

# CHILD ABUSE AND NEGLECT

## Diagnosis, Treatment, and Evidence

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## EPIDEMIOLOGY OF PHYSICAL ABUSE

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### INTRODUCTION

The measurement of the incidence or prevalence of physical abuse is methodologically challenging. The most important challenge is that in many acts of violence, only two people know about the act, the victim and the perpetrator. Estimates of the rate of physical abuse vary depending on methodology used. There are numerous ways to collect incidence data, namely active and passive surveillance, and population-based surveys. There are two major datasets that employ these methods, The National Child Abuse and Neglect Data System (NCANDS), and the National Incidence Study (NIS). This chapter describes these data systems and the incidence and prevalence of physical abuse, and also discusses risk factors for physical abuse and the epidemiology of specific types of abuse.

### SCOPE OF THE PROBLEM

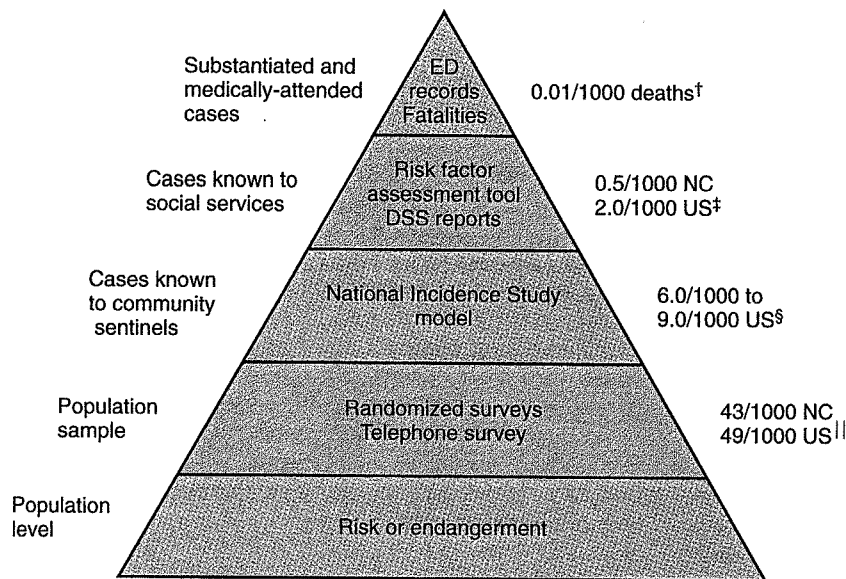
Surveillance refers to ongoing data collection, analysis, and dissemination.<sup>1</sup> Surveillance data describe the scope of physical abuse, the populations at-risk, and the risk factors for abuse. Active surveillance involves identifying cases through numerous data sources, including Child Protective Services (CPS), medical records, and law enforcement records. The cases are followed up through interviews with the parents/guardians of the child, the authorities, and if appropriate, the child. Passive surveillance involves extracting data from sources not designed to collect data about child maltreatment, but that contain those data. For example, death certificates and medical records include information regarding physical abuse. In passive surveillance, this information is extracted and recorded, but not followed up on through interviews or further investigations.<sup>1</sup>

Population surveys of physical abuse use probability samples to ascertain the incidence of abusive parenting behavior.<sup>2</sup> These are frequently conducted through anonymous telephone surveys. Most medical, legal, and social services definitions of abuse include physical harm, which is impossible to determine from telephone surveys. The behaviors identified as physically abusive often include beating, burning, kicking, shaking, or hitting a child with an object other than on the buttocks. A recent population-based study determined that physical abuse occurs at a rate of 43 cases per 1000 children in North Carolina and South Carolina.<sup>3</sup> A national study determined that 49 per 1000 children experience physical abuse.<sup>4</sup>

