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Date: 8/8/14

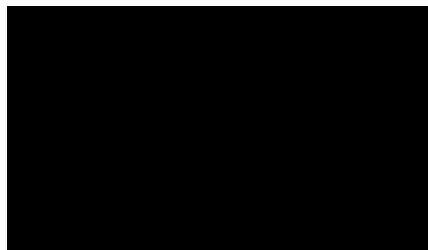
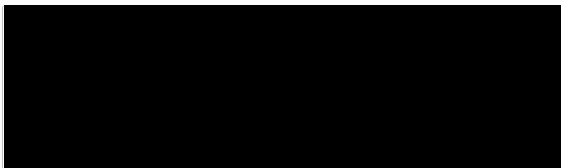
Project Title: Mental and Physical Health Outcomes in Parents of Children with Burn Injuries as Compared to Matched Controls

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SUMMARY: (no more than 250 words single spaced)

Childhood burn injuries are common in the population and may result in many physical and mental health complications for not only the patient, but also their parents. As survival of patients with large burns increases, there is more focus on these patients' recovery. Psychological challenges due to the long term disfigurement and mobility challenges due to the scarring that can occur have the potential to impact the health of parents as well. There is limited literature that examines mental and physical health of parents after their child suffers from a burn injury. This is a population based case matched study linking together information recorded in the Pediatric burn registry at Health Sciences Centre and Children's Hospital with health and social service information in the Population Health Research Data Repository located at the Manitoba Centre for health Policy (MCHP) at the University of Manitoba. Cases were matched 1:5 with controls based on age, sex, and geographical location. ICD codes were used to identify diagnoses of various mental and physical disorders, comparing rates of disease two years prior to and two years following the date of the injury to determine relative rates. 1029 parents of burn-injured offspring and 4923 matched control parents were identified. Findings of this study show that there are increased relative rates of substance use disorder (3.45) and fractures (3.47) in the parents of burn-injured children compared to the relative rates of substance use disorder (2.86) and fractures (2.55) in the matched control parents. These findings have important clinical implications for the care of parents who have a burn-injured child.



ACKNOWLEDGEMENTS:

I gratefully acknowledge the support by one or more of the following sponsors;

- H.T. Thorlakson Foundation
- Dean, Faculty of Medicine
- Manitoba Health Research Council
- Manitoba Institute of Child Health
- Kidney Foundation of Manitoba
- Leukemia and Lymphoma Society of Canada

Other:

- CancerCare Manitoba
- Manitoba Medical Service Foundation
- Associate Dean (Research), Faculty of Medicine
- Heart and Stroke Foundation
- Health Sciences Centre Research Foundation

Mental and Physical Health Outcomes in Parents of Children with Burn Injuries as Compared to Matched Controls

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Background and Introduction

Childhood burn injuries are common in the population and result in many physical and mental health complications for not only the patient, but also their parents. In the United States, in 2013 there were 450,000 burn injuries receiving medical treatment and 40,000 hospitalizations related to burn injury [1,2]. Burn injury was the 6th leading cause of mortality under the age of 19 in the United States in 2009 [2]. Between the years of 1994 and 2003, pediatric burn-related injuries resulted in 10,229 hospitalizations and 494 deaths in Canada [3]. As the survival rate of patients with burns has increased to 96.6% [1], there is more focus on these patients' recovery and psychological challenges due to the long term scarring and disfigurement that can occur. Burn injuries and their treatment are extremely painful, and burn patients of all ages also face functional challenges such as restrictions in range of motion and problems with work and appearance [4]. In addition, body image dissatisfaction is related to prolonged difficulties with mental and physical health-related quality of life in those who have had a burn injury [5]. These challenges often result in mental illness; research has shown increased rates of depression and PTSD in individuals suffering from burn injuries [6–9].

Injuries in children have the potential to have a substantial impact on the health and mental well being of the parents. Following the suicide or motor vehicle collision death of children, parents suffer serious negative mental illness consequences including depression and anxiety, as well as marital break-up [10,11]. However, it is not only offspring death that impacts the mental health of parents; studies have suggested that there is a significant caregiver burden on individuals who are caring for others who have suffered serious non-fatal injuries. This caregiver burden can result in depression, suicide, and social isolation in the caregivers [12].

