

# Health status, healthcare use and child MMR vaccination coverage in Travellers according to their environmental and living conditions in Nouvelle-Aquitaine, France, 2019–2022

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**Background:** The poor health status of underserved populations is compounded by low vaccination uptake, leading to a greater risk of epidemics. On October 2017, a measles outbreak started in the southwest of France among under-vaccinated social groups, including Travellers. We aimed to describe the health status, healthcare use and child measles–mumps–rubella (MMR) vaccination coverage in Travellers according to their environmental and living conditions. **Methods:** A cross-sectional study with a three-stage random sample design was conducted between October 2019 and March 2022 in the Nouvelle-Aquitaine region in France. Trained social workers administered face-to-face questionnaires to collect data on adults and children. Anthropometric measurements, vaccination records and data using an environmental exposure questionnaire were also collected. **Results:** The participation rate was high (73.6%), with 1030 adults and 337 children included. Concerning the adults, 36.6% had obesity, 14.4% reported diabetes, 24.7% hypertension and 14.4% major depression. The prevalence of major depression was significantly higher in adults living in precarious and unauthorized housing than in those with adequate housing (19.8 vs. 14.7%,  $P=0.03$ ). With regard to children, 45.3% had full (i.e. 2-dose) MMR vaccination coverage at 24 months and 17.9% had obesity. Finally, 74.5% of the households experienced housing insecurity, and 22.2% did not have a supply of drinking water. **Conclusion:** Traveller children and adults faced deleterious environmental and living conditions potentially affecting their health, healthcare use and vaccination coverage. These results demonstrate the need for urgent interventions for underserved populations which take into account their specific needs.

## Introduction

In France, the term Traveller is an administrative term to designate a community of people with informal housing, directly or indirectly linked to mobility.<sup>1</sup> Within this broad definition, there are many different socioeconomic groups with diverse historical, cultural and linguistic backgrounds. In the specific context of France, we distinguish them from Roma populations mainly by having the French nationality.

An estimated 250 000–350 000 Travellers were living in France in 2019.<sup>2,3</sup> Travellers are characterized by a history of regular or occasional nomadism and they mainly live in caravans, which are not legally recognized as permanent dwellings or main residences in France.<sup>4</sup> Their mobility is either chosen or forced. Because of their way of life, they often experience discrimination, prejudice and social exclusion.<sup>3</sup>

The relatively few epidemiological data on Travellers in France suggest that they generally have poorer health than the general population, and have a lower life expectancy (9.8 and 10.2 years among women and men, respectively).<sup>3</sup> Studies in other European countries

have highlighted that the prevalence of cardiovascular diseases (hypertension, heart attack, etc.), respiratory problems (asthma, etc.), metabolic pathologies (diabetes, etc.) and infant morbidity (low birth weight, etc.) is higher in Travellers, especially among the most disadvantaged families.<sup>5–7</sup> They also experience higher levels of anxiety and depression.<sup>8,9</sup> Living in caravans with limited access to sanitary equipment, over occupation, as well as proximity to traffic routes and to polluted sites, are all adverse living and environmental conditions that lead to accidents in everyday life and to infectious pathologies.<sup>10–12</sup> Furthermore, certain scrap metal and metalworking activities result in lead and other heavy metal poisoning in this population.<sup>13</sup>

The poor health status of Travellers is compounded by low levels of health literacy, little access to healthcare, and insufficient disease prevention behaviours (including low vaccination uptake), all of which lead to a greater risk of epidemics.<sup>14,15</sup>

On 30 October 2017, a measles outbreak started in the Nouvelle-Aquitaine region in the southwest of France; it rapidly spread to other regions, resulting in a total of 2663 cases throughout the country up to 1 July 2018. Of these, 1101 (41%) cases were in Nouvelle-

Aquitaine, with clusters documented in under-vaccinated social groups, including Travellers.<sup>16</sup>

The lack of data on Travellers' health status and healthcare use contributes to their invisibility in public health policy and planning. This study aimed to describe the health status, healthcare use, and child measles–mumps–rubella (MMR) vaccination coverage in Travellers living in Nouvelle-Aquitaine according to their environmental and living conditions. To our knowledge, this is the first multi-dimensional epidemiological study of Travellers in France.

