

Prevalence of injuries among three-year-old children in the Republic of Ireland in 2011

Supplement to: Longstanding health conditions among three-year-old children in the Republic of Ireland in 2011: A report based on data from the “Growing Up in Ireland” study



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The Institute of Public Health in Ireland (IPH) publishes estimates and forecasts of the prevalence of chronic health conditions for national and subnational areas on the island of Ireland. To date we have published data on the prevalence of chronic airflow obstruction, diabetes, coronary heart disease, hypertension, musculoskeletal conditions, and stroke among adults, as well as the prevalence of carer-reported health conditions among children. This short report on the prevalence of injuries among children is a supplement to a report on carer-reported conditions among children in the Republic of Ireland (Institute of Public Health, 2014).



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The responsibility of the content of the final version of this report lies solely with the IPH.

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Study summary

- This study used the Growing Up in Ireland (GUI) study to estimate the prevalence of injuries in the Republic of Ireland (RoI) among 3-year-olds in 2011.
- Just under one in six children (16.1%; 95% CI = 15.2%-16.9%) ever had an injury that required hospital treatment or admission.
- After adjustment for other risk factors, risk of injury was higher among children in one-parent households, children with other children in their households, children whose primary carer had a longstanding health condition and children whose parents had lower levels of education. Risk of injury was higher among boys, and the combined effects of these risk factors were stronger (more negative) in boys than in girls.
- There was no significant variation in the prevalence (per cent) of injuries across RoI's 34 administrative counties and cities.
- Findings indicate a need for targeted injury prevention strategies that take account of the child's gender, family structure, and home environment.
- The report notes that RoI currently has no child injury prevention strategy and it recommends a more comprehensive study of the injury profile of RoI children to support childhood injury prevention in the state.
- This report supplements a larger study of health conditions among children in RoI in 2011 (IPH, 2014).

1. Introduction

1.1 Uses of data on injuries

This report examines the prevalence of non-fatal injuries among three-year-old children in the Republic of Ireland using data collected in 2011 in the Growing Up in Ireland (GUI) study. Reliable and valid prevalence estimates on injuries can be used to:

- Describe the pattern of injury in a population
- Identify characteristics that are associated with a higher probability of injury, thereby strengthening the evidence base for injury prevention
- Support evidence-informed policy development
- Support evidence-informed planning of health, disability and social care services.

1.2 Policy context

Childhood injury has significant implications for child health, disability and mortality. There is increasing evidence from life course epidemiology that experiences in the early years of life are a determinant of later health and wellbeing (World Health Organization, 2013). The Republic of Ireland's (RoI's) current Government policy *Healthy Ireland: A Framework for Improved Health and Wellbeing 2013-2025* (Department of Health, 2013) identifies a number of issues that this study helps to inform:

- Supporting parents and families in promoting and maintaining child health and safety
- Identifying key risk factors for poor health and wellbeing
- The role of local government and community groups in addressing health, safety and wellbeing.

Better Outcomes, Brighter Futures: The National Policy Framework for Children and Young People 2014–2020 (Department of Children and Youth Affairs, 2014) specifies a shift in policy toward earlier intervention as one of its six transformational goals. This policy framework specifies priorities for RoI in five outcome areas, one of which is that children should be safe and protected from harm. Under this outcome area, a policy priority is that all national public awareness strategies on safety and accident and injury prevention will incorporate and target children.

There is, at present, no national, overarching policy on child (or indeed adult) injury prevention, although there is a strategy to prevent falls in RoI's older population (Health Service Executive, National Council on Ageing and Older People & Department of Health, 2008). A National Injury Prevention Strategy action plan was due to be drawn up towards the end of 2002 as part of the *Quality and Fairness Action Plan 2001-2010* (Government of Ireland, 2001), but at the time of writing, no action plan is in place. However, the Health Service Executive (HSE) has a child safety awareness programme (CSAP). CSAP aims to reduce and prevent child injuries at home and is delivered by public health nurses during child health surveillance visits. It is supplemented by a range of informational materials for parents and others working with children¹. Also, Síolta (the national quality framework for early childhood education) has developed user manuals and other materials which set out guidelines for child safety. These are supported by a quality assurance programme

¹ http://www.hse.ie/eng/health/child/childsafety/awareness_programme_CSAP.html

(QAP) and it has been recommended that elements of the QAP are implemented into the national *Early Years Strategy* (Department of Education and Skills Early Years Education Policy Unit, 2013).

Since around 2001, there have been many calls for an injury strategy or policy. For example, in the report of the Expert Advisory Group on the *Early Years Strategy* (Department of Children and Youth Affairs, 2013), it is noted (p. 13) that “Whilst there is much good work being done by practitioners, such as public health nurses and agencies, with a particular focus on different aspects of injury prevention, there is no overall action plan for the prevention of childhood injury.” That report includes as one of its recommendations under Theme 3 (health and well-being) that a comprehensive child injury prevention action plan should be developed.

In contrast to the Republic of Ireland, Northern Ireland has recently published a ten-year *Home Accident Prevention Strategy* which uses a co-ordinated, interagency approach, with under-5s and over-65s as priority groups (Department of Health, Social Services and Public Safety, 2015).

The EU-level TACTICS (Tools to Address Childhood Trauma, Injury and Childhood Safety) initiative (<http://www.childsafetyeurope.org/tactics>) provides some evidence (through its national Child Safety Report Cards) that ROI has made improvements in some injury prevention policy areas relating to water safety/drowning prevention, poisoning prevention and burn prevention; though there was still a perceived need for improvement in other areas including motor vehicle passenger, pedestrian and cycling safety, drowning, and burns (Vincenten & MacKay, 2014; European Child Safety Alliance, 2012a, 2012b).

Some ‘headline’ facts and figures help to illustrate the importance of child injury as a public health issue:

- Injuries are the leading cause of death among children and place a large burden on health systems. EuroSafe (2013) estimates that 28% of all deaths across the European Union (EU) among children aged 0-14 years are due to injuries. Injury occurrence is disproportionately higher among children compared to the rest of the population (RoSPA, 2013). For example, across the EU, it is estimated that 7.9 million children (aged 0-14 years) are treated in hospital for injuries. This represents 19% of all hospital injuries, while this age group represents only 16% of the total population (EuroSafe, 2013).
- Child injuries are strongly associated with gender and socioeconomic characteristics, being higher among boys and among children in socioeconomically disadvantaged environments (see Section 1.5).
- The large variation in injury rates (Eurosafe, 2013) and injury prevention policies across the EU (see <http://www.childsafetyeurope.org/tactics/>) suggests that injuries are preventable and the evidence² confirms that injury prevention strategies can be both effective and profitable. The Royal Society for the Prevention of Accidents (RoSPA) (2013) comments that a well-designed programme can reduce accidents by 20-30% in the target population or area and that the return rate on investment typically ranges between 3 and 10 times the original

² See, for example, the Effective Measures in Injury Prevention database at <http://www.eurosafe.eu.com/csi/eurosafe2006.nsf/wwwVwContent/12effectivemeasures.htm>; also Vincenten and MacKay (2014).

amount invested. However, regularly updated and high-quality data are required as a base for injury prevention efforts.

1.3 Research and information context

Data on injuries among children requiring hospitalisation are available for RoI under the Hospital In-Patient Enquiry Scheme (HIPE; www.hpo.ie), where data are reported on by broad age band and gender. Data from the Injury Observatory for Britain and Ireland (IOBI; www.injuryobservatory.net) provide information on the rates of hospital admissions for serious injuries (again by age group and gender). However, this information provides only a partial picture since it does not include cases of injury which required treatment but not hospitalisation. Furthermore, other than gender and age, little information is available on the characteristics of children admitted to hospital due to injury, so the capability of the data to inform injury prevention strategies is limited.

