Traumatic dental injuries and general unintentional injuries in children and adolescents in the Swedish BITA study

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They're funny things, Accidents.

You never have them till you're having them.

A.A. Milne - Winnie the Pooh

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ABSTRACT

The aims for this thesis were to investigate which children and adolescents in the Swedish BITA study encountered traumatic dental injuries (TDI) and general unintentional injuries (GUI), their injury etiology, socio-economic and individual risk factors. Furthermore, to explore if the experience of dental injuries affects the child's fear and cooperation in the dental situation.

The BITA study (**B**arn **I TA**ndvården, which means children in dental care) was a longitudinal study in collaboration with seven dental clinics in the Region Västra Götaland and five in the Region Örebro County. During five years, 4 age cohorts (aged 3, 7, 11, and 15 years at study start) were followed, and 2363 children/adolescents were included with an even distribution between the genders. Data was collected at the dental clinics by the regular dental personnel using structured interviews, questionnaires and clinical examinations. Retrospective data regarding TDI was collected via dental records.

The yearly incidence for TDI was 2.8%. The prevalence for TDI was 37.6%, with 27.8% having encountered multiple occasions of TDI, and there were no differences between the genders. 24% had encountered a general injury requiring medical attention. By the age of 7, more boys than girls were assessed by their parents to be injury-prone. Parents, who assessed their children to be injury-prone, had children with more TDI and GUI reported. Most of the reported GUI occurred at home. The most common etiological factor for TDI was due to a fall, and most common among the youngest children. Children with TDI were associated with more occasions of GUI. Shy 3-year-olds had less TDI and GUI, hyperactive/inattentive 7-year-olds had more GUI, and 15-year-olds with a social temperament had more TDI and GUI. Parents born outside of the Nordic countries had children with fewer TDI reported. Children, whose mothers had a low education level encountered more injuries. Pain and fear could be experienced by children during treatment for TDI, despite that most of the children fully cooperated during treatment and at the follow-up treatment. Children's self-rated fear, at the regular dental examination, showed that children with multiple occasions of TDI were more fearful than children with only one occasion of TDI.

This study showed that just over one-third of the children in the BITA study had encountered TDI. Children with TDI were associated with more occasions of GUI. The etiological factors for injuries varied for the different age groups and the socio-economic and individual risk factors for injuries changed with age. Pain and fear during treatment for TDI or at follow-up treatment did not affect the child's ability to cooperate to any great extent. Children with multiple occasions of TDI were more fearful in connection with dental care.

Keywords: children, cooperation, dental fear, dental trauma, etiology, gender, general unintentional injuries, incidence, pain, prevalence, socio-economic risk factors, temperament

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SAMMANFATTNING PÅ SVENSKA

Syftet med föreliggande avhandling var att studera vilka barn och ungdomar i BITA-studien som råkar ut för tandskador och andra kroppsskador, etiologiska faktorer, socioekonomiska och individuella riskfaktorer för skador. Vidare att utforska om erfarenheten av tandskada påverkar barnets rädsla och kooperation i tandvårdssituationen.

BITA-studien (**B**arn **I** **TA**ndvården) var en longitudinell studie i samarbete med 7 kliniker i Västra Götalandsregionen och 5 i Region Örebro län. Under 5 år följdes 4 ålderskohorter (3, 7, 11 och 15 år vid studiestarten) som inkluderade 2363 barn/ungdomar med en jämn könsfördelning. Data samlades in på klinikerna av den ordinarie tandvårdspersonalen med hjälp av strukturerade intervjuer, frågeformulär och kliniska undersökningar. Retrospektiva data för tandskador har samlats in via journaler.

Den årliga incidensen för tandskador var 2.8%, prevalensen var 37.6% där 27.8% hade skadat sig mer än 1 gång, och det var inga skillnader mellan pojkar och flickor. 24% hade råkat ut för kroppsskador som krävt läkarvård. Vid 7 års ålder var fler pojkar än flickor bedömda av föräldrarna att vara skadebenägna. Föräldrar som bedömde att deras barn var skadebenägna hade också barn med fler tandskador och kroppsskador rapporterade. Den vanligaste platsen för kroppsskador var i hemmet. Fallolyckor var den mest förekommande orsaken till tandskada och var vanligast bland de yngsta barnen. Barn som råkade ut för tandskador råkade också ut för kroppsskador i större utsträckning. Blyga 3-åringar hade färre tandskador och kroppsskador, hyperaktiva/ouppmärksamma 7-åringar hade fler kroppsskador och 15-åringar med ett socialt temperament hade fler tandskador och kroppsskador. Föräldrar som var födda utanför Norden hade barn med färre tandskador rapporterade. Barn vars mammor hade låg utbildning skadade sig oftare. Smärta och/eller rädsla kunde upplevas av barnen vid behandlingen av tandskadan, trots det koopererade de flesta barnen till behandlingen av tandskadan och även vid nästföljande behandlingstillfälle. När barnen själva skattade sin rädsla vid den årliga undersökningen, var de barn som råkat ut för flera tandskador mer rädda än barn som råkat ut för en tandskada.

Den här studien visade att drygt 1/3 av alla barn i BITA-studien hade råkat ut för någon tandskada. Barn som råkade ut för tandskador råkade också ut för kroppsskador i större utsträckning. De etiologiska faktorerna för skador varierade för de olika åldersgrupperna. De socioekonomiska och individuella riskfaktorerna för skada förändrades med åldern. Smärta/rädsla vid behandlingen av tandskada påverkade inte barnets kooperation i någon större utsträckning, inte heller kooperationen vid det uppföljande behandlingstillfället. Barn som råkat ut för flera tandskador skattade sig själva som mer rädda i samband med behandlingen.

LIST OF PAPERS

This thesis is based on the following studies, referred to in the text by their Roman numerals.

I. Oldin A, Lundgren J, Nilsson M, Norén JG, Robertson A. Traumatic dental injuries among children aged 0-17 years in the BITA study – A longitudinal Swedish multicenter study. *Dent Traumatol* 2015;31:9-17.

II. Oldin A, Lundgren J, Norén JG, Robertson A. Temperamental and socioeconomic factors associated with traumatic dental injuries among children aged 0-17 years in the Swedish BITA study. *Dent Traumatol* 2015;31:361-7 Corrigendum for Temperamental and socioeconomic factors associated with traumatic dental injuries among children aged 0-17 years in the Swedish BITA study. *Dent Traumatol* 2016;32:166-7.

III. Oldin A, Lundgren J, Norén JG, Robertson A. Individual risk factors associated with general unintentional injuries and the relationship to traumatic dental injuries among children aged 0-15 years in the Swedish BITA study. *Dent Traumatol* 2016;32:296-305.

IV. Oldin A, Arnrup K, Lundgren J, Nilsson M, Norén JG, Robertson A. Dental fear and pain associated with traumatic dental injuries in children aged 3-17 years in the Swedish BITA study. *Submitted for publication in Int J Paediatr Dent.*

CONTENT

ABBREVIATIONS

BITA	Barn I TAndvården (children in dental care)
CFSS-DS	Children's Fear Survey Schedule–Dental Subscale
CG-1	Control Group 1
CG-2	Control Group 2
DAS	Dental Anxiety Scale
deft	decayed, extracted, filled teeth
Dsa	Decayed surfaces approximal
EAS	Emotionality, Activity, and Sociability
EASI	Emotionality, Activity, Sociability and Impulsivity
GUI	General Unintentional Injuries
IASP	International Association for the Study of Pain
IDB	Injury Database
PAI	Parental Assessment of the child's Injury frequency
PDS	Public Dental Service
ROC	Region Örebro County
RVG	Region Västra Götaland
SDQ	Strengths and Difficulties Questionnaire
SES	Socio-Economic Status
SG-1	Study Group 1
SG-2	Study Group 2
SG-3	Study Group 3
SG-4	Study Group 4
TDI	Traumatic Dental Injuries
VAS	Visual Analogue Scale
WHO	World Health Organization

DEFINITIONS IN SHORT

Prevalence	The proportion of injuries/disease in a population at a specific time.
Incidence	The proportion of new cases of injuries/disease during a pre-defined time period.

1 INTRODUCTION

Traumatic dental injuries (TDI) among children of all ages are common, worldwide. Dental injuries affect a small part of the body but can have a major impact on the child and are often painful, frightening and result in the need for emergency treatment. The oral region comprises only 1% of the total body area but has been found to account for 5% of all bodily injuries (1). The World Health Organization (WHO) compiled unintentional injuries involving children and adolescents in 37 European countries, in 2008, in the "European report on child injury prevention". The report found that injuries are the leading cause of death for children and adolescents aged 5-19 years (2). WHO reports that almost all governments in the world have ratified *The Convention on the Rights of the Child*. The Convention states that all children have a right to a safe environment and protection from injury and violence (3).

Despite the best of intentions, traumatic injuries are the main cause of mortality, as well as hospital treatments, for Swedish children aged 0 to 17 years. The mortality rate for Swedish children has decreased over a long period of time and is low in an international perspective (4). Worldwide, almost 47,000 children under the age of 20 are involved in fatal accidents due to a fall. Children under the age of one year have the highest mortality rate for injuries due to a fall, with higher levels in low and middle-income countries. For all regions in the world, boys have a higher risk for unintentional injuries and mortal injuries than girls (3).

Dental care for children in Sweden is organized in a way which constitutes excellent conditions for large studies. In Sweden, all children are included in a dental care system provided by the County Councils and carried out by the Public Dental Service (PDS), or by choice, a private dental clinic. All children, from birth up until the age of 19, have free dental care and are regularly called to a PDS clinic, or their private clinic, according to a recall system. Furthermore, medical care in Sweden, both scheduled appointments and emergency medical treatment, is free of charge for all children and adolescents up until and including 19 years of age. This means that all children in Sweden have the right and opportunity to receive both dental and medical treatment as required.

1.1 Prevalence and incidence of injuries in children and adolescents

The prevalence of injuries shows the proportion of injuries at a specific time, while the incidence shows the proportion of new injuries during a pre-defined time period, often a one-year period. There are variations in studies for both the prevalence and incidence for TDI that can affect the results.

Variations in results can depend on different samples regarding age and when data was gathered and compiled. Studies from several countries show a wide variation for the prevalence of TDI of between 6-58% (Table 1). An Australian study in 1985, with children aged 12-15 years, had a prevalence of 6% (5). In 2001, Saudi Arabia including only boys aged 12-14 years and had a prevalence of 34% (6). In a study from Brazil in 2006, children aged 1-5 years had a prevalence of 37% (7). It has been discussed if TDI has increased or decreased over the years. Due to the variations in study design, it can be difficult to evaluate if there has been a change in prevalence over time.

The incidence also showed variations with results between 1.3% and 4.4% for TDI among children in different parts of the world (Table 2). There is a prospective Norwegian study from 2003 which found no increase in the annual frequency of TDI for children aged 7-18 years (8). Variations in incidence have been found for two Swedish studies. In 1996, a Swedish study found the incidence to be 1.3% for children aged 0-19 years (9), and in 1997, another Swedish study found the incidence to be 2.8% for an age cohort of children aged 16 years, calculated on the ages 1-16 years in the age cohort (10).

Some children encounter more than one occasion of TDI during their lifetime (9, 11-13), and in a Swedish study, it was found that 25% of the children encountered tooth injury more than once, with a higher prevalence for boys than girls (10). A study on Danish children found that 41% suffered from multiple occasions of dental trauma (14). Regarding general injuries, a study from Canada showed that more boys than girls were likely to be injured and to have repeated general injuries (15).

Climate differences between seasons may have an effect on the prevalence of TDI in countries where children participated in different types of seasonal activities and sports. In a Swedish study, seasonal patterns for TDI have been studied, where a decrease has been found for TDI during the

summer, however, studies from Australia and New Zealand found no significant pattern for TDI during the seasons (9, 16, 17). Sweden has seasonal variations with snow in the winter and warm summers, and where it is possible to swim in the ocean, while Australia and New Zealand have summer-like weather all year round.

During the 1950s, safety work in Sweden started to increase child safety and to reduce child injuries (18). In 1954, the number of children who died from general injuries in the age group 0-15 years was 450. In 1988, the number was down to 88 (18). General injuries are also referred to as accidental injuries, but in this study, the term general injuries will be used.

The latest report, compiled from The National Board of Health and Welfare in Sweden (Socialstyrelsen), showed that during the years 2010-2013, 71 children aged 1-17 years died yearly from general unintentional and intentional injuries, with about half of them having died from unintentional injuries (19). According to an estimation based on the Injury Database (IDB), approximately 170,000 (9%) of the 1.9 million children in Sweden, aged 0-17 years, were yearly treated for a general injury at a hospital between the years 2010-2013 (20). In addition, there are children treated for general injuries at their primary care clinics not included in the statistics. Of the 170,000 children with a general injury and treated at an emergency clinic, 18,270 were admitted to a hospital due to the severity of the injury (19).

The incidence for general injuries that occurred at home has been compiled for six European countries. Data was extracted from the European Injury Database (IDB) of unintentional, hospital-treated child injuries, gathered from the six countries participating during 2003 and 2004; Austria, Denmark, France, the Netherlands, Portugal and Sweden (20). Data from IDB was compiled in a study and showed an incidence of 4.5% for the children visiting an emergency room for their general injury that occurred at home (21).

Table 1 (1/3). Prevalence of traumatic dental injuries (TDI) reported in various parts of the world.

Region Country, *author* (ref.)	Year (publ.)	Study description	Age (years)	Sample size	Prevalence (%)	Location for registration
Africa						
South Africa, *Hargreaves et al.* (22)	1995	TDI among children in different ethnic groups attending primary schools	11	1,035	15.4	Not stated
Nigeria, *Otuyemi et al.* (23)	1996	TDI among preschool children at 21 preschools in Ile-Ife	1-5	1,401	30.8	At preschool
Nigeria, *Adekoya-Sofowora et al.* (24)	2009	TDI among schoolchildren in a suburban population in Ile-Ife	12	415	12.8	At school
Asia						
Saudi Arabia, *Al-Majed et al*. (6)	2001	TDI among boys at 15 elementary schools in Riyadh	5-6	354	32.8	At school
Jordan, *Rajab* (25)	2003	TDI among children treated at the Pediatric teaching clinic during 4 years	7-15	2,751	14.2	Dental record study
Thailand, *Malikaew et al.* (26)	2006	TDI among children at 53 primary schools in Muang district, Chiang Mai province	11-13	2,725	35.0	Not stated
Kuwait, *Hasan et al*. (27)	2010	TDI among children attending dental screening at 5 dental centers during 2 months	2-6	500	11.6	Dental clinic
Turkey, *Tümen et al.* (28)	2011	TDI among preschool children in Diyarbakir	2-5	727	8.0	At preschool
India, *Patel et al.* (29)	2012	TDI among school children at 10 different schools in Vadodara city	8-13	3,708	8.8	Not stated
Jordan, *ElKarmi et al.* (30)	2015	TDI among children at 39 preschools randomly selected from different areas of Amman	4-5	1,198	26.4	At preschool

Table 1 (2/3). Prevalence of traumatic dental injuries (TDI) reported in various parts of the world.

Region Country, *author* (ref.)	Year (publ.)	Study description	Age (years)	Sample size	Prevalence (%)	Location for registration
Europe						
Italy, *Petti et al.* (31)	1996	TDI among children at 2 primary schools in Rome	6-11	824	20.3	Dental clinic
Sweden, *Borssén et al.*(10)	1997	TDI among adolescents in the county of Västerbotten	16	3,007	35.0	Dental record study
UK, *Hamilton et al.* (11)	1997	TDI among pupils from 24 secondary schools in 2 health districts in Manchester	11-14	2,022	34.4	At school and in mobile van
Belgium, *Carvalho et al.* (32)	1998	TDI among children at 15 kindergartens in the municipality of Leuven	3-5	750	18.0	Dental setting at Health C.
Ireland, *Norton et al.* (33)	2011	TDI among children at 28 preschools and primary schools in an urban setting	0.75-7	839	25.6	At school/ preschool
Switzerland, *Schatz et al.* (34)	2013	TDI among school children from 24 schools in urban and suburban areas in Geneva	6-13	1,898	14.3	Dental school
Spain, *Mendoza-Mendoza et al.* (35)	2015	TDI in the primary dentition among a subpopulation of children	1-7	879	21.7	Dental clinic
North and Central America						
Dominican Rep., *Garcia-Goday* (36)	1986	TDI among children from 6 private and 6 public schools in the city of Santo Domingo	7-16	1,200	18.9	At school
USA, *Shulman et al.* (37)	2004	TDI among individuals from randomly selected households with different ethnic backgrounds	6-20	6,558	16.0	In mobile examin. center or at home
Cuba, *Rodriguez* (38)	2007	TDI among children at 5 urban preschools in San José de las Lajas	2-5	543	34.2	At preschool
Oceania						
Australia, *Burton et al.* (5)	1985	TDI among high school students in northern Sydney	12-15	12,287	6.1	At school

Table 1 (3/3). Prevalence of traumatic dental injuries (TDI) reported in various parts of the world.

Region **Country, *author* (ref.)**	**Year (publ.)**	**Study description**	**Age (years)**	**Sample size**	**Prevalence (%)**	**Location for registration**
South America						
Brazil, *Marcenes et al.* (39)	2001	TDI among children attending private and public primary schools in Blumenau	12	652	58.6	At school
Brazil, *Granville-Garcia et al.* (7)	2006	TDI among children from 84 state and private preschools in the six regions in Recife	1-5	2,651	36.8	At preschool
Brazil, *Filho et al.* (40)	2014	TDI among students in schools in the city of Diamantina	14-19	687	26.6	At school
Brazil, *Goettems et al.* (41)	2014	TDI among school children at 5 private and 15 public schools in Pelotas	8-12	1,210	12.6	At school

Table 2. Incidence of traumatic dental injuries (TDI) reported in various parts of the world.