## Methods

### Design and study population

We conducted a cross-sectional study between 29 November 2019 and 16 March 2020 (phase 1), and again between 18 October 2021 and 31 March 2022 (phase 2) after the COVID-19 health crisis and related lockdown led to its interruption. The study population comprised adult and child Travellers who were living or who had previously lived in mobile residences in four (Gironde, Charente-Maritime, Charente and Creuse) of the 12 counties in Nouvelle-Aquitaine. These counties were selected according to the density and diversity of Traveller families, the presence of local associations, and territorial contrasts (rural vs. urban area, high vs. low healthcare supply). Living areas included permanent halting sites, large temporary halting sites for traveller-related events, temporary unauthorized encampments, family land and individual houses specifically built for Travellers. The two eligibility criteria were that the household had to be composed of at least one adult capable of providing informed consent, and that the household resided in a living area known to local association-based actors [National Federation of Solidarity Associations for Action with Gypsies and Travellers (FNASAT) network] collaborating in the study. The only exclusion criterion was a lack of French language proficiency.

### Sampling process

A complex three-degree random sample design study was conducted. The sampling frame was constructed from an estimated census of all Traveller living areas in the territory covered by the partner associations. The number of households, type of Traveller housing and geographical sector within the given county were collected for each living area. Housing was classified into four types based on the European Typology on Homelessness and housing exclusion (ETHOS) grid as follows: adequate (legal, safe, with no over occupation and where housing standards are respected whether it be mobile or fixed housing), inadequate (mobile home, mixed housing with legal and safe occupancy but over-occupied), precarious (installation of a mobile home or mixed housing on land belonging to a public or private entity with an occupation agreement), and unauthorized and precarious (installation of a mobile home on land or at a halting site without a temporary occupation agreement and subject to an eviction order). The type of housing and the geographical sector of living areas were taken into account by stratifying the sampling frame into 68 strata. Living areas were then selected using simple random sampling (first degree) from the stratified sampling frame. Subsequently, households were randomly selected from the total households present in the living areas (second degree). Finally, one adult and one child (if any) aged 7–13 years old per household were randomly selected (third degree).

### Data collection

A few days before the interviews took place, social workers conducted a preparatory visit in the selected living areas (first sampling degree outlined in the previous paragraph) to facilitate first contact and to present the study. Graphic-based flyers and posters were used to illustrate the study's objectives. These were developed in collaboration with the partner associations to ensure that the participants'

oral culture would be taken into account (Supplementary figure S1). Using three questionnaires, data were collected in face-to-face interviews for the subsequently selected households (degree 2) and persons (degree 3) by pre-trained social workers from the partner associations. The questionnaires were co-constructed with the partner associations and tested and validated by volunteer Travellers prior to the study. The first questionnaire focused on housing and environmental conditions of the living area. The second was for adults only, and collected data on demographic and socioeconomic characteristics, mobility, exposure risk to chemicals, self-perceived health status (using the Minimum European Health Module<sup>17</sup>), physical health status and mental health (using the Mini-International Neuropsychiatric Interview MINI<sup>18</sup>), physical activity, psychoactive substance use, perinatal health (for women with children under 5 years old), healthcare use and health literacy. The third questionnaire focused on data relating to the selected child (if any) from a household (the parent provided these data). Specifically, data were collected on the child's education, health status, mental health status, behavioural and emotional difficulties (using the Strengths and Difficulties Questionnaire SDQ<sup>19</sup>) and accidents in everyday life were collected. MMR vaccination coverage was estimated from anonymized vaccination data (photograph of vaccination records) of all children (i.e. not only the participating child in the study) aged 2–17 years in the included households. Finally, after being trained, the social workers used an electronic scale (SECA<sup>®</sup> Robusta 813) to measure the selected parents' and childrens' weight, and an electronic ultrasonic measuring tape (SOEHNLE<sup>®</sup> 503) to measure their height. Overweight and obesity were then estimated in children, in accordance with the international obesity task force (IOTF) age- and sex-specific child body mass index cut-off points.<sup>20</sup>

### Statistics

We performed a descriptive analysis of the participants' socio-demographic, socioeconomic, living and environmental conditions, as well as their health status and healthcare use. All prevalences and means were weighted by the inverse probability of inclusion of individuals, households and living areas, except the prevalence of child MMR vaccination coverage which was weighted by the inverse probability of inclusion of households and living areas only. Analyses were post-stratified by gender (reference French population in 2021<sup>21</sup>). Pearson's chi-squared test with Rao & Scott's second-order correction was used to analyse health indicators according to the type of housing. A *P* values of < 0.05 was considered statistically significant. The Kaplan–Meier estimator was used to obtain age-specific estimates of child MMR vaccination coverage. The outcome was defined as receipt of two-dose MMR vaccine, the time scale was measured in years (relative to birth) and data were considered right censored if the child had not received the vaccine by the time of the survey. Statistical analyses were performed using R software (R Core Team, 2022).

