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# Changes in home cooking and culinary practices among the French population during the COVID-19 lockdown

Barthélemy Sarda, Corinne Delamaire, Anne-Juliette Serry, Pauline Ducrot \*

Santé Publique France, French National Public Health Agency, F-94415, Saint-Maurice, France

## ARTICLE INFO

### Keywords:

Home cooking  
Eating habits  
Lifestyle  
Lockdown  
COVID-19

## ABSTRACT

In March 2020, the COVID-19 pandemic led to a strict lockdown in France for 2 months, drastically changing the daily life of the population. We investigated changes in perceived diet quality and cooking practices during the lockdown in comparison with the preceding period. Between June 9 and 30, 2020, 2422 participants were recruited and completed a questionnaire regarding the evolution of their overall diet and cooking habits during the lockdown. Descriptive analyses showed that 41.5% of participants described dietary changes with a similar proportion reporting positive or negative changes (22.0% and 19.5%, respectively). The exceptional circumstances of the lockdown provided a positive opportunity for some people to improve their diet quality by spending more time cooking (54.8% of those reporting a positive change) or eating more fresh products, including fruits and vegetables (47.4%). By contrast, other participants reported a decline in their diet quality, mainly caused by poorer dietary choices due to the consumption of comfort food (50.3% of those reporting a negative change), snacking (40.1%), or food supply issues (35.9%). The lockdown led to a massive rise in home cooking with 42.0% of all participants cooking more frequently (vs 7.0% cooking less), as barriers such as time constraints were reduced. Using multivariate analyses, we found that this change in cooking frequency varied among population subgroups, especially in regard to financial situation, as individuals in financial difficulty tended to cook less. As home cooking has already been linked to better diet quality and thus health status, our results suggest that the lockdown increased social health inequalities. An adequate public health response is therefore needed to support nutritionally vulnerable populations.

## 1. Introduction

The 2019 coronavirus disease (known as COVID-19) caused by the SARS-CoV-2 virus was first identified in the city of Wuhan (China) in December 2019 (Wang et al., 2020a). The virus rapidly spread across the globe, leading the World Health Organization to qualify the outbreak as a pandemic in March 2020 (WHO, 2019). To limit the propagation of the virus and reduce the pressure on health care systems, many countries decided to implement social distancing policies to varying degrees and at different periods. In France, as in over half of countries around the world, a nationwide lockdown was announced in March 2020, which drastically changed the daily life of the population. For 2 months, the population had to stay at home except for medical emergencies or care, legal obligations, grocery shopping, and work (only workers for essential services (e.g., healthcare, food factories or public transport)). In regard to food supply, only food retailers were allowed to remain open and restaurants as well as outdoor markets had to shut down in order to

reduce contact within the population.

These restrictive measures impacted the daily and social life of the population, and as a result, it may have been difficult to maintain eating habits and diet quality. The announcement of the lockdown as well as the initial closure of borders caused panic buying and disruption of the food supply system (Arafat et al., 2020). As a consequence, several staple food items such as wheat flour were unavailable for the first few weeks (Le Parisien, 2020). This temporary unavailability of food products may have had consequences on people's cooking motivation and practices. Second, the closure of restaurants and catering facilities caused a shift in meal preparation practices and thus dietary habits. Several studies in various countries reported the strong impact of the lockdown on diet composition and eating behaviors (Ammar et al., 2020; Bennett et al., 2021; Giacalone et al., 2020; Murphy et al., 2020; Robinson et al., 2021; Rodríguez-Pérez et al., 2020; Romeo-Arroyo, Mora, & Vázquez-Araújo, 2020). In particular, the consumption of "comfort" foods (salty snacks, sweets) showed a significant rise, ranging from 23% to 60% of

\* Corresponding author.

E-mail address: [pauline.ducrot@santepubliquefrance.fr](mailto:pauline.ducrot@santepubliquefrance.fr) (P. Ducrot).

