INTRODUCTION TO POPULATION EPIDEMIOLOGY

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ENV 444

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WHAT IS EPIDEMIOLOGY?

'We've moved a few things around. Travel books are in the Fantasy section, Politics is in Sci-Fi, and Epidemiology is in Self-Help. Good luck.'

WHAT IS EPIDEMIOLOGY?

Epidemiology is:

- The study of the distribution and determinants of disease frequency in populations (MacMahon and Pugh 1970)
- And the application of this study to control health problems

- **What is the prevalence of hypertension (in Geneva)?**
- **What are some determinants of health?**
- **Does exposure to noise impact health? How? Which noise? Where?**
- **Is brain cancer caused by the use of cell phones?**

EPIDEMIOLOGY AT THE GENEVA UNIVERSITY HOSPITALS

- **Bus santé -> cardiovascular disease, diabetes, determinants of health in the general population**
- **Specchio -> longitudinal study**

- **Both were key during the COVID-19 pandemic**

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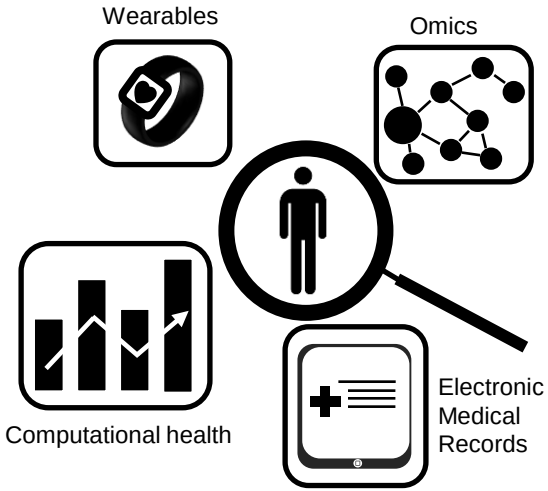
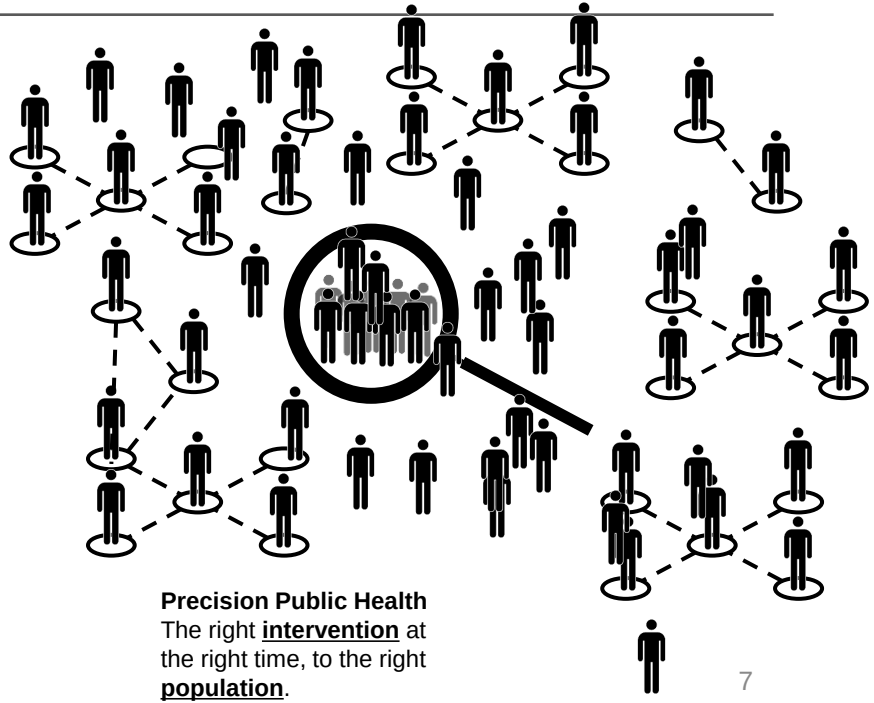
POPULATION HEALTH



Precision Medicine
The right **treatment** at the right time, to the right **person**.



Precision Public Health
The right **intervention** at the right time, to the right **population**.

