



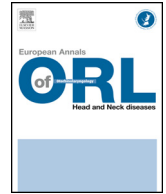
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Original article

# Prevalence and Characteristics of Altered Sense of Smell/Taste During Covid-19 first wave: A French Nationwide Cross-sectional Study



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## ABSTRACT

**Aim:** Altered sense of smell and/or taste is a leading symptom of SARS-CoV-2 infection, but its prevalence at a population-level is unknown.

**Methods:** From a questionnaire addressed to a representative subset of the French general adult ( $\geq 18$ -year) population over a 6-week period during the first French lockdown (April 7 to May 19 2020), self-reported new cases of altered sense of smell and/or taste were collected.

**Results:** From 29,660 participants, new altered sense of smell and/or taste was 2.18% and 2.11% after direct standardization on the French population representing more than 1,110,000 subjects in France. Moreover, 0.5% of participants reported a positive SARS-CoV-2 test, among which 47.4% reported a newly altered sense of smell and/or taste. Male participants, younger ones together with those presenting with chronic condition had higher odds of reporting a newly altered sense of smell and/or taste.

**Conclusion:** This study provides an accurate estimate of new cases of altered sense of smell and/or taste in the general population at a nationwide level during the Covid-19 first wave.

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## 1. Introduction

Coronavirus disease 2019 (Covid-19), resulting from a SARS-CoV-2 infection [1,2], has been associated with a wide range of symptoms, including an altered sense of smell and/or taste (ASST). However, prevalence of new cases of ASST in the general population setting during the Covid-19 pandemic is unknown [3,4]. Main objective was to estimate its prevalence within the French population during the first wave, and secondary objective was to explore for potential factors associated with ASST.

## 2. Methods

Over a 6-week period during the French lockdown (April 7 to May 19 2020), a web questionnaire was addressed to a representative subset of the French general adult ( $\geq 18$ -year) population from the *Access Panel Online* (IPSOS), using quotas method on following

variables: sex, age, level of education, living area and type of population centre (details at [www.datacovid.org](http://www.datacovid.org)). Participants were aware of the use of these data, which are available under an open license 2.0 ([www.etalab.gouv.fr/licence-ouverte-open-licence](http://www.etalab.gouv.fr/licence-ouverte-open-licence), institutional review board approval not needed). Recorded variables were: gender, age range (years), height and weight (allowing to compute body mass index - BMI, kg/m<sup>2</sup>), education level (considered as low - no education, primary education, medium - intermediate education, higher secondary education - and high - higher professional education, university education), and several chronic conditions (diabetes, cancer in the last three years, respiratory diseases, dialysis and cardiovascular diseases - CVD). Participants were asked if they had a positive test (polymerase chain reaction, yes or no) for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and whether or not they suffered from an important newly ASST in the last 7 days (yes or no).

Regarding main objective, prevalence estimates and 95% confidence intervals (CI) were calculated. Standardized estimates were computed (direct method, French adult population as the reference population). Regarding secondary objective, bivariate comparisons used the Chi<sup>2</sup> test or the Fisher's exact test. To explore for potential factors associated with new ASST (outcome),

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**Table 1**  
Characteristics of the study population, and associations with self-reported altered sense of smell and/or taste in the last 7 days.

	Overall N = 29,660	Altered sense of smell and/or taste in the last 7 days		P-value for bivariate comparison	Adjusted OR (95% CI)
		No N = 29,013 (97.8)	Yes N = 647 (2.2)		
Positive SARS-CoV-2 test	154 (0.5)	81 (0.3)	73 (11.3)	<0.001	-
Male gender	13,223 (44.6)	12,902 (44.5)	321 (49.6)	0.01	1.21 (1.00–1.45)
Age range (years)				<0.001	
18–24	2,610 (8.8)	2,505 (8.6)	105 (16.2)	-	1 (reference)
25–34	4,490 (15.1)	4,302 (14.8)	188 (29.1)	-	1.17 (0.87–1.59)
35–44	5,160 (17.4)	5,024 (17.3)	136 (21.0)	-	0.70 (0.51–0.97)
45–54	5,323 (17.9)	5,226 (18.0)	97 (15.0)	-	0.43 (0.31–0.61)
55–64	5,206 (17.6)	5,147 (17.7)	59 (9.1)	-	0.23 (0.15–0.34)
≥ 65	6,871 (23.2)	6,809 (23.5)	62 (9.6)	-	0.15 (0.10–0.23)
BMI category (kg/m <sup>2</sup> )				0.009	
< 18.5	1,154 (4.0)	1,121 (4.0)	33 (5.4)	-	1.01 (0.65–1.52)
18.5–25	13,639 (47.8)	13,325 (47.7)	314 (51.8)	-	1 (reference)
25–30	8,881 (31.1)	8,727 (31.2)	154 (25.4)	-	0.93 (0.74–1.16)
> 30	4,874 (17.1)	4,769 (17.1)	105 (17.3)	-	1.01 (0.77–1.31)
Education level				0.35	
Low	7,212 (24.6)	7,070 (24.7)	142 (22.2)	-	1 (reference)
Medium	13,109 (44.7)	12,812 (44.7)	297 (46.4)	-	1.02 (0.81–1.31)
High	8,996 (30.7)	8,795 (30.7)	201 (31.4)	-	0.83 (0.64–1.08)
Chronic condition					
Diabetes	2,097 (7.2)	2,012 (7.1)	85 (13.7)	<0.001	2.12 (1.52–2.91)
Cancer (last 3 years)	837 (2.9)	794 (2.8)	43 (7.2)	<0.001	2.93 (1.93–4.29)
Respiratory disease	2,158 (7.5)	2,046 (7.3)	112 (18.8)	<0.001	2.23 (1.72–2.86)
Dialysis	111 (0.4)	82 (0.3)	29 (4.8)	<0.001	6.48 (3.48–11.59)
CVD	3,584 (12.4)	3,477 (12.3)	107 (17.7)	<0.001	1.65 (1.23–2.20)