At EU level, the European Injury Data Base (IDB) contains standardised cross-national data on the external causes and circumstances of injuries treated in emergency departments (http://ec.europa.eu/health/data_collection/databases/idb/index_en.htm). In order to encourage continuation of injury data collection efforts, a three-year public health Joint Action on Monitoring Injuries in Europe (JAMIE) was implemented from 2011–2014. Each participating Member State designated a national organisation to co-ordinate EU-JAMIE, which aims to have a common hospital-based surveillance system for injury prevention in operation in all Member States by 2015. JAMIE incorporates two datasets, both of which are collected at hospital emergency departments. All hospitals in a country are supposed to collect the minimum dataset, and this is supplemented by a more detailed dataset, collected by a sample of hospitals (EuroSafe, 2013). In RoI, the organisation responsible for co-ordinating the work on JAMIE is the National Suicide Research Foundation (NSRF).

The Injury Surveillance Platform (network of IDB countries) will continue to operate within the EU Bridge-Health (2015-2018) project (<http://www.bridge-health.eu/>) to further integrate the IDB standardised methodology and classification system into all primary and secondary care health systems. As part of this programme, the Injury Surveillance Platform will continue to support countries through coaching, providing guidance, and arranging training workshops. The NSRF will be involved in as RoI's national data administrator. However, each country is responsible for securing their own funding to implement national surveillance systems (National Suicide Research Foundation (RoI), personal communication, November 15, 2015). Beyond this, future plans for EU-level injury data collection and surveillance efforts are unclear, and funding is an issue (Kirkwood et al., 2014; National Suicide Research Foundation (RoI), personal communication, October 9, 2015).

Survey-based data on non-fatal injuries among children complement hospital admissions data, since they can provide prevalence estimates along with details on other background characteristics, allowing identification of risk factors and, depending on the design of the survey, a tool for monitoring trends in injuries over time. One such source is the international Health Behaviour in School-Aged Children (HBSC) study. HBSC provides cross-sectional data on self-reported injuries among children aged 11 to 17 years every four years (Nic Gabhainn, Kelly, & Molcho, 2007; Molcho et al., 2009; Callaghan et al., 2012; <http://www.hbsc.org/> and <http://www.nuigalway.ie/hbsc>). Survey-based data on carer-reported injuries for younger children in RoI are available from the longitudinal Growing Up in Ireland (GUI) study (Polak & Coen, 2012; Williams et al., 2013; <http://www.growingup.ie>).

There are other data sources on injuries in RoI. These include mortality data from the Central Statistics Office (CSO), Garda data on road accidents and assaults, the National Self-Harm Registry Ireland which records information on emergency department attendances due to self-harm among persons aged 9 years and older (Griffin et al., 2015), the Poisons Information Centre of Ireland (see its 2014 *Annual Report*), Irish Water Safety (analyses of drowning 1998-2012; Irish Water Safety, n.d.), statistics on child injuries and fatalities on farms published by the Health and Safety Authority (http://www.hsa.ie/eng/Your_Industry/Agriculture_Forestry/Young_Elderly_on_Farms/Children_on_Farms/), and the Road Safety Authority (*Child Casualties Report, 1997-2009*; RSA, n.d.)³.

Some limitations with current data sources on injuries in RoI have been noted. For example, there is no national-level collection of emergency unit data. HIPE (www.hpo.ie) reports on injury admissions at a national level (excluding private hospitals; Healthcare Pricing Office and Health Service Executive, 2014), but it does not include individuals presenting to emergency departments who don't require admission (National Suicide Research Foundation (RoI), personal communication, October 9, 2015). This limitation had previously been identified by Scallan et al. (2001, p. 65), who recommended that accident and emergency departments should record injury data, and that this should be centrally collated. There have also been calls for better data on the cause and location of injury (Molcho & Barron, 2014), along with calls for more integration of existing data sources (Department of Children and Youth Affairs, 2011, 2013).

The need for better data surveillance for monitoring child injuries in RoI has been further highlighted by Scallan et al. (2001) and the Department of Children and Youth Affairs (2011, 2013). The *National Strategy for Research and Data on Children's Lives 2011-2016* (Department of Children and Youth Affairs, 2011) has identified child injury as one of the data gaps that should be prioritised, ie to address gaps in information on "rates of occurrence [of injuries] and factors influencing these events" (p. 28). The Expert Advisory Group on the *Early Years Strategy* has commented on the need for support for a review of existing data sources on injuries to develop a more co-ordinated approach, "...to consider how the collective data from these sources can assist in informing policy and interventions that are being put in place to support children and their families, often with a view to breaking the intergenerational cycle of disadvantage and poverty" (Department of Children and Youth Affairs, 2013, pp. 27-28).

1.4 Prevalence of injuries: Previous relevant research

The research and data considered here focus on younger children, since the present study examines injury prevalence among three-year-olds.

Data for RoI on hospital admissions due to injury⁴ for 2012 (the most recently available at the time of writing) come from HIPE (www.hpo.ie). The data indicate that 3.7% of all hospital admissions (adults and children combined) were due to injury. Among children aged 0-14 years⁵, however, the percentage of admissions due to injury was higher, ie 8.8% of all admissions for this age group were

³ These sources are not considered here in detail; see Molcho and Barron (2014) and the Injury Observatory of Britain and Ireland (IOBI; www.injuryobservatory.net) for an overview of these and other data sources on injuries in RoI.

⁴ These are identified by diagnosis category: Injury, poisoning and certain other consequences of external causes.

⁵ A breakdown of injury rates among narrower age bands is not routinely published through HIPE.

due to injury. This represents approximately 13.8% of the total population of 0-14 year-olds⁶ but does not account for the possibility of multiple admissions per individual in the time period.

Admissions to hospital due to injuries amount to 3.8% of all inpatient days (or 4.4% of all inpatient days among 0-14 year-olds). Data for 2011 indicate that 9.2% of all admissions to hospital for children aged 0-17 years were due to injuries (Department of Children and Youth Affairs, 2012).

Data by age group show that 36.7% of injuries admissions were among children aged 0 to 4 years, 24.9% were aged 5 to 9, 22.9% were aged 10 to 14, and the remainder (15.4%) were aged 15 to 17. The three most common causes (among all children) in 2011 were falls (40.5% of all injuries), accidents caused by objects (15.9%), and transport accidents (8.9%) (Department of Children and Youth Affairs, 2012).

Analyses of patterns of unintentional injury in the Republic of Ireland for the years 1993-1997 (Scallan et al., 2001) indicate that children under the age of five years accounted for 9.7% of all hospital admissions. This represents an average annual admission rate of 1,699 per 100,000. Children aged 5 to 14 accounted for 16.6% of all hospital admissions, representing a rate of 1,196.6 per 100,000 children in this age group.

The IPH has been involved in the Injury Observatory for Britain and Ireland (IOBI; www.injuryobservatory.net), an initiative whose work includes the development of comparable injury data for England, Ireland, Northern Ireland, Scotland and Wales. Data on serious injuries which required hospital admission in 2011 have been published by IOBI. By limiting analyses to those considered as serious, IOBI aimed to minimise differences in hospital admissions thresholds and improve comparability between countries; the downside of this analysis is that the prevalence of all injuries is unknown. Among 0-4-year-olds in RoI, there was a hospital admission rate of 132.6 per 100,000 population⁷ for serious injury.

This information, of course, does not include individuals requiring treatment for injury but who were not admitted to hospital.