The long-term consequences and disability following burns place a considerable strain on individuals, their families and health-care facilities [13]. A burn is a unique type of injury in that it requires not only acute care in the form of dressing changes and surgery, but also a commitment to ongoing physical and occupational therapy months after the injury occurs, and has the potential for permanent scarring and disfigurement. Family members play an important role in the long term care and rehabilitation of the burned child and therefore families may lose a wage earner and have financial challenges while caring for their child [14]. Thus the effects of the burn injury extend beyond the child to the parental caregiver.

Existing literature suggests that there are negative consequences to parental mental health following burn injuries of their children. Kent et al found that mothers of children who suffered from a burn injury had higher initial maternal anxiety scores compared to mothers of children who suffered from a fracture or mothers of non-injured children [15]. Interestingly, Kent et al. found that mothers were at a higher risk than children for developing psychological sequelae following a paediatric burn injury [15]. Depression, anxiety and posttraumatic stress disorder have been studied in more depth than other mental disorders. Studies reported levels of depression between 15-44% among parents of burn injured children [16–19]. Existing literature shows that 23-69% of parents experienced anxiety following a burn injury to their child [16,17]. Bakker et al found that although mothers (50%) had higher stress scores than fathers (27%), acute stress reactions in mothers and fathers were correlated with each other [20]. Studies have

also demonstrated that PTSD was prevalent in parents of children who suffered burn injuries [16,19,21–24]. Rivlin et al found that mothers of burned children reported a number of mental health problems such as greater degrees of worry, panic attacks with autonomic symptoms, depressed mood, and hopelessness about the future compared to mothers of children with fractures and controls [25].

The need to care for an injured child can also place a physical strain on parents, and affect their physical health. Dorn et al showed that parents of burn injured adolescents were not only more likely to present with mental health problems in the first 2 years following the incident but also cardiovascular health problems in every year following the injury compared to the baseline [26]. Although health information was extracted from electronic records and therefore included physician generated diagnoses, the cohort of at risk individuals studied by Dorn et al. were adolescents aged 14-20 from one small town who were injured during a single a bar fire. The findings of this study are not generalizable to the standard pediatric population that we examine in our study for a number of reasons; most children do not go to bars, the majority of burns in children under the age of 6 years are due to scald, and in younger children the burden of guilt of failed responsibility for the parent is significant. The cohort used by Dorn et al. is limited to one event in a rural town. We propose to examine the parental caregiver outcomes of childhood burn injuries in the population of Manitoba over two decades.

The current literature demonstrated that having a child that suffered from a burn injury may have a substantial impact on parental mental health. However, there are limitations in existing literature that this study will aim to address. First of all, the existing studies used samples of specific burn populations, whereas this proposed study will be population-based, examining health outcomes of parents for all children admitted with burn injury to the provincial burn centre. The largest sample size in existing literature included 193 families of burn injured children [27], with all other studies ranging from a sample size of 16 [19] to 72 [28]. The present study will include 1029 parents of burn-injured children and 4923 matched controls and will therefore provide more generalizable results than the existing studies. Studies to date have generally used questionnaires or screening tools to evaluate specific mental health concerns. Some commonly used questionnaires include the Hospital Anxiety and Depression Scales [15,28] and the Impact of Events Scale (both original and revised) [16,27,29] which are only able to capture the self-reported symptoms of the particular Axis 1 disorder the questionnaire is designed for. Fukunishi et al used the Structured Clinical interview for DSM-III-R to diagnose depression and posttraumatic stress disorder; however the sample size of this study was 16 and only included mothers of children who suffered from injuries from falling into a bathtub of hot water [19]. The proposed study will expand on current literature by using validated healthcare data that features physician diagnoses of a comprehensive range of health outcomes of parents following a burn injury to their children. Most extant studies are cross-sectional in design, and the few longitudinal studies conducted to date had short follow-up periods. Other than one study which reported post-traumatic stress disorder among 48 mothers 11 years after a child suffered from a burn injury [29], the longest follow up was 6 months for 40 mothers of burn injured children [15]. Existing studies also primarily focussed on maternal mental health rather than the mental health of both parents [15,18,21,24,25]. One study that did include a significant number of fathers (n=154) in addition to mothers (n=182) was primarily focussed on acute stress reactions among couples [27]. Another limitation of existing research is that posttraumatic stress disorder, anxiety and depression have been more thoroughly studied than any of the other health disorders. The proposed study will examine validated mental health disorders of both mothers and fathers two years before and after their child suffered a burn injury and also physical illnesses that might arise. There are also many studies which included primarily young children [15,23,27,28]. The

proposed study will include all offspring of parents who suffered from burn injuries up to 18 years of age and will therefore be more generalizable to the entire pediatric age range.