The National Child Abuse and Neglect Data System (NCANDS) is an example of passive surveillance. It was established by the National Center on Child Abuse and Neglect as result of the Child Abuse Prevention Act (CAPTA).<sup>5</sup> NCANDS data are collected annually from child protective service agencies and contain case level and aggregate data from all states.<sup>6</sup> The data include the number of reports of alleged abuse, dispositions on investigations, data on victims and perpetrators of substantiated and indicated cases, and on children who are the subject of reports.<sup>6</sup> According to NCANDS, in 2006 an estimated 905,000 children were maltreated nationally, for a rate of 12.1 abuse and neglect victims per 1000 children under the age of 18. Additionally, 142,041 children were physically abused (1.9/1000). Physical abuse was the second most common form of maltreatment; neglect was the most common.<sup>6</sup> NCANDS data has shown a 48% decline in rates of physical abuse with similar declines in sexual abuse and almost no change in neglect from 1990 to 2006.<sup>7</sup> It will be an important mark of success for child abuse prevention if other methodologies can validate this progress.

The National Incidence Study (NIS) is a congressionally mandated active surveillance system that takes place approximately every 10 years.<sup>8</sup> The goal of the NIS is to go beyond the cases of maltreatment that come to the attention of CPS and determine a more accurate estimate of the incidence of child maltreatment nationally. The NIS methodology assumes that the number of children who are known to CPS is only a portion of the true prevalence of maltreatment. This survey uses both CPS data and data collected from community sentinels to determine the number of children who are being maltreated nationally. The sentinels are members of the community who come in regular contact with children. Sentinels are selected for their involvement with specific agencies, such as public schools, hospitals, voluntary social service agencies, and police departments.<sup>8,9</sup> The NIS uses a national probability sample to ensure that the data collected and reported can be generalized. According to the third NIS, 1.5 million children are victims of abuse and neglect annually.<sup>9</sup> An estimated 381,700 children are physically abused annually for a rate of 5.7 children per 1000.<sup>9</sup> These data reflect the rate under the "harm standard," where children are actually harmed from abuse or neglect. When considering risk of harm (endangerment standard), rates of abuse and neglect are much higher.

The differences in the results from these studies highlight the importance of considering methodology when interpret-



**FIGURE 2-1** Child abuse surveillance pyramid.

<sup>†</sup> Rate based on 30 child abuse homicides reported in 2003 by the NC Office of the Chief Medical Examiner and census estimate of mid year population <18

<sup>‡</sup> Substantiated reports to social services for physical abuse in 2006, NC and US estimates<sup>52</sup>

<sup>§</sup> Physical abuse as reported by sentinels 1993, lower estimate for harm standard, upper estimate for endangerment or risk of harm standard<sup>46</sup>

<sup>||</sup> Estimates based on 2002 self-reported survey of parents reporting shaking a child <2, beating, burning, or kicking a child, or hitting a child with an object somewhere other than the buttocks<sup>50</sup> and a 1995 survey of US parents.<sup>47</sup>

ing the prevalence of physical abuse. NCANDS consistently reports fewer cases than the NIS.<sup>52,46</sup> It is clear that in only using CPS reports, the NCANDS data represent a smaller proportion of abused children. Anonymous population-based surveys consistently report higher rates of physical abuse.<sup>6,9</sup> The number of physical abuse cases known to CPS or community sentinels, and captured in the NCANDS and NIS studies, represent a small portion of children who actually experience physical abuse. Figure 2-1 demonstrates the range of rates depending on method of surveillance, with death certificates at the apex and surveillance of risk factors at the base considering the largest segment of the population.

Numerous risk factors have been identified for physical abuse. While many studies do not distinguish between types of maltreatment, this chapter will only include literature that has examined the specific risk factors for physical abuse. Risk factors at the child, caregiver, family, and community level will be discussed.