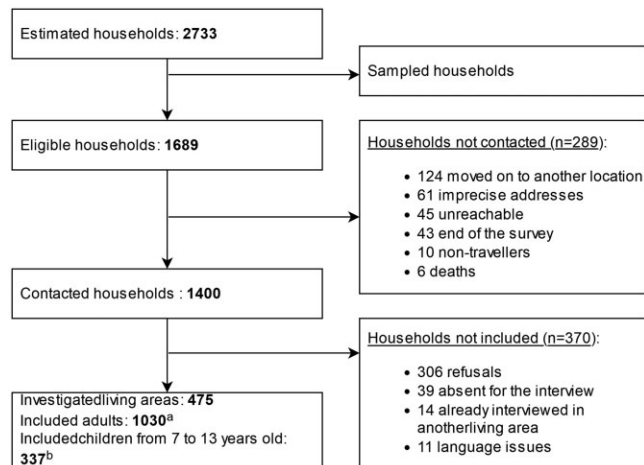
## Results

### Participation rate

A random sample of 1030 adults and 337 children aged 7–13 years were interviewed over the two study phases (figure 1). The participation rate was 73.6%. Among the 306 households that refused to participate in the survey, a lack of interest and a lack of time were most frequently cited (35% and 18.5%, respectively).

### Socio-demographic and socioeconomic characteristics of adults

The median age of adult participants was 42 years (range: 18–92) (Supplementary table S1). Over 80% were aged between 25 and 64. When asked about their family situation, 72.1% stated that they were living with a partner, 40.1% had no children and 6.6% had four or



**Figure 1** Flowchart of the number of adults and children included. <sup>a</sup>612 adults in phase 1 and 418 in phase 2. <sup>b</sup>211 children in phase 1 and 126 in phase 2

more children. Half (49.2%) had regularly attended school while 9.8% had never attended school. Most (92.5%) did not have upper secondary school education. Concerning employment, only 28.7% of the adults reported having a job. Among those who were working, 64.2% had occasional employment. Women were more likely not to have work than men (77.2% vs. 29.3%) and to have occasional employment (75.6% vs. 55.6%).

### Environmental and living conditions

With regard to housing type, 45.9% of the adults had precarious housing, 28.6% precarious and unauthorized housing, and 19.3% adequate housing (table 1). Over half (62.3%) lived in caravans exclusively, with just under one-fifth (15.3%) living in mixed housing (i.e. caravan + buildings or similar). With regard to the 475 living areas and 1030 households surveyed, 22.2% of the adults did not have a drinking water supply, and 41.0% were not equipped with sanitary blocks with a shower and a toilet. Most adults (87.2%) were served by a household waste collection service. Several scrap metal and battery activities were practiced in the living spaces, the most common being dismantling of cars (30.1%), metal storage (26.9%), scrap metal cutting and handling (26.0%), battery recovery (25.2%) and electrical cable recovery (24.6%). From an environmental point of view, 43.0% of the households were located less than 200 m from a major road (national road or highway) or a railway, and one-fifth were located near a commercial area (22.9%) or agricultural crops (20.8%). Finally, 8.8% of the households surveyed were located less than 500 m from a landfill or waste disposal site, and 19.7% less than 200 m from an industrial site.

### Health status of adults

Half of the adults surveyed considered they were in very good or good health, the other half declaring fair, poor or very poor health (table 2). Almost three quarters (72.8%) had overweight (including obesity), and 36.6% of the participants had obesity. With regard to chronic diseases, 14.4% reported diabetes in the previous year, 24.7% high blood pressure, 3.9% myocardial infarction, 17.3% asthma and 41.9% low back pain. Just under half (46.3%) reported they had oral and dental disorders. Two-thirds (67.2%) reported they did not smoke or had quit, 40.2% reported not consuming alcohol, while 6.8% reported daily alcohol consumption. The prevalence of major depression was 14.4% and differed statistically according to the type of housing ( $P=0.03$ ): it was higher in those living in a precarious and unauthorized housing (19.8%) than in those living in adequate housing (14.7%). Medication prescribed for at least 6 months was

**Table 1** Living conditions and environment of adults ( $N=1030$ ); study of Travellers' healthcare use and self-perceived state of health, Nouvelle-Aquitaine, France, 2019–2022