This study will expose the health consequences of parents having a child with a burn injury. Given the importance of burns, their effects on caregivers, and the significant limitations in existing literature, it is imperative to learn more and address mental health issues that arise in parents of children with burn injuries so their children will be able to recover and heal effectively.

To our knowledge this will be the first population-based study to examine mental health of parents following a burn injury to their child. No previous studies have used population databases (such as those at MCHP) to determine the prevalence of mental disorders and physical illness in parents of survivors of a childhood burn. Using a state of the art dataset, a longitudinal design, and matched parent controls, this study will greatly expand on the current literature to provide a better understanding of this important public health problem.

Methods

I. Data Sources

Approval for this study was obtained from the University of Manitoba's Health Research Ethics Board and Manitoba Health's Health Information Privacy Committee. This was a population level epidemiologic study based on provincial administrative health data. This study linked together information recorded in the Pediatric Burn Registry at Health Sciences Centre and Children's Hospital with health and social service information in the Population Health Research Data Repository located at the Manitoba Centre for Health Policy (MCHP) at the University of Manitoba. The MCHP received de-identified Manitoba Health datasets that were supplemented with a variety of other social services and public use datasets for the purposes of health-related research [30]. This rich population-based repository included hospitalization, emergency department use, ambulatory care and specialist physician visits, comprehensive drug utilization, and Vital Statistics data (a record of births and deaths). Datasets of interest at MCHP included the Manitoba health insurance registry and vital statistics. To the best of our knowledge, the linkage of a burn registry with a population-based registry was unique in Canada and the world.

The health registry was used to specify the parents of the identified children with burn injuries. This methodology was used by our group in previous studies of bereavement and had shown excellent specification of mothers (>95%), whereas fathers were specified at rates of approximately 70% [11]. Individual level data is linked across the Repository datasets by the Personal Health Identification Number (PHIN); this research used scrambled PHINs that prevent identification of individuals and thus maintain anonymity. The registry database also included mental and physical disorder diagnoses generated from both outpatient physician billings and hospital separation abstracts. Vital statistics was used to identify suicide deaths of parents. The validity and accuracy of these datasets was excellent and had been validated in previous studies [31]. The linkage of these databases was shown to have very high accuracy [32–35]. For example, the true error rate of an original linkage of deaths reported by Vital Statistics was less than 1% [32].

II. Study Cohorts

Data from the regional burn registry was used to specify children with burn injury. This study included parents of children aged 0-18 years that presented with a burn injury of at least 1% Total Body Surface Area (TBSA) to Winnipeg's Children's Hospital between April 1, 1988 and March 31, 2010. Children (and their parents) who presented with injury as a result of friction

(n=5), radiation (n=6) or inhalation only, blast, frostbite and IV (n=96) were not included which resulted in 880 identified burn cases. In the case of multiple burns only the first injury date was used. Invalid PHINs, out of province patients and duplicate patient records were removed. This resulted in a total of 748 burn cases available for matching. These cases were then anonymously matched 1:5 with controls from the general pediatric population from Manitoba. The matching was based on age of child at the time of burn injury, sex of child, and nearest geographical location. The province of Manitoba is divided into 11 Regional Health Authorities (RHA's) that were used to match children based on geographical residence. Following this, parents were identified by use of Manitoba Health family health number. This resulted in the 2 cohorts of interest in this study: (1) 1029 parents of children with burn injury and (2) 4923 control parents, 5952 in total.

