

## CURRICULUM VITAE

Yasmine Khan (° 12 September 1995) obtained her Bachelor's degree in Dietetics from Institut Paul-Lambin (Brussels) in 2019 and completed a Master's in Public Health with a thesis on burnout among nurses during Belgium's first COVID-19 wave, later published. In July 2021, she began her PhD in Public Health and Primary Care at Ghent University, jointly with the Department of Sociology at VUB, in collaboration with Sciensano.

## KEY PUBLICATIONS

**Khan Y, Verhaeghe N, Devleesschauwer B, Cavillot L, Gadeyne S, Pauwels N, Van den Borre L, De Smedt D.** The impact of the COVID-19 pandemic on delayed care of cardiovascular diseases in Europe: a systematic review. *Eur Heart J Qual Care Clin Outcomes*. 2023 Nov 2;9(7):647-661.

**Khan Y, Verhaeghe N, Pauw R, Devleesschauwer B, Gadeyne S, Gorasso V, Lievens Y, Speybroeck N, Van Damme N, Vandemaele M, Borre LVD, Vandepitte S, Vanthomme K, Verdoodt F, De Smedt D.** Evaluating the health and health economic impact of the COVID-19 pandemic on delayed cancer care in Belgium: A Markov model study protocol. *PLoS One*. 2023 Oct 30;18(10):e0288777.

**Khan Y, Van den Borre L, De Smedt D, Verhaeghe N, Devleesschauwer B, Deboosere P, Vanthomme K, Gadeyne S.** A Nationwide Exploration of Social Inequalities in Cancer Mortality Amidst the COVID-19 Pandemic in Belgium. *Cancer Med*. 2025 Jan;14(1):e70487.

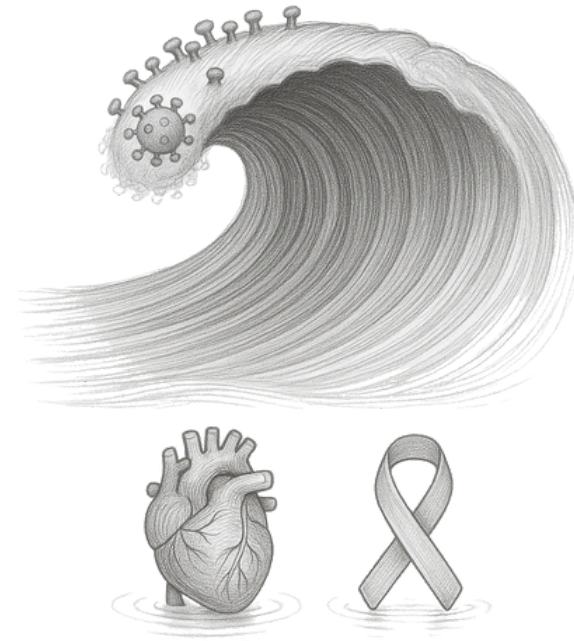
**Khan Y, Verhaeghe N, Monten C, Vanthomme K, Gadeyne S, Devleesschauwer B, Verdoodt F, Peacock H M., De Smedt D.** Subtype-specific health and economic impact of delayed breast cancer diagnosis during the early COVID-19 pandemic in Belgium: A Markov model analysis. *Breast Cancer Research* (Accepted for publication).

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## THE INDIRECT TOLL OF COVID-19 IN BELGIUM: UNVEILING MORTALITY, SOCIAL INEQUALITIES, AND HEALTH AND ECONOMIC CONSEQUENCES OF NON-COVID CARE DISRUPTIONS



### YASMINE KHAN

Doctoral dissertation submitted in partial fulfilment of the requirements for the degree of Doctor of Health Sciences (Ghent University) and Doctor of Sociology (Vrije Universiteit Brussel), 2025

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## **RESULTS**

**Objective 1. Cardiovascular care:** Across Europe, admissions for acute coronary syndromes (12–66%) and strokes (9–44%) fell sharply, with longer delays to care and increased out-of-hospital cardiac arrests and mortality during the first wave. The few studies extending beyond this period pointed to a rebound in care and outcomes

**Objective 2. Cancer mortality in Belgium:** Declines in total and cancer-specific (breast, colorectal, lung, pancreatic, and prostate) cancer mortality were observed in 2020, especially among the oldest age group (75+ years). Social inequalities in cancer mortality persisted—lower-educated groups continued to experience higher cancer death rates.

**Objective 3. Breast cancer model:** Breast cancer diagnostic delays during the first wave were projected to cause modest five-year QALY losses and additional healthcare costs; however, under subtype-specific assumptions, these effects were predominantly driven by aggressive tumours (HER2+ and triple-negative).

## **CONCLUSION**

COVID-19's indirect impact on NCD was complex: CVD disruptions caused immediate harm, while cancer effects were less visible and influenced by competing risks and persistent inequalities. Belgium showed strong healthcare resilience and rapid recovery, yet vulnerable groups and potentially aggressive tumours remained at risk. Protecting essential care, ensuring clear communication and telemedicine capacity, and placing equity at the core of preparedness are crucial. Continued monitoring and modelling are needed to fully capture long-term health and economic impacts.

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## **BACKGROUND**

Non-communicable diseases (NCD) such as cardiovascular diseases (CVD) and cancer are the leading causes of death and disability worldwide. During the COVID-19 pandemic, large parts of the healthcare system were redirected to crisis response, leading to interruptions in prevention, diagnosis, and treatment of chronic conditions. In Belgium, these disruptions included suspended cancer screenings, fewer specialist consultations, and delayed cardiovascular interventions. Such interruptions risked higher mortality, poorer health-related quality of life (HRQoL), and increased healthcare costs.

## **RESEARCH OBJECTIVES & METHODOLOGY**



**Objective 1. Summarise evidence on the impact of delayed cardiovascular care during COVID-19 in Europe.**

→ *Using a systematic literature review (132 studies) on changes in hospital admissions, procedures, and mortality for acute CVD.*



**Objective 2. Quantify changes in cancer mortality and assess whether social inequalities shifted during Belgium's first pandemic year.**

→ *By conducting a nationwide observational study using pseudonymized individually-linked data from Statistics Belgium, death certificates, and the 2011 Census, analysing age-standardised mortality rates and socioeconomic gradients.*



**Objective 3. Project long-term health and economic consequences of delayed breast cancer diagnosis in Belgium.**

→ *Using a decision-analytic Markov cohort model simulating the impact of diagnostic delays on breast cancer outcomes, expressed in quality-adjusted life years (QALYs) and direct medical costs.*

*Inputs included: Belgian Cancer Registry incidence and stage data, National Institute for Health and Disability Insurance (RIZIV/INAMI) NomenSoft tariffs, Belgian Centre for Pharmacotherapeutic Information (BCFI/CBIP) drug costs, and the scientific literature.*