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Title

Deprivation and its impact on non-urgent Paediatric Emergency Department (ED) use: are Nurse Practitioners the answer?

Running Head

Deprivation in ED and Nurse Practitioners

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Conflict of interests

There are no conflicts of interest

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Author contributions

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- Substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- Drafting the article or revising it critically for important intellectual content

Impact statement

This study has expanded our knowledge regarding the range of influences on paediatric ED use for non-urgent care. The comprehensive overview of the literature and the impact of deprivation on the use of Paediatric Emergency Department for non-urgent care have fundamentally changed our understandings of deprivation and primary care access. Further the reconfiguration of primary health care staffing and service delivery through use of nurse practitioners has the potential to alleviate the use of ED for non-urgent care.

The study

Abstract

Aims: This paper reports on the quantitative findings from a large mixed method study that determined the extent to which the provision of alternatives to an Emergency Department, and Index of Relative Social Disadvantage score influenced non-urgent paediatric Emergency Department use.

Background: In Australia there is an increasing use of Emergency Departments for the provision of non-urgent care that may be better serviced in the community. Further, despite the plethora of literature describing the characteristics of non-urgent users of Emergency Departments the link to social and community characteristics remains under explored.

Design: This 2010 retrospective analysis of the Hospital Admission Status data from the paediatric Emergency Department provided the information on attendance types and numbers along with postcode details. The postcodes in conjunction with Australia Bureau of Statistics data provided the levels of deprivation from the Index of Relative Social Deprivation scores.

Method: A logistic regression analysis determined the levels of influence of deprivation and General Practitioner or Nurse Practitioner provision on the use of ED for non-urgent care.

Findings: Rates of use for non-urgent care is higher for populations who come from areas of deprivation and have limited primary care services, such as low levels of General Practitioners. Children from areas of high deprivation and limited access to primary care were up to 6 times more likely to use Emergency Department for non-urgent care.

Conclusions: Deprivation impacts on the use of paediatric ED for non-urgent care even in countries like Australia where there is government subsidised health care.

SUMMARY STATEMENT

- **Why is this research needed?**
 - This study was essential in expanding our knowledge across a range of influences on paediatric Emergency Department use for non-urgent care.
 - The extent to which multiple characteristics, such as deprivation, influence non-urgent care remains under explored. A multivariate analysis was undertaken using binary logistic regression to determine the influence of Index of Relative Social Disadvantage on the use of paediatric Emergency Departments for non-urgent care.
- **What are the key findings?**
 - Deprivation is a significant factor in attendance at this paediatric Emergency Department for non-urgent presentations.
 - Efforts to limit non-urgent presentations at paediatric Emergency Department need to take into account wider societal influences and access to alternative care such as primary care.
- **How should the findings be use to influence policy and practice?**
 - Service configurations need to include GP/population ratios and provide alternative access for non-urgent paediatric patients
 - Nurse partitioners are ideally suited to meet the dearth of primary care for paediatric patients.

Key words: Nursing roles, non-urgent triage, non-urgent care, Australia, paediatric emergency services, deprivation, Emergency Department, Nurse Practitioner, Paediatric primary care.

INTRODUCTION

The use of hospital Emergency Departments (ED) for non-urgent care has increased rapidly in Australia and internationally (Beattie *et al.* 2001, Benahmed *et al.* 2012, Bradley 2005, Burt *et al.* 2003, Cowling *et al.* 2013, Farchi *et al.* 2010, Solar & Irwin 2007, Moore *et al.* 2009). This increased use of ED is believed to cause overcrowding, misdiagnosis and mistreatment (Beattie *et al.* 2001, Benahmed *et al.* 2012, Bradley 2005, Cowling *et al.* 2013, Farchi *et al.* 2010). Presentation at an ED occurs amongst individuals living in deprivation (Bell 2007, Benahmed *et al.* 2012, Kelaher *et al.* 2008). Other studies have shown a significant correlation between deprivation and distance to ED services with closer proximity to ED increasing use (Beattie *et al.* 2001, Benahmed *et al.* 2012, Carlisle *et al.* 1998, Fone *et al.* 2006). Significantly, in Australia non-urgent presentations at ED remains high, despite government funded access to primary care through the universal health access provided by Medicare.