Abbreviations: OR: odd ratio; CI: confidence interval; BMI: body mass index; CVD: cardiovascular disease. Note: positive SARS-CoV-2 test was self-reported. Adjusted ORs are from multivariable logistic regression with a newly altered sense of smell and/or taste as outcome and age, gender, BMI, educational level, and comorbid conditions (diabetes, cancer in the last 3 years, respiratory disease, dialysis and CVD) as predictor variables.

multivariate logistic regression modeling was used to produce odds ratio (OR) and 95% CI. Predictor variables were age, gender, BMI, education level, and comorbid conditions. Analyses were two-sided and performed using R (version 3.6.2) and a *P*-value < 0.005 was considered significant [5,6].

### 3. Results

#### 3.1. Participants

Over the 6-week period, 30,001 participants were included, and 341 had missing data regarding ASST, leaving an analytical sample of 29,660 participants. General characteristics are presented in the Table 1.

#### 3.2. Main objective

The prevalence of a newly ASST was 2.18% (95% CI 2.02–2.35). After direct standardization on the French population, the prevalence rate was 2.11% (95% CI 1.95–2.27), representing 1,110,745 adults aged ≥ 18-year in France. Geographical distribution of new cases of ASST over France was similar to that of Covid-19 (Fig. 1). Prevalence of newly ASST decreased with increasing age (*p* < 0.001) and BMI categories (*p* = 0.009, Fig. 1).

As presented in the Table 1, 154 (0.5%) participants reported a positive SARS-CoV-2 test, among which 47.4% (*n* = 73) reported a newly ASST. Conversely, in participants with a newly ASST, 11.3% reported a positive SARS-CoV-2 test.

#### 3.3. Secondary objective

Participants with an ASST, compared to those without, were younger, more often male and in the normal range of BMI and presented with more chronic conditions (Table 1). In multivariable

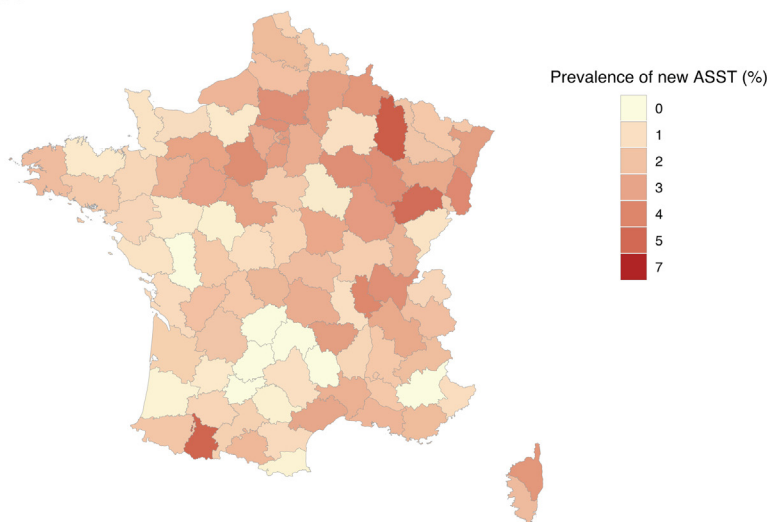
logistic regression (*n* = 3707 participants with missing data on predictor variables), there was a graded inverse association between increasing age category and ASST. Male gender presented higher odds of reporting newly ASST when compared to women, as participants reporting any chronic condition. Neither BMI categories nor education level were associated with a newly ASST (Table 1).