Khoury et al. *Am J Prev Med.* 2016

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Courtesy De Ridder

EPIDEMIOLOGY AT THE GENEVA UNIVERSITY HOSPITALS

- **Quantify human health problems**
- **Identify the etiology of disease or outcomes (associations)**
- **Evaluate the effectiveness of interventions**
- **Improve or guide public health recommendations**

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EPIDEMIOLOGY FOR YOU

- **Critically evaluate published literature**
- **Communicate findings (to colleagues, journals, federal or regulatory agencies etc.)**

Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19: a multinational registry analysis

Mandeep R Mehra, Sapan S Desai, Frank Ruschitzka, Amit N Patel

Summary

Background Hydroxychloroquine or chloroquine, often in combination with a second-generation m[illegible]ide, are be[illegible] widely used for treatment of COVID-19, despite no conclusive evidence of their benefit. Although [illegible]nerally safe whe[illegible] used for approved indications such as autoimmune disease or malaria, the safety and bene[illegible] of th[illegible] treatment regimens are poorly evaluated in COVID-19.

Methods We did a multinational registry analysis of the use of hydroxychloroquine [illegible]oquine with[illegible]thout a macrolide for treatment of COVID-19. The registry comprised data from 671 hosp[illegible]s in s[illegible]ntinents. We included patients hospitalised between Dec 20, 2019, and April 14, 2020, with a positive laboratory [illegible]g for SARS-CoV-2. Patients who received one of the treatments of interest within 48 h of diagn[illegible] included in [illegible] four treatment groups (chloroquine alone, chloroquine with a macrolide, hydroxychlor[illegible]ine alone, or hydroxychloroquine with a macrolide), and patients who received none of these treatments formed [illegible] control gr[illegible]. Patients for whom one of the treatments of interest was initiated more than 48 h after diagnosis or [illegible]ile they w[illegible]on mechanical ventilation, as well as patients who received remdesivir, were excluded. The main outc[illegible] of int[illegible]t were in-hospital mortality and the occurrence of de-novo ventricular arrhythmias ([illegible]tained o[illegible]ed ventricular tachycardia or ventricular fibrillation).

Findings 96 032 patients (mean age 53·8 years, 46·3% women) [illegible]COVID-19 were hospitalised during the study period and met the inclusion criteria. Of the[illegible] patie[illegible] were in the treatment groups (1868 received chloroquine, 3783 received chloroquine with [illegible]macro[illegible]e, 3016 [illegible]eived hydroxychloroquine, and 6221 received hydroxychloroquine with a macrolide) and [illegible] pati[illegible] in the control group. 10 698 (11·1%) patients died in hospital. After controlling for multiple [illegible] fou[illegible]ctors ([illegible] sex, race or ethnicity, body-mass index, underlying cardiovascular disease and its risk fac[illegible] diabetes[illegible]derlying lung disease, smoking, immunosuppressed condition, and baseline disease severity), wh[illegible]mpared wi[illegible]ortality in the control group (9·3%), hydroxychloroquine (18·0%; hazard ratio 1·335, 95%[illegible]·22[illegible]457), hydr[illegible]chloroquine with a macrolide (23·8%; 1·447, 1·368–1·531), chloroquine (16·4%; 1·365, 1·[illegible]18–1·531), [illegible]chloroquine with a macrolide (22·2%; 1·368, 1·273–1·469) were each independently associated [illegible]n an increased [illegible] of in-hospital mortality. Compared with the control group (0·3%), hydroxychloroquine (6[illegible]; 2·36[illegible]·935–2·900), hydroxychloroquine with a macrolide (8·1%; 5·106, 4·106–5·983), chloroquine (4·3%; [illegible]1, 2·[illegible]6–4·596), and chloroquine with a macrolide (6·5%; 4·011, 3·344–4·812) were independently associate[illegible]an incr[illegible]d risk of de-novo ventricular arrhythmia during hospitalisation.

Interpretati[illegible] We w[illegible] unabl[illegible]nfirm a benefit of hydroxychloroquine or chloroquine, when used alone or with a macro[illegible] on in[illegible]spital outc[illegible]mes for COVID-19. Each of these drug regimens was associated with decreased in-hospita[illegible]i[illegible]creased frequency of ventricular arrhythmias when used for treatment of COVID-19.

Funding William[illegible]vey Distinguished Chair in Advanced Cardiovascular Medicine at Brigham and Women's Hospital.

