopping for food and cooking, before and during the first lockdown due to the COVID-19 pandemic, among a sample of 526 Danish consumers, using an online survey. To analyse changes due to the lockdown, they applied a latent class Markov model, which revealed four states: middle of the road, love cooking (and like shopping), like shopping and cooking, and do not like shopping or cooking. In estimating transition probabilities, the findings reveal that most respondents remained in the same state before and during the lockdown, but those that changed were more likely to exhibit relatively higher liking of shopping and cooking. These states also reflect variations in people's food literacy and self-reported food consumption. Finally, respondents with stronger negative emotional reactions to the lockdown were more likely to change their states.

## 1. Introduction

### 1.1. The COVID-19 pandemic and consumer behaviour

During the COVID-19 pandemic in 2020, urban lockdowns were enforced in most countries worldwide, restricting many people's ability to shop, dine in restaurants, or go to work or school; gyms, museums, churches, and other public places often remained closed for several weeks. The aim of such measures was to reduce the chance of contact with others and slow the spread of the virus. Such sheltering at home led to major behavioural changes, particularly with regard to food shopping, procurement, cooking, and eating. That is, the coronavirus forced consumers to get used to the idea of cooking and eating most meals at home, which triggered some widely divergent reactions. Some consumers seemingly rediscovered the pleasure of cooking; others quickly grew tired of the routine or simply maintained their existing attitudes, according to preliminary evidence gathered in the United States (Acosta Market Research Report, 2020) and a few European countries (EIT Food,

2020).

In Denmark, COVID-19 restrictions similarly drove daily work and personal lives online, such that consumers engaged in more online shopping and interactions with colleagues, friends, and family. Compared with other countries though, Denmark's restrictions were relatively less intrusive; for example, restaurants remained closed only from mid-March to mid-May, and Danish schoolchildren were among the first in Europe to go back to school, as early as mid-April. Furthermore, Denmark was one of the last countries in Europe to enforce mask-wearing mandates for public transport and crowded places like shopping centres (October 2020). The weeks with the strictest lockdown measures spanned from mid-March to mid-April 2020, when a gradual re-opening began. This relatively short timespan facilitates our research effort to identify potential shifts in attitudes and behaviours near the end and right after the strictest lockdown weeks, as well as put the results into perspective relative to the time before the pandemic.

For many households, the dual challenge of home-schooling children and working remotely constituted a highly disruptive experience.

\* Corresponding author at: MAPP Centre, Department of Management, Aarhus University, Fuglesangsallé 4, 8210 Aarhus V, Denmark.  
E-mail address: [klg@mgmt.au.dk](mailto:klg@mgmt.au.dk) (K.G. Grunert).

Within a few weeks, they had to develop new practices and schedules with regard to working, care work, shopping, cooking, and sharing meals and chores. Many consumers thus experienced substantial anxiety in spring 2020, though others noted their sense of relief, due to the removal of time-pressured daily routines and expectations. Whether negative or positive, such emotional responses had notable impacts on food-related attitudes and, eventually, behaviours. Arguably, changes in food-related consumer behaviours, due to the COVID-19 pandemic, could also act as a catalyst of the transition of global food systems to greener, more sustainable food supply chains (Bisoffi et al., 2021). Therefore, as a novel contribution to rapidly growing research into how the pandemic struck private households, we pursue a specific research goal: to investigate whether (negative) emotional responses toward lockdown-induced confinement influenced respondents' (negative and positive) attitudes toward cooking, in which direction, and among whom.

### 1.2. COVID-19 induced changes in the light of habit formation and breaking

Meal preparation (shopping and cooking) and eating are self- and role-defining social practices that define physical and social relationships in households. They reflect the external environment (availability, accessibility, affordability), individual preferences, and social and cultural norms and practices (Halkier et al., 2011). From a sociological perspective, food choices inform social aspects of life, by expressing people's preferences, identities, and cultural meanings (Murcott, 2019). Much of what, when, and how people eat and prepare meals is based on routines and habits (van Riet et al., 2011). In such settings, as research on habit formation and habit breaking notes, external or internal shocks or lifestyle disruptions can be "windows of opportunity" to initiate and sustain behavioural change (Verplanken & Aarts, 1999). We predict that COVID-19 represents just such a disruptive event, which might disrupt habits and even contribute to lasting behavioural change (Bisoffi et al., 2021; Janssen et al., 2021; Sheth, 2020), including shifts toward more sustainable consumption. In particular, home-cooking "from scratch" has gained growing social attention (and praise), due to its potential promise (even if not always met) for offering healthier, more sustainable, less wasteful, more environmentally friendly diets that increase well-being, food literacy, and food sovereignty (SAPEA, 2020). Thus, in parallel with our specific focus, we seek indications of behavioural mechanisms and levers for behavioural change in the food domain that might help predict or influence consumption patterns toward more sustainable and healthy diets.

The scenario in spring 2020 in Denmark was comparable to an unplanned natural experiment, in which the intervention was a sudden, inescapable, external shock that profoundly and unexpectedly altered the availability and accessibility of foods in conventional food environments. It remains too early to measure the long-term effects or predict the characteristics of a "post-COVID world," but we can compare the trajectories of people's attitudes and behaviour before and after the lockdown. Food environments have substantial impacts on what and how consumers cook and eat, as well as how they think about food (Herforth & Ahmed 2015). Accordingly, we expect a profound impact of sudden environmental changes and living conditions on food-linked variables.