Nurse practitioners (NP) provide front line patient care that is safe, effective and economical (Wiysonge & Chopra 2008, Twigg *et al.* 2014). The levels of extended and autonomous care provided by NP (Lowe *et al.* 2011) often results in decreased ED use, hospital admissions and readmission (Bayer & John 2010, Wiysonge & Chopra 2008) and this also enhances the cost effectiveness of using NPs (Bayer & John 2010). Additionally, the use of NPs may address the lack of afterhours services available to parents with sick children (Parry & Willis 2012). Patients attending ED for non-urgent care could receive NP care in the community (Stanley 2012). Furthermore, the use of NP could promote healthcare provision diversification (Stanley 2012, Bayer & John 2010, Gardner *et al.* 2012). The use of NP can assist in addressing the health care crisis (Wiysonge & Chopra 2008, Stanley 2012). Thus understanding community based factors that impact on the use of ED for non-urgent care is important, as it provides an insight into the possible role of the NP, in providing alternative care.

Background

Emergency Department users are often between the ages of 0-5 and 60-80 years (Siminski *et al.*, 2008, Siminski *et al.* 2008b, Siminski *et al.* 2005, Solar & Irwin 2007, Brousseau *et al.* 2011). In Australia, these age groups are the heaviest users of non-urgent ED services, increasing at a rate of 9.2% per annum, and often presenting with conditions that could use another service such as General Practitioners and Nurse Practitioners (Siminski *et al.* 2008,

Siminski *et al.* 2008b, Siminski *et al.* 2005, Solar & Irwin 2007, Gardner *et al.* 2012, Stanley 2012). Moore *et al.* (2009) found frequent attendees (those attending ED more than four times in a 12 month period) were more likely to present after hours, be single, middle aged males (>32 years), with these patients accounting for more than 46% of repetitive ED use. Earlier research by Siminski *et al.* (2008b) found that attendance by non-urgent care patients¹ after hours, to be statistically significant. Fone *et al.* (2006) found car ownership, access to public transport and shorter straight-line road distance to ED was correlated with higher levels of ED use. However, the correlation did not vary with income levels (Fone *et al.* 2006). Furthermore, the isolation of the characteristic of a population group, such as ethnicity, shows similar patterns of ED use for gender and age group as those described above, except in the 19-59 year age group which shows much higher rates of ED use in ethnic minorities (Dyhr 2007). In a Danish study, Dyhr (2007) found lower rates of telephone triage and GP use by immigrants. The literature described above illustrates that characteristics, such as levels of deprivation, age, gender, private car ownership, access to public transport, distance from ED, access to after-hours non-urgent care, cost of alternative services, and comprehensiveness of alternative services are also contributing factors to the use of ED for non-urgent care. Beattie, Gorman and Walker (2001), Farchi *et al.* (2010), and Benahmed *et al.* (2012) highlight the use of paediatric ED for non-urgent and possible primary care in the UK, Italy and Belgium respectively. Of note is the dearth of research focusing specifically on children as a unique ED population group. Studies that did measure age cohorts, found that children's access to appropriate care was influenced by deprivation, and organisational factors, such as limited access to a community based paediatrician and primary care. However, the extent of the impact of these influences using multiple characteristics in regression analysis remains under explored.

THE STUDY

Aim

The purpose of this study was to perform a deeper analysis of the Hospital Admission Status (HAS) data to determine the extent to which the Index of Relative Social Disadvantage (IRSD) (Australian Bureau of Statistics 2011b, Australian Bureau of Statistics 2011c) score (deprivation) influenced ED attendance for children.

