Fatal pediatric injuries in Iceland 1980-2010

A population-based study

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Áverkadauði barna á Íslandi 1980-2010

Lýðgrundið rannsókn

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Ritgerð til meistaragráðu í lýðheilsuvisindum
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Abstract

**Background:** Injury has been one of the leading causes of pediatric fatalities in the world. Previous studies on fatal pediatric injuries have shown that injury incidence rates have been declining over the years. Boys have appeared to be more likely to be injured than girls, head injuries are the most common cause and age group, socioeconomic status and accident location may all have impact. Combining extensive official databases by personal social security numbers allowed for a wide exploration of variables on studying fatal pediatric injuries in Iceland. The aim was to investigate the epidemiology of fatal pediatric injuries among Icelandic children, from birth to 17 years old, from 1980 to 2010.

**Method:** This was a population based descriptive register study. Data, obtained from the Causes of Death Registry at the Directorate of Health and Statistics Iceland, included information on all fatal injuries among Icelandic children, 0 to 17 years old, from 1980 to 2010; type of injury, age, sex, accident location (rural/urban) and number of adults and siblings living with the child. Proportions by background factors were calculated. Rate per 100,000 person per year were calculated where possible using Poisson regression model. Trends were analyzed using chi-squared test for the rates and proportions and likelihood ratio test for rate per person year.

**Results:** During the study period 263 children died as a cause of unintentional injury. The most common causes of death were head injuries (41.1%), drowning (17.5%), multiple injuries (14.1%), injuries to the chest (7.6%) and suffocation (6.8%). Boys constituted 69.2% of the fatalities. Most fatalities occurred in the age group 15-17 years (41.1%). More fatalities occurred in rural areas (58.5%) and the majority of individuals studied lived with two adults (77.2%) and two siblings or less (89.4%) at the time of death. The incidence decreased during the study period with the rate for boys per 100,000 persons per year decreased from 1.9 in the first third of the study period to 0.5 in the last third (p=<0,05). The decrease in incidence for girls was not significant. From 2001 to 2010 boys were 55% and girls 45%.

**Conclusion:** Unintentional pediatric injury mortality declined in Iceland through the study period, especially among boys while the decrease for girls was not significant. Head injuries caused most fatalities, most accidents occurred in rural areas and fatalities were most common in the oldest age group. Although these findings are encouraging work must continue to reduce pediatric injury deaths even further.
Ágrip


Aðferðir: Rannsóknin var lýsandi og lýðgrunduð og byggði á gögnum úr dánarmeinaskrá og frá Hagstofu Íslands. Gögn innihéldu upplýsingar um tilvik yfir tíma og áverk, aldur, kyn, slysstað (dreifbýliþetbýli) og fjölda fullorðinna og systkina á heimilinu. Hlutföll eftir bakgrunnsþáttum voru reiknuð. Hlutfall á 100.000 íbúa á ári var reiknað þar sem það var mögulegt með Poisson aðhvarfsgreiningu. Próun yfir tíma var reiknuð með ki-kvaðrat prófi fyrir tíðni og hlutföll en með líkindahlutfalls prófi fyrir tíðni fyrir 100.000 manneskjur á ári.

Niðurstöður: Yfir rannsóknartímabilið lélast 263 börn af völdum slysaáverka. Algengustu dánarorsakir voru höfuðáverkar (41,1%), drukknanir (17,5%), fjöláverkar (14,1%), áverkar á brjóstholi (7,6%) og köfnun (6,8%). Drengir voru 69,2% af þeim sem lélast. Flest dauðsföll voru í höpnum 15 til 17 ára (41,1%). Fleiri dauðsföll áttu sér stað í dreifbýli (58,5%) og meirihluti einstaklinga í úrtakinu bjó með tveimur fullorðnum (77,2%) og tveimur eða færri systkina (89,4%) þegar þeir lélast. Það dró úr nýgengi yfir rannsóknartímabilið þar sem hlutfall fyrir drengi fyrir 100.000 manneskjur á ári lækkaði úr 1.9 á fyrsta þriðjungi rannsóknartímabilsins í 0,5 á seinasta þriðjungi (p=<0,05). Fækkan á nýgengi var ekki tölfraeðilega marktæk fyrir stúlkur. Frá 2001 til 2010 voru drengir 55% og stúlkur 45%.

Niðurstaða: Áverkadauðsföllum af völdum slysa á meðal barna á Íslandi fækkaði yfir rannsóknartímabilið, sérstaklega á meðal drengja á meðan fækkanin á meðal stúlkna var ekki marktæk. Flest dauðsföll urðu vegan höfuðáverka, flest slyn áttu sér stað í dreifbýli og dauðsföll voru algengust í elsta aldurshópnum. Þó að þessar niðurstöður séu góðs viti er mikilvægt að stefna að því að draga enn frekar úr áverkadauðsföllum barna.
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<tr>
<td>AIS</td>
<td>Abbreviated Injury Scale</td>
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<td>Global Health Estimates</td>
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<td>ICD</td>
<td>International Classification of Diseases</td>
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<td>ISS</td>
<td>Injury Severity Scale</td>
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<td>WHO</td>
<td>World Health Organization</td>
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1 Introduction

According to WHO reports based on numbers from 2012 injuries claimed the lives of over five million people around the world annually, accounting for 9% of global mortality (1). Of these, close to one million cases were children and adolescents under the age of 18 years (2). More unintentional pediatric injury deaths occurred in low and middle income countries than in high income countries. In 2004 the rates were 41.7 per 100,000 persons for children from low and middle income countries while it was 12.2 per 100,000 persons for those living in high income countries (2). Although only around 5% of all pediatric fatal-injuries occurred in high-income countries such as Iceland, injuries were still the reason for around 40% of childhood deaths in those countries (3).

The focus of this thesis is pediatric injury death in Iceland from 1980 to 2010, looking at incidence rates over time, age and sex differences, injury type and accident location as well as number of adults and siblings in the home. More detailed knowledge of these factors may be used in future research as well as in improving preventive programs.

1.1 Injury

Public health researchers most commonly refer to the so called “energy definition” in defining injury (4). Hence, there needs to be a transferral of energy to the human body in amounts that exceed the tolerance of the body if the event is to be defined as injury. The amount of energy and the resulting damage to the cells and organs determine the severity of the injury (5). In addition to this, injury can be defined as the result of lack of oxygen or other vital elements to the body (6).

1.2 Injury classification

Injury classification systems used internationally provide a common language in which their users can communicate. The systems facilitate the storage, retrieval, analysis and interpretation of data relating to health and injury. They also allow for comparison of data between populations or within populations over time as well as the compilation of nationally and internationally consistent data (7).

The International Classification of Diseases (ICD) is used by all member states of the World Health Organization (WHO) as a standardized tool for diagnosis in health care practice and epidemiology. It is used by health care providers, researchers, policy makers and others to classify diseases, injuries and causes of death. In using a unified classification system morbidity and mortality statistics can be compiled for the WHO member states (8). Most studies on injury that are conducted in the WHO member states therefore use the ICD to classify the injuries in question (9, 10).

The Abbreviated Injury Scale (AIS) is a global severity scoring system based on anatomy. In it the body is divided into regions and injuries are classified by these regions according to their relative importance on an ordinal severity scale. The scale provides standardized terminology to describe injuries and ranks injuries by severity. The AIS is used by health organizations, motor vehicle crash investigators and researchers for epidemiological studies among others (11).
1.3 Injury intention

Distinction is made between intentional and non-intentional injury in the ICD system. In the WHO Global Health Estimate (GHE), where global and regional assessment of deaths by cause is provided, injuries and non-intentional injuries are divided into subcategories (12, 13).

Listed under intentional injuries in the ICD-10 system are injuries caused by self-harm, interpersonal violence, collective violence and legal interventions. Included in self-harm are all intentional actions toward harming oneself, such as self-poisoning, self-harm by hand gun, by hanging, by drowning and more. Interpersonal violence includes homicide and injuries inflicted by another person with the intent to injure or kill. The means to do so can be assault by strangulation or suffocation, by sharp or blunt object, by bodily force such as a fight, by neglect or abandonment or by other maltreatment such as physical abuse, to name a few. Collective violence and legal interventions refer to injuries inflicted by law-enforcing agents in the course of legal action, injuries sustained by military personnel or civilians as a result of war or civil insurrections as well as legal execution (12).

In the GHE unintentional injuries are noted to be caused by road injuries, poisoning, falls, fire, heat and hot substances, drowning, exposure to forces of nature and other unintentional causes (14). Road injuries include all transport related injuries, be it as a pedestrian or as a vehicle occupant, on land, sea or in the air. Poisonings include accidental poisoning by various drugs, alcohol, gases or vapors, organic solvents, chemicals and more. Falls are listed as falls from same level involving slipping or tripping, roller skates, skis and more, falls from various objects such as beds, playground equipment, ladders, trees and many more. Fire, heat and hot substances include exposure to open fire in various circumstances, ignition or melting of clothing, contact with hot oil, water, steam and household appliances among others. Drownings are accidental drownings or submersion occurring in bathtubs, swimming pools or natural water. Exposure to forces of nature can relate to excessive heat or cold, earthquakes, avalanches, floods and more. Other causes include getting struck by objects, contact with sharp objects, discharge of firearms or fireworks, obstructions to breathing such as strangulations or blocking of airway by objects, exposure to electric current etc. (12-14).

According to the GHE from 2012 unintentional injuries account for over 70% of all injuries included in the estimate. Of these road injuries are by far the most common cause of injury, accounting for one third of all unintentional injuries (14). Registration of causes of death by codes provided in ICD-5 began in Iceland in 1941. From 1951 to 1970 ICD-6 was in use, then ICD-8 until 1980 and from 1981 ICD-9 was put in use. From 1997 and to this day ICD-10 has been in use in Iceland (15). With the 10th revision of ICD the size of the coding frame more than doubled allowing for a more detailed coding of injuries and illnesses (16). Registration by the AIS system began in Reykjavik Hospital in 1991 (17). In addition to being a coding system in itself the AIS provides a basis for other injury scoring systems, such as the injury severity score (ISS) (18). There have been implementations to develop a map to convert ICD codes to AIS codes to better reflect the severity of injury (19, 20). The latest report of such a conversion is from
2015 when a map for converting ICD-9 and 10 codes into AIS was created by specialists from around the world (20).

In summary injury classification systems are widely used for coding data in a way as to facilitate research and comparison across nations. The ICD systems divide injuries in to being intentional or unintentional. In Iceland coding of causes of death based on the ICD system has been in place since 1941.
2 Fatal unintentional pediatric injuries

The vast majority, around 90%, of fatal pediatric injuries have been shown to be unintentional. In international reports the five most common causes of unintentional injury - road traffic accidents, drowning, burns, falls and poisoning - make up 60% of all pediatric injury deaths. Other unintentional injuries have accounted for 23% of pediatric injury deaths (2).

2.1 Causes of unintentional injury

Most fatal pediatric injuries in the world have been reported to be caused by road traffic accidents, drowning, burns, falls or poisoning. Injuries from other causes have also been common, such as asphyxiation, choking and hypothermia (2).

