

# Socioeconomic disparities in rates of facial fracture surgeries for women and men at a regional tertiary care centre in Australia

Elzerie de Jager \* and Yik-Hong Ho\*†

\*College of Medicine and Dentistry, The James Cook University, Townsville, Queensland, Australia and

†Townsville Clinical School, The Townsville Hospital, Townsville, Queensland, Australia

## Key words

disparities, facial fractures, maxillofacial injuries, maxillofacial trauma, socioeconomic status, surgery, surgical access, unemployed.

## Correspondence

Dr Elzerie de Jager, College of Medicine and Dentistry, The James Cook University, 1 James Cook Drive, Townsville, QLD, 4811, Australia.  
Email: [elzerie.dejager@my.jcu.edu.au](mailto:elzerie.dejager@my.jcu.edu.au)

**E. de Jager** MBBS (Hons); **Y.-H. Ho** BS, MD, FRACS.

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial](https://creativecommons.org/licenses/by-nc/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

Accepted for publication 27 April 2022.

doi: 10.1111/ans.17763

## Introduction

Common causes of injuries in patients presenting with facial trauma in Australia are interpersonal violence (IPV) or assault, motor vehicle accidents, falls and sporting injuries.<sup>1,2</sup> Assault is the most common mechanism of injury.<sup>2,3</sup> Despite a decrease in facial trauma from motor vehicle accidents, the incidence of maxillofacial trauma is increasing as injuries due to assault continue to rise.<sup>4,5</sup>

When compared with males, females with facial trauma due to assault are more likely to know their assailants.<sup>3</sup> This may reflect the propensity for maxillofacial injuries to stem from domestic violence in women.<sup>6</sup> Most hospitalizations of women due to assault by a spouse or domestic partner are for the treatment of injuries to the

## Abstract

**Background:** Assault is the most common mechanism of injury in patients presenting with facial trauma in Australia. For women, there is a propensity for maxillofacial injuries to stem from intimate partner violence (IPV). Those with a low socioeconomic status have higher rates of IPV. This study examines variations in the proportion of surgical procedures that are due to facial trauma for Australian women and men by employment status and residential socioeconomic status.

**Methods:** A single centre retrospective study was conducted (2008–2018). The proportion of operative patients presenting with facial fractures was examined. Multivariable logistic regression adjusting for year and age, was performed for women and men.

**Results:** Facial fractures comprised 1.51% (1602) of all surgeries, patients had a mean age of 32, and 81.3% were male. Unemployed patients were more likely to require surgery for a facial fracture (OR 2.36 (2.09–2.68),  $P < 0.001$ ), and there were no significant variations by index of economic resources (IER). Unemployed males had higher rates of facial fractures (OR 2.09 (1.82–2.39),  $P < 0.001$ ). Unemployed and disadvantaged IER females had higher rates of facial fractures (OR 5.02 (3.73–6.75),  $P < 0.001$  and OR 2.31 (1.63–3.29),  $P < 0.001$ ).

**Conclusions:** This study found disparities in rates of surgery for facial fractures; unemployment increased the rates for men and women, whereas disadvantaged IER increased rates for women. Studies have demonstrated higher rates of IPV for unemployed and low socioeconomic status women. Further research ascertaining the aetiology of these disparities is important both for primary prevention initiatives and to enable treating clinicians to better understand and address the role of IPV and alcohol consumption in these injuries.

head or neck.<sup>7,8</sup> Domestic violence is more likely to be detected in adult female hospital patients with orbital fractures than in matched cohorts with any other diagnosis.<sup>9</sup>

In Australia, those residing in the lowest socioeconomic areas are more than seven times as likely to be hospitalized for assault by a spouse or domestic partner (40 per 100 000), compared to those living in the highest socioeconomic areas (6 per 100 000).<sup>7</sup> Those residing in the lowest socioeconomic quintile make up two of every five hospitalizations for assault by a spouse or domestic partner.<sup>7</sup> Almost half of all female domestic violence homicide victims are unemployed.<sup>7</sup> The impact of socioeconomic status and unemployment on rates of facial trauma for women and men are not known. This study aimed to examine variations in the proportion of surgical

procedures that are due to facial trauma by both unemployment and residential socioeconomic status for Australian women and men. It was hypothesized that low residential socioeconomic status and unemployment would increase rates of facial trauma requiring surgery for women and men.