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The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Effect of Hydroxychloroquine in Hospitalized Patients with Covid-19

The RECOVERY Collaborative Group*

ABSTRACT

BACKGROUND

Hydroxychloroquine and chloroquine have been proposed as treatments for coronavirus disease 2019 (Covid-19) on the basis of in vitro activity and data from uncontrolled studies and small, randomized trials.

METHODS

In this randomized, controlled, open-label platform trial comparing a range of possible treatments with usual care in patients hospitalized with Covid-19, we randomly assigned 1561 patients to receive hydroxychloroquine and 3155 to receive usual care. The primary outcome was 28-day mortality.

RESULTS

The enrollment of patients in the hydroxychloroquine group was closed on June 5, 2020, after an interim analysis determined that there was a lack of efficacy. Death within 28 days occurred in 421 patients (27.0%) in the hydroxychloroquine group and in 790 (25.0%) in the usual-care group (rate ratio, 1.09; 95% confidence interval [CI], 0.97 to 1.23; P=0.15). Consistent results were seen in all prespecified subgroups of patients. The results suggest that patients in the hydroxychloroquine group were less likely to be discharged from the hospital alive within 28 days than those in the usual-care group (59.6% vs. 62.9%; rate ratio, 0.90; 95% CI, 0.83 to 0.98). Among the patients who were not undergoing mechanical ventilation at baseline, those in the hydroxychloroquine group had a higher frequency of invasive mechanical ventilation or death (30.7% vs. 26.9%; risk ratio, 1.14; 95% CI, 1.03 to 1.27). There was a small numerical excess of cardiac deaths (0.4 percentage points) but no difference in the incidence of new major cardiac arrhythmia among the patients who received hydroxychloroquine.

CONCLUSIONS

Among patients hospitalized with Covid-19, those who received hydroxychloroquine did not have a lower incidence of death at 28 days than those who received usual care. (Funded by UK Research and Innovation and National Institute for Health Research and others; RECOVERY ISRCTN number, ISRCTN50189673; ClinicalTrials.gov number, NCT04381936.)

- **A strong association between coffee consumption and pancreatic cancer was evident in both sexes.**

MacMahon B, Yen S, Trichopoulos D, Warren K, Nardi G. Coffee and cancer of the pancreas. N Engl J Med. 1981 Mar 12;304(11):630-3. doi: 10.1056/NEJM198103123041102. PMID: 7453739.

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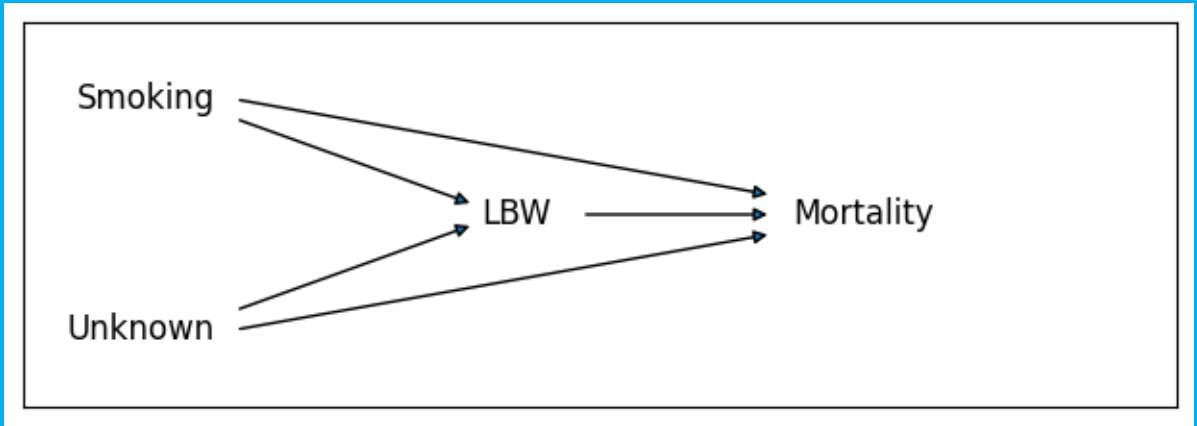
- **Smoking which was more common in coffee drinkers was a confounding factor**