According to a report from 2015 road traffic accidents were one of the leading cause of death in the world (21). They accounted for around 30% of all pediatric injury deaths. Although the mortality rate was highest in low income regions such as Africa, traffic accidents still accounted for around one-fifth of all injury deaths in the countries of the European Union (21, 22). In Denmark, Finland and Sweden traffic injuries accounted for a third to half of all pediatric injury deaths from 1996 to 2000 (22). Children are injured in various situations involving traffic, they may be pedestrians, bicyclists or motorcyclists, vehicle occupants or young drivers. Types of injury most commonly sustained from traffic related injuries may vary depending on the type of accident, age of the child and use of safety equipment. The most common types have been head injuries and injuries to the limbs. In addition to these, thoracic injuries have been quite common for vehicle occupants. Injuries to the abdomen also often occurred and can be very serious in nature. Among all traffic related accidents multiple trauma has been common as well (2, 23).

Although most deaths due to falls have occurred among adults, they ranked as the twelfth leading cause of death among five to nine year olds and 15 to 19 year olds worldwide in 2004 (2). According to a WHO report from 2008 incidence rates of falls were highest in low income countries, but falls were still an important cause of death of children in high income countries (2). Most fatal falls have occurred from a height such as from windows, roofs and balconies (24) as well as from stairs and trees (2). Falls from less height, for example playground equipment, furniture, high chairs, cots and so on as well as from same level, have also been a major cause of injury although those injuries are less commonly fatal. They can however be so, especially if the landing surface is hard (2, 25). A study from 2006 showed most fatalities from falls were caused by head injury, organ damages due to thoracic and abdominal blunt injuries as well as traumatic shock with multiple trauma (26).

Fatal drowning ranked as the thirteenth most common cause of death in the world for children under the age of 15 years in a report from 2008. Although the drowning rate in low and middle income countries was six times that of the rate in high income countries, drowning still caused concern in those parts of the world (2). Studies in Denmark and Finland have shown that the number of drownings had decreased since 1971 but they still were one of the leading causes of pediatric injury deaths in 2010 (27, 28). Drowning has been shown to take place in various situations such as bathtubs, garden ponds, swimming pools, rivers, lakes and the sea (29). According to a study from
USA in 1995 drowning in bathtubs most often involved infants, young children most often drowned in artificial pools or ponds, while older children often drowned in natural bodies of fresh water (30).

According to a Danish study from 1995 asphyxiation was among the most common fatal injuries to children (28). Studies have shown this most often occurred with infants under one year of age, although older children were also often affected (31, 32). The causes of asphyxiation vary somewhat by age. Suffocation due to slipping in between a wall and a bed, due to plastic bag or getting caught between cushions or bedding has been a common reason for asphyxiation in infants and very young children. Strangulation by getting the head caught in between bars of beds or other objects, having clothing or drawstrings get caught and having food or other foreign object get stuck in the airway are all known causes of death for children. Accidental strangulation on playground equipment such as swings and getting caught on cords of window blinds or other loose cords have also been shown to be common causes of asphyxiation in older children (32-38).

A report from WHO from 2008 stated that acute poisoning accounted for the death of around 45,000 children and young people under the age of 20 years worldwide. The rate in high income countries was 0.5 per 100,000 population, but in low and middle income countries the rate was four times higher (2). In developed countries poisonings has commonly involved medicine, both over the counter and prescribed, recreational drugs and household products such as bleach and cleaning agents (2, 39). A study on pediatric poisoning in England and Wales from 1968 to 2000 showed that carbon monoxide poisoning was also common (40) and often occurred during house fires, or as intentional self-harm using car exhaust (41). The youngest age group, children under the age of five years, have been shown to be at most at risk of accidental poisoning. The rates declined but rose again when the adolescent years approach. In that age group accidental overdoses of drugs and intentional self-harm were the most common causes (40, 42, 43).

From these reports and studies it is apparent that road traffic accidents and falls have been major causes of fatal injuries to the head and limbs among others. Drowning has been a common cause of pediatric fatalities through the last decades and asphyxiation and poisoning have also been an important cause to be considered.
3 Factors related to fatal pediatric injuries

Many studies as well as data collection by organizations such as WHO focus on factors related to pediatric injuries (2). These can be age and sex, developmental factors and more, which can provide important information to build on when looking to injury prevention.

3.1 Childhood cognitive development and risk perception

According to the United Nations Convention on the Rights of the Child a child is every person who is under the age of 18 years (44). Icelandic law has since January 1st 1998 stated that a person reaches majority at the age of 18 years, before that the age of majority was 16 years old and had been at that age for centuries (45).

Cognitive development in childhood is linked with brain development. The frontal lobes are an important area of the brain where control and coordination of other areas of the brain takes place to enable complex forms of behavior and thought (46). Important cognitive functions such as planning and regulating behavior are for example connected with development in the frontal cortex of the brain (46). It is believed that the prefrontal cortex is the last region of the brain to mature; hence young children may show impaired judgment in some circumstances (47). Due to a lack in working memory young children may also show less developed probability judgment. They may therefore fail to predict the results of an event, even when provided with the information needed to do so. This ability seems to increase with age as the working memory develops (48).

These cognitive and developmental differences have become evident in studies focusing on how children perceive traffic. In one such study young children, aged five to seven years, showed very poor skills in choosing a safe route to cross a street, judging only upon vehicles they could see and not taking into account obscuring obstacles, complex junctions and such. They also consistently chose the most direct route even though a detour would prove much safer. Children from nine to 11 years old showed much better skills in their judgment of where best to cross (49). Other studies have had similar findings and additionally note that younger children linger and take longer than older individuals to perceive hazards that can be caused by limited view field (50) or when assessing the hazard of a slow moving or stopped road user that has the ability to behave unexpectedly and by that cause danger (51). These findings are not limited to traffic related scenarios since it has been found when children were asked to appraise risk of injury in play situations that younger children identified fewer risks than older children and took longer to do so (52).

In adolescence complex changes in the organization and functioning of the brain again occur. For example, the frontal lobes of the cerebral cortex undergo significant changes. The changes
affect a number of advanced behaviors and processes, such as memory, decision making, reasoning, impulse control and the ability to multitask (46). Not all regions of the brain develop at the same rate and some of these differences have been linked to adolescent risk behavior. Studies have shown that networks of the brain related to processing of reward and inhibition of response mature in early adolescence whereas networks related to attention, regulation of emotion, organization and long range planning mature relatively late (53-56). This may lead adolescents to choose immediate over long term gains (53) and by that be more vulnerable to poor decision making and risk taking (54).

This has become apparent in studies focusing on risk taking where adolescents and adults are compared. Adolescents have frequently been shown to take more risk in set up risk assessments such as gambling tasks. The difference between age groups has been especially notable when the task involves immediate action and feedback (57). Young drivers have been shown to be involved in more traffic related accidents than older drivers. This has been the case in Iceland as well as abroad (58, 59). The reasons for this difference have been linked with inexperience of the young drivers, but also with behavioral and cognitive factors. Results from a Canadian study based on police reports showed that 16 to 19 year olds were involved in twice as many accidents when they had a passenger then when they were driving alone. The rate was also higher when they had two or more passengers compared to one. These results did not apply to the older groups in the study (60). A study from the USA showed similar results with a higher risk of involvement in fatal accidents for teenage drivers with teenage passengers than older age groups. In fact for drivers over 30 years old having a passenger reduced the risk of being in a traffic accident (61). Studies have also shown that young drivers detect hazards less quickly and effectively than older drivers, they underestimate the risk of an accident in many traffic situations and overestimate their own driving skills (62).

Since 1991 efforts have been set in place to reduce pediatric injuries in Iceland. This was in the form of a prevention program implemented by the Icelandic Association for Search and Rescue (Slysavarnafélagið Landsbjörg) which was then moved under the state government as an ongoing project. All expecting and new parents now receive education in injury prevention based on the developmental stages of children and are offered seminars that among other things offer guidance in how to minimize risk in the home environment and in transport (63). The Icelandic Transport Authority (Samgöngustofa) issues educational material in traffic safety aimed to be taught at school and adjusted to different age groups (64). They also set a curriculum for driving education which has been improving and getting more extensive over the years. It involves both written and practical education and since 2010 student drivers need to complete a course in a so-called driving pen where they receive training in coping with various road conditions and education in the limitations of human capability in relations with operating a vehicle (65). Furthermore in regulations on driving licenses from 2011 it was decreed that if a driver loses that license for speeding or driving under the influence in the first three years after
receiving a driving license, he has to participate in further education where the focus is on risk taking, social and cognitive effects on driving and responsibility (66, 67).

Children and adolescents are limited in some areas relating to risk assessment and other cognitive functions. This is due to brain development, but also to environmental factors. These limitations raise injury risk in a variety of situations, most notably in traffic related situations. Preventive measures need to take account of these cognitive and developmental differences.

3.2 Age and sex

After the first year of life estimates have shown that when looking at all WHO member states in 2004, most unintentional injury deaths for children and adolescents occurred with children aged one to four years (45.8 out of 100.000). However, when looking only at European regions mortality rates in the oldest group of 15 to 19 year olds was higher (20.2 for one to four year olds vs 27.6 for 15 to 19 year olds out of 100.000). The difference between these two age groups became even larger when looking at high income European countries only, where the unintentional injury mortality rates for 15 to 19 year olds were 18.8 for every 100.000 and 4.8 for one to four year olds. The age groups in between had lower injury mortality rates than the two groups mentioned in all cases (2).

Sex differences in injury mortality rates have been consistent around the world with boys being a majority of those affected in all age groups after infancy. The gap has been shown to increase with age with differences at the global level showing boys in the five to nine year old age group having injury death rates a third higher than the rate for girls, when aged 10 to 14 years the rate was 60% higher for boys and when looking at the 15 to 17 year old age group the incidence rate has been becoming similar to that of adults, particularly in high income countries, with males accounting for more than 86% of all injury deaths in that age group (2). Nordic countries have been no exception in this and studies conducted there have shown the same results. Results from a study done in Norway, Denmark, Sweden and Finland with data from 1981 to 2000 showed that an average injury mortality incidence rate for boys in these countries was 70 per 100.000 follow-up years while the rate for girls was 54 per 100.000 (9). They also showed that this difference between the sexes had been present through decades. This was shown in a study from Finland where in 1971 the injury mortality incidence rate for boys was 36.7 per 100.000 children per year and for girls it was 20.1. In 2010 the corresponding rates were 3.5 for boys and 2.3 for girls (27). A meta-analysis from 1999 of 150 studies on sex differences in risk taking showed that the difference is largest in childhood and decreases with age. Suggestions as to reasons for this difference were said to be periodic changes in biological maturation, cognitive scope such as future predictions, self-perception such as self-esteem, perceptions of the social environment such as parental and peer influences, personal values such as independence, risk perceptions such as the optimistic bias and characteristics of the peer group such as peer age (68).