## Methods

### Study design

A single centre retrospective study was conducted at a regional tertiary care centre in Queensland, Australia. Due to data availability, data from January 2008 to August 2018 was examined for all surgical procedures in adult (aged >18 years) patients. The Townsville Hospital and Health Service Human Research Ethics Committee in Australia (HREC/QTHS/57820) granted ethics approval which included a patient consent waiver due to the retrospective design of the study.

### Data source, sample selection, definitions and variables

Two administrative databases were utilized; the Operating Room Management Information System (ORMIS) and the Hospital Based Corporate Information System (HBCIS). ORMIS was used to extract operative details for all surgical procedures performed. Patient identification numbers were then matched to HBCIS. This resulted in a data set including data for all operative procedures occurring in the 10-year period.

To determine neighbourhood level residential socioeconomic status, postcodes from a patient's home address were linked to the 2016 Census tract index of economic resources (IER) data. The IER is a proxy for socioeconomic status, focusing on financial aspects of socioeconomic advantage and disadvantage (income and wealth).<sup>10</sup> The 15 variables used to generate this composite index include indicators of disadvantage (e.g. the percentage of those with a household income between the first and second deciles, and the percentage of people aged over 15 years who are unemployed) and variables that are indicators of advantage (e.g. percentage of people with a stated household income in the ninth and tenth deciles, and the percentage of private dwellings with four or more bedrooms). The bottom three national IER deciles (i.e. those with the greatest

relative lack of access to economic resources) were compared with the top three national deciles (i.e. those with the greatest access to economic resources).

To identify unemployment, a free text occupation variable was used. Synonyms/variable spelling of unemployment were used, as well as the various names of unemployment social security benefits. Those indicating that they were not in the labour force were not coded as unemployed (e.g. stay at home parents, disability support/pensions, retirees and pensioners).

### Statistical analysis

The primary outcome was the rate of facial fractures. The primary predictors (i.e. independent variables) were unemployment and disadvantaged IER. Descriptive statistics was presented as well as simple group comparisons. Pearson's chi-squared tests were used for categorical variables and continuous variables were analysed with analysis of variance (ANOVA) tests. The rate of facial fractures was stratified by age and sex.

Multivariable logistic regression models, based on a conceptual model, were used. Covariates included in the model were procedure year, patient age and sex. The data were then stratified by sex and one analysis each done for women and men. In this analysis, sex was removed from the covariate list.

All analyses were performed using Stata 14/MP statistical software package (StataCorp, College Station, TX). A two-sided  $P < 0.05$  was considered statistically significant.

## Results

There were 106 197 total surgical procedures performed in the time period, of those 1602 (1.51%) were due to facial fractures (Table 1). The most common facial fracture was of the jaw (1143 (1.08%)), followed by nasal (264 (0.25%)) and orbital fractures (200 (0.19%)). Male patients were more likely to have a facial fracture ( $n = 1303$ , 81.3%,  $P < 0.001$ ). The mean age of facial fracture patients was younger than other surgical patients (32 ( $SD$  13) vs. 51 ( $SD$  19)).