<https://doi.org/10.1016/j.appet.2021.105743>

Received 24 June 2021; Received in revised form 16 September 2021; Accepted 7 October 2021

Available online 8 October 2021

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respondents who declared snacking more (Ghosh et al., 2020; Rodríguez-Pérez et al., 2020; Scarmozzino & Visioli, 2020; Sidor & Rzymiski, 2020; Wang et al., 2020b). In conjunction with the dramatic reduction in energy expenditure due to the impossibility of going out, this situation could have led to energy imbalance and thus to weight gain (Pellegrini et al., 2020; Zachary et al., 2020). An international review based mostly on self-reported data concluded that a significant part of the population gained weight during the lockdown (Zupo et al., 2020). If confirmed by anthropometric measurements, the consequences could be dramatic, as overweight and obesity are major public health issues around the world.

Furthermore, the lockdown led to increased time in the home environment, which presented an opportunity to change cooking habits. Before the pandemic, there had been a steady decline in domestic food preparation (Kolodinsky & Goldstein, 2011; Plessz & Étlié, 2019). Previous research has pointed to several reasons for this fall: a lack of time (Lavelle et al., 2016), the wide availability of ultra-processed food products at a low cost (Smith & Popkin, 2013; Tharrey et al., 2020), a decline in cooking and food skills (Caraher & Lang, 1999), and limited food resources (Wolfson et al., 2019). However, the lockdown gave people the opportunity to overcome some of these barriers, as additional time at home could be dedicated to gaining knowledge and cooking. The adoption of new behaviors is exemplified by the number of Google searches in France using the word “recipe” according to the Google Trends tool, which almost tripled during the lockdown compared to March to May 2019. Practicing home cooking could have limited the detrimental effects of the lockdown on weight gain and thus on health, as it has been previously linked to healthier dietary patterns, lower BMI, and reduced risk of obesity (Larson et al., 2006; McGowan et al., 2017; Mills et al., 2017). However, only a few studies to date have focused on the evolution of cooking practices during the lockdown (Di Renzo et al., 2020; Murphy et al., 2020; Scarmozzino & Visioli, 2020; Sidor & Rzymiski, 2020).

The aim of this study is to analyze perceived modifications in cooking practices and frequency in the general French population during the lockdown period as well as the evolution of overall perceived diet quality and the motives that may have caused changes. Moreover, our goal was to identify the sociodemographic characteristics of the population associated with an increase or a decrease in home cooking.

## 2. Materials and methods

### 2.1. Sample

The data used in this study come from a representative sample of the French population recruited through an online access panel, provided by BVA, a company specialized in opinion poll. To recruit the sample, an e-mail was sent to members of an online panel, in which they were informed that a questionnaire was available. The questionnaire regarding culinary practices and their evolution during the lockdown was administered between June 9 and 30, 2020, a month after the lifting of the lockdown in France.

Individuals were asked about their sociodemographic characteristics: gender, age (at least 18 years), occupational category, size of place of residence, region, household composition (number of people and presence of children aged 15 years and under), educational level, and monthly household income per consumption unit (CU). One CU was attributed for the first adult in the household, 0.5 CU for other persons aged 14 or older, and 0.3 CU for children under 14 years (INSEE, 2016). In addition, data on people’s concern for a balanced diet (yes/no), occupational situation during the lockdown (work outside the home/telecommuting/reduced professional activity/other), and perceived financial situation at the time of the survey (good/intermediate/difficult) were also collected.

The quota method, which involves collecting answers from the first respondents who fulfill predefined sociodemographic criteria, was used to elaborate the study sample with the following variables: gender, age,

occupational category of the participant, and occupational category of the reference person in the household (upper category: head of businesses, managerial staff, intermediate profession; lower category: employees, laborers, farmers; inactive: students, homemaker), region, and size of place of residence.

### 2.2. Variables

First, to assess the impact of the lockdown on the overall quality of their diet, respondents were asked whether their diet was more, less, or just as balanced during the lockdown compared to the preceding period. Depending on the answer given, they were then asked about the reason (s) for the reported change. To investigate their motives, a list of 10 items was proposed in a random order, and respondents were asked to select any number of items.

Second, we evaluated changes in the frequency of cooking and certain culinary practices during lockdown. Respondents were initially asked about their cooking frequency (no change/more frequent/less frequent). If they answered that they cooked more frequently, they were asked to indicate for the following items whether they did it more frequently, less frequently, or just as often as before the lockdown:

- Number of meals cooked;
- Quantity of prepared food;
- Average time dedicated to preparing a meal;
- Trying new recipes and cooking new meals;
- Cooking fresh products;
- Baking.

