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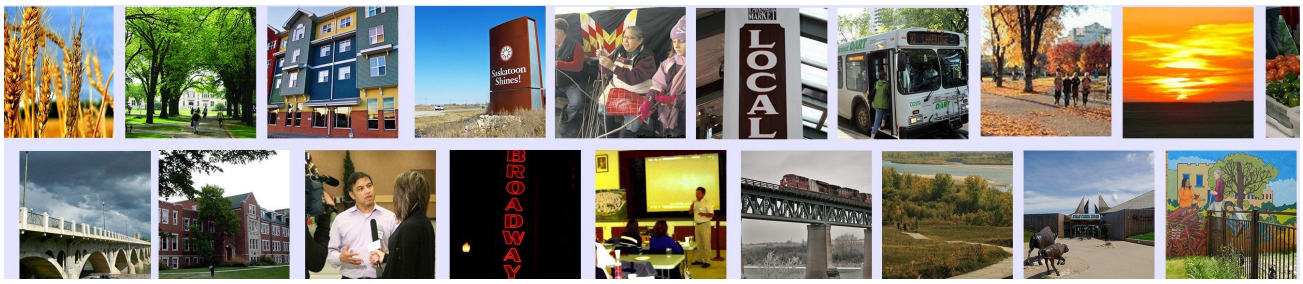
Exploring the Associations between Poverty, Poor Oral Health, and Quality of Life in Saskatoon

Justin Lind, Keith Da Silva, Michael Kowalchuk,
and Isobel M. Findlay



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EXECUTIVE SUMMARY

In the 2018-2019 academic year, Doctor of Dental Surgery (DDS) students from the University of Saskatchewan's College of Dentistry, organized DIRECT Dental, a free student-run dental clinic under the supervision of volunteer dentists from Saskatoon. The DIRECT Dental clinic, which stands for Dental Initiative Rendering Emergency Care Treatment, situated in the College's Saskatoon West Dental Clinic, provided free dental care to individuals in need over the course of 10 weekends throughout the year. Over 183 volunteers participated in the program (students, dentists, faculty, and staff) that provided approximately $50,000 of free treatment to over 200 individuals who normally would not be able to receive treatment because of cost. Through this initiative, the students were able to demonstrate a local need within the city of Saskatoon to address dental care, particularly for individuals who are experiencing homelessness or living in poverty. High demand and continued volunteer support have ensured that the clinic is continuing its operations.

Disparities in oral health

Oral health is integral to overall health and well-being, allowing individuals to function at their full capacity and to have a better quality of life. Oral diseases affect routine functions such as the ability to eat and speak, psychological and social well-being, and interpersonal relations. In addition, poor oral health can result in poor nutrition, reduced self-esteem, social isolation, and may affect employability. Most Canadian adults (80%) generally report positive oral health status; however, vulnerable groups (i.e., low-income families, uninsured, unemployed, and underemployed individuals, Indigenous populations, and individuals experiencing homelessness) with limited access to dental care are at a higher risk for dental problems. Approximately 32% of Canadian residents do not have dental insurance (53% of seniors) and 26% of Canadians are unable to visit the dentist annually, making timely dental care a luxury item that they may not be able to afford. This situation is concerning as the rise in cost of dental care in Canada has been outpacing both inflation and the average salary of the lowest economic groups over the last 25 years. Aside from the impact that chronic disease has on an individual, this will also place additional strain on our health care system where it is estimated that those accessing dental care via hospital emergency rooms is costing Ontario alone over $38 million.

Access to dental care

Timely access to dental care is indeed a challenge in Saskatoon, particularly for individuals who are uninsured, unemployed or underemployed, or living in poverty or experiencing homelessness. Saskatoon residents who qualify for social assistance currently have access to limited dental coverage through the Saskatchewan Supplementary Health Benefits (SSHB) and Family Health Benefits (FHB) programs offered by the Saskatchewan Ministry of Health. Indigenous individuals whose status is recognized may also have dental coverage through the Federal Non-Insured Health Benefits Program (NIHB). However, covered services are often limited to basic and emergency treatment, which is not adequate for maintaining optimum oral health. This situation is particularly problematic when treatment needs are extensive and affecting multiple teeth. For services not covered, individuals must pay out-of-pocket and, in many cases, will forgo treatment because of cost, or pay and sink deeper into poverty. An additional concern is the growing population of individuals who do not meet the minimum income threshold to qualify for social assistance and may be left without any adequate coverage for dental care.

Oral health and quality of life

The available literature suggests that individuals on social assistance who perceive their dental health and appearance to be poor, report a significant negative impact on their self-esteem, social interaction, and employability. Specifically, vulnerable populations directly perceive their oral health as contributing to their overall quality of life. Here, the oral health quality of life can be measured using the Oral Health Impact Profile (OHIP)-14, which is a validated questionnaire that measures people's perception of the social impact of oral disorders on their well-being. Questions in the survey consider limitations across the following domains: functional limitations; physical pain; psychological discomfort; physical disability; psychological disability; social disability; and handicaps. OHIP-14 scores are typically reported as a mean score (minimum 0; maximum 4) and total score (maximum 28), where higher mean and/or total scores are indicative of a lower oral health related quality of life (OHRQofL). Individuals on social assistance feel powerless in taking the first step to reducing the burden of oral disease and admit that it has a large impact on their ability to integrate into society.

Research has shown that improving an individual's oral health status may be associated with an improved sense of self-image; receiving dental treatment may help to restore physical and social function, which is associated with improving self-esteem, confidence, and job procurement. However, it is important to consider that the impact of poor oral health goes beyond the individual; it affects communities. An estimated 2.26 million school days and 4.15 million working days are lost annually in Canada owing to dental visits or dental sick-days. As such, from a political standpoint

and as a matter of social welfare, access to oral health care should be considered an important policy issue that has its place as part of poverty reduction strategies. While the delivery and financing of dental care falls under provincial jurisdiction, progressive City officials who are thinking upstream must look towards finding innovative local solutions to address local problems.

Poverty and oral health

We know that poverty is associated with poor oral health, which in turn reproduces and reinforces poverty. The overall purpose of this research is to examine how improving the oral health of people living in poverty and/or experiencing homelessness in Saskatoon can facilitate their social and professional integration and therefore, ultimately, reduce poverty. The specific research objectives are the following:

a) to assess how individuals living in poverty in Saskatoon perceive and experience their oral health

b) to assess how access to oral health care affects the oral health status, self-esteem, and quality of life for individuals living in poverty in Saskatoon.

Study findings

For this research, we used a cross-sectional survey targeting individuals living in poverty in Saskatoon. Quantitative data were collected using a modified version of the validated OHIP-14 questionnaire which was distributed through the College of Dentistry's (University of Saskatchewan) community-based dental clinics. The OHIP-14 questionnaire is made up of 14 items which explore seven dimensions: functional limitations, physical pain, psychological discomfort, physical disability, social disability, and handicaps. Initial descriptive and comparative analysis of data (means and proportions) is presented here. A total of 189 participants completed the survey (mean age 29.7 ± 1.9). Most participants do not own or rent a home (67.7%), had a total household income less than $25,000 (64.5%), and had not been employed in the last year (68.3%). Less than 8% of participants reported that they had never experienced any form of limitation/disability and/or discomfort across all OHIP-14 domains. The mean and total OHIP-14 scores for the sample population were 2.5 ± 0.6 and 17.6 ± 4.0 respectively. When comparing mean OHIP-14 scores, individuals who had not worked within the last year, and earned less than $25,000 had significantly higher mean and total OHIP-14 scores. Our findings to-date are indicative that both poor oral health and limited access to care have a measurable impact on the quality of life of individuals living in poverty in Saskatoon. While further research is still required, our findings suggest there is an opportunity for policymakers to consider improving access to oral health care as a part of broader poverty reduction strategies.