In high income countries adolescents have had higher injury fatality incidence than younger children. Boys of all ages have had greater injury risk than girls and the reasons for this have been suggested to be sex differences in risk taking behavior due to a variety of biological and environmental factors.
3.3 Family circumstance

Whether family composition, such as living with one or two adults and number of siblings in the home, could be a predictor for fatal pediatric injuries has rarely been directly studied. A population based study from Sweden looking at data from 1991 to 1999 revealed that children who lived with one parent only were more likely to be injured as well as having a higher risk for other health related incidences (69). Results from New Zealand showed an increased risk ratio of 1.8 for unintentional injury mortality of children living with one parent compared with two. The results were adjusted for age and ethnicity (70). This raised risk may however be linked to differences in socioeconomic circumstances (69, 70). In these last decades it has become more common for homes to be run by single mothers. The poverty rate for this type of family is reported to be much higher than that of families with two parents (71). The link between pediatric injury and lower socioeconomic-status has been studied. In a cross sectional study from Trent in England on 56,629 injury related hospital admissions for children 14 years and under during the years 1992 to 1997 results showed that the injury incidence was higher for children from more deprived families of a lower social standing than children of a higher social class (72). Injury death incidence has also appeared to be higher for children from lower social classes. Studies have shown as much as 13 times higher mortality rates for children with the lowest socioeconomic status where the parents had never worked or were long term unemployed compared with children with the highest socioeconomic status (73). In a population-based study from 2013 30,8% of Icelandic children living with one parent were at risk of poverty and 25% were classified as having material deprivation. The corresponding rate for children living with two adults and one sibling was 6,2% for risk of poverty and 4,1% for material deprivation (74). Although the incidence rate of pediatric injury death has been declining the gap between social classes has been widening as the incidence rate has not been falling as rapidly for children of lower socioeconomic status as those of a higher social standing. This was shown in a population based study on one to 15 year old children, done in England and Wales, where injury mortality rates in 1979 to 1983 and 1989 to 1992 were compared. The decline in incidence rates for the highest social class was 32% while it was only 2% in the lowest social class (75).

According to these studies children who are of a lower social standing or are from deprived families have a higher risk of injury death. One parent families seem to more often live in poverty and deprivation, hence children from those family circumstances could have an increased risk of injuries and injury related fatality.

3.4 Accident location

Most research findings have pointed to children living in rural areas having a higher injury and injury death incidence rate than those living in urban areas (76-78). In Norway in the years 1998 to 2007 data looking at pediatric injury mortality showed a rate of 6.57 and 7.89 per 100.000 inhabitants per year in the two most rural areas of the country as opposed to 4.85 and 3.90 in the two more urban areas (78). The differences were apparent when looking at many causes of death such as drowning, falls and by cause of machinery (79, 80). This has also been the case when looking at traffic related injury specifically, rural children have seemed to be at a greater
risk than urban children (81-83). In a population-based study from Canada looking at data from 1997 to 2002 it was noted that children living in rural areas were 5.4 times more likely to die in a motor vehicle accident than children in urban areas (82). It is of notice that it has varied in these studies how the injuries were categorized in to having occurred in a rural or urban setting, sometimes it was linked with the accident location (82), sometimes the hospital visited (81) and in other cases the residence of the injured individual (78, 83).

From these results it seems that children living or travelling in rural areas have an increased risk of injury mortality. Explanations as to the reason for this difference have been suggested to be lack of road safety features such as traffic control devices, lighting and divided traffic streams in rural areas when looking at traffic related accidents (82). More exposure to hazardous farm machinery and open areas of water have also been thought to increase injury risk in rural areas (79). Another important reason for increased mortality in accidents occurring in rural areas may be longer response time of emergency services and longer distances to well-equipped hospitals (78).

### 3.5 Changes in pediatric injury fatality incidence

When looking at Nordic countries and other high income European countries pediatric injury fatality incidence has been declining over the last decades (84, 85). In Finland data show that the injury death rate has fallen considerably between the years 1971 and 2010, from 20.1/100.000 to 2.3/100.000 for girls and from 36.7/100.000 to 3.5/100.000 for boys. That was a relative decrease of 89% for girls and 91% for boys (27). In the years 1976 to 1985 there was a significant decrease in unintentional injury mortality rates for boys in Denmark, while the rate for girls in the same period remained constant. The cumulative mortality proportions over the two five year periods fell from 2.47/1000 to 1.85/1000 for boys, but was constant for girls, 1.25/1000 over the 10 year period (28). In Holland the pediatric injury mortality rate went from 9.7/100.000 in 1996 to 4.4/100.000 in 2011 (86). The most significant attributes to declining rates have been fewer traffic related injury deaths (27, 86, 87) although drowning, poisoning and other unintentional causes of fatal injuries have also declined (27, 29, 40). A study published in 1997 looked into the epidemiology of fatal and non-fatal pediatric injuries in Reykjavík occurring from 1974 - 1991. The results showed that the incidence of hospital admissions due to injury for 0-14 year olds was 7.6 per 1000 children per year and the injury mortality rate was 6.5 per 100.000 children per year (88). No more recent data on pediatric injury mortality has been studied in Iceland.

Overall pediatric injury fatality has been declining. The reasons for this reduction have been suggested to be various. In a review of 48 research papers focusing on population based injury epidemiology from 1970 to 2008 in the UK and Europe reduction in injury and injury mortality rates have been linked with improvements in trauma care and traffic safety programs, but economic, social and political factors have also been mentioned as well as improved preventive measured and technological trends (85).
4 Aims

According to studies, pediatric injury fatalities have been declining in high income countries. Boys have more commonly been involved in injury fatalities than girls and in high income countries adolescents seem to have increased injury risk when compared with younger age groups. Accidents involving children have been reported to occur more in rural areas than urban and family circumstances seem to have an impact where children living with one parent have been at a greater risk for injury fatality than others. The situation in Iceland has not been clear on these subjects. The aim of this study therefore was to look into the epidemiology of pediatric injuries, from birth to 17 years old, in Iceland from 1980 to 2010. We looked to answer whether the annual incidence of fatal pediatric injuries in Iceland had decreased from 1980 to 2010; if fatal injuries were more common among boys than girls; what were the most common types of fatal injuries and if these had changed over the study period; if fatal injuries were more common in certain childhood age groups; if fatal injuries more commonly occur in rural areas than urban and if fatal injuries were more common for children from a certain family circumstance than other, looking at number of adults and siblings in the home. Personal social security numbers were used to code and combine all data allowing for a wide exploration of variables when studying pediatric injury.
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Article

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Fatal pediatric injuries in Iceland 1980-2010

A population-based study

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Abstract

**Background:** Injury has been one of the leading causes of pediatric fatalities in the world. Previous studies on fatal pediatric injuries have shown that injury incidence rates have been declining over the years. Boys have appeared to be more likely to be injured than girls, head injuries the most common cause and age group, socioeconomic status and accident location may all have impact. Combining extensive official databases by personal social security numbers allowed for a wide exploration of variables on studying fatal pediatric injuries in Iceland.

**Method:** This was a population based descriptive register study. Data, obtained from the Causes of Death Registry at the Directorate of Health and Statistics Iceland, included information on all fatal injuries among Icelandic children, 0 to 17 years old, from 1980 to 2010; type of injury, age, sex, accident location (rural/urban) and number of adults and siblings living with the child. Proportions by background factors were calculated. Rates per 100.000 person per year were calculated where possible using Poisson regression model. Trends were analyzed using chi-squared test for the rates and proportions and likelihood ratio test for rate per person year.

**Results:** During the study period 263 children died as a cause of unintentional injury. The most common causes of death were head injuries (41,1%), drowning (17,5%), multiple injuries (14,1%), injuries to the chest (7,6%) and suffocation (6,8%). Boys constituted 69,2% of the fatalities. Most fatalities occurred in the age group 15-17 years (41,1%). There was a statistically significant reduction in incidence rates of all age groups except 10 to 14 year olds over the study period. More fatalities occurred in rural areas (58,5%) and the majority of individuals studied lived with two adults (77,2%) and two siblings or less (89,4%) at the time of death. The incidence decreased during the study period with the rate for boys per 100.000 persons per year decreased from 1.9 in the first third of the study period to 0.5 in the last third (p=<0,05). The decrease in incidence for girls was not significant. From 2001 to 2010 boys were 55% and girls 45%.

**Conclusion:** Unintentional pediatric injury mortality declined in Iceland through the study period, especially among boys, while the decrease for girls was not significant. Head injuries caused most fatalities, most accidents occurred in rural areas and fatalities were most common in the oldest age group. Although these findings are encouraging work must continue to reduce pediatric injury deaths even further.
Background

Injury has been one of the leading causes of death for children under the age of 18 years in the world, resulting in over 900,000 deaths worldwide annually. Road traffic accidents, drowning and other unintentional injuries made up for almost three quarters of all pediatric injury deaths in the world in 2004 (1). More unintentional pediatric injuries deaths have been reported to occur in low and middle income countries than in high income countries. In 2004 the rates were 41.7 per 100,000 persons for children from low and middle income countries while it was 12.2 per 100,000 persons for those living in high income countries (1). Although only around 5% of these fatal pediatric injuries occurred in high-income countries such as Iceland, injuries were still the reason for around 40% of pediatric deaths in those countries (2).

Sex differences in injury mortality rates have been consistent around the world with boys being a majority of those affected in all age groups after infancy (1). Results from a study done in Norway, Denmark, Sweden and Finland with data from 1981 to 2000 showed that an average injury mortality incidence rate for boys in these countries was 70 per 100,000 follow-up years while the rate for girls was 54 per 100,000 (3). Studies have also shown that this difference between the sexes has been present through decades and still prevails as of reports from 2010 (3-5).

When looking at all European regions the highest mortality rates have been in the oldest group of children, 15 to 19 year olds. The difference between those and younger age groups became even larger when looking at high income European countries only. The youngest age group, zero to four year olds, had the second highest mortality rate and the age groups in between the lowest (1). The most common types of injury fatalities have been reported to occur from head or spinal injury, internal injury most often to the chest or abdominal area, from asphyxia caused by varied reasons and from poisoning (6, 7). With head injury having been the most common type of pediatric injury they have been widely studied through the years. Results have shown that the main reasons for head injuries are falls (8), especially for younger children, road traffic accidents (9) and sports (10). In fact falls and road traffic accidents were among the most common reason for pediatric injury overall as well as other unintentional reasons (1, 7, 11).

Most research findings have pointed to children living in rural areas as having a higher injury and injury death incidence rate than those living in urban areas (12-14). The differences have been apparent when looking at many causes of death such as drowning, falls and by cause of machinery (15, 16). This was also the case when looking at traffic related injury specifically, rural children have been shown to be at a greater risk than urban children (17-19). It is of notice that it varied in these studies how the injuries were categorized in having occurred in a rural or urban setting; sometimes it is linked with the accident location (18), sometimes the hospital visited (17) and in other cases the residence of the injured individual (14, 19).

Whether family composition is a predictor for fatal pediatric injuries has not often been studied directly. The existing results have however indicated that children who live with one parent only were more likely to be injured. Results from a New Zealand study showed an increased risk ratio of 1.8 for unintentional pediatric injury mortality when living with one parent compared with two. The results were adjusted for age and ethnicity (20). This raised risk was however linked to differences in socioeconomic
circumstances (20, 21). In these last decades it has become more common for homes to be run by single parents. The poverty rate for this type of family may be higher than that of families with two parents (22). Studies have shown that the injury incidence was higher for children from more deprived families of a lower social standing than children of a higher social class (23, 24). Injury death incidence was also higher for children from lower social classes. Studies have shown as much as 13 times higher mortality rates for children with the lowest socioeconomic status where the parents had never worked or were long term unemployed compared with children with the highest socioeconomic status (25).

