COVID-19-related lost productivity measured by days missed from work by gender and role among students and employees in Canadian dental faculties

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DEDICATION

To my parents, sisters, brother and sons for their unwavering support and love.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

COVID-19: Coronavirus disease 2019

RNA: Ribonucleic acid

SARS-CoV-2: Severe Acute Respiratory Syndrome COVID-2

PPE : Personal protective equipment

AGP: Aerosol-Generating Procedures

OHCPs: Oral Health Care Providers

HCPs : Healthcare providers

CIHI: Canadian Institute for Health Information

MGI : The McKinsey Global Institute

GDP : Gross domestic product

SSRN: Social Science Research Network

STROBE: Strengthening the reporting of observational studies in epidemiology

C19ASS: COVID-19 Anxiety Syndrome Scale

IPC: Infection Prevention and Control

DAG: Directed acyclic graph

ZIM : Zero-inflated model

NB: Negative binomial

AIC : Akaike Information Criterion

VIF : Variance inflation factor

Coef : Negative binomial regression coefficient

IRR : Incidence Rate Ratio

IRRc : Crude incidence rate ratio

IRRadj : Adjusted incidence rate ratio

CI : Confidence interval

SD: Standard deviation

ABSTRACT

Background: During the COVID-19 pandemic, the dental workforce, including trainees, was at high risk of infection. Studies suggest that women faced a greater burden due to increased household and work responsibilities. However, few studies have examined work-related absenteeism in dental schools, particularly in relation to gender differences.

Objectives: The study objectives were to a) estimate the difference in the proportion of days off work among women and men in a sample of students and staff in Canadian dental schools during the COVID-19 pandemic from April 2021 to April 2022; b) estimate the difference in the proportion of days off work among the students and employees during the same period.

Methods: This study used a prospective cohort study database of 10 Canadian dental schools involving 600 participants (students, faculty, and staff) at baseline. Monthly self-reported online questionnaires were collected from April 2021 to April 2022. Data included demographics, work role, province, chronic conditions, COVID-19 infections and symptoms, time off work, vaccination, participation in dental care, exposures with co-workers, and COVID-19-related anxiety. To account for differing follow-up durations, days off work were calculated as a proportion of follow-up days. Descriptive statistics and bivariate tests compared mean proportions of days off work across covariate categories. Negative binomial regression was also used, adjusting for covariates and controlling for follow-up duration with an offset.

Results: Participants had a mean age of 36 (SD=14.3) years, 66.8% were women, and 52.5% were students. A total of 44.3% did not complete all follow-up evaluations. Regression analysis showed that women reported 40% higher rates of missed workdays than men (IRRadj=1.4, 95% CI: 0.93–2.07), though this was not statistically significant. Students reported missing 70% fewer workdays than employees (IRRadj=0.3, 95% CI: 0.17–0.50).

Conclusions: This prospective cohort study has significant implications for workplace policies. The higher reported absenteeism rates among women suggest a need for gender-sensitive workplace policies. The higher absenteeism among employees may be partially due to attrition as students graduated.

RÉSUMÉ

Contexte : La pandémie de COVID-19 a exposé le personnel dentaire à un risque élevé d'infection. Les femmes ont assumé une charge accrue en raison de responsabilités domestiques et professionnelles. Cependant, peu d'études ont analysé l'absentéisme dans les écoles dentaires selon le genre.

Objectifs : Cette étude visait à : a) estimer la différence entre la proportion de jours d'absence chez les femmes et les hommes parmi un échantillon d'étudiants et de membres du personnel des écoles dentaires canadiennes pendant la pandémie de COVID-19 d'avril 2021 à avril 2022, et b) comparer la proportion de jours d'absence entre les étudiants et employés pendant cette période.

Méthodes : Cette étude a utilisé une base de données d'une étude de cohorte prospective de 10 écoles de médecine dentaire canadiennes de 600 personnes (étudiants, professeurs et membres du personnel) au départ. Des questionnaires en ligne mensuels, auto-déclarés ont recueilli des données d'avril 2021 à avril 2022 sur : les données démographiques, rôle professionnel, province, maladies chroniques, infections à la COVID-19 et leurs symptômes, jours d'absence au travail, vaccination, participation aux soins dentaires, expositions avec des collègues et l'anxiété liée à la COVID-19. Pour tenir compte des différences de suivi, le temps d'absence a été calculé en proportion des jours de suivi. Des statistiques descriptives et tests bivariés ont comparé les proportions moyennes de jours d'absence entre les covariables. Une régression binomiale négative a été utilisée, ajustée pour les covariables et la durée du suivi.

Résultats : Dans notre étude, les personnes participantes avaient en moyenne 36 ans (ÉT=14,3), 66 % étaient des femmes et 52 % étaient aux études. 44,3 % n'ont pas complété toutes les évaluations de suivi. L'analyse de régression a montré que les femmes déclaraient un taux d'absentéisme 40 % plus élevé que les hommes (IRRadj = 1,4, IC à 95 % : 0,93–2,07), sans signification statistique. Les étudiants déclaraient manquer 70 % moins de journées de travail que les employés (IRRadj = 0,3, IC à 95 % : 0,17–0,50).

Conclusions : Cette étude de cohorte prospective souligne des implications pour les politiques en milieu de travail. L'absentéisme reporté plus élevé chez les femmes indique un besoin de politiques sensibles au genre. Chez les employés, il pourrait être partiellement dû à l'attrition liée à l'obtention du diplôme des étudiants.

PREFACE

This thesis follows a traditional monography style. Following McGill University standards, this thesis fulfills the requirements for the Master of Science (Dental Sciences) degree. This thesis focuses on gender- and role-based differences in COVID-19-related lost productivity in Canadian dental schools over one year, from April 2021 to April 2022. Following an introduction to the topic in the first chapter, the second chapter examines existing literature in three key areas: The incidence and prevalence of COVID-19 among oral health providers (OHCPs), the psychological impact of COVID-19 on OHCPs, and the gender differences in productivity during the pandemic in various groups, including the general population, educational institutions and oral health care providers. On the basis of this knowledge, the study's rationale and objectives are described in the third and fourth chapters, respectively. Chapter five discusses the study methodology, and chapter six presents the results. Chapter seven provides a comprehensive analysis of the findings, addressing methodological considerations and suggesting key public health implications as well as avenues for future research. Finally, chapter eight presents the conclusions of this project. The thesis acknowledges the contributions of several authors, and their individual roles are explicitly acknowledged below.

CONTRIBUTION OF AUTHORS

Houda Feguery, DDS, M.Sc. Candidate, Faculty of Dental Medicine and Oral Health Sciences, McGill University, Montreal, Quebec, Canada: Conceptualized study, carried out the literature review, statistical analysis, visualization and interpretation of findings, and wrote the entire thesis.

Paul Allison, Professor, Faculty of Dental Medicine and Oral Health Sciences, McGill University. Supervised the candidate, as a PI contributed to conceptual design, and acquired funding for the project. Contributed to designing this thesis project, statistical analyses, editing, and reviewing the entire thesis work.

Sreenath Madathil, Assistant Professor, Faculty of Dental Medicine and Oral Health Sciences, McGill University. Contributed to the planning and implementation of the statistical analyses for the project, and as a committee member contributed to reviewing and improving the project.

1 INTRODUCTION

In December 2019, a novel coronavirus disease (COVID-19) outbreak occurred in Wuhan, China, and spread globally in record time (1). The World Health Organization subsequently declared COVID-19 a pandemic in March 2020 (1). This RNA-based virus is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a highly contagious respiratory disease with a significant mortality rate (2). SARS-CoV-2 is very infectious due to its high mutation rate and short generation time, resulting in rapid evolution (1). In addition, SARS-CoV-2 can spread by direct person-to-person contact, indirect contact through objects, or airborne droplets or aerosols (3). Aerosol transmission remains the predominant route of SARS-CoV-2 infection (4,5).

Governments worldwide issued public health protocols to slow the virus's spread, including lockdowns, vaccination, physical distancing, and quarantine measures for symptomatic and asymptomatic individuals. Personal protective equipment (PPE), such as good ventilation, surgical masks, facial visors, and physical barriers, were also implemented (4). This pandemic resulted in a global public health crisis, posing emotional, epidemiological, and economic challenges to health professionals, oral health professionals, and school and university students and employees (6).

In dental schools, dental students, faculty, and support staff were among the limited number of groups who returned to face-to-face activities at the university (7). Numerous publications have emphasized that oral healthcare workers were at increased risk for SARS-CoV-2 infection (7–9). This increased risk is primarily due to the nature of dental care facilities, which encourage cross-infection between dentists, patients, and dental staff. Close contact during treatment and aerosol-generating procedures (AGP) contribute to this risk

(10). Standard dental instruments, such as high-speed handpieces that use water and compressed air, can also expose dental staff and patients to splashes of saliva or blood, aerosolizing these bodily fluids (11). In addition, asymptomatic patients with COVID-19 can transmit the virus to others (12). This context has contributed to dramatically increased occupational stressors among dental professionals worldwide, such as the risk of infection, anxiety about their ability to provide adequate health care in the future, and financial burdens (13,14). Furthermore, some authors reported a loss of productivity that negatively affected dentists' future career plans (15,16). Research activities were also halted, resulting in significant time and financial losses (17). However, few studies have investigated the decline in productivity due to COVID-19 among those working and studying in dental schools, including faculty, support staff, and dental and dental hygiene students. Even fewer studies have considered how this decline varied along gender lines in this dental community. In the same perspective, the literature points to the burden borne by women in the general population, who experienced increased household and work responsibilities during the lockdown due to the exacerbation of existing traditional social and gender roles. As a result, balancing full-time employment with childcare and school responsibilities affected their psychological well-being and ability to fulfill work obligations(18,19). Therefore, longitudinal studies are needed to compare productivity losses by gender and across various professional groups over time in the specific context of dental schools during the pandemic.

The aim of this prospective cohort study was to address this knowledge gap by examining the total number of workdays lost by dental students, staff, and faculty in ten Canadian dental schools during the COVID-19 pandemic and comparing these outcomes by gender. Findings from this study will provide additional evidence to potentially inform the

implementation of policies and interventions to reduce the amount of sick leave among more vulnerable professional groups, such as working mothers, who bore the burden of caregiving and housework. Providing support to alleviate these burdens would help to address the gender gap in lost productivity among these groups. The likelihood of future pandemics is well known, so this study may provide insights for future research on the reasons for the impact of the pandemic on work productivity differentiated by gender and occupational roles. Thus, in this thesis, the definition provided by the World Health Organization was adopted [1], in which gender refers to the characteristics of women, men, girls, or boys, that are socially constructed. This includes norms, behaviors, and roles associated with being a woman, man, girl, or boy. Sex refers to the different biological and physiological characteristics of females, males, and intersex persons, determined by chromosomes, hormones, and reproductive organs. It is important to note that many researchers integrate females and males and/or women and men in their studies without distinguishing between sex as a biological variable and gender as a social construct. Given this observation, the review of the literature below attempts to differentiate between these concepts as accurately as possible, based on the methodological descriptions in the respective studies. Thus, in this thesis, the terms male/female definitively refer to sex, while men/women refer to gender. The combined terms men/males and women/females are used when reporting results of studies where the distinction between sex and gender is unclear.

[1] https://www.who.int/health-topics/gender#tab=tab_1

2 LITERATURE REVIEW

2.1 The incidence and prevalence of covid-19 among oral health providers (OHCPS)

The SARS-CoV-19 pandemic led to a global public health crisis due to its rapid spread, high infectivity, and significant mortality rate (1,2). This highly contagious virus predominately spreads through airborne droplets, which is particularly challenging for oral healthcare workers (11). Indeed, a dentist's work involves proximity to the patient's oral cavity and aerosol-generating treatment procedures, creating a high-risk setting of cross-infection between dentists/dental hygienists and patients (10). These high-speed dental instruments use water and compressed air that form aerosols when combined with blood, water, and respiratory fluids (11). In addition, an individual can be asymptomatic yet potentially infectious due to the incubation period of 1 to 14 days (11).

Governmental public health measures such as social distancing, vaccination, and quarantines were implemented worldwide to reduce the infection rate (4). Meanwhile, the dental workforce, including students in dental universities across Canada, was forced to provide in-person care to enable students to progress in their learning. Hence, before solid evidence was available, oral healthcare providers, such as dentists, dental hygienists, dental assistants, and dental trainees, were considered at potentially higher risk of contracting COVID-19 than the general population at the beginning of the pandemic (7,20) . Studies conducted among various healthcare providers (HCPs) during the early phase of COVID-19 provided evidence of the increased incidence of the virus among them (21) . A systematic review analyzing data collected through May 8, 2020, revealed that 3.9% of cases worldwide were among HCPs (7,22). In Canada, the Canadian Institute for Health Information (CIHI) reported 19.4% of cases among HCPs in July 2020, with significant variations across

provinces (23). However, dentists, other dental professionals and dental staff were not included in these studies.

Various studies have provided evidence of a low prevalence of COVID-19 infections among dentists and dental professionals during the early phase of the pandemic. A US study in June 2020 found a prevalence of 0.9% confirmed or probable cases of COVID-19 among dentists (24,25). In France, a study conducted in April 2020 found a higher prevalence of 1.9% among dentists and 0.8% among dental hygienists (26)3/20/25 4:47:00 PM. A single prospective cohort study in Canada over six months reported a low infection rate among Canadian dentists, with an incidence rate of 5.1 per 100,000 person-days between August 2020 and February 2021 (7). There is likewise limited evidence of the impact of COVID-19 among dental hygienists in Canada and other parts of the world. A subsequent prospective cohort study among licensed dental hygienists practicing in Canadian communities revealed a low incidence of COVID-19, with a rate of 2.39% from December 2020 to January 2022 (27).

Within all these study's findings, OHCPs had lower overall infection rates despite being considered a high-risk profession early in the pandemic.

2.2 The psychological impact of covid-19 on oral health providers: anxiety

The pandemic psychologically impacted the population in general and health care providers in particular (28), from social isolation to fear of contraction, loss of income and employment, and loss of loved ones (6,29). Such impacts also permeated among oral health professionals and dental students (30,31). Some studies assessed the stress and anxiety levels simply among different grades of students (15,32). In contrast, others reported this outcome with dental professionals and dental hygienists emphasizing gender differences (33,34).

However, most of them applied a cross-sectional design. For instance, two studies conducted in dental faculty in Saudi Arabia and the Faculty of Medicine in Norway found that females and senior students perceived more challenges than males and junior students because of worries about lacking clinical skills (32,35).

Furthermore, a recent scoping review that included 55 studies provided a comprehensive overview of the major stressors faced by dental students worldwide during the COVID-19 pandemic and the subsequent impact on their mental health (6). This review identified the fear of contracting and spreading the SARS-CoV-2 virus, especially during patient interactions, as the most significant stressor for dental students. Other stressors, such as academic challenges, including workload, examinations, and grades, have always been present among dental students. Still, the transition to virtual learning and limited clinical time added new stressors. Indeed, concerns related to reduced clinical competence and manual dexterity development, impacted their self-perceived confidence as oral healthcare providers. The pandemic-related stressors in daily life, including social isolation and financial concerns, influenced their sleeping habits and, for some, worsened their temporomandibular disease symptoms. This review also suggests different effects according to gender. Women were found to be more sensitive to mental health issues, consistent with trends in other health professions and among students in training. However, this review included 54 cross-sectional studies published before June 2021, so it did not address the latest waves of infections (6).

Other factors, including age and occupational role (e.g., academic or non-academic staff), also impacted the experience of stress. Studies among dental academics and dentists during the pandemic suggested that factors such as age, gender, years of experience,

administrative role, performing or not clinic work, being involved in research and grant applications or not, and employment status (full-time or part-time) had an impact on perceived stress (33,34). For instance, a study that considered the effects of the pandemic on various groups within US dental schools (new dentists, pre- and post-graduate students, practicing dentists, and dental educators) found that full-time faculty members, females who provide clinical care, followed by administrative responsibilities experienced a significantly higher level of work-related burnout (34). Under the same perspective, a recent cross-sectional study among Iranian dental academics, of whom 66.4% were female, reported that being female, living with parents, and having a greater fear of infection, concerns over restrictions and academic experience were associated with higher levels of COVID-19-related stress (33). Surprisingly, not having an administrative role was also identified as a stress factor. Unlike these studies, a cross-sectional survey among academic dental staff in Arab countries concluded that older male academic dentists specializing in clinical fields experienced higher levels of burnout (36). These findings contradict previous research in dentistry, which suggests that as individuals age, burnout decreases, and mental health improves (37,38).

Considering the information above, many studies investigated the psychological impacts of COVID-19 on dental professionals; however, very little compared this impact among different occupational groups: dental faculty and staff (e.g., dental hygienists and dental assistants) and non-dental staff (e.g., receptionists, cleaning staff). In addition, these few studies provide limited information comparing the two professional profiles. As an example, a cross-sectional study that included all dental employees (dentists, nurses, data entry/cleaning staff) in a university dental clinic in Nigeria in 2020 only addressed the

significant increase in anxiety for females and specific professional profiles, notably among specialists' dentists and nurses, neglecting the other non-dental positions, such as data entry and cleaning staff (39). Similarly, a second cross-sectional study from Norway among dental staff (dentists, dental hygienists, and dental assistants) reported exclusively on sex and work seniority without addressing the non-dental staff and distinguishing anxiety levels within dentists, dental assistants, and hygienists (40). The study simply indicated that individuals with a work experience of at least ten years were less prone to expressing concerns about instability and infection. Conversely, being female was found to be correlated with a more significant psychological impact. The study included a significantly higher number of female dental professionals (89.4%) compared to males (10.6%).

Overall, a trend emerges from these studies and research conducted in many countries (41–44) that anxiety is generally reported to be higher among dental workforce who are women compared to that reported by men. Other factors, such as age and occupational role among dentists and dental academics, have also been found to influence the incidence of work-related burnouts, with full-time faculty members and females providing clinical care, followed by those in administrative roles, experiencing the highest rates. However, very limited literature exists comparing COVID-19-related stressors and mental health issues among different occupational groups. In addition, most of the studies are cross-sectional and do not capture the change of this impact throughout the pandemic. Thus, further longitudinal studies are needed, including the heterogeneous population of dental schools (students, academic and non-academic staff), to consider and address the gender and occupational-specific stressors prioritizing mental health across all occupational groups.

2.3 The impact of the covid-19 pandemic on productivity

COVID-19 substantially impacted work-related absenteeism due to the overall stress caused by the pandemic. Several studies identified major factors contributing to psychological and physical symptoms, including fear of being infected or infecting one's family, stress due to remote working and living conditions, as well as concerns about financial constraints (29,45). This context led to decreased work productivity, and, in many cases, work absence.

Absenteeism, generally involves an employee not being present at their workplace during expected working hours, regardless of the reasons (46). During the COVID-19 pandemic, additional factors such as quarantine measures, self-isolation requirements, and increased caregiving responsibilities further contributed to work absences, complicating traditional tracking methods (46, 48).