Region **Country, *author* (ref.)**	**Year (publ.)**	**Study description**	**Age (years)**	**Sample size**	**Incidence (%)**	**Location for registration**
Asia						
India, *Basha et al.* (42)	2015	TDI among obese adolescents	13-15	785	3.0	Not stated
Europe						
Sweden, *Glendor et al.* (9)	1996	TDI among children and adolescents registered at all public dental service clinics in the county of Västmanland	0-19	62,914	1.3	Dental clinc
Sweden, *Borssén et al.* (10)	1997	TDI among adolescents in the county of Västerbotten	16	3007	2.8	Dental record study
Norway, *Skaare et al.* (8)	2003	TDI in permanent teeth in children in the county of Nord-Trøndelag and in Oslo examined by 119 dentists at the public dental service clinics	7-18	≈ 70,830	1.8	Dental clinic
Norway, *Skaare et al.* (43)	2005	TDI in primary teeth among children in 5 out of 7 districts at 27 public dental service clinics in the county of Buskerud	1-8	20,300	1.3	Dental clinic
Oceania						
Australia, *Stockwell* (16)	1988	TDI in enrolled children in all “fixed” dental therapy centers in Perth	6-12	66,500	1.7	Dental clinic
South America						
Brazil, *Cecconello et al.* (44)	2007	TDI among adolescents at schools in the city of Luzerna	13-17	159	4.4	At school

1.2 Etiology

The etiological factors for TDI are related to the child's age. The most common causes for TDI among preschool children are falls and collisions with people or objects (13, 45, 46), often occurring during play (43). For the school-aged children, falls and collisions, as well as injuries during sports, were also found to be a common reason for dental injuries (17). A study with children aged 0-15 years found that the most common reason for TDI occurred during play, when colliding with a friend or object, with falling being the second most common reason for TDI. Accidents involving a TDI due to non-motorized vehicles were the third most common reason and included injuries from scooters, bikes, skateboards and go-carts (47). Equipment used during play and leisure time may be popular for a limited duration and usually cause injuries to children during this specific time period.

For Swedish children treated at the emergency room, as well as for the children admitted to a hospital for a general injury, the most common cause was due to a fall (approximately 50%). The general injuries occurred mostly in residential areas and during sports (19). Falls were the most common reported reason for seeking emergency treatment in the European Region (2), which is also shown in a study with children under the age of 6, where the most common reason for unintentional injury was due to a fall and occurred mainly at home (48). Worldwide, the leading causes of death due to injuries for children under the age of 20 were traffic injuries, drowning, and fire-related burns (3).

1.3 Injuries and socio-economic risk factors

Socio-economic classifications are used to describe inequalities with different variables included in the evaluation. Information about the variables can be obtained by questionnaires, interviews or registers, and may have various impacts in different countries. The social variables can include; monthly family income, parental education, children living in families with one or two parents/guardians (hereafter referred to as a parent or parents), the parent's country of birth, home ownership, number of people living in the household, and household overcrowding. Socio-economic status has shown to affect the child's oral health (49-51). It has been shown that having one or both parents of non-western origin, having had a change in family status, and having a mother with low education, are

risk indicators for having caries experience by the age of 5 years (49). Furthermore, studies found that caries in children is more prevalent among children who live in rural areas (50), and for children in families with a lower monthly household income (50, 51).

The relationship between socio-economic status and the occurrence of traumatic dental injuries has shown no clear associations for TDI (52). Conflicting results have been reported for the association between socio-economic status and TDI, where some studies have shown more TDI in children from families with low socio-economic status (53, 54), while another study has shown that children from families with high socio-economic status had more TDI (55). Studies have shown conflicting results for the association between a mother's education level and TDI of the child (39, 56), and others show no association between the mother's education level and the TDI of the child (52, 57).

Whether living with one or two parents affects the child encountering TDI has been previously studied. In the studies investigating this association, no relationship was found for TDI and children living with one or two parents (52, 57). However, it was found that children living with step-parents had a higher risk for TDI than children living in what is denoted as "nuclear families" (52). TDI has been studied in relation to ethnicity, but no associations were found between preschool children encountering TDI and their ethnic background (56).

The relationship between a parent's country of birth and TDI has not yet been investigated in a Swedish context, but general injuries have been studied in relation to the mother's country of birth. Children aged 0-3 years, with a mother born outside of Sweden, were registered at hospitals for fewer fall injuries occurring at home, than children with a mother born in Sweden. In the study, it was speculated that differences in lifestyle-related exposure to injury risks could explain the differences in risks between children of foreign-born and Swedish-born parents (58).

General unintentional injuries in children are more common in low and middle-income countries. Children from deprived backgrounds and minority groups in all countries are involved in more occasions that result in a general injury (2, 3). It has been observed that Swedish children, from households with low socio-economic status and from areas less well-off, have a tendency to be involved to a greater extent in mortal injuries, general injuries, and injuries leading to hospitalization, than other children (4, 59).

Socio-economic determinants and etiological factors for general injuries vary with age. The Swedish Civil Contingencies Agency (Myndigheten för Samhällsskydd och Beredskap) presented a report, in 2007, on children and adolescent injuries in relation to their socio-economic background, where, e.g., an increased risk for injuries due to traffic was found for children aged 0-6 years living with a single parent. Children aged 7-12 years in families living on social welfare or children with parents with a low education had a higher risk for being injured in traffic. No increased risk for accidents due to a fall was found in this age group. Teenagers, aged 13-17 years, living with a single mother or a mother with a low education level, had an increased risk for being injured due to traffic. No increased risk for injuries due to a fall was found for this age group (60).

A Swedish study during the period 1990-2004, which used national data from the in-patient register over general injuries for children and adolescents, aged 0-19 years, showed that fall injuries were the most common and accounted for approximately 66% of all injuries, followed by traffic injuries, which accounted for 25-32% (59). There is a strong association between social factors and fall accidents among children, both between regions and within countries. Identified risk factors for fall accidents include overcrowding, hazardous local environments, single parenting, unemployment, low maternal age, low maternal education, great strain on healthcare providers, and unequal access to healthcare (3).

1.4 Injuries and individual risk factors

Children encounter new challenges as they grow and develop their skills. The new situations they meet at different ages can constitute a risk factor for injuries. Boys and girls are involved in sports in their leisure time and play with their friends. Children are individuals, and a child's personality can affect the risk of injury. Individual risk factors for injuries can be gender, age and the temperament of the child. It has been reported that boys encounter more TDI than girls in both the primary and permanent dentition (5, 8, 10, 43, 45), however, studies have also shown no significant difference between the genders for the primary (23, 27, 30, 61) or the permanent dentition (61).

The difference between the genders may reflect differences in how boys and girls play and are involved in sports. For children with general injuries, approximately 150,000 Swedish children were treated at an emergency

room but not admitted to a hospital for their general injuries. More boys than girls were treated with a distribution of 57% boys and 43% girls. Of the 170 000 children/year with general injuries in Sweden during the years 2010-2013, just over 18,000 were admitted to a hospital due to the nature of the general injury, with the distribution between the genders being 58% boys and 42% girls (19).

Young age is a reported risk factor for TDI and indicates a higher experience of dental injury for the younger population. For the younger children, peaks for TDI in the primary dentition have been identified at 13-18 months and at 1-3 years of age (13, 62). Another peak age for TDI to the permanent teeth has been shown for school children, where the highest frequency was found at 8 and 10 years of age (8, 34). Of the 170,000 Swedish children treated at hospitals for general injuries, children aged 13-15 years have the most injuries, with 10 to 12-year-olds being the second largest group, followed by children aged 1-3 years (19).

As previously mentioned, an individual risk factor that could affect the risk for TDI is the child's temperament. Temperament has been described as present in early childhood, inherited, and the foundation for developing personality traits. There are different ways to describe and measure temperamental variety in children and how they react to and take on the outside world (63). The temperamental model described in the present study is based on a model by Buss and Plomin (64, 65), who defined the temperament dimensions *Emotionality*, *Activity*, *Sociability* and *Impulsivity*. These temperamental dimensions are expected to be relatively stable during childhood.

High levels of emotionality are present as distress, which is explained as the tendency to become upset easily and intensely. People high in emotionality would then be more distressed when exposed to negative emotional stimuli, in the stresses of everyday life, and react with higher levels of emotion. Buss and Plomin argue that early, present fundamental distress differentiates during infancy into fear and anger, though distress itself persists throughout life (64, 65).

Activity is the energy output (tempo and vigor), and high levels of activity describe a person who is often on the move, is energetic, has a tendency to hurry, prefers high-energy games or work, and might be restless (64, 65). Sociability has a directional component and a social person prefers the company of others instead of being alone. Social children prefer to be part

of a group when playing, like to go to sleep with other people present in the room, and in general, prefer the presence of others to being alone. Furthermore, they describe shyness to be a derivate of the temperament sociability, where shyness involves social behavior with people not well known, whereas sociability involves social interaction for all kinds of relationships (64, 65). Impulsivity is described as the degree of having inhibitory control (64, 65).

General unintentional injuries have previously been studied in association with temperament and psychopathology, where impulsivity and over-anxious disorder symptoms showed to be associated with increased risk of injury (66). The relationship between being injury-prone and the temperament of the child has been investigated, and it was found that children high on extraversion and low on inhibitory control, at the age of 6 years, tend to have more injuries requiring medical treatment (67).

It is through the child's behavior that temperament is measured and the risk for injury is determined. A way to measure the child's behavior is by using the Strengths and Difficulties Questionnaire (SDQ), which is a brief behavioral screening questionnaire addressing the five dimensions; *conduct problems*, *emotional symptoms*, *hyperactivity*, *peer problems*, and *pro-social behavior* (68, 69).

Studies from the United Kingdom have established a relationship between emotional disorders and unintentional injuries, where children with disruptive behavior had an increased risk for injury as a result of their impulsivity and emotionality (70, 71). Minor accidents have shown to more likely occur in children who scored high on the SDQ for hyperactivity, emotional symptoms, and total difficulties (71). Children with a more impulsive/hyperactive behavior were found to have more extremity fractures (72). Hyperactivity in children has also been found to be associated with major injuries affecting the face and/or teeth (73), and has been seen in children with TDI, where they score higher for hyperactivity/impulsivity (74). Furthermore, in the literature, it is shown that children with peer relationship problems had an increased risk for TDI, while children with a pro-social behavior had a decreased risk for TDI (75).

1.5 Traumatic dental injuries and dental fear

Fear is described as a reaction to a specific threatening stimulus, with a wish to escape or avoid the situation (76). Among adults, it has been shown that dental fear is one of the most common fears (77). Adult patients suffering from dental fear have been described as being caught in a vicious cycle, where fear leads to avoidance of dental care, resulting in deteriorated oral health and feelings of shame or inferiority (78-80).

Dental fear in adults has been reported to develop during childhood (78, 81, 82). It has been found that the development of dental fear in childhood can be associated with treatments by an inconsiderate or rough dentist, while painful treatments were more associated with the onset of dental fear for adults (78). Also, painful treatments in childhood have been described to initiate dental fear reaching into adulthood. Several informants, in the same study, described a parallel traumatic life situation with difficulties in the family and/or interpersonal problems at school, or with friends, at the onset of dental fear (81).

Dental fear is regarded to be of a multifactorial origin and some causes among children have been associated with inadequate dental management and experience of pain in the dental situation, but also linked with temperamental factors (shyness, negative emotions), general fears, maternal dental fear, and young age (83-89). Childhood dental fear/anxiety has been found to be associated with missed appointments, which may result in invasive dental treatment due to a toothache, which in turn may lead to a negative effect on the child's oral health-related quality of life (85, 90-92). In a study with 11 to 16-year-old children, attempts from the child to deceive the parents or pressure them into cancelling their appointment to avoid dental treatment, were described (93).

The prevalence of dental fear among children varies between 6% and 20% for different age groups and countries (83, 88, 94, 95). The distribution between genders shows differences, where several studies have found more dental fear in girls than in boys (83, 94, 96, 97). However, one study found more dental fear in boys, aged 9-11 years, than girls (88), while others show no differences at all (98, 99). Dental fear changes with age, where dental fear has shown to decrease with increased age (88, 95).

Painful memories from emergency treatments and/or follow-up treatments for TDI have shown to be associated with dental fear in an adult population

with experience of TDI as a child (84, 100). TDI in relation to dental fear has been studied for children aged 5 to 12 years, who had been referred to a dental pediatric clinic. The study showed that children without experience of TDI had a higher level of anxiety than children who had experienced TDI (101).

Dental fear has been studied in association with pain during dental treatment among Swedish children aged 8-19 years. High estimates of pain intensity were found for several dental treatments. The children with higher ratings on the Dental Anxiety Scale (DAS), also rated their pain experiences as higher for most of the dental treatments (102).

1.6 Traumatic dental injuries and pain

The International Association for the Study of Pain (IASP) defines pain as: *"An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. Pain is always subjective"* (103).

Most children encounter acute pain in everyday life, such as bumps and scrapes during play and sports, or acute pain associated with medical or dental invasive treatments. They can also experience recurrent pain such as headache or stomach pain. Some children may also live with chronic pain due to illness or injury. The pain perception is subjective and depends on the child's age, cognitive level, and previous experience of pain and familial learning. Furthermore, children judge pain in relation to the types of pain they have previously felt and experienced. Pain can vary in quality (aching, burning, gnawing, stinging, sharp or dull), intensity (weak or strong), duration (seconds to years), frequency (constant or episodic), unpleasantness (a mild annoyance to intolerable discomfort), and can be localized or spread (104).

A child's reaction and expression to pain is influenced by several variables in their life such as genetic, developmental, familial, psychological, social and cultural. Children also learn about pain and how to cope through their own experience and the reactions of their parents and other family members. Psychological factors may highly alter the child's perception of pain. Emotions such as anxiety, fear or depression can increase the intensity of acute pain, induce recurrent pain episodes, or aggravate chronic pain (104).

In a study where children were observed regarding everyday pain (e.g., bumps, cuts, and scrapes) at a daycare facility, it was found that those who had frequently experienced these everyday pain incidents responded to them more strongly. The findings indicate that increased exposure to this type of pain may lead to sensitization, rather than desensitization (105). Among adolescents, it has been found that more than one reported incidence of pain during dental procedures increased the risk for dental anxiety by ten times (83).

Among Swedish children, aged 8-19 years, high estimates of pain intensity were found for dental treatments involving extracting a tooth, drilling in a tooth, dental injection, restoration of a tooth, and braces being tightened. Children with higher ratings on the Dental Anxiety Scale (DAS) (106), also rated their pain experiences as higher for most dental treatments. Furthermore, it was found that several everyday pain experiences were rated higher by the children who showed elevated dental anxiety on the DAS. Age also influenced the child's assessment of dental pain intensity, measured by the Visual Analogue Scale (VAS), where younger children (aged 8-13 years) rated their experiences as more painful than older children (aged 14-19 years) (102).

1.7 Cooperation during dental procedures

The educational program for dental professionals in Sweden teaches to respect and take consideration of the child in the treatment situation, and to establish the best possible conditions. Despite this, not all children are able to cooperate during dental treatments. Reasons have been associated with pain during procedures, dental fear and a young age (85, 107, 108).

Rud and Kisling created a scale to study and measure the child's ability to cooperate during dental procedures. They found that cooperation was associated with mental age and found the age of 29 months to distinctly separate children who accept dental treatment from those who did not (109).

Two different Swedish studies, regarding uncooperative behavior in children during dental procedures, found that the children in 8% and 10.5%, respectively, did not cooperate during dental treatments (108, 110). Among Brazilian preschool children, the experience of toothache was found to have a negative effect on the child's behavior during the dental procedure.

Furthermore, the relationship between children who encountered TDI was studied in association with behavior during dental treatment, however, no association between dental trauma and child behavior was found (111). Lack of cooperation during dental treatment has been associated with more caries and fewer filled surfaces, postponed dental treatments, or no measures taken at all, despite dental treatment needed (108).

1.8 The rationale for this thesis

Conditions and the environment for children and adolescents vary over time and may influence the risk for injuries. This epidemiological study can increase knowledge regarding injuries in Swedish children in the present time. A deepened knowledge regarding injuries of the occurrence, the etiology, its risk factors, and the effect of traumatic dental injuries for the child's future dental treatments, could help dental personnel to identify children at risk for traumatic dental injuries, and also improve the child's treatment experience.

2 AIMS

The overall aim of this thesis was to investigate children and adolescents, in the Swedish BITA study, who encountered traumatic dental injuries (TDI) and general unintentional injuries (GUI) in relation to risk factors. Furthermore, to explore if the experience and treatment of dental injuries affected the child's fear and cooperation in the dental situation.

The specific aims were to investigate:

- the prevalence and incidence of traumatic dental injuries and general unintentional injuries, changes over time and seasonal variations for traumatic dental injuries.
- the relationship between traumatic dental injuries and general unintentional injuries.
- parental assessment of the child's injury frequency and the relationship to traumatic dental injuries and general unintentional injuries.
- the etiology for traumatic dental injuries and general unintentional injuries.
- socio-economic risk factors for traumatic dental injuries and general unintentional injuries.
- individual risk factors for traumatic dental injuries, general unintentional injuries, and parental assessment of the child's injury frequency.
- the effect of traumatic dental injuries on the child's dental fear over time (trait anxiety).
- the child's self-rated pain and fear (state anxiety), the dental personnel's assessment of the child's fear and cooperation during procedures, at the time for the emergency treatment for traumatic dental injuries, and the follow-up.

3 PATIENTS AND METHODS

3.1 The BITA study

The children in the study were all included in the BITA study (BITA=**B**arn **I** **TA**ndvården, which means children in dental care), which was an accelerated longitudinal study (112), carried out in Sweden, between the years 2008-2013. It was a study for the benefit of children's health, where traumatic dental injuries (TDI), dental caries, and hypomineralized teeth were studied in a longitudinal perspective. The psychological variables studied were dental fear, dental behavior management problems, temperament, and behavioral and psychosocial strengths and difficulties.

Children in the BITA study were invited to participate at seven Public Dental Service (PDS) clinics in the Region Västra Götaland (RVG), and five Public Dental Service clinics in the Region Örebro County (ROC), representing different types of demographic areas, both rural and urban, with different socio-economic backgrounds. The children were followed during five study years. In the Region Västra Götaland, the children were followed during the years 2008-2012 at five clinics, and during the years 2009-2013 at two clinics. In Region Örebro County, the children were followed at five clinics during the years 2008-2012 (Fig. 1).