The GUI infant cohort at age 3, the dataset on which the present study is based, has previously been analysed with respect to injury. Williams et al. (2013) reported that 16% of all children aged 3 years of age in RoI (data collected in 2011) had ever experienced injury that required hospital treatment or admission. The present study builds on that analysis by providing a detailed examination of risk factors associated with injury, as well as an analysis of geographical variation in child injury rates.

⁶ This percentage was calculated on the basis of an estimate of the total number of 0-14 year-olds in 2012 derived from the CSO's online StatBank tool (www.cso.ie).

⁷ These are directly aged standardised rates (DASRs) expressed per 100,000 European Standard Population.

1.5 Injuries among different sub-groups of children: Previous relevant research

The research and data considered here again focus on younger children.

The WHO (World Health Organization, 2008) provides an overview of the research on variations in injuries among different sub-groups of children (including specific types of injury); a detailed examination is outside the scope of this report. This section provides a brief overview of two topic areas – gender and socioeconomic circumstances.

Gender differences in injury rates tend to appear during the first year of life and are consistently higher among boys. Injury rates are about 24% higher among boys than girls aged 0-15 (World Health Organization, 2008). Various explanations have been put forward for these gender differences, common ones being gender differences in activity levels and risk-taking behaviour, gender socialisation, and gender-related patterns of parental or adult supervision (World Health Organization, 2008).

Hospital admissions data for RoI are consistent with gendered patterns of injury occurrence internationally. Data from HIPE for 2012 show that approximately 12.3% of the population of girls aged 0-14, and 15.1% of the population of 0-14 year-old boys, were admitted to hospital due to injury⁸. Similarly, the analyses of 2011 hospital admissions by IOBI due to serious injury among 0-4 year-olds indicate a higher rate of admission among boys in RoI (157.7 per 100,000 population) than girls (106.3 per 100,000)⁹. Scallan et al.'s (2001) analyses of hospital data admissions due to unintentional injury for 1993-1997 indicated that among the under-5s, the rate of admission for boys was 1,920.3 per 100,000 of the population, and for females it was lower, at 1,463.9 per 100,000 of the population.

Survey-based results are consistent with respect to higher injury rates among boys. Williams et al. (2013) reported that, among the three-year-olds in GUI in 2011, 18% of boys compared with 15% of girls had ever had an injury requiring hospital treatment or admission.

The research has also established that injury rates are socially stratified: they are more prevalent among children living in poverty. Vincenten and MacKay (2014) noted that a majority of differences in rates of injury both within and across countries in the EU are due to differences in what they term 'social standing' and levels of exposure to environmental hazards. They comment (p. 8): "The inequalities that exist for child injury are for the most part unnecessary and avoidable – as such they are unjust and unfair and lead to inequity".

The WHO (2008, 2014) and the Child Accident Prevention Trust (2013) show that research has provided consistent evidence for higher injury rates being associated with economic factors (such as low income), social factors (such as mothers' education), family structure (including one-parent families and more children in the family), and accommodation characteristics (such as overcrowding). In addition, children living in poverty tend to be exposed to more environmental

⁸ These percentages were calculated on the basis of an estimate of the total numbers of male and female 0-14 year-olds in 2012 derived from the CSO's online StatBank tool (www.cso.ie).

⁹ It may be noted that the serious injury rate among 0-4 year-olds in RoI (132.6 per 100,000) was the second lowest among the five countries examined (NI, England, RoI, Scotland and Wales: average = 152.3 per 100,000). The ratio of males to females in RoI (1.5:1) was just slightly higher than the five-country average of 1.3:1 (www.injuryobservatory.net).

hazards, such as unsafe homes (unprotected windows, inadequate or faulty electrical supply), unsafe traffic and fewer safe play areas in their local communities.

In a summary paper on inequalities in injury in the UK, the Child Accident Prevention Trust (2013) presents evidence that children aged 0-15 years in households where parents never worked, or were in long-term unemployment, were 13 times more likely to suffer an injury-related death than children in households where parents worked in higher managerial or professional occupations. In analyses of hospital admissions in the UK, it has been found that children from the most disadvantaged families were more likely to be admitted to hospital, and to be admitted with severe injuries. The social gradient associated with injury was more marked among 0-4 year-olds than for 14-year-olds (Child Accident Prevention Trust, 2013).

Hospital data (including data collected through emergency department admissions) as currently collected in RoI do not inform this issue, since, as noted previously, only patient gender and age are routinely reported on. There is limited published work using survey data that examines variations in child injuries in RoI by background characteristics other than age and gender and it has tended to examine injury variation rates among older children (Polek & Coen, 2012; Nic Gabhainn et al., 2007; Molcho et al., 2009; Callaghan et al., 2012).

Using data from the GUI infant cohort at age three years, Williams et al. (2013) examined variations in injury prevalence. They found that the strongest predictor of injury among three-year-olds in their analysis was family type. A quarter (25%) of children in a one-parent, multi-child (2 or more) family had ever experienced injury, compared with 16% of children in a two-parent, one-child family. Research using an identically-worded question on the basis of the GUI child cohort at 9 years (Polak & Coen, 2012) has found associations between rates of injury and a range of socio-demographic characteristics, including household poverty, low parental education, child involvement in bullying (both as victim and perpetrator), and conduct or hyperactivity problems in the child. Research using a UK sample of seven-year-olds suggests that poverty mediates the relationship between family structure and injury rates (Pearce et al., 2013). The relative importance of the child's age and its relationships with various risk factors associated with injury are areas that may merit further research in RoI.

1.6 Aims

This study aims to address some of the gaps in information on injury outlined in the previous sections by examining the prevalence of child injuries and identification of risk factors associated with injury, using data from the Growing Up in Ireland (GUI) survey.

- It provides national estimates of the prevalence of injuries among three-year-old children requiring hospital admission or treatment in the Republic of Ireland in 2011
- It describes how prevalence varies with important characteristics and identifies groups of children and their families who more likely to experience injury
- It describes how the prevalence of these conditions varies across the subnational regions in the Republic of Ireland
- The study also aims to provide information that may be used to develop and enhance injury prevention policy and strategies.

2. Method and data sources

The methods used for this study are the same as those used in the report on *Longstanding health conditions among three-year-old children in the Republic of Ireland in 2011*, which also used the GUI Wave 2 Infant Cohort dataset at age 3 years (Institute of Public Health in Ireland, 2014, Chapter 2).

The prevalence estimates for ROI are based on Wave Two of the Infant Cohort of the Growing Up in Ireland (GUI) National Longitudinal Study of Children. Wave Two consisted of interviews conducted in 2011 with 9,793 families of three-year-old children (91% of families who participated in Wave One of the survey when the children were nine months old). The data were weighted by the GUI study team to account for non-participation of families at Wave Two and are representative of the population of children who were resident in Ireland aged three years in 2011 (and also resident in Ireland at age 9 months). Detailed information about GUI can be found at <http://www.growingup.ie>.

The question from which data were used to estimate the prevalence of injuries is shown in Table 1. Note that GUI asked about injuries that required hospital treatment or admission, and the wording of the question results in *lifetime prevalence* estimates for injuries among three-year-olds.

Table 1: Question used to estimate the prevalence of injuries among three-year-olds in ROI (GUI, 2011)

Injury that required hospital admission or treatment (GUI)	Child's primary carer answered: YES to: "Most children have accidents at some time. Has <child> ever had an accident or injury that required hospital treatment or admission?"
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The national estimate for the Republic of Ireland of the *per cent* of three-year-olds experiencing one or more injuries was based on the per cent of the weighted GUI sample whose main carer reported that their child ever had one or more injuries. The national estimate of the *number* of three-year-olds experiencing injury (again, one or more) was obtained by applying the per cent of the weighted GUI sample experiencing injury to population counts from ROI Census 2011.