¹ Those who could possibly use General Practitioners or primary care services

Research focusing on parental behaviours for presentations at ED for non-urgent paediatric care fails to recognise the impact of societal factors on paediatric ED access (Brousseau *et al.* 2011, Scolnik *et al.* 2011). Research has found a lack of primary care paediatric specialist services (Hendry *et al.* 2005, Williams *et al.* 2009, Brousseau *et al.* 2011) rather than blaming the parents for what is a possible structural service deficits (Hendry *et al.* 2005, Williams *et al.* 2009, Brousseau *et al.* 2011). This study was essential in expanding our knowledge across a range of influences on paediatric ED use for non-urgent care.

This study explored postcode based indices, such as: GP numbers per head of population in a postcode area; the percentage of triage priority presentations at non-urgent care levels per postcode area; the percentage of children discharged from ED per postcode area; the percentage of children accessing a GP prior to attending ED; the influence of deprivation indices on non-urgent ED use and the influence of distance on non-urgent ED use. Further, the novel use of concurrent, cross-sectional mixed methods (Australian Early Development Census 2015, Stewart 2014, Scolnik *et al.* 2011) provided a deeper understanding of the influences on paediatric ED use for non-urgent care from the parents, staff and managers of alternative services, such as GP Plus and GP Super Clinics. This article describes the quantitative results of a larger mixed methods study that isolates deprivation using the Index of Relative Social Disadvantage, and measures the impact of deprivation on presentations of paediatric patients to ED for non-urgent care.

Design

For this study the Paediatric only ED supplied the quantitative data consisting of 25,520 de-identified Paediatric ED attendances from June 2010 to December 2010. The cross-sectional data contained the family postcode, the triage priority of the presentations, whether the child was admitted or discharged, and whether the child has accessed a GP prior to ED attendance obtaining a referral letter (indicating prior primary care access). These variables were combined in the data set and included data from the ABS and *Social Health Atlas*, such as IRSD scores, GP numbers per health of population for postcode and the distance travelled to ED (Australian Bureau of Statistics 2011a, Australian Bureau of Statistics 2011b, Australian Bureau of Statistics 2011c, Glover *et al.* 2006). This data was entered into a logistic regression to determine the level of impact of these factors by deprivation.

Index of Relative Social Disadvantage

The level of deprivation in an area is measured by the Index of Relative Social Disadvantage

(IRSD). The Australian Bureau of Statistics (ABS) uses 17 measures derived from the national census for the Index of Relative Social Disadvantage (IRSD) as a measure of deprivation (Australian Bureau of Statistics 2011a, Australian Bureau of Statistics 2011b, Australian Bureau of Statistics 2011c). The resulting score from the national population census conducted by the Australian Bureau of Statistics provides an indication of deprivation of an area using the 17 measures.

These measures match those that have been identified as factors the impacting on the use of ED for non-urgent care, such as ethnicity (Dyhr 2007, Kelaher *et al.* 2008), lower levels of education (Beattie *et al.* 2001, Bell 2007, Burt *et al.* 2003, Carlisle *et al.* 1998), lack of access to adequate and secure income (Beattie *et al.* 2001 Bell, 2007, Benahmed *et al.* 2012, Kelaher *et al.* 2008), lack of car ownership (Moore *et al.* 2009), and the inability to raise emergency funds (Kelaher *et al.* 2008). For example, the IRSD indicates that areas that contain large numbers of unemployed have lower IRSD scores than areas containing large numbers of those employed as managers (Australian Bureau of Statistics 2011a, Australian Bureau of Statistics 2011b, Australian Bureau of Statistics 2011c). The lower an area's score the higher the rates of deprivation. Hence deprivation is inversely related to the IRSD score. Further, these 17 measures which form the IRSD describe access to income, services, material wealth and community resources in a designated data collection area for example, postcode area. The IRSD score provides further information on an area's population, for example, the descriptor 'employed in low skill community or personal service work' provides not only the level of education required to perform the work but also the wage level of the worker (Australian Bureau of Statistics 2011a, Australian Bureau of Statistics 2011b, Australian Bureau of Statistics 2011c). Areas containing large numbers of personal service workers would therefore have access to particular levels of income and affluence. The 17 measures of deprivation in the IRSD in Australia are listed in Table 1.

