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The economic burden of child maltreatment in the United States and implications for prevention☆,☆☆

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ABSTRACT

Objectives: To present new estimates of the average lifetime costs per child maltreatment victim and aggregate lifetime costs for all new child maltreatment cases incurred in 2008 using an incidence-based approach.
Methods: This study used the best available secondary data to develop cost per case estimates. For each cost category, the paper used attributable costs whenever possible. For those categories that attributable cost data were not available, costs were estimated as the product of incremental effect of child maltreatment on a specific outcome multiplied by the estimated cost associated with that outcome. The estimate of the aggregate lifetime cost of child maltreatment in 2008 was obtained by multiplying per-victim lifetime cost estimates by the estimated cases of new child maltreatment in 2008.
Results: The estimated average lifetime cost per victim of nonfatal child maltreatment is $210,012 in 2010 dollars, including $32,648 in childhood health care costs; $10,530 in adult medical costs; $144,360 in productivity losses; $7,728 in child welfare costs; $6,747 in criminal justice costs; and $7,999 in special education costs. The estimated average lifetime cost per death is $1,272,900, including $14,100 in medical costs and $1,258,800 in productivity losses. The total lifetime economic burden resulting from new cases of fatal and nonfatal child maltreatment in the United States in 2008 is approximately $124 billion. In sensitivity analysis, the total burden is estimated to be as large as $585 billion.
Conclusions: Compared with other health problems, the burden of child maltreatment is substantial, indicating the importance of prevention efforts to address the high prevalence of child maltreatment.

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Introduction

Child maltreatment (CM) is a serious and prevalent public health problem in the United States, responsible for substantial morbidity and mortality. The 4 major types of CM are physical abuse, sexual abuse, psychological abuse, and neglect (Leeb et al., 2007). In fiscal year 2008, US state and local child protective services (CPS) received 3.3 million

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reports of children being abused or neglected and an estimated 772,000 children were classified by CPS authorities as being maltreated (USDHHS, 2010). The number of confirmed cases has decreased over the past several years (USDHHS, 2010), but researchers argue that CPS data grossly underestimate the total incidence of CM (Haugaard & Emery, 1989; Hussey, Chang, & Kotch, 2006; Swahn et al., 2006; Waldfogel, 1998). A nationally representative study of children aged 0–17 reported that 10.2% of US children experienced some form of maltreatment in 2008 (Finkelhor, Turner, Ormrod, & Hamby, 2009).

CM has been shown to have lifelong adverse health, social, and economic consequences for survivors, including behavioral problems (Felitti et al., 1998; Repetti, Taylor, & Seeman, 2002); mental health conditions such as posttraumatic stress disorder (Browne & Finkelhor, 1986; Holmes & Sammel, 2005; Moeller, Bachmann, & Moeller, 1993); increased risk for delinquency, adult criminality, and violent behavior (Fang & Corso, 2007; Widom & Maxfield, 2001); increased risk of chronic diseases (Browne & Finkelhor, 1986; Felitti et al., 1998); lasting impacts or disability from physical injury (Dominguez, Chalom, & Costarino, 2001); reduced health-related quality of life (Corso, Edwards, Fang, & Mercy, 2008); and lower levels of adult economic well-being (Currie & Widom, 2010). Given the high prevalence of CM and the many negative short- and long-term consequences of CM, the economic costs of CM may be substantial. Estimating the economic burden of CM is important for several reasons. Economic estimates can help to increase awareness of the current severity of CM, place the problem in the context of other public health concerns, and may be used in economic evaluation of interventions to reduce or prevent CM.

Several studies have drawn attention to the problem of CM by producing estimates of the national economic burden of CM (Conrad, 2006; Daro, 1988; Fromm, 2001; Miller, Cohen, & Wiersema, 1996; Wang & Holton, 2007). These studies made important contributions and advanced awareness, but shortcomings have been identified (Corso & Fertig, 2010), which should be addressed if burden estimates are to be used for health policy analysis. Problems include the "(1) lack of transparency in inputs used in the estimation procedure, (2) calculation mistakes, and (3) methodological errors" (p. 297) (Corso & Fertig, 2010). Correcting for these flaws is crucial to producing higher quality future estimates of the economic burden of CM. Furthermore, since the last estimate of the economic burden of CM conducted in 2007 (Wang & Holton, 2007), researchers have found additional quantified evidence regarding the health care costs associated with CM during childhood and adulthood (Bonomi et al., 2008; Florence et al., 2012) and the long-term consequence of CM on adult earnings (Currie & Widom, 2010). Including these latest study results should improve understanding of the economic burden of CM.