INTRODUCTION

In the 2018-2019 academic year, Doctor of Dental Surgery (DDS) students from the University of Saskatchewan's College of Dentistry organized DIRECT Dental, a free student-run dental clinic under the supervision of volunteer dentists from Saskatoon. The DIRECT Dental clinic, which stands for Dental Initiative Rendering Emergency Care Treatment, situated in the College's Saskatoon West Dental Clinic, provided free dental care to individuals in need over the course of 10 weekends throughout the year. Over 183 volunteers participated in the program (students, dentists, faculty, and staff) that provided approximately $50,000 of free treatment to over 200 individuals who normally would not be able to receive treatment because of cost. Through this initiative, the students were able to demonstrate a local need within the city of Saskatoon to address dental care, particularly for individuals who are experiencing homelessness or living in poverty. High demand and continued volunteer support have ensured that the clinic is continuing its operations.

Good oral health is an essential component of overall health, allowing individuals to function at their full capacity and to have a better quality of life. Oral diseases affect routine functions such as the ability to eat and speak, psychological and social well-being, and interpersonal relations (Sheiham, 2005). In addition, poor oral health can result in poor nutrition, reduced self-esteem, social isolation, and may affect employability (Locker, 2009; Sheiham, 2005; Singhal et al., 2013; Singhal et al., 2015. Singhal et al., 2016). Most Canadian adults (80%) generally report positive oral health status; however, vulnerable groups (i.e., low-income families, uninsured and/or unemployed and underemployed individuals, Indigenous populations, and individuals experiencing homelessness) with limited access to dental care are at a higher risk for dental problems (Canada Academy of Health Sciences, 2014; Health Canada, 2010). Approximately 32% of Canadian residents do not have dental insurance, making timely dental care a luxury item that they may not be able to afford (Canada Academy of Health Sciences, 2014).

Residents of the city of Saskatoon who qualify for social assistance currently have access to limited dental coverage through the Saskatchewan Supplementary Health Benefits (SSHB) and Family Health Benefits (FHB) programs offered by the Saskatchewan Ministry of Health. Indigenous individuals whose status is recognized may also have dental coverage through the

Federal Non-Insured Health Benefits Program (NIHB). However, covered services are often limited to basic and emergency treatment, which is not adequate for maintaining optimum oral health. This situation is particularly problematic when treatment needs are extensive and affecting multiple teeth. For services not covered, individuals must pay out-of-pocket and, in many cases, will forgo treatment because of cost or pay and sink deeper into poverty (Canada Academy of Health Sciences, 2014). An additional concern is the growing population of individuals who do not meet the minimum income threshold to qualify for social assistance and may be left without any adequate coverage for dental care.

The available literature suggests that individuals on social assistance who perceive their dental health and appearance to be poor report a significant negative impact on their self-esteem, social interaction, and employability (Locker, 2009; Singhal et al., 2013; Singhal et al., 2015). Specifically, vulnerable populations directly perceive their oral health as contributing to their overall quality of life. Here, the oral health quality of life can be measured using the Oral Health Impact Profile (OHIP), which considers limitations across the following domains: functional limitations; physical pain; psychological discomfort; physical disability; psychological disability; social disability; and handicaps (Slade, 1994). Generally, individuals with a higher OHIP score have a lower oral health related quality of life (OHRQofL). Individuals on social assistance feel powerless in taking the first step to reducing the burden of oral disease and admit that it has a large impact on their ability to integrate into society (Slade, 1994).

Research has shown that improving an individual's oral health status may be associated with an improved sense of self-image (Herkrath et al., 2019; Sanders & Spencer, 2005). There is also evidence to demonstrate that receiving dental treatment may help to restore physical and social function, which is associated with improving self-esteem, confidence, and job procurement (Sheiham, 2005; Singhal et al., 2013). However, it is important to consider that the impact of poor oral health goes beyond the individual; it affects communities. An estimated 2.26 million school days and 4.15 million working days are lost annually owing to dental visits or dental sick-days (Canada Academy of Health Sciences, 2014). As such, from a political standpoint and as a matter of social welfare, access to oral health care should be considered an important policy issue and has its place as part of poverty reduction strategies. An individual's dental appearance can weaken their self-esteem, which in turn can affect their ability to be socially and professionally active. In brief, research demonstrates that poverty influences poor oral health, which in turn reproduces and reinforces poverty. While the delivery and financing of dental care falls under provincial jurisdiction, progressive City officials who are thinking upstream must look towards finding innovative local solutions to address local problems.

Report Purpose

Against this background, then, the overall purpose of this research is to examine how improving the oral health of people living in poverty and/or experiencing homelessness in Saskatoon can facilitate their social and professional integration and, ultimately, reduce poverty.

The following are the specific objectives of this study:

1. To assess how individuals living in poverty in Saskatoon perceive and experience their oral health
2. To assess how access to dental treatment affects the quality of oral health, self-esteem, and quality of life for individuals living in poverty in Saskatoon.

LITERATURE REVIEW

Health care in Canada is largely decentralized in terms of the organization, financing, and delivery of care. Each province/territory is responsible for administering its own tax-funded and universal plan as outlined in the *Canada Health Act, 1984*. In return for funding from the federal government, each provincial/territorial plan must meet these criteria: a) universal; b) comprehensive; c) portable; d) accessible; and e) publicly administered (Marchildon, 2013). The plan must provide coverage for all medically necessary hospital, diagnostic, and physician services, which must be free at the point of service. Except for select hospital dental-surgical treatments, provisions for dental care were not included in this legislation. While health care for most Canadians is the responsibility of the provincial/territorial governments, there are a few notable exceptions—including status Indigenous peoples, the Canadian Armed Forces, veterans, inmates in federal penitentiaries, and eligible refugee claimants who are covered by the federal plans.

Similar to the organization of medical care, dental care is also decentralized where each province/territory has the discretion to regulate its oral health care system (including financing and delivery) as it sees fit. Although there is no legislative requirement for the provinces/territories to fund dental care, the majority tend to have safety net plans for targeted populations. This planning generally includes children, social assistance recipients, individuals with disabilities, and seniors (Shaw & Farmer, 2015).

Canadian oral health care is principally financed and delivered via the private sector. In 2018, nearly $17 billion was spent on dental care, 94% of which came from private funding (CIHI, 2018). The main types of private financing were through either employment-based insurance (62%) or direct out-of-pocket payments (32%) (CIHI, 2018). Only 6% of payments was attributed to public programs (40% of these public funds come from federal programs). This financing contrasts with medical care where 75% of care is paid through public funds and 25% private (which includes payments related to prescription medications, vision, physical therapy, and other such services). Of note, 98% of all physician payments were publicly funded (CIHI, 2018; Marchildon, 2013).

Disparities in oral health

While most Canadians (84%) rated their oral health as good to excellent, there are some concerning findings from the last national survey on oral health (Health Canada, 2010). For example, 32% of Canadians are uninsured (53% of seniors), 26% of Canadians are unable to visit the dentists annually, 12% of Canadians avoid food owing to pain, and 16% avoid dental care owing to cost (Health Canada, 2010). A report from the Canadian Academy of Health Sciences identified how the private model of oral health care creates many barriers and leaves vulnerable Canadians at risk for poor oral health and all the associated detrimental outcomes (Canada Academy of Health Sciences, 2014). These vulnerable groups include low-income families, uninsured, seniors, Indigenous peoples, individuals with disabilities, and those living in rural and remote communities (Canada Academy of Health Sciences, 2014). Several studies have now confirmed that income and insurance coverage are significant risk indicators for poor oral health (Locker et al., 2011; Muirhead et al., 2009), and that the problem is now expanding from the low to middle income groups (Ramraj et al., 2013). Additionally, income and insurance coverage have also been correlated with poor oral health across the lifespan, with seniors at the age of retirement being particularly severely affected (Canada Academy of Health Sciences, 2014; Moeller & Quiñonez, 2016). This situation is concerning as the rise in the cost of dental care in Canada has been outpacing both inflation and the average salary of the lowest economic groups over the last 25 years (Ramraj et al, 2014). These findings suggest that the disparities may get progressively worse over time. Essentially, this comes down to the fact that our oral health care system privileges the insured and/or the wealthy, so that those who cannot afford care suffer the most.