III. Outcome Measures

The term “treated rates” was used because the rate of disorders was based on hospital and physician claims data with diagnoses of mental disorder, not specific diagnostic surveys or tests. The health outcomes used in this study were based on previous work done by our group [10,11] and the disorder definitions have been validated by previous research [36,37].

i. Mental Disorders

ICD codes were used to identify parents who received a diagnosis of depression, anxiety disorders, substance abuse or dependence, and suicide attempt. Relative rates of these disorders in the two years prior to the injury as compared to a two-year follow-up period were compared. Coding for disorders of interest include: depression (*ICD-9-CA* codes: 296.2-296.3, 296.5, 300.4, 309, and 311; *ICD-10-CM* codes: F31.3-F31.5, F32, F33, F34.1, F38.0, F38.1, F43.2, F43.8, and F53.0), anxiety (*ICD-9-CA* codes: 300.0, 300.2, and 300.3; *ICD-10-CM* codes: F40, F41.0, F41.1, F41.3, F41.8, F41.9, F42, and F43.1) substance use (*ICD-9-CA* codes: 291, 292, 303, 304 and 305; *ICD-10-CM* code: F10, F11-F19 and F55), suicide attempts (*ICD-9-CA* codes: E950-E959; *ICD-10-CM* codes: X60-X84), and “Any mental disorder” that included individuals who met criteria for any of these disorders. Pre-existing disorder definitions validated in previous studies using the same data sets were used [37].

ii. Physical Disorders

ICD codes were also used to identify parents who received a diagnosis of Total Respiratory Morbidity, Hypertension, Arthritis, Diabetes, Fractures, Coronary Artery Disease or Cancer. Similar to the mental disorder analysis, the various physical disorders were treated as dichotomous variables with rates based on physical disorder exposure in the parent group, using the same 2-year pre-injury and post-injury timelines. Coding for disorders of interest include: total respiratory morbidity (one or more hospitalizations with a diagnosis of asthma, chronic or acute bronchitis, emphysema, or chronic airway obstruction and chronic obstructive pulmonary disease (COPD): *ICD-9-CA* codes 466, 490, 491, 492, 493, or 496 or *ICD-10-CM* codes J20, J21, or J40-J45 or one or more physician visits with a diagnosis of asthma, chronic or acute bronchitis, emphysema, or chronic airway obstruction and chronic obstructive pulmonary disease (COPD): *ICD-9-CA* codes. This combination of diagnoses is used to overcome problems resulting from different physicians (or specialists) using different diagnoses codes for the same underlying illness (eg asthma versus chronic bronchitis), hypertension (*ICD-9-CA*: 401-405; *ICD-10-CM*: I10-I13, I15), arthritis (*ICD-9-CA*: 274, 446, 711-721, 725-729, 739; *ICD-10-CM*: M00-M05, M05-M07, M10-19, M30-36, M65-M79), diabetes (*ICD-9-CA*: 250; *ICD-10-CM*: E10-E14), fractures (*ICD-9-CA* E800-E879 and E890-E999 or *ICD-10-CM* V01-V99), coronary artery disease (*ICD-9-CA*:

401-414; ICD-10-CM: I20-I25), and “Any physical disorder” that included individuals with any of these disorders. Disorders were based on validated diagnostic definitions [36].

iii. Suicide

Suicide deaths were identified in Vital Statistics using ICD codes. Death related to suicide was recorded in the Vital Statistics database as defined by the International Classification of Diseases 9th and 10th revisions (ICD-9-CA: E950-E959; ICD-10-CM: X40-X42, X46, X47, X60-X84).

iv. Demographic Information

Demographic factors including age and sex of the paediatric burn population were contained in the registry. In addition, the burn injury related factors included the agent that caused the burn injury, context of injury (recreational, suspected child abuse, assault, unspecified), length of stay, TBSA, and anatomical location of injury. Burn injuries due to scald, contact and fire/flame were included. Demographic information describing the parents of the pediatric burn patients was found in the Population Health Research Data Repository and included age, relationship of parent to offspring, income and location of residence.

v. Analytic Strategy

The date of burn injury of the offspring in the burn cohort was designated the index date for subsequent analyses. Descriptive characteristics of the parents of children with burn injury and their matches were determined at the injury date. Analysis of data was performed on SAS Version 9.3 software. Unadjusted Relative Rates for each of the mental and physical health outcomes of interest were determined. Due to privacy laws, cell sizes of $n < 6$ could not be reported. The first set of analyses examined parents with offspring with burn injuries and compared rates of the outcomes of interest in the two years after index date to the two years prior to index date. This same analyses was then conducted in control parents. The next set of analyses compared the rates of both parent groups before the burn injury date and after the burn injury date, in order to account for the effect of pre-existing mental and physical disorder morbidity. At a later date, covariates including income, age and sex of offspring, and age and sex of parent will potentially be entered into each of the mental and physical disorder models to develop Adjusted Relative Rates.