Table 1 Characteristics forming the ABS IRSD measure for the SEIFA score

	Measure of deprivation
1	Private dwelling
2	No internet
3	Employed as labourer
4	People aged over 15 years with no post-school qualification
5	People with an annual income between \$13,000-\$20,799

	Measure of deprivation
6	Renting from the Federal government or community organisation
7	Unemployed
8	One parent families
9	Paying less than \$120 rent per week
10	Aged under 70 years with long term health condition or disability needing assistance
11	Of Aboriginal or Torres Strait Islander origin
12	Private dwelling requiring one or more bedrooms
13	Aged over 15 years and has been separated or divorced
14	Employed as a machine operator or driver
15	Over 15 years and did not go to school
16	Employed in low skill community work or personal service work
17	Does not speak English

Source: Australian Bureau of Statistics 2011 2039.0 - Information Paper: An Introduction to Socio-Economic Indexes for Areas (SEIFA).

The use of the IRSD (in table 1) provided an overall picture of an area, the population measures of an area and that areas access to income. The use of the other area information, such as the provision of GP services per head of population is another important factor in the use of ED for non-urgent care. Non-urgent care is determined by the triage priority given to children presenting at ED.

Triage priority

All presentations at ED are subjected to a process of prioritisation using the Australasian Triage Scale (Commonwealth Department of Health and Family Services and Coopers and Lybrand Consultants 2003) that consists of an evaluation of the patients' condition to assess the level of urgency required for treatment. Triage identifies patients needing immediate clinical attention and patients that can wait. The patient's condition is assessed using a priority rating of between 1 to 5 with Priority 1 determining 'very urgent' clinical intervention, for example an abnormal vital sign such as heart rate, and treatment at level 5 'non-urgent' condition where it would be appropriate for the patient to wait 120 minutes or longer, for example chronic rhinitis (Commonwealth Department of Health and Family Services and Coopers and Lybrand Consultants 2003, van Veen *et al.* 2008). Table 2 illustrates the percentages of children admitted or discharged by triage priority during the

period of this study.

Table 2: Triage priority by admission or discharge status for Jun-Dec 2009

Triage Priority	1 Urgent care	2	3	4	5 Non-urgent care
Admitted	86%	70%	41%	11%	6%
Discharged	13%	29%	58%	89%	94%

On attendance at the ED the triage priority level is determined by a qualified Registered ED Nurse. Subsequently, all children in the ED are reviewed by a medical officer prior to admission or discharge. The percentage of children assessed at triage priority level 5 ‘non-urgent’ is of note as 94% are discharged, supporting the assertion that some of these attendees could be seen somewhere other than ED. Conversely, 86% of urgent triage priority level 1, ED attendees are admitted confirming the need of these attendees at ED. This initial information highlighted the need to understand the characteristics that determine increased use of ED for non-urgent care.

Participants

The 25,520 de-identified paediatric ED attendance included only data from participants within a 50km radius of the hospital. The paediatric ED only provides services across two states and is the centre of excellence for paediatric cranial facial services in the Asia Pacific region. Therefore, those patients arriving from further than 50 km would confound the data and were outliers. Additionally, paediatric ED attendees from further than 50 km often arrive by ambulance or air ambulance retrieval and do not constitute non-urgent use.

Ethical considerations

De-identified retrospective hospital and population based data was used in this portion of the research. The larger mixed methods research study received ethical approval from Flinders University (Ref ID=4409), and Women’s and Children Health Network, (Ref ID=REC2156/3/12).