Presenteeism, on the other hand, is the physical presence at work with a reduced work output and difficulty in effectively completing tasks and meeting deadlines (45,47,46). Other authors claimed that presenteeism has become a major occupational health problem over the last few decades, representing a much more costly problem than absenteeism. The authors argue that individuals may feel an obligation to work while unwell due to the increase in contract and self-employed workers, so return to work is often counted as an outcome, while the quality of this return is rarely measured (48).

Given these nuances, this study will specifically examine absenteeism as measured by the proportion of workdays during the period of study missed during the COVID-19 pandemic, regardless of the specific cause of absence. This broad definition aligns with our

methodology, where participants reported whether they stopped working for any reason during the pandemic.

2.3.1 Gender differences in productivity among general populations during the pandemic

The advent of the COVID-19 pandemic put women at a disadvantage due to the unequal division of domestic labour and childcare responsibilities between men and women, a consequence of persisting gender and social roles. This burden was exacerbated during the pandemic, affecting women's labour productivity and intensifying the gender gap (19,49–51). According to UNICEF[2], worldwide, more than 168 million children were out of school for almost an entire year due to COVID-19 lockdowns, resulting in increased childcare needs, which women disproportionately bore (52). Moreover, under social distancing rules, access to other sources of childcare made it difficult or impossible to share childcare responsibilities with informal care providers, such as grandparents, friends, or neighbours (51).

Several studies have highlighted these disparities and their implications. For example, a study using the Understanding Coronavirus in America tracking survey data (51) found a significant gender gap in reducing work hours, particularly among college-educated parents with young children, single mothers, and those struggling to balance work with childcare. While authors also found an overall decline in employment for both genders, female employment dropped by 13% compared to 10% for male employment. This disparity could lead to long-term setbacks in women's careers and earning potential (52). According

[2] Estimated by UNICEF, as of March 02, 2021: https://www.unicef.org/press-releases/schools-more-168-million-children-globally-have-been-completely-closed

to Jarosch (2023), workers who lose their jobs will likely have less secure employment (53). The US study also revealed the stark disparity in caregiving responsibilities among US adults who were married or living with school-age children, with 44% of women reporting being the sole caregiver, compared to 14% of men. This unequal distribution is also pronounced among working parents, with working mothers representing a third of primary caregivers, compared to only 10% of working fathers, resulting in higher levels of mental distress among women (51).

The McKinsey Global Institute (MGI) has released a detailed report on the regressive economic impact of the COVID-19 crisis on gender equality (54). The analysis highlights heightened unpaid care duties and preexisting gender disparities as the primary factors affecting women's productivity. These factors contributed to a staggering 54% of all job losses among women during the pandemic despite women accounting for only 39% of global employment. The MGI also found that women lost about 1.8 times more jobs than men worldwide by 2020. Furthermore, unpaid care provided by women is worth a monumental $10 trillion, or 13% of global GDP (the total monetary value of all goods and services produced by all countries within a specific period). Lastly, the report underscored the exacerbation of violence against women during the pandemic and retrenchment of the gains in girls' education, hindering their ability to enter the workforce and acquire new skills (54).

2.3.2 Gender differences in productivity in academia during the pandemic

Significant academic scholarship examined gender differences in diverse fields during the pandemic using measures of research productivity such as numbers of submissions, publications, first authorship positions, networking opportunities, and the

ability to meet deadlines as indicators. The results of a systematic review and meta-analysis of studies on gender inequalities in universities during the pandemic (55) reported a decrease in the number of first authorships and manuscript submissions by women, with a 5% decrease in the proportion of female/women authors. This may reflect lower submission and acceptance rates of female/women's articles compared to their male/men colleagues or an increase in the number of females/women leaving academia. Multiple studies reported by Lee et al. (2023) highlighted the added burden of caregiving responsibilities as a significant factor for this decline in the proportion of female authors, although the Lee et al. analysis does not isolate caregiving as a singular cause.

Furthermore, the gender gap would have widened more for first and last authorship positions than for middle authorship positions because females/women academics were particularly limited in their ability to take on leading, but not supportive, research roles under lockdown conditions. Lee et al. (2023) also suggests that the overall gender gap in research is more pronounced in fields such as social sciences and medicine potentially because females/women already had relatively smaller collaborative networks, fewer senior positions, and less funding.

Another study in the social sciences, using a comprehensive collection of data from the Social Science Research Network (SSRN) from 25 countries (with preprints as the number of research papers uploaded to SSRN) (56), found a 13.2% decline in the productivity of female/women academics compared to male/men scholars. The results also suggest that the productivity gap is more pronounced among assistant professors and academics from top-ranked universities. Similar results were observed in political science

(57). Female/women scholars had lower research productivity, including fewer journal submissions, citations, and networking opportunities than their male colleagues.

Another study examined the role of parenthood, in addition to gender, on the academic productivity of Brazilian academics from different research institutions during the pandemic (58). The authors focused on the ability to submit papers as planned and to meet deadlines. The study's results also confirmed the noticeable decrease in the number of manuscripts submitted by females/women and publications with females/women as first authors, despite an overall increase in total submissions driven by male/men authors. The authors also found that motherhood remains the most important factor influencing female/women's careers in science, especially for single mothers and mothers with young children. Females/women may suffer a decline in work productivity after the birth of their children, which may prevent them from accessing leadership positions that require long working hours. In addition, the reproductive age of these females/women often overlaps with their early academic careers. Therefore, they have less time for research, networking, and attending conferences, limiting their exposure to emerging research trends and the latest data. Regardless of the motherhood factor, the authors also reported the early career bias that females/women faced prior to the pandemic, resulting in limited opportunities for promotion, leadership, and funding. The gender stereotypes and implicit gender bias suggest that females/women are less competent and less hirable than men. In their opinion article, Malisch et al. (2020) discuss the bias in peer review and grant review panels females/women already face when disseminating scholarly work; for example, females/women must be 2.5 times as productive to be judged equally competent in grant applications (59). The advent of the Covid-19 pandemic amplified the barriers to female/women’s career advancement in

academia. The sudden shift to online teaching has disproportionately affected female/women faculty who tend to have more teaching responsibilities (58). According to Malisch et al. (2020), female/women academics are assigned to teach more remedial and introductory courses, counsel more students, and provide additional support related to COVID-19. This higher-than-average teaching load demands more of their time and, more importantly, reduces the time available for writing research papers and applying for grants (59). In addition, economic inequality has been exacerbated at some institutions. For example, eliminating retirement account contributions, primarily for contingent faculty, to offset the financial burden of COVID-19 amplified known salary inequities for female/women faculty (59). Many institutions offered initiatives such as tenure clock extensions to overcome reduced research productivity in response to pandemic disruptions. Authors argue that these gender-blind extensions may favor males/men, potentially increasing male/men tenure rates**.** This could be due to male/men 's ability to outperform during the extended period and differences in childcare time, particularly in cases of parental leave. Moreover, these extensions might prevent female/women's scholars from applying for large research center grants that require the primary investigator to be tenured and may exclude them from positions of power that require tenure (55,59).

Overall, the results of academic studies follow the same trend, indicating an increase in the gender gap when it comes to research productivity during the pandemic despite the different outcome measures reflecting research productivity. The effect was more prominent in some disciplines, such as social sciences and medicine. In addition, female/women's scientists with young children experienced more severe productivity and employment losses.

2.3.3 Gender differences in productivity among oral healthcare providers during the pandemic

Several studies highlighted the decrease in productivity and its impact on dentists' career plans (15,16,60). For instance, a cross-sectional study among 5,370 Colombian dentists found that 81.96% of dentists reported that the COVID-19 pandemic had some impact on their career plans, including reducing working hours (77.96%), retiring early (26.54%) and changing their career outside of the field of dentistry altogether (18.15%). Moreover, different factors had an influence on dentists' future careers. Age was the most important factor for considering retiring early. According to Plaza-Ruiz et al. (2022) (60), it is likely plausible that age is viewed as a risk factor for disease severity and death from COVID-19. The other factors related to considering early retirement were being a general practitioner, practice owner, dentist who perceived the risk of contagion as very probable, and those with little confidence in avoiding becoming infected in the dental practice. On the other hand, dentists in academic/research or administrative positions had a significantly lower probability of their future career plans being impacted. Nevertheless, this study did not find statistically significant differences based on gender (60).

Furthermore, other studies (61,62) have questioned the burden of the pandemic on women's dental careers throughout the pandemic. For instance, Bishop et al. (2021) highlighted the exacerbation of the pre-existing gender inequalities in the field of oral and maxillofacial surgery, partly due to the increased burden of domestic and childcare responsibilities bore by women. According to Bishop et al. (2021), female/women surgeons experienced gender inequality and bias prior to COVID. First, they represent a small minority of the surgical workforce and a larger majority of junior clinical appointments compared to males /men. They also lack female leadership and are without significant

mentors and role models. Furthermore, according to Bishop et al. (2021), females/women devoted less time and effort to writing research papers and applying for grants, during Covid, which hindered the attainment of tenure, access to senior positions and salary increases, as well as fewer resources for retirement and investments. In addition to the lack of authorship (both co-authorship and first authorship), females/women tend to dedicate more time to clinical and surgical education and focus on committee work. This trend is particularly detrimental to the traditional tenure track, which places less emphasis on these activities than academic roles (61).

These findings are consistent with another qualitative study of 82 clinical academics at various stages of their medical and dental careers in the United Kingdom (from academic clinical fellows and postdoctoral fellows to professors). This study reported the perceived negative impact of the pandemic on the research activities and work experiences of female/women clinical academics, such as switching to full-time clinical work and sacrificing academic time. The authors also reported a decrease in publications by female/women scholars (62).

Overall, COVID-19 had a significant impact on the work productivity of women working in health care in a variety of settings and roles, resulting in a high level of psychological distress. The pandemic generally exacerbated the existing gender gap, affecting women's career advancement and potential earnings. In academia, for instance, increased childcare needs and housework responsibilities led to increased absenteeism—reduction of work hours, sick leave, drop-out from academia, or a decrease in the amount of time devoted to academic work—among women scholars.

As of June 2024, we only have a few studies in dentistry describing the loss of women's productivity during the pandemic. Hence, we do not have a significant understanding of absenteeism and its associated factors among oral healthcare professionals, especially in the context of dental schools during the pandemic. We know even less about work-related absenteeism along gender lines and among different categories of occupational groups, particularly among support staff, such as administrators, receptionists, and dental assistants. In addition, there is a lack of studies focusing on Canadian dentists, dental students, or university staff. Therefore, further longitudinal studies to compare absenteeism by gender across professional groups in dental universities need to be conducted**.** Considering the known likelihood of future pandemics, this will not only inform sick leave reduction policies but also provide support to the most vulnerable occupational groups, such as working mothers.

3 RATIONALE

Women generally faced a higher burden during the pandemic, and many studies highlighted the more significant stress and anxiety among them than men, in addition to the negative impact on work productivity that might span over many years. Moreover, the economic analysis revealed significant financial impacts on women's lives and economic growth globally, making this burden a public health issue. Among the dental community, studies on COVID-19-associated mental health outcomes reported higher anxiety among dental workforce women than men. Other factors, such as age and occupational role, have also been found to influence the incidence of work-related burnouts, with full-time faculty members and women providing clinical care experiencing the highest rate, followed by those in administrative roles. However, there is a lack of evidence regarding women's productivity in dental schools during the pandemic. Only a few studies captured the increased absenteeism among women in the dental workforce and the loss of research productivity during the pandemic. Even fewer explored this loss in the specific context of dental universities over time. Furthermore, minimal studies have compared anxiety levels and productivity among different occupational groups without considering support staff (e.g., receptionists, data entry, cleaning staff, and dental assistants). Hence, more longitudinal studies are needed to understand the impact of COVID-19 on productivity along gender lines and according to professional groups.

The present prospective cohort study aimed to fill this knowledge gap by exploring the number of workdays lost among oral healthcare providers (dental students, staff, and faculty) across ten Canadian dental schools for 12 months, comparing these outcomes by gender across various professional groups. The findings of this population-based study will

not only allow us to understand absenteeism and its associated factors among this occupational group but also have the potential to inform and shape public health interventions during and after future pandemics. This additional evidence is essential for implementing interventions that can reduce the number of sick days among more vulnerable professional groups, such as working mothers. For example, developing supportive learning and working environments would help alleviate women's burden, improve their quality of life, and address the gender gap in lost productivity. Moreover, the study results can be applied to other groups of students, faculty, and support staff in similar settings at universities across Canada and elsewhere. Finally, the chance of experiencing future pandemics is well established; thus, this study may provide insights for future research to explore the pandemic's impact on labour productivity differentiated by gender and occupational role.

4 STUDY OBJECTIVES

The current study focused on contributing evidence toward understanding the impact of COVID-19 on work absenteeism over a 12-month period among students, including undergraduate and graduate students, plus residents, and employees, including faculty and support staff, in Canadian dental schools. We estimated the proportion of days off work by follow-up days during the study period and compared this outcome by gender while controlling for role (students versus employees), among other covariates, to understand which gender experienced greater absenteeism.

The specific aims of this study are:

1. To estimate the difference in the proportion of days off work among women and men in a sample of students and staff in Canadian dental schools during the COVID-19 pandemic from April 2021 to April 2022.
2. To estimate the difference in the proportion of days off work among students and staff in Canadian dental schools during the COVID-19 pandemic from April 2021 to April 2022.

5 METHODOLOGY

To compare work absenteeism between men and women and between students and staff, we used data from a prospective cohort study that aimed to describe the COVID-19 infection rates among participants in Canadian dental schools over a year-long period during the pandemic. This section will describe the methodology of the longitudinal cohort study that addresses these objectives.

5.1 Study Design

This observational study used a prospective cohort design, enrolling and following a population-based sample over 12 months. The study protocol followed the Reporting guidelines of observational studies in Epidemiology *(STROBE) (*https://www.equatornetwork.org/wpcontent/uploads/2015/10/STROBE_checklist_v4_combined.pdf*)* for longitudinal cohort studies.

5.2 Study population

The study sample comprises members from all Canadian dental faculties. There are 10 dental schools located in 9 cities in 7 provinces (Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia), making this a pan-Canadian study. The inclusion criteria were as follows:

a. Students registered in dental and dental hygiene and other dental professional programs, residents registered in specialty programs, graduate students registered in MSc or PhD programs or post-doctoral fellows.
b. Full or part-time faculty and support staff

5.3 Ethical considerations

The study was initially approved by the ethics review board of McGill University in Quebec province, Canada (IRB review number was A12-M69-20B/(20-12-047) as the principal investigator was affiliated with the Faculty of Dental Medicine and Oral Health Sciences at McGill University, followed by those of the 9 participating dental schools across Canada.

A password-protected database was created through McGill University's secure online "Lime Survey" platform to ensure data security and participant confidentiality. In addition, each participant was assigned an identification token to ensure anonymity. Informed consent materials ensured that participants were fully aware of potential risks related to safeguarding privacy and potential conflicts of interest with researchers in dual teaching or management positions.

5.4 Recruitment Strategy

Participant recruitment occurred during the period 29 March to 30 April 2021. The sample was recruited by convenience sampling through invitations sent electronically by schools to their students and employees. This was done in a unified manner across all schools, and regular reminder emails were sent until the required sample size was reached. The invitations were sent to 6,839 individuals, including 3,189 trainees (46.6%), 2,698 faculty (39.5%), and 952 (13.9%) support staff, with a link to the password-protected study database on McGill University's secure LimeSurvey platform (*Limesurvey GmbH. / LimeSurvey: An Open Source survey tool /LimeSurvey GmbH, Hamburg, Germany. URL http://www.limesurvey.org)* and 'Qualtrix' *(Qualtrics, Provo, UT. URL:*

https://www.qualtrics.com/). This link allowed the participants to read and sign a consent form and then progress to the study questionnaires. By the end of the recruitment period, a total of 600 participants had signed the consent form and agreed to participate in the study.

5.5 Sampling Strategy

This project used data from a large prospective cohort study that aimed to describe the COVID-19 infection rates among participants in Canadian dental schools over one year, and the sample size was estimated at 800 for that project. Although 600 participants were recruited, the sample likely had sufficient power to conduct the statistical analyses.

5.6 Data Collection

Data were collected through self-report questionnaires at baseline and each of the 12 monthly follow-ups. Certain sociodemographic, education, economic, residential situation, role and other characteristics of participants were collected at baseline, while data on a range of self-report variables, including COVID-19 infection, symptoms, time off work, place of work, nature of work, living with people with symptoms/infections etc. were collected every 4 weeks during the 12 month period of the study.

5.7 Study Instrument

Participants completed the study questionnaire in either French or English. This standardized instrument was pretested by being used in English and French in the two prospective cohort studies reporting the incidence of COVID-19 among community dentists and dental hygienists in Canada (7,27). The study questionnaire consists of two parts [*Appendix 1*]. The first part allows information to be collected once at baseline on socio-

demographics, educational status, work roles, living conditions, and health status. These questions include:

a. Sociodemographic, socioeconomic, and health status variables include age, sex at birth, gender, ethnicity, education level, living conditions (shared housing or living alone), habit history (tobacco, e-cigarette use), weight and height, current chronic conditions, and medication use.
b. Work information includes primary work roles (students and academic or non-academic staff), tasks engaged in dental school, employment status (full-time or part-time), work setting and students' academic year.

The second part includes sections with questions on time-varying variables collected each month until the end of the study in April-May 2022. The final section consists of the COVID-19 Anxiety Syndrome Scale (C-19 ASS), which assesses COVID-19-related anxiety. The C-19 ASS has advantages because it has been validated for the context of this study. Nikcevic and Spada (2020) first reported that this tool demonstrated acceptable levels of validity and reliability in the general US adult population (63). This scale has subsequently been validated for use with Canadian dentists in both English and French (64).

In short, the second part comprises:

c. COVID-19 testing, including frequency, type, and results of COVID-19 testing, presence or absence of COVID-19 symptoms, if the participant confirmed the presence of COVID-19 symptoms, the onset and the duration of these symptoms were also reported and finally, days lost from work.

d. The potential risk of exposure within activities, including data on outdoor activities, travel, work setting, provision of in-person dental care, and handling of human tissue or prosthetics, if any.

e. In-person dental care episodes, encompassing frequency, type of treatment administered, number of patients treated, number of patients requiring an aerosol-generating procedure, involvement in the care of COVID-19-positive or COVID-19-suspect patients, use of personal protective equipment, and adherence to Infection Prevention and Control (IPC) procedure checklists.

f. Co-workers, encompassing the number of co-workers and frequency of working with COVID-19-positive or COVID-19-suspect colleagues in the shared workspace.

g. Vaccination status, including type, date, and number of vaccine doses received.

h. COVID-19 Anxiety, using the validated Anxiety Syndrome Scale (C19ASS), consisting of nine items and six additional items related to COVID-19 anxiety and worry (63).

5.8 Operational definition of variables:

5.8.1 Primary outcome

- The proportion of days off work: Participants were asked whether they stopped working for any reason (i.e., taken at least one day off) in the past month, with the options of "yes, no, or prefer not to disclose". The question was stated as follows:

In the last month, have you stopped working for any reason (i.e. taken at least 1 day off work)? Please choose only one of the following:

a. Yes…….
b. No……
c. Prefer not to disclose……

Those who answered "yes" could proceed to the next question to report the number of days they took off work. The total number of days missed from work was then counted as a cumulative measure at the end of the longitudinal study as was the follow-up time for each participant. Finally, to control for differences in the number of follow-up days across study participants, the proportion of days off work relative to the number of follow-up days was calculated for each participant and used in the statistical analyses.