Results

The demographic information of the burn cohort of children ($n=681$) and matched control children ($n= 3217$) was compared in **Table 1a**. Of the 748 cases of childhood burn injury that were identified for this study, 681 had identifiable parents, and therefore only these children were included in the burn cohort. There were no significant differences between the age, sex and location distribution of the two groups, confirming the matching process.

Table 1b described the characteristics of the burn injuries of the children in the burn cohort. The mean length of stay in hospital was 17 days and these children had a mean total body surface area (TBSA) of 12%. 51% of the burn injuries were caused by scald, 32% were caused by flame or fire, 8% were caused by contact with a hot object and 9% did not fit into any of the above listed categories. 34% of the burn injured children had burn injuries that involved the head and neck, 47% had injuries that involved the trunk, 5% had injuries involving the genitalia, 46% had injuries that involved the lower extremities and 48% had injuries that involved the upper extremities. Note that the distribution of location of burn injury does not add up to 100% because each patient may have had multiple areas affected by the burn injury.

The demographic information of the parents of burn-injured offspring (n=1029) and matched control parents (n= 4923) was compared in **Table 2**. There were no significant differences in the age distribution or location of residence between the parents of burn-injured offspring and the matched controls. There was a small statistically significant difference between the mean age at injury date between the parents of burned offspring (34 years) and the matched control parents (35 years). However, the age distribution of the two parent groups did not differ with 76% of parents of burned offspring being 39 years of age or younger compared to 74% of the matched controls, and 24% of parents of burned offspring being 40 or older compared to 26% of the matched controls. There was a significant difference in the sex distribution with 66% female and 34% male parents of burned offspring and 61% female and 39% male matched control parents. Due to the methodology through which the parental cohort was developed, it was not possible to have all demographics perfectly matched. Interestingly, 63% of parents of burned offspring were characterized as 'low income' (lowest or second lowest out of five income quintiles or not found), compared to 49% of the matched control parents, which was a statistically significant difference.

Table 3a compared the physical and mental health outcomes of parents of burn injured children 2 years prior to the burn injury to 2 years following the burn injury. Parents of burn-injured children had more than triple the rate of physician-diagnosed substance abuse (RR=3.45) after their child suffered from a burn injury. There was also a 47% increase in the prevalence of depression and a 21% increase in the rate of overall mental disorders. When examining physical health outcomes, the rate of physician-diagnosed hypertension increased by 47%, and the rate of diabetes mellitus increased by 14%. Parents of burn-injured children had more than triple the rate of fractures (RR=3.47) after their child suffered a burn injury.

Table 3b compared the physical and mental health outcomes of matched control parents 2 years prior to the index date to 2 years following the index date. Among the matched controls, rates of diagnosed disorders also increased. The rate of physician diagnosed substance abuse disorder increased significantly (RR=2.86), the rate of depression increased over time by 41%, and the rate of overall mental disorders increased by 21%. The rate of hypertension increased by 38% and the rate of fractures increased by two and a half times (RR=2.55).

Table 4 compared changes in the mental and physical health outcomes between parents of burn injured children and their matched controls. There were substantial changes in relative rates between parents of burn-injured children and matched controls for substance abuse disorders and fractures. The prevalence of substance abuse disorder in the 2 years prior to index date was 3.01% among parents of burn-injured offspring and 2.11% among control parents. In the 2 years after offspring burn injury, the prevalence rose to 10.39% among parents of burn-injured children, whereas controls had a rate of 6.03% in the 2 years after the index date. Therefore, even though both parents of burn-injured children and matched control parents had substance abuse rates that were higher following the injury date, the rate of increase in prevalence of physician diagnosed substance abuse disorder was more pronounced for parents of burn-injured children than the matched controls. The substantial change in relative rate reflected the absolute rate increase of 7.38% for parents of burn-injured offspring compared with the absolute rate increase of 3.92% for the matched control parents. The prevalence of fractures in the 2 years prior to index date was 3.30% among parents of burn-injured offspring and 3.01% among control parents. In the 2 years after offspring burn injury, the prevalence rose to 11.46% among parents of burn-injured children, whereas controls had a rate of 7.66% in the 2 years after the index date. Therefore, even though both parents of burn-injured children and matched control parents had fracture rates that were higher following the injury date, the rate of increase in prevalence of fractures was more pronounced for parents of burn-injured children than the

matched controls. The substantial change in relative rate reflected the absolute rate increase of 8.16% for parents of burn-injured offspring compared with the absolute rate increase of 4.65% for the matched control parents.