## RISK FACTORS FOR PHYSICAL ABUSE

### Child Characteristics

**Age of child:** Physical abuse is more common among older children than younger children.<sup>6,8</sup> The NIS-3 found that the rate of physical abuse among children ages 12 to 14 years was significantly higher than the incidence among children ages 0 to 2 years.<sup>9</sup> This may be due to a lack of identification among the younger children.<sup>9</sup> Children ages 0 to 2 years may have less exposure to people in the community than older children and be less likely identified as abused by community sentinels. NCANDS also reports a higher percentage

of physical abuse cases among older children, but is subject to the same biases as NIS. The association with age has been inconsistent with population-based surveys.<sup>10</sup>

**Sex of child:** Sex is an inconsistent risk factor for physical abuse.<sup>6,8,9</sup> One study determined that male children were more likely to be physically abused.<sup>11</sup> However, another recent study found that girls were at slightly higher risk for physical abuse.<sup>10</sup>

**Race:** The victim's race is sometimes found to be a risk factor for physical abuse.<sup>6,10,11</sup> NCANDS data revealed different rates of physical abuse by race; 14.6% of physical abuse victims were Asian, 12.9% were African-American, and 9.8% were white.<sup>6</sup> Other studies such as the NIS-3 have not found racial differences in rates of physical abuse.<sup>9</sup> Certain races may be more likely to come to the attention of CPS than others, which would bias the NCANDS results.

### Caregiver Characteristics

**Age of mother:** Mothers younger than 26 years are more likely to physically abuse their children than older mothers.<sup>12</sup> A longitudinal study of 644 families determined that younger mothers were 2.37 times as likely to physically abuse their children.<sup>13</sup>

**Mental health of mother:** Children who have caregivers with depression<sup>14,15</sup> or substance abuse<sup>11,15</sup> are more at risk of being physically abused. Additionally, general maternal sociopathy has also been identified as a risk factor for physical abuse.<sup>13</sup>

**Marital status:** Caregiver marital status has also been found to be associated with physical abuse.<sup>9,13,16</sup> Children who live with only one parent are more likely to experience physical

abuse than children who live with both parents.<sup>9,13,16</sup> Additionally, the NIS-3 determined that children who live with only their fathers are at a marginally higher risk of being physically abused than children who live with only their mothers.<sup>9</sup>

### Family Characteristics

*Poverty:* Poverty has been found to be a significant predictor of experiencing physical abuse.<sup>9,13,14,16</sup> In the NIS, as income increases, the rate of physical abuse decreases through all income categories.<sup>9</sup>

*Number in household:* The number of individuals in the household has been found to be a risk factor for physical abuse. One study demonstrated that abused children lived in larger households (average 4.1 members) than children who were not abused (average 3.6 members).<sup>11,15</sup> Another study determined that children who live with four or five children are more likely to be physically abused than children who live in smaller or larger households.<sup>11</sup>

*Domestic violence:* Most studies examining the relationship between domestic violence and child abuse have shown that children who live in families where there is domestic violence are at an increased risk of experiencing physical abuse.<sup>17-21</sup> However, one report using a population-based survey found little relationship between domestic violence and physical abuse, but very strong relationships with other forms of child maltreatment.<sup>22</sup> Another study demonstrated that poor marital quality was associated with physical abuse.<sup>13</sup> Parental conflict and domestic violence might also be associated with physical abuse.

*Corporal punishment:* Parents who spank have been shown to be more likely to be physically abusive.<sup>23</sup> Two studies have shown that most physically abusive acts are either a result of escalated discipline or in response to a specific child misbehavior.<sup>24,25</sup> One study using cross-sectional data demonstrated that the risk of physical abuse increases with increasing frequency of spanking and the use of an object (e.g., belt or switch) on the buttocks.<sup>10</sup>

### Neighborhood Characteristics

Children who live in impoverished neighborhoods are more likely to be physically abused than children who do not live in poor areas.<sup>16,18</sup> One study showed that decreasing neighborhood cohesion was associated with increasing rates of all types of maltreatment.<sup>26</sup> A more recent study examined the relationship of social capital to subtypes of abuse. Decreases in social capital were shown to be associated with neglect and psychological abuse but there was no observed association between social capital and physical abuse.<sup>27</sup> It has also been determined that the percentage of female headed households in a neighborhood and the concentration of alcohol vendors is positively associated with rates of physical abuse.<sup>18</sup>