- **Smoking is a protective factor of mortality in LBW**



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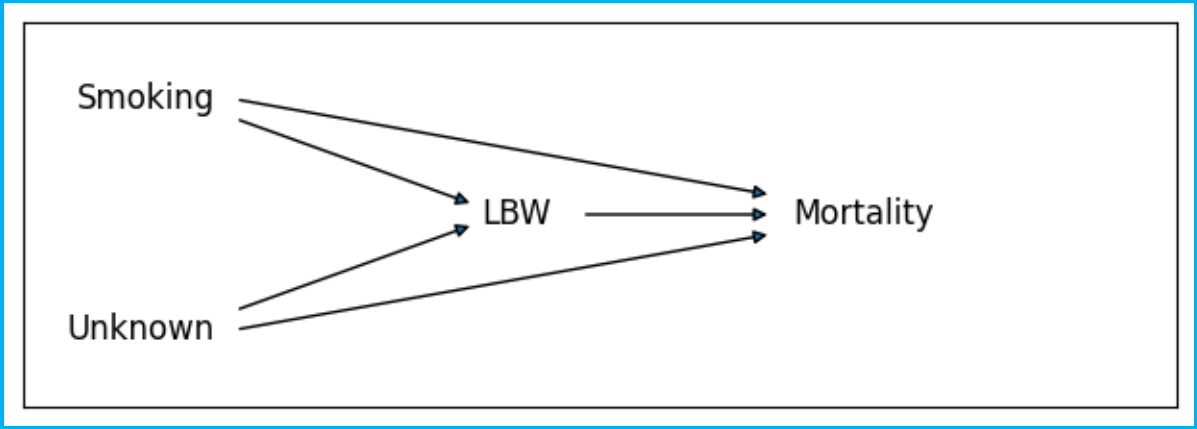
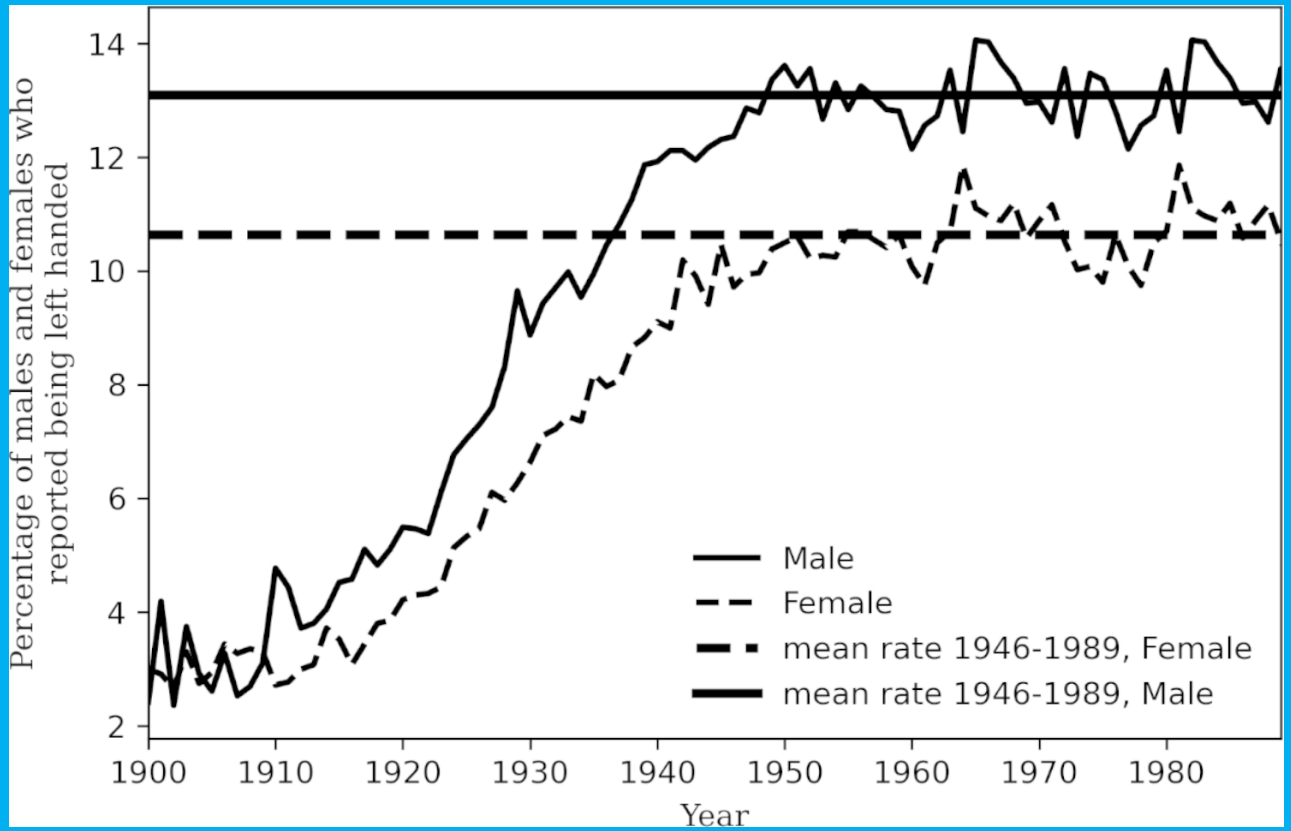