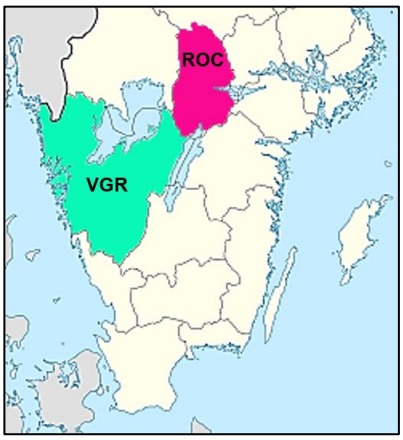

Figure 1. Map of the southern parts of Sweden showing the location of the Region Västra Götaland (**RVG=**green) and the Region Örebro County (**ROC=**cerise).

To describe variations in socio-economics in the catchment areas for the dental clinics included in the BITA study, both regions had already calculated the socio-economic status, and the calculations were available for the research group. Calculations were made for the distribution of money to the clinics, where clinics in low socio-economic areas received more money for managing the children's oral health. For the catchment areas for the clinics in Region Västra Götaland, the factors included at the time were: Families with social assistance/1000 residents, unemployment/1000 residents, higher level of education/1000 residents, deft (decayed, extracted, filled teeth) for children aged 3-6 years, Dsa (Decayed surfaces approximal) for children/adolescents aged 7-19 years, and the number of emergency treatments for adults at the clinic. The RVG graded the areas 1-12, where 1 was considered a high socio-economic status and 12 was the lowest.

In Region Örebro County, a cluster analysis was made with five clusters, with the following factors included for measuring the socio-economic status for the catchment areas for the clinics: Residents 75 years of age and older, born in Sweden, single parent, low income, and no more than 12 years of schooling.

Four age cohorts were created for the study with children aged 3, 7, 11 and 15 years, at the study start. The age groups were chosen to represent all ages provided with free dental care by the Public Dental Service, after the completion of the five-year study period.

3.2 Patients

In the two regions included in the study, approximately 94% of the children were registered and provided care for at a PDS clinic. The remaining 6% chose to go to a private clinic. At the time for the study start, 3,725 children were eligible to participate. Before the study start, 591 children were excluded for not showing up for the examination, needing an interpreter, or for unspecific reasons. After taking into account the excluded children, a total number of 3,134 children were invited to participate in the BITA study. Of these, 771 children declined to participate in the study. Subsequently, a total of 2,363 children accepted to enter the study with a signed consent, resulting in a participation of 75% of the children invited (Fig. 2).

The distribution in the total group of children in the BITA study between the genders was, 1,215 girls (51%) and 1,148 boys (49%). At the study start, **Cohort 1** included 695 children, **Cohort 2** included 642 children, **Cohort 3** included 574 children, and **Cohort 4** included 452 children (Fig. 2).

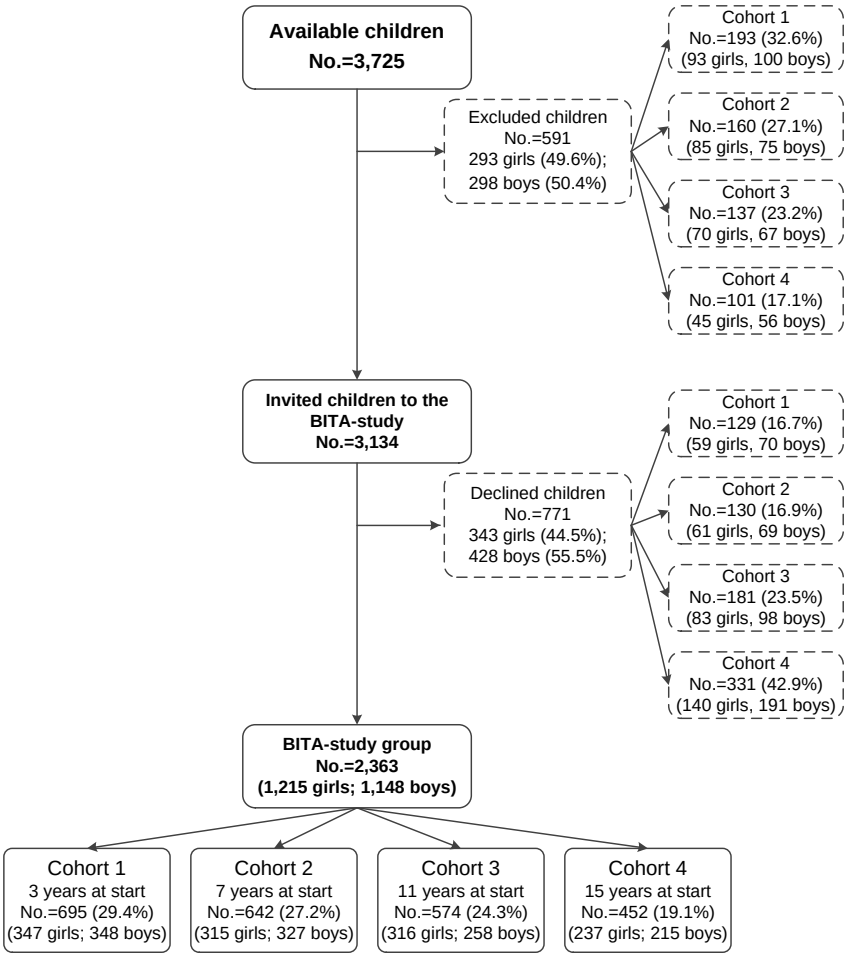

Figure 2. The children who were available, excluded, and invited into the study with the final BITA study group in the 4 age cohorts, after subtracting the children who declined participation, and the distribution between the genders. (**No.**=number.)

3.2.1 Children who were excluded or declined participation

In the group of 591 children who were excluded from the study, there was an even distribution between the genders, with 49.6% girls and 50.4% boys. The proportion of excluded children corresponds to the children participating in the study (Fig. 2). In the group of 771 children who declined participation, 44.5% were girls and 55.5% were boys. Most of the children who declined participation were found in age **Cohort 4** (42.9%), and the least number of children who declined participation were found in age **Cohorts 1** and **2** (16.7% and 16.9%, respectively) (Fig. 2).

3.2.2 Children who moved during the study period

Children, who moved within Sweden during the study period and no longer belonged to a catchment area of the study, were contacted by phone and mail, and contributed with data through interviews and questionnaires. During the three first years of the study, 59 children moved, with a distribution of 19 in **Cohort 1** (7 girls, 12 boys), 13 in **Cohort 2** (5 girls, 8 boys), 17 in **Cohort 3** (9 girls, 8 boys), and 10 in **Cohort 4** (4 girls, 6 boys).

3.3 Study groups with traumatic dental injuries and control groups without traumatic dental injuries

(Papers I-IV)

Four different study groups of children with experience of TDI were identified and denoted **SG-1**, **SG-2**, **SG-3** and **SG-4** (Fig. 3).

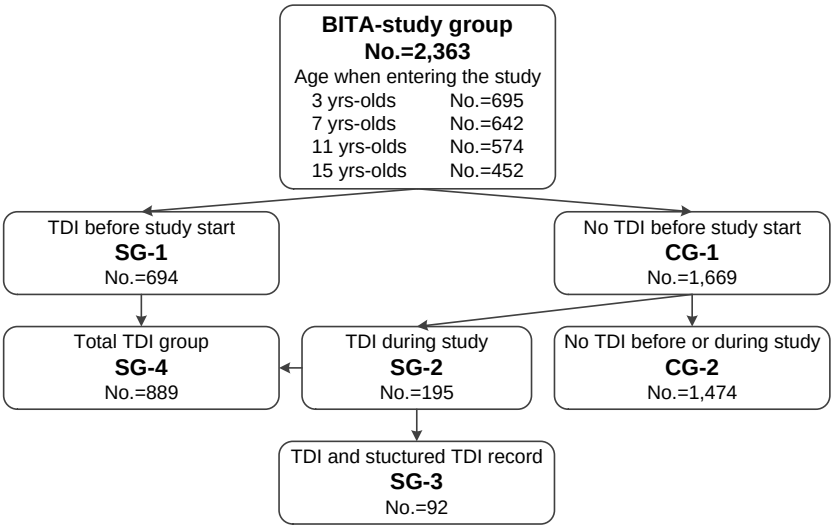

Figure 3. The four study groups (**SG-1**, **SG-2**, **SG-3, SG-4**) of children with experience of traumatic dental injuries (TDI), and the two control groups (**CG-1**, **CG-2**) of children with no TDI. The two groups **SG-1** and **CG-1** contain children with retrospective data from the dental records and interviews regarding TDI, before the start of the BITA study. The group **SG-2** contains children with prospective data from the dental records and interviews regarding TDI during the BITA study. The group **SG-3** had, in addition, a structured TDI record set up at the emergency treatment, specifically designed for the study. **SG-4** represents the total group of children with TDI in the BITA study (**SG-1** and **SG-2** combined). The children with TDI occurring during the study, were followed for the first three years of the study period. (**No.**=number.)

3.4 Children with traumatic dental injuries

3.4.1 Study Group 1 – traumatic dental injuries before the study start

(Papers I, III, IV)

Study Group 1 (SG-1) comprises children with experience of TDI from the age of 0 years up until the study started. They were identified through an interview at the study start, and by retrospective dental records, leading to 694 children identified with experience of TDI before the study started. The distribution of children with TDI before the study start and the gender distribution, within the different age cohorts, are presented in Figure 4.

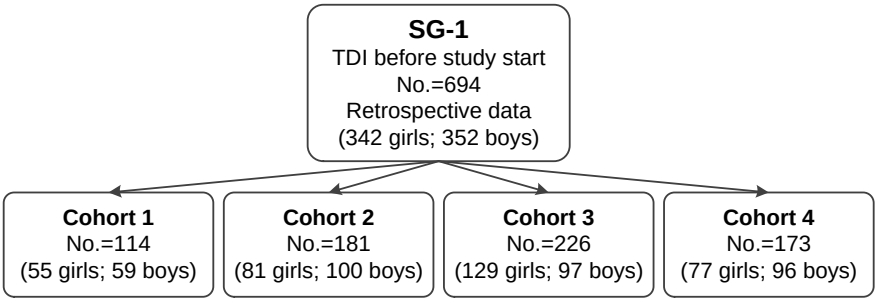

Figure 4. The distribution of children with traumatic dental injuries (TDI) before the study start and the gender distribution, within the 4 age cohorts. (**No.**=number; **Cohort 1**=0-3 years; **Cohort 2**=0-7 years; **Cohort 3**=0-11 years; **Cohort 4**=0-15 years.)

3.4.2 Study Group 2 – traumatic dental injuries during the study

(Papers I, II, IV)

Study Group 2 (SG-2) comprises children who encountered TDI during the three first years of the study. They were identified by interviews, dental records and a structured TDI record, and thus, 195 children were identified to have encountered TDI during the three first years of the study. The distribution of children with TDI during the study and the gender distribution, within the different age cohorts, are presented in Figure 5.

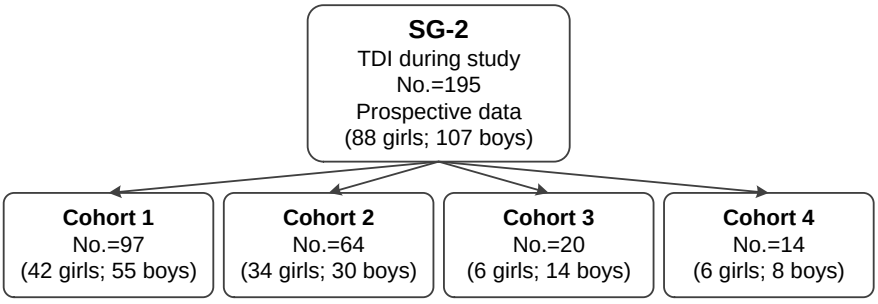

Figure 5. The distribution of children with traumatic dental injuries (TDI) during the study and the gender distribution, within the four age cohorts. (**No.**=number; **Cohort 1**=3-5 years; **Cohort 2**=7-9 years; **Cohort 3**=11-13 years; **Cohort 4**=15-17 years.)

3.4.3 Study Group 3 – traumatic dental injuries during the study and having a structured TDI record

(Paper IV)

Of the 195 children identified having encountered TDI during the three first years of the study, 92 children had, in addition, a structured prospective TDI record set up in the computer-based program *Medview*. These 92 children represent Study Group 3 (SG-3). The distribution of children with TDI during the study, and also having a structured TDI record, and the gender distribution within the different age cohorts are presented in Figure 6.

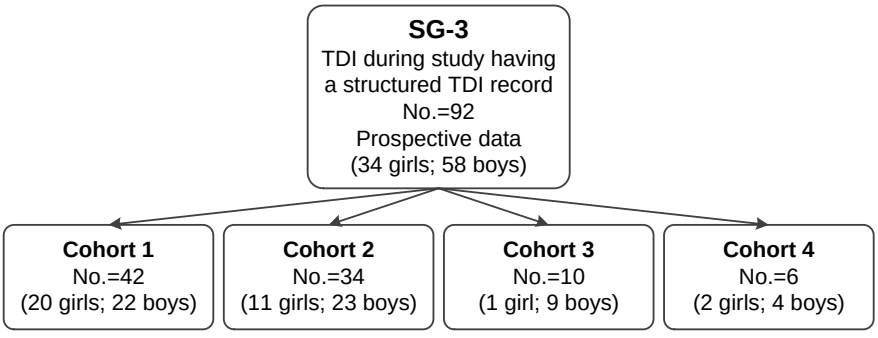

Figure 6. The distribution of children with traumatic dental injuries (TDI) during the study also having a structured TDI record, and the gender distribution, within the 4 age cohorts. (**No.**=number; **Cohort 1**=3-5 years; **Cohort 2**=7-9 years; **Cohort 3**=11-13 years; **Cohort 4**=15-17 years.)

3.4.4 Study Group 4 – traumatic dental injuries before or during the study

(Papers I, II)

Study Group 4 (SG-4) comprises the 694 children with TDI before the study started, and the 195 children with TDI during the three first years of the study. Together, they make up the total group of 889 children with TDI that occurred before or during the study. The distribution of children with TDI before or during the study and the gender distribution within the different age cohorts, are presented in Figure 7.

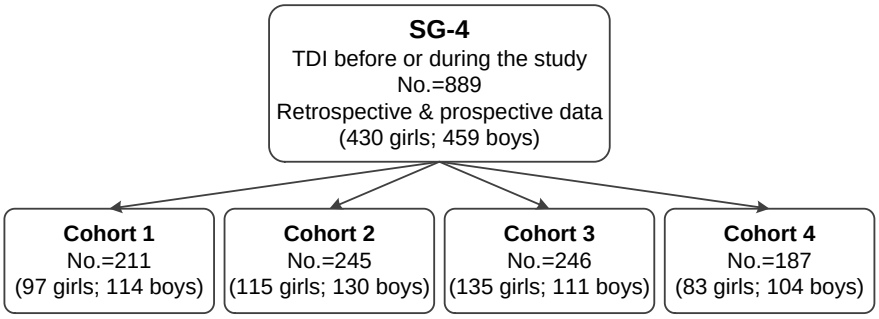

Figure 7. The distribution of children with traumatic dental injuries (TDI) before and during the study, and the gender distribution, within the 4 age cohorts. (**No.**=number; **Cohort 1**=0-5 years; **Cohort 2**=0-9 years; **Cohort 3**=0-13 years; **Cohort 4**=0-17 years.)

3.5 Children without traumatic dental injuries

3.5.1 Control Group 1 – no traumatic dental injuries before the study start

(Papers I-IV)

Control Group 1 (CG-1) comprises the children without experience of TDI from the age of 0 years up until the study started. They were identified by an interview at the study start and by retrospective dental records. A total of 1,669 children entered the study without experience of TDI before the study started. The distribution of children without TDI before the study start and the gender distribution within the different age cohorts are presented in Figure 8.

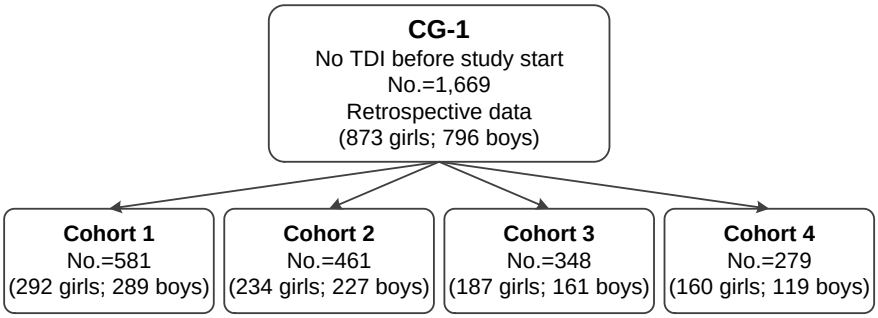

Figure 8. The distribution of children with no traumatic dental injuries (TDI) before the study start and the gender distribution, within the 4 age cohorts. (**No.**=number; **Cohort 1**=0-3 years; **Cohort 2**=0-7 years; **Cohort 3**=0-11 years; **Cohort 4**=0-15 years.)

3.5.2 Control Group 2 – no traumatic dental injuries before or during the study

(Papers I-IV)

Control Group 2 (CG-2) comprises the 1,474 children without any experience of TDI before the study start or during the three first years of the study. They were identified by interviews and dental records. The distribution of children without TDI before or during the study and the gender distribution, within the different age cohorts, are presented in Figure 9.

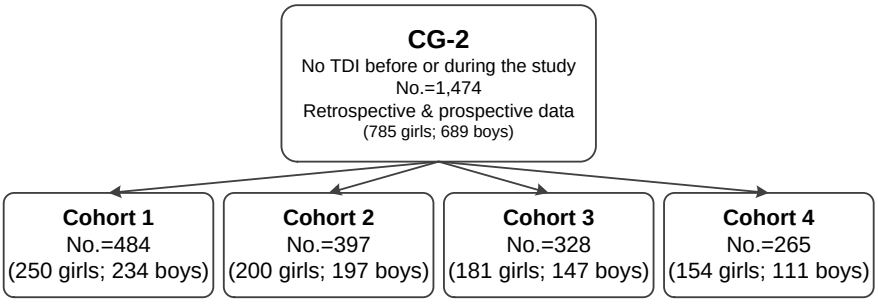

Figure 9. The distribution of children with no traumatic dental injuries (TDI) before or during the study and the gender distribution, within the 4 age cohorts. (**No.**=number; **Cohort 1**=0-5 years; **Cohort 2**=0-9 years; **Cohort 3**=0-13 years; **Cohort 4**=0-17 years.)