Characteristics that influence health operate on a number of interconnected levels. We examined a range of characteristics to see how they were related to injury. These can be grouped into *child characteristics* (biology, health characteristics, and health behaviours), *primary carer characteristics* (health characteristics and health behaviours), and *community or neighbourhood characteristics*. The full list of variables that were examined in these analyses can be found in the report on health conditions among children in ROI (Institute of Public Health in Ireland, 2014, Appendix 2).

A statistical model was developed to describe how the injury prevalence varied with child, carer, household and neighbourhood characteristics in the survey data. The statistical model divided the children into groups defined by these characteristics and provided an estimate of the (weighted) per cent of children having the condition in each of these groups. Characteristics were initially examined one at a time, then jointly. Those which showed significant joint associations with injury were tested for significant interactions.

The number and per cent of three-year-old-children in subnational areas (34 administrative counties and cities in ROI; see Institute of Public Health in Ireland, 2014, Appendix 2) who had experienced an injury was estimated by multiplying the national model's per cent of children who had experienced injury in each of the groups by the estimated number of children in the groups in subnational areas based on data from Census 2011.

3. Results: Injury requiring hospital admission or treatment in the Republic of Ireland

3.1.1 Overall prevalence

About 11,200 (16.1%; 95% CI = (15.2%, 16.9%)) three-year-olds in ROI in 2011 had ever had a carer-reported accident or injury that required hospital treatment or admission.

3.1.2 Comparisons with other studies

Comparisons with other estimates of injury prevalence are hampered due to difference in the age groups of the children and operational definitions of injury, particularly whether or not the injury required admission to hospital, and also whether prevalence refers to lifetime prevalence or prevalence during a specific period of time.

Williams et al. (2013) reported a prevalence rate – 16% – that is identical to the estimate for the present study, which is as expected, since the same dataset was used.

Findings from the Growing Up in Scotland longitudinal study indicated that about 24% of three-year-olds had ever experienced an injury that required assistance from the National Health Service, while about three-quarters of these, or about 18% of all toddlers, went to accident and emergency departments. Only 5% of this 18% resulted in admissions to hospital (data collected in 2004-2005; Anderson et al., 2007). The figure of 18% is comparable and similar to our estimate of 16%.

Using data from the Millennium Cohort Study (MCS) Pearce and her colleagues (Pearce et al., 2010, 2012, 2013) estimated that, across the UK, 35.6% of children aged three years had experienced one or more injuries requiring treatment from a doctor, health centre, or hospital, since the age of nine months; 22% were injured in the home, and 14% outside of the home (Pearce et al., 2013). The estimate of 36% is quite a bit higher than our estimate of 16% and is likely to be due to differences in the wording of questions in MCS (implying any medical treatment) and GUI (implying contact with a hospital).

Recent estimates for Wales of the percentages of children attending emergency departments during 2010-2013 indicate that on average across these years, 16.2% of all children aged 0-4 years (14.6% of females and 17.7% of males) had been to an emergency department for treatment of unintentional injuries. About 11% of this 16.2% were admitted to hospital (see www.injuryobservatory.net). This estimate – 16.2% – is in line with our estimate of 16.1%. However, the meaning of our estimate is not the same as the one for Wales: the Welsh data provides an average annual prevalence for 0-4 year-olds (from emergency department data), while GUI provides lifetime injury prevalence (from a survey).

3.1.2 Characteristics related to overall prevalence

When the 22 child, carer, household and neighbourhood characteristics were considered one at a time, the unadjusted prevalence of carer-reported injury varied significantly with eight characteristics:

- Child's sex ($p=0.0002$): prevalence was higher among males
- Primary carer's health status ($p<0.0001$): prevalence was higher among children whose primary carer had a longstanding illness, condition or disability
- Number of parents in the household ($p<0.0001$): prevalence was higher among children in households with one parent
- Household social class ($p=0.0049$): prevalence was higher among children in households with the lowest social class compared with children in households in the highest two social classes
- Primary carer's education ($p=0.0174$): prevalence was higher among children whose primary carer had a post-second level non-degree compared with third level degree or higher
- General Medical Services (GMS) scheme status ($p=0.0043$): prevalence was higher among children who were fully covered by the GMS scheme compared with children who were not covered
- Safety of playing outside in the neighbourhood ($p=0.0132$): prevalence was higher among children whose primary carer thought it was not safe to play outside in the neighbourhood
- Rural / Urban ($p=0.0011$): prevalence was higher among children living in urban areas.

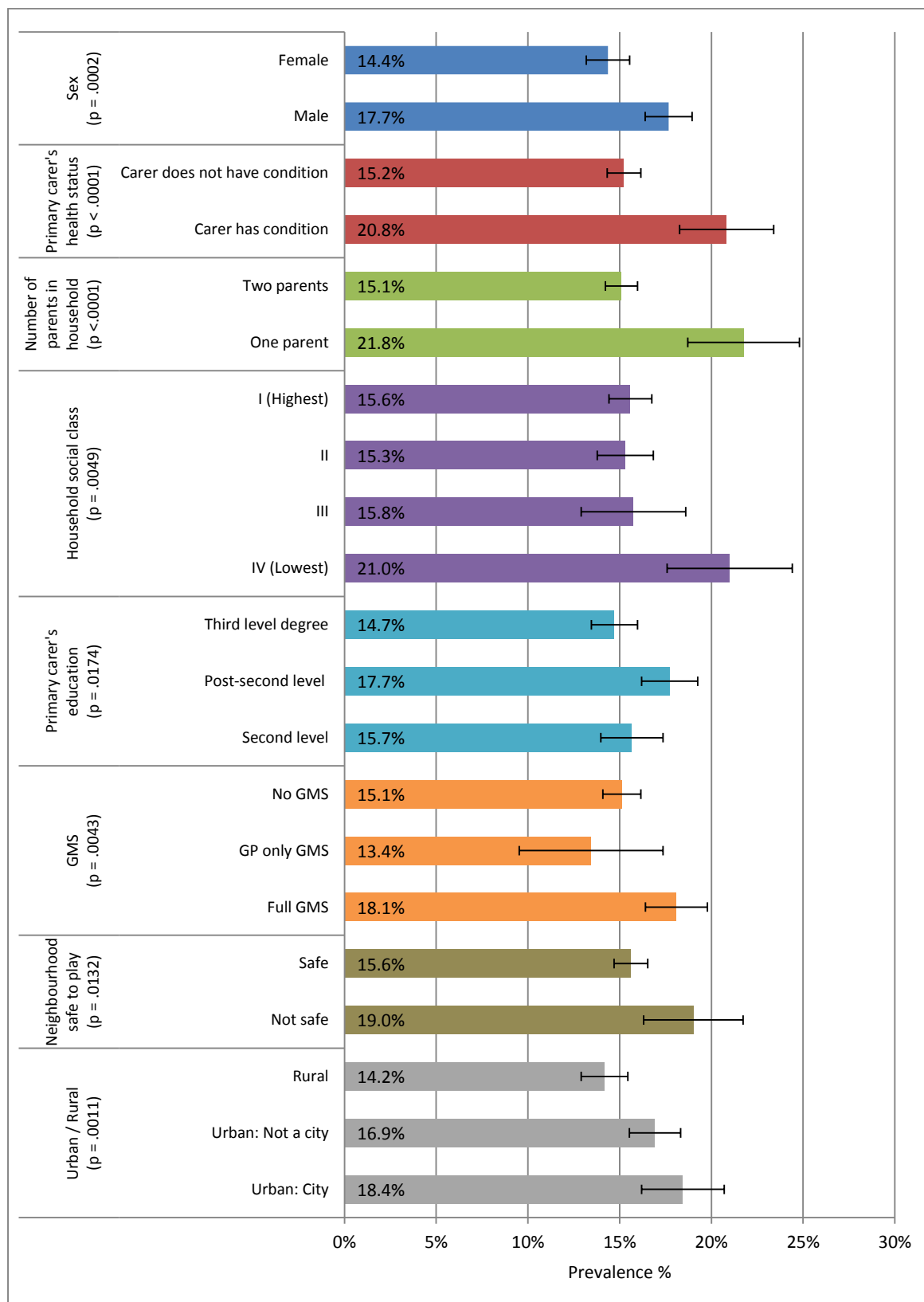
The prevalence per cents and their 95% confidence intervals are shown in Figure 1.