5.8.2 Exposures

5.8.2.1 Primary exposure variable of interest

The gender of the participants in dental schools was collected at baseline through the baseline questionnaire. The question refers to how the participant currently identifies him/herself: agender, genderqueer, gender fluid, man, non-binary, questioning or unsure, transgender, trans man, trans woman, woman, prefer to self-describe or choose not to answer. Sex at birth was also collected at baseline. Participants were asked to report their sex at birth from the following options: female, male, prefer not answering, and prefer to self-describe. Since minimal differences were observed in the proportions of males/females (179 (29.8%) /411(68.5%)) and men/women (171(28.5%)/401(66.8%)), gender as a social construct was chosen rather than sex. Most participants identified themselves as men or women, and very

few chose the other categories; therefore, only “women” and “men” were considered in the statistical analysis, and gender was defined as a binary variable: man or woman.

5.8.2.2 Secondary exposure variable of interest

Role of the participant in dental schools: Data related to subjects' roles were also collected at baseline through the demographic questionnaire. Participants indicated their primary role in the dental school at which they work/study as follows:

- Dental student
- Dental hygiene student
- Resident (general practice resident or resident in specialty training)
- Graduate student in an MSc or PhD program focused on research training (i.e., not clinical, or professional training)
- Academic staff
- Support staff (e.g., administrative staff, clinical staff, laboratory staff)

  Other _____

We created two categories, one involving students and the other employees. We then considered the "role of the subject" as a categorical variable:

- **Students**: Dental students, dental hygiene students, residents (general practice residents or residents in specialty training), and graduate students in an MSc or PhD program focused on research training (i.e., not clinical or professional training).

- **Employees**: Academic staff (including clinical teachers, non-clinical teachers, and researchers), support staff (e.g., administrative staff, clinical staff, laboratory staff), and others.

5.8.3 Exposure covariables

In this study, self-reported sociodemographic and health-related covariates at baseline did not change over time because participants' responses were fixed. These covariates were as follows:

- Age: Data were collected in "years." The age variable was used as a continuous variable in the regression analysis.
- Presence of chronic conditions: According to the World Health Organization (June 2020), some groups are at a higher risk of developing COVID-19 infection, like individuals over 60 years of age, along with comorbidities such as diabetes, chronic respiratory disease and cardiovascular disease (65). In the sociodemographic section of the study questionnaire, the variable "chronic diseases" includes the following group of physician-diagnosed conditions: diabetes, hypertension, obesity, cancer, HIV/other immune deficiency, chronic lung disease (non-asthma), chronic liver disease, a chronic blood disorder, chronic kidney disease, chronic neurological impairment/disease, organ or bone marrow replacement, heart condition, and other chronic conditions. For each of these conditions, participants had to select yes, no, or unknown. In our study, the variable "chronic disease" was considered binary to avoid the complexity of the statistical analysis model. We assigned "yes" to participants who responded that they had at least one health condition from the list provided in the questionnaire and "no" to those who responded "no" or "unknown".

- Provinces of dental universities: Participants were asked to select the name of their dental school province from a list. Data were collected from 10 dental schools in 7 Canadian provinces, British Columbia (n=62), Manitoba (n=60), Nova Scotia (n=74), Ontario (n=165), Quebec (114), Saskatchewan (75), and Alberta (50). Subsequently, the province variable was converted into 3 categories as Quebec and Ontario had more participants than other provinces:

    a. Quebec (n=114)
    b. Ontario (n=165)
    c. All other provinces (n=321).

  This categorization allowed the simplification of the statistical analysis model.

In contrast, the following covariates were time-varying and dynamic with time, allowing participants to change their responses at each follow-up:

- In-person dental care episodes: Participants were asked to report the frequency with which they provided or participated in in-person dental care in the previous month. They had to choose from the following options: no in-person dental care, one day per week or less, two to three days per week, or four to five days per week. Since few participants reported providing one day per week or less, the three options, “one day per week or less, two to three days per week, or four to five days per week,” were combined into a “yes” category. Based on their responses, participants were then grouped into binary “yes” or “no” categories. Finally, the number of "yes" reports for each participant across the 12-time points was summed to create a cumulative measure and a count variable at the end of the longitudinal study.
- Shared workspace with COVID-19-positive co-workers at the dental school or at a setting linked to the dental school: Participants were asked if they had shared a

workspace with COVID-19-positive co-workers at the dental school or in a dental school-related setting in the past month. Response options were yes, no, or unknown. As there were few responses in the unknown category, this category was combined with the negative responses, making the variable binary with “yes” and “no” categories. For the statistical analysis, a new count variable was created summarizing the number of times the participants reported "yes" throughout the study.

- Shared workspace with COVID-19-suspect co-workers at the dental school or at a setting linked to the dental school: Participants were asked if they had shared workspace with COVID-19-suspect co-workers at the dental school or at a setting linked to the dental school over the last month. The response options given to the participants were yes, no, or unknown. Similarly, the unknown category was combined with the negative responses, given the very few responses in the former category, thus converting the variable into binary with “yes” and “no” categories. A cumulative and count measure was also created by summing the number of times each participant answered "yes" over the course of the study.
- Shared workspace with COVID-19-positive co-workers in a setting not associated with the dental school: Participants were also asked if they had shared a workspace with COVID-19-positive co-workers in a setting not associated with the dental school in the past month. The same procedure was used for this variable because the response options given to the participants were similar (yes, no, or unknown), and there were very few participant responses for the unknown category. Therefore, a cumulative and count measure was also created by summing the number of times

each participant answered "yes" over the course of the study after converting the variable to binary with “yes” and “no” categories.

- COVID-19 Infection Status: Participants were asked to report the results of up to four COVID-19 tests. To facilitate the analysis of the follow-up, we created the binary variable “COVID-19 infection status” to indicate whether participants have had a positive test "yes" or a negative test "no”. A new count variable, « Covid infection count, » was then created that summarizes the number of "yes" reports for each participant throughout the study.
- COVID-19-related symptoms: Participants were asked to report any COVID-19-related symptoms they had experienced in the past month. This variable was initially binary, with a “yes” and “no” response. Using the same statistical procedure as for the previous variables, the number of times each participant reported experiencing COVID-19-related symptoms across the 12 study time points was counted and stored in a new count variable, “COVID-19 symptom episodes.”
- Vaccination status: Participants were asked to report the number of doses of vaccine they received, one dose, two doses, or more than two doses. Those with one dose were considered to have received at least one dose of vaccine. In contrast, those with two or more doses were grouped as having received at least two doses of vaccine because there were very few participant responses for the “more than two doses” category. We then counted the participants who received at least one vaccine dose and those vaccinated at least twice. To effectively summarize the vaccination data, we calculated the total number of vaccine doses received by each participant and

interacted between participants who have received at least one dose and those who have received at least two doses and aggregated the total vaccination data.

- COVID-19 Anxiety is a continuous variable with a score ranging from 0 to 36, with higher scores indicating greater COVID-19 anxiety syndrome severity.

Assuming that negative binomial regression was the statistical model of choice to analyze these data, this method allowed us to adjust for these covariates.

5.9 Data analyses

All statistical analyses were performed using the R Statistical language (version 4.2.3; R Core Team, 2023) on Darwin kernel version 19.6.0, using the package report (version 0.5.9; Makowski et al., 2023) (66).

5.9.1 Descriptive analyses

In this study sample, we first conducted the descriptive analysis to describe the population sample's characteristics and illustrate the variables' distribution. The variables included: gender, role in dental schools, age distribution (categorized into quartiles-18-33, 34-45, 46-59, and 60-88-), in-person dental care episodes, work province, presence of chronic conditions, COVID-19 infection status, COVID-19-related symptoms, COVID-positive exposures in dental school, COVID-suspect exposures in dental school, COVID-positive exposures outside of dental school, vaccination status, and Covid-19 anxiety. Categorical variables were described using frequencies and percentages, and continuous variables were described using the mean, median, minimum, and maximum. Boxplots were created to visualize the distribution of the proportion of days missed from work by gender and occupational role.

To address the study objectives, we illustrated the comprehensive distribution of the outcome at the end of the longitudinal study. This included the histogram of the actual number of days off work as well as the histogram of the proportion of days off work to the total number of days the participants were enrolled in the study. We also, illustrated the participant response count at each follow-up with a bar chart to capture the loss to follow-up until the end of the study.

In addition, to illustrate the patterns of missed workdays in the cohort throughout the study, we generated a bar chart with percentages showing the distribution of a categorical variable, indicating whether the participants were working or not working over the 11 follow-up period. This variable, however, was not included in the regression model.

Finally, to report on missing data and dropouts among different groups—men, women, and people in different roles—we compared the characteristics of the original population at baseline and the study population that completed the study.

5.9.2 Preliminary bivariate analyses

Preliminary analyses of differences between groups were performed to compare the mean proportions of days off work between different categories of the covariates at baseline, such as age quartiles, gender, university role, province of work, chronic conditions, COVID-19 infection, and vaccination status. However, these preliminary bivariate analyses did not provide information about the direction or magnitude of the effect; instead, they indicated whether the difference between the groups analyzed was statistically significant.

5.9.3 Generating Directed Acyclic Graphs (DAGs) before running the regression model

As in any observational study, confounding variables may distort the true association between the exposure and the outcome. A confounder is a common cause of both the exposure and the outcome independently but does not fall on a causal path between the exposure and the outcome (67). To identify necessary variables for adjustment in our statistical models examining the relationship between gender/role and total days off work, we used an a priori causal Directed Acyclic Graph (DAG). In epidemiological research, a priori model specification—including the use of directed acyclic graphs (DAGs)— is widely used to visually represent causal relationships and control for confounding based on the backdoor criterion (68).

We constructed 2 Directed Acyclic Graphs (DAGs) for each exposure using the program DAGitty (69) before running the regression model. We identified open and closed paths between the exposures (gender, role in dental school) and the outcome (total days off work). We examined the total and direct effects of the main exposure, gender, on the total days off work, and then we performed a similar examination on the effect of role in dental schools on the total days off work. Open backdoor paths (unblocked) introduced potential confounding, and the aim was to close these paths by adjusting for the appropriate variables (70). No adjustment was required to estimate the total effect of gender on total days off work. In contrast, an adjustment was required for the direct effect of gender on total days off work and included all the covariates: Age, role, work province, chronic conditions, in-person dental care episodes, COVID-19 infection status, COVID-19-related symptoms, COVID-positive exposures in dental school, COVID-suspect exposures in dental school, COVID-positive exposures outside of dental school, vaccination status, and COVID-19 anxiety. To

estimate the total effect of role on total days off, we had to control for gender**,** work provinces**,** and age. Finally, estimating the direct effect involved a more comprehensive adjustment, including the same variables as for the direct effect of gender.

5.9.4 Negative Binomial Regression

Our study's dependent variable was participants' total number of days off work as a proportion of the total number of days of follow-up during the study ie proportion of days off work. The primary exposure of interest was the participant's gender, and the second was their role in dental schools. The covariates were gender, role in dental schools, age, province of work, chronic conditions, COVID-19 infection status, in-person dental care episodes, COVID-19 positive exposures in dental school, COVID-19 suspect exposures in dental school, COVID-19 positive exposures outside dental school, COVID-19-related symptoms, vaccination status, and COVID-19 anxiety.

To understand the relationship between the participant's gender and role and their rate of missed workdays, a negative binomial regression model was used with an offset, the total number of months the participants were in the study, to model the mean number of days off work, adjusting for the different lengths of time participants were enrolled in the study. The negative binomial regression was considered appropriate for this study as the dependent variable (total days off work) is a count variable exhibiting over-dispersion (the variance exceeds the mean). In addition, this model allows for the adjustment of multiple continuous, count, or categorical independent variables and assumes the conditional means are not equal to the conditional variances, capturing this inequality by estimating a dispersion parameter θ (71,72). Thus, this model handles the dependent variable more effectively than a Poisson regression model, which is suitable for analyzing count outcomes and requires a variance

that equals the mean (73). Furthermore, the dependent variable "total days of work" does not comprise an excessive number of zeros, making a zero-inflated model (ZIM) inappropriate. The zero-inflated negative binomial regression is for modelling over-dispersed count outcome variables with excessive zeros, attempting to account for problems that arise from that condition[3].

5.9.5 Model Assumptions

The negative binomial (NB) model follows certain assumptions, such as overdispersion (the variance exceeds the mean), log-linearity (assumes a linear relationship between the log of the expected count of the outcome (days off work) and the predictor variables), absence of perfect multicollinearity among the predictor variables and influential outliers, independence (the residuals of the model should be independent of each other), no excess zeros and large sample size (71,72).

Over-dispersion was first observed after fitting the models. The negative binomial and Poisson models were compared using the residual deviance with the degrees of freedom and the Akaike Information Criterion (AIC) values (74). The NB model exhibited much lower residual deviance than the Poisson regression, with the residual deviance close to the degrees of freedom, confirming its superior fit to the data. In addition, the negative binomial model had a lower AIC than the Poisson model, indicating that NB model effectively accounted for the overdispersion of the data (74).

[3] https://stats.oarc.ucla.edu/stata/seminars/regression-models-with-count-data/.

We also performed a series of diagnostic tests and plots on the negative binomial model using the DHARMa package in R to assess many of the assumptions of the model[4]. The residual uniformity tests, supported by QQ plots and model residual histograms, confirmed the model fits the data well. Residuals vs. fitted plots helped to visually assess whether the assumption of log-linearity held. In addition, the zero-Inflation test confirmed no significant evidence of zero inflation in the NB model.

Diagnostic plots, such as residual vs. leverage plots from the "car package," as well as the outlier test from the DHARMa package, indicated a few outliers. To confirm if these data points significantly affected the NB model, we fitted the NB model with and without these values. The output of the two models showed similar results, confirming no influential data points affecting the negative binomial model. The variance inflation factor (VIF) assessed no significant multicollinearity among the predictors[5] in the NB model. Finally, the assumption of independence of residuals did not apply since we aggregated the total number of days off work at the end of the study period.

In conclusion, these diagnostic tests confirmed goodness-of-fit and compliance with negative binomial model assumptions.

5.9.6 Developing the NB model

To estimate the association between various predictors and the rate of days off work among participants from Canadian dental schools, controlling for follow-up time, MASS package in R (75) was used. The glm.nb function from this package model with an additional

[4] https://cran.r-project.org/web/packages/DHARMa/vignettes/DHARMa.html

[5] https://online.stat.psu.edu/stat462/node/180/

parameter, θ, was used to model the overdispersion of the dependent variable. The offset log (total number of months) was included in the model to accurately reflect the rates of days off per month, accounting for the differences in follow-up duration between participants, making the results more comparable than the raw counts.

The fitted negative binomial model was written as:

glm.nb(total days off work ~ Gender + Age + Work provinces + Role in dental schools+ Chronic condition + In-person dental care episodes + COVID-19 infection status + Vaccination status + COVID-19-related symptoms + COVID-positive exposures in dental school + COVID-suspect exposures in dental school + COVID-positive exposures outside of dental school + COVID-19 anxiety + offset(log(Total number of months).

First, a crude model was developed to observe the associations between the rate of days missed from work and participants' gender and role. Then, based on the DAGs, the appropriate confounding factors were added to the model to observe the adjusted model effects. To measure the strength of associations between the rate of days of work and each predictor, the negative binomial regression coefficients (Coef) and the incidence rate ratios (IRR) with a 95% confidence interval (CI) were reported. The regression coefficient was interpreted as "for a one-unit change in the predictor variable, the log of expected counts of the response variable changes by the respective regression coefficient, given the other predictor variables in the model are held constant" [6]. To convert the regression coefficients into rate ratios, easier to interpret (where each coefficient exponentiated provides the IRR), the exp() function was used to exponentiate the model coefficients. The IRR quantifies the change in the incidence rate of days off work per month for a one-unit increase in the

[6] https://stats.oarc.ucla.edu/stata/output/negative-binomial-regression/

predictor variable, holding other variables constant. Confidence intervals for these rate ratios were calculated using the confint() function, providing a range within which the true effect size is likely to fall, with a specified level of confidence.

5.9.7 Missing values:

Of the 600 participants who reported at baseline, 587 (~98%) indicated their primary role, and 573 (95.5%) reported their gender. The statistical analyses included only these participants. To calculate the proportion of days off work for each participant, we distinguished between participants who explicitly reported no days off and those with missing data. Therefore, the proportion of missing values for the rate of days missed from work was 1.57%. This approach helped to avoid misclassification that could have led to an underestimation of the total number of days missed from work.

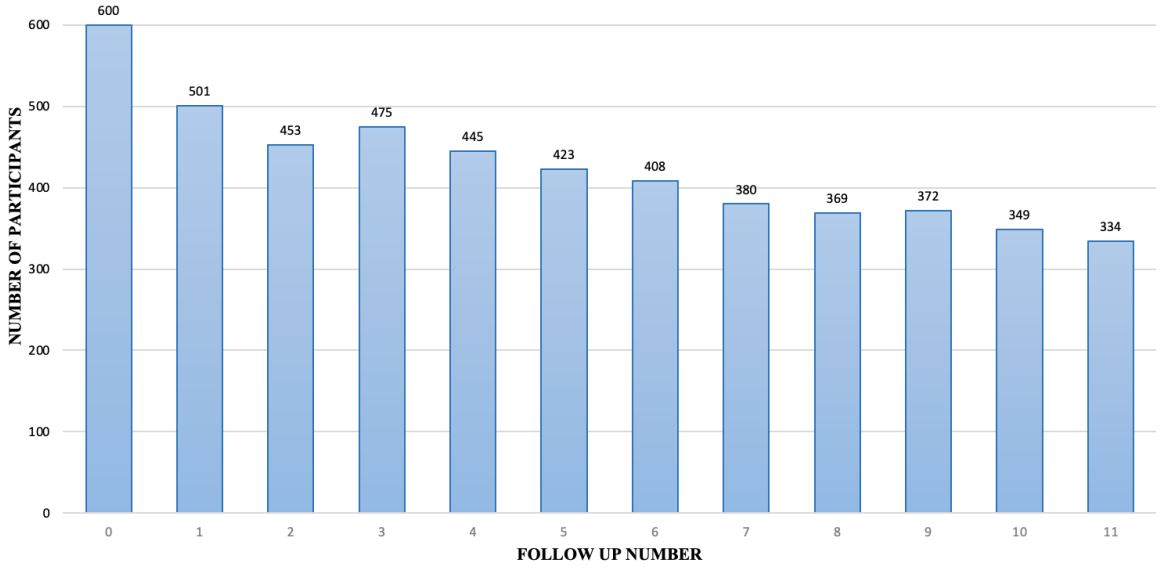
6 RESULTS

6.1 Descriptive Statistics

6.1.1 Participant characteristics

600 participants completed the baseline questionnaire in April and May 2021. During the follow-up period, the questionnaire was collected every month until the study ended in May 2022. Of the 600 enrolled participants, 600 completed the baseline questionnaire, and 334 completed the eleven-month follow-ups. Therefore, 266 participants (44.3%) were lost to follow-up (Figure 6.1). On average, participants completed 338 days of follow-up.