When looking at Nordic countries and other high income European countries the pediatric injury fatality incidence has been declining over the last decades (26, 27). The most significant reason for the declining rates are fewer traffic related injury deaths (4, 5, 28) although drowning, poisoning and other unintentional causes of fatal injuries have also declined (4, 29, 30). The reasons for this reduction have been suggested to be linked with improvements in trauma care and traffic safety programs, economic, social and political factors have also been mentioned as well as improved preventive measured and technological trends (27).

Studies on pediatric injury in the Icelandic population are scarce. One study published in 1997 focused on the epidemiology of fatal and non-fatal pediatric injuries in Reykjavík occurring from 1974 to 1991. The results showed that the incidence of hospital admissions due to injury for zero to 14 year olds was 7.6 per 1000 children per year and the injury mortality rate was 6.5 per 100.000 children per year (31). Since the last study in Iceland on this subject looked at data from at least 25 years ago there has been a need to shed light on the latest data available.

In Iceland we have the advantage of data being coded with personal social security numbers. National census registries, death certificates and coronary reports are all coded with these personal numbers allowing researchers to connect data and look into wider aspects of pediatric injury deaths for example.

In this study we looked at all Icelandic children, under the age of 18, who died as a result of injury between 1980 and 2010. We looked to answer whether the annual incidence of fatal pediatric injuries in Iceland had increased from 1980 to 2010; if fatal injuries were more common among boys than girls; what were the most common types of fatal injuries and if these had changed over the study period; if fatal injuries were more common in certain childhood age groups; if fatal injuries more commonly occur in rural areas than urban and if fatal injuries were more common for children from a certain family circumstance than other, looking at the number of adults and siblings in the home.
Materials and methods

Design and study population: This was a population based descriptive register study. The study population was Icelandic children, from birth to 17 years old, who had registered injury caused death in the Causes of Death Registry from 1980 to 2010. The original study population contained 304 individuals. Four were excluded since they did not die of injury, 25 were excluded as the injury occurred by intentional self-harm, a further nine were excluded as it was not clear from the data if the injury occurred by accident or by intentional self-harm, and lastly three were excluded from the sample as the injury was intentionally inflicted by another person. Remaining was a population of 263 individuals who died from unintentional injury (Figure 1).

Procedure: Data on fatal injuries and place and circumstances of injury was obtained from the Causes of Death Registry at the Directorate of Health in Iceland. Data was retrieved by using causes of death by the ICD-8, 9 and 10 coding system, depending on the years in question. The codes of interest from ICD-10 were S00 – S99; T00 – T98; V01 – X59; X60 – X84; X85 – Y09; Y10 – Y36; Y40 – Y84; Y85 – Y89; Y85 – 98, from ICD-9 there were codes 800-999 and E800 – E999 and from ICD-8 the codes were N800 – N999 and E800 – E969. In a few cases clarification on injury intention was needed and information was then sought from the Coroner’s Office. Injuries were categorized using ICD-10 and the AIS (Abbreviated Injury Scale) as guides. The data on the location of the accident was received in the form of municipality numbers used in Iceland. In Iceland most of the population lives in the capital area. The only other large town is Akureyri in the north of Iceland, other towns have less than 15,000 inhabitants. For this study the urban area was therefore decided to be the capital area and Akureyri. The rest of the country was categorized as rural areas. Using personal identification numbers obtained from the Causes of Death registry data on sharing a home with one or two adults as well as number of siblings was obtained from databases at the Statistics Iceland. The two data sets were then linked together. Permissions were granted by the Icelandic National Bio-Ethics Committee (license number VSN-13-107), Data Protection Authority (license number 2013091017AT), as well as the Directorate of Health which released data upon the permissions mentioned here.

Statistical analysis: As the study sample was not large, to avoid individuals being identifiable and to enhance the statistical power the 31 years in question were divided in-to three periods. Four age groups were formed for the same reason. Numbers and proportions by background factors were calculated for the 10 year intervals. With information from Statistics Iceland on the total number of children in each age group for each year, rate per 100,000 person per year were calculated where possible using Poisson regression model. Confidence interval was set at 95%. Trends were analyzed using chi-squared test for the numbers and proportions and likelihood ratio test for rate per person year. Data was analyzed using the R system (version 3.2.3).
Results

Table 1 presents numbers and proportions by background factors. The overall number of fatal unintentional pediatric injury decreased over the study period, from 140 cases in the years 1980 to 1990 to 40 cases total in the years 2001 to 2010. In the first third of the study period, from 1980 to 1990, boys were 76.4% of all Icelandic children who died of unintentional injury. Through the years 2001 to 2010 the ratio between the sexes was similar, 55% boys and 45% girls. Highest proportions of fatalities occurred in the 15 to 17 years old age group, both overall (41,1%) and when looking at the 10 year intervals separately. The age group 0 to 4 year olds and five to nine year olds had similar proportions (21,3% and 20,9%) and the 10 to 14 year old age group had the lowest proportion overall (16,7%). More fatalities occurred in rural areas (58,5%) than in urban areas (38,8%). In 1991 to 2000 the difference was most prominent, being 71,1% in rural areas and 25,3% in urban areas, the difference in rate is due to some fatalities occurring abroad. The majority of the individuals were living with two adults and two siblings or less at the time of death. Living with one adult became more common during the study period. There was a significant difference in the distribution within the variables sex (p=0,01554), accident location (p=0,04231) and number of adults in the home (p=0,01238) between the 10 year periods.

Table 2 shows numbers and proportions for injury types causing fatalities in the study period. The most common injury types were head injuries (41,1%), drowning (17,5%), multiple injuries (14,1%), injuries to the chest (7,6%) and suffocation (6,8%). The changes within the injury type variable between the 10 year periods was not significant (p=0,3069).

Unintentional injury mortality incidence rates per 100.000 persons among Icelandic children are shown in Table 3. The injury mortality incidence in 1980 to 1990 was 1.9 boys per 100.000 person-year versus 0.7 girls. Over the study period the incidence rate for boys decreased statistically significantly while the rate for girls did not, with both groups being 0.5 per 100.000 person per year from 2001 to 2010. There was a statistically significant reduction in incidence rates of all age groups except 10 to 14 year olds. The incidence rate for 15 to 17 year olds was highest throughout the study period, but decreased from 2.7 fatalities per 100.000 person-years in the first third of the study period to 1.2 in the last third. The most common types of injuries were unchanged during the study period and changes during the study period were not significant.

In Figure 2 unintentional fatal injury incidence rates are shown for boys and girls and in Figure 3 the development of the most common injury types is shown over the study period. Figure 4 shows injury types in relation to sex and Figure 5 shows injury type in relation to accident location, this shows a reduction in head injuries especially for boys and in accidents taking place in urban settings.
**Discussion**

Unintentional pediatric injury fatality in Iceland decreased from 1980 to 2010. Boys had a higher incidence than girls but from the beginning to the end of the study period the rates became closer as the fatal injury incidence rate for boys dropped considerably more than girls. Most fatalities occurred in the 15 to 17 years old age group and the most common types of injuries were head injuries, drowning, multiple injuries, injuries to the chest and suffocation. Most fatal accidents took place in rural settings and more children in the study population lived with two adults.

The reduction in unintentional fatal injury incidence is in line with the development in other high income European countries (26, 27). The reduction was in large part due to much fewer boys having fatal accidents, now being almost at a similar rate to girls. The same trend was found in Denmark between the years 1976 and 1985 (32) and the gap in injury death incidence rates for boys and girls in Finland has also been decreasing (4). As seen in Figure 4 the largest decrease is due to fewer head injuries and drownings for boys.

The oldest age group, 15 to 17 year olds, having the highest mortality rate in the study group, is consistent with other high income European countries (1). In this study the age group with the lowest mortality rate was the 10 to 14 year olds and the two youngest age groups have similar incidence rates. This was in some ways different from what has been found in the European regions where five to nine year olds and 10 to 14 year olds have similar low rates and the zero to four year olds have the second highest rate (1). The reasons for this difference in Iceland is unclear.

The most common types of fatal pediatric injuries in Iceland were head and neck injuries, drowning, multiple injuries, injuries to the chest and suffocation, which is similar to other results (4, 32). The fatalities in Europe are commonly sustained in traffic related injuries, drowning or from falls (1, 33, 34), but we could not conclude the type of accident from our data. The reduction of fatal unintentional pediatric injury is in large part due to fewer fatalities involving the head, chest and multiple injuries. We can assume that these are linked with a decrease in traffic related accidents in Iceland due to improvements in traffic safety. There was also a considerable decline in drownings. Although there is a trend in the data towards fewer head, chest and multiple injuries, the proportional changes between type of injuries was not statistically significant (35, 36).

The majority of the fatalities in this study took place in rural areas. This is in line with results from Colorado and Norway that also looked at the place of pediatric fatalities (12, 14). It is perhaps particularly interesting in this study, as during this study period well over half of all habitants of Iceland lived in what was classified as an urban area. We had the advantage of being able to classify the location based on where the accident occurred and not only on the residence of the individual involved, as these are not necessarily always the same. Head injuries and drownings decreased considerably in urban areas over the study period. Between 1991 and 2000 the difference between incidence rates was especially noticeable. This is in some part at least due to two avalanches that occurred in the West fjords of Iceland in January and October of 1995. They hit two small towns, causing the death of 12 children among others. Since then avalanche defenses have been greatly improved in Iceland.
Most children in this study lived in a household with two adults and two or fewer siblings at the time of death. During the study period the proportion of children living with one adult increased. This could be in line with the general development in Icelandic society. Studies from New Zealand and Sweden have shown not only that children who lived with one parent only were more likely to be injured but also had a higher risk in other health related subjects. This raised risk has however been linked to differences in socioeconomic circumstances (20, 21). Whether this link is represented in Iceland cannot be determined from the results of this study.

