IMPORTANCE Child maltreatment is a risk factor for poor health throughout the life course. Existing estimates of the proportion of the US population maltreated during childhood are based on retrospective self-reports. Records of officially confirmed maltreatment have been used to produce annual rather than cumulative counts of maltreated individuals.

OBJECTIVE To estimate the proportion of US children with a report of maltreatment (abuse or neglect) that was indicated or substantiated by Child Protective Services (referred to as confirmed maltreatment) by 18 years of age.

DESIGN, SETTING, AND PARTICIPANTS The National Child Abuse and Neglect Data System (NCANDS) Child File includes information on all US children with a confirmed report of maltreatment, totaling 5,689,900 children (2004-2011). We developed synthetic cohort life tables to estimate the cumulative prevalence of confirmed childhood maltreatment by 18 years of age.

MAIN OUTCOMES AND MEASURES The cumulative prevalence of confirmed child maltreatment by race/ethnicity, sex, and year.

RESULTS At 2011 rates, 12.5% (95% CI, 12.5%-12.6%) of US children will experience a confirmed case of maltreatment by 18 years of age. Girls have a higher cumulative prevalence (13.0% [95% CI, 12.9%-13.0%]) than boys (12.0% [12.0%-12.1%]). Black (20.9% [95% CI, 20.8%-21.1%]), Native American (14.5% [14.2%-14.9%]), and Hispanic (13.0% [12.9%-13.1%]) children have higher prevalences than white (10.7% [10.6%-10.8%]) or Asian/Pacific Islander (3.8% [3.7%-3.8%]) children. The risk for maltreatment is highest in the first few years of life; 2.1% (95% CI, 2.1%-2.1%) of children have confirmed maltreatment by 1 year of age, and 5.8% (5.8%-5.9%), by 5 years of age. Estimates from 2011 were consistent with those from 2004 through 2010.

CONCLUSIONS AND RELEVANCE Annual rates of confirmed child maltreatment dramatically underestimate the cumulative number of children confirmed to be maltreated during childhood. Our findings indicate that maltreatment will be confirmed for 1 in 8 US children by 18 years of age, far greater than the 1 in 100 children whose maltreatment is confirmed annually. For black children, the cumulative prevalence is 1 in 5; for Native American children, 1 in 7.
Child maltreatment—encompassing neglect and physical, sexual, and emotional abuse of children—is associated with myriad negative physical, mental, and social outcomes. Childhood maltreatment is associated with significantly higher rates of mortality,1,3 obesity,1,4-7 and human immunodeficiency virus infection.1,8 Children who experience maltreatment also have significantly more mental health problems1,9-14 and are as much as 5 times more likely to attempt suicide.1,15 Maltreated children are also more likely to engage in criminal behavior than other children14,16,17 and are more than 50% more likely to have a juvenile record than other children.27 Child maltreatment also has substantial social costs. Estimates suggest that child maltreatment costs the United States $124 billion annually, with per-person lifetime costs higher than or comparable to those of diseases such as a stroke or type 2 diabetes mellitus.16 Childhood maltreatment has thus been referred to as “a human rights violation and a global public health problem [that] incurs huge costs for both individuals and society.”19(p332)

However, a large disparity exists between estimates of the prevalence of maltreatment based on retrospective self-reports and those derived from officially documented maltreatment by Child Protective Services (CPS). Retrospective self-reports indicate that child maltreatment is widespread annually and cumulatively during the course of childhood, with 2 studies18,19 using recent data to report that more than 40% of children will be maltreated during childhood. In contrast, official CPS data indicate that far fewer children experience maltreatment. For example, in 2011, only 0.9% of children were confirmed as victims of maltreatment.22 We do not know the extent to which the difference between these 2 estimates can be attributed to the fact that estimates of confirmed maltreatment only capture the number of children maltreated annually and thus do not reflect the population of children maltreated during the entirety of childhood.

Although other fields have used synthetic cohort life tables to document the cumulative risk of experiencing an event, no such attempts have been made using official child maltreatment data.23 Therefore, the purpose of this study was to use synthetic cohort life tables to determine the percentage of US children confirmed as maltreated according to CPS from birth to 18 years of age. We also estimated differences in maltreatment by race/ethnicity, sex, and year from 2004 through 2011.