One question was also included to evaluate whether respondents found the increased frequency of cooking to be a pleasure (yes/no) or a constraint (yes/no).

Finally, as the questionnaire was conducted in June 2020, respondents who declared cooking more during the lockdown were asked whether after the lifting of the restrictive measures, they continued to cook as much as during the lockdown (yes/no) and whether they intended to continue cooking as much (yes/no).

### 2.3. Statistical analysis

To allow inferences about the general population, a weight was applied to all the analyses to adjust the dataset to sociodemographic variables (variable used for the quota method). The structure used for adjusting the data was taken from the 2016 national census of the French National Institute of Statistics (INSEE).

The counts and proportions were calculated to describe the variables for the overall sample. Comparisons between variables were performed using Pearson’s Chi-Square Test for Independence with a significance level set at 5%.

A multinomial logistic regression model was used to assess the relationship between the evolution of cooking frequency (reference: no change) and personal characteristics. Only variables with a significant association with our variable of interest in univariate analysis were included in the final model. Associations were assessed using Pearson’s Chi-Square test with a significance level of 5%. Finally, the following variables were included: gender, age (under 25, 25–34, 35–49, 50–64, over 65), educational level (with or without high school diploma), size of place of residence, presence of children in the household, perceived financial situation, occupational situation during the lockdown (work outside the home, telecommuting, reduced professional activity, no professional activity), and concern for a balanced diet.

Analyses were carried out using S.A.S. software (Version 9.4; SAS Institute, Inc.).

### 3. Results

Overall, the sample included 2422 participants. Table 1 presents the adjusted sociodemographic characteristics of our sample, including gender, age, level of education, size of place of residence, and perceived financial situation.

#### 3.1. Evolution of diet quality and cooking practices

Table 2 summarizes the self-reported evolution of diet quality and the reasons for adopting a more or less balanced diet. For the majority of respondents, the lockdown did not impact their diet quality with 58.5% reporting no change. Nevertheless, more than four out of ten respondents declared that the situation impacted their diet quality, with similar proportions reporting a more or less balanced diet (22% and 18.5%, respectively). Women were more prone than men to report that the lockdown positively or negatively affected their ability to maintain a balanced diet ( $p < 0.05$ ).

When asked about the reasons for their more balanced diet, the most common explanations were the following: having more time to prepare meals (54.8%), eating more healthy food such as fruits, vegetables and fresh products (47.4%), and eating more homemade meals and less ultra-processed foods (45.9%). Among the other items that were nevertheless identified by more than 30% of the sample, people wanted to limit the negative impact of the lockdown on their health and/or weight, consume less out-of-home food, and reduce snacking. On the contrary, three reasons were frequently mentioned in relation with a less balanced diet: eating more unhealthy food rich in fat, sugar, and/or salt (50.3%), snacking more frequently between meals (40.1%), and having difficulty finding certain foods (35.9%).

The perceived evolution of people's cooking frequency and practices is presented in Table 3. A total of 42.0% of respondents declared cooking more frequently during the lockdown in comparison to the preceding period, while only 7.0% indicated reducing their frequency of cooking. The increase in cooking frequency significantly affected women more than men ( $p < 0.05$ ). Those who reported cooking more frequently tended to spend more time preparing meals (78%), try new recipes (73.6%), and spend more time baking (67.1%). Finally, as presented in Table 4, this increase in cooking frequency remained stable for six out of ten respondents after the lifting of the at-home lockdown measures. This proportion was significantly higher for respondents who declared enjoying cooking more frequently.

**Table 1**  
Sociodemographic characteristics of respondents (weighed data).

Variables	N	%
<b>Total</b>	2422	100%
<b>Gender</b>		
Men	1153	47.6%
Women	1269	52.4%
<b>Age (years)</b>		
18–24	248	10.2%
25–34	380	15.7%
35–49	622	25.7%
50–64	608	25.1%
Over 65	564	23.3%
<b>Level of education</b>		
No high school diploma	670	27.7%
High school diploma or more	1752	72.3%
<b>Size of place of residence</b>		
Less than 20,000 inhabitants	966	39.9%
Between 20,000 and 100,000 inhabitants	327	13.5%
More than 100,000 inhabitants and Paris area	1129	46.6%
<b>Perceived financial situation</b>		
Good	1222	50.5%
Intermediate	834	34.4%
Difficult	366	15.1%