## 2. Material and methods

### 2.1. Sample and data collection

Data were collected with an online questionnaire, distributed to people at least 20 years of age and living in Denmark, by an established online panel provider. The data collection was part of a larger, international study on how the COVID-19 pandemic and resulting lockdowns affected food-related consumer behaviour in 38 countries worldwide

(De Backer et al., 2021). In Denmark, quota sampling for age, gender, and level of education was applied. The final sample thus reflects the composition of the Danish population in terms of gender and education (Table 1), though older age groups and retired people are over-represented and middle age groups are underrepresented. Of 803 participants who initially completed the survey, 277 (35.5% of the initial sample) were excluded because they failed three attention-check questions, leaving a final sample of 526 valid responses, sufficient for the model we apply, according to evidence from prior simulation studies (Nylund et al., 2007; Tein et al., 2013). The median time that participants needed to complete the questionnaire was 31 min, 30 sec; the minimum time was 6 min, 4 sec. By completing the questionnaire, the respondents earned points that the panel provider awarded, which they could exchange for rewards.

The data collection efforts in Denmark took place between April 30 and May 14, 2020, when Denmark had just begun to reopen primary schools, daycare institutions, and retail and service outlets, though it formally remained in a lockdown phase. Table 2 contains an overview of the lockdown measures in place in Denmark during spring 2020.

### 2.2. Measures

Table 3 lists the main constructs that the questionnaire measured. The items related to people's attitudes toward food shopping and cooking, food literacy, shopping and cooking behaviours, and food consumption appeared twice in the questionnaire, referring to the time periods before the lockdown and during the lockdown. For example, an item asking "Before the lockdown, food shopping was..." might be followed later by "At this moment, food shopping is..." In addition to the constructs in Table 3, the questionnaire contained demographic measures, along with several food-related issues not relevant for this study. The study protocol and full questionnaire can be accessed via <https://osf.io/nz9xf/files/>.

### 2.3. Analysis

We analyse changes in attitudes toward food shopping and cooking, from before the lockdown (T0) to during the lockdown (T1), with a hidden Markov model (Vermunt, 2004; for prior consumer behaviour applications, see Juhl et al., 2017; Netzer et al., 2008; Poulsen, 1990). A hidden Markov model combines latent class analysis (Lazarsfeld & Henry, 1968) and Markov models (Ehrenberg, 1965). Latent class analyses applied to consumer behaviour assume that consumers belong to

**Table 1**  
Socio-demographic composition of the sample.

		% (N = 526)
Gender	Female	50.4
	Male	49.2
	Other	0.4
Age	Mean age in years (SD)	52.1 (17.2)
	20–24 years of age	7.2
	25–29 years of age	6.7
	30–39 years of age	20.0
	40–49 years of age	4.4
	50–59 years of age	17.9
	60–69 years of age	20.2
	70–75 years of age	23.7
Education	Lower secondary or equivalent	20.2
	Upper secondary or equivalent	46.4
	Bachelor's degree	20.2
	Master's degree	12.5
	PhD or doctorate	0.8
Occupational status	Working	44.3
	Retired	34.8
	Student	10.1
	Unemployed	5.3
	Other	5.5

**Table 2**  
Government lockdown measures in place in Denmark during spring 2020.

	Status during data collection period, April 30–May 14
Daycare institutions, schools, universities	Primary schools and daycare institutions reopened April 15, 2020, and other schools gradually reopened May 11, 2020, after they all had been closed since March 16, 2020; universities fully closed from March 16 until end of June 2020
Workplaces	All non-essential workplaces in the public sector closed from March 16 until June 2020. Private sector firms were recommended to close or restrict numbers from March 16 until June 2020.
International travel	Non-essential international travel forbidden from March 16 until June 2020.
National travel	No limit to personal movement; public transport continued operating.
Restaurants and cafés	Closed from March 18 until May 17, 2020; takeaway and delivery services still allowed.
Shopping centres and large stores	Reopened March 11, 2020, after having been closed since March 18, 2020 (except for grocery stores).
Hairdressers and other services	Reopened April 20, 2020, after having been closed since March 18, 2020.
Private gatherings	Limited to ten persons, indoors and outdoors, from March 16 until June 2020.

some underlying classes of units, and their probability of belonging to each of them can be estimated. However, the probabilities appear static, in that the measurement occurs for just one time point. Markov models instead analyse the probability that some units of analysis switch states, and they require data for more than one measurement point, reflecting the assumption that the probabilities might be fixed or dynamic over time. Markov models thus have been used, for example, to analyse consumers' brand switching behaviour (Ehrenberg, 1965; Harary & Lipstein, 1962). In a hidden Markov model that combines these two approaches, the latent classes are no longer assumed to be static, and the units of analysis (e.g., consumers) can switch from one class to another with a fixed or dynamic probability, depending on the model's complexity, which in turn can be estimated simultaneously with the estimation of the probabilities of belonging to one class to another.

In applying a hidden Markov model, we group respondents according to their attitudes toward food shopping and cooking, as in a latent class clustering analysis. We refer to the classes as "states" here, to emphasise the sense that people can change states over time. With data about attitudes toward food shopping and cooking both before and during the lockdown, we can analyse how people change their attitudinal states from before to during the lockdown by estimating the transition probabilities from one state to another or the probability of remaining in the same state. The available measurement points restrict the transition probabilities, which we use explicitly as model parameters, to be homogenous in time.

We also analyse if and how the transition from one attitudinal state to another depends on people's *negative emotional reactions* toward the lockdown. Relative to the mean score, computed across the seven items (Cronbach's  $\alpha = 0.89$ ), we established three terciles of low, medium, and strong negative feelings, to which we assigned the respondents. This variable provides a covariate in the hidden Markov model. To estimate this hidden Markov model, we used LatentGold 5.1, which combines the expectation–maximization (EM) algorithm and the Newton Raphson algorithm to estimate model parameters (Vermunt & Magidson, 2013). The convergence limits for the EM tolerance and the tolerance within each iteration were set to 0.01 and 1e-008, respectively, with a limit of 250 iterations for the EM algorithm and 50 iterations for the Newton-Raphson algorithm. To assess the goodness of fit of the model, we calculated Akaike and Bayesian information criteria (AIC and BIC) values (Bartolucci et al., 2014).

