

# Constances, the French nationwide population cohort: major accomplishments

**Marie Zins**

Paris Cité University Faculty of Health: Universite Paris Cite Faculte de Sante

**Marcel Goldberg**

`marcel.goldberg@inserm.fr`

Université Paris Cité Faculté de Santé: Universite Paris Cite Faculte de Sante <https://orcid.org/0000-0002-6161-5880>

**Jack Siemiatycki**

CRCHUM: Centre de Recherche du Centre Hospitalier de l'Université de Montreal

**Antoine Duclos**

Universite Paris 5: Universite Paris Cite Faculte de Sante

---

## Research Article

**Keywords:** Chronic diseases, Women health, Addiction, Socioeconomic factors, Occupation, Environment

**Posted Date:** October 31st, 2025

**DOI:** <https://doi.org/10.21203/rs.3.rs-7829172/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

**Version of Record:** A version of this preprint was published at European Journal of Epidemiology on October 12th, 2026. See the published version at <https://doi.org/10.1007/s10654-026-01463-6>.

# Abstract

The CONSTANCES cohort is an epidemiological research infrastructure accessible to the international epidemiologic research community ([doi.org/10.13143/inserm\\_constances](https://doi.org/10.13143/inserm_constances)). CONSTANCES also provides public health authorities with data regarding prevalence of numerous health conditions and determinants among the French population. CONSTANCES comprises a representative sample of about 220,000 French adults aged 18-69 at enrolment (7.6% participation rate). Follow-up begins at enrolment and is intended to last for the lifetimes of study participants. At inclusion, the selected subjects completed questionnaires and underwent a comprehensive health examination. A biobank was established. The follow-up includes a yearly self-administered questionnaire, and a health examination every four years. Social and health data are collected continually from French national administrative databases. The data collected cover a wide spectrum of somatic and mental health disorders, social and demographic characteristics, socioeconomic status, life events, behaviors, environmental and occupational factors. In order to estimate prevalences that are unbiased by non-participation, weighting methods based on data from national administrative databases were developed. The CONSTANCES research infrastructure is open to legitimate researchers from any country, on any topic for which a sound research project is proposed, and for which certain ethical conditions are met. Up to 2025, over 200 projects have been conducted and more than 250 papers have been published; the numbers are expected to grow as the participants age. Highlighting the broad scope of CONSTANCES data collection, already published papers pertain to many health research fields, such as chronic diseases, aging, women's health, environmental and occupational risks or research methods.

## Context

For a variety of reasons, to enhance the ability to effectively and efficiently investigate potential etiologic relations, epidemiologists have, over the last few decades, established very large-scale population-based cohorts in various countries. Some of these cohorts include hundreds of thousands of participants, from whom extensive data on lifestyle, environmental, occupational, social and genetic factors are collected prospectively. Examples include the EPIC European Prospective Investigation into Cancer and Nutrition in several European countries [1], LifeLines in the Netherlands [2], the German National Cohort [3], the UK Biobank [4] and All of Us in the USA. [5].

The French population-based cohort called CONSTANCES was launched in 2012 and soon thereafter we published its principal characteristics [6]. Now, with 10 years of development and operation, we are in a position to more definitively describe its operational characteristics, its accomplishments and its potential usefulness for the international research community. As we describe below, while it has much in common with other major population-based cohorts, CONSTANCES has some features that make it uniquely capable of addressing many important research questions. This article aims to provide an updated overview of the cohort's main features and recent developments, and to permit French and international health researchers to appreciate how they might benefit from using CONSTANCES data and biomaterials

## Objectives

The overarching objective of CONSTANCES was to constitute a research infrastructure, relying on a large population-based cohort, to serve as an open epidemiologic platform widely accessible to the national and international research and public health community. CONSTANCES also aims to describe the health status of the French population and the distribution of many health determinants.

## Methods

### Recruitment of participants

The sampling frame for selecting a study population was restricted to subjects residing within accessible distance of one of 21 nationally coordinated Health Examination Centers (HECs) that were located in different regions of mainland France. Collectively, these regions were well representative of the entire population mosaic of France. Within these regions the sampling frame consisted of all adult residents who are eligible to receive French social services and who were aged 18-69 at enrolment. All French people are on this list, with a few exceptions for administrative reasons, namely agricultural workers and military personnel. Eligible persons were selected using an unequal probabilities sampling scheme, over-representing subsets of the population who tend to participate less in epidemiological surveys (namely, men, young people, low socioeconomic status (SES) subjects. Selected subjects were sent an information package and an invitation to participate. The participation rate was 7.6%. Those who agreed were instructed to attend the Health Examination Center (HEC) in their region. At the enrolment visit, the participants completed wide-ranging questionnaires and underwent an extensive health examination. They also signed various consent forms allowing Constances to access the data on their files with government health and social services agencies. Enrolment started in 2012; recruitment was gradual and the final cohort was constituted in 2020, comprising 219,144 participants.

In addition to these active participants, a passive “reference-cohort” of 435,522 additional subjects was constituted. These individuals were randomly selected among those who did not accept the invitation to participate actively with questionnaires or biological specimens, but they acquiesced to allow the CONSTANCES team to access their confidential pseudo-anonymized data held in government administrative databases, including health care and socioeconomic data. This virtual representative cohort serves as a reference to calibrate prevalence estimates derived from the main cohort of active participants. This calibration serves to correct for potential biases related to willingness to participate.

### Sources of data

Pursuant to the extensive data collection at enrolment, participants are followed-up via multiple ongoing mechanisms: an annual self-administered questionnaire completed on paper or by internet; every 4 years they are invited for a new health examination at the nearest HEC; annual linkage with the following national administrative databases which continuously register data for each French resident:

- the National Health Data System which collects health-care utilization claims for services provided by all health care providers, hospital discharge records and mortality data;
- the National Retirement Insurance Fund which collects data on employment and salary.

In addition to providing valuable health and socioeconomic data, these linkages to administrative databases ensure that there are virtually no losses to follow-up. Collectively, these sources of follow-up data ensure that the CONSTANCES database contains up-to-date information on each participant's vital status, causes of death, and a wealth of information on morbidity status, in addition to wide-ranging, in-depth and time-related information on potential determinants of health and health behaviours.

## Principal data collected

CONSTANCES was designed to collect high quality detailed data on a large variety of study participants' characteristics from different sources at each stage of the study: questionnaires, medical examinations, linkage to national administrative health, socioeconomic and environmental databases. They relate to social and demographic characteristics (e.g. social position, educational and income level, employment and marital status, housing), health (e.g. disease history, self-reported health scales, incident and prevalent diseases from self-reports, social security and hospital discharge, sick leaves, healthcare utilization and cause of death; in the HEC examination, weight, height, waist-hip ratio, blood pressure, electrocardiogram, vision, hearing, and lung function, extensive cognitive and physical workup for participants aged 45 and over) and to lifestyle (e.g. smoking and alcohol consumption, dietary habits and physical activity, use of addictive substances, sexual life). There was a focus on occupational circumstances (exposure to chemical, physical, mechanical, biological agents and psychosocial factors, full job histories coded for linkage with job-exposure matrices) and environmental factors by linking geocoded residency addresses with various spatialized databases (air and water pollution, green spaces, UV, ionizing radiations, etc.), including the characteristics of the neighborhoods like socio-economic data, access to care, community facilities, etc. Blood and urine samples were collected and are stored in a biobank.

## Who is in the cohort

The composition of the cohort shows quite a diverse distribution of demographic, social, economic and professional characteristics (table 1).

Table 1: Main sociodemographic characteristics of participants at the time of enrolment

|                                      | n       | %     |
|--------------------------------------|---------|-------|
| Age                                  |         |       |
| 18-29                                | 3,155   | 1.43  |
| 30-39                                | 29,679  | 13.47 |
| 40-49                                | 45,587  | 20.68 |
| 50-59                                | 48,102  | 21.83 |
| 60-69                                | 48,199  | 21.87 |
| 70-79                                | 42,970  | 19.50 |
| 80+                                  | 2,703   | 1.23  |
| Gender                               |         |       |
| Men                                  | 101,986 | 46.27 |
| Women                                | 118,409 | 53.73 |
| Education                            |         |       |
| No diploma or lower than high school | 53,155  | 24.12 |
| Completed High school                | 35,364  | 16.05 |
| Completed College                    | 55,646  | 25.25 |
| Completed University                 | 69,936  | 31.73 |
| Other                                | 586     | 0.27  |
| Missing                              | 5,707   | 2.59  |
| Marital status                       |         |       |
| Single                               | 58,846  | 26.70 |
| Married, civil partnerships          | 127,820 | 58.00 |
| Divorced, separated                  | 22,884  | 10.38 |
| Widow(er)                            | 4,138   | 1.88  |
| Missing                              | 6,708   | 3.04  |

### Some quantitative milestones

At last count (September 2025), 1,168,410 questionnaires have been collected, 441,464 inclusion and follow-up health examination have been carried out; 145,497 cognitive and physical function

assessments in subjects aged 45 years and older were performed. Blood and urine samples from 57,848 participants are stored in the biobank; in total the biobank contains 1,393,644 blood (EDTA and HepLi plasma, buffy-coat, serum) and urine aliquots. Participation rates to the annual follow-up questionnaire are high, about 70% on average; since the cohort inception in 2012, less than 0.4% of participants have left the cohort. The cohort is linked to the administrative databases of year n-1 by the end of every year. Among active participants, 3,759 deaths have occurred.

In addition to the data listed above that had been defined in the initial protocol, we regularly enrich the database by adding new data. For health outcomes, additional information not present in the administrative records is collected from medical records, and we have implemented algorithms to identify numerous diseases from the National Health Data System [8, 9,10]. Currently, around 210,000 full job histories have been coded for occupation and industry using French and international classification systems, totaling about 700,000 professional episodes; this is likely one of the largest databases of its kind in the world. The linkage of job histories with various job-exposure matrices concerning, for example, biomechanical factors, solvents, dusts, cleaning products and detergents, or specific exposures of healthcare professionals, was performed, providing data on participants' occupational exposures to many chemical and physical agents, to biomechanical and psychosocial factors [11,12,13,14]. Regarding residential histories, participants' addresses were collected and geocoded at enrollment and during follow-up; for more than 80,000 cohort participants we have also collected and geocoded lifetime addresses prior to their enrolment in CONSTANCES. By developing current and past air pollution models for many areas of France for several airborne pollutants, and linking these to participants' residential addresses, we derived environmental data on participants' neighborhood exposure to many airborne pollutants, including PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, O<sub>3</sub>, SO<sub>2</sub>, several airborne metals or chemicals in drinking water [15,16,17,18,19,20,21,22]. Linking addresses to national data sources, we also have information on additional characteristics of the neighborhoods in which each participant has lived, including access to care, socio-economic data, community facilities, green spaces, light, etc. [23,24].

## Examples of Research that has been conducted in CONSTANCES

More than 250 projects have been or are currently being carried out by more than 160 French and international teams[1], having already produced more than 250 publications in peer-reviewed journals[2]. The annual number of research projects using CONSTANCES is steadily increasing. The annual number of publications was 5 in 2016, 20 in 2020, and 56 in 2024.

The research conducted and published to date pertains to various health fields, such as chronic diseases, aging, women's health, environmental and occupational risks or research methods, which highlights the broad scope of CONSTANCES. The investigators include French and foreign teams from research institutions, hospitals, health agencies. To illustrate the diversity and importance of the research projects conducted in CONSTANCES, here we selected some major findings in various fields.

# Chronic diseases

In the field of *cardiovascular health*, some studies have focused on the incidence of hypertension, showing an association between snoring and daytime sleepiness with subsequent incident hypertension [25], that a systolic blood pressure (SBP) threshold of 130 mmHg predicted 70% of new cases during follow-up, and that one-point BMI reduction significantly reduced hypertension risk by 16%, regardless of initial BMI and SBP levels [26].