Economic burden estimates generally take 1 of 2 perspectives to quantifying a health problem: a prevalence-based approach or an incidence-based approach. Both are relevant to CM. Prevalence-based economic burden provides an estimate of the direct and indirect costs incurred in a period (most often 1 year) as a result of the prevalence of CM during this same period (or this given year), regardless of the onset of CM. Thus, in a prevalence-based study of the economic burden of CM with a time frame of, say, 1 year, costs associated with all cases of CM (including cases with the onset in or at any time before the base year) would be included; however, only costs incurred during the 1-year period would be counted (Haddix, Teutsch, & Corso, 2003).

In contrast, incidence-based economic burden represents the total lifetime costs resulting from new cases of CM that occur within a set time period (most often 1 year) (Haddix, Teutsch, & Corso, 2003). Incidence-based costs are more difficult to estimate because they require data on short- and long-term costs and consequences of CM, such as its chronic sequelae on health, employment, and earnings over the lifetime of an individual. However, incidence-based costs are more useful for the economic evaluation of CM prevention/intervention activities (Haddix, Teutsch, & Corso, 2003). For example, the lifetime costs avoided could be compared with the costs of preventing 1 case of CM in a benefit-cost analysis of prevention. Both direct and indirect costs are included in an incidence-based costing perspective.

All of the previous estimates of the economic burden of CM that we are aware of are not estimated on a cost-per-case basis, except for the Conrad (2006) study. Similar to other studies, Conrad's study has a number of methodological shortcomings. For example, for the effect of CM on juvenile delinquency, Conrad uses the raw number of how many abused children become juvenile offenders as reported in a study by Widom and Maxfield (2001). This number does not take into account how many of these children would have been offenders if they had not been abused and therefore overestimates the effect of CM on juvenile delinquency. Widom and Maxfield (2001) report that about 27% of abused and neglected children have had a juvenile arrest, compared with 17% of non-abused children. This 10% marginal (or incremental) effect would have provided a more accurate estimate of the effect of CM on delinquency. There are similar problems with the estimates of effect of CM on adult criminality and lifetime productivity. In addition, for some of the cost estimates (such as the use of health care and mental health services), annual costs (prevalence-based estimates) of CM were calculated. Because the study was designed to estimate the incidence-based lifetime health care costs, the stream of incremental health care costs associated with CM over the lifetime should be used, discounted, and summed to net present value in the base year of analysis (Haddix, Teutsch, & Corso, 2003).

In this paper, we present new estimates of the average lifetime cost per CM victim and aggregate lifetime costs for all new cases of CM incurred in 2008 using an incidence-based approach. This study extends previous research in this area by correcting methodological flaws of previous studies; incorporating more recent and comprehensive studies of the epidemiology, consequences, and costs of CM; and providing a framework for using the findings in the literature to estimate the incidence-based economic burden of CM.

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Methods

General overview

This study measured costs from the societal perspective. All costs were estimated in US dollars and adjusted to the reference year 2010 using the gross domestic product (GDP) deflator (available from http://www.gpoaccess.gov/usbudget/fy12/pdf/BUDGET-2012-TAB.pdf, Table 10.1). Future costs associated with CM accumulating over time were discounted at 3% to reflect their present value, as recommended by the US Panel on Cost-Effectiveness in Health and Medicine (Gold et al., 1996). Although 3% is often recommended as the base rate for cost-effectiveness analysis of health and medical interventions, a more conservative discount rate of 7% was used as a further sensitivity analysis as recommended by the Committee to Evaluate Measures of Health Benefits for Environmental, Health, and Safety Regulations (Miller, Robinson, & Lawrence, 2006).

Based on previous research (Corso & Fertig, 2010), this study focuses on the following major types of costs that are associated with CM: health care costs (short- and long-term, including physical and mental health), productivity losses, child welfare costs, criminal justice costs, and special education costs. For each category, we used the best available secondary data to develop cost per case estimates. First, a general literature review was performed to identify published, peer-reviewed studies on all outcomes related to CM with a potential economic cost or consequence. Articles were identified by keyword searching in a variety of databases, including PubMed, PsycInfo, EconLit, and Google Scholar. In addition to keyword searches, the bibliographies of all relevant articles were scanned to identify additional relevant studies. Whenever possible, published peer-reviewed studies were used to estimate the costs. However, in cases where the data on costs or effects were particularly sparse, we included non-peer-reviewed reports or white papers containing relevant economic outcomes of CM. Reports and white papers were identified by examining the citations of peer-reviewed studies identified in the general literature review and through searches of EconLit, the Social Science Research Network, and Google and Google Scholar.