Women and men both had the highest rates of fractures in the 20–29-year age group. Most of the men with facial fractures were

**Table 1** Demographics of study population

Characteristic	Overall <i>n</i> = 106 197	Occupation – other <i>n</i> = 100 554 (94.7%)	Occupation – unemployed <i>n</i> = 5643 (5.31%)	<i>P</i> -value	Index of economic resources advantaged <i>n</i> = 24 948 (23.5%)	Index of economic resources disadvantaged <i>n</i> = 28 289 (26.6%)	<i>P</i> -value
<b>Age</b>							
Median, <i>n</i> (IQR)	51 (34–67)	52 (35–68)	37 (27–49)	<0.001	54 (37–68)	46 (31–63)	<0.001
Mean, <i>n</i> ( <i>SD</i> )	51 (19)	52 (19)	38 (13)		53 (19)	48 (19)	
<b>Sex, <i>n</i> (%)</b>							
Male	48 064 (45.3)	44 380 (44.1)	3684 (65.3)	<0.001	10 385 (41.6)	13 698 (48.6)	<0.001
<b>Facial fractures <i>n</i> (%)</b>							
Face	1602 (1.51)	1232 (1.23)	370 (6.56)	<0.001	421 (1.69)	402 (1.43)	0.015
Jaw	1143 (1.08)	834 (0.83)	309 (5.48)	<0.001	299 (1.2)	298 (1.06)	0.123
Nose	264 (0.25)	236 (0.23)	28 (0.5)	<0.001	65 (0.26)	61 (0.22)	0.296
Orbital	200 (0.19)	166 (0.17)	34 (0.6)	<0.001	57 (0.23)	47 (0.17)	0.108

**Table 2** Facial fractures stratified by age (deciles) and sex

Age (years)	All (n, %)	Male (n, %)	Female (n, %)
18–19	206 (12.9)	179 (13.7)	27 (9.03)
20–29	687 (42.9)	584 (44.8)	103 (34.5)
30–39	352 (22)	274 (21)	78 (26.1)
40–49	199 (12.4)	158 (12.1)	41 (13.7)
50–59	104 (6.49)	74 (5.8)	29 (9.7)
60–69	33 (2.06)	23 (1.77)	10 (3.34)
70–79	13 (0.81)	5 (0.38)	8 (2.68)
80–89	8 (0.50)	5 (0.38)	3 (1)

**Table 3** The proportion of surgical admissions that are facial fractures by unemployed and index of economic resources (IER)

	Unadjusted OR (95% CI), <i>P</i> -value	Adjusted† OR (95% CI), <i>P</i> -value
<b>Facial</b>		
Unemployed	5.66 (5.02–6.37), <0.001	2.36 (2.09–2.68), <0.001
Low IER	0.842 (0.734–0.967), 0.015	0.928 (0.805–1.07), 0.303
<b>Jaw</b>		
Unemployed	6.93 (6.06–7.92), <0.001	2.81 (2.44–3.23), <0.001
Low IER	0.881 (0.75–1.04), 0.123	0.977(0.827–1.15), 0.781
<b>Nose</b>		
Unemployed	2.12 (1.43–3.14), <0.001	0.976 (0.655–1.46), 0.906
Low IER	0.830 (0.585–1.18), 0.297	0.92 (0.646–1.31), 0.642
<b>Orbital</b>		
Unemployed	3.67 (2.53–5.31), <0.001	1.61 (1.1–2.35), 0.014
Low IER	0.729 (0.465–1.07), 0.109	0.777 (0.526–1.15), 0.206

†This logistic regression model adjusted for year, age and sex.

**Table 4** Unadjusted and adjusted regression models of the proportion of surgical admissions that are facial fractures by unemployed and index of economic resources (IER), stratified by sex