Injury prevalence did *not* vary by child's birthweight, allergy and non-skin allergy status, body mass index, quality of diet, maternal smoking and alcohol intake during pregnancy, whether the child had been breastfed, current smoking in the child's home, other children in the household, income quintile of the household, private health insurance status, living conditions of the home, or layout of the home.

These characteristics are inter-related and combine in complex ways to influence prevalence. A statistical model based on stepwise logistic regression¹⁰ was used to identify those characteristics that had significant relationships with injury that required hospital treatment or admission that were not explained by the other characteristics. The model's characteristics and their effects are summarised in Table 2.

¹⁰ Details of the statistical model employed are in Institute of Public Health in Ireland (2014, Chapter 2).

Figure 1: Estimated lifetime prevalence (%) of an injury that required hospital treatment or admission among three-year-olds in ROI by child, carer, household and neighbourhood characteristics that were significantly related to prevalence¹¹. Source: Growing up in Ireland, 2011

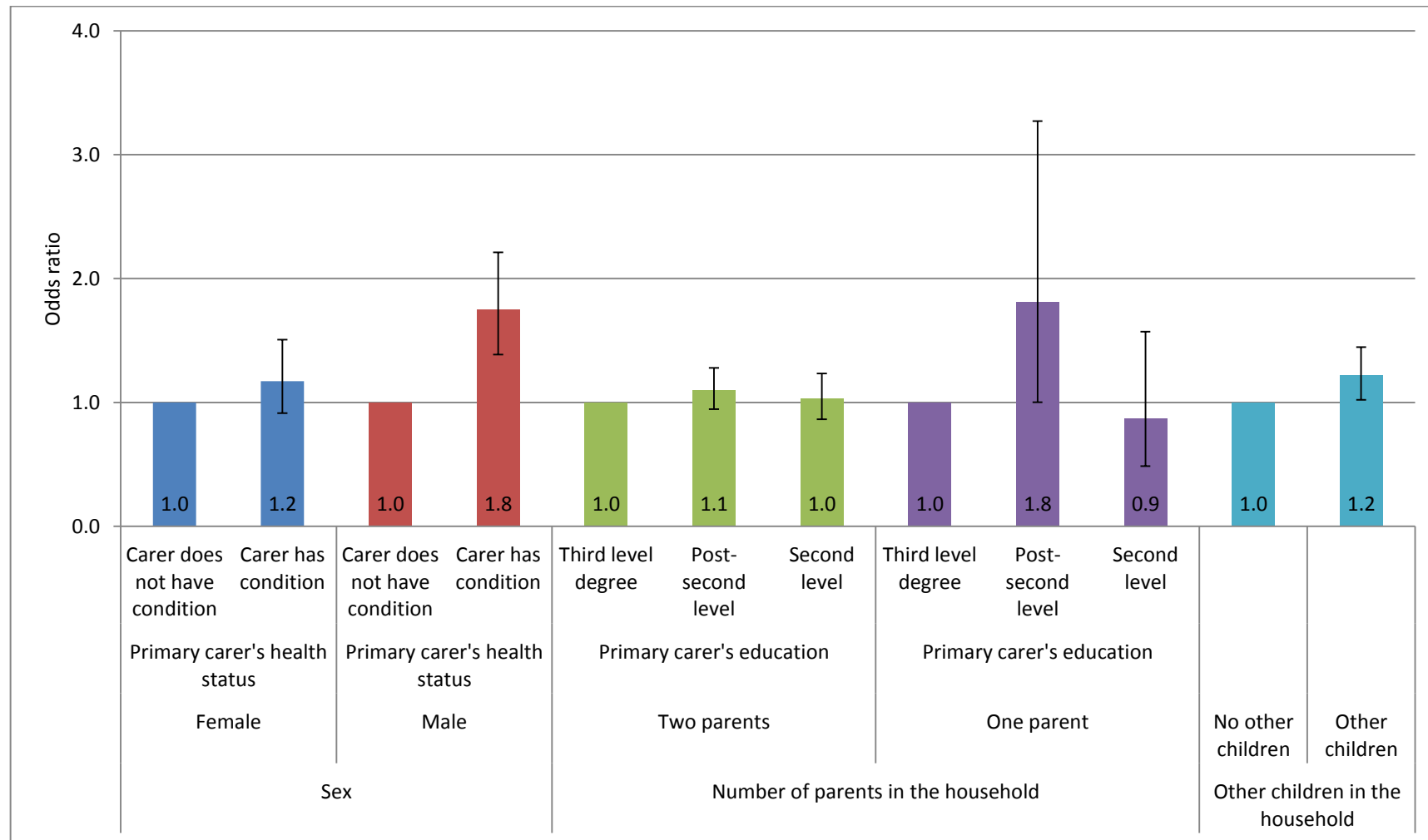


¹¹ Confidence intervals for categories of some child, carer, family and neighbourhood characteristics overlap. However, the confidence intervals for the *difference* between categories do not overlap. Therefore there is a significant association between all characteristics in the figure with the condition in question.

Table 2: Child, carer and household characteristics and their effect on the lifetime prevalence of an injury that required hospital treatment or admission among three-year-olds that is unexplained by the other characteristics (RoI). Source: Growing Up in Ireland, 2011	
Characteristics with significant effects after adjusting for all the other characteristics	Effect
Child's sex	Injury was significantly more likely among males (particularly if the primary carer had a longstanding illness, condition or disability).
Primary carer's health status: Having a primary carer with a longstanding illness, condition or disability	Significant effects depended on child's sex: <ul style="list-style-type: none"> • Females: No significant effect • Males: Injury was significantly more likely if primary carer had a longstanding illness, condition or disability.
Number of parents in the household	Significant effects depended on the primary carer's education: <ul style="list-style-type: none"> • Third level degree: No significant effect • Post-second level non-degree: Injury was significantly more likely if household had one parent • Second level: No significant effect.
Primary carer's education	Significant effects depended on the number of parents in the household: <ul style="list-style-type: none"> • Households with two parents: No significant effect • Households with one parent: Injury was significantly more likely among children whose primary carer had a post-second (non-degree) level.
Other children in the household	Injury was significantly more likely among children in households with other children.

Figure 2 shows the odds ratios and their 95% confidence intervals for these characteristics after adjusting for other characteristics. As noted in Table 2, there is an interaction between child's gender and primary carer's health status, as well as between primary carer's education and number of parents in the household, so results are plotted separately for these groups in Figure 2.

Figure 2: Adjusted odds ratios for lifetime prevalence of an injury that required hospital treatment or admission among three-year-olds in ROI by sex, primary carer's health status, number of parents in the household, primary carer's education, and other children in the household. Source: Growing Up in Ireland, 2011



3.1.3 Prevalence among different groups of children

The national model for RoI (ie, referred to in Table 2 and Figure 2) also provides an estimate of the prevalence per cent among different groups of children defined by their characteristics. Table 3 shows the prevalence of carer-reported injury that required hospital treatment or admission for each of these groups. Although the overall prevalence was 16.1%, there was an unequal burden across groups of children.