For each of the two measurement points, respondents were classified into the state to which they belonged with the highest probability, according to the posterior estimated probabilities of state membership.

**Table 3**  
Constructs measured in the questionnaire.

Construct	Measurement
<i>Attitudes to food shopping</i>	6 items on 7-point agreement scales (strongly disagree/disagree/somewhat disagree/neither agree nor disagree/somewhat agree/agree/strongly agree), indicating the extent to which respondents thought that shopping for food was a type of relaxation, a way to play out creativity and discover new things, enjoyable, too time consuming, frustrating, and stressful. These items were developed for this study.
<i>Attitudes to cooking</i>	6 items measured on 7-point agreement scales, parallel to the items for attitudes to food shopping. These items also were developed for this study.
<i>Food literacy</i>	13 items, 11 taken from the scale developed and validated by Begley et al. (2018), measuring the frequency of certain food-related behaviours ("planning," "selecting," and "preparing" healthier foods) on 7-point frequency scales (never/very rarely/rarely/sometimes/frequently/very frequently/very time). In addition, two items pertaining to leftover food were added.
<i>Shopping behaviour</i>	3 items reflecting <i>how</i> respondents organize their shopping ("I physically go to the supermarket/shop/market/farmer to select and buy food," "I order my food online and pick it up at a seller's point," "I order my food online and have it delivered at home"); 6 items pertaining to <i>where</i> they shop (at a supermarket, neighbourhood shop, organic or fairtrade shop, straight from the farmer, specialty store, via meal kits or meal boxes). All items measured on frequency scales (never/very rarely/ rarely/sometimes/ frequently/very frequently/very time). The items were developed for this study.
<i>Cooking behaviour</i>	4 items asking respondents how often they prepare food from scratch (hot meal from basic ingredients, soup, baked goods, bread), measured on frequency scales (never/very rarely/rarely/sometimes/frequently/very frequently/very time). These items were developed for this study.
<i>Food consumption</i>	20 items adapted from the food frequency questionnaire by Crozier et al. (2010), asking respondents how often they consume at least one portion of fruits, vegetables, legumes/pulses, nuts or nut spread, processed meat and meat alternatives, unprocessed fish, unprocessed poultry, unprocessed red meat, unprocessed vegetarian alternatives, sweet snacks, salty snacks, wholemeal bread, white bread, milk, other dairy products, plant-based drinks, non-sugared beverages, sugared beverages, and alcoholic beverages, other. All items we measured on frequency scales (almost never/less than 1x a week/1x a week/2-4x a week/5-6x a week/1x a day/2x or more a day).
<i>Negative emotional responses to the COVID-19 pandemic</i>	7 items measured on 7-point frequency scales (never/very rarely/rarely/sometimes/frequently/very frequently/all the time): feeling hopeless, feeling restless or fidgety, feeling that everything requires more effort, feeling worthless, feeling nervous, feeling so depressed that nothing can cheer me up, and feeling of struggling financially. The first six items are from the K6 scale of psychological distress from Kessler et al. (2002); the last item was added for this study.

The states were then profiled according to self-reported behaviours, as covered in the food literacy scale, type and location of shopping, type of meal prepared, and frequency of consuming a range of food product categories, through the application of analyses of variance (ANOVA). In addition, we profiled the low, medium, and strong negative feelings groups by their demographic characteristics, using cross-tabulation and chi-square statistical tests, carried out in SPSS 27.

### 3. Results

We estimated hidden Markov models for two to six states. Similar to Juhl et al. (2017), for each number of states, we estimated two models: a “stayer” model, in which participants are assumed not to change states between two measurement points, such that the diagonals of the transition matrix in the Markov model are fixed to 1, and a “mover” model, in which the transition probabilities are freely estimated. For all ten models, we computed AIC and BIC measures and found that the “mover” models offered consistently better fit than the “stayer” models, suggesting some movement across states. Selecting the appropriate number of states normally requires identifying a minimum AIC and/or BIC (Bacci et al., 2014). However, these measures often continue to decrease with more states, such that the selection needs to balance the AIC/BIC values against the interpretability of the results (Paas, 2014). Therefore, we select a model with four states, which we were able to re-estimate several times without any convergence problems. As listed in Table 4 and Fig. 1, these four states can be interpreted rather straightforwardly:

State 1: With means close to the scale midpoints for most items, it can be labelled the *middle of the road* state.

State 2: Respondents are extremely positive about cooking and also about food shopping, so this state is the *love cooking (and like shopping)* state.

State 3: The positive items take ratings slightly above the scale midpoint, and the negative items are very low, so they *like shopping and cooking*, without being as enthusiastic as respondents in State 2.

State 4: The most negative respondents, who find cooking to be time-consuming and frustrating and assign the lowest ratings to the positive items, take the label *don't like shopping and cooking*.

According to the transition probabilities in Table 5, respondents in States 1 and 2 before the lockdown have a very high probability of staying there. Respondents in State 3 instead are most likely to change states, whether they transfer to the *middle of the road state* and become more negative about shopping and cooking or, with an even greater likelihood, to the *love cooking* state, such that they retain their view of shopping but become more positive about cooking. Among those in State 4 before the lockdown, some grow more positive, moving to the *middle of the road* state. Overall, it appears that more people increased their liking of cooking during the lockdown than became more frustrated. We speculate that the positive changes, toward greater liking of food preparation (possibly in parallel with enhanced food preparation skills and food literacy, gained through more repetition and time spent), might stay relatively more involved, at least for a while, even if more

options for dining out safely become available. Table 5 also specifies that the estimated transition probabilities for each group of respondents remains largely similar, especially if they started with negative feelings, such that the groups with mostly negative a priori feelings exhibit the highest chances of changing states due to the lockdown.