- **Smoking contributes to low birth weight which has higher mortality than normal birth weight**
- **But other causes of low birth weight are generally more harmful than smoking.**

- **Left-handed people had lower life expectancy than right-handed people**
  - **Right-handed: 75 years**
  - **Left-handed: 66 years**
- **Surveys sent to family members of people who died in 1989 in two southern California counties that asked about the decedents' handedness**

- **Conclusion: the increased risk of death was likely due to correlates of left-handedness, not the left-handedness itself, as well as a potential increase in accidents due to interactions with the technological environment**



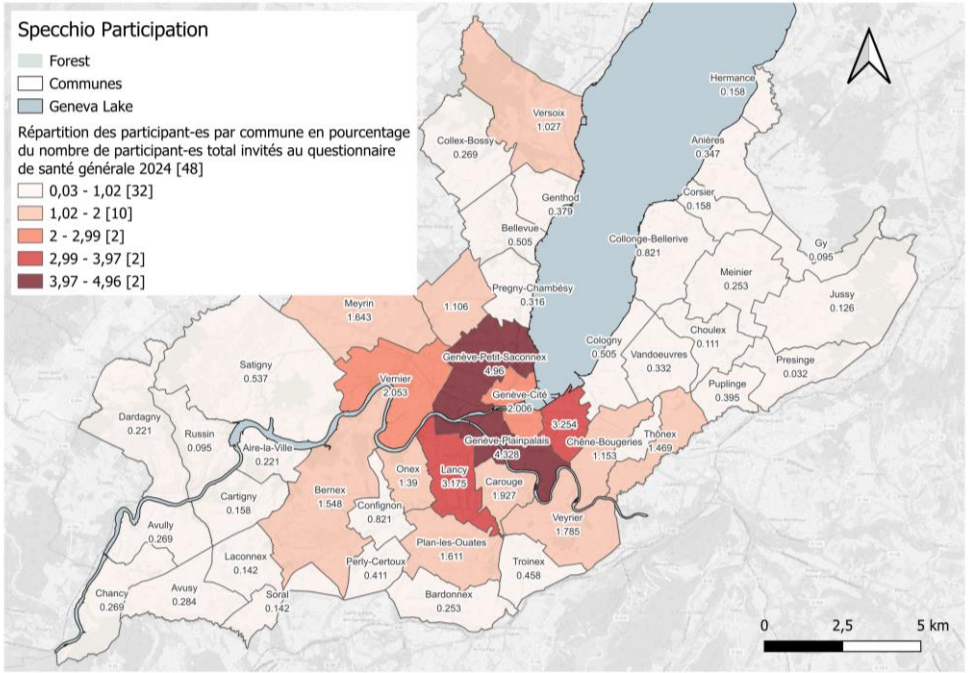
Rate of left-handed people by birth year and gender, United States, 1900–1988.

Ferres JL, Nasir M, Bijral A, Subramanian SV, Weeks WB. Modeling to explore and challenge inherent assumptions when cultural norms have changed: a case study on left-handedness and life expectancy. Arch Public Health. 2023 Jul 26;81(1):137. doi: 10.1186/s13690-023-01156-6. PMID: 37495995; PMCID: PMC10369838.