	Unadjusted	Adjusted†	
<b>Male</b>	<b>Facial</b>		
	Unemployed	4.05 (3.55–4.62), <0.001	2.09 (1.82–2.39), <0.001
	Low IER	0.625 (0.534–0.729), <0.001	0.757 (0.646–0.886), 0.001
	<b>Jaw</b>		
	Unemployed	4.87 (4.21–5.64), <0.001	2.5 (2.15–2.91), <0.001
	Low IER	0.655 (0.549–0.781), <0.001	0.803 (0.67–0.962), 0.017
	<b>Nose</b>		
	Unemployed	1.63 (1.04–2.55), 0.032	0.864 (0.55–1.36), 0.524
	Low IER	0.623 (0.414–0.938), 0.024	0.742 (0.491–1.12), 0.155
	<b>Orbital</b>		
Unemployed	2.31 (1.52–3.52), <0.001	1.22 (0.794–1.86), 0.37	
Low IER	0.54 (0.35–0.834), 0.005	0.64 (0.415–0.994), 0.047	
<b>Female</b>	<b>Facial</b>		
	Unemployed	7.08 (5.3–9.47), <0.001	5.02 (3.73–6.75), <0.001
	Low IER	1.87 (1.32–2.65), <0.001	2.31 (1.63–3.29), <0.001
	<b>Jaw</b>		
	Unemployed	9.26 (6.58–13), <0.001	6.26 (4.42–8.88), <0.001
	Low IER	2.28 (1.45–3.58), <0.001	2.92 (1.85–4.6), <0.001
	<b>Nose</b>		
	Unemployed	2.36 (1.03–5.43), 0.043	1.64 (0.707–3.8), 0.250
	Low IER	1.36 (0.684–2.72), 0.378	1.65 (0.819–3.3), 0.161
	<b>Orbital</b>		
Unemployed	7.67 (3.51–16.8), <0.001	7.26 (3.23–16.35), <0.001	
Low IER	1.51 (0.616–3.7), 0.368	1.64 (0.66–4.04), 0.286	

†This logistic regression model adjusted for year, age and sex.

under 29 years of age and most women were under 39 years of age (Table 2).

Unemployed patients had higher rates of all facial fractures (6.56 vs. 1.23%,  $P < 0.001$ ), jaw (5.48 vs. 0.83%,  $P < 0.001$ ), nose (0.5 vs. 0.23%,  $P < 0.001$ ) and orbital fractures (0.6 vs. 0.17%,  $P < 0.001$ ), when compared with other patients. Patients residing in areas of disadvantaged IER had lower rates of facial fractures overall (1.43 vs. 1.69%,  $P = 0.015$ ) and no significant variations in jaw, nose, or orbital fractures.

### Multivariable analysis

Patients who were unemployed were more likely to require surgery for a facial fracture (OR 2.36 (2.09–2.68),  $P < 0.001$ ), jaw fracture (OR 2.81 (2.44–3.23),  $P < 0.001$ ) and orbital fracture (OR 1.61 (1.1–2.35),  $P = 0.014$ ) (Table 3). Neighbourhood IER was not associated with variation in the risk of requiring surgery for facial fractures.

### Analysis stratified by sex

Male unemployed patients had higher rates of all facial fractures (OR 2.09 (1.82–2.39),  $P < 0.001$ ) and jaw fractures (OR 2.5 (2.15–2.91),  $P < 0.001$ ) compared to other males. There was no significant variation in nose or orbital fractures. Male patients in the most disadvantaged IER had lower rates of facial fractures (OR 0.757 (0.646–0.886),  $P = 0.001$ ), jaw fractures (OR 0.803 (0.67–0.962),  $P = 0.017$ ) and orbital fractures (OR 0.64 (0.415–0.994),  $P = 0.047$ ), when compared to males in the higher IER (Table 4).

Female unemployed patients had higher rates of all facial fractures (OR 5.02 (3.73–6.75),  $P < 0.001$ ), jaw fractures (OR 6.26 (4.42–8.88),  $P < 0.001$ ), and orbital fractures (OR 7.26 (3.23–16.35),  $P < 0.001$ ), when compared to other females. There was no significant variation in nose fractures. Female patients residing in the most disadvantaged IER neighbourhoods had higher rates of facial fractures (OR 2.31 (1.63–3.29),  $P < 0.001$ ) and jaw fractures (OR 2.92 (1.85–4.6),  $P < 0.001$ ) compared with females residing in the most advantaged IER. This contrasts with male patients, where residing in the lowest neighbourhood IER significantly decreased the rates of facial fractures. There was no significant variation in nose or orbital fractures by IER.