Table 6 then reveals how the four states differ in self-reported behaviours. Respondents in the *love cooking* state report the highest frequencies on behaviours that are part of food literacy, respondents in the *do not like shopping and cooking* state report the lowest frequencies, and the two other states are in between. The same pattern holds for shopping at organic/fair trade stores and at specialty stores, as well as for preparing meals from scratch. Respondents in the *do not like shopping and cooking* state are most likely to order food online for home delivery. Not all items in the food frequency part of the questionnaire show a clear pattern, but the *love cooking* state respondents indicate the most frequent consumption of fruits and vegetables, whereas respondents in the *middle of the road* and *do not like shopping and cooking* states report the highest frequency of consuming sweet and salty snacks.

Next, Table 7 relates membership in the three negative feelings groups to selected demographic characteristics. More women than men have strong negative feelings about the situation, in line with the results of other studies (De Backer et al., 2021). Younger people also tend to express strong negative feelings. Among the 13% of respondents who reported having lost (some) income due to the lockdown, unsurprisingly, we find a higher frequency of strong negative feelings.

### 4. Discussion

#### 4.1. Summary of findings

With this research, we sought to investigate whether (negative) emotional responses to the COVID-19-induced confinement situation in Denmark influenced respondents' attitudes toward shopping for food and cooking, and if so, in which direction and among whom. With a latent class Markov model, we determine that people can be characterized as belonging to one of four states, according to their attitudes toward shopping and cooking: *middle of the road*, *love cooking*, *like shopping and cooking*, or *don't like shopping and cooking*. Such variation in consumers' views on shopping for food and cooking is well in line with previous research. For example, studies of food-related lifestyles (Brunso et al., 2021; Grunert et al., 2001) consistently show that people differ in their attitudes toward cooking and shopping, and these differences manifest in multiple food-related behaviours. With this study, we

**Table 4**  
State means and share of respondents.

	State 1: Middle of the road	State 2: Love cooking	State 3: Like shopping and cooking	State 4: Don't like shopping and cooking	Overall
<i>Share of respondents</i>					
Share before	38%	22%	23%	18%	
Share during	38%	25%	19%	17%	
<i>Item means</i>					
Shopping too time consuming**	3.4 <sup>a</sup>	2.6 <sup>b</sup>	1.7 <sup>c</sup>	3.4 <sup>a</sup>	2.8
Shopping frustrating**	3.3 <sup>a</sup>	2.5 <sup>b</sup>	1.6 <sup>c</sup>	3.5 <sup>a</sup>	2.8
Shopping a type of relaxation**	3.7 <sup>a</sup>	4.3 <sup>b</sup>	4.4 <sup>b</sup>	2.3 <sup>c</sup>	3.8
Shopping as a way to be creative**	4.0 <sup>a</sup>	4.7 <sup>b</sup>	4.4 <sup>a</sup>	2.4 <sup>c</sup>	3.9
Shopping enjoyable**	3.7 <sup>a</sup>	4.3 <sup>b</sup>	4.4 <sup>b</sup>	2.6 <sup>c</sup>	3.8
Shopping stressful**	3.7 <sup>a</sup>	2.9 <sup>b</sup>	1.7 <sup>c</sup>	3.5 <sup>a</sup>	3.0
Cooking too time consuming**	3.8 <sup>a</sup>	1.7 <sup>b</sup>	2.7 <sup>c</sup>	4.9 <sup>d</sup>	3.2
Cooking frustrating**	3.1 <sup>a</sup>	1.5 <sup>b</sup>	1.7 <sup>b</sup>	4.2 <sup>c</sup>	2.6
Cooking a type of relaxation**	4.5 <sup>a</sup>	6.3 <sup>b</sup>	4.7 <sup>a</sup>	2.0 <sup>c</sup>	4.6
Cooking as a way to be creative**	4.6 <sup>a</sup>	6.3 <sup>b</sup>	4.7 <sup>a</sup>	2.2 <sup>c</sup>	4.6
Cooking enjoyable**	4.6 <sup>a</sup>	6.3 <sup>b</sup>	4.8 <sup>a</sup>	2.4 <sup>c</sup>	4.7
Cooking stressful**	3.5 <sup>a</sup>	1.6 <sup>b</sup>	1.7 <sup>b</sup>	4.0 <sup>c</sup>	2.7

Notes: All items were measured on 7-point scales, where 1 = do not agree at all, and 7 = agree completely. Means with different superscripts are significantly different, according to a Scheffe test, at  $p < .05$ .

\*\*ANOVA significant F-test,  $p < .001$ .





Fig. 1. Four attitudinal states for shopping for food and cooking.

show that the changes to these attitudes can result from a disruptive event like the COVID-19 pandemic. Although the most common outcome is that people remain in the same state, some people change states, and this change likelihood is greater among people more affected by the pandemic. The changes occurred in both directions, toward more positive or more negative attitudes toward shopping and cooking, but the former are more likely. That is, it appears that the pandemic helped some people rediscover their liking for home cooking and meals at home.

#### 4.2. Findings in the light of research in other countries

With our present study results, we cannot predict whether these findings are specific to Denmark or more generalizable. We note that people more affected by the pandemic appear more likely to change. Considering that Denmark was relatively less affected by COVID-19 than some other countries (Molina-Montes et al., 2021), we might expect even more pronounced changes in other settings. Eating evening meals at home is a default habit in Denmark, whereas other food cultures have stronger traditions for eating out as part of everyday meal practices, and in those food cultures, the pandemic may have been even more disruptive.