Oral health is an integral component of overall health (Marmot, 2005; Petersen et al., 2005). Links between poor oral health and cardiovascular disease, diabetes, obesity, pre-term birth weight, and respiratory disease have been well established (Petersen et al., 2005). Dental-related pain and poor oral health may manifest in several ways; one such example is that the lower income groups have a 3.3 times higher rate of experiencing an inability to chew (Public Health Agency of Canada, 2018). Aside from the impact that chronic disease has on an individual, this will also place additional strain on our health care system. For example, in Ontario, many adults will visit emergency rooms (ER) and/or physicians' offices to treat their dental pain. In 2014, Ontario hospital ERs had almost 61,000 visits for dental-related problems costing the government (i.e., taxpayers) over $38 million (AOHC, 2014). These are not treatment visits, but rather temporary care in the form of prescriptions for antibiotics and pain medications that exacerbate two other emerging public health problems (antibiotic resistance and the opioid crisis). From a societal perspective, we must also consider that poor oral health and subsequent dental visits have resulted in approximately 40.36 million hours per year lost from work, school, or normal activities (Health Canada, 2010).

Access to dental care

Many access to care barriers exists, which are classified according to the availability, accessibility, accommodation, affordability, and acceptability of care (Penchansky & Thomas, 1981). Albeit, all barriers play a very important role in proper access to oral care, we will focus on affordability as it is especially important given that dental care falls outside Canada's universal health care system. Previous research has demonstrated that 26% of Canadians believe that dental care is cost prohibitive (Quiñonez & Locker, 2007). In fact, theoretical grounds have been described to explain inequalities within oral health. At the core of these theories, access to care was a recurring theme (Sanders & Spencer, 2005; Sisson, 2007). Dental coverage for vulnerable populations does exist, but they are not sufficient to cover the full spectrum of needs (i.e., Saskatchewan Supplementary Health Benefits (SSHB), Family Health Benefits (FHB), Non-Insured Health Benefits Program (NIHB)). These often cover only basic and emergency care which does not meet the criteria to support good oral health. Only 19% of the low-income population have adequate coverage, compared to 80.5% of the individuals in high income groups who do (Locker et al., 2011). Approximately 32% of the overall Canadian population is still uninsured (Canada Academy of Health Sciences, 2014); thus, the ones without insurance that must pay out of their own pocket are often faced with a difficult decision to ration dental care with other household expenditures. As access to care barriers grow, people suffer from a larger impact on quality of life than others (Bastos et al., 2019).

Poverty and its impact on oral health

As of April 2018, 475 adults including 11 children were experiencing homelessness in Saskatoon (Findlay et al., 2018). While there is limited information regarding poverty and oral health in Saskatoon, a qualitative study in Montreal demonstrated that people living on social assistance are aware of their declining oral health status (Bedos et al., 2009). Moreover, previous research has also shown that older individuals experiencing homelessness present with more dental decay and pain when compared to their more affluent peers (Freitas et al., 2019). Lastly, a recent study examining adults under the age of 30 revealed that only 38% of that population experiencing poverty have seen the dentist in the last year, compared to 61% of those who were financially stable (Peres et al., 2011). This indicates that poverty is associated with barriers to accessing dental care and may be a risk factor for poor oral health related outcomes.

Individuals living in poverty may be trapped in a vicious cycle where oral health's association with quality of life, employment, and self-esteem negatively impact one another in a proportional way. For example, an individual who cannot afford to take care of their oral health and manage their oral pain might have an impaired ability to work and will eventually need to take time off (if

employed) to deal with the pain. This reality will have a negative effect on their ability to earn, as well as decreasing the net pool of funds available to spend on other essential goods and services. Poor oral health not only effects employment, but underemployment is also a larger contributor to poverty (Poulton et al., 2002). The worse an individual's oral health gets, the deeper into poverty they may fall.

Oral health and quality of life

Previous studies have demonstrated that individuals who require social assistance perceive a negative impact of poor oral health on employability, self-esteem, and quality of life (Locker, 2009; Singhal et al., 2016). It is also apparent that accessing dental care and completing treatment could potentially improve perceptions of self-esteem and quality of life, which in turn has the potential to improve self-confidence and employment prospects (Singhal et al., 2016). Vulnerable groups have been shown to experience poorer oral health than privileged populations (Patel et al., 2018). In one study, it was demonstrated that children who need orthodontic treatment showed a lower score of both self-esteem and oral health related quality of life (OHRQofL) (Herkrath et al., 2019). Moreover, poor oral health can be linked to poor quality of life, as individuals with a higher Oral Health Impact Profile (OHIP) often have worse clinical oral health outcomes and lower OHRQofL. The same goes for individuals who come from a lower socioeconomic group (Slade, 1994). Individuals on social assistance feel powerless in taking the first step to a healthy oral cavity and admit that it has a large impact on their oral health and prevents them from integrating into society (Moeller & Quiñonez, 2016).

It could be argued that improving the oral health outcomes could help integrate unemployed individuals into the workforce. Not only does having poor oral health affect one's ability to go to one's job and adequately perform (Freitas et al., 2019; Hall et al., 2013), but it may also affect one's ability to secure employment (American Dental Association, 2016; Poulton et al., 2002). Oral health may also impede employment as some individuals have difficulty completing tasks at work owing to dental problems (Bedos et al., 2009). Increasing workplace productivity is linked to earnings for working individuals, although it's been shown that people with poor oral health generally earn less when employed (Glied & Neidell, 2010). For the City of Saskatoon, it is important to increase the productivity at all levels of social stratification for both personal satisfaction and the betterment of the growing city.

METHODS

This research protocol was approved by the University of Saskatchewan Behavioural Research Ethics Board (REB ID # 2592). A cross-sectional cohort study design with survey (Appendix A and B) methodology was used for this research. Our target population included a minimum sample of 150 adults who had previously received free dental treatment at the College of Dentistry, University of Saskatchewan, Saskatoon West Dental Clinic (SWDC). Given the location of the dental clinic and the availability of discounted and/or free services, the sample population included individuals who have experienced high levels of material and social deprivation. The participants were recruited through posters (Appendix C) placed at the Saskatoon West Dental Clinic, the College of Dentistry between May and September 2021. Contact information was included on the posters so that interested participants could reach out for further information on how to access the survey link. Consent forms (Appendix A) were also provided as well as withdrawal procedures in the event any participant wished to withdraw their data from the study.

This study included collaboration with the Saskatoon community in an action-based research approach. It is based on a formative approach with the community to enable a connection and understanding to help build trust prior to any intervention. The methodology chosen is beneficial as we can use a culturally sensitive approach to obtain accurate self perceived data from our sample population. Owing to limitations associated with the COVID-19 pandemic, we were prevented from using any in-person focus groups to analyze the downstream effects of dental care on the patients' self-perceived oral health related quality of life. Nevertheless, with the use of a previously validated questionnaire, we are confident that the survey questions and the data obtained show us correlations in the sample population. The analysis of these data allows interpretation of participant perception of quality of life, employment, and self esteem prior to receiving dental care.