## Discussion

Healthcare disparities are potentially avoidable differences in health or in health risks that policy can influence, between groups of people who are more and less advantaged socially.<sup>11</sup> Health systems and providers may have a role in mitigating disparities by influencing policies which shape the surgical risk profile of a population. There are three proposed phases of health disparities research; detecting, understanding and reducing.<sup>12</sup> This study detected disparities in rates of surgery for facial fractures; unemployment increased the risk for men and women while disadvantaged IER increased rates for women.

Facial fractures may result in long-term mental and physical health issues for patients.<sup>13</sup> Functional impairments such as deficits in mastication, speech, swallowing, and vision may follow.<sup>14</sup> Management of facial fractures also places a strain on the healthcare system as patients who require surgery often need long-term follow-up and may require revision surgery. It is important to examine why there are disparities in facial fractures for low socioeconomic status men and women (understanding) and to work towards decreasing these disparities (reducing).

### Understanding the disparities

Most of the patients with facial trauma requiring surgery were male. This had been found in previous studies.<sup>3,15–17</sup> The mean age of a facial fracture requiring surgery was relatively young (32 years). This is echoed by previous studies.<sup>3,15,16</sup> An Irish study described two peaks in the incidence of facial fractures in females, 20–39 years, and 70–89 years. IPV was the most common injury in the younger group, and falls were the most common aetiology of injury in the older group.<sup>18</sup> This study did not find the second peak; only 3.68% of women undergoing surgery for facial fractures were over the age of 70 years. Most of the women with facial fractures in this study were under the age of 39, an age where IPV is the most common aetiology of injury for women.<sup>18</sup>

### Reducing the disparities

#### Intimate partner violence

Australian national population survey data show that from 2014–2015 to 2016–2017, the rate of hospitalization of women assaulted by a partner rose 23%, whereas the rate for men remained stable.<sup>7</sup>

People living in the most disadvantaged areas of Australia are 1.5 times more likely to experience partner violence, when compared to those residing in areas of least disadvantage.<sup>7</sup> It is difficult to identify whether socioeconomic disadvantage and unemployment are risk factors for, or the outcomes of, experiencing IPV.

Recognition and diagnosis of IPV and appropriate referral may prevent future injuries.<sup>19</sup> It can be difficult to identify victims of IPV, as patients who have been assaulted may not report an assault, rather reporting an accident, injury or fall.<sup>9,13,18,20</sup> Patients rarely volunteer a history of IPV, and physicians often fail to inquire appropriately. A survey of Canadian surgical residents found that most underestimated the prevalence of IPV in their practice. Most residents reported screening for IPV only seldom or never, citing a lack of specific training as the primary barrier to routine IPV assessment, and were supportive of additional training.<sup>21</sup> Less than 10% of surgical residents reported that their clinical setting had guidelines for detecting or managing IPV.<sup>21</sup>

Domestic violence is more likely to be detected in adult female hospital patients with orbital fractures than in matched cohorts with any other diagnosis.<sup>9</sup> All patients with non-motor vehicle accidental facial fractures should be questioned regarding IPV.<sup>9</sup> Surgical departments should provide specific training regarding IPV assessment and site-specific guidelines for the assessment and management of IPV.

#### Alcohol consumption

Alcohol is implicated in 47–55% of all maxillofacial injuries and in 72–87% of maxillofacial injuries due to assault.<sup>15–17,22,23</sup> Unemployment is linked to increased alcohol consumption.<sup>24,25</sup> A cohort study in New Zealand found that unemployment was the strongest predictor of alcohol-related trauma requiring surgery.<sup>26</sup> Sixty percent of facial fracture patients screen positive for problem alcohol use, while only 30% have sought or been offered professional help. In a survey of Australasian oral and maxillofacial surgeons, 50% of respondents did not believe it was their responsibility to screen patients and provide intervention or referral.<sup>27</sup> Alcohol screening and brief intervention can reduce injury recurrence and harmful drinking habits.<sup>28</sup> Screening and offering alcohol behavioural modification advice to facial fracture patients may be beneficial.