Statistical analysis

A multivariate analysis was undertaken using binary logistic regression to determine the influence of IRSD on the use of ED for non-urgent care. Univariate logistic regression was

first performed variable by variable, without any adjustment. This was done to explore the association between each variable and the probability of use of ED for non-urgent care. We then proceeded to multivariate logistic regression by including all variables into the models. This was done to adjust for confounding between variables. Regression coefficients were expressed as unadjusted odds ratios from the univariate model and adjusted odds ratios from the multivariate model. Odds ratios (OR) were considered statistically significant if their 95% confidence interval (CI) did not include unity. The more the OR deviated from 1, the stronger the association between the exposure variable and the condition being studied. All statistical analyses were performed using SPSS version 18.0 (SPSS Inc., Chicago IL) and R version 2.14.0 (R Development Core Team).

Results

In the logistic regression model, the triage priority categories were collapsed to 1 = use non-urgent triage priority 4 and 5, and 0 = use urgent triage priority 1 or 2 or 3. The OR, confidence intervals and p values for each variable are presented in Table 3. The OR represents the odds that an outcome occurs given particular patients' characteristics (e.g. patients with lowest IRSD score [deprivation level]) compared to the odds of the outcome occurring in the absence of that characteristic (Szumilas 2010). Therefore this study determined the extent to which characteristics on attendance to ED, such as deprivation, distance and access to primary care, impacted on triage priority particularly non-urgent care. After adjusting the confounding effect of receiving a referral letters, discharge from ED, number of population per GP, and distance, the deprivation IRSD score was significantly associated with ED presentation.

Populations from areas with high levels of deprivation use ED for non-urgent care at significantly higher rates (Adjusted OR=0.83, 95% CI: 0.76-0.92, $p < 0.001$) than children attending from areas of low deprivation. However, the impact of deprivation on ED presentation was not significant in the unadjusted model. Further, there was a significant positive relationship between non-urgent triage priority and discharge from ED. The analysis indicates that children attending at non-urgent triage priority levels are almost 6 times (Adjusted OR=6.06, 95% CI: 5.67-6.48, $p < 0.001$) more likely to be discharged home rather than admitted. In addition, the distance travelled to Paediatric ED, was inversely related to non-urgent care use: long distance travellers have a slightly lower (1%) use of non-urgent

triage priority (Adjusted OR=0.996, 95% CI: 0.993-0.998, $p < 0.03$). This may further indicate that deprivation rather than the distance to ED influences the use of ED for non-urgent care. Furthermore, the analysis showed a significant negative relationship (Adjusted OR=0.72, 95% CI: 0.67-0.77, $p < 0.001$) between non-urgent care ED use and children attending a GP and receiving a referral letter prior to attending ED. Those children receiving a referral letter were more likely to be triaged at an urgent priority level, requiring more immediate care.

Importantly, there was a significant relationship between the numbers of GPs per person in a postcode area and triage priority level ($p < 0.01$), indicating one possible explanation for non-urgent care ED use, in the adjusted logistic regression model. This indicates that those attending ED from postcode areas that have higher population numbers per GP (thus less access to primary care for non-urgent care) are more likely to be triaged at non-urgent priority level signifying a presenting condition that is non-urgent in nature, but also demonstrating that they are in need of primary care. Furthermore, the areas with high numbers of population per GP, and consequently lower access to primary care, also have higher levels of deprivation. Therefore higher population numbers per GP, the more people per GP, can result in less access to primary care for a family. Accordingly, areas of more affluence and lower deprivation have higher numbers of GPs per head of population.

DISCUSSION

The use of ED for non-urgent health conditions by those living in deprivation was confirmed by this research (Beattie *et al.* 2001, Benahmed *et al.* 2012, Burt *et al.* 2003, Carlisle *et al.* 1998, Cowling *et al.* 2013, Fone *et al.* 2006, Siminski *et al.* 2008, Siminski *et al.* 2008b, van Doorslaer *et al.* 2004). Deprivation is a significant factor in the attendance at this ED for non-urgent presentations. Efforts to limit non-urgent presentation at ED need to take into account wider societal influences.