Quantitative data were collected using a modified version of the validated OHIP-14 questionnaire (Slade, 1994). The OHIP-14 questionnaire is made up of 14 items which explore seven dimensions: functional limitation, physical pain, psychological discomfort, physical disability, social disability, and handicap. Participants were asked to evaluate on a 5-point Likert scale (0=never, 1=rarely, 2=sometimes, 3=usually and 4=always) how frequently during the last year

they had experienced any of the problems described. Additional questions to capture demographics and socioeconomic status indicators, along with variables that address oral health status and oral health care utilization, were added and the full questionnaire was pilot tested prior to distribution (Appendix B). This customized version of the OHIP-14 survey focuses on research questions that rely on multi-level, cultural, and validated perspectives. Using SPSS software initial descriptive and comparative analysis of our raw data was completed. Survey responses are presented as proportions and means with standard deviations as appropriate. Mean (minimum 0; maximum 4) and total (maximum 28) OHIP-14 scores were also calculated and compared across different demographic variables. All evaluations of statistical significance were based on two- sided tests at the 5 percent level.

Informed consent was obtained along with the distribution of the survey ensuring no survey was submitted until the consent form was read and understood. If participants wished to remove their information from the research project, they were able to do so prior to data submission. Participants were assured that their data were anonymous, would be held securely, and their confidentiality would be maintained.

FINDINGS

A total of 189 individuals participated in this study. The summary of demographic characteristics of our sample population is presented in Table 1. The mean age of participants was 29.7 ± 1.9 years old, and the majority were male (60.3%). Most individuals did not own or rent a home (67.7%), had a total household income less than $25,000 (64.5%), and had not been employed in the last year (68.3%). All participants were either uninsured (46.1%) or had access to some form of public insurance (53.9%).

A summary of oral health care utilization and oral health status is presented in Table 2. Almost two-thirds of participants (63.4%) rated their oral health as fair/poor and 32.3% had experienced pain within the last month. Most patients (68.2%) also had not visited a dentist within the last year with 44.4% believing that they had undertreated dental conditions that required attention. Cost was most frequently cited (79.9%) as a barrier to accessing care, with other cited barriers including transportation (26.0%), geographic location (15.8%), and issues related to cultural background (14.8%).

The proportion of participant responses to questions related to OHRQoL and a comparison of mean OHIP-14 scores are presented in Table 3 and Table 4 respectively. From Table 3 it becomes apparent that from the whole sample, less than 8% of participants reported that they had never experienced any form of limitation/disability and/or discomfort across all OHIP-14 domains. The mean and total OHIP-14 scores for the sample population were 2.5 ± 0.6 and 17.6 ± 4.0 respectively. Analyzing the table across the domain variables left to right we can acknowledge some statistically significant changes in the OHIP scores when viewed in various demographic variables. When comparing mean OHIP-14 scores, individuals who had not worked within the last year and earned less than $25,000 had significantly higher mean and total OHIP-14 scores. OHIP scores were lowest (1.7 ± 0.8) for the domain of functional limitation for participants who made $50,000 – $74,999 compared to other income groups. For the domains of physical pain, psychological discomfort, and psychological disability, individuals who were not employed (2.8 ± 0.9, 2.9 ± 0.6, 2.9 ± 0.9) or were in the lowest income category (3.0 ± 0.8, 2.8 ± 0.7, 3.0 ± 1.0) had significantly higher mean scores. Individuals who were not employed and did not have a dental visit in the past year had significantly higher scores in the physical disability (2.7 ± 0.8, 2.6 ± 0.6) domain as well as their mean OHIP scores.

Only the participants who did not have any dental insurance had a significantly higher mean score (2.5 ± 0.8) compared to those who were insured when looking at the social disability domain. Lastly, in the handicap domain, individuals who were not employed in the last year (2.7 ± 0.8), or those who were uninsured (2.6 ± 0.8) also had significantly higher mean scores.

Table 1: Sample population demographic characteristics, mean ± SD or %	
Total Sample (n)	**324**
Age	29.7 ± 1.9
Gender	
Male	60.3
Female	35.9
Non-binary	3.8
Rent or own a home currently	
Yes	32.3
No	67.7
In which type of housing do you currently live	
Apartment	30.1
Condominium	5.3
Townhouse	6.2
Duplex	2.3
Mobile home	9.2
Single family home	15.2
Shelter	20.3
Hotel/Motel	11.4
Dependents under the age of 18	
Yes	19.1
No	80.9
Average household Income (CAD$)	
Less than 24,999	64.5
25,000 – 49,999	33.8
50,000 – 74,999	1.7
Income used towards essentials (housing/food/bills) (%)	86.32 ± 6.94
Worked in past 12 months	
Yes	31.7
No	68.3
Has dental insurance plan	
Yes	53.9
No	46.1
If yes what kind	
Government sponsored plan	100

Table 1: Sample population demographic characteristics, mean ± SD or %	
Total Sample (n)	**324**
Relationship status	
Married	39.2
Divorced	15.8
Separated	6.4
Single never married	38.6

Table 2: Self-reported utilization, oral health status, and perceived barriers, % (n)	
Have you experienced dental pain in the past month?	
No	67.7
Yes	32.3
Do you think you have any untreated dental conditions?	
Yes	44.4
No	36.5
I don't know	19.1
Had a dental visit in the past 12 months	
Yes	31.8
No	68.2
When was your last dental visit?	
0 to 6 months	14.8
7 months to 1 year	17.0
> 1 year	68.2
How do you perceive your oral health?	
Poor	26.9
Fair	36.5
Good	22.2
Very Good	12.7
Excellent	1.7
How do you perceive your oral health related quality of life?	
Poor	16.4
Somewhat Poor	20.1
Average	41.3
Good	15.9
Very Good	6.3
Perceived barriers to dental care (% yes response)	
Cost	79.9
Transportation	26.0
Cultural background/values	14.8
Geographic location	15.8

Table 3: Self-reported perceptions on oral health related quality of life, %					
OHIP-14 domain and question	**Always**	**Usually**	**Sometimes**	**Rarely**	**Never**
Functional limitation					
Difficulty pronouncing words	25.0	15.4	31.7	20.2	7.7
Sense of taste worsened	27.9	26.0	26.9	13.5	5.8
Physical Pain					
Experienced constant mouth pain	27.9	26.9	23.1	16.3	2.9
Uncomfortable to eat	30.8	26.9	24.0	12.5	7.7
Physical disability					
Diet unsatisfactory due to teeth	29.8	27.9	25.0	14.4	2.9
Interrupt meals due to teeth	25.0	16.3	30.8	20.2	7.7
Psychological disability					
Difficult to relax	27.9	26.9	23.1	16.3	5.8
Felt embarrassed	27.7	26.7	23.5	16.3	5.8
Social disability					
Irritable with others	29.8	26.9	25.0	12.5	5.8
Difficulty doing usual jobs	25.2	16.3	30.6	20.2	7.7
Handicap					
Life in general is less satisfying	30.8	27.9	24.0	14.5	2.9
Totally unable to function	26.0	15.4	30.8	20.2	7.7
Additional questions					
Uncomfortable about appearance	27.9	26.9	23.1	16.3	5.8
Worried by dental problems	29.8	28.8	25.0	13.5	2.9
Been upset because of dental problems	29.8	27.9	24.0	12.5	5.8
Depressed due to dental problems	29.8	27.9	26.0	13.5	2.9
Felt ashamed due to appearance	27.9	26.9	23.1	16.3	5.8
Avoided going out in public	27.9	26.9	23.1	16.3	5.8
Financial loss due to dental problems	28.8	27.9	25.0	12.5	5.8
Unable to work to best ability	26.0	15.0	30.8	20.2	7.7
Employment less attainable	26.0	15.4	30.8	20.2	7.7
Improved employment with dental care	30.8	27.9	25.0	13.5	2.9
Improved oral health increasing quality of life	29.8	28.8	25.0	13.5	2.9
Felt judged based on oral health status	27.9	26.9	23.1	16.3	5.8