In Europe the reasons for a reduction in pediatric injury fatality rates from 1970 to 2008 have been suggested to be linked to improvements in trauma care and traffic safety programs, but economic, social and political factors have also been mentioned as well as improved preventive measured and technological trends (27). It is likely that the same reasons explain the reduction in incidence in Iceland to some extent at least. In Iceland improvements have also been made through the years for safety in and around communal swimming pools, which are many in Iceland. Laws on child work have also improved over the years, putting the safety and wellbeing of children at the forefront (37). When looking at differences between age groups and the raised risk of adolescents in particular a look at children’s cognitive development and risk assessment may hold some answers. Studies have shown that brain development can explain why young children may show impaired judgment in many situations (38) like in traffic when choosing a safe route to cross a street (39). Development in the adolescent brain may negatively affect behavioral decision making like reasoning, impulse control and the ability to multitask (40). Studies have shown that young drivers do not detect hazards as quickly and effectively as older drivers, they underestimate the risk of an accident in many traffic situations and overestimate their own driving skill (41). In Iceland, efforts have been set in place to reduce pediatric accidents for example by offering new parents education in injury prevention based on the developmental stages of children and seminars are available that among other things offer guidance in how to minimize risk in the home environment and in transport (42). Driving education for adolescents has been improving and getting more extensive over the years. Involving both written and practical education and since 2010 student drivers need to complete a course in a so-called driving pen where they receive training in coping with various road conditions and education in the limitations of human capability in relations with operating a vehicle (43). When looking at why boys have a higher injury mortality incidence than girls studies have suggested differences in the sexes regarding cognitive scope such as future predictions, self-perception such as self-esteem, perceptions of the social environment such as parental and peer influences, personal values such as independence, risk perceptions such as the optimistic bias and characteristics of the peer group such as peer age (44). In regards to rural and urban differences explanations have been suggested to be the lack of road safety features such as traffic control devices, lighting and divided traffic streams in rural areas (18), more exposure to hazardous farm machinery and open areas of water in rural areas (15) and another important reason may be a longer response time of emergency services and longer distances to well-equipped hospitals in rural areas (14). These reasons could well apply to Iceland as well.

In Iceland, all health and socioeconomic information is registered on personal identification numbers. This makes linking data from different official sources possible and increases the reliability of the results.
In this study we are able to include all injury deaths occurring to Icelandic children during a 31-year period, revealing change over a long period. The base of the data is obtained from the Causes of Death Registry at the Directorate of Health in Iceland which contains diagnoses from medical doctors only. There is also an advantage here to know the accident location instead of just the residence of the individuals. Data on actual accident location will be useful when organizing prevention measures in the future.

As the data in this study expands to three decades different coding systems have been in use. The data registered using the ICD-8 and ICD-9 coding systems (from 1980-1995) only provides the main cause of death with no further sub-categorization. After the ICD-10 system was in place data became much more informative as to accident circumstance. This limits the study in knowing the causes of injuries before 1996. The Icelandic nation is not large, around 300,000 people on average during the study period. The injury incidence in the study period is also low which results in a lack of statistical power in some subcategories in the study. The data in this study did not include information on the general trends in family structure in Iceland through the study period. Hence it was not possible to determine if the results shown here represent a different trend than what was usual in the population.

This is the first study that looks at pediatric injury death in Iceland from 1980 to 2010. The results show common trends as to those in Europe. Although incidence rates are declining for boys, girl fatalities are still constant and need attention. Based on our research future preventive measures may focus especially on rural environments and among the oldest age group of children. Future population-based studies may further look into more precise cause of fatal pediatric accidents as well as predictive value of family circumstance and socioeconomic status.
References


Tables and figures

Figure 1 Flowchart showing eliminations from study population of Icelandic children (0-17 years old) who had registered injury death between 1980 and 2010.
Table 1  Unintentional injury mortality numbers and proportions among Icelandic children (0-17 years) from 1980 to 2010 by background factors.

<table>
<thead>
<tr>
<th>Socio-demographic factors</th>
<th>1980-1990 N(%)</th>
<th>1991-2000 N(%)</th>
<th>2001-2010 N(%)</th>
<th>Total N(%)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>107 (76,4)</td>
<td>53 (63,9)</td>
<td>22 (55,0)</td>
<td>182 (69,2)</td>
<td>p=0,01554</td>
</tr>
<tr>
<td>Girls</td>
<td>33 (23,6)</td>
<td>30 (36,1)</td>
<td>18 (45,0)</td>
<td>81 (30,8)</td>
<td></td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>27 (19,3)</td>
<td>23 (27,7)</td>
<td>6 (15,0)</td>
<td>56 (21,3)</td>
<td>p=0,4528</td>
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<tr>
<td>5-9</td>
<td>33 (23,6)</td>
<td>12 (14,4)</td>
<td>10 (25,0)</td>
<td>55 (20,9)</td>
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<tr>
<td>10-14</td>
<td>21 (15,0)</td>
<td>15 (18,1)</td>
<td>8 (20,0)</td>
<td>44 (16,7)</td>
<td></td>
</tr>
<tr>
<td>15-17</td>
<td>59 (42,1)</td>
<td>33 (39,8)</td>
<td>16 (40,0)</td>
<td>108 (41,1)</td>
<td></td>
</tr>
<tr>
<td><strong>Location of accident</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>65 (46,4)</td>
<td>21 (25,3)</td>
<td>16 (40,0)</td>
<td>102 (38,8)</td>
<td>p=0,04231</td>
</tr>
<tr>
<td>Rural</td>
<td>72 (51,4)</td>
<td>59 (71,1)</td>
<td>23 (57,5)</td>
<td>154 (58,5)</td>
<td></td>
</tr>
<tr>
<td>Abroad**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7 (2,7)</td>
<td></td>
</tr>
<tr>
<td><strong>Adults living in the home</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>23 (16,4)</td>
<td>22 (26,5)</td>
<td>15 (37,5)</td>
<td>60 (22,8)</td>
<td>p=0,01238</td>
</tr>
<tr>
<td>2</td>
<td>117 (83,6)</td>
<td>61 (73,5)</td>
<td>25 (62,5)</td>
<td>203 (77,2)</td>
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<tr>
<td><strong>Siblings living in the home</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>None</td>
<td>40 (28,6)</td>
<td>28 (33,8)</td>
<td>10 (25,0)</td>
<td>78 (29,7)</td>
<td>p=0,08128</td>
</tr>
<tr>
<td>1</td>
<td>38 (27,1)</td>
<td>24 (28,9)</td>
<td>19 (47,5)</td>
<td>81 (30,8)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>41 (29,3)</td>
<td>26 (31,3)</td>
<td>9 (22,5)</td>
<td>76 (28,9)</td>
<td></td>
</tr>
<tr>
<td>3 or more</td>
<td>21 (15,0)</td>
<td>5 (6,0)</td>
<td>2 (5,0)</td>
<td>28 (10,6)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>140 (53,2)</td>
<td>83 (31,6)</td>
<td>40 (15,2)</td>
<td>263 (100)</td>
<td></td>
</tr>
</tbody>
</table>

* P-value calculated for significance of distribution in background characteristics between the three periods.

**Only total number shown due to few cases.
Table 2 Unintentional injury mortality numbers and proportions among Icelandic children (0-17 years) from 1980 to 2010 by type of injury

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Head*</td>
<td>60 (42,9)</td>
<td>33 (39,8)</td>
<td>15 (37,5)</td>
<td>108 (41,1)</td>
</tr>
<tr>
<td>Chest</td>
<td>15 (10,7)</td>
<td>5 (6,0)</td>
<td>0 (0,0)</td>
<td>20 (7,6)</td>
</tr>
<tr>
<td>Abdomen</td>
<td>1 (0,7)</td>
<td>3 (3,6)</td>
<td>0 (0,0)</td>
<td>4 (1,5)</td>
</tr>
<tr>
<td>Spine</td>
<td>3 (2,2)</td>
<td>1 (1,2)</td>
<td>0 (0,0)</td>
<td>4 (1,5)</td>
</tr>
<tr>
<td>Limbs</td>
<td>1 (0,7)</td>
<td>0 (0,0)</td>
<td>1 (2,5)</td>
<td>2 (0,8)</td>
</tr>
<tr>
<td>Multiple injury</td>
<td>17 (12,1)</td>
<td>10 (12,0)</td>
<td>10 (25,0)</td>
<td>37 (14,1)</td>
</tr>
<tr>
<td>Drowning</td>
<td>23 (16,4)</td>
<td>16 (19,4)</td>
<td>7 (17,5)</td>
<td>46 (17,5)</td>
</tr>
<tr>
<td>Suffocation</td>
<td>9 (6,4)</td>
<td>5 (6,0)</td>
<td>4 (10,0)</td>
<td>18 (6,8)</td>
</tr>
<tr>
<td>Other**</td>
<td>11 (7,9)</td>
<td>10 (12,0)</td>
<td>3 (7,5)</td>
<td>24 (9,1)</td>
</tr>
<tr>
<td><strong>Total</strong>*</td>
<td>140 (53,2)</td>
<td>83 (31,6)</td>
<td>40 (15,2)</td>
<td>263 (100)</td>
</tr>
</tbody>
</table>

*Injury to the head, face and neck as categorized by AIS were joined in one injury type to enhance statistical power.
**Hypothermia, poisoning, electrocution and burn were joined in this variable.
*** P-value=0.3069. Calculated for significance of distribution with in injury type between the three periods.
Table 3 Unintentional injury mortality rates per 100,000 person among Icelandic children from 1980 to 2010 by sex, age group and five most common types of injury.

<table>
<thead>
<tr>
<th></th>
<th>1980-1990 Rate per 100,000 (CI)</th>
<th>1991-2000 Rate per 100,000 (CI)</th>
<th>2001-2010 Rate per 100,000 (CI)</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>1.9 (1.6-2.3)</td>
<td>1.2 (0.9-1.6)</td>
<td>0.5 (0.3-0.8)</td>
<td>1.178e-10</td>
</tr>
<tr>
<td>Girls</td>
<td>0.7 (0.5-1.0)</td>
<td>0.8 (0.5-1.1)</td>
<td>0.5 (0.3-0.7)</td>
<td>0.1039</td>
</tr>
<tr>
<td><strong>Age group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-4</td>
<td>1.0 (0.7-1.5)</td>
<td>1.0 (0.7-1.5)</td>
<td>0.3 (0.1-0.5)</td>
<td>0.0004501</td>
</tr>
<tr>
<td>5-9</td>
<td>1.2 (0.9-1.7)</td>
<td>0.6 (0.3-0.9)</td>
<td>0.4 (0.2-0.8)</td>
<td>0.0009578</td>
</tr>
<tr>
<td>10-14</td>
<td>0.8 (0.5-1.2)</td>
<td>0.7 (0.4-1.1)</td>
<td>0.4 (0.2-0.7)</td>
<td>0.09084</td>
</tr>
<tr>
<td>15-17</td>
<td>2.7 (2.1-3.4)</td>
<td>2.2 (1.5-3.0)</td>
<td>1.2 (0.7-1.8)</td>
<td>0.001613</td>
</tr>
<tr>
<td><strong>Injury type</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>1.8 (1.4-2.3)</td>
<td>1.8 (1.3-2.5)</td>
<td>1.7 (1.0-2.7)</td>
<td>0.9976</td>
</tr>
<tr>
<td>Drowning</td>
<td>0.7 (0.5-1.0)</td>
<td>0.9 (0.5-1.4)</td>
<td>0.8 (0.3-1.5)</td>
<td>0.9965</td>
</tr>
<tr>
<td>Multiple injury</td>
<td>0.5 (0.3-0.8)</td>
<td>0.6 (0.3-1.0)</td>
<td>1.1 (0.6-2.0)</td>
<td>0.9911</td>
</tr>
<tr>
<td>Chest</td>
<td>0.5 (0.3-0.7)</td>
<td>0.3 (0.1-0.6)</td>
<td>0.0</td>
<td>0.8907</td>
</tr>
<tr>
<td>Suffocation</td>
<td>0.3 (0.1-0.5)</td>
<td>0.3 (0.1-0.6)</td>
<td>0.5 (0.1-1.1)</td>
<td>0.9995</td>
</tr>
</tbody>
</table>

* P-value calculated for significance of changes in trend over time by likelihood ratio test
Figure 2 Incidence of unintentional injury death between 1980 and 2010 for all Icelandic children (0-17 years old) shown as number of cases by sex.