Figure 6-1: Number of participants at each follow up



The median age of the 600 participants was 36 years, with trainees (including dental and dental hygiene students, graduate students and residents) representing 52.5% of the sample. Most of the participants identified themselves as women (66.8%).

We compared the characteristics of the original population at baseline and the study population that completed the study. There were very small changes for most of the variables except participant role, and participants from Ontario (Table 6.1).

Table 6.1- Comparison of participant characteristics at baseline and end of the study

Participant characteristic	Proportion at Baseline	Proportion at Follow-up 11
Total sample size	**600**	**334**
Age categories		
18-33 years	(N=174) 29.0%	(N=91) 27.2%
34-45 years	(N=135) 22.5%	(N=75) 22.5%
46-59 years	(N=136) 22.7%	(N=85) 25.4%
60-88 years	(N=145) 24.2%	(N=81) 24.3%
Missing	(N=10) 1.7%	(N=2) 0.6%
Gender		
Genderqueer	(N=1) 0.2%	0.0
Man	(N=171) 28.5%	(N=88) 26.3%
Woman	(N=401) 66.8%	(N=234) 70.1%
Prefer not answering /Missing	(N=27) 4.5%	(N=12) 3.6%
Primary Role in Dental School		
Employees	(N=285) 47.5%	(N=188) 56.3%
Students	(N=315) 52.5%	(N=146) 43.7%

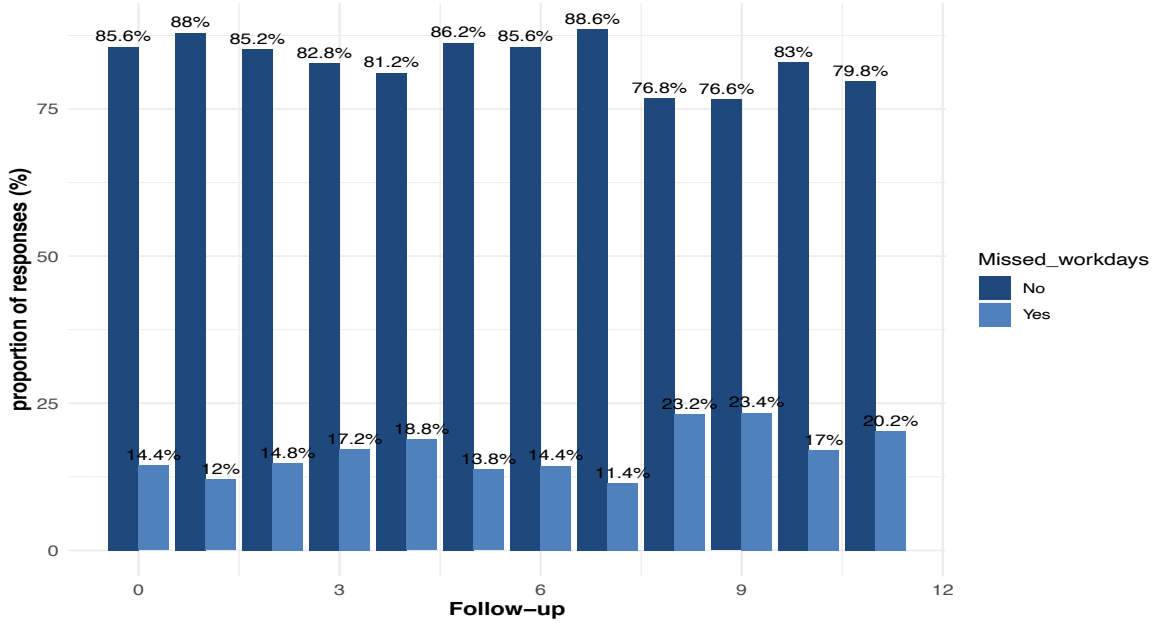
Province of work		
Ontario	(N=165) 27.5%	(N=55) 16.5%
Quebec	(N=114) 19.0%	(N=77) 23.1%
Others (Manitoba, Saskatchewan, Alberta, British Columbia)	(N=321) 53.5%	(N=202) 60.5%
Chronic conditions		
No	(N=459) 76.5%	(N=255) 76.3%
Yes	(N=132) 22.0%	(N=76) 22.8%
Missing	(N=9) 1.5%	(N=3) 0.9%
COVID-Vaccination status (at least one dose)		
No	(N=38) 6.3%	(N=7) 2.1%
Yes	(N=545) 90.8%	(N=326) 97.6%
Missing	(N=17) 2.8%	(N=1) 0.3%

Table 6.2 illustrates the trend of missed workdays throughout the study over the 12 follow-up periods. The percentage of participants reporting missed workdays fluctuates. At baseline, 14.0% of participants reported taking at least one day off work during the last month. At follow-up 11, this percentage reached 19.5%. We also observed that the percentage of participants who reported taking at least one day off peaked at follow-ups 8 and 9 (more than over 22%).

Table 6.2- The patterns of missed workdays in the cohort throughout the study												
Variable	**Follow-up**											
	0 (n=600)	**1 (n=501)**	**2 (n=453)**	**3 (n=475)**	**4 (n=445)**	**5 (n=423)**	**6 (n=408)**	**7 (n=380)**	**8 (n=369)**	**9 (n=372)**	**10 (n=349)**	**11 (n=334)**
Missed workdays												
Yes	84 (14.0%)	57 (11.4%)	64 (14.1%)	77 (16.2%)	74 (16.6%)	55 (13.0%)	56 (13.7%)	41 (10.8%)	82 (22.2%)	83 (22.3%)	56 (16.0%)	65 (19.5%)
No	499 (83.2%)	417 (83.2%)	367 (81.0%)	370 (77.9%)	319 (71.7%)	345 (81.6%)	333 (81.6%)	319 (83.9%)	272 (73.7%)	272 (73.1%)	273 (78.2%)	256 (76.6%)
Prefer not to disclose	2 (0.3%)	1 (0.2%)	3 (0.7%)	3 (0.6%)	3 (0.7%)	2 (0.5%)	1 (0.2%)	4 (1.1%)	3 (0.8%)	1 (0.3%)	2 (0.6%)	1 (0.3%)
Missing	15 (2.5%)	26 (5.2%)	19 (4.2%)	25 (5.3%)	49 (11.0%)	21 (5.0%)	18 (4.4%)	16 (4.2%)	12 (3.3%)	16 (4.3%)	18 (5.2%)	12 (3.6%)

To visually confirm the trend of missed workdays throughout the study, we created a bar chart (Figure 6-2) showing the proportion of participants with 1 or more missed workdays during the previous month, over the 12 month period of study.

Figure 6-2: Proportion of participants reporting missed workdays at each follow-up



Note: *The percentages in Figure 6-2 do not add up to 100% of participants as missing data were excuded when the variable 'Missed workdays' was converted into a binary outcome (at least one day missed versus none).*

6.1.2 Proportion of days off work at the end of the study

To illustrate the distribution of missed workdays in this study population, we generated two histograms. The first histogram (Figure 6.3) represents the actual number of workdays lost by participants during the study period. The second histogram (Figure 6.4) shows the distribution of the proportion of workdays lost relative to the total number of days the participants were enrolled in the study. In both histograms, most participants are clustered to the left, close to zero. Figure 6.3 shows that most participants lost only a few working days. The few cases with a very high number of days lost could be outliers or participants with extensive absence from work. Figure 6.4 suggests that most participants had a proportion close to zero, indicating that for most participants, the number of days lost is a very small fraction of their total follow-up time.

Figure 6.3- Histogram of the actual number of days off work

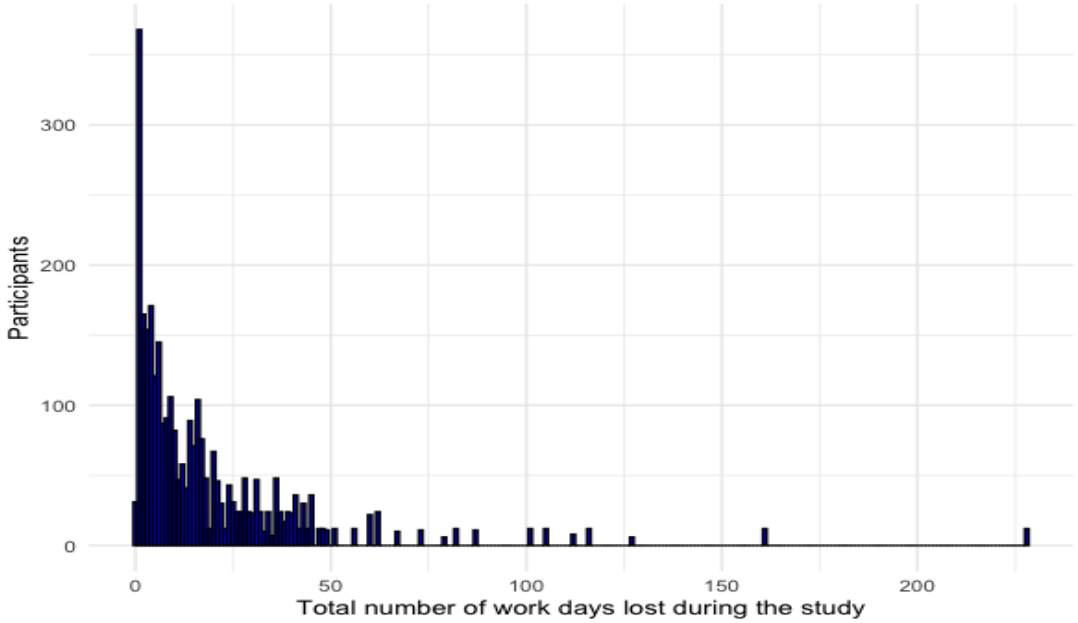
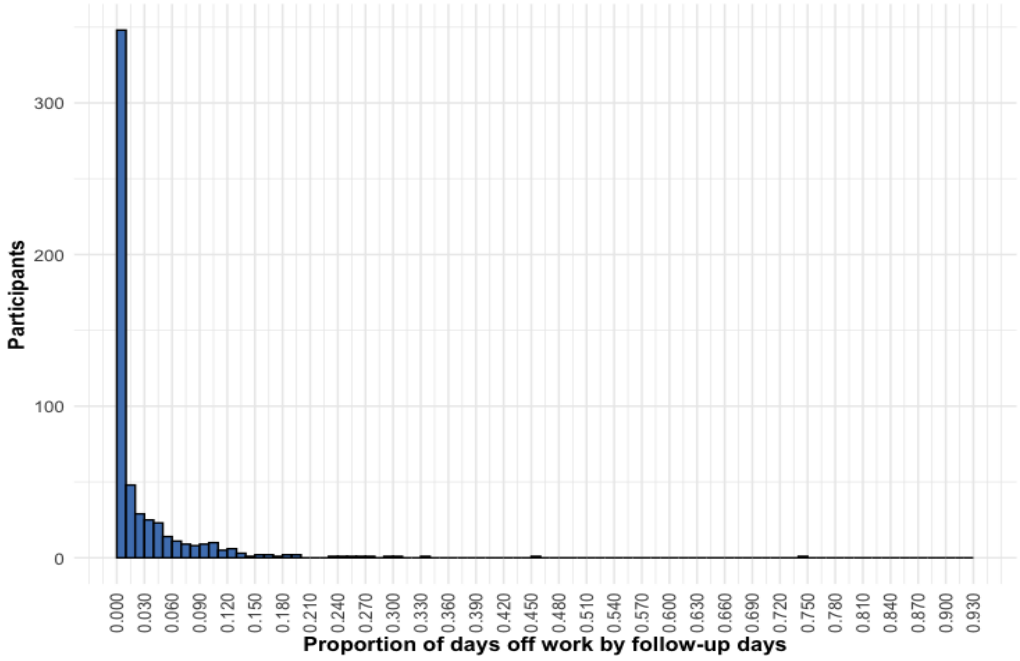


Figure 6.4- Histogram of the proportion of days off work by follow-up days



The boxplot of the distribution of the proportion of days off work by gender **(**Figure 6.5) shows a similar median proportion of days off, very close to zero for both women and men, suggesting that both have very few missed workdays. Moreover, the outliers in both gender categories indicate a small subset of participants who have taken a higher proportion of days off. Regarding the role, the median is similarly close to zero for both employees and students, although slightly higher for employees (Figure 6.6). Also, outliers were more pronounced among employees. Thus, the distribution of the proportion of days off work by role suggest that employees had higher absenteeism than students (Figure 6.6).

Figure 6.5- Boxplot of the distribution of proportion of days off work by gender

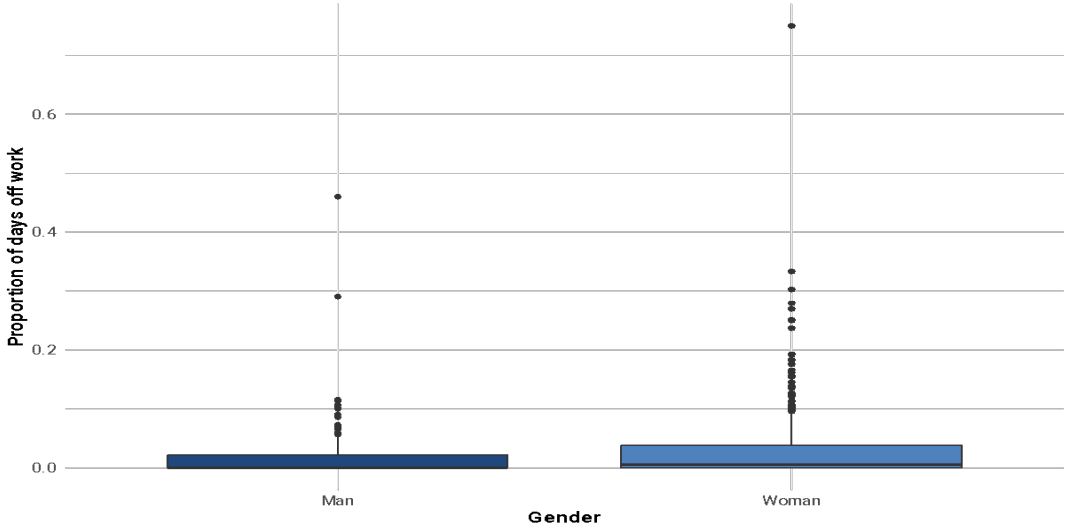
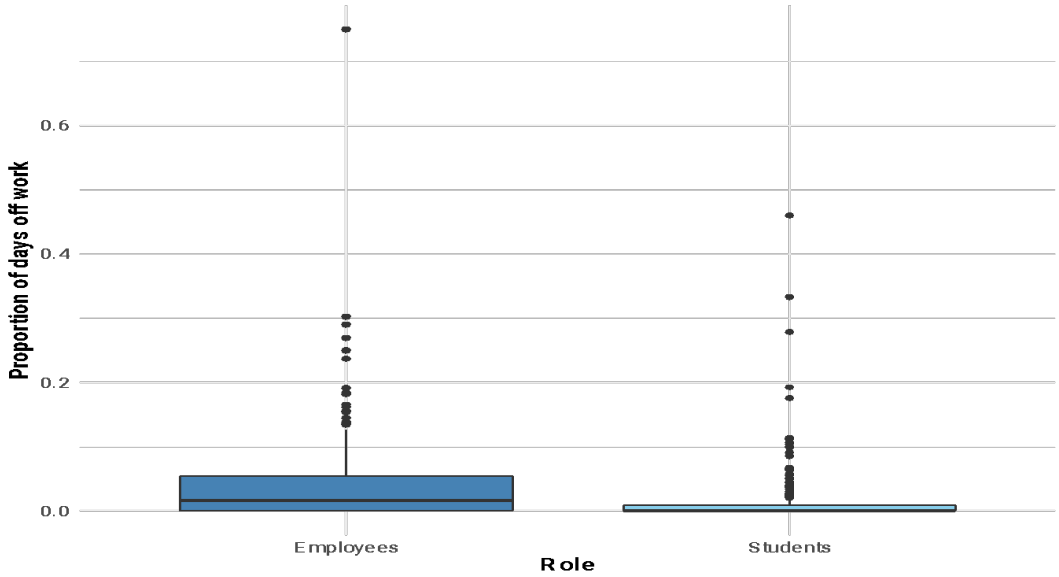


Figure 6.6- Boxplot of the distribution of proportion of days off work by role



6.2 Primary analyses: Bivariate comparisons of mean proportions of days off work

Table 6.3 describes the mean number of days off work and the mean proportion of days off work , categorized by gender and participant role. Women had a slightly higher

mean number and proportion of days off work than men, while employees had a higher mean number and proportion of days off work than students.

Table 6.3- Mean and proportion of days off work by participant characteristics at baseline (N=600)		
Variable	Mean total number of days off work (SD)	**Mean proportion days off work (SD)**
Gender		
Man	6.59 (17.2)	2% (0.05)
Woman	8.85 (15.9)	3 %(0.06)
University Role		
Employees	12.4 (17.6)	4 % (0.07)
Students	4.56 (14.2)	1% (0.04)

6.3 Secondary analyses: Negative binomial regression analyses

A negative binomial model was performed to investigate the associations between the participant's gender and roles, and the rate of missed workdays, accounting for a set of confounding variables. As described in section 5.8.3, Directed Acyclic Graphs (DAGs) were used to identify the necessary variables for adjustment in our negative binomial regression models [*Appendix II*].

Tables 6.4 to 6.7 present the crude and adjusted models of missed workday rates. These tables summarize the fixed effects of the variables on the rate of missed workdays using a negative binomial regression structure. The tables present only the estimates of the primary exposure effect measures, and do not present the values of the coefficient and confidence intervals of the confounders included in the model to prevent the Table 2 fallacy (76) . These estimates represent different types of causal effects: Total effect and direct

effect. As described by Westreich and Greenland (2013) in their discussion of the Table 2 Fallacy, total effect refers to the net of all associations of a variable through all causal pathways to the outcome, and direct effect refers to an association after blocking or controlling some of those pathways.

Table 6.4 shows the crude incidence rate ratio (IRRc) of the association between gender and the rate of missed workdays reported, which reflects the total effect of gender without adjusting for other variables. The IRRc for women was 1.45 (95% CI: 1.00, 2.13), meaning that women had 45% more workdays lost than men (95% CI: 1.00, 2.13).

Table 6.5 presents the direct effect estimates of gender in dental schools on the rate of missed workdays after adjusting for a more comprehensive set of covariates, including age, role, work province, chronic conditions, in-person dental care episodes, COVID-19 infection status, COVID-19-related symptoms, COVID-positive exposures in dental school, COVID-suspect exposures in dental school, COVID-positive exposures outside of dental school, vaccination status, and COVID-19 anxiety. The IRRadj for women was 1.4 (95% CI: 0.93, 2.07), meaning a 40% higher rate of missed workdays than men.