*OHIP – oral health impact profile

Table 4: Comparison of mean OHIP scores across different demographic variables, %

	Functional limitation	Physical pain	Psychological discomfort	Physical disability	Psychological disability	Social disability	Handicap	Mean OHIP	Total OHIP
Total Sample	2.4 ± 0.9	2.6 ± 0.9	2.6 ± 0.7	2.5 ± 0.8	2.6 ± 1.9	2.5 ± 0.7	2.5 ± 0.9	2.5 ± 0.6	17.6 ± 4.0
Employed within the last year †									
Yes	2.3 ± 0.9	2.5 ± 0.9	2.4 ± 0.6	2.3 ± 0.9	2.4 ± 1.0	2.4 ± 0.7	2.3 ± 0.9	2.4 ± 0.6	17.1 ± 4.0
No	2.5 ± 0.8	2.8 ± 0.9*	2.9 ± 0.6*	2.7 ± 0.8*	2.9 ± 0.9*	2.6 ± 0.8	2.7 ± 0.8*	2.7 ± 0.5*	18.9 ± 3.8*
Household income ‡									
<24,999	2.5 ± 0.9	3.0 ± 0.8*	2.8 ± 0.7*	2.5 ± 0.8	3.0 ± 1.0*	2.5 ± 0.8	2.4 ± 0.8	2.8 ± 0.6*	18.6 ± 4.1*
25,000 – 49,999	2.4 ± 0.9	2.5 ± 0.9	2.5 ± 0.5	2.4 ± 0.9	2.6 ± 0.9	2.6 ± 0.8	2.4 ± 0.8	2.6 ± 0.9	17.2 ± 3.9
50,000 – 74,999	1.7 ± 0.8*	2.6 ± 0.7	2.6 ± 0.6	2.5 ± 0.9	2.5 ± 0.8	2.4 ± 0.9	2.5 ± 0.7	2.5 ± 0.8	17.1 ± 3.8
Own or rent home †									
Yes	2.4 ± 0.9	2.5 ± 0.9	2.5 ± 0.7	2.4 ± 0.8	2.4 ± 0.9	2.5 ± 0.9	2.4 ± 0.7	2.4 ± 0.9	17.2 ± 4.5
No	2.4 ± 0.8	2.6 ± 0.9	2.6 ± 0.7	2.5 ± 0.9	2.7 ± 1.1	2.4 ± 0.7	2.5 ± 0.7	2.6 ± 0.8	17.9 ± 3.7
Dental insurance †									
Yes	2.4 ± 0.8	2.5 ± 0.9	2.6 ± 0.6	2.3 ± 0.9	2.5 ± 0.9	2.3 ± 0.6	2.3 ± 0.9	2.5 ± 0.5	17.2 ± 3.6
No	2.5 ± 0.8	2.6 ± 0.9	2.6 ± 0.7	2.5 ± 0.8	2.6 ± 1.0	2.5 ± 0.8*	2.6 ± 0.8*	2.6 ± 0.6	18.0 ± 4.3
Dental visit within the last year †									
Yes	2.3 ± 0.7	2.4 ± 0.7	2.5 ± 0.8	2.4 ± 0.5	2.5 ± 0.8	2.3 ± 0.6	2.5 ± 0.9	2.5 ± 0.8	17.5 ± 3.8
No	2.4 ± 0.7	2.6 ± 0.9	2.6 ± 0.7	2.6 ± 0.6*	2.6 ± 0.9	2.5 ± 0.8	2.5 ± 0.8	2.6 ± 0.9	18.1 ± 4.2

† Independent t-test,; ‡ One-way ANOVA, Tukey post-hoc test; * p-value < 0.05

DISCUSSION

In this study we examined how poverty, employment, and access to oral health care can impact an individual's OHRQoL. Our results demonstrate that oral health conditions are impacting the quality of life of individuals living in poverty in Saskatoon (as determined by income, employment status, and living situation). While there are limitations to self-reported survey data, the use of a validated OHIP-14 questionnaire decreases the risk of bias in findings. The target population was accurately represented as most of the respondents who exhibited poor oral health were in a lower income bracket, were unemployed, and perceived cost as a barrier for oral health care. This accurate representation allows us to confidently analyze our data to demonstrate how specific barriers are impeding one's ability to experience a high quality of life across various domains.

The relationship between poor oral health and daily function, self-esteem, employment, and quality of life has been previously explored (Locker, 2009; Sheiham, 2005; Singhal et al., 2013; Singhal et al., 2015; Singhal et al., 2016). We know that oral health disparities in Canada exist for those in lower SES groups, and that these individuals carry a greater burden of oral disease (Millar & Locker, 1999. Slade, 1994). However, when we look for specific correlations between poor oral health, poverty and quality of life, research on the topic is mixed. Our results complement existing research that demonstrates that individuals who require social assistance have worse oral health outcomes and higher overall treatment needs (Bedos et al., 2009; Canadian Academy of Health Sciences, 2014) Additionally, individuals living in poverty were less likely to access oral health care (Canadian Academy of Health Sciences, 2014). Individuals who require social assistance may also perceive their poor oral health as having a negative impact on employability, self esteem, and quality of life (Hall et al., 2013; Herkrath et al., 2019; Sanders & Spencer, 2005). Our sample population experienced many barriers to timely oral health care which results in a further deterioration in their oral health status.

Our data represent an accurate and desirable population for this study. We were able to have a high yield response of individuals who do not own or rent a home, had low household income less than $25,000, were unemployed, and either had no insurance or were insured through a public program. It was important to put this into perspective as there has been a lack of research analyzing groups in the light of these variables. Therefore, we demonstrated a correlation between these

barriers and the high response rate showing poor self-perceived oral health. Other research agreed with our results by demonstrating that poor oral health reflects on a higher OHIP score especially pertaining to those in lower socioeconomic status standing (Slade, 1994). When considering the different domains of oral health related quality of life, we noted that dental pain, dysfunction, social anxiety, self-esteem, comfort, or functional limitation were all associated with low socioeconomic status. This finding indicates that individuals in a lower income bracket were at a higher risk for experiencing barriers to dental care, and thus had a worse oral health related quality of life. It becomes a challenge for these individuals to escape poverty and thrive when their daily functioning is impaired. It is challenging to maintain employment when you need to miss work to manage dental pain, and it is a challenge to pay your bills when you have to pay out of pocket to relieve that pain. It becomes part of a harmful cycle that can cause a household to sink further into poverty.

Improving access to dental care through a wider safety net or more accessible clinics has the potential to interrupt this cycle and allow individuals living in Saskatoon to improve their overall quality of life. In support of this point, other research has acknowledged that poor oral health makes it more challenging for individuals to get a job and then to do a job sufficiently (Hall et al., 2013). Correlating a cause for this poor oral health with barriers discussed in this paper, we find a connection between the cause and the consequences and perhaps can decrease the burden of poor oral health by increasing accessibility or better insurance for this population. Within Saskatoon homelessness and poverty represent a growing epidemic (Kalagnanam et al., 2019), suggesting that these barriers may start affecting more and more people. When individuals are unable to take care of their overall health, including oral health, it creates challenges in their day- to-day living whether it be a matter of physical discomfort or self-esteem. The correlations between poor oral health and socioeconomic status are strong, particularly amongst those living in extreme poverty.