#### 3.2. Factors associated with the evolution of cooking frequency

Table 5 shows the associations between the changes in cooking frequency and the sociodemographic characteristics of respondents. First, women were more likely to increase their cooking frequency, whereas gender was not associated with a decrease in cooking frequency. Living in a large urban area (more than 100,000 inhabitants) or having a child under 15 years in the household were associated with a higher cooking frequency. Being concerned about one's diet or working full-time at home were associated with both an increase and a decrease in cooking frequency. Respondents who reduced their professional activity (total or partial unemployment) tended to cook more frequently. Overall, the cooking frequency of older respondents was subject to fewer changes. Finally, individuals in a difficult financial situation were less likely to cook more often and more likely cook less often.

### 4. Discussion

The results presented in this study showed how the strict COVID-19 lockdown impacted the diet and cooking practices of the French population between March and May 2020. Overall, two out of five people modified their diet, with similar proportions of people adopting a more or less balanced diet. A more balanced diet appeared to be a consequence of evolutions in cooking practices with more time spent to cook with minimally-processed foods, whereas a less balanced diet was reported to be caused by unhealthier dietary behaviors as well as food supply issues. Additionally, this study highlighted a change in the home cooking practices of the French population, which partly continued 4–7 weeks after the lifting of the lockdown. Finally, multivariate analysis provided insights into the individual characteristics of people who cooked more or less frequently during this period.

First, our results indicate that the majority of the population perceived no changes in terms of maintaining their diet. This finding is consistent with findings of several articles, which indicate that most people self-reported stable dietary behaviors and intake during the lockdown (Antunes et al., 2020; Di Renzo et al., 2020; Rodríguez-Pérez et al., 2020; Scarmozzino & Visioli, 2020). At the same time, we observed that around two-fifth of respondents each reported improving or worsening their diet quality. This result illustrates that the lockdown had an unequal impact on people's diets, as reported in previous studies (Bennett et al., 2021; Deschasaux-Tanguy et al., 2021).

To explain the perceived improvement in diet quality, different reasons were proposed to respondents. First, they declared spending more time cooking, preparing more meals at home, and consuming less out-of-home food. This observation is in accordance with previous data reported before the lockdown, which showed that home cooking is linked to better diet quality (Larson et al., 2006; Mills et al., 2017), while eating outside the home is associated with a higher total energy intake and a lower intake of vitamin C and some minerals (Lachat et al., 2012). A better-balanced diet was also reported to be caused by a greater consumption of fresh products, including fruits and vegetables. We also observed that individuals who declared to have a more balanced diet reported cooking more frequently, which may suggest that the time was allocated to cook raw products such as fresh produce. Spending more time cooking as well as cooking products from scratch were shown to be associated with improved diet quality through higher "food agency" (Trubek et al., 2017; Wolfson et al., 2020), which encompasses one's ability to procure and prepare food in one's social, physical and economic environment. Additionally, concerns regarding the overall health status may have been a contributing factor to improve diet quality as more than 30% of those who reported having a more balanced diet expressed a will to stay healthy or to avoid gaining weight. Consistently, similar trends were mentioned in another French study on food choice motives during the lockdown (Marty et al., 2021).

By contrast, respondents who declared having a less balanced diet during the lockdown highlighted two main reasons for this change. The