#### COVID-19

The COVID-19 pandemic has changed the daily life of people internationally. COVID-19 related restrictions have altered the epidemiology and aetiology of trauma. Some reports suggest that while the total number of facial fractures have decreased in this period, especially fractures related to sport, the proportion of assaults have increased and the number of alcohol related facial fractures have increased significantly.<sup>29,30</sup> Interpersonal violence and IPV may have increased with increased alcohol consumption and COVID-19 lockdowns.<sup>31–33</sup> Due to COVID-19 restrictive measures, alcohol consumption in the home has increased, which is where the majority of the assaults leading to women's facial fractures occur.<sup>20,34,35</sup> Addressing safety in the home is therefore increasingly important both in terms of primary prevention of facial

fractures and when discharging facial fracture patients from surgical wards.

## Limitations

In this study, facial surgery rates were compared with all surgery rates. As the denominator is the rate of all surgical procedures, this metric is reliable only if there is equal access to surgery, that is, that there is no systematic under or overutilization of surgical procedures for the demographic groups being analysed. If there is a systematic under or overutilization of surgical procedures, this metric may produce results that reflect these variations rather than the outcome being assessed. This study was conducted at a public hospital in a country with universal health care, which, in theory, should create equal access to surgical care for people in all societal demographics.

To attain data on socioeconomic status, residential postcodes were linked to census tract IER data. This produced neighbourhood level socioeconomic status data. There are more granular geographical areas that can be linked to census tract data. Internationally, it has been shown that more granular areas perform more consistently as neighbourhood level markers of socioeconomic status when compared with postcodes.<sup>36,37</sup> More granular neighbourhood areas may have been a more reliable marker of IER. This may explain why, in this study, unemployment was a risk factor for surgical procedures related to facial fractures in both women and men, whereas disadvantaged IER decreased rates for men and increased rates for women. Further work is required to examine IER on a more granular and reliable manner, as well as to ascertain the aetiologies of these injuries.

Aboriginal and/or Torres Strait Islander adults are 32 times as likely to be hospitalized for family violence, when compared to other Australians.<sup>7</sup> Adjusting for Aboriginal and/or Torres Strait Islander status when examining rates of facial fracture surgeries in unemployed and low IER patients, as well as examining outcomes for this group individually, would have been prudent in this study. Unfortunately, the Queensland Government did not allow for the acquisition of any data relating to Aboriginal and/or Torres Strait Islander status, despite investigators acquiring the necessary full HREC approval to do so (HREC/QTHS/57820) and attaining specific extramural funding to analyse this data.

## Conclusion

This study found disparities in rates of surgery for facial fractures; unemployment increased the risk for men and women, whereas disadvantaged IER increased rates for women. Previous work has demonstrated higher rates of IPV for unemployed and low socioeconomic status women. Further research ascertaining the aetiology of these disparities is important, both for primary prevention initiatives to decrease rates facial fractures, and to enable treating clinicians to better understand and address the role of IPV and alcohol consumption in these injuries.

## Disclosures

Elzerie de Jager is a Doctor of Philosophy candidate at an Australian university; this research degree is supported by an

Australian Government Research Training Program (RTP) Scholarship. This work is also supported by the Avant Doctor in Training Research Scholarship.

## Acknowledgement

Open access publishing facilitated by James Cook University, as part of the Wiley - James Cook University agreement via the Council of Australian University Librarians.

## Conflict of interest

Nil authors declared any conflict of interest.

## Author contributions

**Elzerie de Jager:** Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; resources; software; validation; visualization; writing – original draft; writing – review and editing. **Yik-Hong Ho:** Funding acquisition; project administration; supervision; writing – review and editing.