Methods

Data Source

This study was approved by the institutional review board at Yale University. To estimate the cumulative prevalence of confirmed childhood maltreatment, we used data from the National Child Abuse and Neglect Data System (NCANDS) Child Files from 2004 through 201124-31 and estimates of the population of US children by age, race/ethnicity, sex, and year from the Centers for Disease Control and Prevention.32 The NCANDS Child File is composed of case-level data for each report of maltreatment that was investigated by CPS in the United States. Child Protective Services receives reports of alleged maltreatment from individuals who are required by law to report suspected abuse or neglect (eg, physicians or teachers) and from other sources (eg, neighbors). Child Protective Services typically screens reports and then investigates those that appear most likely to involve abuse or neglect. After the CPS investigation, a case may or may not be confirmed as maltreatment.

We defined confirmed maltreatment as any report that was substantiated or indicated, meaning sufficient evidence existed for CPS to conclude that abuse or neglect had occurred. (Most states use the term substantiated to imply sufficient proof to confirm maltreatment occurred, but some use the term indicated instead.) Data from CPS, which are initially reported by state CPS agencies, were provided by the National Data Archive on Child Abuse and Neglect at Cornell University, Ithaca, New York, and collected under the auspices of the Children’s Bureau, an agency of the US Department of Health and Human Services.

Population

From 2004 through 2011, 5,689,900 children had a confirmed report of maltreatment. Almost 80% of the cases in the NCANDS are cases of neglect, not abuse.

Measures

We relied on measures of age, sex, and race/ethnicity and whether the report was the child’s first confirmed report of maltreatment in any given year to generate our estimates. Age, sex, and race/ethnicity were recorded by CPS caseworkers. We coded race/ethnicity into the following 5 categories: white, black, Hispanic, Asian/Pacific Islander, and Native American. A child's race/ethnicity was coded as Native American in all instances in which this group was entered. For all children who were not Native American, we coded the child as Hispanic or Asian/Pacific Islander. If this ethnic indicator was entered. All children who were not Native American or of Hispanic origin were considered black if black was reported as a remaining race and Asian/Pacific Islander if this category was reported and Native American, Hispanic, or black were not reported. The remaining children were considered white. The measure of first confirmed maltreatment report was based on a variable in the original NCANDS data. In those instances in which a child had multiple CPS reports open for investigation at the same time and during the same year, only the first confirmed maltreatment report was counted. Recognizing the possibility of overcounting first confirmed maltreatment reports is vital for ensuring precision in the estimates, because allowing individual children to have multiple first confirmed maltreatment reports in the same year would dramatically inflate estimates, an issue to which we will return.

Management of Missing Data

Of all investigated reports, a total of 697,400 (12.3%) were missing information on age, sex, race/ethnicity, or prior maltreatment, with most of the missing information involving race/ethnicity (7.0%). We addressed missing data on these 4 measures by generating 5 multiply imputed data sets. Because the level of missing data in the NCANDS was low, alter-
native methods of dealing with missing data on these key variables produced very similar estimates.

In 20 of 408 state-years (4.9%, with Washington, DC, treated as a state), the state did not report data about maltreatment to NCANDS, and information on that state is therefore missing in those years. The combined 4.9% of state-years missing represent 3.1% of the US population from 2004 through 2011—and far less than that since 2009 (1.4% in 2009 and 1.2% in 2010 and 2011). In missing years, we assumed the state’s cumulative prevalence of confirmed maltreatment shifted in a manner consistent with its relationship to the national estimate. Therefore, if a state’s cumulative prevalence was 1.2 times that of the national mean in 2005 and missing in 2006, we assumed the state’s cumulative prevalence in 2006 was 1.2 times the national mean.

Analytic Strategy
To produce cumulative estimates of children with confirmed maltreatment, we used synthetic cohort life tables that were initially designed to provide estimates of life expectancy at birth and the probability of surviving to any given age from annual mortality rates. Synthetic cohort life tables can also be used to generate estimates of the proportion of individuals in a cohort who will experience an event for the first time by a given age if the age-specific risks of experiencing any event (eg, death, marriage, maltreatment) were held at that year’s rates. For example, life expectancy at birth in 2010 could be estimated using synthetic cohort life tables to see how long the average newborn could expect to live if he or she was exposed to the age-specific mortality rates in 2010 at each age. Although synthetic cohort life tables are widely used (eg, to generate all Census Bureau predictions of life expectancy at birth in the United States), they produce the most reliable estimates when the rate of change in the age-specific rates is low and are less reliable when the rate of change in the age-specific rates is high.