3.6 General unintentional injuries

(Paper III)

Children, with general unintentional injuries that required medical attention, and/or children often getting bumps/bruises, were identified by a structured interview at the study start (answers were missing for 208 children). The occurrence of the injuries was divided into having occurred from birth up until three months prior to the study start, and injuries occurring during the three months period before the study started.

823 children were identified with experience of general unintentional injuries, up until three months prior to the study start. The injuries were distributed among the age groups as follows; In **Cohort 1**; 195 children (92 girls, 103 boys), in **Cohort 2**; 197 children (71 girls, 126 boys), in **Cohort 3**; 225 children (123 girls, 102 boys), and in **Cohort 4**; 206 children (97 girls, 109 boys).

510 children reported injuries during the three-month period before the study started. The injuries were distributed among the age groups as follows, in **Cohort 1**; 129 children (59 girls, 70 boys), in **Cohort 2**; 136 children (51 girls, 85 boys), in **Cohort 3**; 133 children (73 girls, 60 boys), and in **Cohort 4**; 112 children (51 girls, 61 boys).

3.7 Methods

Data from the three first years of the BITA study for children, aged 3-17 years, is presented in this thesis and compiled together with their lifelong retrospective data. Data on TDI was collected from dental records, clinical examinations at the regular dental check-ups, by structured interviews at the same check-up visit, TDI records, and questionnaires. Data on GUI and PAI was collected by the structured interview at their regular dental check-ups.

3.7.1 Education and training for dental personnel before the study start

In order to calibrate all dental personnel involved in the study, before the collection of data started, the dental personnel were invited to a meeting. They were informed on how the structured interviews should be conducted, how to assess the child's dental fear and cooperation during dental procedures, how to register the children's self-rated pain and fear, how to

collect data for the study, and how to fill out the forms correctly. Recurrent meetings with the same information were yearly held at the clinics.

At every visit to the dental clinic, all treatments performed during the study and all assessments were registered in the computer program *Medview*. The personnel were trained to use the program at the dental clinics. The program was developed in close collaboration with the Department of Computer Science, Chalmers University of Technology, Gothenburg, Sweden, and the School of Informatics, University of Skövde, Skövde, Sweden (113).

The dental personnel were instructed that children, from the age of 7 years, should use the Visual Analogue Scale (VAS) for assessing pain, and children, aged 3 to 6 years old, should assess their pain on a facial scale.

To calibrate the examiners for assessing the child's dental fear and cooperation during treatment, dental personnel watched films with children being treated by a dentist showing different situations, and a child's reaction during the procedure. After the films, a discussion followed with instructions on how to grade dental fear and cooperation. This calibration was repeated one year after the study started.

3.7.2 Data from dental records

All children included in the study went for regular check-ups and treatments. All treatments and assessments were registered in the clinic's computerized dental record and in the *Medview* program.

Various computer programs for collecting data during dental treatment were used in the study. In the Region Västra Götaland, the computer program for dental records is denoted *T4*, and in the Region Örebro County, *Effica*. The digital dental records were read to identify retrospective data regarding TDI.

During emergency treatments for TDI, detailed prospective data was collected in the computer program *Medview*, during the whole study period. The structured TDI record contained detailed information regarding the injured tooth/teeth; the number involved, primary or permanent, color, mobility, percussion, X-ray findings, injuries to the hard tissue, supporting and/or soft tissue, performed treatments, and medical prescriptions.

3.7.3 Interviews

Background

(Papers II, III)

In a structured background interview at the study start, the parents were asked about their education, current occupation, and their country of birth. They also answered a question regarding the family structure, and whether the children lived together with one or two parents. Information on parental education and occupation was used for calculation of the families' socio-economic status. Details of the parents' country of birth were divided into two groups: (i) Nordic countries represented by Sweden, Norway, Denmark, Finland and Island, and (ii) Non-Nordic countries. Based on the background interview, the family structure was divided into two groups: (i) Children living in families with two parents, and (ii) Children living in families with one parent.

Traumatic dental injuries

(Papers I-IV)

At the study start, the parents were interviewed regarding any traumatic dental injuries to their child's primary and/or permanent teeth, for all ages and occasions. At the regular dental check-ups during the study, the parents were interviewed concerning new TDI after their last visit to the clinic. Children/adolescents, 12 years of age or older, were allowed to be interviewed without parental assistance at the regular dental check-ups. The interview identified children/adolescents with TDI treated in the acute situation at a different clinic not included in the study, or children/adolescents not treated for TDI.

General Unintentional Injuries

(Paper III)

At the study start, the parents were interviewed regarding the **P**arents' **A**ssessment of their child's **I**njury frequency (PAI), in order to obtain an assessment whether or not there were any "injury-prone" children. They were also interviewed regarding their child's general unintentional injuries (GUI). At the regular dental check-ups during the study, the parents were interviewed concerning new GUI after their last visit to the clinic. Children/adolescents, 12 years of age or older, were allowed to be interviewed without parental assistance at the regular dental check-ups.

The form used during the structured interview for PAI and GUI was based on Rowe *et al*. 2007 (66). The first question on the form regards the parents' assessment of their child's injury frequency (PAI); *All children hurt themselves at times; Is your child a child who is injured more often than other children according to your assessment?* The questions could be answered with *Yes, much more often*, *Yes, more often*, or *No*. The answers *Yes, much more often* and *Yes, more often* were pooled into the present study and renamed *More often*.

Questions regarding GUI with the specific topics, *Bumps and/or bruises, Cuts requiring stitches, Other injuries needing treatment*, were asked and in the present study, a question regarding *Burn injuries* was also asked. The questions could be answered with *Not at all, Yes, occasionally* or *Yes, frequently*. If the child had encountered an injury, there were supplementary questions regarding where the injury occurred, with the alternatives: *In preschool/school, In traffic, At home, During organized sports, or Elsewhere*, and also if any *violence* or *bullying* was involved.

The interview included questions regarding injuries during the child's lifetime (from birth until 3 months prior to study start), which required medical attention, and injuries that occurred during the three-month period before the study started (which required medical attention and included children often getting bumps and/or bruises) (Appendix I).

3.7.4 Clinical examination

(Papers I-IV)

Data was collected and registrations were made in the *Medview* program at all planned dental visits, emergency treatments and follow-ups during the

study period. At emergency treatments for dental injuries and follow-ups, registrations were made in the structured TDI record.

3.7.5 Assessments

(Paper IV)

The assessments and self-ratings were made and registered at all dental visits during the study.

The child's self-rating of pain

The children made a self-assessment of pain experienced during the dental treatment or examination. If the child answered *Yes* to having experienced pain during treatment, children, aged 3 to 6 years, assessed the pain on a scale with faces showing nine different facial expressions from happy to very sad (114). Children, aged 7 years or older, were asked to assess the intensity of pain on the ten-point Visual Analogue Scale (VAS) (Appendix II).

The child's self-rating of fear

Children, from the age of 7 years, assessed their fear at the dental treatment by answering the question: *How did you feel today?* The question had the alternative answers; *Not afraid at all*=**0** or *Afraid,* on a scale graded **1-4** (Appendix III).

The dental personnel's assessment of the child's fear

Assisting dental personnel made an assessment of the child's dental fear, for every child at all ages, based on the child's physiological reactions, behavior, and verbal description of the situation, and then answered the question, *How afraid do you estimate that the child was during today's visit?* The question had the alternative answers; *Not afraid at all*=**0** or *Afraid,* on a scale graded **1-4** (Appendix III).

Assessment of the child's cooperation

The child's cooperation was graded by the treating dental personnel according to the scale by Rud and Kisling (109), rated **3** to **0,** where **3**=*full acceptance to treatment*; **2**=*indifferent acceptance*; **1**=*reluctant acceptance*; and **0**=*non-acceptance* (Appendix IV).

3.7.6 Questionnaires

All of the questionnaires were handed out at the regular dental visits and were provided with a code to use for log in to a computer. The answers on paper were sent directly to the research group. The dental personnel at the clinics did not have access to the answers of the questionnaires. The children and parents could, by choice, log in to a computer and answer the questionnaires online.

Temperament - Emotionality, Activity, Sociability and Impulsivity

(Papers II, III)

The children's temperament was measured by the questionnaires EASI and EAS, by Buss and Plomin (64), in a Swedish translation (115). The EASI questionnaire measures the dimensions; *Emotionality*, *Activity*, *Sociability* and *Impulsivity*, and EAS measures; *Emotionality*, *Activity*, and *Sociability*. The dimension *emotionality* comprises the three subgroups *distress*, *fear* and *anger*, for both EASI and EAS. For **Cohorts 1** and **2**, the EASI questionnaires were used, and for **Cohorts 3** and **4**, the EAS questionnaires were used. In **Cohort 1**, at 3 years of age, and in **Cohort 2**, at 7 years of age, the parents answered the EASI. In **Cohort 3**, at 11 years of age, and in **Cohort 4**, at 15 years of age, parents and children answered the EAS, separately (Appendix V-VII). Data is presented for both parents and children.

Behavior – The Strengths and Difficulties Questionnaire

(Paper III)

The Strengths and Difficulties Questionnaire (SDQ) is a brief behavioral screening questionnaire for children and adolescents, answered by the parents for all ages, and by the children from the age of 11 years. The questionnaire provides balanced coverage of the child and adolescent's behaviors, emotions, and relationships. Besides covering common areas of emotional and behavioral difficulties, it also enquires whether the informant thinks that the child has a problem in these areas and if so, asks about resultant distress and social impairment. The SDQ questionnaire consists of 25 attributes, both positive (*strengths*) and negative (*difficulties*). The 25 items are grouped into five dimensions with five items for each. The dimensions are *Emotional symptoms, Conduct problems, Hyperactivity/inattention, Peer relationship problems,* and *Pro-social*

behavior, which includes being considerate and generous (68, 69, 116) (Appendix VIII, IX).

Dental fear - Children's Fear Survey Schedule–Dental Subscale

(Paper IV)

The child's dental fear was measured by the questionnaire Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) (117), at the regular dental examination, in a Swedish translation, and answered by the parents regarding their child in **Cohorts 1** and **2** (118). The questionnaire consists of 15 questions and the answers are scored **1** (*not afraid at all*) to **5** (*terrified*), giving a range between 15-75 points (Appendix X, XI).

For a maximum of three missing items, an individual mean was calculated to replace missing data on single items. Questionnaires with more than three missing answers were excluded from the analyses.

3.7.7 Calculation of socio-economic status

Hollingshead Four Factor Index of Social Position

(Papers II, III)

The socio-economic status (SES) was calculated for the family by using an adapted version for Sweden, using two factors of the Hollingshead *Four Factor Index of Social Position*. The four factors of the original version used by Hollingshead were *education, occupation, gender* and *marital status* (119). The modified version for Sweden used the two factors *education* and *occupation*, with seven different levels for *education*, scored **1-7**, and nine levels for *occupation* scored **1-9** (120). The score for education is then multiplied by three and the score for occupation is multiplied by five, according to the Hollingshead method (119). The scores for education and occupation (for both parents) are then added up and divided by two. If information regarding education and occupation only came from one parent, that information was used to represent the family's socio-economic status.

All the different scores from all families were then divided into three levels of socio-economic status, depending on the score. The levels represent different levels of socio-economic status where **1**=low, **2**=medium, and **3**=high. The scores representing the low-level of socio-economic status ranged from 8 to 29.5. The scores representing the medium-level of socio-

economic status ranged from 30 to 41. The scores representing the high-level of socio-economic status ranged from 41.25 to 66. The grouping of the families into the low, medium or high level was made as equal in numbers as possible. The groups were made to compare equally sized groups with different socio-economic levels, and the exact values for the break point between the thirds was not decisive, thus leaving 613 families in the low-level group, 623 families in the medium-level group, and 611 families in the high-level group.

A parent's level of education represents one of the socio-economic factors studied and was analyzed, by itself, in relation to TDI. The parent's level of education was divided into three groups (Groups 1-3): **Group 1**=*low*, 11 years of school/education or less, **Group 2**=*medium*, 12-15 years of school/education, and **Group 3**=*high*, >15 years of school/education.

3.7.8 Statistical methods

Statistical analyses were performed using the IBM SPSS Statistics for Windows, Version 21.0. (IBM Corp., Armonk, NY, USA). The level of significance was set to $p<0.05$.

Chi-square test was performed to detect differences between:

- the genders and prevalence over time (*Paper I*).
- the groups with or without TDI, which were tested against Family structure, Parent's country of birth and the Socio-economic status with regard to parental education and occupation (*Paper II*).
- the genders for children with traumatic dental injuries (TDI), general unintentional injuries (GUI), and being assessed to be injured more often by their parents (PAI) (*Paper III*).
- levels of socio-economic status, and parental education for children with GUI (*Paper III*).
- children with TDI in **SG-3** and experience of fear and/or pain during treatment for TDI (*Paper IV*).

Mann-Whitney U test was performed to detect differences in:

- genders during different seasons (*Paper I*).
- assessed fear between the study group **SG-1** (with 1 TDI or >1 TDI) and the control group **CG-1** (*Paper IV*).

Independent *t*-test was used when comparing:

- the temperament between the groups (0-1 TDI or >1 TDI) in the four age cohorts (*Paper II*).

- the temperament, behavioral psychosocial strengths and difficulties for children with TDI, GUI and PAI, in the four age cohorts, and between the genders for the injury scale (*Paper III*).
- dental fear between the study group **SG-2** and the control group **CG-2** (*Paper IV*).

ANOVA was used to compare:

- dental fear measured by CFSS-DS between the study group **SG-1** (with 1 TDI or >1 TDI) and the control group **CG-1**, and within the age cohorts (*Paper IV*).

Wilcox signed rank test was performed to detect differences in:

- children's fear during treatment for TDI and during the first post TDI treatment session (*Paper IV*).

3.7.9 Corrigendum

In the article entitled, "Temperamental and socioeconomic factors associated with traumatic dental injuries among children aged 0-17 years in the Swedish BITA study", published in *Dent Traumatol* 2015;31:361–7, the mean values presented for temperament, measured by EAS, were unfortunately reversed for **Cohorts 3** and **4**, which resulted in inaccuracies. The corrected values were presented in a corrigendum published in *Dent Traumatol* 2016;32:166-7.

In this thesis, the corrected values for EAS are presented, discussed, and concluded.

4 RESULTS

4.1 Prevalence

4.1.1 Traumatic dental injuries

(Paper I)

A total of 803 children with traumatic dental injuries (TDI) were identified through dental records, and an additional 86 children were identified via the interviews. By combining data from dental records and interviews, a total of 889 children with TDI (before or during the study) were identified, resulting in a prevalence of 37.6% for TDI (Table 3).

Table 3. Prevalence with the distribution of gender in numbers and percent and incidence in percent in the four age cohorts of children with traumatic dental injuries, divided into before the study start and during the study. The table is based on all individuals with traumatic dental injuries noted in the dental records and from interviews where time for the trauma could be established.
(**Before**=before start of the study; **During**=during the study; **No.**=number; **Total**=total in the study; **Age** in years; ∗=p<0.05.)

	Cohort 1	**Cohort 2**	**Cohort 3**	**Cohort 4**	**Total**
No. of child.	**695**	**642**	**574**	**452**	**2363**
Age before	**0-2**	**0-6**	**0-10**	**10-14**	
Age during	**3-5**	**7-9**	**11-13**	**15-17**	
Prevalence of TDI	**% (No.)**	**% (No.)**	**% (No.)**	**% (No.)**	**% (No.)**
Before	16.4 (114)	28.2 (181)	39.4 (226)	38.3 (173)	29.4 (694)
Girls	48.2 (55)	44.8 (81)	57.1∗ (129)	44.5 (77)	49.3 (342)
Boys	51.8 (59)	55.2 (100)	42.9 (97)	55.5 (96)	50.7 (352)
During	14.0 (97)	10.0 (64)	3.5 (20)	3.1 (14)	8.3 (195)
Girls	43.3 (42)	53.1 (34)	30.0 (6)	42.9 (6)	45.1 (88)
Boys	56.7 (55)	46.9 (30)	70.0 (14)	57.1 (8)	54.9 (107)
Total	30.4 (211)	38.2 (245)	42.9 (246)	41.4 (187)	37.6 (889)
Girls	46.0 (97)	46.9 (115)	54.9 (135)	44.4 (83)	48.4 (430)
Boys	54.0 (114)	53.1 (130)	45.1 (111)	55.6 (104)	51.6 (459)
Yearly incidence during study in percent					
	4.7	3.3	1.2	1.0	2.8

4.1.2 General unintentional injuries

(Paper III)

Twenty-four percent (24%) of the children had experienced a serious, general unintentional injury (GUI) at some point during their lifetime, up until three months prior to the study start.

4.1.3 Multiple occasions of traumatic dental injuries

(Paper I)

Of the 889 children with TDI, there were 247 (27.8%) with more than one occurrence of TDI. The children with multiple occurrences of TDI were distributed evenly between the genders. No statistical significant difference between boys and girls was found (Table 4).

Table 4. The distribution of gender in the four age cohorts for children with more than one trauma occasion in numbers and percent. The table is based on all trauma occasions noted in the dental records and from interviews, where the individual child had more than one occasion with traumatic dental injuries.
(**TDI**= traumatic dental injuries; **No.**=number.)

	Cohort 1		**Cohort 2**		**Cohort 3**		**Cohort 4**		**Total**	
	No.	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**	**No.**	**(%)**
Total TDI	211		245		246		187		889	
>1 TDI	44	(20.9)	69	(28.2)	76	(30.9)	58	(30.1)	247	(27.8)
Girls	20	(45.5)	28	(40.6)	35	(46.1)	31	(53.4)	114	
Boys	24	(54.5)	41	(59.4)	41	(53.9)	27	(46.6)	133	

4.1.4 Changes in prevalence over time for traumatic dental injuries

(Paper I)

The prevalence for TDI for the children within the study did not change over time in the age groups; 3-5, 6-9 and 10-13 years of age, or in the four age cohorts during the years 1996-2010. Between the ages 0-2 years in **Cohort 1**, there was a statistical significant increase of TDI over time between the years 1993-2007 ($p<0.001$) (Table 5).

Table 5. Prevalence of traumatic dental injuries in numbers and percent in the four cohorts, divided into four age groups, when trauma occurred between 0-13 years of age, and the total number of children in the cohorts. The table is based on all registered trauma occasions in the dental records and from interviews where time for the trauma could be established. (**MD**=missing data; **No.**=number; ******=p<0.001.)