Since the model of risk factors is reasonably complex, it is useful to examine it in more detail and consider which children have lowest and highest rates of injuries, depending on the particular combinations of characteristics.

Among children, injury rates are *lowest* (about 11-14% in girls and 13-17% in boys) in two-parent households where the primary carer did not have a longstanding condition, irrespective of whether there were other children in the household or not, and irrespective of parental education levels.

Injury rates are slightly higher in both girls (about 13-16%) and boys (21-26%) in two-parent households where the primary carer *did* have a longstanding condition, again irrespective of parental education or the number of children in the household. Injury rates among children are higher again in one-parent households and where the primary carer had a longstanding condition (ranging from 17-32% in girls and 25-46% in boys), and in these groups the cumulative effects of parental education become evident.

Among girls in one-parent households where the main carer had a longstanding condition, injury rates were *highest* where the main carer had a post-secondary non-degree education level, whether with (32%) or without (28%) other children in the household. A similar pattern is evident among boys, but the accumulation of risks results in higher injury prevalence (41% among boys in one-parent household where the primary carer had a longstanding condition, post-second non-degree education, and no other children; and 46% with other children).

Three main patterns are therefore evident in these results:

- First, children in homes with two parents and whose primary carer did not have a longstanding health condition were at the lowest risk of injury.
- Second, children in one-parent households, and where the carer had a longstanding condition, were at higher risk of injury, most notably children whose primary carer had post-second level (non-degree) education.
- Third, the cumulative effect of these risks is stronger (more negative) for boys than for girls.

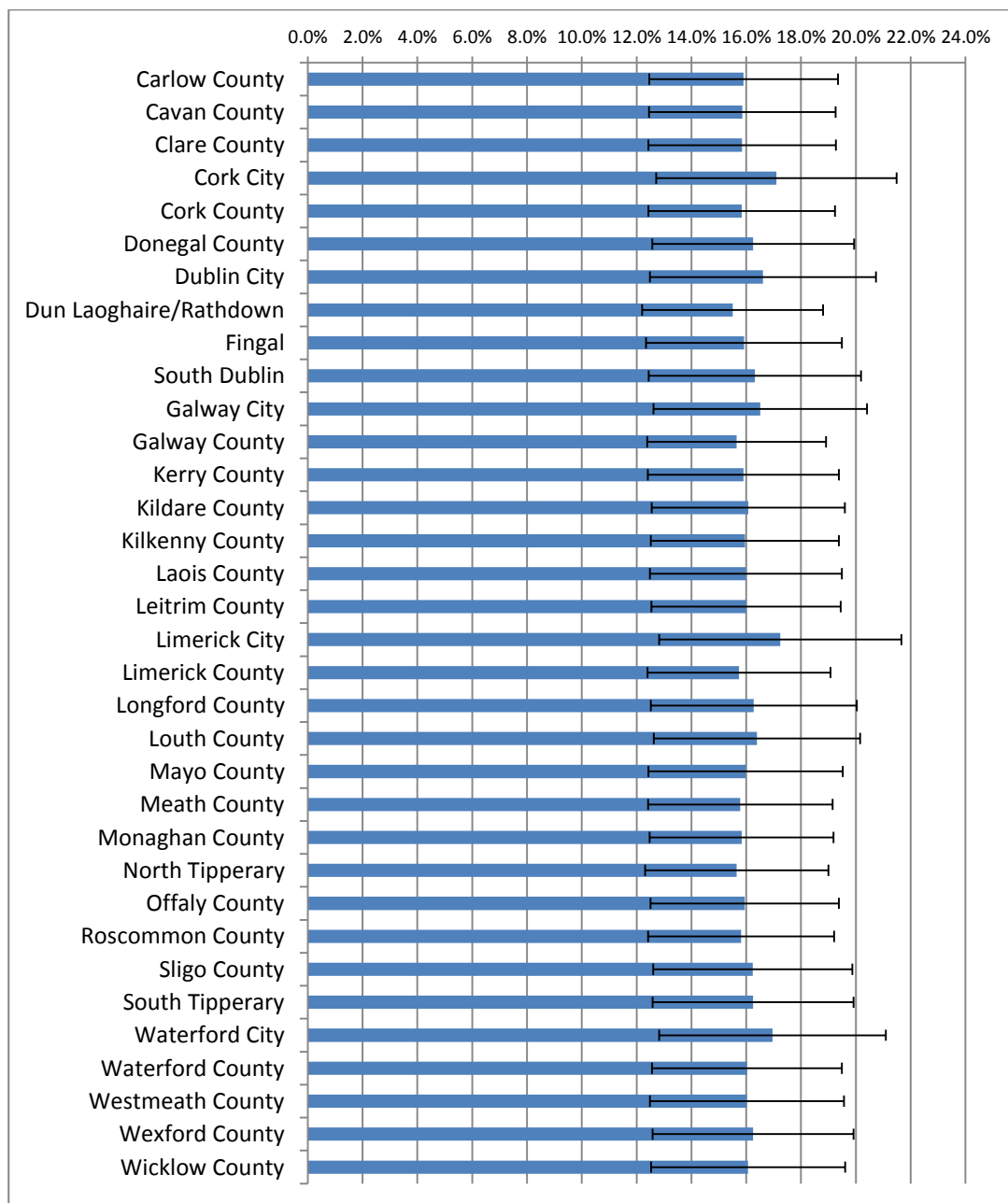
Table 3: Estimated lifetime prevalence (%) of an injury that required hospital treatment or admission among three-year-olds in RoI by sex, primary carer's health status, number of parents in the household, other children in the household and primary carer's education. Source: Growing Up in Ireland, 2011