**Table 2**  
Perceived evolution of the diet quality and reasons leading to diet changes.

	Total		Men		Women		p-value <sup>a</sup>
	N	%	N	%	N	%	
<b>Evolution of diet quality</b>	2422	100%	1153	100%	1269	100%	
More balanced during lockdown	532	22.0%	239	20.7%	293	23.1%	
Less balanced during lockdown	473	19.5%	207	17.9%	266	20.9%	0.02
No change	1417	58.5%	707	61.4%	710	55.9%	
<b>Reasons leading to a more balanced diet</b>	532	100%	239	100%	293	100%	
Having more time to prepare meals	291	54.8%	114	47.8%	177	60.4%	0.048
Eating more fruits, vegetables and fresh products	252	47.4%	111	46.6%	141	48.1%	0.77
Eating more homemade meals and less ultra-processed foods	244	45.9%	106	44.6%	138	47.0%	0.67
Wanting to stay healthy	188	35.3%	77	32.1%	111	37.9%	0.26
Avoiding weight gain	177	33.2%	60	24.9%	117	39.9%	0.002
Eating out less often (restaurants or fast food)	171	32.2%	77	32.2%	94	32.1%	0.99
Avoiding snacking between meals	166	31.3%	51	21.4%	115	39.3%	<0.001
Eating smaller amounts of food	111	20.8%	45	18.8%	66	22.4%	0.36
Cooking with easily available products	97	18.3%	36	15.2%	61	20.8%	0.13
Starting a diet	19	3.5%	6	2.5%	13	4.3%	0.28
Other reasons	8	1.5%	6	2.6%	2	0.5%	0.047
<b>Reasons leading to a less balanced diet</b>	473	100%	207	100%	266	100%	
Eating more food products high in fat, salt, sugar	238	50.3%	92	44.5%	146	54.9%	0.12
Snacking more frequently between meals	190	40.1%	71	34.1%	119	44.8%	0.07
Having difficulty finding certain foods	170	35.9%	66	31.9%	104	39.0%	0.20
Eating greater amounts of food	89	18.7%	37	18.0%	51	19.4%	0.73
Paying attention to food-related expenditures	80	17.0%	38	18.2%	43	16.0%	0.57
Preparing more meals	75	15.9%	25	12.1%	50	19.0%	0.06
Eating more ready-to-eat meals and less homemade meals	61	12.9%	35	17.1%	26	9.7%	0.03
Skipping meals	57	12.0%	24	11.5%	33	12.4%	0.79
Eating takeaways and ordering from restaurants or fast food	46	9.8%	24	11.5%	23	8.5%	0.29
Other reasons	16	3.4%	5	2.6%	11	4.0%	0.42

<sup>a</sup> Significance levels obtained with Pearson's Chi-Square tests. Single p-values are presented for tests applied to the overall variable and multiple p-values for tests applied to each sub-variable.

first related to an increase in unhealthy dietary behaviors, including higher intakes of foods high in fat, salt, and/or sugar, often described as comfort food, as well as more frequent snacking between meals. These behaviors could be linked to boredom (Moynihan et al., 2015), as millions of people were forced to stay at home while partially or completely interrupting their professional activity. Furthermore, several studies have highlighted the overall deterioration of mental health throughout the world (Otu, Charles, & Yaya, 2020; Torales et al., 2020), including in France (Chan-Chee et al., 2020), due to the sanitary crisis. Anxiety and depressive disorders can cause emotional eating, which is characterized by a greater consumption of comfort foods and more snacking (Van Strien et al., 2016; Yannakoulia et al., 2008). Another issue raised by people to explain why their diet was negatively impacted was the difficulty of finding certain foods. Some staple products were unavailable due to food hoarding or stockpiling behaviors in days following the announcement of the lockdown (Hall et al., 2020). More importantly, the price of some food products increased which may have prevented households with limited food budgets from purchasing them. According to the French authorities, average fruit and vegetable purchase prices increased by 6.2% in 2020 compared in 2019 (FranceAgriMer, 2020). This phenomenon was even more accentuated during the lockdown when food supply chains were disrupted (FranceAgriMer, 2020). This impact on food supply exacerbated the food insecurity of more fragile populations, as highlighted by the growth in the number of people seeking food assistance, ranging from a 10%–25% increase 6 months after the start of the sanitary crisis (AFP, 2020). Additionally, we also observed in univariate analysis that individuals reporting being in a difficult situation answered more frequently than the rest of the population that they had a less balanced diet (resp 24.3% vs 18.5%;  $p = 0.02$ ). This is in line with a study in Belgium which found that around 10% of the population feared to not be able to afford a healthy diet during the lockdown and this feeling was associated with greater soft drinks consumption and lower fruit and vegetable consumption (Vandevijvere

et al., 2021). Similarly, a study in Italy reported that the number of households reporting to be food insecure doubled during the pandemic, reaching 16.3% (Dondi et al., 2020a). As weight gain and pediatric obesity have been linked with food insecurity in low income groups (Dondi et al., 2020b), the pandemic has led to an increase in social health inequalities by exerting a disproportionate burden on these populations (Tester, Rosas, & Leung, 2020).