	Cohort 4 No. (%)	Cohort 3 No. (%)	Cohort 2 No. (%)	Cohort 1 No. (%)	Total No.
0-2 yrs	**1993-1995**	**1997-1999**	**2001-2003**	**2005-2007 ****	
	50 (11.1)	70 (12.1)	75 (11.7)	117 (16.8)	2363
3-5 yrs	**1996-1998**	**2000-2002**	**2004-2006**	**2008-2010**	
	65 (14.4)	102 (17.8)	104 (16.2)	133 (19.1)	2363
6-9 yrs	**1999-2002**	**2003-2006**	**2007-2010**		
	75 (16.6)	98 (17.1)	129 (20.1)		1668
10-13 yrs	**2003-2006**	**2007-2010**			
	38 (8.4)	56 (9.8)			1026
MD	10	11	14	3	
Total	452	574	642	695	2363

4.1.5 The relationship between traumatic dental injuries and general unintentional injuries

(Paper III)

Children with the occurrences of TDI (No.=820) were statistically significantly associated with both the occurrences of GUI, three months prior to the study start

(No.=510) (p<0.001), and GUI, from birth and up until three months prior to the study start (No.=823) (p<0.001).

4.1.6 Parental assessment of injury frequency and its relationship to traumatic dental injuries and general unintentional injuries

(Paper III)

Data was compiled from 2125 parents, who assessed their child's injury frequency (PAI), and showed that 11% of the parents made the assessment that their child was injured more often than other children.

Children, who were assessed by their parents as being injured more often than other children, had a higher prevalence of TDI (p=0.011) and more GUI during the three-month period prior to the study start (p<0.001), and during the child's lifetime (from birth until 3 months prior to study start) (p<0.001).

4.2 Incidence

4.2.1 Traumatic dental injuries

(Paper I)

During the first three years of the study, the yearly incidence for children with TDI was 2.8%. The incidence was highest among 0 to 2-year-olds and decreased with increased age (Table 3).

4.2.2 General unintentional injuries

(Paper III)

Before the study started, the incidence for the three-month period showed that 24% (No.=510) of the children in the study had suffered from a general unintentional injury. The largest percentage of the unintentional injuries consisted of bumps and/or bruises. More bumps and/or bruises were found among boys than girls in the two youngest age cohorts (Table 6).

4.3 Etiology

4.3.1 Traumatic dental injuries

(Paper I)

In the total group of children with injuries, the most common reason for TDI was due to a fall (42.1%). Figure 10 shows a description of the etiology factors in specific age groups, showing that the highest proportion of TDI between 0-1 year was due to a *Fall*; 6-7 years due to a *Fall* and *Blow by a moving object*; 8-9 years due to a *Fall* and *During play*; 12-13 years due to *Sports*; and 16-17 years due to *Biting on hard objects*. The highest frequency for the different etiological factors in relation to the age groups showed that the etiological factor *Fall* decreased with increasing age. TDI due to *Sports* increased for the school children up until the age of 15 years, and TDI *During play* was relatively constant between 4-15 years of age.

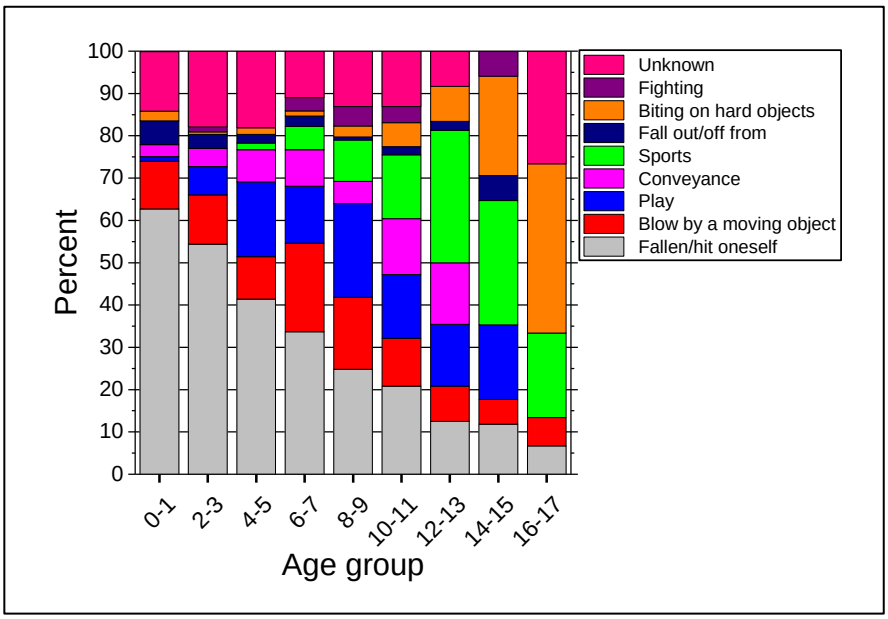

Figure 10. Distribution in percent of the different etiological factors in each age group based on 1,204 occasions of traumatic injuries. Total number of children in the study = 2,363.

4.3.2 General unintentional injuries

(Paper III)

Most of the reported GUI occurred *at home*. The second most common place for injuries was *in preschool* or *school*. The third most common place for injuries was *elsewhere*, and injuries *during organized sports* came in fourth place (Table 6). For some occasions of GUI, *violence* or *bullying* was involved (Table 6).

Table 6. The distribution between the different injury sites and violence or bullying associated with any injury presented in numbers, regarding injuries during the **3 months prior to study start,** and also **Other serious injuries** that required medical attention (up to 5 injuries described) during the child's **lifetime** (from birth until 3 months prior to study start).
(Total number of children=2,363; Missing answers in the questionnaire=208; Number of children with "**Other serious injuries**" = 527.)

	3 months					Lifetime
	Burns	**Bumps & bruises**	**Cuts**	**Other**	**Total**	**Other serious injuries Total number of injuries 1-5 occasions**
Injury site						
At home	78	532	29	59	698	357
In preschool/school	17	421	16	26	470	139
Elsewhere	17	247	26	40	330	220
Organized sports	5	255	2	18	280	49
In traffic	1	26	1	4	32	25
No data	7	0	0	6	13	5
Violence/Bullying						
Violence	3	26	3	3	35	21
Bullying (Yes)	1	3	0	1	5	4
Bullying (Maybe)	1	14	0	0	15	6

4.4 Risk factors for injuries

4.4.1 Socio-economic risk factors

Family structure - traumatic dental injuries

(Paper II)

In Study Group 2, at the study start, 81% of the children lived in families with two parents and 15% lived with one parent. There was no information on 4% of the children. There were no statistical significant differences between children with TDI living in families with two parents and the children living in families with one parent. Both groups injured their teeth to the same extent.

Parents' country of birth - traumatic dental injuries

(Paper II)

Children of parents, where one or both were born outside of the Nordic countries, reported statistically significant fewer TDI in the primary dentition, both where 0 TDI was tested against ≥ 1 TDI, (p<0.001), and where 0 or 1 TDI was tested against >1 TDI, (p<0.001). In the mixed/permanent dentition, they reported statistically significantly fewer TDI, where 0 TDI was tested against ≥ 1 TDI, (p<0.001).

Family socio-economic status and parents' education - traumatic dental injuries and general unintentional injuries

(Papers II, III)

There were no differences for the three groups *low*, *medium*, or *high* socio-economic status and TDI. Children from all three socio-economic groups suffered from TDI to the same extent.

SES, for the three groups *low*, *medium*, or *high*, was not associated to children with experience of GUI during the three months prior to the study start.

Children, whose mothers had a *low* level of education, suffered statistically significantly more often from TDI in the mixed/permanent dentition, where 0 TDI was tested against ≥ 1 TDI (p=0.004). There were no differences in the primary dentition. Children, with mothers with a *low* level of education,

had statistically significant more GUI during the three months prior to the study start (p=0.003).

Children, whose fathers had a *low* level of education, suffered statistically significant more often from TDI in the mixed/permanent dentition, both where 0 TDI was tested against ≥ 1 TDI (p<0.001), and where 0 or 1 TDI was tested against >1 TDI (p=0.041). There were no differences between a father's education and TDI in the primary dentition.

4.4.2 Individual risk factors

Gender - traumatic dental injuries

(Paper I)

For the 889 children with TDI (before or during the study), the distribution between the genders was 48% girls and 52% boys. There were no statistical significant differences between the genders regarding TDI for the total group, but when divided into before and during the study, there were statistically significantly more girls with TDI in **Cohort 3** before the study started (Table 1).

The distribution of TDI between the genders during the seasons showed that boys suffered statistically significantly more injuries during the spring (p=0.047) and fall (p=0.007), compared to girls (median for all groups =0).

Gender - general unintentional injuries

(Paper III)

Boys had statistically significantly more *bumps & bruises* and *cuts* at the age of 3, *burns* and *bumps & bruises* at 7 years, and *burns* and *cuts* at 15 years, than girls, however, girls had statistically significantly more *burns* at the age of 11 years than boys. The distribution of GUI between the genders during the three-month period before the study started is presented in Table 7.

*Table 7***.** The distribution of injuries during the **three months prior to study start** presented in percent for the genders at the four ages in the cohorts. Total occasions and Number of answers in the cohorts are presented in numbers.
(Total number of children=2,363; Missing answers in the questionnaire=208; **No.**=number; chi-square test employed.)

	Burns (%)	**Bumps & bruises** (%)	**Cuts** (%)	**Other injuries** (%)	**Total occasions in cohort** (No.)	**Number of answers in cohort** (No.)
3-year-olds (No.=695)						
Girls (No.=347)	4.3	54.3	0.9	4.9	210	326
Boys (No.=348)	5.5	67.6	4.2	4.2	268	333
p value		**<0.001**	**0.008**			
Total	4.4	61.0	2.6	4.6	478	659
7-year-olds (No.=642)						
Girls (No.=315)	2.2	62.5	2.2	5.9	198	272
Boys (No.=327)	8.0	72.0	5.0	5.0	270	300
p value	**0.002**	**0.015**				
Total	5.2	67.5	3.7	5.4	468	572
11-year-olds (No.=574)						
Girls (No.=316)	9.6	60.0	2.7	9.6	239	292
Boys (No.=258)	4.3	65.5	3.0	8.2	188	232
p value	**0.021**					
Total	7.3	62.4	2.9	9.0	427	524
15-year-olds (No.=452)						
Girls (No.=237)	4.3	51.9	2.4	10.6	144	208
Boys (No.=215)	9.9	56.8	6.8	12.0	164	192
p value	**0.029**		**0.035**			
Total	7.0	54.2	4.5	11.2	308	400

Parental assessment of their child's injury frequency

(Paper III)

At the age of 7 years, in **Cohort 2**, more boys than girls were assessed by the parents (PAI) as being injured more often than other children (p=0.02). No difference between the genders was found in the other age cohorts.

Age - traumatic dental injuries

(Paper I)

The number of TDI varied at different ages. A peak for TDI was found for the preschool children at 3 years of age and for the school children at 8 years of age (Fig. 11).

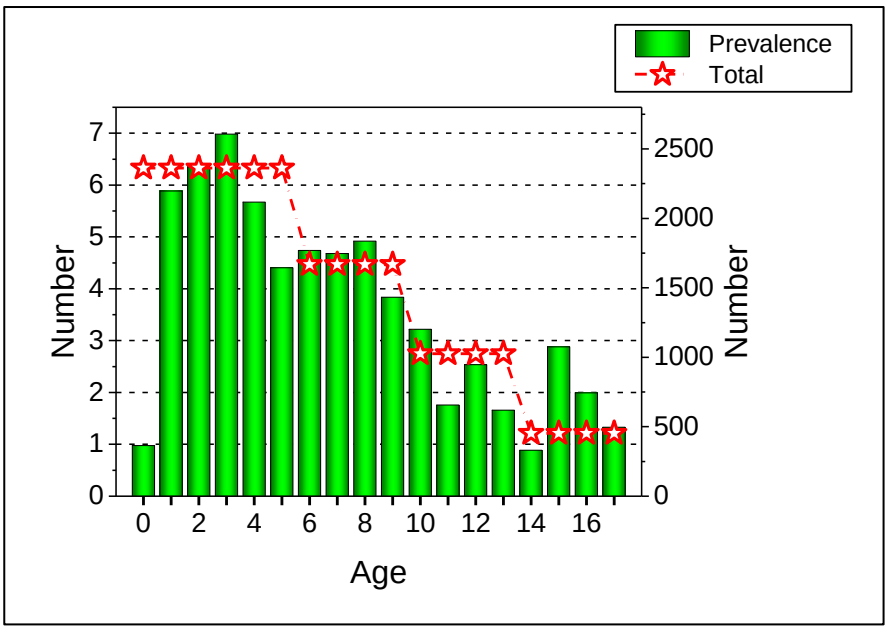

Figure 11. Prevalence in percent of children with traumatic dental injuries and the total number of children at each age. Total number of children in the study =2,363.

Age - general unintentional injuries

(Paper III)

The distribution of GUI between the age cohorts, during the three-month period before the study started, is presented in Table 7.

Temperament - traumatic dental injuries

(Paper II)

The corrected mean values for the temperamental dimensions are presented for **Cohorts 3** and **4**.

The children with multiple occasions of TDI were in:

Cohort 1: less shy than the children with 0 or 1 occasion of TDI (means=1.87/2.18, $p<0.001$).

Cohort 2: less impulsive than the children with 0 or 1 occasion of TDI (means=2.24/2.44, $p=0.037$).

Cohort 3: more social than the children with 0 or 1 occasion of TDI (means=4.37/4.23, $p=0.024$), when the children measured their own temperament.

Cohort 4: more active (means=3.07/2.82, $p=0.033$) and social (means=4.08/3.92, $p=0.032$) than the children with 0 or 1 occasion of TDI, when the parents measured their child's temperament.

Temperament - assessment of injury frequency

(Paper III)

The children who were assessed by their parents as being injured more often than other children were in:

Cohort 1: more emotional (means=3.30/3.00, $p=0.003$) and active (means=4.26/3.96, $p=0.002$) than the children who were assessed by their parents to be injured equally or less often than other children.

Cohort 2: more emotional than the children who were assessed by their parents to be injured equally or less often than other children (means=3.17/2.82, $p<0.001$).

Cohort 4: less social than the children who were assessed by their parents to be injured equally or less often than other children (means=3.73/3.96, p=0.019).

In **Cohort 3**, no statistical significant differences were found between the children who were assessed by their parents as being injured more often or not.

Temperament - general unintentional injuries

(Paper III)

The children with GUI in:

Cohort 1: were more emotional (means=3.16/2.97, p=0.003), more active (means=4.08/3.95, p=0.040), and less shy (means=2.01/2.24, p=0.001), than the children without GUI.

Cohort 4: had more anger than the children without GUI (means=2.95/2.76, p=0.025).

In **Cohorts 2 and 3**, no statistical significant differences were found between the groups with and without GUI.

Behavioral and psychosocial strengths and difficulties - traumatic dental injuries

(Paper III)

In the **Cohorts 1, 2 and 4**, no statistical significant differences were found between the children with and without TDI.

The children with TDI in:

Cohort 3: had a more pro-social behavior (means=8.76/8.42, p=0.040) and fewer peer relationship problems (means=1.07/1.57, p=0.001), than the children without TDI.

Behavioral and psychosocial strengths and difficulties - assessment of injury frequency

(Paper III)

The children who were assessed by their parents as being injured more often than other children in:

Cohort 1: had more conduct problems (means=1.96/1.32, p=0.001) and were more hyperactive/inattentive (means=3.69/2.90, p=0.010), than the children who were assessed by their parents to be injured equally or less often than other children.

Cohort 2: had more conduct problems (means=1.70/1.12, p=0.020) and were more hyperactive/inattentive (means=4.16/2.44, p=0.001), than the children who were assessed by their parents to be injured equally or less often than other children.

In **Cohorts 3 and 4**, no statistical significant differences were found between the children who were assessed by their parents as being injured more often or not.

Behavioral and psychosocial strengths and difficulties - general unintentional injuries

(Paper III)

The children with GUI in:

Cohort 2: were more hyperactive/inattentive than the children without GUI (means=2.92/2.49, p=0.041).

Cohort 4: had a more pro-social behavior than the children without GUI (means=8.72/8.19, p=0.007).

In **Cohorts 1 and 3**, no statistical significant differences were found between the groups with and without GUI.

4.4.3 Other risk factors

Distribution of traumatic dental injuries during the seasons

(Paper I)

For the total group of children with TDI in the study (SG-4), no statistical significant differences were found between the four seasons regarding frequencies of TDI.

4.5 Traumatic dental injuries and dental fear

(Paper IV)

4.5.1 Traumatic dental injuries before the study start and dental fear at the study start

Children without TDI (**CG-1**) had higher levels of dental fear (measured by the Children's Fear Survey Schedule – Dental Subscale) than the children with one (p=0.002) or multiple occasions of TDI (**SG-1**) (p=0.006) (Table 8).

Children with multiple occasions of TDI (**SG-1**) had a higher mean for self-rated fear than the children with one TDI (**SG-1**) or children without TDI (**CG-1**) (Table 8).

Children without TDI (**CG-1**) had a higher mean for fear, when dental personnel assessed the children's fear, than the children with one or multiple occasions of TDI (**SG-1**) (Table 8).

Table 8. The **upper part** of the table shows dental fear measured by the Children's Fear Survey Schedule – Dental Subscale (**CFSS-DS**), at the regular dental examination, at the study start. The **lower part** of the table shows dental fear assessed by the children and by dental personnel at the regular dental examination for the first year of the study.Number of patients with traumatic dental injuries (**TDI**) at the study start=694 (**SG-1**); the study group **SG-1** was divided into children with one TDI (number=472) or >1 TDI (number=222); number of patients with 0 TDI at the study start=1,669 (**CG-1**). (**No.**=number; **SD**=standard deviation; **n.s.**=non-significant; ***p***=p-value).