CONSTANCES data showed that the new blood pressure thresholds recommended in 2024 by the European Society of Cardiology could lead to an overestimation of the prevalence of excessively high blood pressure [27]. Among treated hypertensive subjects, there was an increased odds of uncontrolled hypertension (defined as mean systolic BP  $\geq 140$  mmHg and/or mean diastolic BP  $\geq 90$  mmHg), associated with heavy alcohol drinking, with low adherence to dietary recommendations and with overweight or obesity [28]. Significant associations of exposure to long working hours, defined as working time  $\geq 10$  h/day for at least 50 days/year, has been established for both ischemic heart disease [29] and stroke [30]; the risk of incident non-fatal cardiovascular disease was significantly increased among subjects exposed to stressful psychosocial work [31]. A study of the associations of Life's Essential 8 (LE8) and Life's Simple 7 (LS7) cardiovascular health scores with sexual minority status showed that lesbian and bisexual women had greater percentages of high LE8 scores (80–100) compared with heterosexual women, whereas the distribution of LS7 score levels did not differ by sexual status; in men, gay and bisexual men had higher LE8 and LS7 scores than heterosexual men [32].

Several studies have focused on *respiratory health*. In terms of public health, it has been shown that half of symptomatic individuals with airflow limitation had undiagnosed obstructive lung diseases [33]. Some results concern the prevalence of selected respiratory diseases among adults in France: the prevalence of current asthma was estimated to be 5.8 % [34] and the prevalence of obstructive ventilatory disorder was 5.6% [35]. Some findings concern the biological and clinical aspects of asthma and rhinitis. Asthma inflammatory phenotypes based on blood eosinophil and neutrophil counts have been shown to be associated with distinct clinical manifestations of asthma [36,37]. Also, studies showed that rhinitis alone or in combination with asthma and conjunctivitis are different phenotypes [38] and that asthma is associated with increased severity and duration of rhinitis [39]. Occupational exposure to solvents, paints, inks, disinfectants and cleaning products was shown to be associated with asthma and high asthma symptom score [40, 41, 42]. Weekly use of disinfecting wipes at home was associated with current asthma, but lower risks were observed for the use of green and homemade products [43]. Regarding environmental exposure, associations were demonstrated between airborne particulate matter with an aerodynamic diameter lower than 2.5  $\mu\text{m}$ , black carbon and NO<sub>2</sub> and the asthma symptom score [44]. Long-term exposure to PM<sub>2.5</sub>, black carbon and NO<sub>2</sub> were associated with an increase of prevalence of current rhinitis in adults, the results suggesting that among air pollutants, black carbon may be of special interest [45]. Increased frequencies of respiratory symptoms (asthma symptom score and chronic bronchitis) were observed in both current and former electronic cigarettes users [46].

A number of studies have focused on metabolic diseases. Some addressed various aspects of Nonalcoholic Fatty Liver Disease (NAFLD). In these studies, the adjusted prevalence of NAFLD was 18.2%; when extrapolated to the general population in metropolitan France, NAFLD affects about 8.5 million adults. The prevalence was substantially higher among men and increased with age, from 4% in women aged 18 to 27 years to 44.2% in men aged 68 to 78 years. According to risk groups, the prevalence of NAFLD reached almost 80% in obese subjects, 62% in type 2 diabetic subjects, and 52% in those with elevated alanine aminotransferase [47]. Diabetes increased the risk of advanced fibrosis by almost fourfold in NAFLD subjects and was associated with an increased risk of severe liver-related, cardiovascular disease and overall mortality [48]. NAFLD with intermediate or advanced fibrosis were associated with cardiovascular disease, extra-hepatic cancer, and chronic kidney diseases [49]. It was also shown that NAFLD in lean subjects is more severe than in non-lean NAFLD for fibrosis, the progression of liver disease, chronic kidney disease, and overall mortality [50]. While hypobetalipoproteinemia, a lipid disorder characterized by permanent, inherited low levels of LDL-cholesterol is associated with a lower risk of cardiovascular events, it was shown to increase the risk of hepatic complications, including primary liver cancer [51]. The prevalence of undiagnosed diabetes and prediabetes in France were 1.6% and 7.2%, respectively. These rates were significantly higher in men, older persons, those with obesity and lower education levels. Excessive corpulence was the variable most strongly associated with undiagnosed diabetes and prediabetes [52].

There have been prevalence estimates of various dermatological diseases. The prevalence of atopic dermatitis and vitiligo have been described in the French population with estimates of 9.1% [53] and 0.71% [54]. respectively.

Thanks to the availability for almost 75,000 CONSTANCES participants of their health booklet (which is systematically given out at birth in France) where birth weight and birth term are recorded, it was found that early developmental characteristics were associated with adult disease risk. For instance, extreme low or high birth weight, as well as preterm birth were associated with various long-term health outcomes such as fasting glucose impairment, hypertriglyceridemia, high blood pressure, NAFLD, and high LDL-cholesterol, depression, anxiety and asthma and with a lesser likelihood of tertiary education attainment [55,56,57].

Several studies have examined mental health, in particular depression, measured several times during follow-up by the Center for Epidemiologic Studies Depression Scale (CES-D) scale. A cross-sectional association was observed between depressive symptoms and the exclusion of any food group from the diet, including but not restricted to animal products; the association gradually increased with the number of excluded food groups [58]; moreover, dietary exclusion at inclusion predicted depressive symptoms at follow-up [59]. Post-partum depression among fathers showed that 5.6% of them have an elevated risk of anxiety up to 3 years after the arrival of their first child [60]. Depressive symptoms were also associated with electronic cigarette use and mainly significant among smokers or former smokers at baseline [61]. Depression has also been studied in relation to professional careers; results showed that male participants who previously experienced unemployment periods, temporary employment or years

out of paid work were at elevated risk of self-reported depression [62]. Unlike men, for women, upward career mobility to high-skilled jobs was associated with more depressive symptoms compared to stagnation at origin, highlighting the mental health issues faced by women who break through the glass ceiling [63]. Comparing SES in childhood with that reached at the time of enrolment in Constances, elevated prevalence of depression was observed for upward and downward mobility, for persistently low socioeconomic position and downward mobility, particularly for women [64]. A major education reform introduced in 1959 in France that raised the minimum school leaving age from 14 to 16 years, offered a unique natural experiment to examine the effect of increased schooling duration: for men, this reform improved cognitive scores; among women, increased schooling duration had no effect on cognitive scores, but on the contrary, led to higher levels of depressive symptoms [65].

As CONSTANCES participants aged 45 and over undergo an extensive cognitive and physical workup, it was possible to study from an early age *various aspects of ageing*: decline of physical [66, 67, 68] and cognitive performance [69, 70], vision [71] or hearing [72] impairment.

Thanks to the linkage with the National Health Data System, which provides access to detailed *cost-of-care* data, it was possible to estimate the cost of treatments for asthma [73], metabolic dysfunction [74] or the determinants of use [75] or forgoing healthcare [76].

## Women's health

A substantial proportion (7.5%) of French women of reproductive age (18-49 years) experience two or more types of severe and frequent pelvic pain symptoms (dysmenorrhea, dyspareunia, and non-menstrual chronic pelvic pain) [77]. Among women aged 18-25 years, increased intensity of dysmenorrhea, increased frequency of dyspareunia, non-menstrual chronic pelvic pain, body mass index over 25 kg/m<sup>2</sup> and non-use of the hormonal contraceptive pill were significantly associated with disability assessed with the Global Activity Limitation Indicator [78]. In women aged 45 and over, walking speed was positively associated with age at menarche, age at first birth, duration of breastfeeding, number of children (highest in women with three), age at menopause, and reproductive lifetime duration, and negatively associated with time since menopause [79]; grip strength increased with age at menarche and duration of breastfeeding [80]. Among individuals with type 2 diabetes, women had a higher mean LDL cholesterol level than men but women at very high cardiovascular risk received significantly less frequent statin delivery than men [81]. Sexual dysfunction was more frequent in women who had a history of breast cancer with less sexual interest, more pain during sexual intercourse and more dissatisfaction related to their sex life [82].

## Addiction

*Addiction to tobacco, alcohol, cannabis or benzodiazepine* has been studied, particularly in relation to working conditions and employment. High physical exertion at work was associated with tobacco and

cannabis use and diet rich in sugar and fat [83]. Atypical working hours were linked to several health behaviors: night work was associated with reduced smoking cessation and increased relapse in women, higher cannabis use in men, and increased alcohol use in both sexes. Weekend work was linked to reduced smoking cessation and increased alcohol use in both men and women. Non-fixed hours were associated with reduced smoking cessation in women, increased relapse in men, and higher alcohol use in both sexes [84]. Men exposed to job stressful exposure to the public showed increased risks of heavy episodic drinking, tobacco and cannabis use; in women, stressful exposure was associated with increased risks of chronic alcohol consumption, alcohol use risk, tobacco and cannabis use [85]. Benzodiazepine use was also positively associated with stressful exposure to the public [86], and in a longitudinal analyze, effort-reward imbalance at work was associated with incident long-term benzodiazepine use in a dose dependent way [87]. Regarding the relationships between substance use and employment, it was shown that among unemployed job seekers, remaining unemployed was associated with smoking, being a high or very high-risk alcohol user, or using cannabis once a week or more [88]. Alcohol, tobacco and cannabis use were independently associated with job loss [89]. Cannabis use was associated with an increased risk of sickness absences [90]. Smokers with the least education living in highly deprived neighborhoods are less likely to quit [91]. With regard to sexual orientation, the risk of alcohol addiction and cannabis use was greatly increased for women who had homosexual relations [92]. Another study looked at benzodiazepine consumption in the French population in relation to the terrorist attacks in Paris in November 2015 showing among participants under 50 an overall increase in benzodiazepine use [93].

## Environmental health

Taking advantage of the geocoded residential histories of the participants, the health effects of various environmental exposures have been the subject of research.

Regarding airborne pollution, exposure to particulate matter with an aerodynamic diameter lower than  $2.5\text{ }\mu\text{m}$  ( $\text{PM}_{2.5}$ ), black carbon and  $\text{NO}_2$  was analyzed in relation with several outcomes. The asthma symptom score showed to be significantly positive for each pollutant; black carbon effect persisted independently of total  $\text{PM}_{2.5}$ , highlighting that it could be one of the most harmful particulate matter components [94]. Positive associations was observed between long-term exposure to air pollution and both allergic and non-allergic rhinitis [95]. Exposures to  $\text{PM}_{2.5}$ , black carbon and  $\text{NO}_2$  were each significantly associated with a higher CES-D total score, with depressed affect, and somatic complaints [96]. Exposure to airborne pollutants was associated with poorer cognitive function, especially on semantic fluency and domains of executive functions [97]. Negative associations were found between exposure to all three pollutants and handgrip strength [98].

Regarding domestic exposure to irritant and sprayed cleaning products, weekly use of irritants, scented, green, and homemade products, as well as sprays, disinfecting wipes were associated with asthma, but

fewer risks were observed for the use of green and homemade products compared to commercial ones [99].

The prevalence in the population of other environmental exposures has been described with a view to studying the risks for various outcomes, such as cancer, rhinitis and asthma, or mental health. Studies have been carried out on contamination of drinking water [100], airborne metals [101], mold in housing [102], use of cell phones and radiofrequency-emitting devices [103].

## Occupational hazards

Many studies which have demonstrated associations between occupational exposure and different health problems were limited by highly selected populations. Thanks to the full job histories and the wide variety of occupations present among CONSTANCES participants, it was possible to study the effects of various occupational exposures in the general population.