Characteristics	Total $N=1030$	$N$ (%) <sup>a</sup>	CI 95%
Type of housing	1030		
Adequate		305 (19.3)	18.1–20.5
Inadequate		69 (6.2)	5.3–7.1
Precarious		464 (45.9)	44.1–47.7
Precarious and unauthorized		192 (28.6)	26.7–30.4
Mode of living	1023		
Caravan		548 (62.3)	59.6–65.0
Buildings or similar		326 (22.4)	20.3–24.5
Mixed housing (caravan + buildings or similar)		149 (15.3)	12.9–17.7
Occupancy status			
Legal (owner, tenant, etc.)	998	802 (73.4)	70.5–76.3
Access to drinking water source	1006	831 (77.8)	74.9–80.7
Access to a sanitary block with shower and toilet	938	638 (59.0)	56.2–61.7
Living space served by a regular garbage collection service	975	880 (87.2)	84.5–89.9
Scrap metal and battery recovery activities in the living area			
Metal storage	1030	297 (26.9)	24.2–29.7
Cutting and handling of scrap metal	1030	277 (26.0)	23.1–28.9
Battery recovery	1030	276 (25.2)	22.5–27.9
Dismantling of cars	1030	328 (30.1)	27.1–33.1
Electrical cable recovery	1030	252 (24.6)	21.7–27.5
Burning of materials to separate metals	1030	176 (15.3)	13.1–17.4
Recovery of radiators	1030	197 (16.2)	14.2–18.1
Presence of a road/railway within 200 m	1002	387 (43.0)	39.4–46.6
Presence of a commercial area within 200 m	999	190 (22.9)	20.1–25.7
Presence of agricultural crops within 50 m	992	240 (20.8)	18.5–23.1
Presence of a landfill within 500 m	942	69 (8.8)	6.3–11.3
Presence of an industrial site within 200 m	996	198 (19.7)	17–22.3

$N$ , number of respondents; CI, confidence interval.

a: Weighted and post-stratified proportion by gender.

also significantly associated with the type of housing. Finally, although not statistically significant, the prevalence of hypertension and diabetes was higher in those living in precarious and unauthorized housing compared to those in adequate housing (28.3% vs. 21.8% and 16.5% vs. 13.2%, respectively) (table 3).

### Children's health status (7–13 years old)

The prevalence of overweight and obesity in children was 17.8% and 17.9%, respectively. An assessment of children's mental health indicated that 7.6% exhibited behavioural and emotional difficulties. Finally, 10.2% of the children had had symptoms suggestive of asthma (wheezing or nocturnal dry coughs) in the previous year (table 2).

### Healthcare use

Most adults (92.3%) had complementary health insurance; specifically, 83.6% were beneficiaries of France's solidarity complementary health insurance scheme and 6.3% reported they had no complementary health insurance. In the previous year, 82.6% of the adults had visited a general practitioner, 31.4% had gone to a hospital emergency department and 52.2% had consulted a dentist. Almost half (48.4%) reported they had foregone some type of healthcare at least once; the most frequently cited reasons for this were: a lack of time or other issues for concern (40%), waiting times too long (12.3%), a lack

**Table 2** Self-perceived health status of adults ( $N = 1030$ ) and children ( $N = 337$ ); study of Travellers' healthcare use and self-perceived state of health, Nouvelle-Aquitaine, France, 2019–2022

Characteristics	Total	$N$ (%) <sup>a</sup>	CI 95%
Adults ( $N = 1030$ )			
Self-perceived health status	1020		
Very good or good		519 (50.0)	46.2–53.8
Fair, poor or very Poor		501 (50.0)	46.2–53.8
Limited activity due to a health problem for at least 6 months	1017	398 (40.9)	37.1–44.6
Diabetes	1030	127 (14.4)	11.7–17.2
Hypertension	1030	227 (24.7)	21.2–28.1
Myocardial infarction <sup>b</sup>	418	13 (3.9)	1.6–6.3
Asthma <sup>b</sup>	418	66 (17.3)	10.7–23.8
Chronic obstructive pulmonary disease <sup>b</sup>	418	51 (11.1)	7.2–15.0
Low back pain <sup>b</sup>	418	165 (41.9)	35.0–48.8
Major depression <sup>c</sup>	1000	145 (14.4)	11.6–17.2
Weight status	678		
Underweight		13 (1.3)	0.6–2.0
Normal		205 (26.0)	22.3–29.8
Overweight		223 (36.2)	31.8–40.5
Obesity		237 (36.6)	31.8–40.5
Oral and dental disorders	1016	487 (46.3)	42.6–50.0
Children ( $N = 337$ )			
Behavioural and emotional difficulties <sup>d</sup>	299	21 (7.6)	4.2–11.0
Weight status <sup>e</sup>	106		
Underweight		7 (9.5)	2.3–16.6
Normal		51 (54.8)	44.6–65.0
Overweight		25 (17.8)	10.9–24.7
Obesity		23 (17.9)	11.2–24.7
Self-reported diabetes	336	3 (1.0)	0.0–2.3
Symptoms suggestive of asthma	337	33 (10.2)	6.7–13.8