## References

- Lee K, Qiu M. Characteristics of alcohol-related facial fractures. *J. Oral Maxillofac. Surg.* 2017; **75**: 786.e1–7.
- Cabalag MS, Wasiaik J, Andrew NE, Tang J, Kirby JC, Morgan DJ. Epidemiology and management of maxillofacial fractures in an Australian trauma centre. *J. Plast. Reconstr. Aesthet. Surg.* 2014; **67**: 183–9.
- Elledge R, Elledge R, Aquilina P, Hodson J, Dover S. The role of alcohol in maxillofacial trauma: a comparative retrospective audit between the two centers. *Alcohol* 2011; **45**: 239–43.
- Lynham A, Tuckett J, Warnke P. Maxillofacial trauma. *Aust. Fam. Physician* 2012; **41**: 172–20.
- Roccia F, Savoini M, Ramieri G, Zavattero E. An analysis of 711 victims of interpersonal violence to the face, Turin, Italy. *J. Craniomaxillofac Surg* 2016; **44**: 1025–8.
- Zachariades N, Koumoura F, Konsolaki-Agouridaki E. Facial trauma in women resulting from violence by men. *J. Oral Maxillofac. Surg.* 1990; **48**: 1250–3.
- Australian Institute of Health and Welfare. Family, domestic and sexual violence in Australia: continuing the national story 2019 [internet]. Canberra; 2019 [Cited 26 Oct 2021.] Available from URL: <https://www.aihw.gov.au/getmedia/b0037b2d-a651-4abf-9f7b-00a85e3de528/aihw-fdv3-FDSV-in-Australia-2019.pdf.aspx?inline=true>
- Ochs H, Neuenschwander M, Dodson T. Are head, neck and facial injuries markers of domestic violence. *J Am Dent Assoc* 1996; **127**: 757–61.
- Goldberg S, McRill C, Bruno C, Ten Have T, Lehman E. Orbital fractures due to domestic violence: an epidemiologic study. *Orbit* 2000; **19**: 143–54.
- Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016 [Internet]. 2016 [Cited 27 Sep 2021.] Available from URL: <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2033.0.55.001~2016~Main%20Features~IER~21>
- Braveman P. Health disparities and health equity: concepts and measurement. *Annu. Rev. Public Health* 2006; **27**: 167–94.