## PHYSICAL ABUSE EPIDEMIOLOGY BY INJURY TYPE OR BODY SECTION

Epidemiology can be used to better understand types of injury either by body location, organ system, or injury type. This can inform clinicians about the presentation of various types

of injuries, about how commonly such injuries occur because of abuse versus other mechanisms, and about clinical and demographic risk factors for abuse. Some studies use diagnostic test terminology to characterize the relationship of a finding or injury type to abuse. This section reviews lessons from epidemiological studies specific to abuse injuries.

### Head (Excluding Brain and Skull) and Neck

*Face:* Facial injuries are common among child physical abuse victims. One case series of 390 abused children seen as outpatients demonstrated that 59% of these children had orofacial injuries, most commonly bruising or abrasions of the face (95%).<sup>28</sup> A similar study of hospitalized children showed that 41% had facial injuries, with the cheek as the most common site (30% of facial injuries).<sup>29</sup> The eyes (25%), forehead (22%), nose (13%), and ears (10%) were also commonly involved. Injuries to the face involve lacerations, burns, and welts.<sup>28-30</sup> Most of the children with facial injuries in these case series were under 5 years.<sup>28,29</sup> In both large cohort studies, the perpetrator was most often male—usually the father of the child or the mother's boyfriend.<sup>28,29</sup>

*Oropharynx:* The mouth is a less frequent but important site of trauma from physical abuse. In some of the same studies cited above and in other retrospective cohort studies, the oropharynx was involved as a site of trauma in 1% to 11% of cases of physical abuse.<sup>28-31</sup> Tooth fractures, avulsions, labial lacerations, frenulum lacerations, mucosal injury, palatal injury, and fracture of the mandible or maxilla have all been reported.<sup>29,31</sup>

Injury of the labial frenulum has received somewhat more attention as an injury suggestive of abuse. A systematic review found 19 studies meeting inclusion criteria.<sup>32</sup> These included 30 cases of labial frenulum laceration. Most children suffered fatal abuse (27/30) and most were less than 5 years old (22/30). They identified two cases of frenulum laceration resulting from intubation, complicating the study of frenulum injury. Of the 30 cases, only two had an identified mechanism (direct blow to the face). It has been suggested that forced feeding or pulling of the lips may cause frenulum injury, but there were no documented cases in this review. The most serious limitation to this literature is the absence of cross-sectional or case-control data to understand the specificity or predictive value for frenulum injury and abuse.<sup>32</sup>

*Neck:* Skin injury to the neck, mostly bruising and abrasions, were included in several studies of facial trauma. In one cohort study, bruising of the neck was identified in 12% and abrasion in 7% of physical abuse victims. One study found that of children hospitalized for abuse, 6% are found to have neck injuries.<sup>29</sup> A series of pediatric cervical spine injuries at a trauma center found 3 of 103 injuries were due to abuse.<sup>34</sup> Abuse injuries were all classified as spinal cord injury without radiographic abnormality (SCIWORA), underscoring the challenge of diagnosing cervical spine injuries in abuse victims. All three of these patients were infants, two suffered head injuries, and the third massive injuries of the chest, abdomen, and bones.

The epidemiology of abusive head trauma is discussed in Chapter 6.