Discussion

To our knowledge, this was the first population-based study to examine the consequences of offspring burn injuries on the parental caregivers. It was clear that burn injuries of offspring had a significant impact on the parental caregiver. Parents of burn-injured children had substantial physical and mental health consequences after the burn injury to their offspring, including higher rates of substance abuse and fractures compared to matched controls. These findings have important clinical implications for the care of parents who have a burn-injured child.

The findings of this study showed that there was an increase in the rate of depression, substance abuse disorder, any mental disorder, hypertension, fractures and any physical disorder among parents of burn injured children 2 years following the burn injury compared to 2 years prior to the burn injury. However, the rates of these outcomes also increased in the matched control parents, suggesting that they may be due to aging or other factors unrelated to their children's injury. Substance abuse disorder and fractures stand out as the two outcomes that had rates that increased at a higher rate than those of the matched control parents. Interestingly, the finding of increased rates of substance abuse disorder was a unique finding to parents of children with burn injury. Bolton et al. previously showed that there was not a relative increase in the rate of alcohol or drug use disorder between bereaved parents of children who completed suicide or died in a motor vehicle collision and the matched controls [10,11]. This suggests that different patterns of injury in offspring impact parents in systematically different ways. Parents may have used substances as a coping strategy in order to manage their ongoing stress of caring for their injured child.

The difference in the parental response to a child's injury is a key finding in guiding treatment of these parental caregivers; special attention must be paid to substance use disorders in parents following the burn-injury of their offspring. Early education and support to help parents develop effective coping skills may be very beneficial in preventing the substantial increase in substance abuse in parents following burn injuries of their children. In addition, physicians may want to begin screening parents following their child's burn injury in order to identify substance use problems early and initiate treatment. The rate of fractures may have increased among parents following a burn injury to their children for a few different reasons. First of all, it is possible that the labour, stress, and fatigue from caring for their child with a burn injury through changing dressings and coping with the child's decreased mobility may put these parents at an increased risk of injury, specifically fractures. It is also possible that risk-taking traits run in the family, and that the same risk factors that predisposed a child to suffer from a burn injury (pulling a pot of boiling eater off the stove), also predisposed their parent to suffer from fractures (risky driving of motor vehicles).

This study also showed that rates of all mental and physical health disorders 2 years prior to burn-injury date were higher among parents of burn-injured offspring compared to the matched control parents. This may reflect the social environment of the child and parent. This was supported by the finding of the lower income among parents of burn-injured offspring compared to matched controls. Family characteristics associated with low income may predispose families to burn injuries among children as well as physical and mental health disorders.

I. Limitations

The results of this study should be interpreted within the context of the limitations. Matching in this study was based on the age, sex and nearest geographic location of the children and not the parents and therefore differences in the success of identification of parents of burn-injured children and control children led to some minor differences in the characteristics of parents of burn-injured children compared to the matched control parents. Another limitation of this study was the ability to identify fathers of burn-injured offspring. The identification of fathers was dependent upon registered marriages, thus not all fathers were identified.

The mental health diagnoses of the patients in this study came from physician billing claims and were therefore dependent on health care seeking. Epidemiologic studies show that a substantial proportion of individuals who meet criteria for a mental disorder do not seek treatment, therefore the treated rate of mental disorders based on administrative data may lead to underestimates of the prevalence of mental disorders. However, it is not expected that this effect on health seeking would impact one of the parent groups more than the other. This study was also limited to the diagnoses that were included in the MCHP database.

Due to the nature of ICD-9 Code Data and the fact that Medical Claims Data only codes to 3 digits, dysthymia (300.4) was included under anxiety so we may have overestimated anxiety and underestimated depression. Another limitation of 3 digit coding is the inability to identify specific anxiety disorders such as PTSD, a key outcome in other studies.

This study found that the families of the burn-injured children were significantly poorer than the families of the matched control children; this factor and the pre-injury characteristics of the parents of burn-injured children are likely to contribute to the differences in rates of both mental and physical disorders observed, including the rates pre-injury date.