$N$ , number of respondents; CI, confidence interval.

a: Weighted and post-stratified proportion by gender.

b: Indicators measured only in phase 2; prevalence estimated with weights calculated for interviews conducted in phase 2 only ( $n = 418$ ).

c: Using the Mini-International Neuropsychiatric Interview.

d: Total score of the Strengths and Difficulties Questionnaire (SDQ) > 17.

e: Using the IOTF age- and sex-specific child body mass index cut-off points (20).

of knowledge about the healthcare system (11.3%), financial reasons (8.2%) and transportation problems (7.1%). Finally, 20.1% of adults stated that a healthcare professional had refused to provide them care, mainly because of their origins, and because doctors usually do not take on new patients. More than half of the adults (59.9%) had experienced discrimination because of their origins.

### Measles–mumps–rubella vaccination coverage among children

Child MMR vaccination coverage data were collected from 460 vaccination records for all children aged 2–17 years of age (i.e. not only the selected child) from the households surveyed. Children were on average 8.9 years old. Two-dose MMR vaccination coverage at 24 months was estimated at 45.3% (one-dose at 75.6%). Reverse Kaplan–Meier curves show cumulative two-dose MMR coverage according to age (Supplementary figure S2). Finally, coverage was significantly higher in children living in adequate housing compared to those living in precarious and unauthorized housing (85.1% vs. 79.3%,  $P = 0.02$ ).

## Discussion

To the best of our knowledge, this is the first multi-dimensional epidemiological study of Travellers in France. Most adults were living with a partner (72.1%), very few had upper secondary school education (7.5%) and employment was mostly occasional (64.2%). A large proportion had precarious living conditions (legal occupation or not) (74.5%), had no access to running water (22.2%) and lived near an industrial site (19.7%) or a major highway (43.0%), exposing them to air and noise pollutants. These results are consistent with a previous French study on the location of public facilities for Travellers, which highlighted in particular the geographic, social and symbolic relegation of their living areas.<sup>12</sup>

Half (50.0%) of the adults in our study declared they were in fair, poor or very poor health, compared to 31.9% in the general population in France.<sup>22</sup> This result is of the same order of magnitude (46.4%) as those found for homeless families in France—another population which is socially excluded because of their housing conditions. It highlights the key role of structural social determinants such as housing on Travellers' health.<sup>23</sup> The prevalence of obesity

**Table 3** Health indicators by type of housing for adults ( $N = 1030$ ); study of Travellers' healthcare use and self-perceived state of health, Nouvelle-Aquitaine, France, 2019–2022

Characteristics <sup>a</sup>	Type of housing				$P$ -value <sup>b</sup>
	Adequate ( $n = 305$ )	Inadequate ( $n = 69$ )	Precarious ( $n = 464$ )	Precarious and unauthorized ( $n = 192$ )	
Self-perceived health status					0.4
Very good or good	147 (48.8)	37 (54.8)	242 (53.4)	93 (44.1)	
Fair, poor or very poor	155 (50.9)	32 (46.2)	215 (46.3)	99 (55.9)	
Limited activity due to health (>6 months)	117 (38.5)	25 (39.1)	177 (38.7)	79 (46.3)	0.6
Medication(s) prescribed for at least 6 months	89 (43.4)	30 (48.4)	100 (41.1)	53 (57.1)	0.03
Weight status					0.2
Overweight	74 (34.4)	15 (30.7)	91 (33.2)	43 (44.8)	
Obesity	85 (37.9)	19 (36.1)	96 (37.4)	37 (34.0)	
Diabetes	37 (13.2)	15 (25.1)	49 (12.2)	26 (16.5)	0.11
Hypertension	64 (21.8)	12 (17.9)	103 (24.5)	48 (28.3)	0.4
Major depression <sup>c</sup>	47 (14.7)	6 (6.5)	60 (12.1)	32 (19.8)	0.03

a: Number of respondents (percentage weighted and post-stratified proportion by gender).

b: Pearson's chi-squared test with Rao & Scott's second-order correction.

c: Using the Mini-International Neuropsychiatric Interview.