In a study using intake data for different foods in 16 countries during the first lockdown, Molina-Montes et al. (2021) find that adherence to a Mediterranean diet (indicator of healthy eating) increased, indicating a general trend toward healthier eating. An analysis of Danish data (Giacalone et al., 2020) also reveals that most Danes' food intake was unchanged during the lockdown, but among those for whom it changed, the shifts include both healthier and less healthy directions, in line with our findings. A survey of British adults, focused on the role of food, also revealed that households started placing more importance on health, weight control, and mood during lockdowns (Snuggs & McGregor, 2021). A social media study of Spanish households during lockdown showed that products purchased with higher frequency were pasta and vegetables (health motivations) but also nuts, cheese, and chocolates (Laguna et al., 2020). Perhaps unsurprisingly, during these unprecedented times, people used food to regulate their moods. Another Spanish study, conducted early in the pandemic (Romeo-Arroyo et al., 2020),

based on the Spanish version of the Dutch Eating Behavior Questionnaire and measures of people's food and cooking attitudes, indicated increased sweets and snacks consumption in some population groups. These results indicated some different food attitudes and diverging trajectories across Spanish food segments, including some trends related to poor emotional states and less-healthy food habits, but also others indicating efforts to maintain healthier habits, as well as some that largely maintained their existing food styles and attitudes. Similar results emerged from a cross-national study on food-related behaviour from Denmark, Germany, and Slovenia (Janssen et al., 2021), such that it indicated diverging trends in all food categories, spanning both decreased and increased consumption frequencies. The authors also specified that changes in food consumption during the first wave of the pandemic were driven by both contextual factors, such as lockdown conditions, and personal factors, such as anxiety related to COVID-19, loss of income, household composition, and gender (Janssen et al., 2021). Thus, the pandemic has had different impacts on people's lifestyles and food consumption patterns, very much in line with the findings of the present study.

#### 4.3. Implications and future research

In terms of policy implications, our findings suggest that identifying the food-related motives of different consumer groups, as well as culture-specific ideas about how foods can support well-being or regulate moods, can effectively inform targeting for efforts to encourage healthier eating. Such segmentation and direct targeting attempts could promote cooking-related attitudes that might last after the pandemic, by enhancing people's food skills and creating better "food democracy" (SAPEA, 2020), possibly through social media. A disruptive event like the pandemic can be an agent of change, and policy can try to build on changes that already are occurring and are in line with policy goals.

Further research also might compare how various cultures regard food as a tool for well-being and mood regulation. It would be worthwhile to dive deeper into the different levels of stress versus comfort created by various situations and how people develop their coping strategies. Comparative food research also might propose and validate new methodologies and surveys to capture and measure relevant

**Table 5**  
Transition probabilities (%).

From.../to...	State 1: Middle of the road	State 2: Love cooking	State 3: Like shopping and cooking	State 4: Don't like shopping and cooking
<i>Whole sample</i>				
State 1: Middle of the road	94.7	3.3	1.5	1.5
State 2: Love cooking	5.7	91.4	2.2	0.6
State 3: Like shopping and cooking	10.0	13.4	73.1	3.4
State 4: Don't like shopping and cooking	8.3	1.1	4.0	86.6
<i>No negative feelings</i>				
State 1: Middle of the road	9.6	0.2	0.1	0.1
State 2: Love cooking	0.1	98.4	1.5	0.1
State 3: Like shopping and cooking	7.9	6.0	80.3	6.0
State 4: Don't like shopping and cooking	9.7	0.1	3.2	87.1
<i>Some negative feelings</i>				
State 1: Middle of the road	95.2	4.7	0.1	0.1
State 2: Love cooking	6.7	93.1	0.1	0.1
State 3: Like shopping and cooking	9.2	9.0	79.3	2.6
State 4: Don't like shopping and cooking	2.8	2.6	2.6	92.1
<i>A lot of negative feeling</i>				
State 1: Middle of the road	79.3	6.8	7.0	6.9
State 2: Love cooking	15.0	74.8	7.6	2.6
State 3: Like shopping and cooking	16.0	36.1	47.7	0.2
State 4: Don't like shopping and cooking	16.1	0.1	8.5	75.3

variables. The data from the overall project, including all 38 countries (De Backer et al., 2021), suggest that Danish respondents express less strong negative feelings than respondents in most other countries.

**4.4. Limitations**

Some limitations also apply. We took good care to obtain a high-quality sample, with the help of a professional market research company, but we did not fill all the established quotas, such that older and retired people are overrepresented and middle age people are underrepresented. In terms of the timing of the field work, it took place in May, after the strictest lockdown measures had been lifted in Denmark; in particular, children were back to school, so the most extreme time pressures on working parents largely had lifted as well. In addition, the newly composed scales might have limited validity, stemming from the strong time pressures we faced to gather samples and conduct the fieldwork while the lockdown measures were still (mostly) in place. Finally, we do not have long-term data or information about changes in states over time. However, some cross-sectional evidence, collected later during the pandemic, indicates similar tendencies in various parts of Europe (EIT Food, 2020).