Only 19% of the low-income population have proper coverage to have sufficient dental care (Locker et al., 2011), which leaves a large proportion of this vulnerable population to suffer further from the negative effects of poor oral health. Greater attention to providing accessible dental care would greatly improve the self-esteem and overall well-being of these individuals. With 32% of Canadians remaining uninsured (Canadian Academy of Health Sciences, 2014), paying out-of-pocket for dental care is still a critical challenge, forcing individuals to ration or choose among essentials such as food and shelter and dental care. Without improvements to the social welfare system as it relates to dental care, these challenges will continue to grow and further impact the quality of life. Existing publicly funded dental coverage is not sufficient, and most dentists believe the governments need to take a larger role in public insurance (Quiñonez et al., 2010). Although further analysis is required, there is an opportunity to consider access to oral health care as a part of broader poverty reduction strategies.

CONCLUSION

The main purpose of this research is to assess the perception and experiences of oral health of impoverished populations in Saskatoon. Observing how poverty and oral health are interrelated helps us further understand how both of those factors influence employment, self-esteem, and quality of life. The examination of oral health's relation to social determinants of health from the perception of people living in poverty in Saskatoon can give insight about public strategies designed to reduce both poverty and the access barriers. Helping these individuals get dental care could be a first step out of poverty. Increasing oral health is not just good from the individual's perspective but a good step towards a healthy community too. When we have poor oral health, it makes it challenging to be socially present and professionally active. In short, the research aims to demonstrate why oral health is important and to encourage City officials to adopt an upstream approach to reducing oral health impacts on impoverished populations in Saskatoon.

Our findings are indicative that poor oral health has a measurable impact on the quality of life of individuals living in poverty in Saskatoon. Further research is still required to determine if improving oral health and accessing care has any measurable impact on improving employment prospects and leaving social assistance. However, given how oral health contributes to our overall health and well-being, there is a need to start including access to oral health care as part of policy discussions on how to reduce poverty and improve quality of life.

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APPENDIX A

Consent Form

Research Title: Exploring the Associations between Poverty, Poor Oral Health and Quality of Life in Saskatoon.

Research Funded by: Research Junction (City of Saskatoon – USask)

Principal Researcher: Keith Da Silva DDS, MSc, FRCD (C)

Research Student: Justin Lind BSc, BSc

Research Fund: Research Junction and Pathways Development Grant (City of Saskatoon/ USask)

Project Description:

Oral health is an important aspect of overall health and quality of life. People with poor oral health are affected by oral disease everyday, including difficulty eating, speaking, smiling, and having to manage pain. In Canada, depending on your income, education, status, and level of poverty, there may be many additional different barriers to accessing oral health care. Furthermore, poor oral health may further the cycle of poverty affecting one's ability to get jobs, their self-esteem and overall quality of life. Unfortunately, the research between poor oral health and poverty is still limited. Thus the objective of our work is to assess the links between poverty, poor oral health, and quality of life.

Participant Involvement:

As a participant in this research study, you will be asked to complete a survey that is expected to take no more than 45 minutes of your time. The questionnaire will consist of an online survey. You will be given secure access to the questionnaire via SurveyMonkey®. **Alternatively, if you are unable to access the online survey you can contact the principal researcher (Keith Da Silva, 306-262-1800) who will conduct the survey via telephone and will enter your responses directly to SurveyMonkey® on your behalf.** All responses will be digitally stored for accuracy, and upon completion of the study, a summary of the results will be provided to you.

Risks and discomforts:

Some of the questions could bring up feelings of unease and even distress due to poor oral health or limited money. **Should you experience any distress, you can contact any member of the research team listed below, the Saskatoon Mobile Crisis Intervention at 306-933-6200 or your family physician and/or nearest walk-in clinic.**

Benefits of the research:

There are no direct and immediate benefits associated with the participation of this study. The objectives of this research are to assess the association of poverty's effect on oral health and in turn,

oral health's effects on poverty. The findings may be used to bring awareness and improve public policies that attempt to increase oral health of Saskatoon's residents.

Compensation

Each participant will receive a $25 Amazon Gift Card whether or not they complete the entire survey. At the end of the online survey, you will be redirected to a new page where you can enter an email address where an electronic gift card can be sent. Your e-mail address will not be linked to your survey responses. If you complete the survey via phone, you will be given instructions on how to retrieve your gift card via mail or onsite at the Saskatoon West Dental Clinic.

Voluntary participation and withdrawal:

Your participation is voluntary. You can decide not to participate at any time by closing your browser, or choose not to answer any questions you do not feel comfortable with. Survey responses will remain anonymous. Since the survey is anonymous, once it is submitted it cannot be removed. Your decision to participate or not will not affect your relationship with the researchers or the College of Dentistry, at the University of Saskatchewan, in any way. Nor will it affect your access to dentistry services through the College.

Confidentiality:

The information you provide will be anonymous. All response data, and other documentation will be stored on the secure University of Saskatchewan network for up to 5 years following the date of a final publication. Only authorized individuals will have access to the survey responses, stored in a separate encrypted and password protected personal storage device. The SurveyMonkey® website will be used to administer the questionnaire. SurveyMonkey's security features prevent unauthorized access to your responses.

Questions regarding the research project:

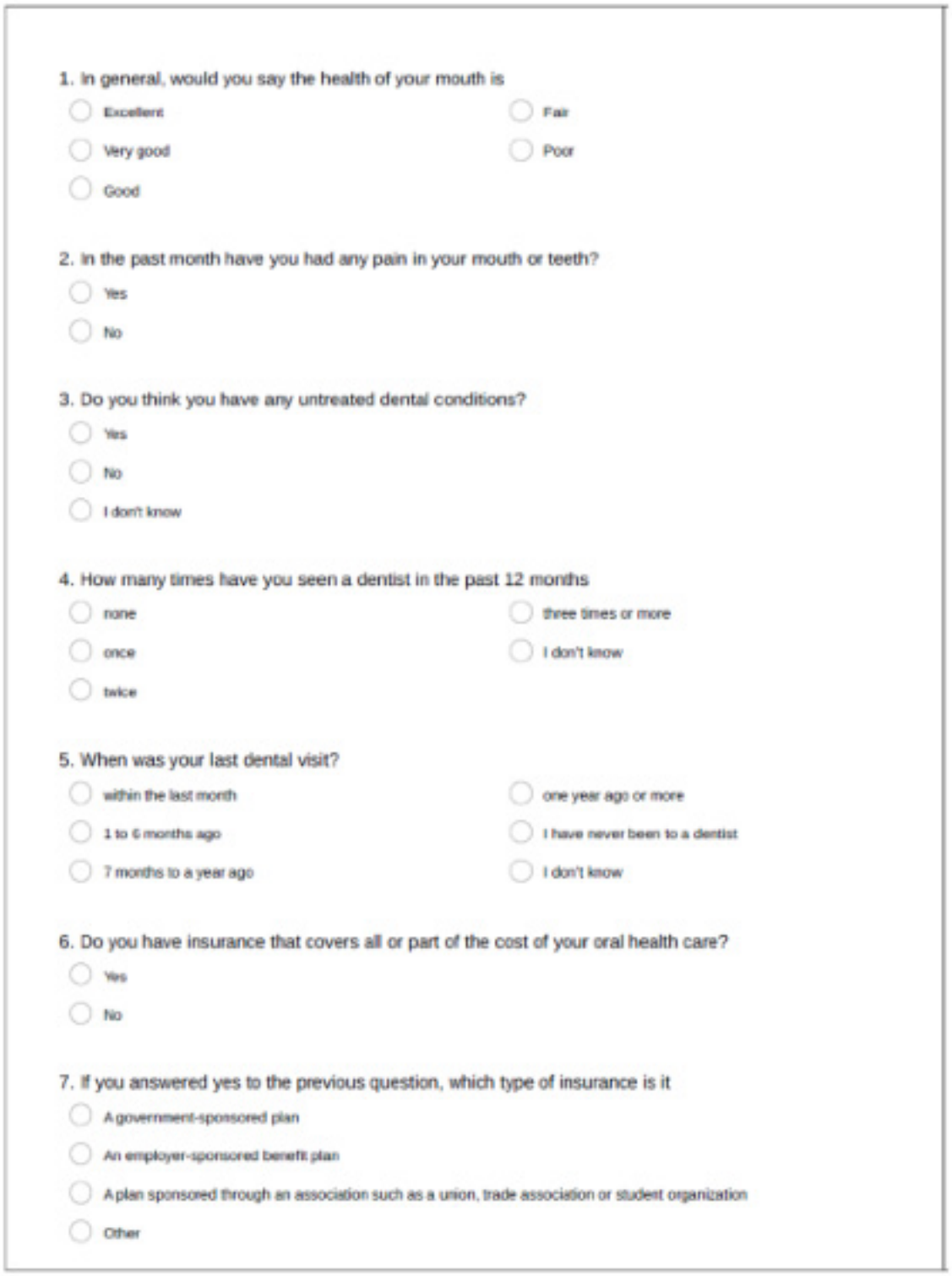
If you have any questions about this research project, please feel free to contact either Keith Da Silva, (Ph: 306-966-5124, ked294@usask.ca, 105 Wiggins Road, Saskatoon SK S7N 534) or Justin Lind (jrl294@usask.ca, 105 Wiggins Road, Saskatoon SK S7N 534)