Table 6.6 presents the adjusted total effect model for dental school's role on the rate of missed workdays after accounting for the minimum sufficient adjustment sets: gender, work province and age. Significant results were obtained from this table showing that the IRRadj for students was 0.3 (95% CI: 0.17, 0.50), meaning that students had 70% fewer reported missed workdays than employees (95% CI: **0.17, 0.50**), adjusting for other factors in the model (IRRadj for students compared to employees was 0.3).

Table 6.7 presents the direct effect estimates of the role in dental schools on the rate of missed workdays after adjusting for the same set of covariates applied to estimate the direct effect of gender. The IRRadj for the role was **0.31** (95% CI: **0.18, 0.53)**, indicating that students took 70% less days off work than employees.

Table 6.4 - Total effect of gender on the rate of total days off work among cohort participants (N=569) during COVID-19 (April 2021 to May 2022): Crude Negative Binomial Regression, adjusted for follow-up time.

Variable	Coefficient	IRRc	95 % CI
Gender			
Woman	0.4	1.45	(1, 2.13)

IRRC: Crude Incidence rate ratio
CI: Confidence Intervals
N- Number of participants
Crude model- glm.nb(total days off work ~ Gender + offset(log(total number of months))

Table 6-5 - Direct effect of gender on the rate of total days off work among cohort participants (N=512) during COVID-19 (April 2021 to May 2022): Results from Negative Binomial Regression, adjusted for confounders

Variable	Coefficient	IRRc	95 % CI
Gender			
Woman	0.3	1.4	(0.93, 2.07)

Adjusted model- glm.nb(total days off work~ Gender + Role + Age + Work provinces + Chronic condition + In-person dental care episodes + COVID-19 infection status + COVID-19 symptoms episodes + COVID-positive exposures episodes in dental school + COVID-suspect exposures episodes in dental school + COVID-positive exposures episodes outside of dental school + Total vaccination doses + COVID-19 anxiety score+ offset(log(total number of months))

Table 6.6 - Adjusted total effect of role on the rate of total days off work among cohort participants (N=567) during COVID-19 (April 2021 to May 2022): Results from Negative Binomial Regression, adjusted for follow-up time

Variable	Coefficient	IRRadj	95 % CI
Role in dental schools			
Students	-1.2	0.3	(**0.17, 0.50)**

IRRadj: Incidence rate ratio (adjusted)
Adjusted model- glm.nb(total days off work~ Role + Gender + Work provinces + age + offset(log(total number of months))

Table 6-7 - Direct effect of role on the rate of total days off work among cohort participants (N=512) during COVID-19 (April 2021 to May 2022): Results from Negative Binomial Regression, adjusted for confounders

Variable	Coefficient	IRRadj	95 % CI
Role in dental schools			
Students	-1.2	0.3	(**0.18, 0.53)**

Adjusted model- glm.nb(total days off work~ Role + Gender + Age + Work provinces + Chronic condition + In-person dental care episodes + COVID-19 infection status + COVID-19 symptoms episodes + COVID-positive exposures episodes in dental school + COVID-suspect exposures episodes in dental school + COVID-positive exposures episodes outside of dental school + Total vaccination doses + COVID-19 anxiety score+ offset(log(total number of months))

7 DISCUSSION

7.1 Summary of the results

This prospective cohort study was conducted to estimate the association between participants' gender and role and the rate of reported days off work over a period of a year, from April 2021-April 2022, in a sample of trainees and employees at Canadian dental schools during the COVID-19 pandemic. We compared the proportion of reported days off work relative to the number of follow-up days between men and women and between students and staff, while adjusting for confounders.

Our study results showed a borderline association between gender and the rate of reported days off work. The preliminary bivariate tests revealed that women had a slightly higher mean proportion of reported days off work than men with an average of 7.2 days per year compared to 4.8 days for men, given a typical working year of 240 days. This preliminary finding was confirmed by negative binomial regression analysis, with an IRRadj for women of 1.4 (95% CI: 0.93, 2.07), holding all other factors constant (role, age, work province, chronic conditions, in-person dental care episodes, COVID-19 infection status, COVID-19-related symptoms, COVID-positive exposures in dental school, COVID-suspect exposures in dental school, COVID-positive exposures outside of dental school, vaccination status, and COVID-19 anxiety) . These results suggest that women experienced a 40% higher rate of reported missed workdays than men over the one-year period. Despite the statistical significance threshold ($p < 0.05$) not being met with, the confidence interval marginally overlapping the null value of 1.0., the observed difference in reported missed workdays between men and women over the study period holds clinical and practical relevance. These findings corroborate with existing literature documenting the disproportionate impact of the

pandemic on women in healthcare and academic settings, suggesting an increased stress and a notable difference in work absence rates among women, impacting their work-productivity. (77). Furthermore, a 40% higher rate of reported missed workdays among women in dental schools, could signal systemic issues requiring targeted interventions from a public health perspective, such as flexible scheduling, childcare support, or mental health resources.

When comparing our findings with the literature on the topic, it is important to note that the directly comparable sudies we identified comprised cross-sectional and qualitative studies describing and exploring the impact of COVID-19 on productivity among oral healthcare providers. Cross-sectional designs, while useful for capturing a snapshot of productivity loss in this community, do not allow for comparisons over time based on gender or occupational groups. Meanwhile, the qualitative studies conducted for exploratory purposes, did not not aim to describe rates of days off work or analyze differences among population groups. Moreover, there were no studies of this topic performed among Canadian populations. In this context**,** our research, with its unique longitudinal approach, provides a significant addition to the limited body of research investigating predictors of absenteeism in Canadian dental schools.

It is also important to point out that the vast majority of studies use self-report indicators, leading to gender differences in reporting health-related issues for social desirability reasons, among others. For instance, women have consistently been shown to report symptoms more frequently than men, while men underreport them**.** Kroenke and Spitzer (1998) shed light on this phenomenon and found that most physical symptoms are typically reported at least 50% more often by women than by men, with women more likely

to report a wide range of symptoms (78). Kroenke and Spitzer (1998) also presented theories for this gender difference, which included physiological, sociocultural, and psychological factors**.** The cultural factors and gender norms appear to influence the greater expressiveness among women, how symptoms are reported, and how discomfort and stress are expressed. Similarly, a review by Jensen et al. (2022) investigated the emerging evidence on long COVID, examining sex differences among hospitalized COVID-19 patients (79). These authors concluded that females are more likely to experience milder acute COVID-19 disease and a higher number of persistent physical, cognitive, neurological, and neuropsychiatric symptoms compared to males. According to Jensen et al. (2022), in addition to biological factors, behavioural and social components contribute to an increased tendency in women to report symptoms and seek care compared to men, as well as their reporting higher rates of pre-existing mental health conditions (79).

Another important finding of our study was the association between participants' roles and rates of reported days off work, while controlling for gender, age, work province, chronic conditions, in-person dental care episodes, COVID-19 infection status, COVID-19-related symptoms, COVID-positive exposures in dental school, COVID-suspect exposures in dental school, COVID-positive exposures outside of dental school, vaccination status, and COVID-19 anxiety. The preliminary analyses showed a higher mean proportion of days off work per year among employees, who took approximately 16.8 days, compared to students, with 9.5 days. Students consistently had a lower rate of reported lost workdays than employees after conducting the negative binomial regression. These regression analyses showed an IRRadj for students compared to employees equal to 0.3 (95% CI: 0.18, 0.53), with students taking 70% fewer missed workdays than employees over the one-year period,

after adjustment for other variables. Several reasons may explain these findings. It is plausible that missed workdays differ between dental students and academic and non-academic staff due to their varying roles and age. Indeed, academic staff, compared to students, are older and more likely to have families with children at school. Employees would consequently experience more disruptions to their professional productivity, due to, homeschooling, caregiving responsibilities and the increased risk of contracting COVID-19. From the same perspective, evidence has shown that age and occupational roles among dentists and dental academics have been found to influence the incidence of work-related burnouts, with full-time faculty members, followed by those in administrative roles, experiencing the highest rates (33).

Another area of potential difference between employees and trainees lies in clinical practice, which was disrupted during the lockdowns and practice restrictions. Among trainees some dental students and other clinical trainees had to stay at home or practice in simulation laboratories and study online. However, some non-clinical graduate dental students were able to work remotely. Among employees, some clinicians were clinically active, treating patients, while others were not involved in clinical care. However, a number of research faculty and support staff were able to work remotely as they had administrative or non-laboratory research responsibilities. In this regard, covariates related to the frequency of participation in in-person dental care episodes and working with COVID-19-positive colleagues, were not found to predict the rate of days off work in our study. These findings align with previous studies, showing that involvement in clinical care does not increase the risk for COVID-19 infection, due to the implementation of infection control and prevention

protocols that effectively reduce COVID-19 risk within the dental clinical care academic setting (17).

Finally, the reporting of absences varies among different groups in academic settings. While support staff must report their days off work, academic staff and students largely manage their absences rather than formally reporting them. Moreover, as these findings are based on self-reported days off work, there may be differences in how students and employees perceive what constitutes a "day off work". Furthermore, individuals among the faculty, support staff, and students might attend work or class while sick. Evidence has shown a high prevalence of presenteeism or sickness presence among physicians as they tend to attend work while ill (80,81). Sickness presenteeism in university hospitals is part of a larger behavioural pattern where physicians seem to neglect or hide their illness because of factors associated with the competitive climate (80). In addition, many doctors and dentists in Canada operate under a fee-for-service model[7], where they are paid per patient visit or procedure performed. This model may influence these health care providers' decisions to work when they are sick as they are not compensated for days not worked.

This is the first study to examine trends in sickness absence among students and employees in Canadian dental schools. However, it did not allow us to compare the sickness absence rates between academic and non-academic employees, given the small number of participants in each group. Nevertheless, our sample includes a substantial proportion of students, faculty, and support staff across 10 universities in 7 provinces, representing the typical roles in Canadian and North American dental schools, and has the advantage of being a prospective cohort design. Our research differs from previous studies, such as Bishop et

[7] https://www.dr-bill.ca/blog/billing-tips/physician-payment-models

al. (2021) and Hamad et al. (2022) who have examined dental students or professionals as a single group and included only students or staff from a single department in Louisiana State and from a single College of Dentistry in Saudi Arabia, respectively (15,61). In addition, none of these studies had a prospective cohort design.

With respect to the provincial location of the dental school, participants working in dental schools in Quebec had a higher mean proportion of days off work than those working in schools in Ontario, with 9.6 days off work per year compared to 2.4 days off work for those from Ontario. The regression analyses showed an association between the province of work and the rate of lost days. Participants in Quebec schools were nearly 3 times more likely to report days off work during the study period compared to those in Ontario schools (IRR of 2.98 [95% CI: 1.80, 4.95]). Furthermore, participants from all other Canadian provinces combined experienced an 85% higher rate of total reported days off work compared to those in Ontario. The findings of this research may be partly explained by the different infection prevention and control (IPC) strategies implemented in dental schools, according to the protocols of each dental school and the COVID-19 guidelines established by the regulatory bodies responsible for the licensing and practice of dentists in each province (20). For instance, public health and regulatory authorities in Ontario and Saskatchewan mandated that aerosol-generating procedures had to be performed in enclosed rooms (20). This is relevant in this study as most dental schools, including all in Canada, have large open, teaching clinics with multiple dental chairs.

Our study findings revealed that COVID-19 related symptom episodes significantly predict the rate of reported days off work. Participants who reported episodes of COVID-19 symptoms had an IRR of 1.3 with statistical significance (95% CI: 1.04,1.62), indicating a

30% higher rate of total days off work than those without symptoms. These results are consistent with the existing literature on the impact of COVID-19 symptoms on work attendance and productivity. A systematic review on work ability and the return to work of individuals previously infected with SARS-CoV-2 highlighted that the severity and duration of symptoms were likely to lead to increased absenteeism, resulting in prolonged recovery times, reduced working hours and challenges in returning to work (82). This systematic review also emphasized the increased relevance of presenteeism in the case of long- and post-COVID-19 symptoms, as a significant contributor to reduced work productivity with work limitations (82). Given the increased risk due to the nature of dental care work, it is plausible that symptomatic staff may have been particularly cautious about returning to work until they were fully recovered. This caution was not only due to physical recovery, but also in adherence to public health guidelines that required isolation.

None of the other covariates were associated with the rate of days off work. Regarding the mean proportion of reported days off work in different age groups, participants aged 46-59 took more days off work than those in the first, second and fourth quartiles of age, with a mean of 9.5 days per year, compared to 3.5, 5 and 7 days per year, respectively. However, there was no significant relationship between age and the rate of days off work.

In our bivariate tests based on the presence of chronic conditions, there was no difference in the mean proportion of reported days off work between participants with and without a chronic conditions. Negative binomial regression did not reveal the presence of chronic conditions as a predictor of the rate of days off work.

With regard to vaccination status, participants who were not vaccinated against COVID-19 had a higher mean proportion of days off work than those who were vaccinated, with a mean of 12 days per year, compared to 6 days per year. However, there was no statistically significant association between vaccination status and the rate of days off work, probably because the number of non-vaccinated participants in our study was very low, so we had insufficient power for this analysis.

7.2 Methodological Considerations

7.2.1 Strengths of the study

The strengths of this study include, first, the study design being a prospective cohort design. Furthermore, the study protocol adhered to the reporting guidelines of observational studies in Epidemiology *(STROBE)* for longitudinal cohort studies, ensuring the robustness of the research.

Second, this research is a pan-Canadian study enrolling and following a population-based sample over 12 months that included students, faculty, and support staff from all 10 dental schools in Canada. The inclusion of all these groups is relevant to the study's outcome, given that the missed workdays are likely to differ between students and employees due to their varying roles, experience, and age. The comparison of this outcome by gender across diverse occupational roles over a year provides a better understanding of absenteeism among more vulnerable professional groups, in the context of a global pandemic. These findings can inform targeted public health interventions aimed at reducing the number of sick days among these groups. In addition, the disproportionate sampling of women among dental and dental hygiene students and support staff increases the ability to generalize the study's

findings, considering the predominantly female workforce in other healthcare and service industries. Moreover, the study has sufficient sample size to assess the incidence rate ratio with a power of 80%, enabling the study results to be applied to other groups of students, faculty, and support staff in similar settings at universities across Canada and elsewhere.

Third, we used a standardized questionnaire that was pretested by being used in English and French in two previous prospective cohort studies reporting the incidence of COVID-19 among community dentists and dental hygienists in Canada. Additionally, the COVID-19 anxiety syndrome scale, a validated and reliable tool, was used to record the participant's anxiety score. This scale has been specifically validated for Canadian dentists in both English and French.

Fourth**,** a comprehensive direct acyclic graph (DAG) was constructed to select the confounding variables to ensure an appropriate adjustment for confounders in the analysis.

Finally, a negative binomial regression model was used to estimate the proportion of days off work at the end of the study and to compare this outcome by gender while controlling for role. Extensive tests were performed to assess the assumptions and goodness of fit of this model. This robust statistical approach allows for effectively handling count data with overdispersion and accounting for confounders.

To the best of our knowledge, this is the first longitudinal study to record sickness absences monthly over one year and to estimate COVID-19-related absenteeism by gender across different occupational groups**,** with participants from multiple dental schools throughout Canada.

7.2.2 Limitations of the study

Despite the strengths of the present study, it is important to recognize some of its limitations. Firstly, the sample for this project was a convenience sample of volunteers, possibly introducing selection bias. Participants who were motivated to join the study may have had different characteristics as well as specific experiences related to work absenteeism compared to the community in dental schools.

Another limitation of our prospective study relates to the loss to follow-up as with any prospective cohort design. At the end of the study, 44.3% (266 out of 600) participants were lost to follow-up compared with baseline (Figure 6-1). It is important to note that we did not have data on the absenteeism rate among those who dropped out. It is therefore plausible that those who dropped out would likely be most sick. Additionnally, there were significant differences between participants at baseline and those who completed the study (Table 6.1). Regarding the participant's role, there was a notable decrease in the proportion of students (0.54 to 0.44) and a corresponding increase in the proportion of employees (0.46 to 0.56). Students' graduation by the end of the study could explain this drop, which could have affected the findings, given the significant decrease in the proportion of students reporting their number of days off work in the follow-up questionnaires. Consequently, our findings, where students had 70% fewer days off work than employees, should be interpreted with caution. Significant differences were also observed when it came to the distribution of participants from different provinces, with the proportion from Ontario decreasing while the proportions from other provinces increased.

Another limitation in our study is its reliance on self-reported data for our primary outcome, which may have introduced social desirability and recall bias. Participants may

fear being perceived negatively, thus underreporting their total days off work in the previous month, which would more likely result in an underestimation of their absenteeism rate. This social desirability bias is especially relevant in healthcare and academia, which have a strong cultural emphasis on productivity. Addressing this bias involved informing the participants about the anonymity of the self-report questionnaires. Participants may also need help remembering the exact number of days they missed work, leading to recall bias. Moreover, the use of these self-reported questionnaires could lead to measurement errors and misclassification. To minimize this bias, standardized and pre-tested self-report questionnaires were used monthly, together with a validated and reliable COVID-19 anxiety syndrome scale. The data collection was also conducted by a single research coordinator throughout the study period to reduce the variability in data collection.

Finally, as with any observational study, unmeasured confounding effects may remain and distort the true association between gender, occupational roles, and the rate of reported days off work. Examples of potential unmeasured confounders could be: Living conditions (living alone and living with friends/family or roommates), care of family members infected with COVID-19, and more importantly, parental responsibilities when considering the age of children. In line with the existing literature, academics who are women and have young children experienced additional demands related to homeschooling and caregiving during the social isolation period, causing a reduction in their working hours (58). Marital status is another relevant unmeasured confounder well-documented in the literature. Single mothers, for instance, faced a compounded challenge combining work with caring for children at home, increasing their absenteeism rate (58). This reality is likely

significant in oral healthcare and academia, as women are overrepresented in these professions.

7.3 Implications for Public Health

This study investigated the association between gender, professional roles and missed workdays among participants from Canadian dental schools during COVID-19. Our study adds valuable insight by providing a better understanding of work absenteeism within the diverse population of Canadian dental schools (students, academic and non-academic staff) over a year. The results highlight the negative impact of the COVID-19 pandemic on work absenteeism among women and employees. The literature underscores the gender gap in work productivity during the pandemic, challenging women emotionally and economically and significantly affecting their careers (49,51). The literature also highlights the effect of this loss of productivity and the burden of unpaid labor on both women and global economic growth, making this a significant public health challenge (54).

Reducing gender inequalities in productivity loss and unpaid labour requires tailored public health interventions that address the social determinants affecting the productivity of women and vulnerable groups in the dental and healthcare sectors, especially during public health crises. Inclusive measures such as flexible work schedules, mental health support, and on-site childcare are preventive strategies that can significantly improve these groups' work capacity and overall quality of life. In addition, initiatives to promote gender equity in faculty evaluation and career assessment, such as the COVID-19 CV matrix approach, require collective action (83). This matrix developed during the pandemic, could be a framework for revised tenure and promotion metrics, incorporating metrics that account for disruptions such as caregiving responsibilities and other activities (e.g., teaching and mentoring) beyond

academic roles. This framework emphasizes evaluating academic merit using holistic measures and on an individual basis. This evaluation tool can also be used for publication of manuscripts, with a focus on gender equity. For instance, the formation of a Pandemic Faculty Merit Committee, including diverse groups, could ensure that these new metrics and policies are adopted at the university scale (83).