was higher in our study than in a national French study in 2015 (36.6% vs. 17%) which aimed to evaluate the health status, diet and physical activity of the general population.<sup>24</sup> In terms of chronic diseases, the prevalence of diabetes (14.4%), high blood pressure (24.7%), myocardial infarction (3.9%), asthma (17.3%), and low back pain (41.9%) in our sample was higher than in the general population, according to the 2012 Health, Health Care and Insurance French representative survey (4.4%, 14.6%, 1.0%, 3.3% and 13.0%, respectively); however, that survey only estimated prevalence in adults aged 25 years old and over.<sup>25</sup> The prevalence of oral and dental disorders in our sample was high (46.3%). Mental health was also a major issue; 14.4% of the adult participants reported having major depression, compared to less than 10% in the general population.<sup>26,27</sup> The prevalence of major depression was significantly higher in people living in precarious and unauthorized housing compared to those in adequate housing (19.8% vs. 14.7%). Our results also showed a social exclusion gradient relating poor health status to precarious housing: the more precarious the housing, the more likely the participant was to report a chronic disease such as diabetes or hypertension. Our results on adults' health status are similar to those obtained in the 2010 All-Ireland Traveller Health Study, which included 10 618 Irish Traveller families.<sup>5</sup> In that study, the prevalence of chronic diseases appeared to be greater than in the general population, especially back pain conditions, diabetes, heart attacks and respiratory conditions.

With regard to the children aged between 7 and 13 years old (third degree of random sampling), 7.6% had emotional and behavioural difficulties, which is similar to the general French population (8.0%).<sup>28</sup> The prevalence of children with overweight and obesity in our sample was also much higher than that in the general population (17.8% vs. 17.0%, and 17.9% vs. 3.9%, respectively).<sup>24</sup>

With regard to healthcare use, adults were less likely to have consulted a dentist (52.2 vs. 54.9% in the general population) or general practitioner (82.6 vs. 87.6%) in the previous year. In contrast, 31.4% (versus 18%) had visited a hospital emergency department in the previous year and 20.9% had been hospitalized at least one night (vs. 12.1%). Foregoing healthcare was also higher in our sample than in the general population (48.4% vs. 25%). This decision by people living in social precariousness suggests there are multiple barriers to healthcare use, including lower self-perceived needs and competing needs. Indeed, the primary reason for foregoing care was a lack of time or other issues of concern (40%). The percentage who reported foregoing care for financial reasons was lower than in the general population (8.2% vs. 25%), but a larger percentage mentioned transportation difficulties (7.1% vs. 3%).<sup>29</sup> Finally, most (83.6%) adults were beneficiaries of France's solidarity complementary health insurance scheme (8.7% in the general population<sup>29</sup>). A small percentage (6.5%) of adults reported that they did not have any complementary health insurance (4.6% in the general population<sup>29</sup>).

Two-dose MMR vaccination coverage at 24 months in children was 45.3%, which is much lower than the 95% needed to eliminate the disease,<sup>30</sup> and lower than health-certificate based estimates for the general French population at 24 months (89.6%).<sup>31</sup> One-dose MMR vaccination coverage at 24 months was much higher but still lower than in the general population (75.6% vs. 92%, respectively).<sup>31</sup> This result highlights the delay in obtaining the second MMR dose in the Traveller population. Although two-dose MMR vaccination coverage at 24 months was low, we observed a progressive catch-up until the age of 12. Future analyses will allow us to identify the potential reasons for lower coverage more precisely, for example vaccine hesitancy and poor access to the healthcare system.

### **Strengths and limitations**

This multi-dimensional epidemiological study describes the health status, healthcare use and child MMR vaccination coverage in Travellers for the first time in France. One of the original aspects of this work is that several tools (questionnaires, flyers, etc.) were co-

constructed with partner associations and with Travellers themselves. This participative approach, which required a great deal of preparation time, was adopted so that possible obstacles to conducting the interviews could be overcome (e.g. taboo questions, language elements not adapted to Traveller culture, etc.). We believe that this implication partly explains the high participation rate (73.6%) of the Travellers contacted. Another reason is the strong bond of trust built over many years between the social workers of the study's partner associations and the Traveller population. Thanks to this trust, we were able to gain access to this marginalized hard-to-reach community.

Our study has limitations. First, only Travellers who were known to the partner organizations participated; this may have resulted in desirability bias. Second, the study was interrupted because of the national COVID-19 lockdown implemented in March 2020. It was subsequently relaunched in October 2021. This event had an impact on the length of the survey period. We compared prevalences between the two phases but they were globally similar (results not shown). Finally, participant recruitment was challenged by the mobility of Traveller groups; this may have led to a lack of power for the analysis according to the type of housing.