Dental fear		**Total**					
CFSS-DS		**No.**	**Mean**	**SD**	***p***	***p***	***p***
>1 TDI	**(SG-1)**	187	21.78	6.91	n.s.		
1 TDI	**(SG-1)**	365	22.13	7.72		0.002	
0 TDI	**(CG-1)**	1197	23.84	8.97			0.006

Dental fear		**Child**							**Dental personnel**						
assessments		**No.**	**Mean**	**Range**	**Median**	***p***	***p***	***p***	**No.**	**Mean**	**Range**	**Median**	***p***	***p***	***p***
>1 TDI	**(SG-1)**	198	0.27	0-3	0	0.009			187	0.27	0-3	0	n.s.		
1 TDI	**(SG-1)**	395	0.14	0-3	0		0.003		400	0.20	0-3	0			n.s.
0 TDI	**(CG-1)**	1274	0.23	0-4	0			n.s.	1353	0.33	0-4	0	<0.001		

4.5.2 Traumatic dental injuries during the study and dental fear at the third year of the study

Children with TDI occurring during the study (**SG-2**), and children without TDI (**CG-2**), showed no significant difference for dental fear measured by CFSS-DS at the third year of the study (Table 9).

Children with TDI occurring during the study (**SG-2**) had a higher mean for self-rated fear than the children without TDI (**CG-2**) (p=0.019) (Table 9).

Children with TDI occurring during the study (**SG-2**), or children without TDI (**CG-2**), showed no significant difference for dental fear when dental personnel assessed the children's fear (Table 9).

Table 9. Dental fear measured by CFSS-DS and assessed by the dental personnel and children at the regular dental examination at the third year of the study. Number of patients with TDI during the study=195 (**SG-2**); Number of patients with no TDI before or during the study=1,474 (**CG-2**). (Children's fear: CFSS-DS=Children's Fear Survey Schedule – Dental Subscale and assessed by personnel and self-rated by the children; **SD**=Standard Deviation; ***t***=Independent *t*-test; ***p***=p value; **No.**=number; **n.s.**=non-significant.)

Experience of TDI Measurements at 3rd yr.	**TDI (SG-2) during study**			**No TDI (CG-2) before or during the study**				
	No.	**Mean**	**SD**	**No.**	**Mean**	**SD**	***t***	***p***
Total group (No.=1,669)								
Children's fear								
CFSS-DS	120	21.79	7.10	948	22.09	7.30	0.49	n.s.
Assessed by personnel	135	0.28	0.50	938	0.21	0.46	-1.75	n.s.
Self-rated	138	0.29	0.56	998	0.19	0.44	-2.35	0.019

4.5.3 Assessed fear at emergency treatment for traumatic dental injury and the following treatment session

The assessed fear for the children at the treatment for TDI (SG-3) showed that fear could either increase or decrease until the first treatment after TDI. There were also a group of children who were not afraid at either of the treatments. The Wilcox Signed Rank Test showed no statistical significant increase or decrease for either the children's self-rated fear, or the assessment made by dental personnel, during the treatment for TDI and until the first treatment session after TDI.

4.6 Assessed pain and fear at emergency treatment for children with traumatic dental injury during the study

(Paper IV)

In the group of 92 children with TDI during the study, and who had a structured TDI record set up (**SG-3**), the distribution between the genders was 34 girls and 58 boys. Of the 92 children, 45 children had injuries to the primary teeth, and 44 children had injuries to the permanent teeth. In the same group of children, 27 children had injured the hard tissue, 40 children the supporting tissue, and 38 children the soft tissue (Table 10).

In **SG-3,** 32 children had stated that they experienced pain during the treatment for TDI, and 43 stated no pain. Children reporting pain were found for all types of dental injuries (Table 10).

In **SG-3**, 25 children had stated that they experienced fear during the treatment for the traumatic dental injury or assessed to be afraid by the dental personnel, and 53 were assessed having no fear. The children reported fear for all types of dental injury (Table 10).

Table 10. Pain experience and self-rated or assessed fear by dental personnel for children at the time for treatment of a traumatic dental injury (TDI). The subjective assessment of pain=**Yes** or **No,** was made by the child at the treatment session. The rated fear by the children and dental personnel had a scale of 0 to 4, where 0=**No fear**, and 1 to 4=**Fear**. The numerical distribution of gender and data from the structured TDI records is shown for the total TDI group (**SG-3**), and reported for children who had experienced **Pain/discomfort** or **No pain/ discomfort** and **Fear** or **No fear**. (**No.**=number; **MD**=missing data; Incomplete data=1.)

		Pain at time for TDI			Fear at time for TDI		
	No.	**Yes**	**No**	**MD**	**Yes**	**No**	**MD**
Total (No.=92)							
Girls	34	12	15	7	10	20	4
Boys	58	20	28	10	15	33	10
Injured teeth							
0-1	53	20	21	12	13	30	10
>1	39	12	22	5	12	23	4
Injured teeth*							
Primary	45	8	24	14	13	22	11
Permanent	44	23	19	2	13	29	2
Injury to**							
Hard tissue	27	11	13	3	8	16	3
Supporting tissue	40	13	21	6	14	23	3
Soft tissue	38	14	18	6	15	20	3

**=a patient can have both primary and permanent teeth injured on the same occasion.
**=a patient can have injuries in more than one subgroup on the same occasion.

4.7 Cooperation at emergency treatment for traumatic dental injury and at the following treatment session

(Paper IV)

Sixty-six of the 76 children with assessments of cooperation, fully cooperated during dental treatment for TDI. The Wilcox Signed Rank Test showed that *pain* or *no pain* for TDI did not have a statistical significant effect on the child's cooperation during treatment for TDI or during the first treatment session after TDI.

5 DISCUSSION

This thesis focused on Swedish children and adolescents in the BITA study having experienced traumatic dental injuries (TDI) and general unintentional injuries (GUI). Furthermore, risk factors for injuries and potential consequences of dental injuries were explored.

This study showed that 38% of the children in the BITA study had encountered TDI, with a yearly incidence of 2.8%. There was no difference between the genders. Children, who were assessed by their parents to be more injury-prone, had more TDI and GUI reported. Children with TDI were associated with more occasions of GUI. The etiological factors for injuries varied for the different age groups and the socio-economic and individual risk factors for injuries changed with age. Pain and fear during treatment for TDI or at follow-up treatment, did not affect the child's ability to cooperate during dental procedures, to any greater extent. Children with multiple occasions of TDI were more fearful in connection with dental care.

At the dental clinics included in the study, all the children in the four age cohorts were invited into the BITA study, with no previous discretion. Dental care for children in Sweden is organized in such a way to constitute excellent conditions for large studies, retrospectively, as well as prospectively. At the 12 clinics included in the study, approximately 94% of the children were reached through their catchment areas. Of the 3134 children invited into the study, 75% entered, which is considered a high participation.

Children with TDI within the study were identified by a combination of regular clinical examinations, interviews during the visit, retrospective and prospective dental records, and specific dental record for TDI. These combined ways to collect data provided good conditions to identify all children with TDI within the study. Several studies have only used a clinical examination to identify children with TDI (6, 34, 39, 43), while other studies were based on retrospective dental records (10, 25, 121). Visual clinical examinations do not cover all diagnosis for TDI, just the visible sign of a dental injury (6, 39, 122). Retrospective dental records excluded the children with dental injury who did not seek dental care for their TDI (10, 35, 121). One strength of the BITA study is the different ways to identify TDI among the children, by interviews, retrospective dental records, and longitudinal prospective dental records.

Data regarding children with general unintentional injuries was obtained by structured interviews, since access to medical records was not available. Memory flaws can affect self-reported retrospective data and the reports may be both too high and too low. Two different periods of injury were presented in the questionnaires. The periods for questions regarding GUI were from birth up until three months before the study started, as well as for the three-month period before the study start. The shorter three-month period may possibly be more accurately remembered. The longer perspective for GUI gave an overview of the child's history of injuries.

Some children seem to be more injury-prone. The parents who assessed their child as having more injuries, had children with more experiences of general unintentional injuries and TDI.

The yearly incidence for TDI was 2.8% and varied between the age groups. The highest incidence was found for the youngest children and decreased with increased age. The difficulty of comparing incidences between the studies may be the different age groups included. The BITA study had the benefit of having included several age groups. The incidence for all four age groups in the study could be compared to another Swedish study, with children aged 0-19 years, which showed a lower incidence at 1.3% (9). For the children aged 7-9 years in the BITA study, the incidence was 3.3%, which was higher than in a recent study showing an incidence of 2.2% for Swedish children aged 8-10 years (123).

The prevalence for TDI was 37.6% for all children included in the study, but it has been speculated that the prevalence has increased. The wide variation in study designs makes it difficult to assess whether there has been an increase in TDI or not. No change in prevalence of TDI could be seen for the children in this study in **Cohorts 2-4**; however, there was an increase in **Cohort 1** for ages 0-2 years. A Norwegian study (8) reported no changes in TDI for children aged 7-18 years, while an increase of TDI in preschool children was seen in Brazil (122). If Swedish parents are more aware of dental injuries and seek more dental care, or if it in fact has increased, is difficult to know in the current situation. The constant level of dental injuries could also reflect the effective on-going safety work for decades, in Sweden, to eliminate accidents and general unintentional injuries, which may also affect the number of TDI. This study showed no differences for TDI between seasons, however, boys had more TDI during the spring and fall than girls. Despite changes in climate between seasons in Sweden, this may indicate that many children play and practice in the

same sports all year round, in certain parts of the country. Studies on TDI from countries with little or no weather variations during the year, found no fluctuations (16, 17). The distribution of TDI during the seasons can reflect risk factors, when children participate in various activities depending on the season. In other studies, TDI during seasons has shown a lower frequency during the summer and higher during the winter, for studies in climates with great variations between seasons (9, 123).

Eleven percent (11%) of the children in the study were assessed by their parents to be injury-prone, with more GUI reported. The three older age cohorts in the BITA study, at 7, 11 and 15 years of age, had more occasions of GUI reported, than in a previous published study (66). The higher frequency reported for the BITA study brings about the question if the children were actually injured more often, or if the discrepancy in injury frequency between the studies can be due to too many or too few injuries reported.

Children encounter TDI at all ages, however, the etiology for the injury varies with age. For the children in the study, the most common etiological factor for TDI was due to a *Fall*, with children aged 2-3 years most affected. This is in agreement with several other studies, where a fall is the most common cause of TDI (43, 124, 125). Injuries *During play* occurred in all age groups and were most common for the children aged 4-5 years.

When children reach school age, organized sport activities become more common. The largest group involved in sports is found for children before their teen years, since many children in Sweden quit their regular sport activities once they reach this age. Injuries while practicing *Sports* were common for children aged 8-9 and 12-13 years. This is in line with the finding of a high prevalence of TDI in sport accidents, and furthermore, that more injuries have been found in the permanent dentition than in the primary dentition (45).

Many dental injuries are difficult to predict or avoid, however, during some sport activities, children should use a mouth guard for protection, e.g., with anything involving sticks, balls and contact sports. The BITA study found that older teenagers injured their teeth when *Biting on hard objects*, not seldom by using their teeth as a tool. These findings show the need for information be given to teenagers to be careful with their teeth.

The most common general unintentional injuries for both boys and girls were bumps and/or bruises and most of the GUI were reported to have occurred at home. Also, for children seeking medical care in Sweden during the years 2007-2009, the same reason was reported (4). It demonstrates that child safety in the home environment is important and parents need to consider risk areas. Some children are injured numerous times both at home and at other locations, and it has been shown that previous injuries predict future injuries (126).

A recent Swedish study on children aged 12, 15 and 17 years and living in southern Sweden, showed that general injuries were commonly occurring during sport activities and while riding a bike (127). The question has been raised regarding the relationship between children's increased time spent in front of a screen (computers, tablets and smart phones) and the potential decrease in injury frequency. The study mentioned above, with children, aged 12, 15 and 17 years, showed that 58% of the boys, at 12 years of age, and 50% of the 15 and 17-year-olds boys, were physically active at least one hour per day. For girls, the corresponding figures were just under 50% for 12-year-olds, 38% for 15-year-olds, and 32% for the 17-year-olds. Around 30% of the boys at the three ages stated that they spent more than three hours each day playing computer games. For girls, the figures were 10% at 12 years and approximately 5-6% for the 15 and 17-year-olds.

Since many children were involved in physical activities, the time spent in front of the computer may be taken from "play time" or time spent with friends, and not from sport or other physical activities. These thoughts about the children's division of leisure time between different activities might suggest that the prevalence of injuries will not bring about change dramatically.

This study showed that for some occasions of general injuries, violence and bullying were involved in all of the four age cohorts. In Sweden, a study showed that approximately 6-7% of students in grades 4-9 were vulnerable to bullying (128). Teachers, together with children in preschools and schools in Sweden, are obligated to work against bullying, but despite efforts, it still occurs.

There is no standardized way to measure socio-economic status (SES) in Sweden. Variations are seen in different studies. Dispersed systems aiming to calculate SES are used for primary care, schools and dental care for children and adolescents. The variables included could be a parent's

education, a child or parent's country of birth, how long they have lived in Sweden, if the family is receiving social welfare, the family structure, and residential area.

For studies on TDI, variables used to reflect socio-economic differences vary between studies. Some variables to describe socio-economics could be the child's gender, age, parents' or mother's education, mother's occupation, household income, family structure and number of residents in the home (39, 57, 129-131). The dental clinics included in the BITA study were selected to include children with different socio-economic backgrounds, and the BITA study used previously calculated socio-economic status for the clinics in the two regions.

To measure socio-economic status for the families in the study, occupation and education were combined (119), with no association between TDI and socio-economic status found, i.e., the children from all levels of socio-economic status suffered from TDI to the same extent. This is in line with results from another study, where no association between socio-economic status and TDI was found, and where the combination of parental education and household income was used to describe socio-economic status (129). In the BITA study, the occupation of the parents is comparable to the household income in the above compared study.

Studies have previously shown TDI to be associated with both low and high SES. School children in Brazil from high socio-economic backgrounds were more likely to encounter a dental injury than children with low SES (55), while children with low socio-economic status in India had a higher risk for dental injuries (132). One reason for the contradicting results could be the different ways to measure socio-economic status, with varying factors included and their significance in regard to the countries.

In this study, no association between GUI and SES was found, however, it has been reported that Swedish children from households with low SES have a tendency to encounter more general injuries (4). GUI are generally more common in low and middle-income countries and for children from deprived backgrounds (2, 3). This indicates that environment may be a factor related to the occurrence of injuries, indicating that a connection between SES and environment needs to be considered.

The SES in this study was divided into education and occupation and was investigated separately in relation to TDI. *Low* parental education showed

to be associated with more occasions of TDI and GUI, however, it has earlier been found to be an association between mothers with higher education and TDI (39), which contradicts the result from this study. In the literature, it has also been described as no association between a mother's education and TDI (130).

The findings for parental education and GUI in the BITA study is consistent with previous findings, where it has been shown that children, whose parents had completed nine years or less of school (which is considered low education in Sweden), had higher risks for injury-related hospitalizations (59). In Sweden, an increased risk for traffic injuries for the children living with a single parent or having parents with low education or living on social welfare, has been found, however, no increased risk for fall injuries were found (60).

In the BITA study, there were no associations between TDI and children living with one or two parents. The same relationship between family structure and TDI has also been found in a recent study, with children 4 years of age (57), while the opposite was found for 13-year-olds, where children from non-nuclear families were more likely to have dental injuries (52). The results from this study indicate that the children are well-protected living either with one or two parents. In Sweden, most children attend preschool. When children reach the age for the mixed/permanent dentition, most of them, up to the age of 10 years, attend an after-school center located close to or at the school. Their care is similar during daytime and adults other than their parents are responsible for their safety.

No previous studies investigating the relationship between a parent's country of birth and TDI were found. Attitudes and knowledge regarding risk factors for TDI may vary between countries. Parents have different cultural backgrounds and customs concerning, e.g., raising their children and the child's dental care. The children in the study with parents born outside of the Nordic countries were found to have less occasions of TDI. However, others have found that there was no association between ethnic origin and TDI (56, 131).

The children in the study with parents born outside of the Nordic countries may not necessarily experience less TDI, but instead seek less dental care due to the cultural background of the parents. Thoughts regarding tendencies to consider an injury severe enough or not to seek medical attention, could depend on the socio-economic and cultural background

(133). Regarding general injuries due to a fall, it has been shown that children with a mother born outside of Sweden had less fall injuries registered at hospitals (58). Background has been found to be an important determinant in lifestyles and it has been speculated if these backgrounds explain differences in risks between children of foreign-born and Swedish-born parents, when confronted with injury risks (58).

In the BITA study, both boys and girls injured their teeth to the same extent, but for GUI, there was a difference between the genders. Boys encountering more GUI is in line with the report from The National Board of Health and Welfare in Sweden, where boys also had more general unintentional injuries reported than girls (4). Several studies have shown that more boys than girls encounter dental injuries (8, 10, 11, 26, 38, 43), but it has been suggested there is a decline in the difference in TDI, in relation to gender, in the permanent dentition (134). Instead of gender being a determinant, the risk of more TDI may be due to what activities the children are participating in, their age, personality, and socio-economic risk factors. Other studies of TDI, where no differences were found between the genders, have proposed that the decline in gender differences could be that girls, over time, have started practicing more sports (12, 135).

Children encounter TDI at all ages, but younger children suffered more occasions with the peak found at 3 years of age for the preschool children, and at 8 years of age for the school children. This is in agreement with previous studies (8, 13, 61).

There are no consistent relationships in temperamental reactivity between the four age cohorts. Accident proneness has been discussed and it has been found to be associated with personality features (136). Children and adolescents with repeated accidents have been found to have certain personality characteristics. Some of the characteristics could be a daring lifestyle, being very active, liking to explore, being extroverted and showing aggressiveness toward peers (137). It has been found that unintentional injuries in children have no strong relationship to temperament (138), however, a predictor of injury was dependent on parental efforts to control and supervise the child (138, 139).

In the BITA study, shy 3-year-olds had fewer occasions of TDI and GUI. Young children, and especially shy ones, are often close to their parents or other adults, who can naturally protect them from risky situations. Emotional and active 3-year-olds were more injury-prone and had more

occasions of GUI reported. Activity and shyness is in line with a study were it was found that children, who scored higher for energy and lower for shyness, were exposed to more unintentional injuries (140). The relationship between emotionality and reports of GUI, in 3-year-olds, could be explained by these children not necessarily being injured more often, but that they communicate their distress to a higher extent, which in turn affects the parent's notion of an injury. The children in this age group, who had conduct problems and were hyperactive, were injury-prone. The activity level has been identified as predicting the risk for unintentional injuries for children, where a higher activity level increased the risk (139, 141), and positive parenting showed to protect the child from unintentional injuries (142).