Sex	Primary carer's health status	Number of parents in the household	Other children in the household	Primary carer's education	% of children in this group	Prevalence %	95% confidence interval
Female	Carer does not have condition	Two parents	No other children	Third level degree	3.1%	11.0%	(9.2%, 13.0%)
				Post-second level	2.5%	11.9%	(10.0%, 14.2%)
				Second level	1.3%	11.3%	(9.3%, 13.7%)
			Other children	Third level degree	14.3%	13.0%	(11.6%, 14.7%)
				Post-second level	11.4%	14.1%	(12.5%, 16.0%)
				Second level	6.1%	13.4%	(11.6%, 15.5%)
		One parent	No other children	Third level degree	0.5%	15.3%	(9.5%, 23.6%)
				Post-second level	1.0%	24.6%	(19.5%, 30.5%)
				Second level	0.8%	13.6%	(10.5%, 17.4%)
			Other children	Third level degree	0.4%	18.0%	(11.4%, 27.2%)
				Post-second level	1.1%	28.4%	(22.7%, 34.9%)
				Second level	1.4%	16.1%	(12.5%, 20.4%)
	Carer has condition	Two parents	No other children	Third level degree	0.5%	12.6%	(9.8%, 16.1%)
				Post-second level	0.4%	13.7%	(10.6%, 17.5%)
				Second level	0.2%	13.0%	(10.0%, 16.7%)
			Other children	Third level degree	1.7%	14.9%	(12.1%, 18.3%)
				Post-second level	1.9%	16.2%	(13.1%, 19.9%)
				Second level	1.2%	15.4%	(12.3%, 19.0%)
		One parent	No other children	Third level degree	0.1%	17.4%	(10.6%, 27.3%)
				Post-second level	0.1%	27.6%	(21.2%, 35.2%)
				Second level	0.2%	15.6%	(11.6%, 20.6%)
			Other children	Third level degree	0.1%	20.4%	(12.6%, 31.3%)
				Post-second level	0.2%	31.7%	(24.5%, 39.9%)
				Second level	0.4%	18.3%	(13.7%, 24.0%)
Male	Carer does not have condition	Two parents	No other children	Third level degree	2.8%	13.0%	(10.9%, 15.3%)
				Post-second level	2.5%	14.1%	(11.8%, 16.7%)
				Second level	1.0%	13.3%	(10.9%, 16.1%)
			Other children	Third level degree	13.5%	15.3%	(13.8%, 17.0%)
				Post-second level	10.9%	16.6%	(14.8%, 18.5%)
				Second level	6.4%	15.8%	(13.7%, 18.1%)
		One parent	No other children	Third level degree	0.5%	17.9%	(11.3%, 27.2%)
				Post-second level	1.0%	28.3%	(22.7%, 34.6%)
				Second level	0.8%	16.0%	(12.4%, 20.3%)
			Other children	Third level degree	0.4%	20.9%	(13.4%, 31.2%)
				Post-second level	1.0%	32.4%	(26.2%, 39.2%)
				Second level	0.5%	18.8%	(14.8%, 23.6%)
	Carer has condition	Two parents	No other children	Third level degree	0.4%	20.7%	(16.6%, 25.5%)
				Post-second level	0.3%	22.3%	(17.9%, 27.4%)
				Second level	0.1%	21.2%	(16.8%, 26.5%)
			Other children	Third level degree	1.9%	24.1%	(20.1%, 28.5%)
				Post-second level	2.0%	25.9%	(21.7%, 30.5%)
				Second level	1.2%	24.7%	(20.3%, 29.6%)
		One parent	No other children	Third level degree	0.1%	27.6%	(17.8%, 40.2%)
				Post-second level	0.2%	40.8%	(32.7%, 49.5%)
				Second level	0.1%	25.0%	(19.1%, 32.0%)
			Other children	Third level degree	0.0%	31.7%	(20.9%, 44.9%)
				Post-second level	0.2%	45.6%	(37.1%, 54.4%)
				Second level	0.4%	28.8%	(22.3%, 36.4%)

3.1.4 Prevalence in subnational areas

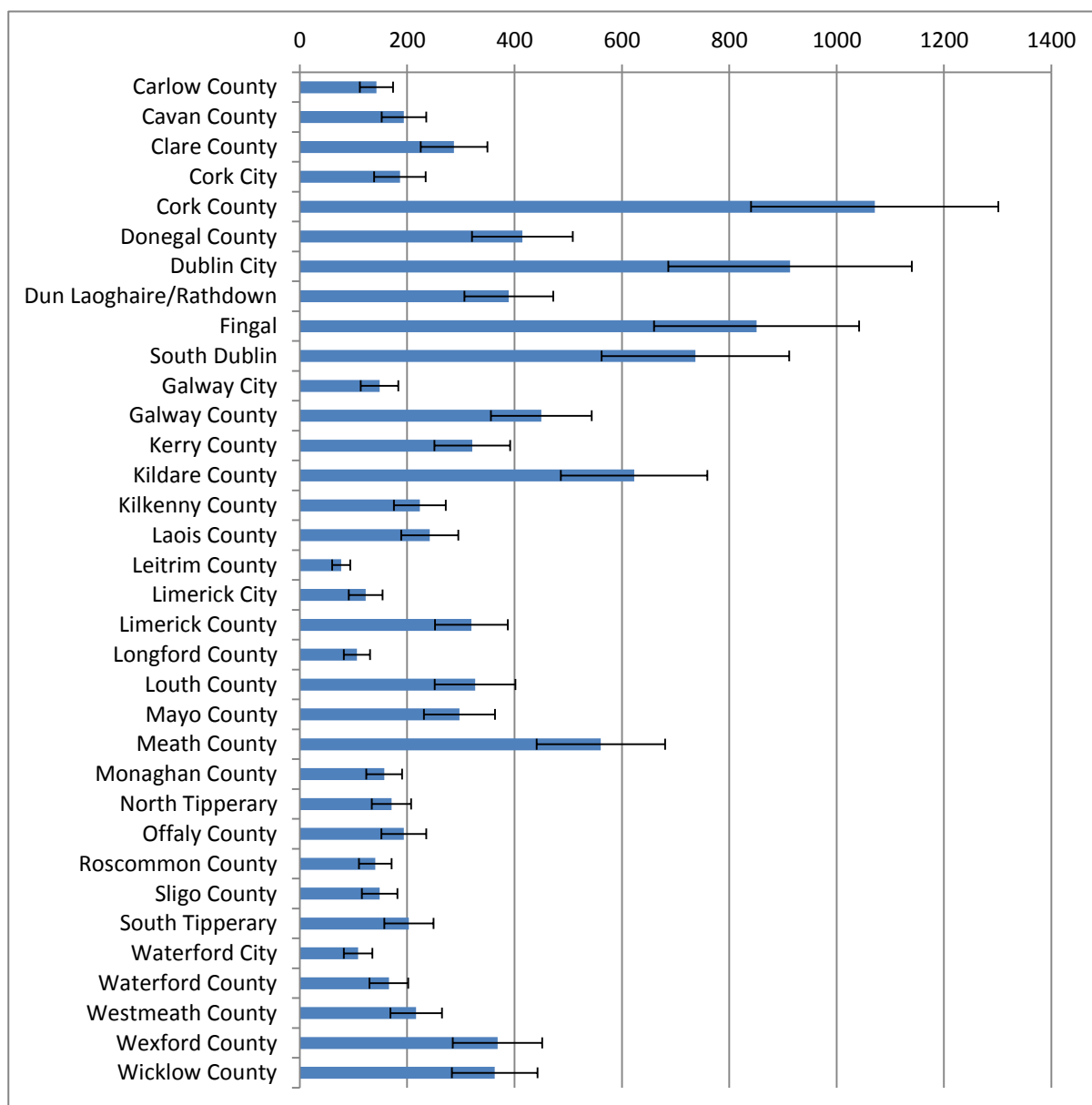
Lifetime prevalence estimates of carer-reported injury that required hospital treatment or admission were also prepared for 29 administrative counties and five cities based on the same model used to estimate national prevalence: sex, primary carer’s health status, number of parents in the household, other children in the household, and primary carer’s education. Variation in prevalence per cent across areas was due to variation in the distribution of these characteristics across areas (Figure 3).

Figure 3: Estimated prevalence (%) of ever had an injury that required hospital treatment or admission among three-year-olds by administrative county/city (RoI). Source: Growing up in Ireland, 2011



The lowest estimated prevalence was in Dun Laoghaire/Rathdown (15.5%; 95% CI = (12.2%, 18.8%)) and the highest was in Limerick City (17.2%; 95% CI = (12.8%, 21.7%)). Comparisons of 95% confidence intervals revealed no significant variation in the prevalence per cents of the areas. However, because of substantial differences in population sizes, there was significant variation between areas in the *number* of three-year-olds who had ever had these injuries (Figure 4).

Figure 4: Estimated prevalence (number) of ever had an injury that required hospital treatment or admission among three-year-olds by administrative county/city (RoI). Source: Growing up in Ireland, 2011



4. Discussion and conclusions

This brief report provides lifetime prevalence estimates of non-fatal injuries requiring hospital treatment or admission among three-year-old children in the Republic of Ireland (RoI) in 2011 using data from the Growing Up in Ireland (GUI) study. National estimates and variation in prevalence depending on children's background characteristics are provided, as well as estimates for the 29 administrative counties and five cities in RoI.