Figure 3 Incidence of unintentional injury death between 1980 and 2010 for all Icelandic children (0-17 years old) shown as number of cases by most common types of injury.
Figure 4 Sex specific incidence of unintentional injury death between 1980 and 2010 for all Icelandic children (0-17 years old) shown as number of cases by injury type.

Figure 5 Incidence of unintentional injury death between 1980 and 2010 for all Icelandic children (0-17 years old) by accident location, shown as number of cases by injury type.
Dórdís Katrín Þorsteinsdóttir,
Grenborg-Landspitalinn í Fossvogi
v/Fossvog
108 Reykjavík

Persónuvernd
Raudhófn 10 105 Reykjavík
sní: 590/600 beinami: 590/605
netfang: postur@personuvernd.is
vefling: personuvernd.is

Reykjavík, 27. febrúar 2014
Tíðninum: 201309161731--

Heimild

til aðgangs að sjúkraaskrá og dánarmeinskrá vegna visindaranntsóknar á
hællibgølsvíði
og til miðlunar og samkeyrsli viðkvæma personuupplýsinga í þágu slikar rannsóknar

I.

Umsetning

Persónuvernd hefur borist umsókn frá Dórdís Katrín Þorsteinsdóttur, verkefnastjóra og lektor
við hjúkrunarfæðileiði Háskóla Íslands, Brynjólfur Mogensen, yrístjóri á bráðasviði Landspítala,
Órunn Hauksdóttur, dóseint við Miðstöð í ljóðheilsuvísindum og Steinunn Órunn Eiriksdóttur,
meistarann for lýðheilsuvísindum, dagis 2. september 2013, um leyfi til aðgangs að sjúkraaskrá
Landspítala, dánarmeinskrá landlærkis, grýgnum Hagstofu Íslands og líðslógreglunýra og til
samkeyrsli viðkvæma personuupplýsinga vegna rannsóknar sem ber yfirlitinn „Sjaraldafreiði
áverkadaða höfð þórnum í Íslandi frá 1980-2010“.

Í umsókninni er tilgangi fyrirhugðrar viðnu lýst á eftirfarandi hátt:

„Markmiðið er að rannsaka fjaraldríanféí áverkadaða höfð þórnunum, frá 0-18 ára, í Íslandi frá
1980-2010, það er tími, eða áverk, stóður sem áverkar verdu í og félögina bakgrunnspætri hvað
væðar aldur, kyn, bæsett, húsaraparnið, foreldra, sjálva systýna barna sem áttast vegna áverka.”

Samkvæmt umsókninni verður fyrirhugð rannsóknarúrtak valid með eftirfarandi hætti:

1
„Rannsóknarfyrðið verður valið á grundvelli gagna sem fengin eru úr dánarheimskri frá meinaðstíðum í Landspítala Húsakvöldsárbaðinni og úr lögregluskýrslum á tímaðinninu 2008-2010. Gagna verður leiðir á þessum þremur stóðum til að auka líkøt á að fá upplýsingar um alla einstaklinga í aldurinn 0-18 ára sem léttast vegna áverka í Íslandi á þessu tímaðinni, en enkelir upplýsingar geti verið skráð í þessi gagnræðinum án þess að þau skratist. Stærð þjóðsins er ekki þekkt.”


Samkvæmt umsóknunni er fyrirhugað að afla upplýsingar frá Landspítala, landleiðni, Hagsstofu Íslands og Ríkiligreglustrjóra. Eftriðarandi upplýsingum verður safnað í þágu rannsóknarinna.

„A. Úr Dánarheimskrá og úr lögregluskýrslum Rannsóknarstoðu í meinaðri [l. Landspítala] verður safnað upplýsingum um einstaklinga (kennitökur) með undirliggjandi dánararvök með því að nota dánararskakóðan ICD10 og leita að eftriðarandi köðum: S00-S59; T00-T99; T30-T50; T51-T66; V01-Y98; V01-V98; W00-W99; X00-X59; X60-X84; X85-Y90; Y01-Y36; Y40-Y84; Y85-Y98; Y90-

B. Gögn um áverkadóuða, staðsetningu og áhrif 23 verður aflað frá Ríkiligreglustrjóra með leið til takynnum um anéliti barna vegna áverka. Kennitökur sem komu fram við ofanáltaðar leiti verða keyrðar saman og bætt til eitt gagnsafn og tengt við:

C. Gögn um bætuna, hjáskarpóðið foreldra og fjölka systrina frá Hagsstofu Íslands.

Eftri það verða kennitölur þóðir í rannsóknarnir eða einungis þóðóþínu invadelegar upplýsingar notaður við töflaóðavindslu.”

Með tövulveit frá 13. janúar 2014 veitir Bórdís Katrín nánar upplýsingar um hvernig rannsóknarfyrðisins væri aflað og greindi frá fyrirhugum samkeyrslu upplýsinga í þágu rannsóknarinna. Um það sagði:

„Í fyrsta lagi þarf að keypa saman upplýsinga undir kennitöku um öll tilfelli áverkadóuða barna á umræðu tímanni úr Dánarheimskrá Landlaðakís við gögn frá Rannsóknarstoðu í meinaðri í LS1 (lögregluskýrsla) í þeim tilgangi að þau til að tila svo það er gagnagnarum um öll skráðir tilfelli um áverkadóuða þessum embættum. Ingbjörg Richter krefsfraðingur á upplýsingarstjórnálið LS1 mun keyra saman gögn úr þessum tveimur skráum eftri kennitöönum og samrænum.

Í öðru lagi verður annars vegar beðið um gögn frá Hagsstofu um það einstaklinga sem koma fram í úrslitunum og fjölskyldusvæðum þessar samkvæmt fyrri lýsinga. Þessi gögn fást rafraða undir kennitöönum. Hins vegar verður beðið um gögn um það einstaklinga sem koma fram í úrslitunum og til eru rafraðar lögregluskýrslum um. Þessi gögn fást ekki rafraða heldur þarf rannsóknandi að ryna í útprenum úr skýrslum (sfr. þefri frai LS1) og skrá í rafraði skrá undir kennitöönum og mun Ingbjörg Richter gera það.

Þegar lokasækin verður tilbúinn mun krefsfraðingur (IR) gefa hverjum einstaklingi rannsóknarnirum og fjárlægja kennitölur. Óll töflavinnsla í endanlegum gagnarannum undir einungis á rannsóknarnúmerum.

Fyllta öryggis verður gött við flutning gögn milli stofnunnar. Starfsmálur viðeigandi stofnunar (í Hagsstofu, Landleiðni) mun aðhenda gögg á þeim um ÚSIH-lyki sem einungis er hefti að opinu með lykóðið sem rannsóknandi hefur aðgang að. Ábyrgðarmálar rannsóknar (þeirritur Bórdís Katrín Þorsteinsdóttir) mun því því Þessa ÚSIH lykla og flytja þá til Ingbjörg Richter, Krefsfraðing Landspítala.”

Í leyfissúum kemur fram að krefsfraðingur Landspítala, Ingbjörg Richter, mun varðveita
greiningarlykill sem tengir saman kenniður þátttakenda og rannsóknarnúmer en rannsóknargögn verði að öðru leyti geymd í aðgangsstýrðu svæði hún Miðstöð í lóðheilsusviðinum. Þá segir að greiningarlykill og gögnum verði eftir aðhefurðinn hatt innan fimmu ára frá rannsóknarlokum.

Með tölvubreði þann 11. febrúar 2014 öskði Persónuvernd náma skyrjinga um framkvæmd samkeyslunnar og öryggi persónumuppfýsinga við hana frá rannsakanda, kerfisfræðingi Landspitala og þeim ábyrgðaðalum sem fyrirhagð væri að afla upplýsinga hja í þaðu samkeyslunnar.

Í svarbréfi Ingibjögar Richter, sem bæst með tölvubréfi þann 18. febrúar 8 , kom m.a. fram að að hún samþykkti framkvæmd samkeyslu upplýsingu fyrir rannsakanda um öll tilfellir ákveðnaða hønna á umræðuðu tímabilð úr dánarmeinskrá landlæknis við gögn frá rannsóknarstofu í meinahreði á Landspitala í þeim tilgangi að bæ til rannsóknarhitak rannsóknarinnar. Ingibjörg myndi sjálf að þeirra upplýsinga sem um rækti úr sjökraðkom Landspitala en ekki rannsakandi. Þá stærfti Ingibjörg einnig að hún myndi beta við útakað, með samkeyslu undir kenniðöllum, upplýsingum um þátttakendur frá Hagsætum Íslands og Ríkisólgreplustjóra.

Vartandi skráningu persónuauðkenna og vatnveisslu rannsóknargögn í tengslum við rannsóknina segir eftirfarandi:

„Öll gögn eru í tölvutakum formi og verða geymd ðöfennagreinaleg á aðgangsstýru/kestu svæði hún Miðstöð í lóðheilsusviðinum, helinagrænaðalagið Hi. Persónagreinalegum gögnnum verður eftir eftirfældingu þagadafóða og mynd innan rannsóknargreininganna og greiningarlykill göymur hún kerfisfræðingi á LSH. Rannsakendur eru alla bandur trúatud og hafa skráði undir yfirlýsingum um þagadafóða hún Hi og LSH. Við árunum gagna og kynningu verður þjólas trúatud og öryggi gett þannig að ekki verði í nokkur hatt hægt að rekja niðurstöður til einstaklinga.“


II.
Lejifskýld núnska persónamælum

aðgang að persónugreiningum upplýsingum úr heilbrigðisskám landalekin, þ.m.t.
dánarmeinskri, str. 3. mgr. 15. gr. laga nr. 74/1997 og þarf jafnframt leyfi Persónuverndar til aðgangs að henni.

Í 5. tölu. 1. mgr. 4. gr. reglna nr. 712/2008, um tilkynningarskylda og leyfiskylda vinnslu persónuupplýsinga, sbr. 33. gr. laga nr. 77/2000 um persónuvernd og meðferð persónuupplýsinga, er með fyrir um að leyfi þarfi til vinnslu persónuupplýsinga um félageleg vandamál eða ôðrum einkahaftariðið nema vinnslar sér naðurlyngur og eðgalög þarinn í starfsemi viðkomandi aðila. Í 8. tölu. sömu greinar er með fyrir um að leyfi þarfi til miðlar viðkvenna persónuupplýsinga sem varðvitnar eru hjá stjórnvöldum, í þessu tilvik landlekin og Ríkiðsreglugjóða, til rannsakaða í það viðsindarannsóknar. Þá þarf ekki leyfi samkvæmt framgangreindum töluðum ef fengð er samþykki hins skráða, sbr. 2. mgr. 4. gr. reglnana. Sú undantekning á ekki við um rúðgerða miðlar fyrirfræði aðila og eftrarandi vinnslu rannsakaða á upplýsingum sem leyfi þetta tekur til og þarf hún því að byggjaút á leyfi Persónuverndar.