Hyperactive 7-year-olds were considered to be both injury-prone and exposed to unintentional injuries. Conduct problems were also associated with being injury-prone. Impulsive 7-year-olds had less occasions of TDI. The result regarding being impulsive did not correspond to what this study expected from the beginning. It has earlier been shown that children rating high on *Extraversion,* and those rated with low *Inhibitory Control,* have been identified as having more general injuries than peers without these traits (67). The parents with impulsive children are likely to be aware of their child's temperament and can more easily protect them from risky situations.

Social 11-year-olds had more occasions of TDI. Social children are more involved with other people and situations, which can lead to dental injuries, however, no association was found for temperament and being injury-prone or being exposed to GUI in this age group. Children with peer relationship problems had less TDI and those with pro-social behavior had more. Children with a pro-social behavior like to be together with other children, are socially active, and are included in many social contexts. The children with peer relationship problems in this age group were not associated with TDI, which could reflect that these children are not so socially active and more alone. A previous study, with children aged 7-15 years, showed the opposite relationship between peer relationship problems, pro-social behavior, and TDI, than was found in this study (75).

Social and active 15-year-olds had more occasions of TDI, but the social children were less injury-prone. Pro-social 15-year-olds were associated with more occasions of GUI. The same reasoning regarding being social and active, as for the 11-year-olds, may apply here. The temperamental

dimension, *Emotionality*, is composed of subgroups and one of them is anger. The children in this age group with more anger had more unintentional injuries. Aggressive behavior in preschool children has shown to be associated with unintentional injuries (143).

In the longitudinal perspective of this study, it was possible to measure changes in dental fear for the children encountering dental injuries during the study period. It has earlier been suggested that the child's subjective perception of a dental visit plays a vital role in developing dental fear (144). At the study start, no difference in the self-rated fear was found for the children with experiences of TDI or without experiences of TDI. The self-rated fear at the third year of the study showed that children with TDI, having occurred during the study, rated themselves as more afraid than the children without experiences of TDI. For the children with dental injuries that occurred during the study, the injury may be closer in time to a dental appointment, where dental fear was assessed. For the group of children with experience of TDI at the study start, the injury could stem far back in time and in that way, have little or no influence on dental fear.

The child's self-ratings, and the dental personnel's assessment regarding fear, were made at every dental appointment, while the questionnaire CFSS-DS was answered at the regular dental examination. The self-rated measurements of fear showed that children could feel fear during treatment for all types of injuries, but were not always accompanied by dental fear measured by CFSS-DS. Self-ratings of the child's dental fear are of value and should be part of the dental records. The children without the experience of TDI showed to have a higher level of dental fear at the study start, measured by CFSS-DS, than the children with experience of TDI before the study start. This could reflect that there was a large proportion of young children without TDI and the younger children tend to have higher levels of dental fear.

Traumatic dental injury does not generally mean that the child becomes dental anxious. A child can have high scores on single items on the CFSS-DS questionnaire, but in total, not be regarded as having dental fear. A traumatic dental injury incident can be a dramatic event for the child, and good care by the dental personnel is of importance. As previously mentioned, dental professionals are taught to highly respect the child and it is reasonable to assume that good care during treatment for TDI is given to minimize the risk of developing dental fear. Since children with experiences of TDI showed less fear, it could indicate that dental personnel

provide good care during treatments. This could be in line with latent inhibition, where several dental treatments with good care help the child cope with the occasional more severe treatment, without increasing or developing dental fear (145).

Pain is always a patient's subjective experience (103). This study showed that the children with experience of TDI could feel pain during treatments for all types of injuries, single or multiple teeth, for both the primary and permanent teeth. For injuries to the permanent teeth, more children stated that they felt pain during dental treatment, than the children with injuries to the primary teeth. This may be due to treatments often required to the permanent teeth. Studies have found a relationship between adolescents with experiences of pain during dental treatment and dental fear. Furthermore, a relationship was found between subjective experiences of pain, negative dental experiences, and fear (83, 86, 146).

Developing dental fear was also seen in a study where patients remembered pain during emergency treatment and at the follow-up treatments for TDI. In the same study group, a large percentage reported fear to be caused by treatment effects during the dental procedures for TDI (100). Pain during treatment may be one of the reasons for developing dental fear, and pain may also be the reason for the child to not cooperate during dental treatment. It is important to reduce the experience of pain for children wherever possible.

Dental personnel have a great responsibility to create conditions of security for children, to help the child more easily cooperate during dental treatments. In the BITA study, most children fully cooperated during the treatment for their dental injury, and at the follow-up treatment. They cooperated regardless of experienced pain during the acute dental procedure for TDI. The child’s ability to cooperate during dental care gives no information on the child’s experienced pain. This indicates that good care by the dental personnel has a positive effect on the child and for the outcome of the treatment. To help children coping with distress during painful medical procedures, it has been shown that distraction by adults has successfully been associated with increased child coping (147, 148).

5.1 Ethical considerations

The project was started for the benefit of children's health, with dental care as a base. An ethical application was submitted to the ethics review committee in June 2007. They found the project not subject to the Swedish Act on Ethical Review, but still provided additional feedback.

Before entering the study, parents and children received written information regarding BITA. The parents and children were asked to participate in the study when attending a routine dental appointment at one of the 12 clinics included in the study. At the same dental appointment, the parents signed a consent form to participate, valid also for their child. If a parent had not accompanied the child, the child brought the paper home to be signed and returned to the project assistant. The children and parents were informed that they could leave the study at any time.

The children in the study underwent no additional treatments at the clinics during the study period, however, they responded to several questionnaires that were time-consuming and contained personal questions, which could cause concern. During the study period, the parents and children could contact a psychologist if questions arose when answering the psychological questionnaires. No personnel at the clinics had any access to the answers in the questionnaires that the parents and children answered.

The study has provided information useful for dental personnel with knowledge concerning children’s temperament, behavior and socio-economic risk factors for TDI, and children being assessed to be injury-prone and its association to general unintentional injuries and TDI.

Documenting and following-up a child’s self-rated fear and pain during treatment for TDI may be useful in improving future treatment experiences for children encountering TDI.

5.2 Strengths and limitations

One strength of the study is that the Public Dental Service (PDS) system makes it possible to include a representative sample of Swedish children. This provides excellent opportunities for a longitudinal design, which gives the advantage of studying changes over time. The prospective BITA study design gave the benefit of adjusting the design of dental records for TDI during the study period, where data was collected during the children’s

regular treatment sessions. The study was designed to include children from families with different socio-economic status and stretched over a long period of time, including many children who responded to numerous questionnaires and interviews. The multiple ways to find and identify the children with TDI and using the PDS system are unique strengths for the study.

One limitation of the study is that fewer children in the oldest age cohort entered the study, than in the other three age groups, where accordingly, it may be difficult to generalize these findings to 15-year-olds. The extensive number of questionnaires may have lead to some of the children and/or parents becoming tired of participating, hence the missing data. Due to the young age for some of the children included in the study, the parents answered the questionnaires concerning them. For some questionnaires, only the parental answers were used in order to be consequent for all the age cohorts, although self-reports from older children may be more valid for some variables.

The study extended over several years with the continuity of dental personnel varying over time. New personnel at the clinics may have missed important information regarding the BITA study.

5.3 Clinical implications

This study found a correlation between parent assessments regarding their child's injury frequency and traumatic dental injuries, as well as for general unintentional injuries, where injury-prone children had more experiences of TDI and GUI. This gives dental personnel the possibility to screen a child's injury-proneness by asking the parents about their child's injury frequency, and providing targeted preventive information about TDI for the children at risk.

Children can feel pain during treatment for TDI for all types of dental injuries and dental personnel need to be perceptive to this fact. It could be of value to add new data to the dental trauma record regarding the child's self-rating of pain and fear, the dental personnel's assessment of the child's fear, and cooperation during the procedure.

6 CONCLUSIONS

The BITA study showed that just over one third of the included children, with an even gender distribution, had encountered traumatic dental injuries, with a yearly incidence of 2.8%. TDI had increased in the BITA study, for the age group 0-2 years, between the years 1993-2007. One quarter of the children in the study had encountered a serious general injury, with approximately 10% of the children assessed by their parents to be injury-prone. Children with TDI were associated with more occasions of GUI.

The etiological factors for injuries varied for the different age groups. The younger children had the highest incidence and suffered the most TDI due to a *Fall*. TDI *During play* occurred in all age groups but was most common for the children aged 4-5 years. When the children reached school age, TDI during *Sports* became more common. Teenagers often injured their teeth while *Biting on hard objects*. Most of the reported GUI occurred *at home*. Boys had more *bumps & bruises* and *cuts* by the age of 3 years, *burns* and *bumps & bruises* by the age of 7 years, and *burns* and *cuts* by the age of 15 years, than girls. However, girls had more *burns* by the age of 11 years, than boys.

Children, living in families with one or two parents, injured their teeth to the same extent. Children, in families where one or both parents were born outside of the Nordic countries, had fewer TDI reported. SES had no effect for any of the three groups *low, medium,* or *high* status and the occurrence of TDI or GUI. Children, whose mothers had a *low* level of education, suffered more often from TDI and GUI.

The individual risk factors for injuries changed with age. Shy, 3-year-old children had fewer occasions of TDI and GUI, while the active had more TDI. The emotional, active, hyperactive, or those with conduct problems were assessed to be injury-prone. Children, who were emotional, hyperactive or had conduct problems by the age of 7 years, were assessed to be injury-prone, and the hyperactive children had more GUI reported. Sociable and pro-social 11-year-old children had more TDI, and the children with peer relationship problems had less. Sociable and active 15-year-old children had more TDI, and the pro-social were assessed to be injury-prone and had more GUI reported.

At the study start, children without TDI had higher levels of dental fear (measured by CFSS-DS), than the children with one or multiple occasions of TDI. At the third year of the study, children with TDI occurring during the study, and children without TDI, showed no difference for dental fear (measured by CFSS-DS).

Pain and fear could be experienced by children during treatment for TDI, despite that most of the children fully cooperated during treatment and at the follow-up treatment. When the children rated their own fear, children with multiple occasions of TDI were more fearful in connection with dental care.

7 FUTURE PERSPECTIVES

To be able to further study the possible changes in prevalence over time, for traumatic dental injuries, the longitudinal study design for the BITA study is of value. The collection of data for all five years is completed, and could be of interest when investigating prevalence changes over the years for the children included in the BITA study.

To work for a better structured dental TDI record for the children encountering a dental injury. The structured dental TDI record could include self-ratings and assessments of the child's pain and fear during dental procedures. These self-ratings and assessments could serve as a basis for documenting and working for improving the child's treatment experience.

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APPENDIX I-XI

Appendix I

Olyckshändelser som lett till andra oavsiktliga skador (baserad på Rowe et al. 2007)

Frågor ställda till föräldrar eller barn (över 11 år) under intervju. Intervjuaren noterar svaren.

Vid frågan om HUR skadan uppstått får följdfrågor anpassas till samtalet, t.ex. Blev du slagen? Blev du jagad så du slog dig? för att intervjuaren skall kunna göra en enkel kategorisering av våld eller mobbing. OBS att vi med våld menar avsiktligt våld, så långt detta går att bedöma.

Alla barn skadar sig ibland. Är ditt barn ett barn som skadar sig oftare än andra enligt din bedömning? ( ) Ja, mycket oftare ( ) Ja, lite oftare ( ) Nej

Vilken/vilka av följande skador har drabbat ditt barn de senaste tre månaderna?

Tandskador ( ) Nej ingen ( ) Ja, någon/några ( ) Ja, flera

Vad?……..…

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Brännskador ( ) Nej ingen ( ) Ja, någon/några ( ) Ja, flera

Vad? ……

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Blåmärken, skrapsår och dylikt ( ) Nej ingen ( ) Ja, någon/några ( ) Ja, flera

Vad?……

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Skärsår eller sticksår som behövt sys eller tejpas ( ) Nej ingen ( ) Ja, någon/några ( ) Ja, flera

Vad? ……

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Andra skador som behövt läkarvård (bruten arm, djurbett, klämda fingrar etc.) ( ) Nej ingen ( ) Ja, någon/några ( ) Ja, flera

Vad? ……

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Appendix I

Andra allvarliga olyckshändelser som föranlett besök hos läkare eller tandläkare under barnets livstid (första mätningen) resp. sedan förra besöket hos tandläkaren (mer än tre månader sedan)

Vad? ……..……

……..……..

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Vad? ……..……

……...

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Vad? ……..

……...

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Vad? ……..

……...

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Vad? ……..

……...

Var? ( ) i skolan ( ) i trafiken ( ) hemma ( ) idrott ( ) annan plats

Hur? *våld* ja/nej *mobbing* ja/kanske/nej

Övrigt:

Appendix II

Barnets upplevda smärta och obehag

Smärta (barnets egen skattning – frågas av assisterande personal)
Ansiktsskalan till 3-åringar. (Använd bokstavsskalan ovanför ansikten vid registrering)
Termometern till 7-, 11- och 15-åringar.

1. Var det något av det vi gjorde idag som gjorde ont? Ja/Nej

2. Vad var det som gjorde ont:

_____

1. Hur ont gjorde det (det som var värst)? _____ (Värde från Smärttermometer)

2. Var det något som var obehagligt på något annat sätt? Ja/Nej

3. Vad var det som var obehagligt:

_____

1. Hur obehagligt var det (det som var värst)? _____ (Värde från ”termometer”)

Appendix III

Skattning av barns rädsla i undersökningsrummet

Utgångspunkter:

1. Ska om möjligt göras av assisterande personal; om detta inte går, görs det av behandlaren själv.
2. Ska komplettera förälderns skattning och barnets självskattning (CFSS-DS)
3. Ska göras oberoende av skattning av behandlingsbarhet och smärta
4. Ska vara en helhetsbedömning av hur rädd barnet var i undersöknings-/behandlingssituationen alltså inte hemma eller i väntrummet!
5. Ska göras vid varje besök (Barnets skattning från 7 år)
6. Ska göras före barnets skattning av upplevd smärta

Barnets skattning:

Hur kändes det idag?

( ) 0 = Inte alls rädd
( ) 1= Lite nervös
( ) 2= Ganska rädd
( ) 3= Väldigt rädd
( ) 4= Skräckslagen

Sköterskans/behandlarens skattning:

Hur rädd uppfattar du att barnet/patienten var under dagens besök?

Bedömningen görs på en 5-gradig skala i form av en sammanvägning av rädsla uttryckt som:

1. Fysiologiska reaktioner (motorik, svettning, spänt tal, hjärtklappning, muskelspänningar etc.)
2. Beteende (talar väldigt tyst och enstavigt, svarar inte på frågor, vänder sig till föräldern, gråter, försöker undkomma instrument eller vägrar öppna munnen p gr a ängslighet/rädsla (som tandsköterskan/behandlaren uppfattar det)
3. Verbal beskrivning efter avslutad undersökning på frågorna ”Hur rädd kände Du dig under undersökningen/behandlingen idag?” Hur känns det nu?”

( ) 0 = Inte alls rädd
( ) 1= Lite nervös
( ) 2= Ganska rädd
( ) 3= Påtagligt rädd
( ) 4= Skräckslagen

Appendix IV

Skattning kooperation enligt Rud Kieslingsskalan (behandlare)

(3) full accept, öppen, avslappnad inga avvärjningsreaktioner

(2) tveksam eller likgiltig accept, viss anspänning, fortfarande inga avvärjningsreaktioner

(1) motvillig accept, avskärmning, ointresse, lätta protester eller avvärjningsförsök

(0) ingen accept, högljudd protest eller gråt, fysisk protest

Appendix V

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

EASI – Barns temperament

Barn är olika. Påståendena nedan handlar om ditt barns temperament, dvs. barnets typiska sätt att reagera i olika situationer. Du svarar genom att kryssa för något av alternativen från 1 – 5, beroende på hur väl Du tycker att påståendet stämmer med ditt barns sätt reagerar nu för tiden.

	Stämmer inte alls (1)				Stämmer mycket bra (5)
1. Barnet är blygt	☐	☐	☐	☐	☐
2. Barnet har lätt för att gråta	☐	☐	☐	☐	☐
3. Barnet tycker mycket om att vara med andra människor (även andra än föräldrarna)	☐	☐	☐	☐	☐
4. Barnet är ständigt i farten och rör sig mycket	☐	☐	☐	☐	☐
5. Barnet håller på med en uppgift länge för att försöka lösa den	☐	☐	☐	☐	☐
6. Barnet föredrar ensamlek framför att leka med andra	☐	☐	☐	☐	☐
7. Barnet reagerar ofta känslomässigt, dvs visar ofta glädje, ilska, ledsnad, etc.	☐	☐	☐	☐	☐
8. När barnet leker, byter hon/han ofta från en aktivitet till en annan	☐	☐	☐	☐	☐
9. När barnet rör sig, gör hon/han det oftast långsamt	☐	☐	☐	☐	☐
10. Barnet skaffar sig lätt kamrater	☐	☐	☐	☐	☐
11. Det är full fart på barnet så fort hon/han kommer upp på morgonen	☐	☐	☐	☐	☐
12. Barnet tycker att kontakt med andra människor är mer stimulerande än allting annat	☐	☐	☐	☐	☐
13. Barnet gnäller, skriker eller gråter ofta	☐	☐	☐	☐	☐
14. Om barnet får en svår uppgift överger hon/han uppgiften ganska snart	☐	☐	☐	☐	☐
15. Barnet har lätt att få kontakt med människor	☐	☐	☐	☐	☐
16. Barnet är mycket energiskt	☐	☐	☐	☐	☐

Appendix V

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

	Stämmer inte alls (1)				Stämmer mycket bra (5)
17. Barnet kan sysselsätta sig med en aktivitet långa stunder	☐	☐	☐	☐	☐
18. Det tar lång tid för barnet att vänja sig vid främmande människor	☐	☐	☐	☐	☐
19. Barnet blir lätt argt eller ledset	☐	☐	☐	☐	☐
20. Barnet ger lätt upp när hon/han stöter på svårigheter	☐	☐	☐	☐	☐
21. Barnet föredrar ofta att vara för sig själv	☐	☐	☐	☐	☐
22. Barnet föredrar lugna och stillsamma lekar framför mer aktiva lekar	☐	☐	☐	☐	☐
23. När barnet inte har någon att leka med, längtar hon/han efter sällskap	☐	☐	☐	☐	☐
24. Barnet reagerar starkt och intensivt när hon/han är upprörd	☐	☐	☐	☐	☐
25. Barnet är mycket glatt och positivt mot främmande personer	☐	☐	☐	☐	☐

Appendix VI

Id nr…… Datum……..……..