Despite these limitations, this study, based on a complex random sample design, can be considered to be representative of the Traveller community in the Nouvelle-Aquitaine region. It provides robust results on their health needs and on healthcare use and disease prevention behaviours. It also provides an estimate of the order of magnitude of the disease burden in this population according to their environmental and living conditions. Housing, like one's living environment, is an important determinant of social and territorial health inequalities. These inequalities are particularly present for Travellers; indeed, we observed a social exclusion gradient linking poor health to precarious housing.

Our study highlights the need for urgent and focused actions for this community in terms of housing policies and the location of Travellers' living areas. Housing instability and precarious living conditions must be tackled, and more adequate healthcare use and prevention measures promoted for Traveller children and adults. Considering the social exclusion this population faces on a daily basis, health mediation could be one promising intervention to promote prevention and access to health services.

### **Supplementary data**

Supplementary data are available at *EURPUB* online.

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## Data availability

The data underlying this article were provided by Santé publique France. Data will be shared on request to the corresponding author with permission of Santé publique France.

### Key points

- Travellers face deleterious environmental and living conditions related to their housing.
- Travellers have a greater burden of chronic diseases than the general French population.
- The more precarious the housing, the more likely Travellers are to report having a chronic disease (social exclusion gradient).
- MMR vaccination coverage among Traveller children is lower than in the general population.