- **Left-handed people had lower life expectancy than right-handed people**
  - **Right-handed: 75 years**
  - **Left-handed: 66 years**

- **Shorter lifespans in left-handed people could be explained by the fact that – because of social pressures - the percentage of left-handed people had been growing in the population over time**

EPIDEMIOLOGY AND GEOSPATIAL ANALYSIS



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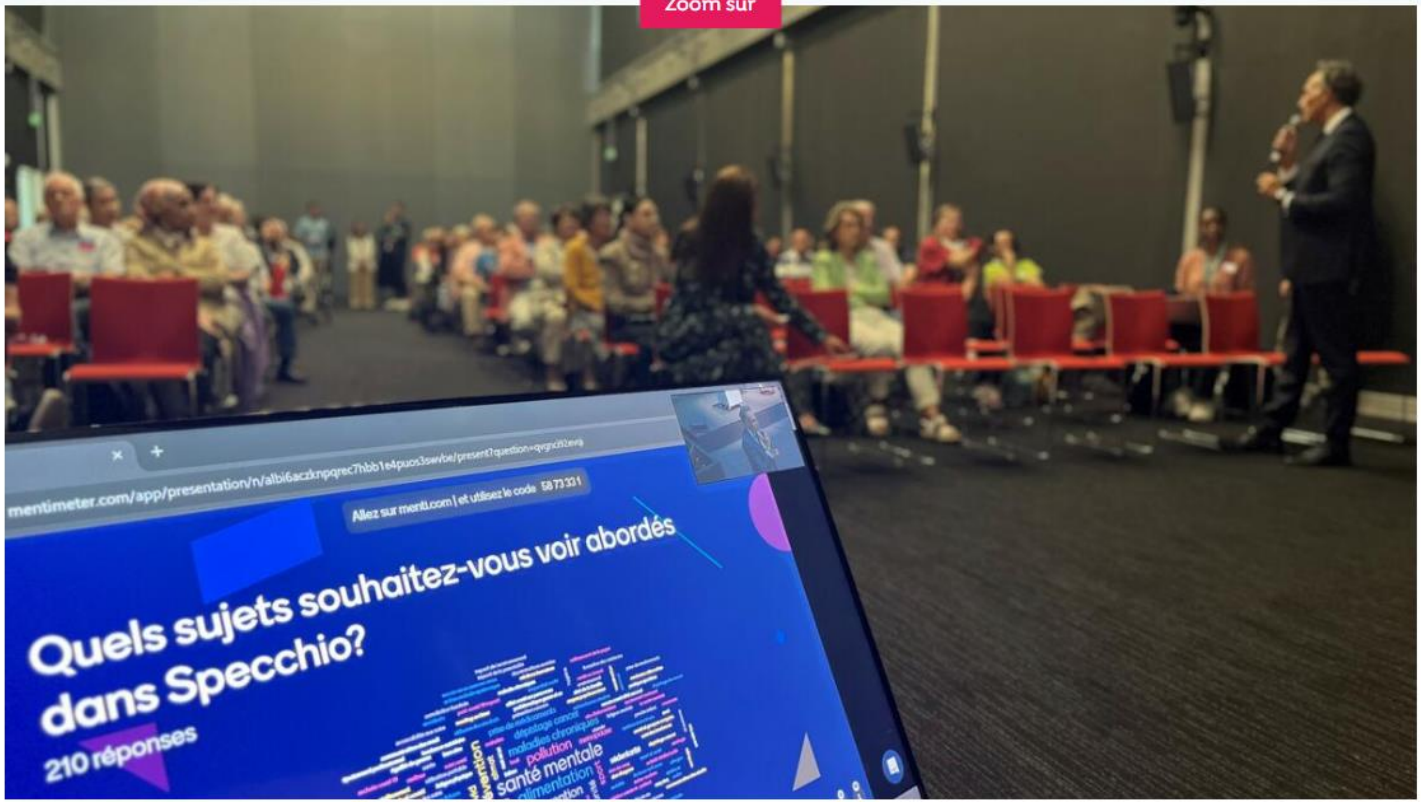

Plus de 120 participantes et participants partenaires de l'étude Specchio se sont réunis le 25 juin dernier au Campus Biotech pour échanger avec les équipes de recherche de l'Unité d'épidémiologie populationnelle (UEP) du Service de médecine de premier recours des HUG.

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THANK YOU

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