II. Strengths

The use of population-based data was significant strength of this study. The use of a large, matched control cohort was also an important strength, as it allowed this study to detect relative increases in health outcomes of case parents compared to control parents. As we observed that the overall rates also increased in the general population, the ability to compare cases and controls helped unmask rate increases that were specific to the case parents. This allowed us to determine if the increase was more than what occurred over time in the general population. This study was able to distinguish increases in the rates of health outcomes of parents that were specifically due to the burn-injury of a child rather than increases that were due to ageing or increased health care access over time.

III. Conclusion

In conclusion, this study provided novel findings about the physical and mental health consequences to parents following a burn injury to their child. The use of matched controls and physician-generated diagnoses in this study addressed many limitations of previous literature. The findings of this study showed that parents of children with burn injuries are at an increased risk of substance use disorder and fractures compared to the general population. These findings are valuable clinically because they will help in guiding the care and support of parents after their child has suffered from a burn injury. Future studies could evaluate mental, physical and social outcomes of parents with burn-injured offspring over a longer period of time to better understand this important group of at-risk individuals and further examine the effect of socioeconomic status on these outcomes.

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Tables**Table 1a. Comparison of the pediatric offspring at time of burn injury to a control cohort**

Demographic	Burn Cohort (n= 681)	Control cohort (n= 3217)	Test Statistic	P-value
Age at index date ¹				
Mean ± SD	5.16 ± 4.86	5.2 ± 4.80	-0.2 ^a	0.8416
Median (IQR)	3 (8)	3 (7)	0.9654 ^b	0.3258
<5, N (%)	382 (61.91%)	1873 (62.54%)	0.0852 ^c	0.7703
≥5, N (%)	235 (38.09%)	1122 (37.46%)		
Sex ¹				
Female, N (%)	211 (34.20%)	1050 (35.06%)	0.1668 ^c	0.683
Male, N (%)	406 (65.80%)	1945 (64.94%)		
Location ²				
Urban, N (%)	312 (50.90%)	1553 (52.10%)	0.293 ^c	0.5883
Rural, N (%)	301 (49.10%)	1428 (47.90%)		

^a - T-test, ^b - Kruskal-Wallis, ^c - Chi squared, ¹ - N= 3612, ² - N=3594

Table 1b. Descriptive characteristics of the pediatric offspring at time of burn injury

Characteristic	Study Burn Cohort (n = 681)
Context of Injury, N (%) ¹	
Recreational	105 (15.63%)
Suspected Child Abuse	29 (4.32%)
Other and Unspecified	538 (80.00%)
LOS; Mean ± SD; Range ²	17.46 ± 18.01; 1-173
LOS; Median; IQR	13; 15
TBSA % Mean ± SD; Range ³	11.86 ± 12.18; 1.5-95.0
TBSA % Median; IQR	8; 11
Cause of Injury, N (%) ⁴	
Scald	344, (50.66%)
Contact	55 (8.1%)
Fire/Flame	219 (32.25%)
Other	61 (8.98%)
Anatomical Location of Burn, N (%) ⁵	
Head/Neck	46 (33.58%)
Trunk	64 (46.72%)
Genitalia	7 (5.11%)
Lower Extremities	63 (45.99%)
Upper Extremities	66 (48.18%)

¹ - N=672 ² - N=665, ³ N=456, ⁴ - N=679, ⁵ - N=137

Table 2. Descriptive characteristics of the parents of burned offspring at time of injury.

Demographic	Parents of Burned Offspring (n = 1029)	Matched Control Parents (n = 4923)	Test Statistic	P-value
Age at index date ¹				
Mean ± SD; Range	34.00 ± 8.44; 15-70	35.22 ± 8.21; 18-85	4.12 ^a	<0.0001
Median; IQR	33 (11)	34 (10)	17.0897 ^b	<0.0001
<40 N (%)	699 (75.73%)	3531 (73.72%)	1.6352 ^c	0.201
≥40 N (%)	224 (24.27%)	1259 (26.28%)		
Sex ¹				
Male	316 (34.24%)	1848 (38.58%)	6.2066 ^c	0.0127
Female	607 (65.76%)	2942 (61.42%)		
Income of parent at index date ²				
Low Income ⁱ	393 (62.98%)	1489 (49.34%)	38.5443 ^c	<0.0001
Moderate to High Income ⁱⁱ	231 (37.02%)	1529 (50.66%)		
Location ²				
Urban	272 (47.39%)	1352 (48.55%)	0.256 ^c	0.6129
Rural	302 (52.61%)	1433 (51.45%)		