Musculoskeletal disorders: a study compared biomechanical work exposures by gender within the same occupations and found that men generally reported higher exposures, except in nursing roles where women reported higher physical exposures [104]. Cumulative work exposure to carrying heavy loads across the working life was associated with physical limitations in both genders among the less educated [105]. Exposure to vibration and/or forearm rotation was associated with surgery for Dupuytren's contracture [106]. A strong potentiating effect of co-exposure to biomechanical wrist stressors and chemicals on the risk of carpal tunnel syndrome was also found [107]. Teleworking during lockdown due to the COVID-19 epidemic was shown associated to the risk of neck pain [108].

Cardiovascular and respiratory diseases: we have already cited the research showing associations between asthma and exposure to organic solvents, paints, inks, disinfectants and cleaning [40,41,42], and between long working hours and the risk of myocardial infarction [29] and of stroke [30]. Among men, long working hours were also associated with higher anthropometric markers, adverse lipid levels, higher glucose, creatinine, white blood cells and higher alanine transaminase [109]. The risk of incident non-fatal cardiovascular disease increased among subject exposed to stressful work [31].

Participants exposed to formaldehyde during their professional life were at higher risk of global cognitive impairment [12]. Similar findings were observed for solvent exposure; for the first time the detrimental effect of solvent was evidenced also in women[110].

For both men and women, adverse employment trajectories, characterized by number of temporary jobs, number of job changes, number of unemployment periods, years out of work, occupational position and lack of job promotion were related to higher levels of a score of allostatic load based on 10 biomarkers [111].

The effects of unemployment on health have been the subject of several studies. Participants who were unemployed at inclusion were overexposed to non-moderate alcohol consumption, smoking, leisure-time

physical inactivity and depression, whereas those who have been unemployed at least once in the past were additionally overexposed to obesity, diabetes, sleep, non-fatal myocardial infarction and peripheral arterial disease [112]. High lifetime exposure to unemployment among retirees (i.e. no longer exposed) was associated with an increased prevalence of suboptimal self-rated health, disability for routine tasks and cardiovascular diseases including stroke, myocardial infarction and peripheral arterial disease; bad prior working conditions were associated with an increased prevalence of disability for routine tasks and cancers [113].

Research into occupational hazards has also included *methodological work* aimed at better characterizing occupational exposures. Several job-exposure matrices have been developed specifically for CONSTANCES to assess exposure to biomechanical factors [114,115], to the SARS-CoV-2 virus in the workplace [116], or to evaluate exposures of healthcare professionals [117].

## COVID-19 and SARS COV-2 infection

During the COVID-19 epidemic, CONSTANCES data were analyzed to investigate various aspects of the epidemic and its evolution, notably COVID-19 symptoms and other health problems, including mental health, the use of care, prevention behaviors and their impact on COVID-19 risk, impact on employment and working conditions, belief and trust.

On an operational level, six questionnaires were sent to the Internet participants of CONSTANCES between April 2020 and October 2021, and retrospective determination of SARS COV-2 serological status of participants collected for the biobank between November 2019 and March 2020 was performed. We also conducted a telephone survey in subjects over 65 years old. Later, a study of the pathophysiological mechanisms of post-acute sequelae following COVID-19 was carried out. These researches have resulted so far in over 30 publications, concerning the epidemiological, biological, social and behavioral issues of the SARS- CoV2 epidemic.

Some of the most noteworthy results include the study of the *dynamics and main features of the epidemic in France*. We analyzed the antibody status and cumulative incidence of SARS-CoV-2 infection among adults in three regions of France with high or low rate of COVID-19 following the first lockdown and associated risk factors [118]. We also were able to show that while the first “official” case in France was recognized on January 24, 2020, using blood samples from the biobank we have identified positive cases as soon as early November 2019 [119]. Other research focused on COVID-19-like symptoms and SARS-CoV-2 seropositivity profiles, hospitalization and fatality risks according to age [120,121,122], on infection probabilities and the link between COVID-19 incidence and infection fatality rate [123,124], and on association between and COVID-19 infection and work exposure [125,126]. The *immunological aspects* of SARS-CoV-2 infection have also been the subject of several studies [127,128,129,130,131]. Other studies have looked at the *consequences of the illness or lockdowns* on mental health [132,133] and particularly depression [134,135,136], on somatic disorders [137,138], on behavior [139,140,141], or on social inequalities [142]. More recently, various studies have focused on long-lasting symptoms after

an acute COVID-19 episode (“Long COVID”), including risk factors, symptoms, pathophysiology, links with serology and experience of acute symptoms [143,144,145,146]. Finally, we should mention research into beliefs about the disease [147], the trust in sources of information on COVID-19 [148] and representations of the COVID-19 epidemic [137].

## Prevalence estimates and “normal values” in the French population

In addition to providing an infrastructure for etiologic and evaluative research, CONSTANCES also aims to describe the health status of the French population and the distribution of many health determinants. Indeed, the large size of the socio-demographically diverse CONSTANCES sample, the collection of health examination data according to rigorous and monitored Standard Operating Procedures [149] and of validated questionnaires, the availability of the passive “reference-cohort” which allows to calibrate prevalence estimates derived from the main cohort of active participants, made it possible to provide prevalence estimates in the French population, corrected for selection or participation biases. CONSTANCES is now a major source of data on the health of the French population, widely used by public health authorities.

Among the conditions or risk factors which were previously undocumented or poorly documented in terms of prevalence in France, the following have now been described with the help of the CONSTANCES data: treated and untreated obstructive sleep apnea [150], hearing loss and hearing aid use [151], periodontitis [152], asthma [33], chronic respiratory diseases [34, 153], obstructive ventilatory disorder [35] rhinitis [45], type 1 and type 2 diabetes [8], prediabetes and undiagnosed diabetes [52], women’s chronic pelvic pain [77], Nonalcoholic Fatty Liver Disease [47], chronic kidney disease [154], obesity [155], atopic dermatitis [53], vitiligo [54], alcohol consumption and addictive behavior [156], cardiovascular risk factors [157], electronic cigarette use [46], occupational exposure to dusts [158], atypical working hours [159], musculoskeletal disorders and occupational biomechanical factors [160].

In addition to providing prevalence data, CONSTANCES has also produced “normal values” of diverse health-related parameters which are useful for clinicians. “Normal values” for the French general adult population were produced for usual and fast walking speed [68], and for standard neuropsychological tests (Mini-Mental State Examination, the Free and Cued Selective Reminding Test, the Trail Making Test, verbal fluency tasks and the Digit Symbol Substitution Test), by age, sex, and education [161].

[1] <https://www.constances.fr/en/scientific-area/research-and-studies-2/>

[2] <https://www.constances.fr/en/scientific-area/scientific-publications/>

## Discussion

CONSTANCES, France's largest population-based epidemiological cohort, has several strengths. It was designed as a general-purpose cohort both to help answer research questions in diverse areas and to provide public health information needed by the health authorities. It includes a balanced number of adult women and men living and working in diverse settings, from large cities to small villages in different regions of France, with a broad range of socioeconomic status and trades. A large quantity and diversity of high quality, detailed data are collected at enrolment and during follow-up, including an extensive medical, physiological and biological examination, and biospecimens. The follow-up is extensive, relying both on active participation of the volunteers through annual questionnaires and regular visits to the health clinics, and on passive methods through the regular linkage to exhaustive and detailed health and socioeconomic national administrative databases. Of particular importance is the high frequency of measurements from many different sources, allowing for the continuous enrichment of new data and for analyses of life course trajectories of health in relation to personal, social, occupational factors and major life events. Specific efforts were put into the quality of data collection and the validation of main. The age range is wide, and one of the characteristics of the cohort is that it recruited a large number of young subjects (almost 30,000 subjects aged 18 to 29 at enrollment); a unique feature of CONSTANCES is also to include a comprehensive set of cognitive and physical tests starting as young as 45 years which is earlier in the life course than most available studies on ageing. Other highlights include environmental data through the prospective collection and geocoding of participants' residential addresses, of which more than 80,000 provided all their successive addresses since birth, providing data on lifetime exposure to numerous factors such as air and water pollution, ionizing and UV radiation, nocturnal light pollution or green and blue spaces. More than 210,000 complete job histories, representing some 700,000 occupational episodes, coded in French and international classification systems, can be linked to various job-exposure matrices, providing unique data on exposure to chemical, physical, biological, organizational and psychosocial factors.

Of course, CONSTANCES has some limitations. There is an underrepresentation of hard-to-reach subjects, such as heavy drinkers or socially excluded persons. Comparisons between participants and non-participants at enrolment and during the follow-up through the “reference-cohort” allow assessment of potential biases due to selection effects, but some subgroups have too few subjects to provide reliably valid weights. Further, despite its large size, CONSTANCES does not have sufficient power to study rare outcomes or rare exposures. This limitation is common to all population-based cohorts, which has led us to include CONSTANCES in several French and European cohort consortia.

## Data access and availability

The CONSTANCES data are not accessible without explicit authorization. Access can be granted upon approval of a research proposal by the CONSTANCES cohort International Scientific Committee and provided the project meets the legal requirements set by the French data protection authority (Commission nationale de l'informatique et des libertés, CNIL) under the General data protection regulation (GDPR). The use of cohort data is governed by the CONSTANCES cohort access charter. The

data access procedure is available on the CONSTANCES cohort website (<https://www.constances.fr/>, “Scientific area” / “Access to CONSTANCES”).

## Declarations

**Acknowledgements:** The authors acknowledge the French national health insurance fund (Caisse nationale d’assurance maladie, CNAM) and its Health examination centers for collecting a large part of the data, as well as the French national old-age insurance fund (Caisse nationale d’assurance vieillesse, CNAV) for their contribution to the establishment of the cohort, and ClinSearch for performing data quality control.

**Funding:** The CONSTANCES cohort study was supported and funded by the French national health insurance fund (“Caisse nationale d’assurance maladie”, CNAM). CONSTANCES is a National infrastructure for biology and health (“Infrastructure nationale en biologie et santé”) and benefits from a grant from the French National Agency for Research (ANR-11-INBS-0002). CONSTANCES is also partly funded to a small extent by industrial companies, notably in the healthcare sector, within the framework of Public-Private Partnerships (PPP). None of these funding sources had any role in the design of the study, collection and analysis of data or decision to publish.

**Competing interests:** All authors declare that they have no conflicts of interest.

**Author Contributions:** All authors contributed to the study conception and design. The first draft of the manuscript was written by Marcel Goldberg and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

**Regulatory and ethical approvals:** This study was performed in line with the principles of the Declaration of Helsinki. All participants signed a written consent form for their participation in CONSTANCES, and, where applicable, for their participation in the biobank. The CONSTANCES cohort has been approved by the Institutional Review Board (IRB) of the French Institute of Health (Inserm) (Opinion n°01-011, then n°21-842), and authorized by the French Data Protection Authority (“Commission Nationale de l’Informatique et des Libertés”, CNIL) (Authorization #910486). The biobank obtained a favorable advice from the Committee for the protection of individuals – CPP Sud Est I (#2018-32) and an authorization from the CNIL (#DR-2-2018-137).

## References

1. Riboli E, Hunt KJ, Slimani N, Ferrari P, Norat T, Fahey M, Charrondière UR, Hémon B, Casagrande C, Vignat J, Overvad K, Tjønneland A, Clavel-Chapelon F, Thiébaud A, Wahrendorf J, Boeing H, Trichopoulos D, Trichopoulou A, Vineis P, Palli D, Bueno-De-Mesquita HB, Peeters PH, Lund E, Engeset D, González CA, Barricarte A, Berglund G, Hallmans G, Day NE, Key TJ, Kaaks R, Saracci R. European Prospective Investigation into Cancer and Nutrition (EPIC): study populations and data collection. *Pub Health Nutr.* 2002;5:1113–24.