The median age for CM victims in 2008 was 6 years old (USDHHS, 2010). We used the median age to calculate the average lifetime cost per victim, which was defined as the sum of short-term health care costs, long-term health care costs, productivity losses, child welfare costs, criminal justice costs, and special education costs. In other words, the present value of all future costs is estimated starting at age 6. For each category, we used attributable costs whenever possible (e.g., health care costs); these estimates reflect econometric procedures to statistically identify the difference between the costs of CM victims and non-maltreated controls, adjusting for observed differences between the 2 groups. Attributable cost data were not available for some categories; in these, costs were estimated as the product of incremental effect of CM on a specific outcome multiplied by the estimated cost associated with that outcome. For example, the cost of adult criminality due to CM is estimated as the product of the incremental probability of being an adult criminal by the average cost per adult criminal career. The estimate of the aggregate lifetime cost of CM in 2008 was obtained by multiplying per-victim lifetime cost estimates by the estimated cases of new CM in 2008.

Incidence rate

To generate incidence-based estimates, we begin with an estimate of CM cases and deaths during 2008. For cases, an estimated 772,000 children were determined by CPS agencies to be victims of abuse or neglect during 2008 (USDHHS, 2010). Three-quarters of victims (75%) had no history of prior victimization (USDHHS, 2010), yielding an estimated 579,000 new cases in 2008. Although researchers have argued that CPS data underestimate the total incidence of CM (Haugaard & Emery, 1989; Hussey, Chang, & Kotch, 2006; Swahn et al., 2006; Waldfogel, 1998), to be conservative, this study uses the CPS estimate of 579,000 new cases as the baseline for our estimation of the aggregate lifetime cost of CM in 2008.

Given that definitions of CM and criteria for substantiation vary between states and that previous research has shown that children in unsubstantiated cases have similar maltreatment experiences and developmental outcomes to children in substantiated cases (Drake, 1996; Hussey, Marshall, & English, 2005; Kohl, Jonson-Reid, & Drake, 2009; Leiter, Myers, & Zingraff, 1994), a sensitivity analysis on the aggregate lifetime cost of CM was conducted using the investigated incidents of CM. In 2008, nearly 3.7 million children received an investigation or assessment (USDHHS, 2010); assuming that 75% of these investigated children were also new reports, this suggests about 2,775,000 new victims of CM as an alternative estimate of CM incidence for sensitivity analysis.

The other major source of national estimates of the incidence of nonfatal CM is the periodic National Incidence Study (NIS), which combines information about reported cases with data on maltreated children identified by community professionals who are likely to come into contact with maltreated children such as child care providers, teachers, and hospital staff. There have been 4 cycles of NIS conducted in the United States: NIS-1 (1979–1980); NIS-2 (1986); NIS-3 (1993) and NIS-4 (2005–2006). According to NIS-4, the most recent NIS data available, an estimated 1,256,600 children experienced maltreatment using the "Harm Standard," and an estimated 2,905,800 children experienced maltreatment using the broader "Endangerment Standard" during the 2005–2006 study year (Sedlak et al., 2010). Assuming that 75% of these cases were new reports, this suggests an estimated 942,450 new cases using the "Harm Standard" and 2,179,350 new cases using the "Endangerment Standard." Both numbers were included as alternative estimates of CM incidence in 2008 in the sensitivity analysis.

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An incidence-based accounting of the costs of CM must also include the value of mortality for fatal cases of maltreatment. An estimated 1,740 children nationally died from abuse or neglect in 2008 (USDHHS, 2010). About 80% of all fatalities were children younger than 4 years old. Valuation is described in detail below.

Average lifetime cost per victim of nonfatal child maltreatment

Short-term health care costs. Short-term health care costs of CM in this study refer to the health care costs resulting from a new case of CM that occurred in childhood. Because the median CM case is a child aged 6 years, short-term health care costs include the incremental health care costs attributable to CM from age 6 to age 17.