This research project has been approved on ethical grounds by the University of Saskatchewan Behavioural Research Ethics Board. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office: ethics.office@usask.ca; 306-966-2975; out of town participants may call toll free 1-888-966-2975.

By completing and submitting this questionnaire, **your free and informed consent is implied** and indicates that you understand the above conditions of participation in this study.

APPENDIX B

Questionnaire



1. In general, would you say the health of your mouth is

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

2. In the past month have you had any pain in your mouth or teeth?

- ○ Yes
- ○ No

3. Do you think you have any untreated dental conditions?

- ○ Yes
- ○ No
- ○ I don't know

4. How many times have you seen a dentist in the past 12 months

- ○ none
- ○ once
- ○ twice
- ○ three times or more
- ○ I don't know

5. When was your last dental visit?

- ○ within the last month
- ○ 1 to 6 months ago
- ○ 7 months to a year ago
- ○ one year ago or more
- ○ I have never been to a dentist
- ○ I don't know

6. Do you have insurance that covers all or part of the cost of your oral health care?

- ○ Yes
- ○ No

7. If you answered yes to the previous question, which type of insurance is it

- ○ A government-sponsored plan
- ○ An employer-sponsored benefit plan
- ○ A plan sponsored through an association such as a union, trade association or student organization
- ○ Other

8. Has cost been a barrier for you to receive oral health care

- Yes
- No

9. Has transportation been a barrier for you to receive oral health care

- Yes
- No

10. Do you perceive your culture, background, or social values as being a barrier to receiving oral health care?

- Yes
- No

11. Is the location of dental offices a barrier for you to receive oral health care?

- Yes
- No

12. Have you ever been too self conscious about your oral health to seek oral health care?

- Yes
- No
- Maybe

13. How would you rate your oral health related quality of life?

- Poor
- Somewhat poor
- Average
- good
- very good

14. Have you had trouble pronouncing any words because of problems with your teeth or mouth?

- Always
- Usually
- Sometimes
- Rarely
- Never

15. Have you felt that your sense of taste has worsened because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

16. Have you ever experienced constant pain or aches in your mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

17. Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

18. Have you been self-conscious because of your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

19. Have you felt tense because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

20. Has your diet been unsatisfactory because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

21. Have you had to interrupt meals because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

22. Have you found it difficult to relax because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

23. Have you ever felt embarrassed socially because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

24. Have you ever been irritable with other people because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

25. Have you had difficulty doing your usual job because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

26. Have you felt that life in general was less satisfying because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

27. Have you been totally unable to function because of problems with your teeth or mouth?

- Always
- Rarely
- Usually
- Never
- Sometimes

28. Have you ever felt uncomfortable about the appearance of your teeth, mouth or dentures?

- Always
- Rarely
- Usually
- Never
- Sometimes

29. Have you ever been worried by dental problems?

- Always
- Usually
- Sometimes
- Rarely
- Never

30. Have you been upset because of problems with your teeth, mouth or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

31. Have you felt depressed because of problems with your teeth, mouth or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

32. Have you avoided going out in public because of problems with your teeth, mouth or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

33. Have you suffered any financial loss because of problems with your teeth, mouth or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

34. Have you been unable to work to your full capacity because of problems with your teeth, mouth or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

35. Have you felt that employment is less attainable because of problems with your teeth, mouth, or dentures?

- Always
- Usually
- Sometimes
- Rarely
- Never

36. Have you felt ashamed to smile due to the appearance of your teeth?

- Always
- Usually
- Sometimes
- Rarely
- Never

37. Have you ever thought that better oral health will increase your employment opportunities?

- Always
- Usually
- Sometimes
- Rarely
- Never

38. Have you ever thought that better oral health will increase your quality of life?

- Always
- Usually
- Sometimes
- Rarely
- Never

39. Have you ever thought that people judge you because of your teeth?

- Always
- Usually
- Sometimes
- Rarely
- Never

40. What is your current age (in years)?

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

41. Gender: How do you identify?

- Man
- Non-binary
- Woman
- Prefer to self-describe, below

Self-describe:

42. Which of the following best describes your current relationship status?

- Married
- Widowed
- Divorced
- Separated
- In a domestic partnership or civil union
- Single, but cohabiting with a significant other
- Single, never married

43. Do you have any children under 18?

- Yes
- No

44. What is your approximate average household income?

- $0-$24,999
- $25,000-$49,999
- $50,000-$74,999
- $75,000-$99,999
- $100,000-$124,999
- $125,000-$149,999
- $150,000-$174,999
- $175,000-$199,999
- $200,000 and up

45. Approximately what percentage of your monthly income would you say you spend on your rent, mortgage payment, food, and any other government bills?

0 100

46. Which of the following categories best describes your employment status?

- Employed, working full-time
- Employed, working part-time
- Not employed, looking for work
- Not employed, NOT looking for work
- Retired
- Disabled, not able to work