## Visceral Injuries

Several case series have demonstrated a wide range of abdominal injuries from child abuse, including liver laceration, splenic laceration, renal contusion, and hollow viscus injury.<sup>35-37</sup> Several retrospective cohort studies have examined all admissions to large hospitals for children with abdominal injuries. The rates of abuse among these series range from 11% to 19%.<sup>35,37,38</sup> Children with inflicted abdominal injuries are more likely to have higher injury severity scores. Additionally they are more likely to have hollow viscus injury and extraabdominal injuries (such as bruises and rib fractures).<sup>37</sup> Of all children coming to an emergency department with injuries, abdominal injury from abuse is extremely uncommon (<1%); however, of all abdominal injuries seen in the emergency department, 4% were classified as abuse.<sup>39</sup>

## Skeletal Injury

Estimates of fractures in physically abused children vary widely by setting (11%-31%).<sup>40-42</sup> One study found that unsuspected fractures were identified by skeletal survey in 26% of children admitted to a children's hospital for physical abuse.<sup>43</sup> Unsuspected fractures were most common in children with suspected fractures and head injuries, but uncommon in children admitted with burns. Most unsuspected fractures were found in children less than 1 year (80%).

*Rib fractures:* Rib fractures are a common skeletal manifestation of abuse. Most abusive rib fractures occur in children less than 2 years old.<sup>42</sup> One cohort study included only infants and found 82% of 39 infants with rib fractures were caused by abuse. Of the remaining seven cases not due to abuse, three were clearly due to unintentional injuries (one motor vehicle, one fall down stairs, and one crush injury), one to birth trauma, and three to bone fragility.<sup>44</sup> A second study included 78 children with a total of 336 rib fractures.<sup>45</sup> Sixty-two children were aged 3 years or younger and 82% were determined to have inflicted rib fractures by the child abuse team. The remaining 11 children (nonabused group) had postoperative rib fractures (5), skeletal dysplasias (3), osteoporosis of prematurity (2), or been in a motor vehicle crash (1). The positive predictive value of a rib fracture for abuse in children less than 3 years old is 95%, and if clinical and historical information are used to exclude children with other causes, the positive predictive value is 100%.

Many children with suspected abuse will undergo cardiopulmonary resuscitation (CPR) prior to first radiographic study. This raises the question of chest compressions as a potential cause of the rib fracture. A recent systematic review of rib fractures caused by CPR reviewed 427 studies, but only six met inclusion criteria. Of the 923 children who underwent CPR, only three had rib fractures, all anterior. Rib fractures from CPR are rare and only anterior fractures have been associated with CPR.<sup>46</sup> A recent study, however, did identify subtle rib fractures at autopsy in 11% of resuscitated infants after the parietal pleura was stripped from the ribs.<sup>47</sup> The fractures were anterior and lateral in location rather than posterior, and most were not visible before the pleura was removed.

*Limb fractures:* Among all children, femur fractures are rarely due to abuse. However, several studies have

demonstrated that femur fractures among young children, especially preambulatory children, are more likely due to abuse. One study identified 139 children less than 4 years old with femur fractures.<sup>48</sup> The overall rate of fractures due to abuse was 9% with an average age of 1.1 years in the abuse group and 2.3 years in the unintentional injury group. Children who are not yet walking were more likely to be victims of abuse. A case-control study of fractures from abuse and unintentional injuries found that 93% of abuse injuries were in children aged less than 1 year.<sup>49</sup> This study found no differentiating characteristics either in fracture type or radiographic appearance. A study of a referral center's trauma registry found that abusive injuries accounted for 67% of lower extremity fractures for children under 18 months old compared with 1% for children 18 months or older.<sup>50</sup> Of children hospitalized with an abusive lower extremity fracture, 68% had femur fractures and 56% had tibia fractures. A study of a national administrative database found that 15% of all femur fractures in children under 2 years were coded as caused by abuse and almost no abusive fractures were reported among older children.<sup>51</sup> It is clear from these studies that abuse should be considered as a potential cause of long bone fractures in young children, especially those who are nonambulatory.