EAS

De här frågorna handlar om vem man är som person och hur man brukar vara. Här vill vi veta något om hur Du ser på Dig själv. Varje fråga har fem svarsalternativ:

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls

För varje påstående skall ett av de 5 alternativen kryssas för.

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls
1. Jag tycker om att vara tillsammans med andra människor	☐	☐	☐	☐	☐
2. Jag brukar för det mesta ha bråttom	☐	☐	☐	☐	☐
3. Jag blir lätt skrämd	☐	☐	☐	☐	☐
4. Jag blir ofta orolig/bekymrad	☐	☐	☐	☐	☐
5. När jag är missnöjd säger jag ifrån på en gång	☐	☐	☐	☐	☐
6. Jag är något av en enstöring	☐	☐	☐	☐	☐
7. Jag tycker om att alltid ha mycket att göra	☐	☐	☐	☐	☐
8. Andra tycker att jag är hetlevrad och temperamentsfull	☐	☐	☐	☐	☐
9. Jag känner mig ofta besviken och irriterad	☐	☐	☐	☐	☐
10. Jag håller ett högt tempo	☐	☐	☐	☐	☐
11. Jag blir oroad och upprörd av vardagliga händelser	☐	☐	☐	☐	☐
12. Jag känner mig ofta otrygg	☐	☐	☐	☐	☐

Appendix VI

Id nr…… Datum…….……..

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls
13. Det finns mycket som retar mig	☐	☐	☐	☐	☐
14. När jag blir skrämd får jag panik	☐	☐	☐	☐	☐
15. Jag arbetar heller tillsammans med andra än ensam	☐	☐	☐	☐	☐
16. Jag blir lätt upprörd	☐	☐	☐	☐	☐
17. Jag känner mig ofta alldeles sprängfylld av energi	☐	☐	☐	☐	☐
18. Det skall mycket till innan jag blir arg	☐	☐	☐	☐	☐
19. Jag är mindre rädd av mig än mina jämnåriga	☐	☐	☐	☐	☐
20. Att vara med andra är det roligaste som finns	☐	☐	☐	☐	☐

Appendix VII

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

EASI – ungdom - föräldraversionen

De här frågorna handlar om vem man är som person och hur man brukar vara. Här vill vi veta något om hur Du ser på ditt barn. Varje fråga har fem svarsalternativ:

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls

För varje påstående skall ett av de 5 alternativen kryssas för.

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls
1. Mitt barn tycker om att vara tillsammans med andra människor	☐	☐	☐	☐	☐
2. Mitt barn brukar för det mesta ha bråttom	☐	☐	☐	☐	☐
3. Mitt barn blir lätt skrämd	☐	☐	☐	☐	☐
4. Mitt barn blir ofta oroligbekymrad	☐	☐	☐	☐	☐
5. När mitt barn är missnöjd säger hon/han ifrån på en gång	☐	☐	☐	☐	☐
6. Mitt barn är något av en enstöring	☐	☐	☐	☐	☐
7. Mitt barn tycker om att alltid ha mycket att göra	☐	☐	☐	☐	☐
8. Mitt barn är hetlevrad och temperamentsfull	☐	☐	☐	☐	☐
9. Mitt barn är ofta besviken och irriterad	☐	☐	☐	☐	☐
10. Mitt barn håller ett högt tempo	☐	☐	☐	☐	☐
11. Mitt barn blir oroad och upprörd av vardagliga händelser	☐	☐	☐	☐	☐
12. Mitt barn känner sig ofta otrygg	☐	☐	☐	☐	☐
13. Det finns mycket som retar mitt barn	☐	☐	☐	☐	☐
14. När mitt barn blir skrämd får hon/han panik	☐	☐	☐	☐	☐
15. Mitt barn arbetar hellre tillsammans med andra än ensam	☐	☐	☐	☐	☐

Appendix VII

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

	Stämmer precis	Stämmer ganska bra	Stämmer varken bra eller dåligt	Stämmer inte så bra	Stämmer inte alls
16. Mitt barn blir lätt upprörd	☐	☐	☐	☐	☐
17. Mitt barn är ofta alldeles sprängfylld av energi	☐	☐	☐	☐	☐
18. Det skall mycket till innan mitt barn arg	☐	☐	☐	☐	☐
19. Mitt barn är mindre rädd av sig än sina jämnåriga	☐	☐	☐	☐	☐
20. Mitt barn tycker att vara med andra är det roligaste som finns	☐	☐	☐	☐	☐

Appendix VIII

Id nr…… Datum…….……..

Styrkor och svårigheter (SDQ-C 1-33)

Kryssa för något av ”stämmer inte”, ”stämmer delvis” och ”stämmer helt” för varje fråga. Sätt bara ett kryss på varje fråga och försök att besvara alla frågor.
Frågorna gäller hur Du har haft det de senaste 6 månaderna.

	Stämmer inte	Stämmer delvis	Stämmer helt
1. Jag försöker att vara vänlig mot andra. Jag bryr mig om deras känslor	☐	☐	☐
2. Jag är rastlös. Jag kan inte vara stilla länge	☐	☐	☐
3. Jag har ofta huvudvärk, ont i magen eller illamående	☐	☐	☐
4. Jag delar ofta med mig till andra (t ex godis, spel, pennor)	☐	☐	☐
5. Jag blir mycket arg och tappar ofta humöret	☐	☐	☐
6. Jag är ofta för mig själv. Jag gör oftast saker ensam	☐	☐	☐
7. Jag gör oftast som jag blir tillsagd av vuxna	☐	☐	☐
8. Jag oroar mig mycket	☐	☐	☐
9. Jag är hjälpsam om någon är ledsen, upprörd eller känner sig dålig	☐	☐	☐
10. Jag har svårt att sitta stilla, jag vill jämt vrida och röra på mig	☐	☐	☐
11. Jag har en eller flera kompisar	☐	☐	☐
12. Jag slåss eller bråkar mycket. Jag kan tvinga andra att göra som jag vill	☐	☐	☐
13. Jag är ofta ledsen, nedstämd eller gråtfärdig	☐	☐	☐
14. Jämnåriga verkar gilla mig för det mesta	☐	☐	☐
15. Jag har svårt att koncentrera mig, jag är lättstörd	☐	☐	☐
16. Jag blir nervös i nya situationer. Jag blir lätt osäker	☐	☐	☐
17. Jag är snäll mot yngre barn	☐	☐	☐
18. Jag blir ofta anklagad för att ljuga eller fuska	☐	☐	☐
19. Andra barn eller ungdomar retar eller mobbar mig	☐	☐	☐
20. Jag ställer upp och hjälper andra (t ex föräldrar, lärare, jämnåriga)	☐	☐	☐
21. Jag tänker mig för innan jag gör olika saker	☐	☐	☐
22. Jag tar saker som inte tillhör mig, t ex från skolan eller andra ställen	☐	☐	☐
23. Jag kommer bättre överens med vuxna än med jämnåriga	☐	☐	☐
24. Jag är rädd för många olika saker, jag är lättskrämd	☐	☐	☐
25. Jag kan koncentrera mig, göra klart det jag arbetar med	☐	☐	☐

Skriv gärna i rutan nedan om Du har kommentarer eller vill tillägga något:

Appendix VIII

Id nr…… Datum…….……..

26. Jämfört med andra i din ålder, hur bra tycker Du att Du:

	Sämre	Lika bra	Bättre	Ej aktuellt
Kommer överens med dina syskon	O	O	O	O
Kommer överens med andra barn	O	O	O	O
Kommer överens med dina föräldrar	O	O	O	O
Leker eller arbetar på egen hand	O	O	O	O
Presterar i skolan	O	O	O	O

27. Ungefär hur många nära kamrater (bästa kompisar) har Du?

Ingen	En	Två eller tre	Fyra eller fler
O	O	O	O

28. Tycker Du att Du har svårigheter med något av följande: dina känslor, din koncentrationsförmåga, ditt beteende eller med att komma överens och umgås med andra?

Nej	Ja, små svårigheter	Ja, klara svårigheter	Ja, allvarliga svårigheter
☐	☐	☐	☐

Om Du svarade ”Ja” på fråga 28, fortsätt med fråga 29 - 32. I annat fall hoppa direkt till fråga 33 på nästa sida

29. Hur länge har svårigheterna funnits?

Mindre än 1 månad	1-5 månader	6-12 månader	Mer än 1år
☐	☐	☐	☐

30. Besväras eller oroas Du av svårigheterna?

Inte alls	Bara lite	Ganska mycket	Väldigt mycket
☐	☐	☐	☐

31. Stör svårigheterna Ditt vardagsliv inom följande områden?

	Inte alls	Bara lite	Ganska mycket	Väldigt mycket
a/ Hemma/i familjen	☐	☐	☐	☐
b/ Med kamrater	☐	☐	☐	☐
c/ I skolarbetet	☐	☐	☐	☐
d/ Vid fritidsaktiviteter	☐	☐	☐	☐

32. Tror Du att svårigheterna blir jobbiga för människor omkring Dig (familj, kamrater, lärare osv)?

Inte alls	Bara lite	Ganska mycket	Väldigt mycket
☐	☐	☐	☐

Appendix VIII

Id nr…… Datum…….……..

33. Har Du haft kontakt med kurator, psykolog eller annan stödperson?

O Nej O Ja

Om ja, med vilken typ av stödperson?

	Förr	Nu	Vad var det för problem?
Skolkurator	O	O	……..……
Skolpsykolog	O	O	……..……
BUP	O	O	…….
Annan	O	O	…….

Finns det någon annan i familjen som har/haft likartade eller andra problem?

O Nej O Ja, vem? ……....……

Beskriv problemet ……..……..…..……

Appendix IX

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

Styrkor och svårigheter hos barn och ungdomar (SDQ-P 1-33)

Kryssa för något av ”stämmer inte”, ”stämmer delvis” och ”stämmer helt” för varje fråga. Sätt bara ett kryss på varje fråga och försök att besvara alla frågor.
Frågorna gäller hur Du har haft det de senaste 6 månaderna.

	Stämmer inte	Stämmer delvis	Stämmer helt
1. Omtänksam, tar hänsyn till andra människors känslor	☐	☐	☐
2. Rastlös överaktiv, kan inte vara stilla länge	☐	☐	☐
3. Klagar ofta över huvudvärk, ont i magen eller illamående	☐	☐	☐
4. Delar gärna med sig till andra barn (t ex godis, spel, pennor)	☐	☐	☐
5. Har ofta raseriutbrott eller häftigt humör	☐	☐	☐
6. Ganska ensam, leker eller håller sig ofta för sig själv	☐	☐	☐
7. Som regel lydig, följer vanligtvis vuxnas uppmaningar	☐	☐	☐
8. Oroar sig över mycket, verkar ofta bekymrad	☐	☐	☐
9. Hjälpsam om någon är ledsen, upprörd eller känner sig dålig	☐	☐	☐
10. Svårt att sitta stilla, rör och vrider jämt på sig	☐	☐	☐
11. Har minst en god vän (kamrat)	☐	☐	☐
12. Slåss/bråkar ofta med andra barn eller mobbar dem	☐	☐	☐
13. Ofta ledsen, nedstämd eller tårögd	☐	☐	☐
14. Vanligtvis omtyckt av andra bar	☐	☐	☐
15. Lättstörd, tappar lätt koncentrationen	☐	☐	☐
16. Nervös eller klängig i nya situationer, blir lätt otrygg	☐	☐	☐
17. Snäll mot yngre barn	☐	☐	☐
18. Ljuger eller fuskar ofta	☐	☐	☐
19. Blir retad eller mobbad av andra barn	☐	☐	☐
20. Ställer ofta upp och hjälper andra (t ex föräldrar, lärare, andra barn)	☐	☐	☐
21. Tänker sig för innan han/hon gör olika saker	☐	☐	☐
22. Stjäl hemma, i skolan, eller på andra ställen	☐	☐	☐
23. Kommer bättre överens med vuxna än med andra barn	☐	☐	☐
24. Rädd för mycket, är lättskrämd	☐	☐	☐
25. Fullföljer uppgifter, bra koncentrationsförmåga	☐	☐	☐

Har Du andra kommentarer eller bekymmer Du vill ta upp?

Appendix IX

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

26. Jämfört med andra barn i samma ålder, hur bra tycker Du som förälder att Ditt barn:

	Sämre	Lika bra	Bättre	Ej aktuellt
Kommer överens med sina syskon	O	O	O	O
Kommer överens med andra barn	O	O	O	O
Kommer överens med sina föräldrar	O	O	O	O
Leker eller arbetar på egen hand	O	O	O	O
Fungerar på dagis/fritids/lekskolan	O	O	O	O
Presterar i skolan	O	O	O	O

27. Ungefär hur många nära kamrater (bästa kompisar) har Ditt barn?

Ingen	En	Två eller tre	Fyra eller fler
O	O	O	O

28. Sammantaget, tycker Du att ditt barn har svårigheter på ett eller flera av följande områden:: med känslor, koncentration, beteende eller med att komma överens och umgås med andra människor?

Nej	Ja, små svårigheter	Ja, klara svårigheter	Ja, allvarliga svårigheter
☐	☐	☐	☐

Om Du svarade ”Ja” på fråga 28, fortsätt med fråga 29 - 32. I annat fall hoppa direkt till fråga 33 på nästa sida

29. Hur länge har svårigheterna funnits?

Mindre än 1 månad	1-5 månader	6-12 månader	Mer än 1år
☐	☐	☐	☐

30. Oroas eller lider ditt barn av sina svårigheter?

Inte alls	Bara lite	Ganska mycket	Väldigt mycket
☐	☐	☐	☐

31. Stör svårigheterna barnets vardagsliv på något av följande områden?

	Inte alls	Bara lite	Ganska mycket	Väldigt mycket
a/ Hemma/i familjen	☐	☐	☐	☐
b/ Med kamrater	☐	☐	☐	☐
c/ I skolarbetet	☐	☐	☐	☐
d/ Vid fritidsaktiviteter	☐	☐	☐	☐

32. Blir svårigheterna en belastning för dig eller för familjen som helhet?

Inte alls	Bara lite	Ganska mycket	Väldigt mycket
☐	☐	☐	☐

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum……..….. ( ) Pappa ( ) annan manlig vårdnadshavare

33. Har Ni avseende barnet haft kontakt med kurator, psykolog eller annan stödperson?
O Nej O Ja

Om ja, med vilken typ av stödperson?

	Förr	Nu	Vad var det för problem?
BVC-psykolog	O	O	……
Skolkurator	O	O	……
Skolpsykolog	O	O	……
BUP	O	O	……
Annan	O	O	……

Finns det någon annan i familjen som har/haft likartade problem som barnet?
O Nej O Ja, vem? ……...……

Beskriv problemet ……..……..……

Tack för att Du besvarat formuläret!

Appendix X

Id nr…… Datum……..……..

TANDVÅRDSRÄDSLA (CFSS-DS)

Hur rädd är Du i följande situationer? Sätt kryss i den ruta som stämmer bäst från "1= inte alls rädd" till "5= livrädd".

	inte alls rädd 1	*bara lite rädd* 2	*ganska rädd* 3	*mycket rädd* 4	*liv-rädd* 5
1. när du är hos tandläkaren	☐	☐	☐	☐	☐
2. när du är hos doktorn	☐	☐	☐	☐	☐
3. för att få spruta eller bedövning	☐	☐	☐	☐	☐
4. när någon undersöker dina tänder eller mun	☐	☐	☐	☐	☐
5. när Du gapar hos tandläkaren	☐	☐	☐	☐	☐
6. när någon Du inte känner kommer för nära inpå Dig eller tar i Dig	☐	☐	☐	☐	☐
7. när någon Du inte känner tittar på Dig	☐	☐	☐	☐	☐
8. när tandläkaren borrar i Din tand	☐	☐	☐	☐	☐
9. när Du ser tandläkaren borra i någon annans tand	☐	☐	☐	☐	☐
10. för att höra tandläkarborren	☐	☐	☐	☐	☐
11. när någon håller instrument i Din mun	☐	☐	☐	☐	☐
12. för att kväljas, sätta i halsen	☐	☐	☐	☐	☐
13. för att behöva åka till sjukhus	☐	☐	☐	☐	☐
14. för personer i vita sjukhus- eller tandläkarkläder	☐	☐	☐	☐	☐
15. när någon gör rent eller fluorlackar Dina tänder	☐	☐	☐	☐	☐

Appendix XI

Id nr…… Ifylld av: ( ) Mamma ( ) annan kvinnlig vårdnadshavare
Datum…….. ( ) Pappa ( ) annan manlig vårdnadshavare

TANDVÅRDSRÄDSLA

Hur rädd är Din son/dotter i följande situationer?

	inte alls rädd 1	*bara lite rädd* 2	*ganska rädd* 3	*mycket rädd* 4	*liv-rädd* 5
1. för tandläkaren	☐	☐	☐	☐	☐
2. för doktorn	☐	☐	☐	☐	☐
3. för att få spruta eller bedövning	☐	☐	☐	☐	☐
4. när någon undersöker barnets tänder eller mun	☐	☐	☐	☐	☐
5. när barnet gapar hos tandläkaren	☐	☐	☐	☐	☐
6. när någon barnet inte känner rör eller tar i barnet	☐	☐	☐	☐	☐
7. när någon barnet inte känner tittar på det	☐	☐	☐	☐	☐
8. när tandläkaren borrar i barnets tand	☐	☐	☐	☐	☐
9. för att se tandläkaren borra i någon annans tand	☐	☐	☐	☐	☐
10. för att höra tandläkarborren	☐	☐	☐	☐	☐
11. när någon håller instrument i barnets mun	☐	☐	☐	☐	☐
12. för att kväljas, sätta i halsen	☐	☐	☐	☐	☐
13. för att behöva åka till sjukhus	☐	☐	☐	☐	☐
14. för personer i vita sjukhus- eller tandläkarkläder	☐	☐	☐	☐	☐
15. när någon gör rent eller fluorlackar barnets tänder	☐	☐	☐	☐	☐