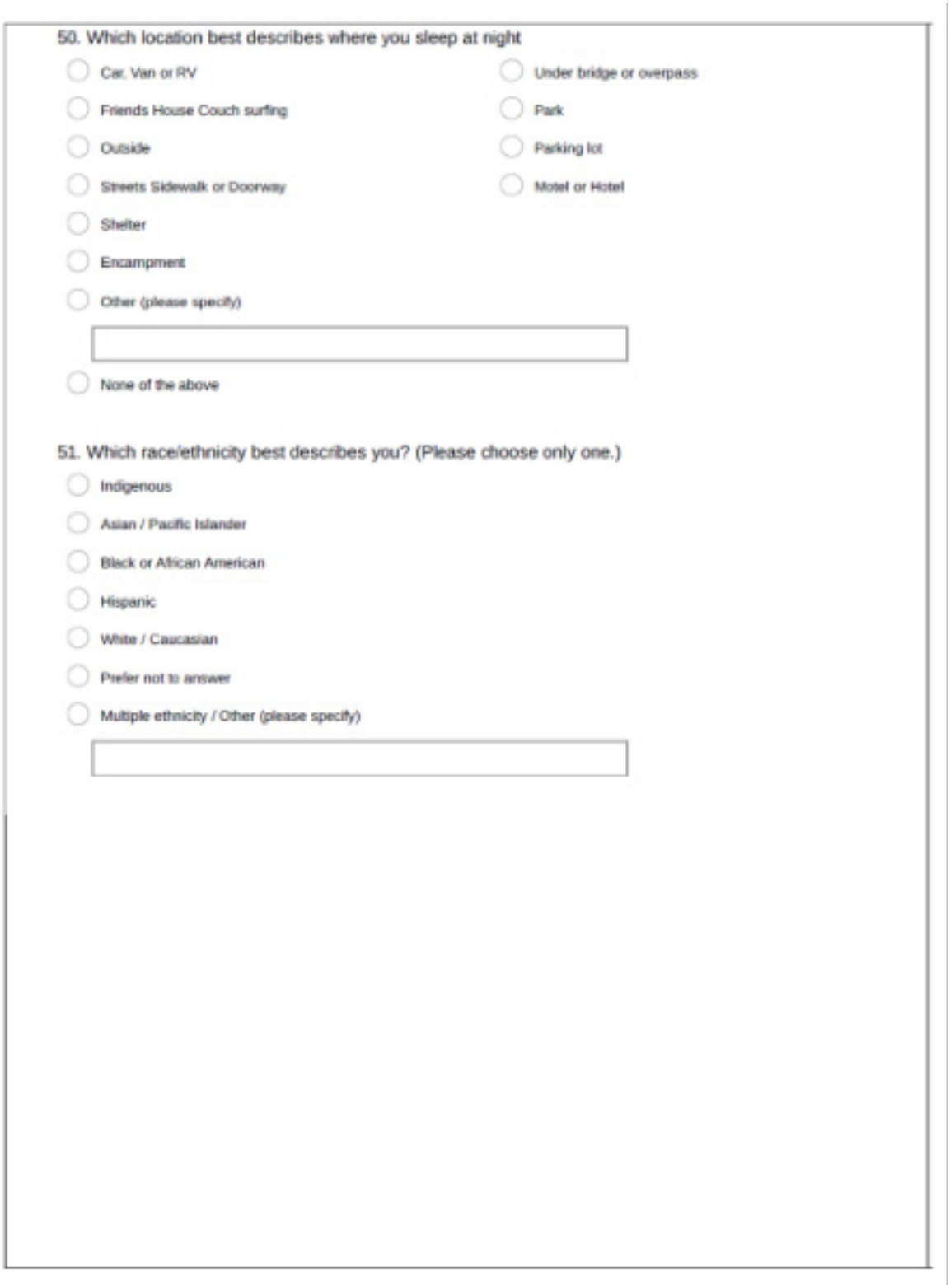
47. What is the highest level of education you have completed?

48. Do you currently own or rent a home or apartment?

- Yes
- No

49. In which type of housing do you currently live?

- Apartment
- Condominium
- Townhouse
- Duplex
- Mobile home
- Single-family home
- Shelter
- Hotel/Motel
- Other (please specify)



50. Which location best describes where you sleep at night

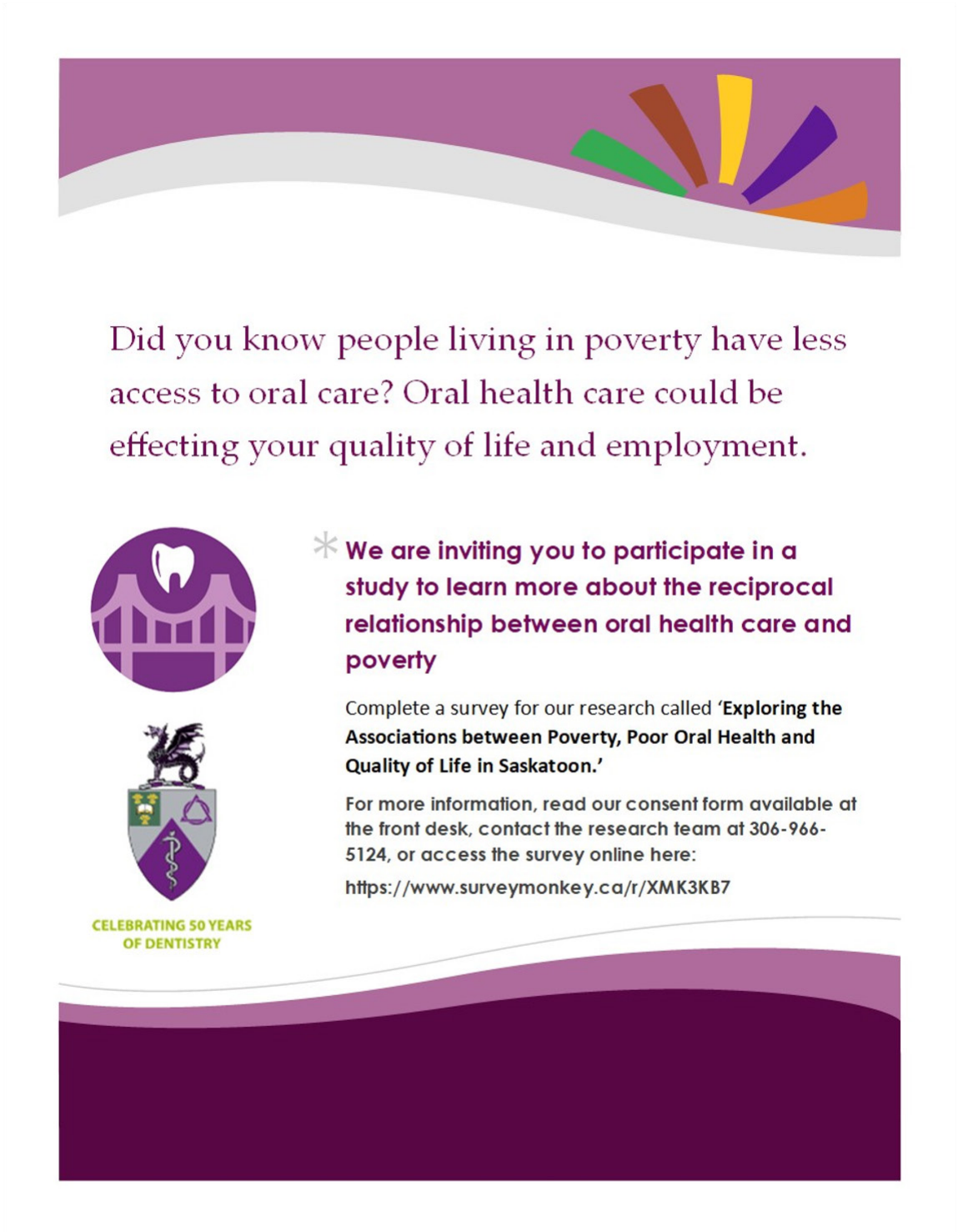
- ○ Car, Van or RV
- ○ Friends House Couch surfing
- ○ Outside
- ○ Streets Sidewalk or Doorway
- ○ Shelter
- ○ Encampment
- ○ Other (please specify)
- ○ None of the above
- ○ Under bridge or overpass
- ○ Park
- ○ Parking lot
- ○ Motel or Hotel

51. Which race/ethnicity best describes you? (Please choose only one.)

- ○ Indigenous
- ○ Asian / Pacific Islander
- ○ Black or African American
- ○ Hispanic
- ○ White / Caucasian
- ○ Prefer not to answer
- ○ Multiple ethnicity / Other (please specify)

APPENDIX C

Recruitment Poster



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