### 4. Discussion

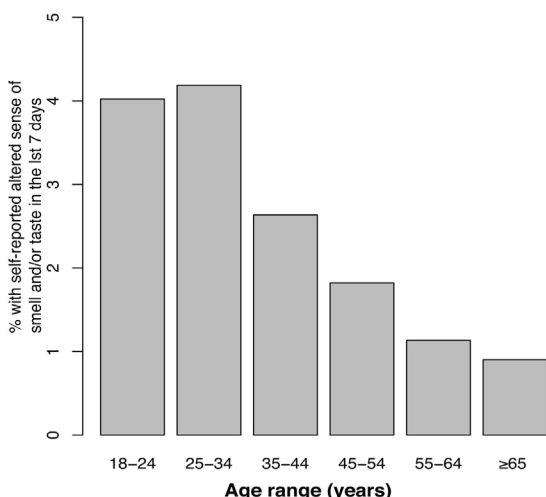
This study provides estimates of new cases of ASST in the general French population at a nationwide level during the Covid-19 pandemic, which was 2.11% of the adult population, representing more than 1,110,000 adults in France. These data could be used as baseline estimation of ASST in France for follow-up studies of ASST evolution since the emergence of SARS-CoV-2. Moreover, among participants with newly ASST, 11.3% reported a positive SARS-CoV-2 test, in line with previous publications with serologic testing [7]. Conversely, 0.5% of the adult population reported a positive SARS-CoV-2 test, among which 47.4% had a newly ASST.

In line with previous publications, male participants and those with any chronic condition had higher odds of reporting a newly ASST [8,9]. Interestingly, we found that younger participants were more likely to present with new ASST, although increasing age is a well-recognized risk factor for incident ASST [10,11]. For instance, from the National Health and Nutrition Examination Survey, the prevalence of olfactory dysfunction was 4% in subjects aged 40–49 years and 43.1% in those aged 80+ years [11]. Similar findings were observed regarding the 5-year incidence rate of olfactory dysfunction in a population-based study, which was 4.1% for participants aged 53–59 years and increased up to 47.1% in those aged 80–97 years [10]. Hence, our study results suggest that self-reported new cases of ASST are likely related to new SARS-CoV-2 infections, which can constitute an indirect marker of incident cases of SARS-CoV-2 infections. While anosmia due to viral infection is known

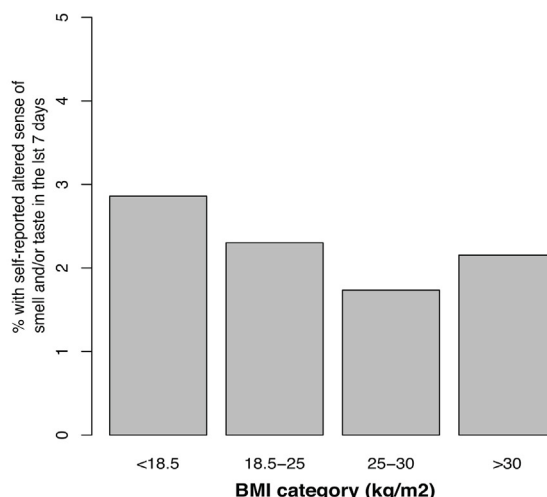
**A) By geographical areas**



**B) By age range (years)**



**C) By BMI category (kg/m2)**



**Fig. 1.** Prevalence of self-reported altered sense of smell and/or taste in the last 7 days according to A) geographical areas in France, B) age ranges and C) BMI categories. Abbreviations: ASST: altered sense of smell and/or taste; BMI: body mass index.

for a long time [12], a 2.11% incidence rate of new ASST over a 6-week period is likely to be highly abnormal, when compared to a 12.5% incidence rate over a 5-year period in older subjects (aged 53+ years) [10].

Despite its representativeness and its large sample size, this study has several limitations. First, we do not have objective serologic data. Second, ASST was self-reported and not objectively tested, and the correlation between objective and subjective measures is still unclear [13,14]. Moreover, the severity of ASST was not assessed. Third, new ASST rates may be underestimated since participants were only asked about new ASST in the last 7 days, which did not take into account potential older ASST which resolved. Fourth, at the time of the study period, only symptomatic subjects were tested for SARS-CoV-2 in France, and given that the country was under lockdown, it is likely that the rate of positive tests for SARS-CoV-2 reported here is underestimated.

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**Disclosure of interest**

The authors declare that they have no competing interest.

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