¹ - N=5713, ² - N=3642

ⁱ- poor includes lowest and second lowest quintile, ⁱⁱ- not poor includes middle, second highest and highest quintile

^a- T-test, ^b- Kruskal Wallis, ^c- Chi squared

Table 3a. Mental and Physical Disorders, Social Factors, and Treatment Use Among Parents of Burned Children, Before and After their Offspring’s Burn Injury

Outcomes	2-Year Prevalence Pre-burn (N=1029)	2-Year Prevalence Post-burn (N=1029)	Unadjusted Relative Rate
Mental Disorders			
Depression	98 (9.52%)	144 (13.99%)	1.47
Anxiety Disorder	152 (14.77%)	157 (15.26%)	1.03
Substance Use Disorder	31 (3.01%)	107 (10.39%)	3.45
Suicide Attempt	-- ¹	-- ¹	-- ¹
Any Mental Disorder	221 (21.48%)	268 (26.04%)	1.21
Physical Disorders			
Coronary Artery Disease	-- ¹	-- ¹	-- ¹
Cancer	-- ¹	-- ¹	-- ¹
Total Respiratory Morbidity	187 (18.17%)	185 (17.98%)	0.99
Hypertension	64 (6.22%)	94 (9.14%)	1.47
Diabetes mellitus	100 (9.74%)	114 (11.10%)	1.14
Arthritis	209 (20.31%)	230 (22.35%)	1.10
Fractures	34 (3.3%)	118 (11.46%)	3.47
Any physical disorder	390 (37.90%)	433 (42.20%)	1.11

¹Cell was suppressed due to lo frequency (N<6)

Table 3b. Mental and Physical Disorders, Social Factors, and Treatment Use Among Control Parents

Outcomes	2-Year Prevalence Pre-burn (N=4923)	2-Year Prevalence Post-burn (N=4923)	Unadjusted Relative Rate
Mental Disorders			
Depression	353 (7.17%)	496 (10.08%)	1.41
Anxiety Disorder	606 (12.31%)	625 (12.70%)	1.03
Substance Use Disorder	104 (2.11%)	297 (6.03%)	2.86
Suicide Attempt	-- ¹	-- ¹	-- ¹
Any Mental Disorder	878 (17.83%)	1060 (21.53%)	1.21
Physical Disorders			
Coronary Artery Disease	-- ¹	-- ¹	-- ¹
Cancer	-- ¹	-- ¹	-- ¹
Total Respiratory Morbidity	741 (15.05%)	774 (15.72%)	1.04
Hypertension	248 (5.04%)	342 (6.95%)	1.38
Diabetes mellitus	248 (5.04%)	250 (5.08%)	1.01
Arthritis	981 (19.93%)	1008 (20.48%)	1.03
Fractures	148 (3.01%)	377 (7.66%)	2.55
Any physical disorder	1828 (37.13%)	1953 (39.65%)	1.07

¹Cell was suppressed due to lo frequency (N<6)

Table 4. Pre-burn and Post-burn Comparisons of Parents of Burned Offspring and Matched Control Parents of Non-Burned Offspring

Outcomes	Unadjusted Relative Rate of Cases	Unadjusted Relative Rate of Controls	Comparison of Changes in Relative Rates between Cases and Controls
Mental Disorders			
Depression	1.47	1.41	1.04
Anxiety Disorder	1.03	1.03	1.00
Substance Use Disorder	3.45	2.86	1.21
Suicide Attempt	-- ¹	-- ¹	-- ¹
Any Mental Disorder	1.21	1.21	1.00
Physical Disorders			
Coronary Artery Disease	-- ¹	-- ¹	-- ¹
Cancer	-- ¹	-- ¹	-- ¹
Total Respiratory Morbidity	0.99	1.04	0.95
Hypertension	1.47	1.38	1.06
Diabetes mellitus	1.14	1.01	1.13
Arthritis	1.10	1.03	1.07
Fractures	3.47	2.55	1.36
Any physical disorder	1.11	1.07	1.04

¹Cell could not be calculated due to lo frequency (N<6)