2. Stolk RP, Rosmalen JG, Postma DS, de Boer RA, Navis G, Slaets JP, Ormel J, Wolffenbuttel BH. Universal risk factors for multifactorial diseases: LifeLines: a three-generation population-based study. *Eur J Epidemiol.* 2008;23(1):67–74.
3. Peters A, German National Cohort (NAKO) Consortium, Peters A, Greiser KH, Göttlicher S, Ahrens W, Albrecht M, Bamberg F, Bärnighausen T, Becher H, Berger K, Beule A, Boeing H, Bohn B, Bohnert K, Braun B, Brenner H, Bülow R, Castell S, Damms-Machado A, Dörr M, Ebert N, Ecker M, Emmel C, Fischer B, Franzke CW, Gastell S, Giani G, Günther M, Günther K, Günther KP, Haerting J, Haug U, Heid IM, Heier M, Heinemeyer D, Hendel T, Herbolzheimer F, Hirsch J, Hoffmann W, Holleczeck B, Hölling H, Hörlein A, Jöckel KH, Kaaks R, Karch A, Karrasch S, Kartschmit N, Kauczor HU, Keil T, Kemmling Y, Klee B, Klüppelholz B, Kluttig A, Kofink L, Köttgen A, Kraft D, Krause G, Kretz L, Krist L, Kühnisch J, Kuß O, Legath N, Lehnich AT, Leitzmann M, Lieb W, Linseisen J, Loeffler M, Macdonald A, Maier-Hein KH, Mangold N, Meinke-Franze C, Meisinger C, Melzer J, Mergarten B, Michels KB, Mikolajczyk R, Moebus S, Mueller U, Nauck M, Niendorf T, Nikolaou K, Obi N, Ostrzinski S, Panreck L, Pigeot I, Pischon T, Pschibul-Thamm I, Rathmann W, Reineke A, Roloff S, Rujescu D, Rupf S, Sander O, Schikowski T, Schipf S, Schirmacher P, Schlett CL, Schmidt B, Schmidt G, Schmidt M, Schöne G, Schulz H, Schulze MB, Schweig A. Framework and baseline examination of the German National Cohort (NAKO). *Eur J Epidemiol.* 2022;37(10):1107–24. 10.1007/s10654-022-00890-5.
4. Collins R, UK Biobank Steering Committee. UK Biobank: Protocol for a large-scale prospective epidemiological resource. Manchester: UK Biobank Coordinating Centre; 2007.
5. The. *N Engl J Med.* 2019;381:668–76. 10.1056/NEJMSr1809937.
6. Zins M, Goldberg M, the CONSTANCES team. The French CONSTANCES population-based cohort: design, inclusion and follow-up. *Eur J Epidemiol.* 2015;30(12):1317–28. 10.1007/s10654-015-0096-4.
7. Henny J, Nadif R, Le Got S, Lemonnier S, Ozguler A, Ruiz F, Beaumont K, Brault D, Sandt E, Goldberg M, Zins M. The CONSTANCES Cohort Biobank: An Open Tool for Research in Epidemiology and Prevention of Diseases. *Front Public Health.* 2020;8:605133. 10.3389/fpubh.2020.605133.
8. Fuentes S, Hrzic R, Haneef R, Kab S, Fosse-Edorh S, Cosson E. Identifying Type 1/Type 2 diabetes in medico-administrative database to improve health surveillance, medical research and prevention in diabetes: Algorithm development and application. *Diabetes Epidemiology and Management*, April–June. 2023, 10,100137.
9. Haneef R, Fuentes S, Fosse-Edorh S, Hrzic R, Kab S, Cosson E, Gallay A. Use of Artificial Intelligence for Public Health Surveillance: A case study to develop a Machine Learning-algorithm to predict the incidence of Diabetes Mellitus. *Arch Public Health.* 2021;79(1):168. 10.1186/s13690-021-00687-0.
10. Fuentes S, Cosson E, Mandereau-Bruno L, Fagot-Campagna A, Bernillon P, Goldberg M, Fosse-Edorh S, for the CONSTANCES-Diab Group. Identifying diabetes cases in health administrative databases: a validation study based on a large French cohort. *Int J Public Health* 2019 Apr (Epub 2018 Dec 4);64(3):441–50. 10.1007/s00038-018-1186-3

11. Deltreil G, Tardivel P, Graczyk P, Escobar-Bach M, Descatha A. How to Use Biomechanical Job Exposure Matrices with Job History to Access Work Exposure for Musculoskeletal Disorders? Application of Mathematical Modeling in Severe Knee Pain in the Constances Cohort. *J Occup Environ Med*. 2023 Mar;14. 10.1097/JOM.000000000000284.
12. Letellier N, Gutierrez LA, Pilorget C, Artaud F, Descatha A, Ozguler A, Goldberg M, Zins M, Elbaz A, Berr C. Association between occupational exposure to formaldehyde and cognitive impairment. *Neurology*. 2022;98(6):e633–40. 10.1212/WNL.0000000000013146.
13. Sit G, Letellier N, Iwatsubo Y, Goldberg M, Leynaert B, Nadif R, Ribet C, Roche N, Roquelaure Y, Varraso R, Zins M, Descatha A, Le Moual N, Dumas O. Occupational exposures to organic solvents and asthma symptoms in the Constances cohort. *Int J Environ Res Public Health*. 2021;18:9258. <https://doi.org/10.3390/ijerph18179258>.
14. Fadel M, Gilbert F, Legeay C, Dubée V, Esquirol Y, Verdun-Esquer C, Dinh A, Sembajwe G, Goldberg M, Roquelaure Y, Leclerc A, Wiernik E, Zins M, Descatha A. Mat-O-Covid investigators. Association between and COVID-19 infection and work exposure assessed by the Mat-O-Covid JEM in the CONSTANCES cohort. *Occup Environ Med*. 10.1136/oemed-2022-108436. Online ahead of print.
15. Keirsbulck M, Savouré M, Lequy-Flahault E, Chen J, de Hoogh K, Vienneau D, Goldberg M, Zins M, Roche N, Nadif R, Jacquemin B. Long-term exposure to ambient air pollution and asthma symptom score in the French CONSTANCES cohort. *Thorax*. 2023;78(1):9–15. 10.1136/thoraxjnl-2021-218344.
16. Javad Zare Sakhvidi M, Lafontaine A, Lemogne C, Berr C, Chen J, de Hoogh K, Lequy E, Vienneau D, Goldberg M, Zins M, Jacquemin B. Ambient air pollution exposure and depressive symptoms: findings from the French CONSTANCES cohort. *Environ Int*. 2022;170:107622. doi: 10.1016/j.envint.2022.107622. Online ahead of print. PMID: 36384066.
17. Javad Zare Sakhvidi M, Lafontaine A, Yang J, Lequy E, Artaud F, Canonico M, Ozguler A, Vienneau D, Zins M, Jacquemin B. Association between air pollution exposure and handgrip strength as a marker of frailty: findings from the French CONSTANCES cohort. *Environ Int*. 2022;170:107622. 10.1016/j.envint.2022.107622. PMID: 36384066.
18. Lequy E, Meyer C, Vienneau D, Berr C, Goldberg M, Zins M, Leblond S, de Hoogh K, Jacquemin B. Modeling exposure to airborne metals in urban areas using moss biomonitoring in cemeteries in the Paris and Lyon areas, France. *Environ Pollut*. 2022;303:119097. 10.1016/j.envpol.2022.119097.
19. Lequy E, Javad Zare Sakhvidi M, Vienneau D, de Hoogh K, Chen J, Dupuy JF, Garès V, Burte E, Bouaziz O, Le Tertre A, Wagner V, Hertel O, Christensen JH, Siemiatycki J, Goldberg M, Zins M, Jacquemin B. Influence of exposure assessment methods on associations between long-term exposure to outdoor fine particulate matter and risk of cancer in the French cohort GAZEL. *Sci Total Environ*. 2022;820:153098. 10.1016/j.scitotenv.2022.153098.
20. Javad Zare Sakhvidi M, Yang J, Lequy E, Chen J, de Hoogh K, Letellier N, Mortamais M, Ozguler A, Vienneau D, Zins M, Goldberg M, Berr C, Jacquemin B. Air pollution exposure and cognitive

- performance: findings from the enrollment phase of the CONSTANCES cohort. *Lancet Planet Health*. 2022;6:e219–29. 10.1016/S2542-5196(22)00001-8.
21. Savouré M, Lequy E, Bousquet J, Chen J, de Hoogh K, Goldberg M, Vienneau D, Zins M, Nadif R, Jacquemin B. Long-Term Exposures to PM2.5, Black Carbon and NO2 and Prevalence of Current Rhinitis in French Adults: the CONSTANCES Cohort. *Envir Int*. 2021;157:106839. doi.org/10.1016/j.envint.2021.106839.
  22. Zare MJ, Lequy E, Goldberg M, Jacquemin B. Air pollution exposure and bladder, kidney and urinary tract cancer incidence and mortality: a systematic review. *Environ Pollut*. 2020;267:115328. 10.1016/j.envpol.2020.115328.
  23. Letellier N, Carrière I, Cadot E, Berkman L, Goldberg M, Zins M, Berr C. Individual and neighborhood socioeconomic inequalities in cognitive performances among French middle-aged people. *BMJ Open*. 2020;10(3):e033751. 10.1136/bmjopen-2019-033751.
  24. Neufcourt L, Deguen S, Bayat S, Paillard F, Zins M, Grimaud O. Geographical variations in the prevalence of hypertension in France: Cross-sectional analysis of the CONSTANCES cohort. *Eur J Prev Cardiol*. 2019 Aug. 2047487319842229. 10.1177/2047487319842229
  25. Balagny P, Vidal-Petiot E, Kab S, Frija-Masson J, Steg PG, Goldberg M, Zins M, d'Ortho MP, Wiernik E. Association of snoring and daytime sleepiness with subsequent incident hypertension: a population-based cohort study. *Hypertension*. 2024;81(11):2286–97. 10.1161/HYPERTENSIONAHA.124.23007.
  26. Cheddani L, Lelong H, Goldberg M, Zins M, Blacher J, Kab S. Prediction of incidence of hypertension in France and associated factors. Results from the Constances cohort. *J Hypertens*. 2025;43(6):976–85. 10.1097/HJH.0000000000003989.
  27. Vidal-Petiot E, Kab S, Steg PG. New Definition of Elevated Blood Pressure in the 2024 ESC Guidelines: Increased Prevalence, Uncertain Evidence. *Circulation*. 2025;151(8):518–20. 10.1161/CIRCULATIONAHA.124.072696.
  28. Cherfane M, Vallee A, Kab S, Salameh P, Goldberg M, Zins M, Blacher J. Unhealthy behaviors and risk of uncontrolled hypertension among treated individuals-The CONSTANCES population-based study. *Sci Rep*. 2020;10(1):1925. 10.1038/s41598-020-58685-1.
  29. Fadel M, Li J, Sembajwe G, Gagliardi D, Pico F, Ozguler A, Evanoff BA, Baer M, Tsutsumi A, Iavicoli S, Leclerc A, Roquelaure Y, Siegrist J, Descatha A. Cumulative exposure to long working hours and occurrence of ischemic heart disease: evidence from the CONSTANCES cohort at inception. *J Am Heart Assoc*. 2020;9(12):e015753. 10.1161/JAHA.119.015753.
  30. Fadel M, Sembajwe G, Iavicoli S, Pico F, Li J, Ozguler A, Siegrist J, Evanoff BA, Baer M, Leclerc A, Roquelaure Y, Descatha A. Association between reported long-working hours and stroke in the CONSTANCES cohort. *Stroke* 2019 Jul 50(7):1879–82. 10.1161/STROKEAHA.119.025454
  31. Siegrist J, Goldberg M, Zins M, Wahrendorf M. 2023. Social inequalities, stressful work and non-fatal cardiovascular disease: follow-up findings from the CONSTANCES Study. *Occup Environ Med* oemed-2022-108794. <https://doi.org/10.1136/oemed-2022-108794>