As expected, the lockdown led to an increase in home cooking. This result was observed in several studies on eating and cooking behaviors during the lockdown (Bennett et al., 2021; Ghosh et al., 2020; Górnicka et al., 2020; Rodríguez-Pérez et al., 2020; Romeo-Arroyo et al., 2020; Sidor & Rzymiski, 2020). In the present study, among those who reported cooking more frequently, they especially reported spending more time cooking and trying new recipes. Time constraints were previously described as a barrier to home cooking (Smith et al., 2013), and the lockdown may have changed the situation, since most people spent longer periods at home due to full- or part-time telecommuting, total or partial unemployment, temporary leave for taking care of children, and so on. Interestingly, spending more time cooking and trying unknown cooking techniques may have contributed to people gaining knowledge and confidence, which are essential dimensions of food skills and cooking skills (Azevedo Perry et al., 2017). In accordance with this idea, a cross-continental study found that organizational and management food practices were improved during the lockdown (Murphy et al., 2020). Developing cooking and food skills in the domestic environment are considered key components of a favorable diet in regard to long-term health according to the food literacy framework (Azevedo Perry et al., 2017). Moreover, more than two-thirds of our respondents who reported cooking more also indicated baking more frequently. This result is in line with previous studies (Di Renzo et al., 2020; Górnicka et al., 2020) that observed a rapid rise in the consumption of homemade bread, pizzas, and pastries during the lockdown. Baking might have been an easily accessible leisure activity to limit inactivity and boredom. However,

**Table 3**  
Perceived evolution of cooking frequency and culinary practices reported most frequently during the lockdown.

	Total		Men		Women		p-value <sup>a</sup>
	N	%	N	%	N	%	
<b>Evolution of cooking frequency</b>	2422	100%	1153	100%	1269	100%	
More frequent during lockdown	1017	42.0%	440	38.2%	577	45.4%	
Less frequent during lockdown	171	7.0%	82	7.1%	89	7.0%	0.001
No change	1234	51.0%	631	54.7%	603	47.5%	
<b>Culinary practices reported as more frequent during lockdown</b>	1017	100%	440	100%	577	100%	
Spending more time preparing meals	793	78.0%	344	78.2%	449	77.8%	0.95
Trying new recipes and/or cooking unusual meals	749	73.6%	295	67.0%	454	78.7%	0.03
Spending time baking	682	67.1%	267	60.7%	415	71.9%	0.03
Cooking fresh products	613	60.3%	273	62.0%	340	58.9%	0.53
Preparing a greater number of meals	583	57.3%	260	59.1%	323	56.0%	0.52
Preparing food in larger quantities	498	49.0%	208	47.3%	290	50.3%	0.50

<sup>a</sup> Significance levels obtained with Pearson's Chi-Square tests. Single p-values are presented for tests applied to the overall variable and multiple p-values for tests applied to each individual sub-variable.

given the overall negative impact of the lockdown on the weight status of the French population (Deschasaux-Tanguy et al., 2021), attention should be paid to the nutritional quality of foods prepared at home, especially in stressful times such as the lockdown. Nevertheless, this positive perception of home cooking is still important, since our results also suggested that taking pleasure in cooking was linked to frequent cooking after the end of the lockdown, which could be favorable in the long term if healthier dietary patterns are adopted.

The associations between home cooking frequency and individual characteristics highlighted disparities among subgroups of the population. First, people concerned about their diet were more likely to report an increase or decrease in cooking frequency. One explanation might be that they were more prone to paying attention to their diet and thus noticing any changes, whereas the least concerned individuals might have been less sensitive to dietary changes. Then, women were only more likely to increase their cooking frequency. Indeed, domestic work including meal preparation is still a gendered activity, and women tend to be more frequently responsible for cooking (McGowan et al., 2016; Mills et al., 2018). The impact of the lockdown on cooking frequency was also greater in the younger part of the population. This may be explained by the fact that younger respondents were more subject to insecurity and thus were more likely to change their living habits than older individuals as they tend to have fewer resources and savings (Tapper & Fenna, 2019) and to be in a more precarious occupational situation (e.g. part-time jobs or short-term contract). For example, many young people had to move back to the parental home if their job was interrupted or if they telecommuted. The closure of out-of-home food services may have also had a greater impact on younger respondents, as they tend to be more reliant on these services according to the French representative study INCA3 (ANSES, 2017). Having financial difficulties was associated with cooking less frequently, which may be explained by the higher prices of raw food products (i.e. fresh produce) during the lockdown as mentioned above. By contrast, populations living in large urban areas and working at home on a part- or full-time basis were more likely to cook more during this period. For these populations, the