A literature review identified a set of 8 articles on pediatric, short-term medical costs of CM. However, all of the studies are based on inpatient hospital data and limit their per-case reporting time period to a single inpatient episode (Brown, Fang, & Florence, 2011). Estimating the average annual medical costs of CM requires capturing increased expenditures outside of hospital settings. For example, CM may lead to increased costs for mental health services, prescription drugs, or chronic disease care, which are not captured in the inpatient studies. Furthermore, only the most severe instances of CM require inpatient care, and therefore these studies capture a non-representative sample of abused children.

In the absence of appropriate estimates in the literature, we have, in separate analyses, estimated the medical costs of maltreatment during childhood using linked survey and Medicaid claims (Florence et al., 2012). Specifically, we linked a sample of 1,151 children with cases investigated by CPS, drawn from the National Survey of Child and Adolescent Well-Being, to individual 2000–2003 Medicaid claims. We formed a comparison group of Medicaid children based on propensity score matching. The attributable difference in annual medical costs between the case and control groups is $2,703 (2003 dollars) per victim. Full details of methods and results for this analysis can be found elsewhere (Florence et al., 2012). Adjusted by GDP deflator, the cost difference measured in 2010 dollars is $3,184, or $32,648 per victim of nonfatal CM for the present value of medical costs from ages 6 through 17.

Long-term medical costs. A few sources of data exist for adult estimates of the long-term medical costs of CM (Bonomi et al., 2008; Hulme, 2000; Walker et al., 1999). Based on a review (Brown et al., 2011), we determined that Bonomi et al.'s (2008) estimates were most suitable for this study. They examined long-term health care costs associated with physical, sexual, or both physical and sexual childhood abuse using data from 3,333 women (ages 18–64) enrolled in a large health care delivery system. Total annual health care costs were 21% higher (about $507) in 2004 for women with a history of physical or sexual childhood abuse compared to women without these abuse histories. Based on Bonomi et al.'s (2008) findings and acknowledging that the study only included women (as did the 2 other adult estimates), we assume that the average annual incremental health care costs for a CM victim from age 18 through age 64 are $507 (2004 dollars), or $582 in 2010 dollars. The present value of a stream of these incremental health care costs over the period from age 18 through age 64 is $10,530 per case.

We did not locate any studies that report incremental health care costs associated with CM for adults older than age 65. As a result, the long-term medical costs of CM included in this study only account for the incremental health care costs from age 18 to 64.

Productivity losses. Lifetime productivity losses associated with CM were estimated using the human capital approach, which measures the potential loss of earnings due to being maltreated during childhood. Currie and Widom (2010) assessed the economic consequences in individuals with documented histories of childhood neglect and physical and sexual abuse and a matched comparison group who were followed up into adulthood (mean age = 41). They found that individuals with documented histories of neglect and/or abuse earned about $5,000 less per year on average than controls, controlling for background characteristics. Based on their findings, we assume that experience of CM reduces victim earnings by $5,000 (2003 dollars) per year from ages 18 to 64, assuming that productivity losses are negligible beyond 65 when most retire. Adjusted to 2010 dollars, the earning gap is $5,890, and assuming a long-term growth in labor productivity of 1% per year (Grosse, 2003), the present discounted value of these earnings losses from age 6 would be $144,360. We do not include the value of lost tax receipts from reduced earnings. Although these are a cost to the government, from a social perspective, this is a transfer from individuals to the public sector, and there is no net loss.

Child welfare costs. Given that some of the child welfare services provided to CM victims last more than 1 year (e.g., long-term foster care), the ideal way to estimate lifetime child welfare costs associated with CM would be to track the CM victims and their child welfare costs over their entire childhood. To date, there have been no such longitudinal studies. However, according to the Administration for Children and Families, the number of children investigated for CM and the cross-section of the investigated sample with respect to age and services provided to the children (e.g., substantiated vs. unsubstantiated; in-home services vs. out-of-home placement) remained relatively constant between 2004 and 2008 (USDHHS, 2010), which satisfies the assumptions for the steady-state methodology used by other researchers to estimate the lifetime costs of disease when direct or longitudinal data on lifetime costs are not available (Barnett, Birnbaum, Cremieux, Fendrick, & Slavin, 2000; Birnbaum, Leong, & Kabra, 2003). Following their methodology, by making steady-state assumptions, the total annual child welfare costs in 1 year serve as a proxy for the lifetime welfare costs of victims investigated in that year.