Fractures outside of the axial skeleton and lower extremities can be due to abuse, but such injuries have been the subject of less research. In a national U.S. study of a probability sample from administrative data, 1053 children were hospitalized for abuse with 1794 fractures.<sup>52</sup> The axial skeleton was the site of 50% of these fractures (59% skull, 37% rib, 3% vertebrae, 1% pelvis). Only 14% of fractures were to the upper extremity (45% humerus, 34% radius/ulna, 17% scapula/clavicle, 4% carpal/metacarpal). The lower extremity fractures accounted for 18% of these injuries (59% femur, 37% tibia/ fibula/ankle, 2% tarsal/metatarsal).<sup>52</sup>

## Skin Injury

*Bruises:* Skin injury is one of the most common presentations for physical abuse, with bruises by far the most common injury. However, bruises are an extremely common injury in all children. A large prospective study of children seen for nontrauma reasons found that 76.6% had recent skin injuries, mostly bruises, and 17% had five or more injuries.<sup>53</sup> Epidemiological studies have been invaluable in characterizing normal versus abnormal bruising. Large case series of abused children, nonabused children, and case-control studies have been used to characterize normal and potentially abusive bruising.<sup>33</sup>

Nonabused children rarely have bruises before starting to transition to independent mobility (<1%).<sup>54</sup> The most common sites for nonabusive bruises are over the legs, bony prominences, and the head for infants and toddlers.<sup>53-55</sup> Child abuse victims commonly have bruises (28%-98%).<sup>33</sup> Bruises due to abuse tend to be greater in number, to be present with older injuries (i.e., scar or healing abrasion), and to be defensive in location (outer arm). Abusive bruises can carry the imprint of an implement such as a cord.<sup>33</sup> Bruises that are high in number (studies suggest 10-15), unusual in location or pattern, or occurring in young children not yet walking should be considered for abuse or bleeding disorder.<sup>33,53,54</sup>



**Burns:** Most epidemiological studies of burns compare cases of inflicted pediatric burns with unintentional burns. In series of hospitalized pediatric burn patients, the rates of abuse and/or neglect range from 4% to 16%.<sup>56-60</sup> These studies often combine abuse and neglect. A burn registry has recently allowed epidemiological study of nearly all serious pediatric burns in the United States.<sup>61</sup> This study found that 6% of children aged 12 years or younger admitted to burn units were suspected victims of abuse. The use of registries comes at the cost of detail, and the assessment of abuse is less clear and perhaps less standardized than a single center's approach.

Inflicted burns are most often due to liquid scald (78% of inflicted burns versus 59% of unintentional burns).<sup>61</sup> Abusive burns tend to be larger, involve younger children, have higher risk of mortality, and longer hospital stays.<sup>60,61</sup> They tend to be deeper and more often require grafting.<sup>56,61</sup> They more often involve both hands or both feet.<sup>58</sup> Social stress is a prominent risk factor in these injuries. Victims of abusive burns are more often from unstable families,<sup>58,59</sup> from single parent families,<sup>56,57,59</sup> live in poverty,<sup>57,59</sup> and have had prior involvement with protective services.<sup>56</sup>

## FUTURE RESEARCH

Understanding the epidemiology of child physical abuse requires a combination of active and passive surveillance and population-based surveys. Passive surveillance allows for the systematic collection of large amounts of administrative data on an ongoing basis, but such systems only capture cases that present to care. Emergency department passive surveillance, a new approach to studying injury epidemiology, and hospital discharge data, similarly will only capture children who present to care and where the cause of injury is correctly identified and recorded. These systems can be helpful for studying severity and trends. Increasing collaboration in trauma registries and burn registries provide similar insight. A promising approach for understanding risk and abuse epidemiology is the combination of data by linking identifiers. This is occurring in some states, but concerns for privacy and interagency silos can hinder these productive efforts.

Active surveillance is more expensive and less practical. It allows for more complete case ascertainment of children in a variety of systems of care. This approach has been used to study children seen by many types of professionals in the National Incidence Studies<sup>9</sup> and specifically to study head trauma epidemiology,<sup>62</sup> and will be useful, especially in multicenter and national surveillance, to better understand the epidemiology of child physical abuse. Prospective studies of orthopedic and burn injuries would help clarify the epidemiology of these types of abuse as well.

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