Such interventions woul not only address current gender inequalities but also prepare the dental workforce for future public health challenges.

7.4 Future directions of research

There are several potential directions for future research. Future studies need to compare work absenteeism between diverse professional roles in academia, such as dental, non-dental staff, and students, while including objective documentation of work time to record sickness rates. This alternative would reduce the recall or social desirability bias related to self-reporting data.

Examining the intersection of gender with other variables is another important area of research to investigate. According to McGee et al. (2017), gender inequality intersects with the racial profile of academics (84). Indeed, Black women experience a lack of professional networking due to structural racism, which was exacerbated during the pandemic, in addition to the overloaded caregiving responsibilities they faced (58) .

Distinguishing between gender and sex in future longitudinal studies is one of the most important future avenues for research. With their potentially large sample sizes**,** these studies could reveal how sex and gender influence work absenteeism. They could also help create more inclusive preventive strategies in dental academia by capturing the diversity of gender identities beyond the binary perspective of men and women.

Finally, qualitative research can provide valuable insights by exploring the biopsychosocial factors affecting productivity and understanding the specific needs and concerns of vulnerable subgroups within the dental workforce. Incorporating this approach would enable targeted interventions and appropriate support to address these groups' needs.

8 CONCLUSIONS

This prospective cohort study revealed higher rates of self-reported absenteeism among women and employees compared with men and students. The borderline association between gender and days off work highlights a meaningful trend that, while not statistically conclusive, underscores the importance of gender-sensitive workplace policies. These findings have significant implications for public health policymakers and dental education administrators, emphasizing the relevance of this study.

As for professional roles, a significant association was found, with employees reporting taking 70% more days off work than students over the one-year study period. However, caution is warranted in interpreting these findings due to the potential biases introduced by participant attrition, which was partly explained by student graduation.

These findings could help implement preventive measures to foster inclusive and supportive working environments. Among these measures, institutions should prioritize the creation of robust frameworks to address the systemic inequalities faced by vulnerable groups, mitigating the loss of productivity among them, while addressing the long-term effects of this loss.

While these results provide valuable insights, it is essential to acknowledge the study's limitations. These findings could benefit future research on vulnerable groups in the dental workforce who face intersecting systems of oppression, such as ethnicity and race, preparing them for future public health challenges.

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10 APPENDIX-I

10.1 IRB approval letter

McGill | Faculty of Medicine and Health Sciences | Faculté de médecine et des sciences de la santé
3655 Promenade Sir William Osler #633 Montreal, QC H3G 1Y6 | 3655, Promenade Sir William Osler #633 Montréal, QC H3G 1Y6 | T: (514) 398-3124

December 21, 2020

Dr. Paul Allison
Faculty of Dentistry
2001 McGill College – Suite 500
Montreal, Quebec H3A 1G1

RE: IRB Review Number: A12-M69-20B / (20-12-047)
COVID-19 experience in Canadian dental schools

Dear Dr. Allison,

Thank you for submitting the above-referenced study for an ethics review.

As this study involves no more than minimal risk, and in accordance with Articles 2.9 and 6.12 of the 2nd Edition of the Canadian Tri-Council Policy Statement of Ethical Conduct for Research Involving Humans (TCPS 2 2018) and U.S. Title 45 CFR 46, Section 110 (b), paragraph (1), we are pleased to inform you that approval for the study and consent form (December18, 2020) was provided by an expedited/delegated review on December 21, 2020, valid until December 20, 2021. The study proposal will be presented for corroborative approval at the next meeting of the Committee.

The Faculty of Medicine and Health Sciences Institutional Review Board (IRB) is a registered University IRB working under the published guidelines of the Tri-Council Policy Statement 2, in compliance with the Plan d'action ministériel en éthique de la recherche et en intégrité scientifique (MSSS, 1998), and the Food and Drugs Act (17 June 2001); and acts in accordance with the U.S. Code of Federal Regulations that govern research on human subjects (FWA 00004545). The IRB working procedures are consistent with internationally accepted principles of good clinical practice.

The Principal Investigator is required to immediately notify the Institutional Review Board Office, via amendment or progress report, of:

- Any significant changes to the research project and the reason for that change, including an indication of ethical implications (if any);
- Serious Adverse Effects experienced by participants and the action taken to address those effects;
- Any other unforeseen events or unanticipated developments that merit notification;
- The inability of the Principal Investigator to continue in her/his role, or any other change in research personnel involved in the project;
- A delay of more than 12 months in the commencement of the research project, and;

- Termination or closure of the research project.

The Principal Investigator is required to submit an annual progress report (continuing review application) on the anniversary of the date of the initial approval (or see the date of expiration).

The Faculty of Medicine and Health Sciences IRB may conduct an audit of the research project at any time.

If the research project involves multiple study sites, the Principal Investigator is required to report all IRB approvals and approved study documents to the appropriate Research Ethics Office (REO) or delegated authority for the participating study sites. Appropriate authorization from each study site must be obtained before the study recruitment and/or testing can begin at that site. Research funds linked to this research project may be withheld and/or the study data may be revoked if the Principal Investigator fails to comply with this requirement. A copy of the study site authorization should be submitted the IRB Office.

It is the Principal Investigator's responsibility to ensure that all researchers associated with this project are aware of the conditions of approval and which documents have been approved.

The McGill IRB wishes you and your colleagues every success in your research.

Sincerely,

Roberta Palmour, PhD
Chair
Institutional Review Board

cc: Dr. S. Baillet, Associate Dean, Research Medicine
A12-M69-20B / (20-12-047)

10.2 IRB approval letter-Annual renewal letter

McGill | Faculty of Medicine and Health Sciences | Faculté de médecine et des sciences de la santé

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December 13, 2022

Dr. Paul Allison
Faculty of Dental Medicine and Oral Health Sciences
2001 McGill College – Suite 500
Montreal, Quebec H3A 1G1

RE: IRB Study Number A12-M69-20B (20-12-047)
COVID-19 experience in Canadian dental schools

Dear Dr. Allison,

Thank you for submitting an application for Continuing Ethics Review for the above-referenced study.

The study progress report was reviewed and Full Board re-approval was provided on December 12, 2022. The ethics certification renewal is valid from December 19, 2022 to December 18, 2023. The status of your renewal submission including documents can be accessed on eRAP.

Investigators are reminded of the requirement to report all McGill IRB approved study documents to the Research Ethics Offices (REOs) of participating study sites, if applicable. Please contact the individual REOs for instructions on how to proceed. Research funds may be withheld and / or the study's data may be revoked for failing to comply with this requirement.

Should any modification or unanticipated development occur prior to the next review, please notify the IRB promptly. Regulation does not permit the implementation of study modifications prior to IRB review and approval.

Regards,

Roberta M. Palmour

Roberta M. Palmour, PhD
Chair
Institutional Review Board

cc: A12-M69-20B (20-12-047)

10.3 Consent Form

COVID-19 experience in Canadian dental schools

Principal investigator: Dr. Paul Allison, Faculty of Dentistry, McGill University
Co-Investigators:
Drs. Mary McNally and Leigha Rock, Faculty of Dentistry, Dalhousie University
Dr. Aimee Dawson, Faculté de médecine dentaire, Université Laval
Dr. Felix Girard, Faculté de médecine dentaire, Université de Montréal
Dr. Sreenath Madathil, Faculty of Dentistry, McGill University
Drs. Michael Glogauer and Carlos Quinonez, Faculty of Dentistry; and Drs. Olga Rojas and Jennifer Gommerman, Faculty of Medicine, University of Toronto
Dr. Sharat Pani, Schulich School of Medicine and Dentistry, Western University
Dr. Robert Schroth, Dr Gerald Niznick College of Dentistry, University of Manitoba
Dr. Walter Siqueira, College of Dentistry, University of Saskatchewan
Dr. Liran Levin, Faculty of Medicine and Dentistry, University of Alberta
Dr. Mario Brondani, Faculty of Dentistry, University of British Columbia

Purpose of the study: The primary purpose of the study is to estimate the incidence rate of COVID-19 among trainees (including undergraduate and graduate students and residents), professors and support staff in Canadian dental schools. On top of this, we wish to investigate how sociodemographic factors, work-related placement and tasks and use of infection control protocols and equipment may be related to risk of COVID-19 infection among study participants. Finally, among those who do test COVID-19 positive and among those receiving a vaccine against COVID-19, we aim to investigate their immune response through saliva and dried blood tests.

Description of the research: The study will follow a group of trainees, professors and support staff in Canadian dental schools for 12 months. First, participants will be invited to complete an online baseline survey. Three domains of information will be collected at this stage: i) Socio-demographics and illnesses you may currently have or have had in the past; ii) details of work performed in the previous week; and iii) symptoms related to COVID-19 and infection status. After this initial survey, participants will be invited to the follow-up phase of the study. For the follow-up phase, we will contact participants every 4 weeks to complete an online survey related to work performed and COVID-19 infection status and symptoms. In addition, for those participants who volunteer to do so, we will collect a sample of your saliva each month. The reason for collecting saliva from participants is to verify whether any participants have symptom-free COVID-19 disease.

If I participate in this study, what will be involved? Participating in this study means that you are willing to complete an online baseline survey (approx. 15-20 mins) and then complete another online survey (approx. 5-10 mins) every 4 weeks for the next 12 months. In addition, participants who agree to do so will be asked to provide a sample of their own saliva every 4 weeks for 12 months. To enable you to do this, we will provide participants with a simple saliva sample collection kit and ask you to bring it to the study research assistant at your dental school on the next occasion you are coming to work in the dental school facility linked to the dental school. The analysis of the saliva will be performed at no cost to you. You will be informed of the results of the saliva test as soon as we have them.

If at any stage in the study period, you test positive for COVID-19, whether through a test performed outside the study in a community setting or through a test performed in this study, we will ask you to provide three additional saliva samples plus dried blood samples over the month following that positive test. If the study test is positive or you self-report in the monthly questionnaire that you are positive, the

study research assistant at your dental school will contact you to organize these three additional saliva and dried blood sample collections. They will be within a few days of knowing of the COVID-19 positive test and then 2 weeks and 6 months later. We will also ask you to complete a short online questionnaire concerning your symptoms at the same times as these follow-up saliva and dried blood samples.

Also, if at any stage during the study you receive a vaccine, we will ask you to provide three additional saliva samples plus dried blood samples over the month following the first vaccine you receive. The study research assistant at your dental school will contact you to organize these additional saliva and dried blood sample collections. They will be within a few days of receiving a vaccine and then 2 weeks and 6 months later. We will also ask you to complete a short online questionnaire concerning your experience with the vaccine at the same times as these follow-up saliva and dried blood samples.

The saliva and dried blood sample collections are both done by participants themselves at home or in any other convenient, private site. If you agree to participate in the collection of saliva and/or dried blood samples, you will be provided with home collection kits for both samples. The collection of saliva involves dipping a collection tube into your mouth. The collection of a dried blood sample involves a pin-prick of the tip of one of your fingers to collect a very small amount of blood. For both sample collections, those who agree to participate in this element of the study will receive full instructions on how to do this and will be trained by the research assistant at your dental school for the first time you perform these tasks.

If one of your study saliva tests is COVID-19 positive or if you self-report being COVID-19 positive due to a test performed outside the study, we will not inform anybody else. We will not inform anybody at your dental school. We will however, provide you with information on the best courses of action if you are COVID-19 positive.

It is important to understand that if you participate in this study, you must at all times continue to follow the COVID-19 related protocols at your dental school, university and with your provincial licensing body if you are a licensed practitioner. If you need a COVID-19 test independent of this research project because you have symptoms, or have been in close contact with someone diagnosed with COVID-19 or any other appropriate reason, you need to proceed with a test in your local community health centre as advised by your local public health authority. The saliva test in our research study is not a replacement for such routine tests, it is in addition. We are performing saliva tests as part of the study to identify symptom-free cases of COVID-19.

Potential harms, discomforts or inconveniences: The only potential discomfort you may suffer in this study goes with the collection of the dried blood sample, for which there is a small pin prick sensation. Apart from this, there is no risk associated with participating in this study. It involves no treatment or procedures that can cause harm or injuries.

Potential benefits: The results from the study will help better understand the risk of COVID-19 among trainees, professors and support staff in Canadian dental schools and may inform protocols and guidelines in the future. It will also enable us to investigate the immune response of people infected with COVID-19 and of those receiving a vaccine against COVID-19 during the study. We plan on performing interim analyses of the data every few months and will inform all participants if we see infection rates among participants that are different from the infection rates in the general community. We will also inform participants if we observe that certain work practices are associated with an

increase or decrease in risk for infection. We will also be informing dental schools of the overall results, including these interim analyses, in case they need to change their guidelines. We will however only inform dental schools or others of overall results. No information about any individual participant will be shared with anyone.

Confidentiality: We assure you that all information gathered during the course of this research project will be kept confidential. Although the invitation to participate in this study was sent to you be the leadership of your dental school, they do not know and will not know who is participating in the study. When you register and consent to participate and then complete study questionnaires, all the data is stored in a password-protected server at McGill University. Only Dr. Allison, the lead investigator in this project, Drs. Glogauer, Rojas and Siquiera, who will oversee the analyses of saliva samples, and the research assistants working on the project at each dental school will have access to the information you provide, which will be stored in a firewall-protected server at McGill University. Other investigators will only have access to de-identified data for the purpose of analyses. All the data will be identified through a code number.

If a saliva sample you provide is positive for COVID-19, the research assistant at your dental school will inform you as soon as possible. We will however, not inform anybody else. We will not inform anybody at your dental school. We will however, provide you with information on the best courses of action if you are COVID-19 positive.

The results of the research will be published in scientific journals in an anonymous form. De-identified data (after removing any identifiable information) will be shared with researchers across the world through Canadian open data repositories such as the Federal Research Data Repository. This is the norm with the agency funding this project, the COVID-19 Immunity Task Force (https://www.covid19immunitytaskforce.ca) which is a Canadian federal government agency, as well as for other agencies such as the Canadian Institutes of Health Research (https://cihr-irsc.gc.ca/e/193.html).

Participation and withdrawal: Participation in this research project is entirely voluntary. You are free to withdraw from this research project at any time you want to. Should you decide to withdraw from this study, after completing the online questionnaire, you may send a request to paul.allison@mcgill.ca, and we will delete your data immediately.

Further information: If you would like to have more information or have any questions related to this study, please do not hesitate to contact the project leader, Dr. Allison. For any questions regarding your rights as a research participant, please contact the Ms. Ilde Lepore (ilde.lepore@mcgill.ca) who is Ethics Officer at the Faculty of Medicine and Health Sciences, McGill University.

Dr. Paul Allison
Faculty of Dentistry, McGill University
2001 McGill College Avenue, Suite 500
Montreal, QC, H3A 1G1
Tel: 514 398 6324
Email: paul.allison@mcgill.ca

Consent

I have carefully read the above and understand this agreement. I consent to participate in this study, which involves the regular collection of data through online questionnaires, plus saliva samples that will be sent to laboratories for analyses. I do not waive any of my rights by signing this consent.

- o I do not consent to participate in this study

- o I consent to participate in this study
    - o I consent to completing online questionnaires in this study
    - o I consent to the collection of saliva samples for this study
    - o I consent to the collection of dried blood samples for this study

10.4 Study Questionnaire

BASELINE QUESTIONNAIRE

Section 1. Contact information

The contact information you provide, on this page, will be kept confidential and will only be used for the purpose of communicating matters pertinent to this study.

- **Please enter your contact information**

Please write your answer(s) here:

First name: _____

Family name / Surname: _____

Phone: _____
Please **do not** use country code or leave spaces for your phone number.
Example: **5141238888**

E-mail address: _____

- **Please provide the first three digits of the postal code plus the province of your residence:**

Please write your answer(s) here:

Postal Code (e.g., A1A) _____
Province _____

Section 2. Demographics & Current health status

- **How old are you?**

Your answer must be between 18 and 99
Only an integer value may be entered in this field.

Please write your answer here: _____years

- **What was your assigned sex at birth?**

Choose one of the following answers
Please choose **only one** of the following:

- Female
- Male

- **What is your sex now?**

Choose one of the following answers
Please choose **only one** of the following:

- Female
- Male
- Prefer to self-describe: _____
- Prefer not to answer

- **What is your gender/how do you currently identify?**

Please choose **all** that apply:

- Agender
- Genderqueer
- Gender fluid
- Man
- Non-binary
- Questioning or unsure
- Transgender
- Trans man
- Trans woman
- Woman
- Prefer to self-describe: _____
- Prefer not to answer

- **How would you describe your ethnicity?**

Please choose **all** that apply:

- White (Caucasian)
- Indigenous person

- South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
- Chinese
- Black
- Filipino
- Latin American
- Arab
- Southeast Asian (e.g., Vietnamese, Cambodian, Laotian, Thai, etc.)
- West Asian (e.g., Iranian, Afghan, etc.)
- Korean
- Japanese
- Prefer to self-describe: _____
- Prefer not to answer

➢ **Please indicate which group best describes you:**

Only answer this question if the following condition is met: Answer was "Indigenous person", to question 7.