lockdown freed up a substantial amount of time to cook, as they did not have to commute to work, which is known to be particularly time-consuming in large cities. According to a report from the French public authorities, the average daily travel time is greater in large urban areas (more than 500,000 inhabitants) compared to smaller urban areas (Le Breton & Lecomte, 2019). In addition, populations living in large cities usually tend to be more dependent on out-of-home food services compared to small urban or rural areas (ANSES, 2017). However, working at home was also related to less frequent cooking, which might be due to people's difficulty in adapting to this new situation. Indeed, working at home blurred the lines between private and professional spheres, and the situation was particularly challenging for some individuals who were unable to disconnect from work (Allen et al., 2021). Finally, families with at least one child tended to cook more frequently, which suggests the important role played by children in structuring eating patterns during the lockdown. This is in line with a recent French study, which reported that 66% of parents declared cooking more during the lockdown and that 71% declared spending more time cooking with their children (Philippe et al., 2021). We also observed in univariate analysis that individuals living in a household with at least one child reported more frequently to have improved their diet quality (resp 29.1% vs. 19.7%;  $p < 0.01$ ). In line with this finding, a cross-continental survey found that inclusion of children in cooking was associated with greater intake of fruit and vegetables and better diet quality (Benson et al., 2021), which suggests that the presence of children may have incentivized individuals to adopt healthier dietary patterns. Given the positive effects of including children in meal preparation on diet quality during the lockdown, such activities should be emphasized in public health messages.

## 5. Strengths and limitations

To our knowledge, this is the first study to specifically investigate cooking practices during the lockdown in France. Our questionnaire also included questions to follow the evolutions of these practices after the

**Table 4**  
Post-lockdown continuation of the increased cooking practices.

	Total		Took pleasure in cooking more frequently		Did not take pleasure in cooking more frequently		p-value <sup>a</sup>
	N	%	N	%	N	%	
<b>Continue to cook more frequently after lockdown</b>	1017	100%	861	100%	156	100%	
Yes	609	59.9%	540	62.7%	69	44.2%	
No	408	40.1%	321	37.3%	87	55.8%	<0.001

<sup>a</sup> Significance levels obtained with Pearson's Chi-Square tests.

Table 5

Association between cooking frequency and sociodemographic characteristics modeled using a multinomial logistic regression (N = 2422).

	Cooked more vs cooked as much as usual		Cooked less vs cooked as much as usual		p-value <sup>b</sup>
	Odds ratio	95% CI <sup>a</sup>	Odds ratio	95% CI <sup>a</sup>	
<b>Gender</b>					0.02
Men	1		1		
Women	1.29**	[1.07–1.54]	1.09	[0.78–1.54]	
<b>Age (years)</b>					<0.001
18–24	1		1		
25–34	0.81	[0.56–1.17]	0.74	[0.43–1.27]	
35–49	0.80	[0.57–1.14]	0.35***	[0.20–0.61]	
50–64	0.71*	[0.51–0.98]	0.21***	[0.12–0.38]	
Over 65	0.41***	[0.28–0.59]	0.29***	[0.14–0.58]	
<b>Concerned for its diet</b>					<0.001
No	1		1		
Yes	1.88***	[1.54–2.29]	1.67**	[1.13–2.44]	
<b>Occupational situation during lockdown</b>					<0.001
Work outside the home	1		1		
Telecommuting	1.89***	[1.43–2.51]	1.93**	[1.17–3.29]	
Reduced professional activity (interrupted work, partial unemployment)	1.68***	[1.29–2.18]	1.47	[0.92–2.36]	
Other (unemployed, student, retiree)	0.98	[0.72–1.33]	0.62	[0.33–1.16]	
<b>Educational level</b>					0.13
No high school diploma	1		1		
High school diploma or more	1.16	[0.94–1.43]	0.81	[0.55–1.19]	
<b>Perceived financial situation</b>					0.02
Good	1		1		
Intermediate	0.94	[0.77–1.14]	1.24	[0.85–1.81]	
Difficult	0.76*	[0.59–0.99]	1.61*	[1.02–2.52]	
<b>Size of place of residence</b>					0.01
Less than 20,000 inhabitants	1		1		
Between 20,000 and 100,000 inhabitants	1.27	[0.96–1.68]	1.39	[0.85–2.28]	
More than 100,000 inhabitants and Paris area	1.41***	[1.16–1.71]	1.15	[0.79–1.66]	
<b>Presence of children in the household</b>					0.005
No children	1		1		
At least one child	1.47***	[1.16–1.84]	1.19	[0.79–1.79]	