32. Deraz O, Caceres B, Streed CG Jr, Beach LB, Jouven X, Touvier M, Goldberg M, Zins M, Empana JP. Sexual Minority Status Disparities in Life's Simple 7 and Life's Essential 8 Cardiovascular Health scores, A French Nationwide Population-Based Study. *J Am Heart Assoc.* 2023 May;17:e028429. Online ahead of print. hal id: hal-04103368, version 1.
33. Delmas M-C, Bénézet L, Ribet C, Iwatsubo Y, Provost D, Varraso R, Zins M, Leynaert B, Nadif R, Roche N. [Prevalence of asthma among adults in France, data from the Constances cohort study]. *Rev Mal Respir.* 2021;S0761-8425(21)00246-1. 10.1016/j.rmr.2021.05.007. [Article in French].
34. Delmas MC, Bénézet L, Ribet C, Iwatsubo Y, Zins M, Nadif R, Roche N, Leynaert B. Underdiagnosis of obstructive lung disease: findings from the French CONSTANCES cohort. *BMC Pulm Med.* 2021;21(1):319. 10.1186/s12890-021-01688-z.
35. Fuhrman C, Cyr D, Giraud V, Ruiz F, Perez T, Iwatsubo Y, Leynaert B, Delmas MC, Roche N. Qualité de la spirométrie dans la cohorte Constances et prévalence du trouble ventilatoire obstructif. *Bull épidémiologie hebdomadaire* 16 (35–36), 654–9.
36. Nadif R, Henny J, Tsiavia T, Ribet C, Goldberg M, Zins M, Orsi L, Roche N. Blood Basophils and asthma among participants from CONSTANCES, the French population-based cohort. *Allergy.* 2024;79(9):2527–31. 10.1111/all.16093.
37. Tsiavia T, Henny J, Goldberg M, Zins M, Roche N, Orsi L, Nadif R. Blood inflammatory phenotypes were associated with distinct clinical expression of asthma in adults from a large population-based cohort. *eBioMedicine*,76,2022,103875,doi.org/10.1016/j.ebiom.2022.103875
38. Savouré M, Bousquet J, Leynaert B, Renuy A, Siroux V, Goldberg M, Zins M, Jacquemin B, Nadif R. Rhinitis phenotypes and multimorbidities in the general population Constances cohort. *Eur Respir J.* 2023;61(2):2200943. 10.1183/13993003.00943-2022.
39. Savouré M, Bousquet J, Leynaert B, Ribet C, Goldberg M, Zins M, Jacquemin B, Nadif R. Asthma is associated with increased severity and duration of rhinitis: a study with the Allergic Rhinitis and Its Impact on Asthma (ARIA) classes in the Constances cohort. *Clin Transl Allergy.* 2023;13(11):e12316. 10.1002/clt2.12316.
40. Ibrahim B, Le Moual N, Sit G, Goldberg M, Leynaert B, Ribet C, Roche N, Varraso R, Zins M, Nadif R, Orsi L, Dumas O. Occupational Exposure Patterns to Disinfectants and Cleaning Products and Its Association With Asthma Among French Healthcare Workers. *Am J Ind Med.* 2025 Apr 23. 10.1002/ajim.23725
41. Sit G, Orsi L, Iwatsubo Y, Dananche B, Orsi F, Goldberg M, Leynaert B, Nadif R, Ribet C, Roche N, Roquelaure Y, Varraso R, Zins M, Pilorget C, Le Moual N, Dumas O. Chronic occupational exposures to irritants and asthma in the CONSTANCES cohort. *Occup Environ Med.* 2024;81:129–35. 10.1136/oemed-2023-109100.
42. Sit G, Letellier N, Iwatsubo Y, Goldberg M, Leynaert B, Nadif R, Ribet C, Roche N, Roquelaure Y, Varraso R, Zins M, Descatha A, Le Moual N, Dumas O. Occupational exposures to organic solvents and asthma symptoms in the Constances cohort. *Int J Environ Res Public Health.* 2021;18:9258. <https://doi.org/10.3390/ijerph18179258>.

43. Pacheco Da Silva E, Sit G, Goldberg M, Leynaert B, Nadif R, Ribet C, Roche N, Zins M, Varraso R, Dumas O, Le Moual N. Household use of green and home-made cleaning products, wipe application mode and asthma among French adults from the CONSTANCES cohort. *Indoor Air*. 2022;32:e13078. doi.org/10.1111/ina.13078. hal id: inserm-03764509, version 1.
44. Keirsbulck M, Savouré M, Lequy-Flahault E, Chen J, de Hoogh K, Vienneau D, Goldberg M, Zins M, Roche N, Nadif R, Jacquemin B. Long-term exposure to ambient air pollution and asthma symptom score in the French CONSTANCES cohort. *Thorax*. 2023;78(1):9–15. 10.1136/thoraxjnl-2021-218344.
45. Savouré M, Lequy E, Bousquet J, Chen J, de Hoogh K, Goldberg M, Vienneau D, Zins M, Nadif R, Jacquemin B. Long-Term Exposures to PM2.5, Black Carbon and NO2 and Prevalence of Current Rhinitis in French Adults: the CONSTANCES Cohort. *Envir Int*. 2021;157:106839. doi.org/10.1016/j.envint.2021.106839.
46. Delmas MC, Pasquereau A, Renuy A, Bénézet L, Ribet C, Zins M, Guignard R, Pérez T, Roche N, Leynaert B. Electronic cigarette use and respiratory symptoms in the French population-based Constances cohort. *Respir Med*. 2024;221:107496. 10.1016/j.rmed.2023.107496.
47. Nabi O, Lacombe K, Boursier J, Mathurin P, Zins M, Serfaty L. Prevalence and Risk Factors of Nonalcoholic Fatty Liver Disease and Advanced Fibrosis in General Population: the French Nationwide NASH-CO Study. *Gastroenterology*. 2020;159(2):791–e7932. 10.1053/j.gastro.2020.04.048.
48. Nabi O, Boursier J, Lapidus N, Mathurin J, de Ledinghen V, Goldberg M, Zins M, Lacombe K, Serfaty L. The Burden of NAFLD in Type 2 Diabetic Subjects from the General Population: a Nationwide Population-Based Follow-Up Study. *Liver Int*. 2022;42(3):595–606. 10.1111/liv.15171. hal id: hal-03604061, version 1.
49. Nabi O, Lacombe K, Boursier J, Mathurin P, de Ledinghen V, Goldberg M, Zins M, Serfaty L. Comorbidities are associated with fibrosis in NAFLD subjects: a nationwide study (NASH-CO study). *Dig Dis Sci*. 2022;67(6):2584–93. 10.1007/s10620-021-07032-z. Epub 2021 May 24. hal id: hal-03267103, version 1.
50. Nabi O, Lapidus N, Boursier J, de Ledinghen V, Petit JM, Kab S, Renuy A, Zins M, Lacombe K, Serfaty L. Lean individuals with NAFLD have more severe liver disease and poorer clinical outcomes (NASH-CO Study). *Hepatology*. 2023 Feb;24. 10.1097/HEP.0000000000000329.
51. Wargny M, Goronflot T, Rimbert A, Boursier J, Kab S, Henny J, Leux C, Smati S, Gourraud PA, Hadjadj S, Le May C, Goldberg M, Zins M, Cariou B. Primary hypocholesterolemia is associated with an increased risk of hepatic complications in the general population. *J Hepatol*. 2024;80(6):846–57. 10.1016/j.jhep.2024.01.030.
52. Lailier G, Fuentes S, Kab S, Piffaretti C, Guion M, Cosson E, Fosse-Edorh S. Risk factors associated with prediabetes and undiagnosed diabetes in France: the national Constances cohort. *Diabetes Epidemiol Manage*. 2023;10:100121. hal id: hal-04021715, version 1.

53. Ezzedine K, Hourblin V, Connétable S, Ruiz F, Ziad A, Sobczak A, Kab S, Renuy A, Goldberg M, Zins M, Nosbaum A. Atopic dermatitis in the French cohort CONSTANCES (PreDDA study): Focus on persistence and remission in adulthood. *J Eur Acad Dermatol Venereol*. 2025 Feb;21. 10.1111/jdv.20595.
54. Ezzedine K, Seneschal J, Da Silva A, Préaubert N, Lamblin A, Delattre C, Emery C, Nevoret C, Finzi J, Bouée S, Passeron T. Vitiligo Patient Population and Disease Burden in France: VIOLIN Study Results from the CONSTANCES Cohort. *J Eur Acad Dermatol Venereol*. 2023 Aug;21. 10.1111/jdv.19447.
55. Amadou C, Ancel PY, Zeitlin J, Ribet C, Zins M, Charles MA. Long-term health in individuals born preterm or with low birth weight: A cohort study. *Pediatr Res*. 2024 Jul;4. 10.1038/s4139024-03346-6.
56. Amadou C, Heude B, de Lauzon-Guillain B, Lioret S, Descarpentrie A, Ribet C, Zins M, Charles MA. Early origins of metabolic and overall health in young adults: an outcome-wide analysis in a general cohort population. *Diabetes Metab*. 2023;49(2):101414. 10.1016/j.diabet.2022.101414.
57. Amadou C, Nabi O, Serfaty L, Lacombe K, Boursier J, Mathurin P, Ribet C, de Ledinghen V, Zins M, Charles MA. Association between birth weight, preterm birth and non-alcoholic fatty liver disease in a community-based cohort. *Hepatology*. 2022;76(5):1438–51. 10.1002/hep.32540.
58. Matta J, Czernichow S, Kesse-Guyot E, Hoertel N, Limosin F, Goldberg M, Zins M, Lemogne C. Depressive symptoms and vegetarian diets: Results from the Constances cohort. *Nutrients*. 2018;10(11). 10.3390/nu10111695. pii: E1695.
59. Matta J, Hoertel N, Airagnes G, Czernichow S, Kesse-Guyot E, Limosin F, Goldberg M, Zins M, Lemogne C. Dietary restrictions and depressive symptoms: longitudinal results from the Constances cohort. *Nutrients*. 2020;12:2700. 10.3390/nu12092700.
60. Scarlett H, Wiernik E, van der Waerden J. Longitudinal trajectories and associated risk factors of paternal mental illness in the nine years surrounding the transition to fatherhood. *J Affect Disord*. 2024 Jul 8:S0165-0327(24)01056-5. 10.1016/j.jad.2024.07.008
61. Wiernik E, Airagnes G, Lequy-Flahault E, Gomajee R, Melchior M, Le Faou AL, Limosin F, Goldberg M, Zins M, Lemogne C. Electronic cigarette use is associated with depressive symptoms among smokers and former smokers: cross-sectional and longitudinal findings from the CONSTANCES cohort. *Addict Behav*. 2019;90:85–91. 10.1016/j.addbeh.2018.10.021.
62. Hoven H, Wahrendorf M, Goldberg M, Zins M, Siegrist J. Adverse employment histories, work stress and self-reported depression in the French CONSTANCES study. *Eur J Public Health*. 2021;31:1230–6.
63. Beaufiles C, Wiernik E, Cambois E. Mind the glass ceiling: The gender gap in how depressive symptoms after age 55 relate to earlier career mobility in CONSTANCES. *Soc Sci Med*. 2024;362:117446. 10.1016/j.socscimed.2024.117446.
64. Melchior M, Ziad A, Courtin E, Zins M, van der Waerden J. Intergenerational socioeconomic mobility and adult depression: the CONSTANCES study. *Am J Epidemiol*. 2018;187(2):260–9. 10.1093/aje/kwx252.