**Table 6**  
Profiling of attitudinal states by self-reported behaviour.

	State 1: Middle of the road	State 2: Love cooking	State 3: Like shopping and cooking	State 4: Do not like shopping and cooking	Overall
<i>Food literacy - item means</i>					
Plan meals ahead of time**	2.8 <sup>a,b</sup>	2.9 <sup>b</sup>	2.4 <sup>a,c</sup>	2.1 <sup>c</sup>	2.6
Make a list before you go shopping*	4.6 <sup>a</sup>	5.1 <sup>b</sup>	4.9 <sup>a,b</sup>	5.0 <sup>a,b</sup>	4.8
Plan meals to include all food groups**	4.2 <sup>a</sup>	4.9 <sup>b</sup>	4.1 <sup>a,c</sup>	3.7 <sup>c</sup>	4.2
Think about healthy choices when deciding what to eat**	4.5 <sup>a</sup>	5.2 <sup>b</sup>	4.5 <sup>a</sup>	4.4 <sup>a</sup>	4.7
Feel confident about managing money to buy healthy food**	4.3 <sup>a</sup>	4.9 <sup>b</sup>	4.1 <sup>a</sup>	4.1 <sup>a</sup>	4.4
Use of nutritional information panel to make food choices*	2.21 <sup>b</sup>	2.5 <sup>b</sup>	1.9 <sup>a</sup>	2.2 <sup>a,b</sup>	2.2
Use of other parts of food label to make food choices**	3.0 <sup>a</sup>	3.6 <sup>b</sup>	2.7 <sup>a</sup>	3.2 <sup>a</sup>	3.1
Cook meals at home using healthy ingredients**	4.7 <sup>a</sup>	5.4 <sup>b</sup>	4.9 <sup>a</sup>	4.6 <sup>a</sup>	4.9
Feel confident about cooking a variety of healthy meals**	4.6 <sup>a</sup>	5.3 <sup>b</sup>	4.6 <sup>a</sup>	4.1 <sup>v</sup>	4.7
Try a new recipe**	4.1 <sup>a</sup>	4.9 <sup>b</sup>	4.1 <sup>a</sup>	3.2 <sup>c</sup>	4.1
Change recipes to make them healthier**	3.5 <sup>a</sup>	4.2 <sup>b</sup>	3.2 <sup>c</sup>	3.0 <sup>c</sup>	3.5
Cook with leftover food**	4.5 <sup>a,c</sup>	5.1 <sup>b</sup>	4.7 <sup>c</sup>	4.3 <sup>a</sup>	4.7
Throw away leftover food	2.7	2.6	2.6	2.9	2.7
<i>Shopping behaviour - item means</i>					
Physically go to the store*	6.1 <sup>a</sup>	6.4 <sup>b</sup>	6.2 <sup>a,b</sup>	6.0 <sup>a</sup>	6.2
Order food online for pickup	1.3	1.2	1.2	1.3	1.2
Order food online for home delivery**	1.6 <sup>a,c</sup>	1.4 <sup>a,b</sup>	1.3 <sup>b</sup>	1.8 <sup>c</sup>	1.5
Shop at supermarket	6.2	6.3	6.4	6.3	6.3
Shop at corner/convenience store	2.0	2.1	1.9	1.9	2.0
	1.7 <sup>a,b</sup>	1.9 <sup>b</sup>	1.5 <sup>a</sup>	1.4 <sup>a</sup>	1.6

(continued on next page)

Table 6 (continued)

	State 1: Middle of the road	State 2: Love cooking	State 3: Like shopping and cooking	State 4: Do not like shopping and cooking	Overall
Shop at organic/ fair trade store**					
Shop directly from farmer/ producer	2.00	2.0	1.8	1.7	1.9
Shop at specialty store**	3.00 <sup>a,b</sup>	3.3 <sup>b</sup>	3.1 <sup>b</sup>	2.6 <sup>a</sup>	3.0
Shop via meal kits/meal boxes**	1.4 <sup>a,c</sup>	1.1 <sup>b</sup>	1.2 <sup>a,b</sup>	1.5 <sup>c</sup>	1.3
<b>Cooking behaviour – item means</b>					
Prepare hot main meal from basic ingredients from scratch**	5.6 <sup>a</sup>	6.2 <sup>b</sup>	6.0 <sup>b</sup>	4.8 <sup>c</sup>	5.7
Prepare soup from scratch**	3.7 <sup>a</sup>	4.9 <sup>b</sup>	4.0 <sup>a</sup>	2.7 <sup>c</sup>	3.9
Prepare baked goods from scratch**	3.8 <sup>a</sup>	4.4 <sup>b</sup>	3.6 <sup>a</sup>	2.6 <sup>v</sup>	3.7
Prepare bread from scratch*	3.6 <sup>a</sup>	4.3 <sup>b</sup>	3.6 <sup>a</sup>	2.5 <sup>c</sup>	3.6
<b>Food consumption – item means</b>					
Fruit**	4.5 <sup>a,c</sup>	4.9 <sup>b</sup>	4.6 <sup>b,c</sup>	4.1 <sup>a</sup>	4.6
Vegetables**	4.8 <sup>a</sup>	5.4 <sup>b</sup>	4.8 <sup>a</sup>	4.6 <sup>a</sup>	4.9
Legumes/ pulses**	2.7 <sup>a</sup>	3.2 <sup>b</sup>	2.7 <sup>a</sup>	2.5 <sup>a</sup>	2.8
Nuts or nut spread	2.7	2.9	2.6	2.6	2.7
Processed meat/ poultry/fish	3.4	3.3	3.3	3.4	3.3
Unprocessed fish**	2.2 <sup>a,c</sup>	2.5 <sup>b</sup>	2.4 <sup>b,c</sup>	2.0 <sup>a</sup>	2.3
Unprocessed poultry*	2.4 <sup>a,b</sup>	2.6 <sup>a,b</sup>	2.7 <sup>b</sup>	2.3 <sup>a</sup>	2.5
Unprocessed red meat*	3.00 <sup>a</sup>	3.2 <sup>a,b</sup>	3.3 <sup>b</sup>	2.9 <sup>a</sup>	3.1
Unprocessed vegetarian alternatives*	1.3 <sup>a,b</sup>	1.5 <sup>b</sup>	1.2 <sup>a</sup>	1.3 <sup>a,b</sup>	1.3
Sweet snacks**	3.5 <sup>a,c</sup>	3.3 <sup>a,b</sup>	3.1 <sup>b</sup>	3.7 <sup>c</sup>	3.4
Salty snacks*	2.8 <sup>a</sup>	2.7 <sup>a,b</sup>	2.5 <sup>b</sup>	2.7 <sup>a,b</sup>	2.7
Wholemeal bread, pasta, grains	4.6	4.9	4.5	4.7	4.7
White bread, pasta, grains	3.7	3.7	3.4	3.6	3.6
Milk**	4.5 <sup>a</sup>	4.1 <sup>a,b</sup>	4.5 <sup>a</sup>	3.8 <sup>b</sup>	4.3
Other dairy products	4.6	4.7	4.6	4.6	4.6
Plant-based drinks*	1.6 <sup>a,b</sup>	1.8 <sup>b</sup>	1.4 <sup>a</sup>	1.5 <sup>a,b</sup>	1.6
Non-sugared beverages*	6.0 <sup>a</sup>	6.4 <sup>b</sup>	6.3 <sup>a,b</sup>	6.2 <sup>a,b</sup>	6.2
Sugared beverages	2.9	2.6	2.7	2.9	2.8
Alcoholic beverages**	2.8 <sup>a,b</sup>	3.1 <sup>b</sup>	3.2 <sup>b</sup>	2.4 <sup>a</sup>	2.9