In contrast, to the literature discussed earlier (Fone *et al.* 2006), our findings suggest that distance from this Paediatric ED impacts only slightly on the use of ED for non-urgent care. In this study the researchers have successfully further isolated deprivation as a significant characteristic impacting on the use of ED for non-urgent care and we provide an alternative explanation to the characteristic of distance for non-urgent ED attendance. Thus rather than a short distance to the ED as the reason for increased ED use for non-urgent care, deprivation is a possible explanation for increasing ED use for non-urgent care. In addition,

this ED is situated in an area of high affluence and low levels of deprivation further isolating deprivation as a unique variable in the regression analysis. It is possible that deprivation rather than hospital location is an important predictor of non-urgent ED use.

In this study we found that those attending a non-urgent triage priority were almost six times more likely to be discharged. This finding assists in validating the triage categories and processes, as those children presenting in non-urgent triage priority are not deemed in need of immediate care or hospitalisation.

Families from areas with high levels of deprivation attending this ED were less likely to attend and obtain a GP referral letter to present to ED services as GP access in areas with high levels of deprivation is limited. A GP referral letter would indicate attendance at a primary care service prior to presentation at the ED services. The finding that children from areas of high deprivation do not attend ED with referral letters could be due to the notable lack of primary care service provision in areas of high deprivation, which was significant in the adjusted logistic regression ($p < 0.001$).

The method of analysis used a number of variables thus providing a greater understanding of the characteristics that impact on the use of ED for non-urgent care. This study assisted in illustrating the importance of community based service provision, such as GPs and Nurse Practitioners, and deprivation on the use of ED for paediatric non-urgent care. Offering NP paediatric specific alternatives to ED use may decrease the use of ED for non-urgent care.

Implications for nursing

This research highlights that a lack of community based services for children impacts on the use of ED for non-urgent care. Nurse practitioners (NP) are uniquely placed to address the needs of this vulnerable population group (Wiysonge & Chopra 2008, Stanley 2012, Bayer & John 2010). The use of NP may aid in the provision of timely and cost effectively alternatives to ED (Parry & Willis 2012, Stanley 2012, Naylor & Kurtzman 2010). Additionally, the use of regression analysis outlines the impact of several measures on non-urgent paediatric ED use and can inform future service configurations. The use of NP in areas of need can be justified by using the findings from examining societal factors, such as a lack of GP provision, to provide alternatives services for non-urgent paediatric ED use. Patient health, social and wellbeing measures have showed an improvement with the use of NP provided

care (Naylor & Kurtzman 2010). Nurse practitioners would enhance the use of community based healthcare services, such as Medicare Locals (Parry & Willis 2012).

Further, research that fails to determine the extent to which structural factors impact on service delivery do not address non-urgent use of paediatric ED access. Focusing on the behaviour of parents can blur the issues of service provision in areas of deprivation. Therefore using analysis that includes the level of GP provision provides greater insight into the lack of available services for non-urgent paediatric ED use.

Limitations and future research

This research has provided valuable insight into the role of deprivation on the non-urgent use of paediatric ED. The analysis framework could be used to determine the need for the provision and placement of future non-urgent care services. Further, the methods could be used as a template for analysis of the multiple variables involved in ED use. However, only one paediatric ED service was assessed and the inclusion of data from other ED would strengthen the study.

CONCLUSIONS

This research has expanded our knowledge across a range of influences on paediatric ED use for non-urgent care. The use of paediatric ED for care that could be provided by another health professional, such as a GP is influenced by the levels of deprivation in the area of residence rather than the location of the hospital or the distance travelled to receive care. This research is important as it illustrates those factors other than hospital location that impact on the use of ED for non-urgent care. Furthermore, there is a correlation between the provision of GP services, deprivation and the use of ED for non-urgent care. Arguably children living in areas of higher deprivation have less access to GP services and therefore rely on ED for non-urgent care. To address the increasing use of ED for non-urgent care could require the provision of alternative services, such as Nurse Practitioners in the community especially in areas with higher levels of deprivation. The use of ED for non-urgent care is of clinical significance as it has the potential to impede the care of acutely ill children.

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