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The most recent national estimate of child welfare costs available is from 2006. Overall, states spent $25.7 billion in federal, state, and local funds on child welfare activities in fiscal year 2006, and an estimated 3,578,000 children received a CPS investigation in 2006 (DeVooght, Allen, & Geen, 2008). This yields an estimated $7,183 in child welfare costs per investigated child, or $7,728 per child in 2010 dollars.

Criminal justice costs. Criminal justice costs associated with CM were determined based on the effects of CM on juvenile and adult arrests. Widom and Maxfield (2001) analyzed data from a longitudinal study that followed a group of 908 substantiated cases of CM and a comparison group of 667 children through adulthood; they reported that 27.4% of maltreated children had a juvenile arrest, compared with 17.2% of non-abused children. We used the simple difference in these, 10.2%, as our estimate for the incremental effect of CM on the likelihood of arrest. Regarding the associated costs, Reynolds, Temple, Robertson, and Mann (2002) estimated that expenditures to the criminal justice system for juveniles with court petitions were $18,950 per participant in 1998 dollars, including the administrative expenditures associated with the juvenile arrest and the weighted national average of the proportion of cases that led to residential treatment, community treatment or probation services, and release. Updated to 2010 dollars, the criminal justice costs per juvenile arrest are $24,513. Based on the mean age of juvenile arrest of 14 (Reynolds et al., 2002) and the incremental increase of 10.2%, the present value of future expenditures to the criminal justice system associated with juvenile arrest evaluated at age 6 is $1,974 (2010 dollars) per CM victim.

For adult criminal justice costs, we used additional data from Widom and Maxfield (2001), who reported that CM increases the likelihood of having an adult criminal record by 9.1 percentage points (41.6% for the maltreated group vs. 32.5% for the comparison group). Reynolds et al. (2002) estimated that the average social cost of an adult crime — including the costs of arrest, judicial processing, and treatment — is $69,038 in 1998 dollars or $89,304 in 2010 dollars. Based on the assumed mean age of first adult arrest at 23 and an incremental increase of 9.1%, the present value of future expenditures to the criminal justice system associated with adult arrest is $4,773 (2010 dollars) per CM victim. Given the incidence-based costing framework we are using, this estimate reflects the average costs of all criminals, including chronic re-offenders.

Special education costs. Maltreated children are more likely to receive special education. Jonson-Reid, Drake, Kim, Porterfield, and Han (2004) found that 24.2% of maltreated children received special education at a mean age of 8 years, compared with 13.7% of children with no maltreatment record. Again, based on a simple difference, we assumed that the incremental effect due to CM is 10.5%. Reynolds et al. (2002) estimated that the average annual cost per child for special education services was $7,791 (1998 dollars) above and beyond regular instruction. Assuming that the average number of years receiving special education services is 9 years (from age 8 to 17) and the incremental increase is 10.5%, the present value of future special education costs associated with CM is estimated to be $7,999 (2010 dollars) per victim.

Average lifetime cost per victim of fatal child maltreatment

According to Corso, Mercy, Simon, Finkelstein, and Miller's (2007) work, for children aged 0–4, the average cost per case for a fatal assault was $11,300 (in 2000 dollars) in medical costs and $1,005,650 (in 2000 dollars) for lost productivity. Adjusted to 2010 dollars, the medical costs and productivity losses are $14,100 and $1,258,812, respectively.

Results

Table 1 presents the average lifetime cost of nonfatal CM per victim. Discounted at 3%, we estimated the average lifetime cost per victim of nonfatal CM to be $210,012 in 2010 dollars. The cost includes discounted present values of $32,648 in childhood health care costs, $10,530 in adulthood medical costs, $144,360 in productivity losses, $7,728 in child welfare costs, $6,747 in criminal justice costs, and $7,999 in special education costs. Because cost estimates vary as a function of the discount rate, we also estimated the average lifetime cost per case of nonfatal CM using the discount rate of 7% (Miller et al., 2006). Based on a 7% annual discount rate, the average lifetime cost per nonfatal victim was estimated to be $97,952 (see Table 1). For fatal CM, the average lifetime cost per death was estimated to be $1,272,900 in 2010 dollars, including $14,100

Table 1
The average lifetime cost per victim of nonfatal child maltreatment.