In the present study, the synthetic cohort life tables were structured using age-specific first-time confirmed maltreatment rates to determine the proportion of the cohort that will ever have a confirmed report of maltreatment by 18 years of age on the basis of first-time confirmation rates at each age from birth to 18 years for each year from 2004 to 2011. (A full life table for the analysis is presented in the eTable in the Supplement for those interested in more detail.) We used Greenwood’s method to estimate standard errors and 95% CIs. Commercially available statistical software was used for this analysis.

Because the cumulative risk of experiencing an event is typically reported as a proportion, the Tables and Figures report the cumulative risk of confirmed maltreatment as a proportion.

Table 1. Demographic Characteristics of US Children in 2011

<table>
<thead>
<tr>
<th>Racial/Ethnic Group</th>
<th>No. of US Children</th>
<th>CPS-Confirmed Report of Maltreatment, No. (%) of Children</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>All</td>
</tr>
<tr>
<td>All</td>
<td>75 091 700</td>
<td>670 000 (0.9)</td>
</tr>
<tr>
<td>White</td>
<td>41 327 000</td>
<td>317 900 (0.8)</td>
</tr>
<tr>
<td>Black</td>
<td>11 602 400</td>
<td>174 400 (1.5)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>16 921 800</td>
<td>153 400 (0.9)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>3 863 000</td>
<td>9300 (0.2)</td>
</tr>
<tr>
<td>Native American</td>
<td>1 377 500</td>
<td>15 000 (1.1)</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>38 029 200</td>
<td>326 800 (0.9)</td>
</tr>
<tr>
<td>White</td>
<td>20 865 000</td>
<td>155 500 (0.7)</td>
</tr>
<tr>
<td>Black</td>
<td>5 950 600</td>
<td>86 400 (1.5)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 592 000</td>
<td>73 100 (0.9)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>1 938 500</td>
<td>4600 (0.2)</td>
</tr>
<tr>
<td>Native American</td>
<td>683 100</td>
<td>7300 (1.1)</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>37 062 400</td>
<td>343 200 (0.9)</td>
</tr>
<tr>
<td>White</td>
<td>20 462 000</td>
<td>162 400 (0.8)</td>
</tr>
<tr>
<td>Black</td>
<td>5 651 800</td>
<td>88 000 (1.6)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 329 800</td>
<td>80 200 (1.0)</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>1 924 500</td>
<td>4800 (0.2)</td>
</tr>
<tr>
<td>Native American</td>
<td>694 300</td>
<td>7800 (1.1)</td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>12 915 900</td>
<td>122 700 (1.0)</td>
</tr>
<tr>
<td>Midwest</td>
<td>16 060 400</td>
<td>143 100 (0.9)</td>
</tr>
<tr>
<td>West</td>
<td>18 002 200</td>
<td>135 700 (0.8)</td>
</tr>
<tr>
<td>South</td>
<td>28 113 200</td>
<td>268 500 (1.0)</td>
</tr>
</tbody>
</table>

Abbreviation: CPS, Child Protective Services.

*All values have been rounded to the hundreds to highlight that they are estimates (not exact counts), so the totals for specific groups (eg, boys/girls) may not sum to the population total. Mean age for all US children was 9.1 years; for all children with CPS-confirmed maltreatment, 6.8 years; for those with CPS confirmed first reports of maltreatment, 6.2 years.
portion. However, these estimates are reported as percentages in the text in the interest of readability.

Results

A total of 670,000 children (0.9% of all US children) experienced a confirmed report of maltreatment in 2011 (Table 1). The percentage of white children in the United States with a confirmed report of maltreatment (0.8%) was significantly lower than the percentages of black (1.5%), Native American (1.1%), and Hispanic (0.9%) children, although higher than the percentage of Asian/Pacific Islander children (0.2%). Rates of confirmed maltreatment were slightly but significantly higher for girls than boys. Rates of confirmed maltreatment were significantly higher in the Northeast (1.0%), South (1.0%), and the Midwest (0.9%) than in the West (0.8%).