## References

- Council of Europe. Glossaire terminologique raisonné du Conseil de l'Europe sur les questions roms, 2012. Available at: <http://a.cs.coe.int/team20/cahrom/documents/Glossaire%20Roms%20FR%20version%2018%20May%202012.pdf> (5 December 2022, date last accessed).
- Cour des comptes, Paris. L'Accueil et l'accompagnement des Gens du voyage. 2012, p. 346. Available at: [https://www.ccomptes.fr/sites/default/files/EzPublish/rapport\\_thematique\\_Gens\\_du\\_voyage.pdf](https://www.ccomptes.fr/sites/default/files/EzPublish/rapport_thematique_Gens_du_voyage.pdf) (4 October 2023, date last accessed).
- European Union Agency for Fundamental Rights (FRA). Roma and Travellers Survey in Six Countries, 2020. Available at: [https://fra.europa.eu/sites/default/files/fra\\_uploads/fra-2020-roma-travellers-six-countries\\_en.pdf](https://fra.europa.eu/sites/default/files/fra_uploads/fra-2020-roma-travellers-six-countries_en.pdf) (5 December 2022, date last accessed).
- Reyniers A. Les gens du voyage en France. *Quelques Données Historiques Et Sociologiques. Études Tsiganes* 2017;61–62:10–21.
- Abdalla S, Cronin F, Daly L, et al. All Ireland Traveller Health Study, 2010. Available at: [https://www.ucd.ie/t4cms/AITHS\\_SUMMARY.pdf](https://www.ucd.ie/t4cms/AITHS_SUMMARY.pdf) (5 December 2022, date last accessed).
- Parry G, Cleemput PV, Peters J, et al. Health status of Gypsies and Travellers in England. *J Epidemiol Community Health* 2007;61:198–204.
- Ministerio de Sanidad de Espanad, Servicios Sociales e Igualdad. Segunda Encuesta Nacional de Salud a Población Gitana, 2014. Available at: <https://www.sanidad.gob.es/en/profesionales/saludPublica/prevPromocion/promocion/desigualdadSalud/docs/ENS2014PG.pdf> (4 October 2023, date last accessed).
- Peters J, Parry GD, Van Cleemput P, et al. Health and use of health services: a comparison between Gypsies and Travellers and other ethnic groups. *Ethn Health* 2009;14:359–77.
- Goward P, Repper J, Appleton L, Hagan T. Crossing boundaries. Identifying and meeting the mental health needs of Gypsies and Travellers. *J Ment Health* 2006;15:315–27.
- Vandentorren S, Roingear C. Effets de santé des déterminants environnementaux chez les Gens du voyage. *Etudes Tsiganes* 2019;67:16–23.
- Acker W. Où sont les « gens du voyage »? Inventaire critique des aires d'accueil. 2021. Available at: [https://cdn.shopify.com/s/files/1/0079/3313/2881/files/Ou\\_sont\\_les\\_gens\\_du\\_voyage\\_-\\_William\\_Acker.pdf?v=11950590303093634809](https://cdn.shopify.com/s/files/1/0079/3313/2881/files/Ou_sont_les_gens_du_voyage_-_William_Acker.pdf?v=11950590303093634809) (5 December 2022, date last accessed).
- Loiseau G, Granal L. La localisation de l'offre publique d'accueil et d'habitat des gens du voyage. Fédération nationale des associations solidaires d'action avec les Tsiganes et les Gens du voyage (FNASAT-GDV). 2022. Available at: <http://www.fnasat.asso.fr/LaLocalisationdeloffrepubliquedaccueiltdhabitatdesgensduvoyage2022.pdf> (5 December 2022, date last accessed).
- Vandentorren S, Brabant G, Spanjers L, et al. Activities at risk of lead exposure and lead poisoning in children of travellers' families in Charente, France. *Heliyon* 2023;9:e13056.
- Cook B, Wayne GF, Valentine A, et al. Revisiting the evidence on health and health care disparities among the Roma: a systematic review 2003–2012. *Int J Public Health* 2013;58:885–911.
- Fournet N, Mollema L, Ruijs WL, et al. Under-vaccinated groups in Europe and their beliefs, attitudes and reasons for non-vaccination; two systematic reviews. *BMC Public Health* 2018;18:196.
- Bernadou A, Astrugue C, Méchain M, et al. Measles outbreak linked to insufficient vaccination coverage in Nouvelle-Aquitaine Region, France, October 2017 to July 2018. *Euro Surveill* 2018;23:1800373.
- Cox B, Oyen HV, Cambois E, et al. The reliability of the Minimum European Health Module. *Int J Public Health* 2009;54:55–60.
- Pettersson A, Modin S, Wahlström R, et al. The Mini-International Neuropsychiatric Interview is useful and well accepted as part of the clinical assessment for depression and anxiety in primary care: a mixed-methods study. *BMC Fam Pract* 2018;19:19.
- Goodman R. The Strengths and Difficulties Questionnaire: a research note. *J Child Psychol Psychiatry* 1997;138:581–6.
- Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000;6320:1240–3.
- Institut national de la statistique et des études économiques. Population par sexe | Insee. Available at: <https://www.insee.fr/fr/statistiques/2381466#tableau-figure1> (3 January 2023, date last accessed).
- Direction de la recherche, des études, de l'évaluation et des statistiques (DRESS), Santé publique France (SpF). L'état de santé de la population en France—Rapport 2017. Available at: <https://drees.solidarites-sante.gouv.fr/publications-documents-de-reference/rapports/letat-de-sante-de-la-population-en-france-rapport-2017> (5 December 2022, date last accessed).
- Arnaud A, Caum C, De Watrigant T et al. Enfants et familles sans logement personnel (ENFAMS) en Ile-de-France (Paris): Premiers résultats de l'enquête quantitative, 2014, 442. Available at: <https://www.santepubliquefrance.fr/docs/enfams-enfants-et-familles-sans-logement-personnel-en-ile-de-france-premiers-resultats-de-l-enquete-quantitative> (4 October 2023, date last accessed).
- Verdot C, Torres M, Salanave B, Deschamps V. Corpulence des enfants et des adultes en France métropolitaine en 2015. Résultats de l'étude Esteban et évolution depuis 2006. *Bull Epidemiol Hebd* 2017;13:234–41.
- Coste J, Valderas JM, Carcaillon-Bentata L. Estimating and characterizing the burden of multimorbidity in the community: a comprehensive multistep analysis of two large nationwide representative surveys in France. *PLoS Med* 2021;18:e1003584.
- Fond G, Lancon C, Auquier P, Boyer L. Prevalence of major depression in France in the general population and in specific populations from 2000 to 2018: a systematic review of the literature. *Presse Med* 2019;48:365–75.
- Guardia D, Salleron J, Roelandt JL, Vaiva G. Prevalence of psychiatric and substance use disorders among three generations of migrants: results from French population cohort. *Encephale* 2017;43:435–43.
- Shojaei T, Wazana A, Pitrou I, Kovess V. The strengths and difficulties questionnaire: validation study in French school-aged children and cross-cultural comparisons. *Soc Psychiatry Psychiatr Epidemiol* 2009;44:740–7.
- Célant N, Guillaume S, Rochereau T. L'Enquête santé européenne - Enquête santé et protection sociale (EHIS-ESPS) 2014. Available at: <https://www.irdes.fr/recherche/rapports/566-enquete-sante-europeenne-ehis-enquete-sante-et-protection-sociale-esps-2014.pdf> (5 December 2022, date last accessed).
- Montali M, Kawalec A, Leoni E, Dallolio L. Measles immunization policies and vaccination coverage in EU/EEA countries over the last decade. *Vaccines (Basel)* 2020;8:86.
- Lévy-Bruhl D, Fonteneau L, Vaux S, et al. Assessment of the impact of the extension of vaccination mandates on vaccine coverage after 1 year, France, 2019. *Euro Surveill* 2019;24:1900301.