65. Courtin E, Nafilyan V, Glymour M, Goldberg M, Berr C, Berkman L, Zins M, Avendano M. Long-term effects of compulsory schooling on physical, mental and cognitive ageing: a natural experiment. *J Epidemiol Community Health* 2019 Apr (Epub 2019 Jan 11); 73:370–6. 10.1136/jech-2018-211746
66. Le Noan-Lainé M, Artaud F, Ozguler A, Coëuret-Pellicer M, Ringa V, Elbaz A, Canonico M. Association of hormonal exposures with grip strength in women over 45 years: Data from the CONSTANCES cohort study. *J Endocr Soc.* 2024;8(10):bvae150. 10.1210/jendso/bvae150.
67. Santos F, Ozguler A, Ribet C, Goldberg M, Zins M, Artaud F, Elbaz A. Association between education and walking speed: counterfactual mediation analysis in favor of a motor reserve hypothesis. *Am J Epidemiol* 2024 Jul 11:kwae197. 10.1093/aje/kwae197
68. Santos F, Ozguler A, Ribet C, Goldberg M, Zins M, Artaud F, Elbaz A. Norms for usual and fast walking speed in adults 45–69 years old from the French general population: Constances study. *J Am Med Dir Assoc.* 2024;25(2):266–74. 10.1016/j.jamda.2023.10.001.
69. Vulser H, Hoertel N, Wiernik E, Melchior M, Mura T, Olekhovitch R, Fossati P, Limosin F, Goldberg M, Zins M, Lemogne C. Depression, cognitive functions and impaired functioning in middle-aged adults from the CONSTANCES Cohort. *J Clin Psychiatry.* 2018;79(6). pii: 17m12003. 10.4088/JCP.17m12003
70. Mura T, Amieva H, Goldberg M, Dartigues JF, Ankri, Zins M, Berr C. Effect size for the main cognitive function determinants in a large cross-sectional study. *Eur J Neurol.* 2016;23:1614–26. 10.1111/ene.13087.
71. Merle B, Moreau G, Ozguler A, Srouf B, Cougnard-Grégoire A, Goldberg M, Zins M, Delcourt C. Unhealthy behaviours and risk of visual impairment: The CONSTANCES cohort. *Sci Rep.* 2018;8(1):6569. 10.1038/s41598-018-24822-0.
72. Grenier B, Berr C, Goldberg M, Jouven X, Zins M, Empana JP, Lisan Q. Objective evaluation of hearing loss, hearing aids use and cognitive impairment: A population-based study of 62,072 participants. *JAMA Netw Open.* 2024;7(10):e2436723. 10.1001/jamanetworkopen.2024.36723.
73. Roche N, Nadif R, Fabry-Vendrand C, Pillot L, Thabut G, Teissier C, Bouée S, Goldberg M, Zins M. Asthma burden according to treatment steps in the French population-based cohort CONSTANCES. *Respir Med.* 2023 Jan;206:107057. 10.1016/j.rmed.2022.107057.
74. Nze Ossima A, Brzustowski A, Paradis V, Van Beers B, Postic C, Laouénan C, Pol S, Castéra L, Gautier JF, Czernichow S, Vallet-Pichard A, Larger E, Poynard T, Serfaty L, Zins M, Valla D. Durand Zaleski I. Factors associated with high costs of patients with metabolic dysfunction-associated steatotic liver disease: an observational study using the French CONSTANCES cohort. *Clin Diabetes Endocrinol.* 2024;10:9. <https://doi.org/10.1186/s40842-023-00163-4>.
75. Sassenou J, Ringa V, Zins M, Ozguler A, Paquet S, Panjo H, Franck JE, Menvielle G, Rigal L. Combined influence of immigration status and income on cervical cancer screening uptake. *Prev Med Rep.* 2023;36:102363. 10.1016/j.pmedr.2023.102363. eCollection 2023 Dec.
76. Feral-Pierssens AL, Rives-Lange C, Matta J, Goldberg M, Juvin P, Zins M, Carette C, Czernichow S. Forgoing Health Care Even Under Universal Health Insurance: The Case of France. *Int J Public*

- Health. 2020;65(5):617–25. 10.1007/s00038-020-01395-2.
77. Margueritte F, Fritel X, Zins M, Goldberg M, Panjo H, Fauconnier A, Ringa V. The underestimated prevalence of neglected chronic pelvic pain in women, a nationwide cross-sectional study in France. *J Clin Med*. 2021;10(11):2481. 10.3390/jcm10112481.
78. Margueritte F, Fritel X, Serfaty A, Coeuret-Pellicer M, Fauconnier A. Screening women in young adulthood for disabling dysmenorrhea: a nationwide cross-sectional study from the CONSTANCES cohort. *Reprod Biomed Online*. 2024;49(1):103861. 10.1016/j.rbmo.2024.103861.
79. Le Noan-Lainé M, Artaud F, Ndoadoumgué A, Ozguler A, Pellicer M, Ringa V, Elbaz A, Canonico M. Characteristics of reproductive history, use of exogenous hormones and walking speed among women: Data from the CONSTANCES French Cohort Study. *Maturitas*. 2023;170:42–50. 10.1016/j.maturitas.2023.01.008.
80. Le Noan-Lainé M, Artaud F, Ozguler A, Coeuret-Pellicer M, Ringa V, Elbaz A, Canonico M. Association of hormonal exposures with grip strength in women over 45 years: Data from the CONSTANCES cohort study. *J Endocr Soc*. 2024;8(10):bvae150. 10.1210/jendso/bvae150.
81. Paquet S, Sassenou J, Ringa V, Czernichow S, Zins M, Ozguler A, Rigal L. Women with type 2 diabetes have LDL cholesterol levels higher than those of men, regardless of their treatment and their cardiovascular risk level. *Nutr Metab Cardiovasc Dis*. 2023;33(6):1254–62. 10.1016/j.numecd.2023.03.015.
82. Mangiardi-Veltin M, Mullaert J, Coeuret-Pellicer M, Goldberg M, Zins M, Rouzier R, Hequet D, Bonneau C. Prevalence of sexual dysfunction after breast cancer compared to controls, a study from CONSTANCES cohort. *J Cancer Surviv*. 2024;18(5):1674–82. 10.1007/s11764-023-01407-z.
83. Hamieh N, Descatha A, Zins M, Goldberg M, Czernichow S, Hoertel N, Plessz M, Roquelaure Y, Limosin F, Lemogne C, Matta J, Airagnes G. Physical exertion at work and addictive behaviors: tobacco, cannabis, alcohol, sugar and fat consumption: longitudinal analyses in the CONSTANCES cohort. *Sci Rep*. 2022;12(1):661. 10.1038/s41598-021-04475-2.
84. Hamieh N, Airagnes G, Descatha A, Goldberg M, Limosin F, Roquelaure Y, Lemogne C, Zins M, Matta J. Atypical working hours are associated with tobacco, cannabis and alcohol use: longitudinal analyses from the CONSTANCES cohort. *BMC Public Health*. 2022;22(1):1834. 10.1186/s12889-022-14246-x.
85. Airagnes G, Lemogne C, Goldberg M, Hoertel N, Roquelaure Y, Limosin F, Zins M. Job exposure to the public in relation with alcohol, tobacco and cannabis use: Findings from the CONSTANCES cohort study. *PLoS One*. 2018;13(5):e0196330. 10.1371/journal.pone.0196330. eCollection 2018.
86. Airagnes G, Lemogne C, Olekhovitch R, Roquelaure Y, Hoertel N, Goldberg M, Limosin F, Zins M. Work-related stressors and increased risk of benzodiazepine long-term use: Findings from the CONSTANCES population-based cohort. *Am J Public Health*. 2019;109(1):119–25. 10.2105/AJPH.2018.304734.
87. Airagnes G, Lemogne C, Kab S, Hoertel N, Goldberg M, Wahrendorf M, Siegrist J, Roquelaure Y, Limosin F, Zins M. Effort-reward imbalance and long-term benzodiazepine use: Longitudinal findings

- from the CONSTANCES cohort. *J Epidemiol Community Health*. 2019;73(11):993–1001. 10.1136/jech-2019-212703.
88. El Haddad R, Lemogne C, Matta J, Wiernik E, Goldberg M, Melchior M, Roquelaure Y, Limosin F, Zins M, Airagnes G. The association of substance use with attaining employment among unemployed job seeking adults: Prospective findings from the French CONSTANCES cohort. *Prev Med*. 2022;163:107196. 10.1016/j.ypmed.2022.107196.
  89. Airagnes G, Lemogne C, Meneton P, Plessz M, Goldberg M, Hoertel N, Roquelaure Y, Limosin F, Zins M. Alcohol, tobacco and cannabis use are associated with job loss at follow-up: Findings from the CONSTANCES cohort. *PLoS One*. 2019;14(9):e0222361. 10.1371/journal.pone.0222361. eCollection 2019.
  90. Déguilhem A, Leclerc A, Goldberg M, Lemogne C, Roquelaure Y, Zins M, Airagnes G. Cannabis use increases the risk of sickness absence: longitudinal analyses from the CONSTANCES cohort. *Front Public Health* 2022 10:869051. 10.3389/fpubh.2022.869051
  91. Dotsikas K, Lanoy E, Lequy E, Wiernik E, Mary-Krause M. *BMC Public Health*. Neighbourhood deprivation and smoking cessation: a survival analysis using the French CONSTANCES cohort. *BMC Public Health*. 2025;25(1):2317. 10.1186/s12889-025-23261-7.
  92. Saurel-Cubizolles MJ, Lhomond B, Coeuret-Pellicer M. Same-sex sexual behaviour and psychological health: Constances, a population survey in France. *SSM Popul Health*. 2023;22:101396. 10.1016/j.ssmph.2023.101396.
  93. Gouraud C, Airagnes G, Kab S, Courtin E, Goldberg M, Limosin F, Lemogne C, Zins M. Changes in benzodiazepine use in the French general population after November 2015 terrorist attacks in Paris: findings from the national CONSTANCES cohort. *BMJ Open*. 2021;11(9):e044891. 10.1136/bmjopen-2020-044891.
  94. Keirsbulck M, Savouré M, Lequy-Flahault E, Chen J, de Hoogh K, Vienneau D, Goldberg M, Zins M, Roche N, Nadif R, Jacquemin B. Long-term exposure to ambient air pollution and asthma symptom score in the French CONSTANCES cohort. *Thorax*. 2023;78(1):9–15. 10.1136/thoraxjnl-2021-218344.
  95. Savouré M, Lequy E, Bousquet J, Chen J, de Hoogh K, Goldberg M, Vienneau D, Zins M, Nadif R, Jacquemin B. Long-Term Exposures to PM2.5, Black Carbon and NO2 and Prevalence of Current Rhinitis in French Adults: the CONSTANCES Cohort. *Envir Int*. 2021;157:106839. doi.org/10.1016/j.envint.2021.106839.
  96. Javad Zare Sakhvidi M, Lafontaine A, Lequy E, Berr C, de Hoogh K, Vienneau D, Goldberg M, Zins M, Lemogne C, Jacquemin B. Ambient air pollution exposure and depressive symptoms: Findings from the French CONSTANCES cohort. *Environ Int* 2022 Dec:170:107622doi: 10.1016/j.envint.2022.107622
  97. Zare Sakhvidi M, Yang J, Lequy E, Chen J, de Hoogh K, Letellier N, Mortamais M, Ozguler A, Vienneau D, Zins M, Goldberg M, Berr C, Jacquemin B. Air pollution exposure and cognitive performance:

- findings from the enrollment phase of the CONSTANCES cohort. *Lancet Planet Health*. 2022;6:e219–29. 10.1016/S2542-5196(22)00001-8.
98. Zare Sakhvidi M, Lafontaine A, Yang J, Lequy E, Artaud F, Canonico M, Ozguler A, Vienneau D, Zins M, Jacquemin B. Association between air pollution exposure and handgrip strength as a marker of frailty: findings from the French CONSTANCES cohort. *Environ Health Perspect*. 2022;130(5):57701. 10.1289/EHP10464.
  99. Pacheco Da Silva E, Sit G, Goldberg M, Leynaert B, Nadif R, Ribet C, Roche N, Zins M, Varraso R, Dumas O, Le Moual N. Household use of green and home-made cleaning products, wipe application mode and asthma among French adults from the CONSTANCES cohort. *Indoor Air*. 2022;32:e13078. doi.org/10.1111/ina.13078. hal id: inserm-03764509, version 1.
  100. Lafontaine A, Lee S, Jacquemin B, Glorennec P, Le Bot B, Verrey D, Goldberg M, Zins M, Lequy E, Villanueva M. Chronic exposure to drinking water nitrate and trihalomethanes in the French CONSTANCES cohort. *Environ Res*. 2024;259:119557. 10.1016/j.envres.2024.119557.
  101. Lequy E, Meyer C, Vienneau D, Berr C, Goldberg M, Zins M, Leblond S, de Hoogh K, Jacquemin B. Modeling exposure to airborne metals in urban areas using moss biomonitoring in cemeteries in the Paris and Lyon areas, France. *Environ Pollut*. 2022;303:119097. 10.1016/j.envpol.2022.119097.
  102. Tsiavia T, Fréalle E, Bex V, Dumas O, Goldberg M, Le Moual N, Ribet C, Roche N, Savouré M, Zins M, Leynaert B, Orsi L, Nadif R. Determinants of mouldy area size in dwellings from the French CONSTANCES population-based cohort. *Build Environ*. 2023;242:110606. <https://doi.org/10.1016/j.buildenv.2023.110606>.
  103. Deltour I, Guida F, Ribet C, Zins M, Goldberg M, Schüz J. Use of Mobile Phones and Radiofrequency-Emitting Devices in the COSMOS-France Cohort. *Int J Environ Res Public Health*. 2024;21(11):1514. 10.3390/ijerph21111514.
  104. Wuytack F, Evanoff B, Dale AM, Gilbert F, Fadel M, Leclerc A, Descatha A. Comparing physical work exposures between men and women: findings from 65 281 workers in France. *Occup Environ Med*. 2023;80(10):558–63. 10.1136/oemed-2023-108839.
  105. Ngabirano L, Fadel M, Leclerc A, Evanoff BA, Dale AM, d’Errico A, Roquelaure Y, Descatha A. Association between physical limitations and working life exposure to carrying heavy loads assessed using a job-exposure matrix: CONSTANCES cohort. *Arch Environ Occup Health*. 2021;76:243–7. <https://doi.org/10.1080/19338244.2020.1819184>.
  106. Fadel M, Leclerc A, Evanoff BA, Dale AM, Ngabirano L, Roquelaure Y, Descatha A. Association between occupational exposure and Dupuytren’s contracture using a job-exposure matrix and self-reported exposure in the CONSTANCES cohort. *Occup Environ Med*. 2019 Nov;76(11):845–8. 10.1136/oemed-2019.
  107. Roquelaure Y, Garlantézec R, Rousseau V, Descatha A, Evanoff B, Mattioli S, Goldberg M, Zins M, Bodin J. Carpal tunnel syndrome and exposure to work-related biomechanical stressors and chemicals: Findings from the Constances cohort. *PLoS One*. 2020;15(6):e0235051. 10.1371/journal.pone.0235051. eCollection 2020.

108. Bodin J, Fadel M, Goldberg M, Zins M, Petit A, Roquelaure Y. Association between teleworking imposed by the COVID-19 and neck pain: Results from the CONSTANCES cohort. *Arch Occup Environ Dis.* 2025;86:102886. doi.org/10.1016/j.admp.2025.102886.
109. Virtanen M, Magnusson Hanson L, Goldberg M, Zins M, Stenholm S, Vahtera J, Westerlund H, Kivimäki M. Long working hours, anthropometry, lung function, blood pressure, and blood-based biomarkers: cross-sectional findings from the CONSTANCES study. *J Epidemiol Community Health.* 2018;73(2):130–5. 10.1136/jech-2018-210943.
110. Letellier N, Choron G, Artaud F, Descatha A, Goldberg M, Zins M, Elbaz A, Berr C. Association between occupational solvent exposure and cognitive performances in the French CONSTANCES study. *Occup Environ Med.* 2020;77(4):223–30. 10.1136/oemed-2019-106132.
111. Wahrendorf M, Chandola T, Goldberg M, Zins M, Hoven H, Siegrist J. Adverse employment histories and allostatic load: evidence from the population-based CONSTANCES cohort. *J Epidemiol Community Health.* 2022;76(4):374–81. 10.1136/jech-2021-217607.
112. Sanchez Rico M, Plessz M, Airagnes G, Ribet C, Hoertel N, Goldberg M, Zins M, Meneton P. Cardiovascular burden and unemployment: A retrospective study in a large population-based French cohort. *PLoS ONE.* 2023;18:e0288747. <https://doi.org/10.1371/journal.pone.0288747>.
113. Sanchez Rico M, Plessz M, Airagnes G, Ribet C, Hoertel N, Goldberg M, Zins M, Meneton P. Lifetime exposure to unemployment and prior working conditions are associated with retiree's health: A retrospective study in a large population-based French cohort. *Soc Sci Med.* 2024;341:116550. 10.1016/j.socscimed.2023.116550.
114. Wuytack F, Evanoff BA, Dale AM, Gilbert F, Fadel M, Leclerc A, Descatha A. 2023. Development and evaluation of the gender-specific CONSTANCES job exposure matrix for physical risk factors in France. *Scand J Work Environ Health.* 10.5271/sjweh.4118 hal-04210150, version 1.
115. Evanoff B, Yung M, Buckner-Petty S, Andersen J, Roquelaure Y, Descatha A, Dale AM. The CONSTANCES Job Exposure Matrix Based on Self-Reported Exposure to physical risk factors: Development & Evaluation. *Occup Environ Med.* 2019 Jun;76(6):398–406. 10.1136/oemed-2018-105287. (Epub 2019 Jan 31);.
116. Fadel M, Gilbert F, Legeay C, Dubée V, Esquirol Y, Verdun-Esquer C, Dinh A, Sembajwe G, Goldberg M, Roquelaure Y, Leclerc A, Wiernik E, Zins M, Descatha A. Mat-O-Covid investigators. Association between and COVID-19 infection and work exposure assessed by the Mat-O-Covid JEM in the CONSTANCES cohort. *Occup Environ Med.* 10.1136/oemed-2022-108436
117. Singier A, Fadel M, Gilbert F, Temime L, Zins M, Descatha A. Development and validation of a French job-exposure matrix for healthcare workers: JEM Soignances. *Scand J Work Environ Health.* 2024;50(8):653–64. 10.5271/sjweh.4194.
118. Carrat F, de Lamballerie X, Rahib D, Blanché H, Lapidus N, Artaud F, Kab S, Renuy A, Szabo de Edelenyi F, Meyer L, Lydié N, Charles MA, Ancel PY, Jusot F, Rouquette A, Priet S, Saba Villarroel PM, Fourié T, Lusivika-Nzinga C, Nicol J, Le Got S, Druesne-Pecollo N, Esseddik Y, Lai C, Gagliolo JM, Deleuze JF, Bajos N, Severi G, Touvier M, Zins M. Antibody status and cumulative incidence of SARS-

- CoV-2 infection among adults in three regions of France following the first lockdown and associated risk factors: a multicohort study. *Int J Epidemiol*. 2021;50(5):1458–72. 10.1093/ije/dyab110.
119. Carrat F, Figoni J, Henny J, Desenclos JC, Kab S, de Lamballerie X, Zins M. Evidence of early circulation of SARS-CoV-2 in France – Findings from the population-based CONSTANCES cohort. *Eur J Epidemiol*. 2021;36(2):219–22. 10.1007/s10654-020-00716-2. hal id: hal-03869403, version 1.
120. Carrat F, Lapidus N, Ninove L, Blanché H, Rahib D, Saba Villarroel PM, Touvier M, Severi G, Zins M, Deleuze JF, de Lamballerie X, SAPRIS-SERO study group, Age. COVID-19-like symptoms and SARS-CoV-2 seropositivity profiles after the first wave of the pandemic in France. *Infection*. 2022;50(1):257–62. 10.1007/s15010-021-01731-5. hal id: hal-03456505, version 1.
121. Hozé N, Paireau J, Lapidus N, Tran Kiem C, Salje H, Severi G, Touvier M, Zins M, de Lamballerie X, Lévy-Bruhl D, Carrat F, Cauchemez S. Monitoring the proportion infected by SARS-CoV-2 from age-stratified hospitalisation and serological data. *Lancet Public Health*. 2021;6(6):e408–15. 10.1016/S2468-2667(21)00064-5.
122. Lapidus N, Paireau J, Levy-Bruhl D, de Lamballerie X, Severi G, Touvier M, Zins M, Cauchemez S, Carrat F, the SAPRIS-SERO study group. Do not neglect SARS-CoV-2 hospitalization and fatality risks in the middle-aged adult population. *Infect Dis Now*. 2021;51(4):380–2. 10.1016/j.idnow.2020.12.007.
123. Glemain B, de Lamballerie X, Zins M, Severi G, Touvier M, Deleuze JF, SAPRIS-SERO study group, Lapidus N, Carrat F. Estimating SARS-CoV-2 infection probabilities with serological data and a Bayesian mixture model. *Sci Rep*. 2024;14(1):9503. 10.1038/s41598-024-60060-3.
124. Glemain B, Assaad C, de Lamballerie X. Revisiting the link between COVID-19 incidence and infection fatality rate during the first pandemic wave. *Sci Rep*. 2025;15(1):15638. 10.1038/s41598-025-99078-6.
125. Descatha A, Sembajwe G, Gilbert F, Group M-O-CI, Fadel M. 2022. Mat-O-Covid: Validation of a SARS-CoV-2 Job Exposure Matrix (JEM) Using Data from a National Compensation System for Occupational COVID-19. *IJERPH* 19, 5733. <https://doi.org/10.3390/ijerph19095733>
126. Fadel M, Gilbert F, Legeay C, Dubée V, Esquirol Y, Verdun-Esquer C, Dinh A, Sembajwe G, Goldberg M, Roquelaure Y, Leclerc A, Wiernik E, Zins M, Descatha A. Mat-O-Covid investigators. Association between and COVID-19 infection and work exposure assessed by the Mat-O-Covid JEM in the CONSTANCES cohort. *Occup Environ Med*. 10.1136/oemed-2022-108436. Online ahead of print. hal id: inserm-03782693, version 1.
127. Ramillon J, de Lamballerie X, Robineau O, Blanché H, Severi G, Touvier M, Zins M, Carrat F; SAPRIS-SERO study group; SAPRIS study group; Lapidus N. Antibody response, associated symptoms and profile of patients presumably infected by SARS-CoV-2 with taste or smell disorders in the SAPRIS multicohort study. *BMC Infect Dis*. 2023;23(1):228. doi: 10.1186/s12879-023-08162-7.
128. Manry J, Bastard P, Gervais A... Casanova JL, Abel L, Cobat A. The risk of COVID-19 death is much greater and age dependent with type I IFN autoantibodies. *Proc Natl Acad Sci USA*. 2022 May (Epub 2022 May 16), 119(21):e2200413119. doi: 10.1073/pnas.2200413119.