Notes: All items measured on 7-point scales, where 1 = “never,” and 7 = “all the time.” Means with different superscripts are significantly different, according to Scheffe tests,  $p < .05$ .

\*\* ANOVA significant F-test,  $p < .001$ . \* ANOVA significant F-test,  $p < .01$ .

Table 7

Profiling low/medium/strong negative feelings groups by demographics.

	Low negative feelings	Medium negative feelings	Strong negative feelings	Overall
<b>Gender*</b>				
Female	42%	50%	61%	51%
Male	58%	50%	39%	49%
<b>Education</b>				
Lower	20%	22%	18%	20%
Medium	49%	49%	41%	46%
Higher	31%	29%	41%	34%
<b>Age**</b>				
18–39	21%	33%	50%	34%
40–59	24%	24%	19%	22%
60 -	55%	43%	31%	44%
<b>Lost income since the lockdown?***</b>				
Yes	7%	8%	26%	13%
No	93%	92%	74%	87%

\*Significant Chi square test,  $p < .01$ . \*\*Significant Chi square test,  $p < .001$ .

## 5. Conclusions

During the first COVID-19 lockdown, most Danish consumers did not change their attitudes toward food shopping and cooking; among those who did, the changes moved in opposite directions, but on balance, positive changes were more likely than negative ones. The likelihood of any change related to how much consumers felt affected by the pandemic. The pandemic and the lockdown that it imposed thus might be an agent of change and, at least for some consumers, result in more positive outlooks on food shopping and cooking.

## Author contributions

**Klaus G. Grunert:** Conceptualization, methodology, formal analysis, writing – original draft, review and editing; **Meike Janssen:** Conceptualization, methodology, writing – original draft, review and editing; **Rikke Nyland Christensen:** Methodology, formal analysis, writing – review and editing; **Lauranna Teunissen:** writing – review and editing; **Isabelle Cuykx:** writing – review and editing; **Paulien Decorte:** writing – review and editing; **Lucia Reisch:** Conceptualization, methodology, writing – original draft, review and editing.

## Funding

None.

## CRedit authorship contribution statement

**Klaus G. Grunert:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing - review & editing. **Meike Janssen:** Conceptualization, Methodology, Writing – original draft, Writing - review & editing. **Rikke Nyland Christensen:** Methodology, Formal analysis, Writing - review & editing. **Lauranna Teunissen:** Writing - review & editing. **Isabelle Cuykx:** Writing - review & editing. **Paulien Decorte:** Writing - review & editing. **Lucia A. Reisch:** Conceptualization, Methodology, Writing – original draft, Writing - review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Acknowledgements

We acknowledge Charlotte De Backer, Kathleen Van Royen, and Sara Pabian, all from University of Antwerp, who initiated, designed, and

coordinated the data collection for the larger international project, of which this study is a part.