- Status First Nations
- Non-status First Nations
- Inuit
- Metis
- Other indigenous
- Prefer not to answer

➢ **What is the highest level of education you have completed?**

Please choose **only one** of the following:

- Less than high school graduation
- High school graduation
- Trade certificate, vocational school, or apprenticeship training
- Non-university certificate or diploma from a community college, cegep etc.
- University bachelor's degree (such as DDS, DMD, RDH)
- University graduate degree (such as a masters or doctorate)
- Prefer not to answer

➢ **How many people (including yourself) live at your residence?**

Please write your answer here: _____

➢ **How many bedrooms at your residence?**

Please write your answer here: _____

➢ **How many bathrooms at your residence?**

Please write your answer here: _____

- **What is your current weight?**

Please write your answer here: _____**kg or pounds**

- **What is your current height?**

Please write your answer here: _____**feet/inches or metres**

- **Do you currently have a family physician/primary care provider?**

- Yes
- No
- Don't know

- **Did you get a flu shot in fall 2020?**

- Yes
- No
- Don't know

- **Do you currently smoke tobacco?**

Please choose **only one** of the following:

- No
- Yes, less than daily
- Yes, daily

- **Do you currently use e-cigarettes (vape)?**

Please choose **only one** of the following:

- No
- Yes, less than daily
- Yes, daily

- **Have you ever been diagnosed by a physician with one of the following disease(s)/condition(s)?**

Please choose the appropriate response for each item: (Yes/No/Unknown):

	Yes	No	Unknown
Obesity			
Cancer			
Diabetes			
HIV/other immune deficiency			

Asthma (requiring medication)			
Chronic lung disease (non-asthma)			
Chronic liver disease			
Chronic blood disorder			
Chronic kidney disease			
Chronic neurological impairment/disease			
Organ or bone marrow replacement			
Heart condition			
High blood pressure			

- **Do you have any other disease/condition?**

Please write your answer here:

_____

- **Are you currently taking any prescribed medication?**

Please choose **only one** of the following:

- Yes
- No

- **If yes to question 22, what medication(s)**

Please write your answer here:

_____

- **Are you currently pregnant?**

Please choose **only one** of the following:

- Yes
- No
- Unknown

- **If yes to question 23, please specify trimester:**

Please choose **only one** of the following:

- First trimester
- Second trimester
- Third trimester

- **If yes to question 23, what is the estimated delivery date?**

Answer must be greater or equal to today

Please enter a date:

Section 3: Work Information

- **Please indicate the dental school at which you work/study?**

Please choose **only one** of the following:

- Dalhousie University
- Université Laval
- Université de Montréal
- McGill University
- University of Toronto
- Western University
- University of Manitoba
- University of Saskatchewan
- University of Alberta
- University of British Columbia

- **What is your primary role in the dental school at which you work/study?**

Please choose **only one** of the following:

- Dental student
- Dental hygiene student
- Resident (general practice resident or resident in specialty training)
- Graduate student in MSc or PhD program focused on research training (i.e. not clinical or professional training)
- Academic staff
- Support staff (e.g. administrative staff, clinical staff, laboratory staff)
- Other _____

- **How many different settings do you work in each week** ("settings" refers to places like at home, in a clinic, in a campus office, in a laboratory. Also, you may work in two different clinics or two different offices. So, for example, if you work at home and work at one clinic, that is two settings; if you work in a private clinic and dental school clinic, that is also two settings; if you work in the dental school clinic and two private clinics, that is three settings)**?**

Please choose **only one** of the following:

- One per week
- Two per week
- Three per week
- More than three per week

- **What type of settings do you work in each week (using the same definition of settings as in question 28)?**

Please choose **all** that apply:

- At home
- In a campus office (including an office linked with a clinic e.g. a reception area)
- In a campus clinic
- In a campus laboratory
- In a private clinic
- In a hospital clinic
- Other _____

➢ **What year of studies are you in?**

Only answer this question if the following conditions are met:
Answer was "Dental student", "Dental hygiene student", "Resident" or "Graduate student in MSc or PhD program focused on research training" to question 27 (What is your primary role in the dental school at which you work/study?)
Please choose **only one** of the following:

- First
- Second
- Third
- Fourth
- Fifth
- Sixth or more

➢ **Which of the following best describes the work you are doing on a weekly basis as a trainee?**

Only answer this question if the following conditions are met:
Answer was "Dental student", "Dental hygiene student", "Resident" or "Graduate student in MSc or PhD program focused on research training" to question 27 (What is your primary role in the dental school at which you work/study?)
Please choose **all** that apply:

- Academic studies/course work or research work at home
- Laboratory work on campus
- Clinical work in campus clinic
- Clinical work in a hospital setting
- Clinical work in another community setting

➢ **What are your main roles at the dental school?**

Only answer this question if the following conditions are met:
Answer was "Academic staff" or "Support staff" to question 27 (What is your primary role in the dental school at which you work/study?)
Please choose **all** that apply:

- Clinical teacher
- Non-clinical teacher

- Researcher
- Academic administration
- Clinical support staff
- Laboratory support staff
- Office support staff
- Other _____

➢ **How many days per week do you work for the dental school?**

Only answer this question if the following conditions are met:
Answer was "Academic staff" or "Support staff" to question 27 (What is your primary role in the dental school at which you work/study?)

Please choose **only one** of the following:

- Five
- Four
- Three
- Two
- One
- Less than one

➢ **Which of the following best describes the work you are doing on a weekly basis <u>at the dental school</u>:**

Only answer this question if the following conditions are met:
Answer was "Academic staff" or "Support staff" to question 27 (What is your primary role in the dental school at which you work/study?)
Please choose **all** that apply:

- Academic or administrative work at home
- Academic or administrative work on campus
- Laboratory work on campus
- Laboratory work in a hospital setting
- Clinical work on campus
- Clinical work in a hospital setting
- Other _____

➢ **When you are <u>not working</u> for the dental school, which of the following best describes the activities you are engaged in on a weekly basis?**

Only answer this question if the following conditions are met:
Answer was "Four", "Three", "Two", "One" or "Less than one" to question 33 (Which of the following best describes the amount of time per week you work for the dental school?)
Please choose **all** that apply:

- I am at home not working for money
- Paid work at home

- Administrative work in a private office setting
- Administrative/office work in a hospital setting
- Laboratory work in a private laboratory setting
- Laboratory work in a hospital setting
- Clinical work in a private clinic setting
- Clinical work in a hospital setting
- Other _____

➢ **Is the clinic, the office, the laboratory or other place where you worked <u>most of the time over the past week</u>:**

Please choose **only one** of the following:

- Open [no walls between dental chairs, office desks or laboratory work spaces]
- Semi-open [some areas are open to each other while others have walls or other barriers separating them]
- Closed concept [all areas are separated by walls]
- I worked at home most of the time
- Other _____

Section 4: Potential for exposure

- **Since January 2020, have you travelled and stayed overnight outside the province where you currently live?**

Please choose **only one** of the following:

- Yes
- No

- **If yes, please specify how many times?**

Please write your answer here: _____

- **If yes, please specify where?**

Please choose **all** that apply:

- NFL
- NS
- NB
- PEI
- QC
- ON
- MB
- SK
- AB
- BC
- NUN
- NWT
- YU
- USA
- Other(s) _____

- **Have you shared a living space/residence with someone (family or other), in the past 2 weeks?**

Please choose **only one** of the following:

- Yes
- No

- **Did any of the people you shared a living space/residence with attend school, college or university in-person or go to work, in the past 2 weeks?**

Please choose **only one** of the following:

- Yes
- No

- **Did any of the people you shared a living space/residence with have a positive test for COVID-19, in the past 2 weeks?**

Please choose **only one** of the following:

- Yes
- No
- Unknown

- **Did any of the people you shared a living space/residence with have any symptoms that made you suspect they have COVID-19, in the past 2 weeks? ***

Please choose **only one** of the following:

- Yes
- No
- Unknown

- **In past 2 weeks, have you attended a health care facility (other than the clinics you provide care) for yourself or with someone else?**

Please choose **only one** of the following:

- Yes
- No

- **In past 2 weeks, have you attended any private gatherings with a person or persons who do not live at your residence?**

Please choose **only one** of the following:

- Yes
- No

- **In past 2 weeks, have you attended any public gatherings/events with 10 or more people?**

Please choose **only one** of the following:

- Yes
- No

- **Have you ever worked at a facility which knowingly cares for COVID-19 patients?**

Please choose **only one** of the following:

- Yes
- No

➢ **Have you ever provided any form of service for people with COVID-19?**

Choose one of the following answers

Please choose **only one** of the following:

- Yes
- No
- Unknown

FOLLOW-UP QUESTIONNAIRE

Section 5: COVID-19 Tests and symptoms

(Questions 49 to 53 to be asked once only, as part of the baseline questionnaire. Remaining questions to be asked each month)

➢ **Have you been tested for COVID-19, other than as part of this project?**

Please choose **only one** of the following:

- Yes
- No

➢ **If yes to question 49, how many times have you been tested?**

Please write your answer here: _____

➢ **If yes to question 49, what were the dates of the test(s)?**

- 1st test date _____
- (if applicable) 2nd test date _____
- (if applicable) 3rd test date _____
- (if applicable) 4th test date _____
- Other test dates _____

➢ **If yes to question 49, what were the results of the test(s)?**

- 1st test: positive _____; negative _____; don't know/waiting for the result _____
- 2nd test: positive _____; negative _____; don't know/waiting for the result _____
- 3rd test: positive _____; negative _____; don't know/waiting for the result _____
- 4th test: positive _____; negative _____; don't know/waiting for the result _____
- Other tests: positive _____; negative _____; don't know/waiting for the result _____

➢ **If yes to question 49, please specify the type of test(s) you have had?**

Please choose **all** that apply:

- Nasopharyngeal swab sample and PCR based test
- Nasopharyngeal swab sample and antigen test
- Nasopharyngeal swab sample BUT not sure if PCR or antigen test
- Saliva sample (other than the test performed in this project) and PCR based Test
- Saliva sample (other than the test performed in this project) and antigen Test
- Saliva sample (other than the test performed in this project) BUT not sure if PCR or antigen test
- Serum sample (Blood) and antibody testing
- Other: _____
- Don't know

➢ **In the last month have you been tested for COVID-19, other than as part of this project?**

Please choose **only one** of the following:

- Yes
- No

➢ **If yes to question 54, what were the results of the test(s)?**

Please choose **only one** of the following:

- Positive
- Negative
- Don't know/waiting for the result

➢ **In last month, have you experienced any COVID-19-related symptoms?**

Please choose **only one** of the following:

- Yes
- No

If the answer to this question is no, please go directly to question 58

➢ **If you answered yes to question 56, in last month, have you experienced any of the following symptoms**

Please choose the appropriate response for each item:

Symptom	No	Yes	If yes, date of onset (day/month)	If yes, duration (days)
Fever				
Sore throat				
Runny nose				

Shortness of breath				
Chills				
Vomiting				
Nausea				
Diarrhoea				
Headache				
Rash				
Conjunctivitis				
Muscle aches				
Joint aches				
Nosebleed				
Fatigue				
General malaise				
Loss of appetite				
Loss of smell /altered sense of smell				
Loss of taste / altered sense of taste				
Any other symptoms – list • _____ • _____				

- **<u>In the last month</u>, have you stopped working for any reason (i.e. taken at least 1 day off work)?**

Please choose **only one** of the following:

d. Yes
e. No

- **<u>If you answered yes to question 58</u>, how many days did you stop working?**

Please write your answer here: _____

- **<u>If you answered yes to question 58</u>, what was the reason you stopped working?**

Please choose **all** that apply:

- I had symptoms suggesting COVID-19
- I had been in contact with someone diagnosed with COVID-19
- I had been in contact with someone suspected of having COVID-19
- I tested positive for COVID-19
- I was ill with a condition other than COVID-19
- I took time off for reasons other than illness
- Other_____

Section 6: Activities

These questions are about your activities in the last month.

➢ **During this period of the last month, did you spend most of your waking time at home?**

Please choose **only one** of the following:

- Yes
- No

➢ **During the last month, how many times did you leave your home?**

Please choose **only one** of the following:

- Never
- Once
- Twice
- 3 to 5 times
- 6 to 10 times
- More than 10 times

➢ **During the last month, if you left home, what was the purpose?**

Please choose **all** that apply:

- To go to work/university
- To do shopping (Including shopping for groceries)
- To engage in physical activity in indoor settings (e.g., gym, sports, dancing)
- To engage in outdoor physical activity
- To engage in wellness or lifestyle services (e.g., spa, hair or nail saloons)
- To visit family or friends indoors
- To visit family or friends outdoors
- To visit family or friends in a residence or long-term care facility
- Other:_____

➢ **During the last month, in what sort of setting did you work? ***

Please choose **all** that apply:

- I worked at home
- I worked in an office on my own
- I worked in an office with other people
- I worked in a classroom, library or other large non-clinic, non-laboratory space
- I worked in a reception area greeting patients for a clinic
- I worked in a laboratory on my own
- I worked in a laboratory with other people

- I worked in the clinical space of a private clinic (i.e. worked in the space providing care for patients, not the reception area or other office space)
- I worked in the clinical space of a large open clinic in a dental school or hospital setting
- I worked in a closed clinical space in a dental school or a hospital setting
- Other _____

➢ **During the last month, did you provide or accompany somebody else providing any form of in-person dental care (including consultations)?**

Please choose **only one** of the following:

- Yes
- No

➢ **During the last month, did you handle any human tissue material (e.g. a saliva or blood sample) or any item that had been in contact with a human (e.g. a prosthetic device or impression)**

Please choose **only one** of the following:

- Yes
- No

Section 7: In-person dental care episodes

This section refers to the in-person care you provided or participated in (for example, as an assistant) during the last month.

- **During the last month how often did you provide or participate in in-person dental care?**

Please choose **only one** of the following:

- I did not provide any in-person dental care (If this is your response, go to section 8, question 84)
- One day per week or less
- Two-three days per week
- Four-five days per week

- **During the last month, during the days you provided or participated in in-person dental care, approximately <u>how many patients did you see per day</u> (e.g. 10 patients per day)?**

Your answer must be at least 1 and should be a whole number.

Please write your answer here: _____

- **During the last month, during the days you provided or participated in in-person dental care, approximately <u>how many patients per day required an aerosol-generating procedure</u> (e.g. 10 patients per day)?**

Only a whole number may be entered in this field. If none, enter "0".

Please write your answer here: _____

- **During the last month did you provide any in-person dental care for COVID-19 positive patients?**

Please choose **only one** of the following:

- Yes
- No

- **<u>If you answered yes to question 70</u>, for how many COVID-19 positive patients?**

Your answer must be at least 1. Only a whole number may be entered in this field.

Please write your answer here: _____

- **During the last month did any of the patients you cared for, have any symptoms that made you suspect they are infected with COVID-19?**

Please choose **only one** of the following:

- Yes
- No

➢ **<u>If you answered yes to question 72</u>, how many patients?**

Your answer must be at least 1. Only a whole number may be entered in this field.

Please write your answer here: _____

➢ **Please specify the types of in-person dental care you provided during the month:**

Please choose **all** that apply:

- Advice and education only
- Tooth extraction
- Radiographs
- Examination and evaluation
- Scaling with hand instruments
- Scaling with ultrasonic scaler
- Abscess drainage
- Mineralized tissue removal with handpiece
- Adjustment of prosthesis or orthodontic appliance
- Pulp removal
- Provision of a prescription for a painkiller
- Provision of a prescription for an antibiotic
- Provision of a prescription for another medication
- Other: _____

➢ **Please specify the types of facial protection you used at the <u>dental school or hospital clinic</u> where you provided or participated in care during the last month**

Please choose **all** that apply:

Please choose the appropriate response for each item:

	For all procedures	For AGPs only	For non-AGPs only	For none
Routine surgical mask				
N-95 [or higher] mask				
Eye-glasses or goggles				
Facial visor				
Other form of hood or complete head coverage				

*AGP = aerosol-generating procedure

- **Please specify the types of facial protection you used at the <u>private clinic</u> where you provided or participated in care <u>the most</u> during the last month**

Please choose **all** that apply:

Please choose the appropriate response for each item:

	For all procedures	For AGPs only	For non-AGPs only	For none
Routine surgical mask				
N-95 [or higher] mask				
Eye-glasses or goggles				
Facial visor				
Other form of hood or complete head coverage				

*AGP = aerosol-generating procedure

- **Did you use any other form of facial covering during the provision of in-person care during this period?**

Please choose **only one** of the following:

- No
- Yes (Please specify below)
- Make a comment on your choice here:_____

(Questions 78 and 81 will be asked at baseline only. Questions 79, 80, 82 and 83 will be asked each month)

- **From the list below, please choose the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>dental school or hospital clinic</u> where you provided or participated in care during the last month:**

Please choose **all** that apply:

- Separate entrance and exit doorways
- Screening or interviewing patients before appointment for COVID-19 related symptoms
- Screening or interviewing staff members for COVID-19 related symptoms
- Checking the temperature of the patients using a thermometer before the appointment
- Checking the temperature of the staff members at least once a day using a thermometer
- Insisting or encouraging patients to wear masks or face covering
    - At all times
    - Only in the waiting area
    - Only in areas close to where dental care is provided

- Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches)
    - After every patient
    - More than once per day but not after every patient
    - Once a day only
    - Never
- Preprocedural mouthwash rinse
- Installation of special air filtering or purification unit
- Use of extra oral aerosol suction device during procedures
- Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)
- Plan in place for contact tracing in case of an outbreak at your clinic
- Other:_____

➢ **Have the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>dental school or hospital clinic</u> where you provided or participated in care changed during the last month**

- No
- Yes

➢ **<u>If you answered yes to question 79</u>, what new IPC measures have been added or removed?**

Measure	**Added**	**Removed**
Separate entrance and exit doorways		
Screening or interviewing patients before appointment for COVID-19 related symptoms		
Screening or interviewing staff members for COVID-19 related symptoms		
Checking the temperature of the patients using a thermometer before the appointment		
Checking the temperature of the staff members at least once a day using a thermometer		
Insisting or encouraging patients to wear masks or face covering o At all times o Only in the waiting area o Only in areas close to where dental care is provided		
Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches) o After every patient o More than once per day but not after every patient o Once a day only o Never		
Preprocedural mouthwash rinse		
Installation of special air filtering or purification unit		

Use of extra oral aerosol suction device during procedures		
Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)		
Plan in place for contact tracing in case of an outbreak at your clinic		
Other:		

- **From the list below, please choose the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>private clinic</u> (if more than one respond concerning the private clinic where you worked the most during the past month) where you provided or participated in care during the last month:**

Please choose **all** that apply:

- Separate entrance and exit doorways
- Screening or interviewing patients before appointment for COVID-19 related symptoms
- Screening or interviewing staff members for COVID-19 related symptoms
- Checking the temperature of the patients using a thermometer before the appointment
- Checking the temperature of the staff members at least once a day using a thermometer
- Insisting or encouraging patients to wear masks or face covering
    - At all times
    - Only in the waiting area
    - Only in areas close to where dental care is provided
- Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches)
    - After every patient
    - More than once per day but not after every patient
    - Once a day only
    - Never
- Preprocedural mouthwash rinse
- Installation of special air filtering or purification unit
- Use of extra oral aerosol suction device during procedures
- Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)
- Plan in place for contact tracing in case of an outbreak at your clinic
- Other:_____

- **Have the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>private clinic</u> (if more than one respond concerning the private clinic where you worked the most during the past month) where you provided or participated in care changed during the last month**

- No
- Yes

➢ **<u>If you answered yes to question 82</u>, what new IPC measures have been added or removed?**

Measure	**Added**	**Removed**
Separate entrance and exit doorways		
Screening or interviewing patients before appointment for COVID-19 related symptoms		
Screening or interviewing staff members for COVID-19 related symptoms		
Checking the temperature of the patients using a thermometer before the appointment		
Checking the temperature of the staff members at least once a day using a thermometer		
Insisting or encouraging patients to wear masks or face covering o At all times o Only in the waiting area o Only in areas close to where dental care is provided		
Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches) o After every patient o More than once per day but not after every patient o Once a day only o Never		
Preprocedural mouthwash rinse		
Installation of special air filtering or purification unit		
Use of extra oral aerosol suction device during procedures		
Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)		
Plan in place for contact tracing in case of an outbreak at your clinic		
Other:_____		

Section 8: Working in a laboratory setting

This section refers to the work you may have performed in a laboratory (e.g. a research laboratory, a preclinical/simulation laboratory or a dental prosthetics laboratory) during the last month.