Of the 670,000 children confirmed as victims of maltreatment in 2011, the report was the first one confirmed for 492,400 (73.5%) (Table 1). Those children for whom the report was a first-time confirmed report were significantly more likely to be black, Native American, or Hispanic than white or Asian/Pacific Islander. They were also significantly more likely to be female, although sex differences in this population were small (0.7% to 0.6%).

For all US children, the cumulative prevalence of confirmed maltreatment was 12.5% (95% CI, 12.5%-12.6%) in 2011 (Figure 1 and Table 2). Approximately 1 in 8 US children were confirmed to be maltreated from birth to 18 years of age. This prevalence is 13.9 times as many children as experience confirmed maltreatment annually (0.9%; Table 1).

The cumulative risks for confirmed maltreatment differed by race/ethnicity (Figure 1 and Table 2). Black children had the highest risks at 20.9% (95% CI, 20.8%-21.1%), followed by Native American children at 14.5% (14.2%-14.9%), Hispanic children at 13.0% (12.9%-13.1%), white children at 10.7% (10.6%-10.8%), and Asian/Pacific Islander children at 3.8% (3.7%-3.9%). All differences were statistically significant.

Sex differences in the cumulative prevalence of confirmed maltreatment were small but statistically significant (Figure 1). The cumulative prevalence of confirmed maltreatment was 13.0% (95% CI, 12.9%-13.0%) for girls vs 12.1% (12.0%-12.1%) for boys. These small but significant differences held for all racial/ethnic groups. Black girls had the highest cumulative prevalence at 21.6% (95% CI, 21.5%-21.8%).

First-time rates of confirmed maltreatment were especially high during the first few years of life (Figure 2). The rate of first confirmed maltreatment was highest in the first year of life, during which 2.1% (95% CI, 2.1%-2.1%) of children had a confirmed report of maltreatment. This figure was roughly halved to 1.1% (95% CI, 1.1%-1.1%) during the second year of life. The rate then gradually decreased until 11 years of age, where it essentially held steady through 18 years of age.

All racial/ethnic groups and both sexes experienced similar age patterns of first reports of confirmed maltreatment (Figure 2 and eFigure 1 in the Supplement). Black children had the highest occurrence of first-time confirmed maltreatment before their first birthday, with 4.0% (95% CI, 4.0%-4.1%) experiencing this outcome.

For the total population, roughly one-quarter of children’s first confirmed reports occurred before 2 years of age, with 3.2% (95% CI, 3.1%-3.3%) of all children confirmed as being
maltreated before their second birthday (Table 2). Nearly half of confirmed maltreatment happened before 5 years of age, with 5.8% (95% CI, 5.8%-5.9%) of all children confirmed as being maltreated before their fifth birthday (Table 2).

When data were examined from the 8 years included in our analyses, the cumulative prevalence differed significantly from 2004 through 2011 for all US children, but even in the year with the lowest prevalence, it was high. The cumulative prevalence fluctuated from 12.0% (95% CI, 12.0%-12.0%) in 2009 to 20.8%) in 2006.

Patterns were similar across race/ethnicity (Figure 3 and eFigure 2 in the Supplement). The largest fluctuations were for black children, from 20.9% (95% CI, 20.9%-21.0%) in 2011 to 26.2% in 2005 (26.1%-26.3%), and for Native American children, from 14.0% (13.7%-14.2%) in 2010 to 20.5% (20.2%-20.8%) in 2006.

Discussion

At 2011 rates, from birth to their 18th birthdays, 1 in 8 US children will experience maltreatment so persistent or so severe that it results in a state-confirmed maltreatment report. For black and Native American children, the cumulative prevalence is even greater. About 1 in 5 black children and 1 in 7 Native American children will have a confirmed maltreatment report before 18 years of age. In other words, black children are about as likely to have a confirmed report of maltreatment during childhood as they are to complete college.

The estimates generated in this analysis are significant for at least 2 reasons. First, this study provides the first national estimate of the proportion of children who experience maltreatment that is reported to and confirmed by CPS. Although other data sources have been used to produce state,-37,38 or county-specific estimates, this study is, to our knowledge, the first to present national estimates of the cumulative prevalence of child maltreatment.