Í 1. tölu. 1. mgr. 4. gr. reglna nr. 712/2008, sbr. 33. gr. laga nr. 77/2000, er með fyrir um að leyfi Persónuverndar þarfi til samkeyrsu skráara, sem hefur að geyma viðkvennar persónuupplýsingar, við aðra skrá, hvort sem síður hefur að geyma almennar eða viðkvennar persónuupplýsingir, sbr. þó vissa undantekningar frá þeirri leyfiskylda, m.a. ef fengð er samþykki fyrir samkeyrsu, sbr. 2. mgr. 4. gr. reglnana. Samkvæmt umsókn er fyrirhugið að samkeyra viðkvennar persónuupplýsinga fyrirfræði aðila og mun Ingibjörg Richter, kerfisfræðingur í upplýsingatekniska Landspitala, sjá um samkeyrsu og samætingu rannsóknaragna og þarf hún því eintök að byggjaút á leyfi Persónuverndar.

III.

Leyfi og leyfisskilmálir er náða
landalekin og Ríkiðsreglugjóða


Nánar tiltekki tekur leyfði til miðlar upplýsinga til Úrbæðis Katríns Borsteinsdóttur, leikdóttar, um alla einstaklinga á aldrinum 0-18 ára sem lætur vegna áverka á Islandi í tímabilinum 1980-2010. Annars vegar er um að ræða upplýsingum á áverkadaðu, staðsetningu og aðstödur samt kenniðum frá Ríkiðsreglugjóða. Hins vegar er um að ræða upplýsingir úr dánarmeinskri landlekin um dánarannsók ásamt kenniðum frá landlekin. Leyfði gildir til 31. desembar 2014 og er bundið eftrarandi skýrðum varðandi landlekin og Ríkiðsreglugjóða:


2. Ábyrgðaraðilar skulu tryggja að engum öðrum en rannsakaða, Bóðins Katrínu Borsteindsóttur, eða þeim sem starfa á hennar ábyrgð verði afhentar upplýsingarnar. Í því
augnamiði skal lagt fyrir Bórdís Katrínna að undirrita trúannaðarflýtingar þess cefnis.

3. Ábyrgðardælaðir skulu skrá og varðveita yfirlét um þær upplýsingar, sem veitir er aðgangur að, í því skynni að geta fullnægt skyldum sinnum samkvæmt 18. gr. laga nr. 77/2000 þar sem mælt er fyrir um upplýsingarrett hins skráða. Í yfirinuntu skulu koma fram heiti rannsóknar og nafni ábyrgðaráðlaðinnar skv. IV. kafla leyfis þessa.

4. Ef upplýsingar eru aftanfar út úr husnafli ábyrgðaráðlaða ber að geta þær með uruggum hætti með hliðsöfn af eðli gagnanna. Óheimilt er að senda upplýsingarnar með faxi eða ódulköðum tölvupósti.

5. Ábyrgðaráðilum ber að veita Persónuvernd, starfsmönnum og tilhjónarmönnum hennar allar unmbudnar upplýsingar um vinslub personuupplýsinganna sé eftir því leitað í þágu eftirfils.


IV. 

Leyst og leyfiskilsmálar 

er nýrta rannsakanda

Með vísan til 3. mgr. 15. gr. laga nr. 74/1997 um réttindi sjúklinga, er Bórdís Katrínna Bórustinsdóttur, í leyfi þessu nefnd leystafh, heimilauður aðgangur aðgang að sjúkra skráð Landspitala og dönamækistra landleiknis um alla einstaklinga á aldrinninum 0-18 ára sem lætur vegna áverka í Islandi í tímaritum 1980-2010 í þágu rannsóknarinnar “Írannsókn á áaverkadaða hjá bónunum í Íslandi frá 1980-2010”. Er rannsakanda heimilauður aðgangur að upplýsingum um kenniðar einstaklinga með undirfjárrandi dönamánask sem kvæmt eftirfarandi dönamánaskóðun TCD10: S00-S99; T00-T98; T36-T50; T51-T66;V01-V98; V01-V98; W00-W99;X00-X95; X60-X84; X85-Y90; Y10-Y36; Y40-Y84; Y85-Y90; Y90-Y98 frá Landspitala og landleikni.


Leyfi þetta gildir til 31. desember 2014 og er bundið eftirfarandi skilyrðum:

1. Ábyrgðaráðlar að vinslu personuupplýsinga

2. Lágbandir leyfiskilsmálar
a. Þegar leyfisafn fer þess á leið við ábyrgðarmenn sjúkra skráða á Landspitala, dönamækistra landleiknis og annarri ábyrgðaráðlaði persónuupplýsingu hjá Hagstofu Islands og Ríkisögreglustjóra að fá aðgang að viðkomanði göggnum, ber honum að framvisa leyfi þessu.

b. Leyfi þetta er bundið því skilyrði að ábyrgðarmenn unrekka upplýsinga haft lýsl því yfir að
3. Lögferð viðnuleg pursoneinnýslaug og þagarskyldur


3.3. Húðsóknarnar og aðrir sem ekki teljar til gyllgíta heilurgöngusstutta en taka það í framkvæmd raðmökuninnar skulu, áður en vinslan hefð, undirrita sérstaka þagarskyldufylkifylsingu, þar sem þær m.a. ábyrgjast að tilkynna leyfshafa ef í raðmökumargongum eru viðkvæmar pursoneinnýslaugar um þa sem eru eða hafa verið máli viðkomandi, skyldur eða margöð horunum í árinn legg eða að þöru lí til hliðar eða tengdir honum með sama hakti vegna ættuleiðingar. Ef viðkomandi það heimilt að kynna sér gögn um þa einastæðinga. Leyfshafa eða fulltrúa hans ber að votta réttta endurskipti hlutadeigandi og dagsetningu áhætt við upplýsingar og varðveita hans. Leyfshafa ber að aðheima Persónuvernd aftast af silki yfirlýsingu þegar og ef stofnuma kallar eftir henni. Þagarskyldan er byggð á 3. tr. 35. gr. laga nr. 77/2000. Á heimsstýri Persónuverndin er að finna stúðlaðeydablað fyrr þagarskyldufylkifylsingu. Ef þagarskyldufylkifylsingu er ekki skilað innan tilvikils freds getur Persónuvernd aftað yfirlýsinga leyfi þetta.

4. Ásamtýning raðmökargongu


4.2. Leyfi þetta verir raðskaðanda ekki heimild til aðgangs að sjúkrafráðupplýsingum hafi viðkomandi sjúkningar eða umboðsmaður hans legt benn við því að leyfishafi, eða annar tiltekin aðhlið sem starfa á hans vegum, hafi aðgang að sjúkrafráði viðkomandi, sbr. 4. tr. 13. gr. tj. sjúkrafráðalaga nr. 55/2009.

c. Þar þar upplýsingar, sem leyfi þetta tekur til, hafa verið skráðar í rannsóknargögn, skal ávallt geta að því og trygga að þar liðið aldrei fyrir auðkenningu á því frá hvaða einstaklingi upplýsingarnar stafa hvorkvi með því að skrá þar persónaauðkenni, þ.d. nafn, kenntíðla, heimilisfang, áftunarmær, nefingaf og eða því um líkt, ný samansætn upplýsinga sem gerði lefitt að afhagsa hver hinn skráði er.

d. Persónuvernd getur gert úttek að því hvort farið sé að fyriræðum b-liðar þessaar er greinar um erýðinga upplýsinga. Til þess getur stofnunnin notið aðstoðar sérfreiðings í upplýsingu þeirri, str. og g-liði 6. gr. bær að eftir.

5. Öryggi við viðnams persónuupplýsinga

Leyfisfafa ber að gera viðeigandi taksnímei og skipulagskeppur öryggisráðstafanir til að vernda persónuupplýsingur gogn óleyflægum aðgangi í samtæmi við 11. og 12. gr. laga nr. 77/2000. Þar er meðal annars áskilið að:

b. beita skuli ráðstöðum sem tryggja nágøgur öryggjum við aðstæðu við viðnærum og eðli þeirra gögn sem verja á, með hiljóðum af nýjustu tekní og kostnaði við framkvæmd þeirra, og

b. tryggja skuli að aðstæðum við öryggisráðstafanir við viðnælu persónuupplýsinga séu í samtæmi við lög, reglur og fyriræði Persónuverndar um hvernig tryggja skal öryggj upplýsinga, þ.e.m. þá stjóða sem hún ákveður að skrá fylgt.

Leyfisfafi ber ábyrgð að því að hver sé að starfari í umboði hans og hefur aðgang að persónuupplýsingum vinni aðeins með þær í samtæmi við skýr fyriræði sem hann gefur og að því marki að falli innan skilyrða leyfís þessa, nema lág mæli fyrir að annan veg, sbr. 3. mgr. 13. gr. laga nr. 77/2000.

6. Almenningar skilmálar

a. Ávallt skal tryggt að rannsóknargögn séu viðrættir á þryggum stað og aðeins þar sem lögmum samkvæmt er heimilt að verðeina þau.

b. Leyfisfafi ber ábyrgð að þar farið sé með öll persónuauðkenni gogn sem sjúkraþrängjum í samtæmi við lög, reglur og ákveði þessa leyfís.

b. Leyfisfafi skal ábyrgjast að eingur aðr eru hann, eða aðili semstarf á hans vegum, fái í hendur persónuþráttarleg gogn sem um þarð verður með í tengslum við þessa rannsókn.

b. Leyfisfafi ber að tilkynna Persónuvernduð tæflaust ef upp komur ótryggðarbreiður viðhindi þær persónuupplýsingaring sem leyfís þetta tekur til.

b. Ólíki leyfisfahr er því að hættu þannatnar ber honum að tilkynna það til Persónuverndar á skriflegum og samtættum hátt. Skal þá tilgreina hvort öllum þeim persónuupplýsingum, sem unnar voru upp ur þeim gögnum sem veitir var aðgangur að þegar verða leyfís, hafi verið eftir. Að því þáum kosti anskrifik Persónuvernd um hvort persónuupplýsingum skuli eftir upp þær verðeittir með skilyrðum skilyrðum.

b. Leyfisfafi ber að veita Persónuvernd, stærðfræðum og tilheyringum þennnar allar umbeðnar upplýsingar við viðnælu persónuupplýsinga sé eftir því leiða, svo sem í þágu eftirlits eða vegna meðferðar mála sem tengjast viðnælu.


Leyfi þetta gildir til 31. december 2014 og er bundið eftirfarandi skilyrðum:

1. Ábyrgðaráðili að vinsla persónuupplysinga

2. Lögumhunirá leyfisskiður
a. Leyfi þetta er bundið því skilyrði að áhanda en vinnslan hestf hafi störf nefnd, eða eftir atvirkum visindastæðar tók mat á rannsóknina og lát haf í te skilyrði allt sitt ef þetta einnig að hverki visindaleg störf nefnd svar að þegar samkyninni um heilsufarsupplýsingum sem undir er með, sbr. 3. mgr. 15. gr. laga nr. 74/1997, sbr. 4. mgr. 2. gr. sömu laga.