<sup>a</sup> 95% confidence interval.<sup>b</sup> p-value obtained using a Wald test.

lockdown. As cooking practices and diet quality are linked, these data may be useful to better assess the short-term effects of a strict lockdown on both diet and health. Additionally, identifying the most affected subgroups is of importance to elaborate adequate public health interventions in the future. However, some limitations of this study should be acknowledged. First, the present study did not use validated measurement tools even though questions were informed by the available literature at time of questionnaire design and have been critically reviewed by the research team involved in this study. In addition, due to time constraints, no pilot was conducted to ensure that questions were correctly understood by participants. Then, the quota sampling method can lead to possible bias in the selection of the sample. Data show that compared to random sampling, quota sampling can result in significant differences in sample composition, and the quota method tends to have difficulty reaching nutritionally at-risk populations (Tester et al., 2020). Further, our study was administered through an online access panel for practical reasons, which could have accentuated the selection bias. According to the French National Institute of Statistics (INSEE, 2019), 10% of French households still lack Internet access, and panel surveys tend to have a higher prevalence among women, older people, and more educated populations compared to paper-based surveys (Tsuboi, Yoshida, & Ae, 2015). Finally, we conducted this study in June, a month after the lifting of the lockdown, and asked respondents about their motivations during the lockdown. Social desirability bias and post-hoc rationalization may have influenced the outcome, particularly in an informed and educated population. Nonetheless, we observed trends that were consistent with previously reported data in other countries and cultural settings.

## 6. Conclusion

This study on people's cooking habits and motivations during the

first lockdown in France found that this exceptional situation brought about changes in perceived diet quality and cooking practices of the population. Even though the majority of people reported no change, a significant part of the population changed their diet with the adoption of both favorable and unfavorable behaviors. Our results indicated that the lockdown unequally affected the diet and cooking practices of the French population. On the one hand, this situation represented an opportunity for some people to cook more and make healthier choices with more nutritional foods, leading to perceived improvements in diet quality. On the other hand, some individuals reported a degradation in the quality of their diet due to food supply issues or the higher consumption of unhealthy foods. Additionally, more fragile populations such as those in financial difficulty were identified as more likely to cook less during the lockdown, which could have also affected their diet quality. As diet quality has been positively linked to overall health status, the lockdown seems to have accentuated social health inequalities. Further investigations of nutritionally vulnerable populations are required to better understand their food practices and behaviors during the lockdown in order to provide a better public health response. Consequently, monitoring eating habits and promoting healthier dietary patterns through accessible and cost-friendly cooking practices appear to be particularly relevant during the pandemic and in the future.

## Ethical statement

The questionnaire was administered to eligible respondents according to the access panel provider's ethical procedures (BVA Group). Personal data treatment of participants was carried out in accordance with European Regulation n° 2016/679, known as the General Data Protection Regulation. Participation in this study was on a voluntary basis. Written informed consent was obtained from all participants. Respondents were given small incentives for participation and were

compensated in the form of an internal loyalty program.

## Funding

No specific funding to declare.

## Author contributions

BS performed data analyses and interpretation, drafted, and revised the paper. AJS and PD conceptualized the project and designed the data collection. PD supervised the data analyses, interpretation, the writing and critically revised the paper for important intellectual content. CD and AJS interpreted the data and critically revised the paper for important intellectual content. All authors have read and agreed to the published version of the manuscript.

## Declaration of competing interest

None.

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