4.1 Discussion

The results indicate that more than 11,200 (16.1%; 95% CI = (15.2%, 16.9%)) three-year-olds in Ireland in 2011 had ever had a carer-reported accident or injury that required hospital treatment or admission. Prevalence estimates (percentages) did not vary significantly across the 29 administrative counties and five cities of RoI.

When examined together, we found that children in homes with two parents and whose primary carer did not have a longstanding health condition were at the lowest risk of injury (with prevalence rates ranging from about 11-16%). Higher rates of injury were found among children in one-parent households, and where the carer had a longstanding condition, most notably among children whose primary carer had post-second level (non-degree) education. The results showed that the cumulative effect of risks for injury is stronger for boys than for girls. That is, while the estimated prevalence of injury was highest among both boys and girls in the same specific sub-group (ie with one parent and other children in the household, a main carer with a longstanding health condition, and with post-second level non-degree education), it was higher among boys (45.6%) than girls (31.7%) in this sub-group.

Using the same dataset, Williams et al. (2013) found that rates of injury were highest among children in one-parent, multi-child households; they also reported that injury rates were higher among boys than girls. These findings are consistent with those of the present study.

Our findings provide evidence for the contributions of children's family structures and home environments to risk of injury. They suggest that injury prevention strategies among young children may need to be targeted at children in one-parent households, particularly where the main carer has a long-term health condition, since the potential for limited supervision of young children in these households is increased. The World Health Organization (2008) has noted that there is considerable *indirect* evidence from previous research that relates supervision to injury, for example, increased injury in single-carer households with multiple siblings and substance abuse difficulties. The WHO also draws attention to the need for better measures of the construct of supervision, as well as further research: "the role of supervision and guidelines for its age-appropriate application in various settings of injury risk need further investigation" (World Health Organization, 2008, p. 11; see also Morrongiello & McArthur, 2010). A better understanding of children's environments is also indicated, since it cannot be assumed that supervision alone is causally related to injury.

In Northern Ireland, data on home safety and accident indicators are collected through local council Environmental Health Departments as part of their home safety check programmes (Royal Society for the Prevention of Accidents, 2013). Visits are targeted at specific groups, including families with children under 5 years. Although data do not represent the general population, closer examination of this information may

help develop a better understanding of how the risk factors identified in RoI operate in the home. Consideration could be given to developing a system for data collection in home safety visits in RoI.

Our findings also suggest that boys may be more vulnerable to these risk factors than girls. Previous research suggests that the reasons are likely to be complex, involving an interplay between the child's sex, caregiver supervision, and risk factors in the environment. For example, in a study of risk-taking, caregiver response, and environmental hazards among toddlers, Morrongiello and Dawber (1998) found that boys were more likely than girls to approach and retrieve injury-risk hazard objects. Mothers in the study used more, and more effortful, redirection strategies for boys, and boys were less compliant than girls in response to their mother's efforts to redirect them from hazards. Research has indicated that risk-taking behaviour is more frequent among boys than girls and is evident as early as one year of age, but sex differences in risk-taking do not explain all of the gender differences in injury rates (Rivara et al., 1982; World Health Organization, 2008). The evidence suggests that injury prevention efforts should be differently targeted at boys and girls (Morrongiello & McArthur, 2010), while not in any way affecting opportunities to enhance physical activities.

4.2 Strengths and limitations

The GUI data provides a rich context in which to analyse injury patterns among children on the basis of a nationally representative sample of three-year-olds and their families.

However, there are some limitations associated with modelling prevalence of injury among children in RoI using the GUI data which should be noted.

As with any survey, GUI is not perfectly representative of the population. GUI was not designed to represent all three-year-olds living in Ireland in 2011, as it does not include three-year-olds who moved to Ireland after Wave 1 of the study (see Institute of Public Health in Ireland, 2014, Chapter 5, for a discussion on the GUI sample).

Second, prevalence of injury reported here depends on the accuracy of carer reports. There is a possibility of recall bias, since carers need to consider any injuries in the child over the previous 36 months or so; however, this issue is common to many surveys. Research (Pless & Pless, 1995) indicates that mothers accurately recollect child injury information for more serious injuries, though recollection of minor injuries may be poorer (Peterson, Harbeck & Moreno, 1997). Socially desirable responding may also play a part (de Mortel, 2008).

Third, more contextual information (such as type and location of injury), and from different age groups, would be desirable: the literature suggests that as well as child's gender and their socioeconomic and home environment, age is an important factor in understanding injury prevalence (see Agran et al., 2001, 2003; World Health Organization, 2008). This study only included children aged 3 and GUI did not gather information on the type of injury or location.

4.3 Conclusions

This study aimed to address some of the information gaps with respect to child injury. Our findings confirm previous research which has shown higher rates of injury among boys and among children in one-parent households, as well as variations by socioeconomic status. Findings point to a need for targeted injury

prevention strategies which are cognisant of the child's home and family environment if social and economic inequalities in childhood injuries are to be addressed.

The results also point to the need for more research in RoI on the following:

- Gender differences in injury rates and risk of injury among different groups of children
- Injury among different age-groups
- How injury risk plays out in homes with more vulnerable parenting and childcare structures (eg one-parent homes with health conditions in the main carer).

The need for a systematic strategy for the regular monitoring of injuries among children using multiple data sources is indicated from our brief review of available data and research in RoI, which has shown that data and reporting on injury is not systematic or, in the case of hospital data, complete. This echoes the situation at EU level, where the longer-term strategy for the collection of cross-nationally comparable injury data following JAMIE is not confirmed (EuroSafe, 2013; Kirkwood et al., 2014). As a first step towards a systematic means to monitor child injuries in RoI, we recommend that a comprehensive review of the available data is undertaken, with a view to investigating what information and conclusions may be drawn from them, what gaps in information exist, and how these might be addressed.

Glossary of terms and abbreviations

Please see the *Glossary* in the report on the prevalence of longstanding conditions among children in the Republic of Ireland (Institute of Public Health in Ireland, 2014) for explanations of statistical terms used in this report.

CSAP

Child Safety Awareness Programme (of the HSE)

CSO

Central Statistics Office. www.cso.ie

GUI

Growing Up in Ireland National Longitudinal Study of Children, a longitudinal study that follows two cohorts of children (aged 9 months and 9 years), first surveyed in 2007-2008. www.growingup.ie

HBSC

Health Behaviour in School-aged Children, a World Health Organization cross-sectional survey of children aged 11 to 17 years, conducted every four years. www.hbsc.org and www.nuigalway.ie/hbsc

HIPE

Hospital In-Patient Enquiry System. www.hpo.ie

HSE

Health Service Executive

IDB

Injury Data Base (of the EU). ec.europa.eu/health/data_collection/databases/idb/index_en.htm

IOBI

Injury Observatory for Britain and Ireland. www.injuryobservatory.net

IPH

Institute of Public Health in Ireland in Ireland. www.publichealth.ie

JAMIE

Joint Action on Monitoring Injuries in Europe (2011-2014).

ec.europa.eu/health/data_collection/databases/idb/network/index_en.htm

QAP

Quality Assurance Programme

Roi

Republic of Ireland

RoSPA

Royal Society for the Prevention of Accidents. www.rospa.com

Subnational areas

The subnational areas included in this report are the 29 administrative counties and five cities of the Republic of Ireland as classified in Census 2011. These 34 regions are listed in Institute of Public Health in Ireland (2014, Appendix 2).

TACTICS

Tools to Address Childhood Trauma, Accidents and Childhood Safety. www.childsafetyeurope.org/tactics

WHO

World Health Organization. www.who.int/en

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