## References

- Acosta Market Research (2020). New Acosta report details how COVID-19 is reinventing how America eats. Retrieved from <https://www.acosta.com/news/new-acosta-report-details-how-covid-19-is-reinventing-how-america-eats>.
- Bacci, S., Pandolfi, S., & Pennoni, F. (2014). A comparison of some criteria for states selection in the latent Markov model for longitudinal data. *Advances in Data Analysis and Classification*, 8(2), 125–145.
- Bartolucci, F., Farcomeni, A., & Pennoni, F. (2014). Latent Markov models: A review of a general framework for the analysis of longitudinal data with covariates. *Test*, 23(3), 433–465.
- Begley, A., Paynter, E., & Dhaliwal, S. (2018). Evaluation tool development for food literacy programs. *Nutrients*, 10(11), 1617. <https://doi.org/10.3390/nu10111617>
- Bisoffi, S., Ahrné, L., Aschemann-Witzel, J., Báldi, A., Cuhls, K., DeClerck, F., ... Brunori, G. (2021). COVID-19 and sustainable food systems: What should we learn before the next emergency. *Frontiers in Sustainable Food Systems*, 5. <https://doi.org/10.3389/fsufs.2021.650987>
- Brunso, K., Birch, D., Memery, J., Temesi, Á., Lakner, Z., Lang, M., ... Grunert, K. G. (2021). Core dimensions of food-related lifestyle: A new instrument for measuring food involvement, innovativeness and responsibility. *Food Quality and Preference*, 91, 104192. <https://doi.org/10.1016/j.foodqual.2021.104192>
- Crozier, S. R., Inskip, H. M., Barker, M. E., Lawrence, W. T., Cooper, C., & Robinson, S. M. (2010). Development of a 20-item food frequency questionnaire to assess a 'prudent' dietary pattern among young women in Southampton. *European Journal of Clinical Nutrition*, 64(1), 99–104.
- De Backer, C. J. S., Teunissen, L., Cuykx, I., Decorte, P., Pabian, S., Gerritsen, S., Matthys, C., Al Sabbah, H., & Van Royen, K. (2021). An evaluation of the COVID-19 pandemic and social distancing policies in relation to planning, selecting, and preparing healthy meals: An observational study in 38 countries worldwide. *Frontiers in Nutrition*, 7(375).
- Ehrenberg, A. S. C. (1965). An appraisal of Markov brand-switching models. *Journal of Marketing Research*, 2(4), 347–362.
- E.I.T. Food COVID-19 impact on consumer food behaviours in Europe Retrieved from [https://www.eitfood.eu/media/news-pdf/COVID-19\\_Study\\_-\\_European\\_Food\\_Behaviours\\_-\\_Report.pdf](https://www.eitfood.eu/media/news-pdf/COVID-19_Study_-_European_Food_Behaviours_-_Report.pdf) 2020.
- Giacalone, D., Frøst, M. B., & Rodríguez-Pérez, C. (2020). Reported changes in dietary habits during the Covid-19 lockdown in the Danish population: The Danish COVIDiet study. *Frontiers in Nutrition*, 7, 294.
- Grunert, K. G., Brunso, K., Bredahl, L., & Bech, A. C. (2001). Food-related lifestyle: a segmentation approach to European food consumers. In *Food, people and society* (pp. 211–230). Berlin, Heidelberg: Springer.
- Halkier, B., Katz-Gerro, T., & Martens, L. (2011). Applying practice theory to the study of consumption: Theoretical and methodological considerations. *Journal of Consumer Culture*, 11(1), 3–13.
- Harary, F., & Lipstein, B. (1962). The dynamics of brand loyalty: A Markovian approach. *Operations Research*, 10(1), 19–40.
- Herforth, A., & Ahmed, S. (2015). The food environment, its effects on dietary consumption, and potential for measurement within agriculture-nutrition interventions. *Food Security*, 7(3), 505–520.
- Janssen, M., Chang, B. P. I., Hristov, H., Pravst, I., Profeta, A., & Millard, J. (2021). Changes in food consumption during the COVID-19 pandemic: Analysis of consumer survey data from the first lockdown period in Denmark, Germany, and Slovenia. *Frontiers in Nutrition*, 8, Article 635859. <https://doi.org/10.3389/fnut.2021.635859>
- Juhl, H. J., Fenger, M. H., & Thøgersen, J. (2017). Will the consistent organic food consumer step forward? An empirical analysis. *Journal of Consumer Research*, 44(3), 519–535.
- Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L. T., Walters, E. E., & Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32, 959–976.
- Laguna, L., Fiszman, S., Puerta, P., Chaya, C., & Tárrega, A. (2020). The impact of COVID-19 lockdown on food priorities. Results from a preliminary study using social media and an online survey with Spanish consumers. *Food Quality and Preference*, 86, Article 104028.
- Lazarsfeld, P. F., & Henry, N. W. (1968). *Latent structure analysis*. Boston: Houghton Mifflin.
- Molina-Montes, E., Uzhova, I., Verardo, V., Artacho, R., García-Villanova, B., Jesús Guerra-Hernández, E., ... Rodríguez-Pérez, C. (2021). Impact of COVID-19 confinement on eating behaviours across 16 European countries: The COVIDiet cross-national study. *Food Quality and Preference*, 93, 104231. <https://doi.org/10.1016/j.foodqual.2021.104231>
- Murcott, A. (2019). *Introducing the sociology of food and eating*. Bloomsbury Publishing.
- Netzer, O., Lattin, J. M., & Srinivasan, V. (2008). A hidden Markov model of customer relationship dynamics. *Marketing Science*, 27(2), 185–204.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14(4), 535–569.
- Paas, L. J. (2014). Comments on: Latent Markov models: A review of a general framework for the analysis of longitudinal data with covariates. *Test*, 23(3), 473–477.
- Poulsen, C. S. (1990). Mixed Markov and latent Markov modelling applied to brand choice behaviour. *International Journal of Research in Marketing*, 7(1), 5–19.
- Romeo-Arroyo, E., Mora, M., & Vázquez-Araújo, L. (2020). Consumer behavior in confinement times: Food choice and cooking attitudes in Spain. *International Journal of Gastronomy and Food Science*, 21, 100226. <https://doi.org/10.1016/j.ijgfs.2020.100226>
- SAPEA, Science Advice for Policy by European Academies. (2020). A sustainable food system for the European Union. Berlin: SAPEA. <https://doi.org/10.26356/sustainablefood>.
- Sheth, J. (2020). Impact of Covid-19 on consumer behavior: Will the old habits return or die? *Journal of Business Research*, 117, 280–283.
- Snuggs, S., & McGregor, S. (2021). Food and meal decision making in lockdown: How and who has Covid-19 affected? *Food Quality and Preference*, 89, Article 104145.
- Tein, Jenn-Yun, Coxé, Stefany, & Cham, Heining (2013). Statistical power to detect the correct number of classes in latent profile analysis. *Structural Equation Modeling*, 20(4), 640–657.
- Riet, Jonathan van't, Sijtsema, Siet J., Dagevos, Hans, & De Bruijn, Gert-Jan (2011). The importance of habits in eating behaviour. An overview and recommendations for future research. *Appetite*, 57(3), 585–596.
- Vermunt, J. K. (2004). Latent Markov model. In *The Sage encyclopedia of social sciences research methods* (pp. 553–554).
- Vermunt, J. K., & Magidson, J. (2013). *Technical guide for Latent GOLD 5.0: Basic, advanced, and syntax*. Belmont, MA: Statistical Innovations Inc.
- Verplanken, Bas, & Aarts, H. (1999). Habit, attitude, and planned behaviour: Is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology*, 10(1), 101–134.