129. Sokal A, Bastard P, ... Casanova JL, Mahévas M. Human type I IFN deficiency does not impair B cell response to SARS-CoV-2 mRNA vaccination. *J Exp Med*. 2023;220(1):e20220258.doi: 10.1084/jem.20220258. Epub 2022 Nov 7.
130. Bastard P, Gervais A, ... Cobat A, Abel L, Casanova JL. Autoantibodies neutralizing type I IFNs are common in the elderly and account for at least 20% of COVID-19 deaths.*Sci Immunol*. 2021;6(62):eabl4340. doi: 10.1126/sciimmunol.abl4340.
131. Zhang Q et al. Autoantibodies against type I IFNs in patients with critical influenza pneumonia. *J Exp Med*. 2022 Nov (Epub 2022 Sep 16), 219(11):e20220514. doi: 10.1084/jem.20220514.
132. Varga T, ... Hulvej Rod N. Loneliness, worries, and precautions in response to the COVID-19 pandemic: longitudinal data on 200,000 Western and Northern Europeans. Loneliness, worries, anxiety, and precautionary behaviours in response to the COVID-19 pandemic: a longitudinal analysis of 200,000 Western and Northern Europeans. *Lancet Reg Health Eur*. 2021;2:100020. doi: 10.1016/j.lanepe.2020.100020.
133. Keller A, Groot J, Matta J, Bu F, El Aarbaoui T, Melchior M, Fancourt D, Zins M, Goldberg M, Nybo Andersen AM, Hulvej Rod N, Strandberg-Larsen K, Varga TV. Housing environment and mental health of Europeans during the COVID-19 pandemic: a cross-country comparison. *Sci Rep*. 2022;12:5612. <https://doi.org/10.1038/s41598-022-09316-4>.
134. Gouraud C, Wiernik E, Matta J, Melchior M, Airagnes G, Ouazana-Vedrines C, Robineau O, Carrat F, Severi G, Goldberg M, Zins M, Lemogne C. Housing conditions and changes in professional activity during lockdown and depression: Findings from the CONSTANCES Cohort. *J Affect Disord*. 2023 May 6: S0165-0327(23)00631-6. 10.1016/j.jad.2023.05.004. Online ahead of print.
135. Matta J, Robineau O, Wiernik E, Carrat F, Severi G, Touvier M, Gouraud C, Ouazana Vedrines C, Pitron V, Ranque B, Pignon B, Hoertel N, Kab S, Goldberg M, Zins M, Lemogne C. Depression and anxiety before and at the beginning of the COVID-19 pandemic and incident persistent symptoms: a prospective population-based cohort study. *Mol Psychiatry*. 2023;28(10):4261–71. 10.1038/s41380-023-02179-9.
136. Pignon B, Wiernik E, Ranque B, Robineau O, Carrat F, Severi G, Touvier M, Gouraud C, Ouazana-Vedrines C, Pitron V, Hoertel N, Kab S, Tebeka S, Goldberg M, Zins M, Lemogne C. SARS-CoV-2 infection and the risk of depressive symptoms: a retrospective longitudinal study from the population-based CONSTANCES cohort. *Psychol Med*. 2024;1–10. <https://doi.org/10.1017/S0033291724002435>.
137. Matta J, Wiernik E, Robineau O, Carrat F, Touvier M, Severi G, Gouraud C, Hoertel N, Ranque B, Goldberg M, Zins M, Lemogne C. Association of Self-reported COVID-19 Infection and SARS-CoV-2 Serology Test Results with Persistent Physical Symptoms Among French Adults During the COVID-19 Pandemic. *JAMA Intern Med*. 2022;182(1):19–25. 10.1001/jamainternmed.2021.6454.
138. Pignon B, Wiernik E, Kab S, Matta J, Toussaint A, Löewe B, Horn M, Amad A, Fovet T, Gouraud C, Ouazana-Vedrines C, Pitron V, Goldberg M, Zins M, Lemogne C. Somatic Symptom Disorder-B criteria scale (SSD-12): psychometric properties of the French version and associations with health

- outcomes in a population-based cross-sectional study during the COVID-19 pandemic. *J Psychosom Res.* 2023;176:111556. 10.1016/j.jpsychores.2023.111556.
139. Airagnes G, Matta J, Melchior M, Zins M. Differences in social distancing may not explain the decreased likelihood of SARS-CoV-2 infection in smokers. *Nicotine Tob Res* 2023 May 26: ntad083. 10.1093/ntr/ntad083
  140. Varga TV, Bu F, Dissing AS, Elsenburg LK, Bustamante JJH, Matta J, van Zon SKR, Brouwer S, Bültmann U, Fancourt D, Hoeyer K, Goldberg M, Melchior M, Strandberg-Larsen K, Zins M, Clotworthy A, Rod NH. *Lancet Reg Health Eur.* 2021;2:100020. 10.1016/j.lanepe.2020.100020.
  141. Pacheco Da Silva E, Varraso R, Orsi L, Wiernik E, Goldberg M, Paris C, Fezeu LK, Ribet C, Nadif R, Carrat F, Touvier M, Zins M, Dumas O, Le Moual N. SAPRIS study group. Changes in household use of disinfectant and cleaning products during the first lockdown period in France. *BMC Public Health.* 2024;24(1):2691. 10.1186/s12889-024-20202-8.
  142. Bajos N, Jusot F, Pailhé A, Spire A, Martin C, Meyer L, Lydié N, Franck JE, Zins M, Carrat F, for the SAPRIS study group. When lockdown policies amplify social inequalities in COVID-19 infections. Evidence from a cross-sectional population-based survey in France. *BMC Public Health.* 2021;21(1):705. 10.1186/s12889-021-10521-5.
  143. Matta J, Pignon B, Wiernik E, Robineau O, Carrat F, Severi G, Touvier M, Gouraud C, Ouazana-Vedrine C, Pitron V, Tebeka S, Ranque B, Hoertel N, Kab S, Goldberg M, Zins M, Lemogne C. Depressive symptoms and sex differences in the risk of persistent symptoms after COVID-19: a prospective population-based cohort study. *Nat Mental Health.* 2024;2:1053–61. <https://doi.org/10.1038/s44220-024-00290-6>.
  144. Robineau O, Hüe S, Surenaud M, Lemogne C, Dorival C, Wiernik E, Bami S, Nicol J, de Lamballerie X, Blanché H, Deleuze JF, Ribet C, Goldberg M, Severi G, Touvier M, Zins M, Levy Y, Lelievre JD, Carrat F. Symptoms and Pathophysiology of Post-acute Sequelae of SARS-CoV-2 (PASC): A Cohort Study. *EBioMedicine.* 2025 Jul;117:105792. 10.1016/j.ebiom.2025.105792
  145. Robineau O, Wiernik E, Lemogne C, de Lamballerie X, Ninove L, Blanché H, Deleuze JF, Ribet C, Goldberg M, Severi G, Touvier M, Zins M, Carrat F. Persistent symptoms after the first wave of COVID-19 in relation to SARS-CoV-2 serology and experience of acute symptoms: a nested survey in a population-based cohort. *Lancet Reg Health – Europe.* 2022;17:00363. <https://doi.org/10.1016/j.lanepe.2022.100363>.
  146. Robineau O, Zins M, Touvier M, Wiernik E, Lemogne C, de Lamballerie X, Blanché H, Deleuze JF, Dorival C, Nicol J, Gomes-Rima J, Correa E, Pellicer M, Druetne-Pecollo N, Essedik Y, Ribet C, Goldberg M, Severi G, Carrat F. Long-lasting symptoms after an acute COVID-19 episode and factors associated with their resolution. *JAMA Netw Open.* 2022;5(11):e2240985. 10.1001/jamanetworkopen.2022.40985. PMID: 36350653.
  147. Maudet M, Spire A. Les représentations de l'épidémie de Covid-19 à l'épreuve des différences sociales et du temps. *Rev Fr Sociologie.* 2021;62:413–50. 10.3917/rfs.623.0413.

148. Matta J, Wiernik E, Robineau O, Carrat F, Severi G, Touvier M, Gouraud C, Ouazana-Vedrines C, Pitron V, Ranque B, Hoertel N, Van Den Bergh O, Witthöft M, Kab S, Goldberg M, Zins M, Lemogne C. Trust in sources of information on COVID-19 at the beginning of the pandemic first wave and incident persistent symptoms: a prospective population-based cohort study. *J Psychosom Res.* 2023;169:111326.
149. Ruiz F, Goldberg M, Lemonnier S, Ozguler A, Boos E, Brigand A, Giraud V, Perez T, Roche N, Zins M. High quality standards for a large-scale prospective population-based observational cohort: Constances. *BMC Public Health.* 2016;16(1):877–86. 10.1186/s12889-016-3439-5.
150. Balagny P, Vidal-Petiot E, Renuy A, Matta J, Frija-Masson J, Steg PG, Goldberg M, Zins M, d'Ortho MP, Wiernik E. Prevalence, treatment and determinants of Obstructive Sleep Apnea and its symptoms in a population-based French cohort. *ERJ Open Res.* 2023;9(3):00053–2023. eCollection 2023 May. hal id: hal-04098004, version 1.
151. Lisan Q, Goldberg M, Lahlou G, Ozguler A, Lemonnier S, Jouven X, Zins M, Empana JP. A nationwide study on the prevalence and determinants of hearing loss and hearing aid use in adults. The CONSTANCES study. *JAMA Netw Open.* 2022;5(6):e2217633. 10.1001/jamanetworkopen.2022.17633.
152. Wiernik E, Renuy A, Kab S, Steg PG, Goldberg M, Zins M, Caligiuri G, Bouchard P, Carra MC. Prevalence of self-reported severe periodontitis: data from the population-based CONSTANCES cohort. *J Clin Periodontol.* 2024;51(7):884–94. 10.1111/jcpe.13969.
153. Provost D, Delmas MC, Pilorget C, Houot M, Bénézet L, Chesneau J, et al. Surveillance des maladies respiratoires chroniques chez les travailleurs affiliés au régime général. Prévalences et secteurs d'activité et professions à risque à partir des données d'inclusion de la Cohorte Constances. Synthèse. Saint-Maurice: Santé publique France; 2025.
154. Blacher J, Cheddani L, Halimi JM, Stengel B, Alencar De Pinho N, Goldberg M, Kab S, Zins M, Olié V. Prevalence of chronic kidney disease in France - The Constances cohort. *BMC Nephrol.* 2025;26(1):312. 10.1186/s12882-025-04213-0.
155. Czernichow S, Renuy A, Rives-Lange C, Carette C, Airagnes G, Wiernik E, Ozguler A, Kab S, Goldberg M, Zins M, Matta J. Evolution of the prevalence of obesity in the adult French population in France, 2013–2016: the Constances study. *Sci Rep.* 2021;11(1):14152. 10.1038/s41598-021-93432-0.
156. Airagnes G, Lemogne C, Zins M. Consommation d'alcool et conduites addictives dans la cohorte CONSTANCES: Données descriptives et impact sur la vie professionnelle. Rapport pour la MILDECA. <https://uca.hal.science/CONSTANCES/hal-04813993v1>
157. Les facteurs de risque cardiovasculaire en France, à partir de l'étude des données de Constances. Direction générale de la santé. 2018. {hal-04814117} {[https://hal.science/hal-04814117v1/file/RAPP-INTERM-DGS\\_NEUF COURT.pdf](https://hal.science/hal-04814117v1/file/RAPP-INTERM-DGS_NEUF COURT.pdf)}
158. Exposition professionnelle aux poussières et pathologies respiratoires. Direction générale du travail. 2023. hal-04627688 {<https://hal.science/hal-04627688v1/file/Constances%20Poussi%C3%A8res-Rapport%20DGT%20mars%202023.pdf>}

159. Bouziri H, Leclerc A, Zins M, Goldberg M, Kab S. Effets des horaires de travail atypiques sur la santé: analyse des données de la cohorte CONSTANCES. Rapport pour l'ANSES; 2024.
160. Carton M, Santin G, Leclerc A, Gueguen A, Goldberg M, Roquelaure Y, Zins M, Descatha A. Prévalence des troubles musculo-squelettiques et des facteurs biomécaniques d'origine professionnelle: premières estimations à partir de Constances. Bull Epidemiol Hebd. 2016;35–36:630–9.
161. Ouvrard C, Berr C, Meillon C, Ribet C, Goldberg M, Zins M, Amieva H. Norms for standard neuropsychological tests from the French CONSTANCES cohort. Eur J Neurol. 2019 May;26(5):786–93. 10.1111/ene.13890. (First published: 2018 Dec 21);