12. Kilbourne AM, Switzer G, Hyman K, Crowley-Matoka M, Fine MJ. Advancing health disparities research within the health care system: a conceptual framework. *Am. J. Public Health* 2006; **96**: 2113–21.
13. Gerber B, Ahmad N, Parmar S. Trends in maxillofacial injuries in women, 2000–2004. *Br J Oral Maxillofac Surg* 2009; **47**: 374–7.
14. Lee K, Olsen J, Sun J, Chandu A. Alcohol-involved maxillofacial fractures. *Aust. Dent. J.* 2017; **62**: 180–5.
15. Hutchison I, Magennis P, Shepherd J, Brown A. The BAOMS United Kingdom survey of facial injuries part 1: aetiology and the association with alcohol consumption. British Association of Oral and Maxillofacial Surgeons. *Br J Oral Maxillofac Surg* 1998; **36**: 3–13.
16. Lee K, Snape L. Role of alcohol in maxillofacial fractures. *N. Z. Med. J.* 2008; **121**: 15–23.
17. Lee K, Antoun J. Zygomatic fractures presenting to a tertiary trauma centre, 1996–2006. *N. Z. Dent. J.* 2009; **105**: 4–7.
18. Ogunbowale A, Costello L, McCormack D, Ekanayake K, Kearns G. Maxillofacial fractures in females: a 5-year retrospective review. *Ir. J. Med. Sci.* 2022; **191**(1): 367–74.
19. Halpern LR. Orofacial injuries as markers for intimate partner violence. *Perioper. Nurs. Clin.* 2011; **6**: 359–69.
20. Ferreira M, Batista A, de Oliveira Ferreira F, Ramos-Jorge M, Marques L. Pattern of oral-maxillofacial trauma stemming from interpersonal physical violence and determinant factors. *Dent Traumatol* 2014; **30**: 15–21.
21. Sprague S, Kaloty R, Madden K *et al.* Perceptions of intimate partner violence: a cross sectional survey of surgical residents and medical students. *J Inj Violence Res.* 2013; **5**(1): 1–10.
22. Laverick S, Patel N, Jones D. Maxillofacial trauma and the role of alcohol. *Br J Oral Maxillofac Surg* 2008; **46**: 542–6.
23. Lee K, Snape L, Steenberg L, Worthington J. Comparison between interpersonal violence and motor vehicle accidents in the aetiology of maxillofacial fractures. *ANZ J. Surg.* 2007; **77**: 695–8.
24. Claussen B. Alcohol disorders and re-employment in a 5-year follow-up of long-term unemployed. *Addiction* 1999; **94**: 133–8.
25. Henkel D. Unemployment and substance use: a review of the literature (1990–2010). *Curr. Drug Abuse Rev.* 2011; **4**: 4–27.
26. Nair SM, Mishra P, McLennan S, Lee J, Tsao C-H, Celi LA. Alcohol-related injuries requiring surgery. *N. Z. Med. J.* 2013; **126**(1374): 92–5.
27. Lee KH, Bobinskas AM, Sun J. Addressing alcohol-related harms within maxillofacial trauma practice. *J. Oral Maxillofac. Surg.* 2015; **73**: 314.e1–6.
28. Murphy DA, Shetty V, Zigler C, Resell J, Yamashita DD. Willingness of facial injury patients to change causal substance using behaviors. *Substance Abuse* 2010; **31**: 35–42.
29. Wang C, Hoffman G, Walton G. The implementation of COVID-19 social distancing measures changed the frequency and the characteristics of facial injury: the Newcastle (Australia) experience. *Craniofacial Trauma Reconstr.* 2021; **14**: 150–6.
30. Lee D-W, Choi S-Y, Kim J, Kwon T-G, Lee S-T. The impact of COVID-19 on the injury pattern for maxillofacial fracture in Daegu city, South Korea. *Maxillofac Plast Reconstr Surg* 2021; **43**(1): 35.
31. Krishnakumar A, Verma S. Understanding domestic violence in India during COVID-19: a routine activity approach. *Asian J. Criminol.* 2021; **16**: 19–35.
32. Barbara G, Facchin F, Micci L *et al.* COVID-19, lockdown, and intimate partner violence: some data from an Italian service and suggestions for future approaches. *J. Women's Health* 2020; **29**: 1239–42.
33. Pollard MS, Tucker JS, Green HD. Changes in adult alcohol use and consequences during the COVID-19 pandemic in the US. *JAMA network open* 2020; **3**: e2022942.
34. Grossman E, Benjamin-Neelon S, Sonnenschein S. Alcohol consumption during the COVID-19 pandemic: a cross-sectional survey of US adults. *Int. J. Environ. Res. Public Health* 2020; **17**: 1–10.
35. Wright J, Kariya A. Characteristics of female victims of assault attending a Scottish accident and emergency department. *J. Accid. Emerg. Med.* 1997; **14**: 375–8.
36. Krieger N, Chen JT, Waterman PD, Soobader M-J, Subramanian SV, Carson R. Geocoding and monitoring of US socioeconomic inequalities in mortality and cancer incidence: does the choice of area-based measure and geographic level matter?: the public health disparities geocoding project. *Am. J. Epidemiol.* 2002; **156**: 471–82.
37. Hyndman JCG, Holman CDJ, Hockey RL, Donovan RJ, Corti B, RiverA J. Misclassification of social disadvantage based on geographical areas: comparison of postcode and Collector's district analyses. *Int. J. Epidemiol.* 1995; **24**: 165–76.