Second, these data highlight that the burden of confirmed maltreatment is far greater than suggested by single-year national estimates of confirmed child maltreatment and that the risk for maltreatment is particularly high for black children, who had cumulative risks for confirmed maltreatment in excess of 25% for many years (and never <20%). As such, these estimates are valuable for informing public health monitoring and investments.

This study, nonetheless, has several limitations. First, the estimates presented herein may underestimate the true cumulative prevalence of maltreatment and misestimate racial/ethnic disparities in child maltreatment because our estimates are based on maltreatment that came to the attention of and were confirmed by CPS. Indeed, the most recent estimate of the cumulative risk for self-reported maltreatment in a national sample shows that more than 40% of children ever experience maltreatment, indicating that the cumulative prevalence of self-reported maltreatment is roughly 3 times the cumulative prevalence of confirmed maltreatment.

Although this limitation applies to all CPS data, it still bears mentioning.

Second, although the level of missing data in NCANDS is modest, especially since 2004, our estimates may be slightly imprecise because children missing information on multiple measures included in our analysis potentially introduce bias.

Third, because CPS data are collected by states and then aggregated, children may be counted more than once if maltreated in multiple states in different years. Although this limitation makes our estimates less precise, its effect on our estimates is likely small.
Fourth, definitions of maltreatment vary across states and have been changing over time within states. Variation in definitions across states means that the national estimates we have produced are based not on a single definition of maltreatment, as would be ideal, but on many definitions of maltreatment. Definitional variation over time also means that we are uncertain as to how much of the change in the cumulative risk for confirmed maltreatment is due to actual changes in rates of maltreatment vs changes in definitions of maltreatment. We thus cannot speak with confidence about how the cumulative risk for actual maltreatment has changed during this period.

Fifth, if the NCANDS data incorrectly code later confirmed reports of maltreatment as first confirmed reports, we would overestimate the cumulative prevalence of confirmed maltreatment. To address this possibility, we followed up a cohort of children from birth in 2004 until 2011. Results suggested that few later confirmed maltreatment cases were incorrectly coded as first confirmed maltreatment cases. This finding is relevant because it means that the data are reliable to 8 years of age. Even if we assume that all first confirmed maltreatments after 8 years of age are incorrectly coded as first maltreatment cases (which is unlikely), the lowest the cumulative risk for confirmed maltreatment could be is 8.5% (the cumulative risk by 8 years of age), which is two-thirds of the cumulative risk by 18 years of age (12.5%). For black children, the lowest the cumulative risk of confirmed maltreatment could be is 14.7% (relative to 20.9% by 18 years of age).

Sixth, because of the structure of the NCANDS data, we were not able to estimate differences in the cumulative prevalence of different types of maltreatment (eg, neglect, physical abuse, and sexual abuse), as is common in much research in this area, because doing so would have involved using a multiple-decrement life table for a birth cohort and made it possible for us to consider cumulative prevalences only to 8 years of age rather than 18.

Finally, because the rate of first-time confirmed maltreatment has decreased sharply in some recent years (although less than the total confirmed maltreatment rate), our synthetic cohort life table estimates will be higher than the cumulative...
prevalence of confirmed maltreatment in 2012, assuming rates of first-time confirmed maltreatment decline. However, because first-time rates of confirmed maltreatment have declined only moderately since 2007, as indicated by the stable cumulative prevalence for the total population from 2007 to 2011 (Figure 3 and eFigure 2 in the Supplement), we expect the estimates presented herein to be quite similar to what the 2012 and 2013 data find.

Conclusions
The results from this analysis—which provides a cumulative rather than annual estimates—indicate that confirmed child maltreatment is common, on the scale of other major public health concerns that affect child health and well-being. Moreover, child maltreatment is unequally distributed by race/ethnicity, with many more black, Native American, and Hispanic children experiencing a confirmed report of maltreatment at some point than white or, especially, Asian/Pacific Islander children. Because child maltreatment is also a risk factor for poor mental and physical health outcomes throughout the life course, the results of this study provide valuable epidemiological information. Being able to assess the extent and severity of maltreatment across populations and time accurately can inform policies and practices that can be used not only to reduce maltreatment but also to improve population health and reduce health disparities.

REFERENCES
Confirmed Maltreatment Among US Children


35. StataCorp. STATA Statistical Software: Release 11. College Station, TX: StataCorp LP; 2009.