3. Lögnum vinsla persónuupplysinga og þjóðarskyldas


4. Samkeyrslys nítkennslu persónuupplysinga
a. Rannsóknarþýggj fær að skynnt því leyfisfari, Ingjörgu Richter, frá Dórdís Katrín Porsteinsdóttir, rannsakanda, skul með því að hinni með því heimi eftirfarandi, s.s. í listu skjafi á minniskubbi sem lætur er það að þegar þegar sem þegar að samkeyrslynt lokinni.
b. Þær upplýsingar, sem heimilt er að samkeyra, eru upplýsingar móteknar frá rannsakanda
n.t.t. úr sjúkraaskróð Landspítala, dánarmeinskra landleiknis og gögnun Hagstofu Islands og Rískíslegregl烘jóðra álfar einstaklinga á aldrinum 0.18 ára sem leiðust vegna áverka á Islandi á tímabilið 1980-2010, sbr. upprahningu í upphafi IV. kafla leyfis þessa.


d. Að samkeyrslu lokiinni og áður en kemur að afhendingu hins samkeyrslu safnis til rannsakaenda skal þeir gætt að með öllu sér ökleifst, án greiningalýkillins, að tengja niðuröður samkeyrslun verð þessum þomann.  

5. Afhending rannsóknargagna til rannsakaenda

a. Leyfishafa er heimilt að afhenda rannsakaenda opiniónregime þann dagur þar sem þær verða með framgangepinda samkeyrslu upplýsinga úr sjúkraaskróð Landspítala, dánarmeinskra landleiknis og skrárn Hagstofu Islands og Rískíslegregl烘jóðra. Nánar ritilið ber leyfishafa að gana úr skugga um að rannsóknargagnunninn, sem afhendir verða rannsakaenda, sé á kennitalna, persónnúmera eða fjólskylendumála eða annarr persónuævinnu sem umt vörð að rekja tilbaka til einstaklings.

b. Eðli málins samkvæmt tekur þessu hluti leyfins eingöngu til samkeyrslu tilhekkna upplýsinga úr sjúkraaskróð Landspítala, dánarmeinskra landleiknis, skrárn Hagstofu og Rískíslegregl烘jóðra sbr. upplýsingun í upphafi IV. kafla leyfis þessa og samkeyrslu þeirra og loks afhendingu opiniónregime þann dagur þar sem þær verða með framgangepinda samkeyrslu, þar sem rannsóknarmálar um stað kennitalna, til rannsakaenda, en ekki til eftirfarandi vinnslu rannsakaenda úr upplýsingunum í þágö viðurnarinnar sinnar. Er nánar fjallað um skilmála til handa rannsakaenda, verðandi útvinnslu gagna frá fyrirmeðlun aðfleddum, í kafla IV hér að framan.

6. Avmennska, tveiriðis og eyðingagna

a. Fr Ingjóðgu Richter, kerfiðafla Ingjóðgu Richter Landspítala, heimilt við framkvæmd rannsóknar þessarar að skrá og varðveita tímavétsið sérstaka skrá, greiningalýkill, sem tengir saman upplýsingum um kennítöður einstaklinga og rannsóknarmálar um stað Kennedy er að utðáttúra þeirra. Síðan greiningalýkill skal aðallega tilhaldur að skrá þeirra og rannsóknargagnunninum sem þær verða með þeirra.


d. Persónuvæm getur gert úttð stærkt því hvort farið sé að fyriræðum b- og c-liðum þessarar greinar um eyðingu upplýsinga. Til þess getur stofnanin notið aðstoða sérfræðinga í upplýsingunum eyðingu, sbr. og g-líð 8. gr. hér á eftir.

7. Öryggi við vinnslu persónuupplýsinga

Leyfishafa ber að geria viðeigandi tæknilegar og skipulageilegar öryggsráðstafafanir til að vernda persónuupplýsingar gagn Óleyfilegum aðgangi í samræmi við 11. og 12. gr. laga nr. 77/2000. Þar er m.a. áskil að

a. þetta skuli ræðfræðumunum sem tryggja saklegg öryggi midbó við áhættu af vinnslunni og eðli þeirra gagna sem verja á, með líðhjósinum af nýjasta tekní og kostnúði við framkvæmd þeirra, og

b. tryggja skuli að áhættumatur og öryggsráðstafanir við vinnslu persónuupplýsinga séu í
sammæni við lög, reglur og fyriræli Persónuverndar um hvernig tryggja skal öryggji upplýsinga, þ.m.t. það staðla sem hún ákveður að skrá fylgt. Leyfishafi ber ábyrgð á því að hver sá er starfi í umboði hans og hefur aðgang að persónuupplýsingum vinni aðeins með þær í sammæni við skýr fyriræli sem hann gefur og að því marki að falli innan skilyrða leyfis þessa, nema lög með fyrir á annan veg, þ. b. str. 3. mrg. í f. gr. laga nr. 77/2000.

8. Álmenning skiliníllar

a. Ávalt skal tryggt að rannsóknargögn sér varðveitt á tryggum stað og aðeins þar sem lögum samkvæmt er heimilt að varðveita þau.
b. Leyfishafi ber ábyrgð á að farði sé með öll persónuaðkennsl gögn sem sjúkraókrargögn í sammæni við lög, reglur og ákveði þessa leyfis.
c. Leyfishafi skal ábyrgjast að engir aðrir en hann fái í hendur persónugreinileg gögn sem hann sjálvur með í þágu þessarar rannsóknar.
d. Leyfishafa ber að tilkynna Persónuvernd tafarlausst ef upp kemur öryggisheuretvar vandandi þer persónuupplýsingar sem leyfi þetta tekur til.
e. Óski leyfishafi eftir því að hættu rannsókn ber honum að tilkynna það til Persónuverndar á skriflegan og samanlegan hátt. Skal þá tilgreina hvort þeim persónuupplýsingum, sem unnar voru á grundvelli þessu leyfis, hafi verið eftir. Að öðrum kosti úrskurðar Persónuvernd um hvort persónuupplýsingum skrái eftir eða þar varðveittur með ákveðnum skilyðum.
f. Leyfishafa ber að veita Persónuvernd, starfsmenn þess og þessum í allri umboðnar upplýsingar um vinnslu þessu persónupplýsinga sér eftir því leiðtak, svo sem í þágu eftir þess eða vegna meðferðir mála sem tengjast vinnslunni.
h. Leyfi þetta er hæð því þeir skilyrði að einangis verði safnað þeim upplýsingum sem naðurlegur eru vegna rannsókninum.
i. Brot á ákveðnum leyfis þessa getur varðað því að leyfið verði felld niður.

Vinnslarefning

[Unter хорошее]


Á fundi sinum 27.08.2013 fjallaði Visindasidaneðfund um umsókn þína. Meðrannsakaður þínum eru: Brynjóllur Mogensen, Arna Hauksdóttir og Steinunn Anna Eiríksdóttir.

Eftir að hafa faríð vandlega yfir umsókn þína og innfeld göng gerir Visindasidaneðfund ekki aðugasendur við framkvæmd rannsóknarinnar en áréttað að rannsakendur fari varlega í tölkin og birtningu níðurstöðun til að koma í veg fyrir mörgulegan persónuættíkennaleita.

Rannsóknarhistorin er endurlega samþykkt með framtigniningri áréttingu.

Visindasidaneðfund bendir rannsakendum vinsamlegast að að birta VSN tilvísunarnúmer rannsóknarinnar þar sem vítnám er í leyfi nefndarinnar í birtum greinum um rannsóknina. Jafnframt fer Visindasidaneðfund fram að að fá send aftir af, eða tilvísun í, birtar greinar um rannsóknina. Rannsakendur eru minntr á að tilkynna rannsóknarlok til nefndarinnar.

Áréttað er að allar fyrirhugaðar breytingar á þegar samþykktir rannsóknararéttur þurfa að koma inn til nefndarinnar til umfjöllum. Jafnframt þar ábyrgðarmann að láta stofnunir, sem veitt hafa leyfi vegna frumkvæmdar rannsóknarinnar eða öflynar gagna vita af fyrirhugum breytingum.

Med kveðja og ósk um gott rannsóknargengi,

[Unterschrift]

Kristján Erlendsson, læknir, formúður
Efni: Aðgangur að gögnum úr dánarmeinskrá vega visindarannsóknar


Leyfi þetta er háð því skilyrði að rannsóknin fái leyfi Personuverndar og Visindasóknunum. Afrit af þessum leyfum þurfa að berast Embætti landlaðniss áður en aðgangur er veittur að umboðnum gögnnum.

Geta skal dánarmeinskrá sem heimildar í birtu sem og kynntu efni sem byggar á upplýsingum úr gagnagrunninum. Einnig er þess vestur að birt efni verði sent Embætti landlaðniss.

Fyrirvari við samþykki fyrir aðgangi að gögnum úr dánarmeinskrá.


Virkjafyllst,

[Handskrif]

Sigríður Haraldsdóttir
svitshjóðir
heilbrigðisupplýsingasvið

Afríð. Persónuvernd
Visindasóknunefnd
Landspítali húskólaáskraðafls, Rannsóknarstofa
LSH og hl í bráðaflæðum
Dórað Katrin hóriskeinsdottir, lektor
Fossvogi
108 Reykjavík

Reykjavík 17. nóvember 2015
Tlf.: VSNK2013080093/03.11


Á fundi sínum 17.11.2015 fjarlægði Visinsdælanæfnd um umsókn bina daga. 02.11.2015, vegna
viðbótar nr. 2 við oftagnýinda rannsóknarflæðum.

I brefnun kemur eftirfarandi fram:
“Óskar er eftir framlegun og leyfi til framkvæmdar rannsóknarinnar en Persónuvernd velti leyfi
þann 27. febrúar 2014 með gildistíma til 31. desember 2014. Það gign er fyrir þáttur er að liggja til
grundvallar írtuks rannsóknarinnar, það er gign í Dæmarkeflaða Landlistasamband þessari eftir
veitingi í þessari listi í þessari lýsingu. Á gagnveitingi áður teknir á gagnveitingi áður tekna eftir
veitingi í þessari listi í þessari Lýsingu. Á gagnveitingi áður tekna eftir veitingi í þessari listi í þessari Lýsingu.

Vinsidaugur og gagnveitingi áður tekna eftir veitingi í þessari listi í þessari Lýsingu.

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Visindasráðuneyt hendingi til þess að ábyrgðarmætur raunnökunarinnar ber ábyrgð á að sött sé um viðeigandi leyf vegg viðbótar breytinga þá þeim stofnum sem við á. Óheimilt er að beðja framkvæmd raunnökunarinnar fyrir en slikt leyfi liggja fyrir. Afrit leyfa samstarfssýningu þarfa að berast nefndum. Jafnframt ber ábyrgðarmannir að tillýkna þeim stofnum, sem veitir hafa leyfi vegg framkvæmdar raunnökunarinnar eða öflunar gagna, um framangreiðint, ef við á. Óheimilt er að breyta framkvæmd raunnökunarinnar fyrir en slikt leyfi liggja fyrir.

Med kvöðja,
FH Vísindasráðuneyt,

Kristján Erlendsson, lækni, formúður