- **<u>During the last month</u> how often did you work in a laboratory of any sort (e.g. a research laboratory, a preclinical/simulation laboratory or a dental prosthetics laboratory)?**

Please choose **only one** of the following:

- Never (If this is your response, go to the next section)
- One day per week or less
- Two-three days per week
- Four-five days per week

- **During the last month, what sort of laboratory did you work in?**

Please choose **all** that apply:

- A research laboratory
- A simulation/preclinical laboratory
- A dental prosthetics laboratory
- Another form of laboratory

- **Please specify the types of facial protection you used at the <u>dental school laboratory you worked in most of the time in the past month</u>**

Please choose **all** that apply:

Please choose the appropriate response for each item:

	For all procedures	For some procedures	For none
Routine surgical mask			
N-95 [or higher] mask			
Eye-glasses or goggles			
Facial visor			
Other form of hood or complete head coverage			

- **From the list below, please choose the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>dental school laboratory</u> where you worked most during the last month:**

Please choose **all** that apply:

- Separate entrance and exit doorways
- Screening or interviewing patients before appointment for COVID-19 related symptoms
- Screening or interviewing staff members for COVID-19 related symptoms
- Checking the temperature of the patients using a thermometer before the appointment
- Checking the temperature of the staff members at least once a day using a thermometer
- Insisting or encouraging patients to wear masks or face covering
    - At all times
    - Only in the waiting area
    - Only in areas close to where dental care is provided
- Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches)
    - After every patient
    - More than once per day but not after every patient
    - Once a day only
    - Never
- Preprocedural mouthwash rinse
- Installation of special air filtering or purification unit
- Use of extra oral aerosol suction device during procedures
- Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)
- Plan in place for contact tracing in case of an outbreak at your clinic
- Other:_____

➢ **Have the Infection Prevention and Control (IPC) procedures and amenities in-place at the <u>dental school laboratory</u> where you where you worked most changed during the last month**

- No
- Yes

➢ **<u>If you answered yes to question 88</u>, what new IPC measures have been added or removed?**

Measure	Added	Removed
Separate entrance and exit doorways		
Screening or interviewing patients before appointment for COVID-19 related symptoms		
Screening or interviewing staff members for COVID-19 related symptoms		
Checking the temperature of the patients using a thermometer before the appointment		
Checking the temperature of the staff members at least once a day using a thermometer		

Insisting or encouraging patients to wear masks or face covering o At all times o Only in the waiting area o Only in areas close to where dental care is provided		
Disinfecting of surfaces frequently touched by patients (e.g., doorknobs, switches) o After every patient o More than once per day but not after every patient o Once a day only o Never		
Preprocedural mouthwash rinse		
Installation of special air filtering or purification unit		
Use of extra oral aerosol suction device during procedures		
Installation of physical barriers in areas of frequent staff-patient interaction (e.g., plexiglass frames)		
Plan in place for contact tracing in case of an outbreak at your clinic		
Other:_____		

Section 9: Co-workers

The questions in this section refer to your work with co-workers during the last month.

- **During the last month, <u>when you were working at the dental school or at a setting linked to the dental school (e.g. hospital or university laboratory)</u>, approximately how many other people were working with you in the same room/space (office, laboratory, clinic)?**

Please choose **only one** of the following:

- None
- 1-3
- 4-10
- 11-20
- More than 20

- **During the last month, as far as you are aware, did any of the people working with you in the same room/space <u>at the dental school or at a setting linked to the dental school (e.g. hospital or university laboratory)</u> have a positive test for COVID-19?**

Please choose **only one** of the following:

- Yes
- No

- Unknown

➢ **During the last month, did any of the people working with you in the same room/space <u>at the dental school or at a setting linked to the dental school (e.g. hospital or university laboratory)</u> have any symptom which made you suspect that they have COVID-19?**

Please choose **only one** of the following:

- Yes
- No
- Unknown

➢ **During the last month, <u>when you were working in a space NOT linked with the dental school</u> (if you regularly work in more than one setting, apart from the dental school, this is related to the setting you work in most), approximately how many other people were working with you in the same room/space (office, laboratory, clinic)?**

Please choose **only one** of the following:

- I do not work in a space not linked with the dental school (if so, go to section 9, question 90)
- None
- 1-3
- 4-10
- 11-20
- More than 20

➢ **During the last month, as far as you are aware, did any of the people working with you in the same room/space you refer to in question 87 (i.e. NOT linked with the dental school) have a positive test for COVID-19?**

Please choose **only one** of the following:

- Yes
- No
- Unknown

➢ **During the last two weeks, did any of the people working with you in the same room/space you refer to in question 87 (i.e. NOT linked with the dental school) have any symptom which made you suspect that they have COVID-19?**

Please choose **only one** of the following:

- Yes
- No
- Unknown

Section 9: Vaccination

The questions in this section refer to receiving a vaccination against COVID-19.

- **Have you been vaccinated against COVID-19?**

Answer 'Yes' if you have received at least one dose of the COVID-19 vaccine.
Note: Certain types of vaccines require more than one dose to protect against COVID-19. You would have been informed at the time of vaccination if you needed a second dose.

- Yes
- No

- **How many doses of the COVID-19 vaccine have you received so far?**

Note: Certain types of vaccines require more than one dose to protect against COVID-19. You would have been informed at the time of vaccination if you needed a second dose.

- One dose
- Two doses
- More than two doses

- **When did you receive your first dose of the COVID-19 vaccine?**

Day	Month	Year

- **When did you receive your second dose of the COVID-19 vaccine?**

Day	Month	Year

- **Which vaccine did you receive?**

- Pfizer and BioNTech mRNA vaccine
- Moderna mRNA vaccine
- AstraZeneca Oxford vaccine
- Other _____
- Don't know

Section 10: COVID-19 Anxiety

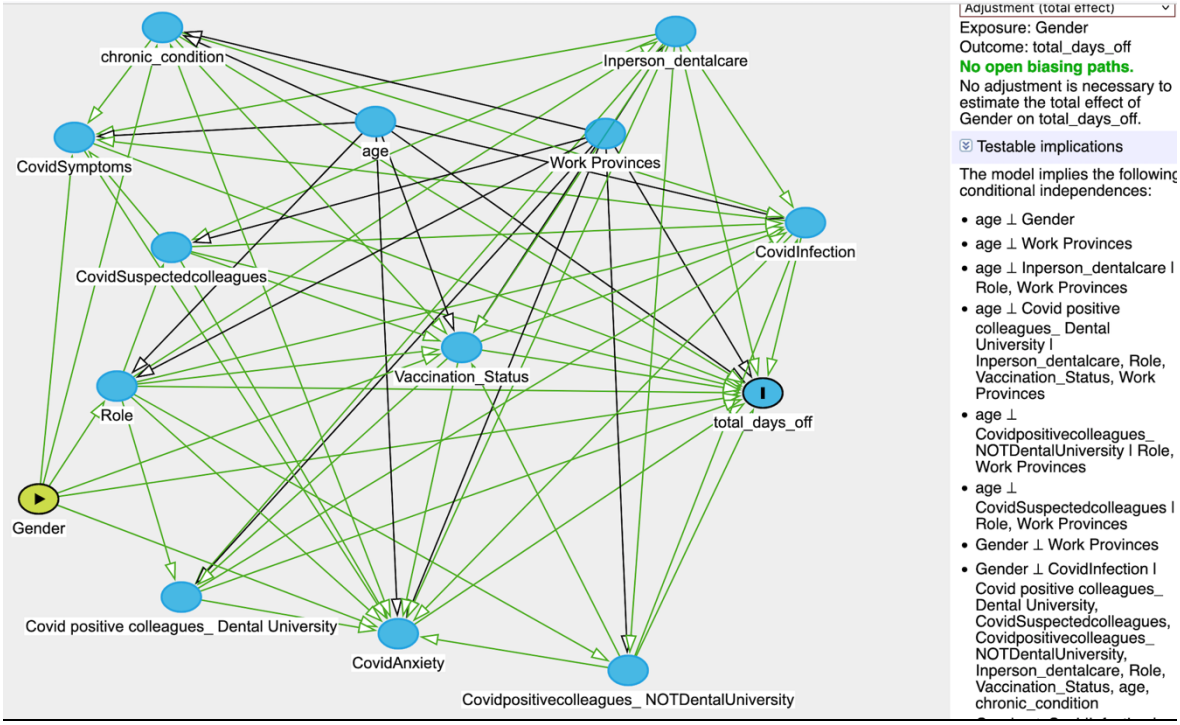
- **Please rate the extent to which each statement applies to you over the last month**.

	Not at all (0)	Rarely, less than a day or two (1)	Several days (2)	More than 7 days (3)	Nearly every day (4)
• I have avoided using public transport because of the fear of contracting coronavirus (COVID-19)					
• I have checked myself for symptoms of coronavirus (COVID-19)					
• I have avoided going out to public places (shops, parks) because of the fear of contracting coronavirus (COVID-19)					
• I have been concerned about not having adhered strictly to social distancing guidelines for coronavirus (COVID-19)					
• I have avoided touching things in public spaces because of the fear of contracting coronavirus (COVID-19).					
• I have read about news relating to coronavirus (COVID-19) at the cost of engaging in work.					
• I have checked my family members and loved one for the signs of coronavirus (COVID-19).					
• I have been paying close attention to others displaying possible symptoms of coronavirus (COVID-19).					
• I have imagined what could happen to my family members if they contracted coronavirus (COVID-19).					
• I am afraid of getting COVID-19 from a patient or a co-worker					
• I am anxious when providing treatment to patients with flu like symptoms					

• I fear that the PPE I am using may not be sufficient to protect me against COVID-19					
• I worry about how effective vaccines may be against COVID-19					
• I worry about the side effects of vaccines against COVID-19					
• I am anxious about the new strains of COVID-19 that are emerging					

11 APPENDIX-II- Directed acyclic graphs

Directed acyclic graph presenting the associations between gender and the crude effect on days off work



Legend for Directed Acyclic Graphs (DAGs)

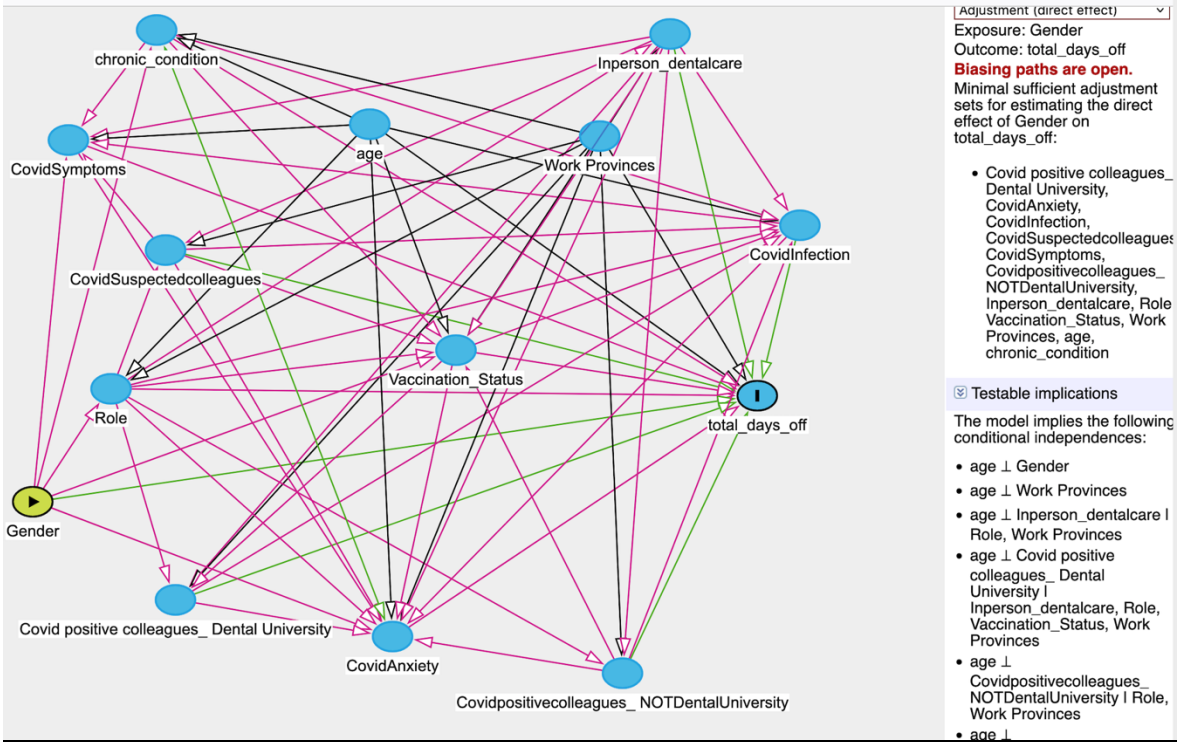
Total_days_off: The total number of days missed from work.
Gender: The gender of the participants in dental schools.
Role: Role of the participant in dental schools.
Age: Age of the participants in dental schools.
Chronic_condition: Presence of chronic conditions.
Work Province: Provinces of dental universities.
Inperson_dentalcare: In-person dental care episodes.
Covid positive colleagues_Dental Universities: COVID-positive exposures in dental school.
CovidSuspectescolleagues: COVID-suspect exposures in dental school.
Covidpositivecolleagues_NotDentalUniversity: COVID-positive exposures outside of dental school.
CovidInfection: COVID-19 infection Status
CovidSymptoms: COVID-19-related symptoms

Vaccination_Status: Vaccination status
CovidAnxiety: COVID-19Anxiety

 Non-biasing paths (No adjustment required).

 Crude causal relationships.

Directed acyclic graph presenting the associations between gender and the direct effect on days off work

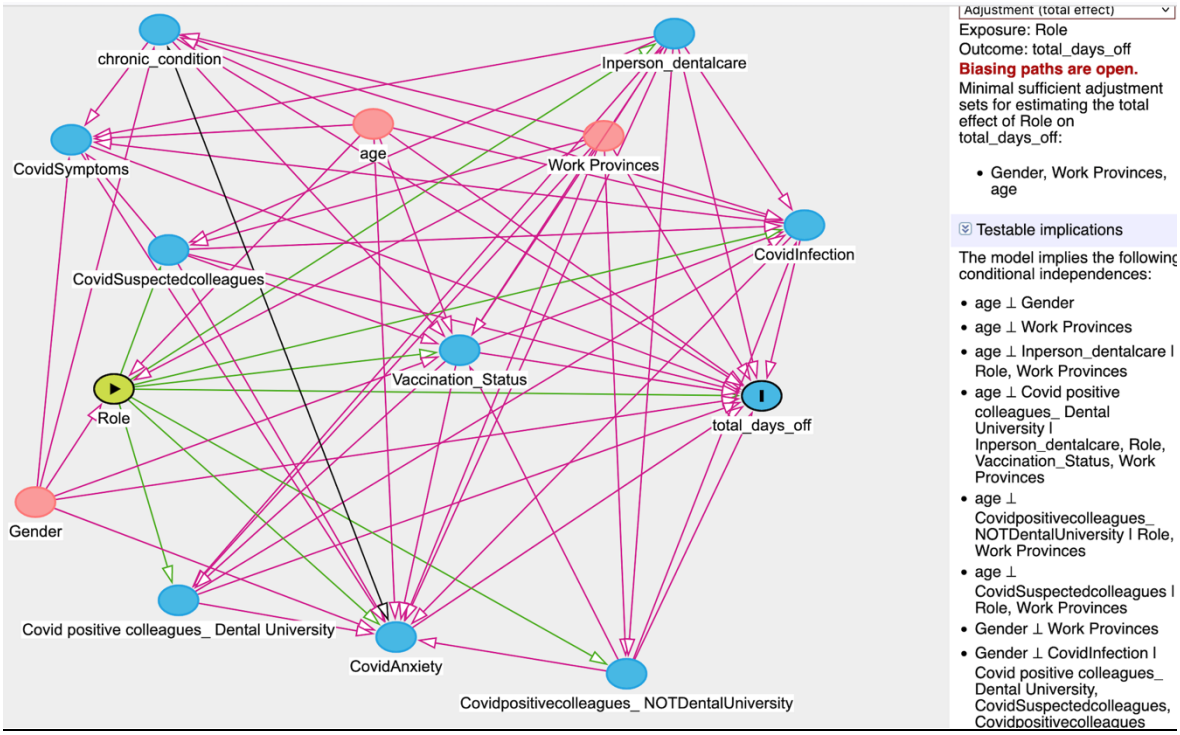


Non-biasing paths (No adjustment required).

Biasing paths (Adjustment required).

Direct causal relationship.

Directed acyclic graph presenting the associations between the role and the crude effect on days off work

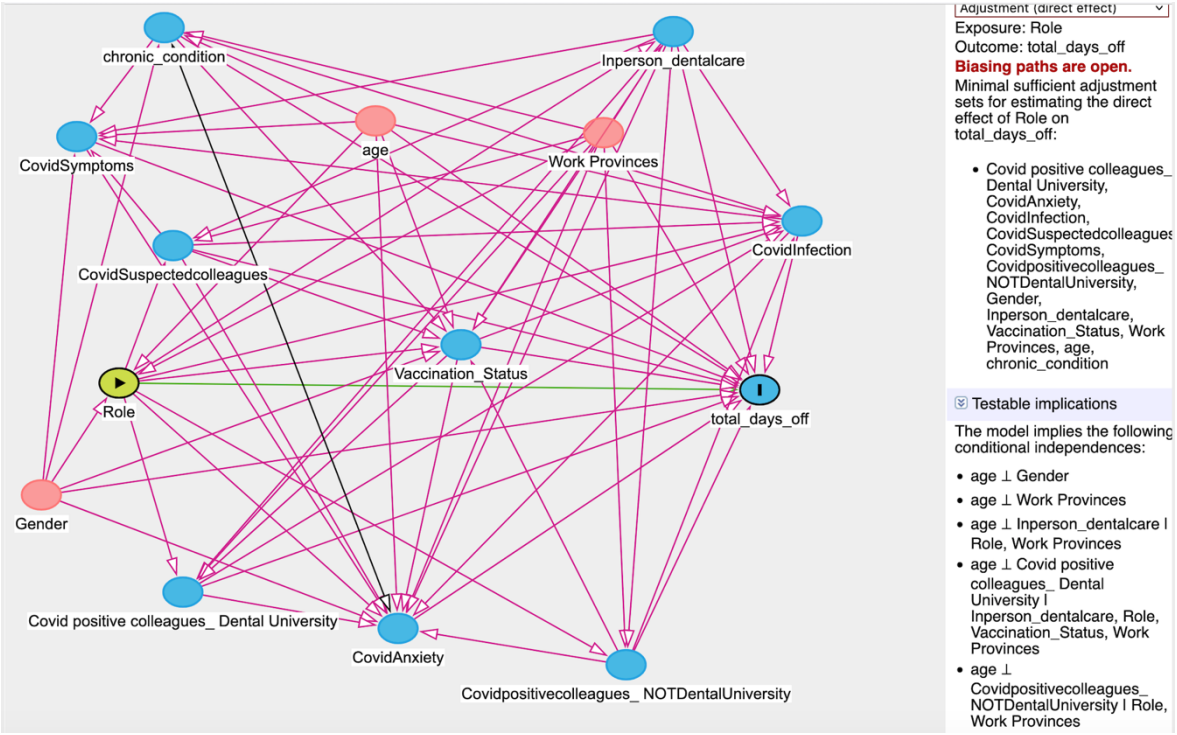


Non-biasing paths (No adjustment required).

Biasing paths (Adjustment required).

Crude causal relationship

Directed acyclic graph presenting the associations between the role and the direct effect on days off work



Non-biasing paths (No adjustment required).

Biasing paths (Adjustment required).

Direct causal relationship.