Source of cost	Reference	Average lifetime cost per victim (in 2010 dollars)	
		Discounted at 3%	Discounted at 7%
Short-term health care costs	Florence et al. (2012)	$32,648	$27,063
Long-term health care costs	Bonomi et al. (2008)	$10,530	$3,789
Productivity losses	Currie and Widom (2010)	$144,360	$49,068
Child welfare costs	DeVooght et al. (2008)	$7,728	$7,728
Criminal justice costs	Widom and Maxfield (2001) Reynolds et al. (2002)	$6,747	$3,860
Special education costs	Jonson-Reid et al. (2004) Reynolds et al. (2002)	$7,999	$6,443
Total		$210,012	$97,952

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Table 2
The average lifetime cost per case of fatal child maltreatment.

Source of cost	Average lifetime cost per victim (in 2010 dollars)	Average lifetime cost per victim (in 2010 dollars)
	Discounted at 3%	Discounted at 7%
Medical costs	$14,100	$14,100
Productivity losses	$1,258,800	$325,267
Total	$1,272,900	$339,367

Table 3
Total lifetime costs of child maltreatment, 2008, United States (based on substantiated cases of child maltreatment).

Source of cost	Total lifetime costs (in 2010 dollars)	
	Discounted at 3%	Discounted at 7%
Nonfatal		
Incidence (cases)	579,000	579,000
Short-term health care costs	$18,903,192,000	$15,669,477,000
Long-term health care costs	$6,096,870,000	$2,193,831,000
Productivity losses	$83,584,440,000	$28,410,372,000
Child welfare costs	$4,474,512,000	$4,474,512,000
Criminal justice costs	$3,906,513,000	$2,234,940,000
Special education costs	$4,631,421,000	$3,730,497,000
Total	$121,596,948,000	$56,714,208,000
Fatal		
Incidence (cases)	1,740	1,740
Medical costs	$24,534,000	$24,534,000
Productivity losses	$2,190,312,000	$565,964,580
Total	$2,214,846,000	$590,498,580
Total costs (including both fatal and nonfatal cases)	$123,811,794,000	$57,304,706,580

in medical costs and $1,258,800 in productivity losses (Table 2). The average lifetime cost per death would be $339,367 if using the discount rate of 7%.

Table 3 presents the total lifetime economic burden of CM in 2008 based on the baseline estimate of 579,000 new cases of nonfatal CM. For these cases, the aggregate lifetime costs were estimated to be $121.6 billion. Of the total costs, childhood health care costs accounted for $18.9 billion, adulthood medical costs accounted for $6.1 billion, productivity losses accounted for $83.6 billion, child welfare costs accounted for $4.5 billion, criminal justice costs accounted for $3.9 billion, and special education costs accounted for $4.6 billion. The aggregate lifetime costs associated with the 1,740 deaths resulting from CM were estimated to be $2.21 billion, with medical costs accounting for $25 million and lost productivity accounting for $2.19 billion. Adding together the fatal and nonfatal costs gave us the total lifetime costs associated with new cases of fatal and nonfatal CM in 2008, approximately $124 billion. When using the more conservative discount rate of 7%, the total lifetime costs of CM in 2008 still exceed $57 billion (Table 3).

In sensitivity analysis (Table 4), when we assumed that all investigated children were victims of CM (i.e., 2,775,000 new victims in 2008), the total lifetime costs associated with new cases of fatal and nonfatal CM in 2008 would increase to $585 billion using the discount rate of 3% and to $272 billion using the discount rate of 7%. When incidence estimates using the NIS "Harm Standard" (i.e., 942,450 new victims per year) and "Endangerment Standard" (i.e., 2,179,350 new victims per year) were applied to the sensitivity analysis, the total lifetime costs of CM in 2008 were approximately $200 billion and $460 billion, respectively, using the discount rate of 3%. When using the discount rate of 7%, the total lifetime costs of CM were $93 billion and $214 billion respectively.

Table 4
Sensitivity analysis of total lifetime costs of child maltreatment, 2008, United States.

Source of incidence data	Incidence (cases)	Total lifetime costs (in 2010 dollars) discounted at 3%	Total lifetime costs (in 2010 dollars) discounted at 7%
Nonfatal			
NIS harm standard	942,450	$197,925,809,400	$92,314,862,400
NIS endangerment standard	2,179,350	$457,689,652,200	$213,471,691,200
CPS investigated cases	2,775,000	$582,783,300,000	$271,816,800,000
Fatal			
CPS data	1,740	$2,214,846,000	$590,498,580
Total costs (including both fatal and nonfatal cases)			
NIS harm standard		$200,140,655,400	$92,905,360,980
NIS endangerment standard		$459,904,498,200	$214,062,189,780
CPS investigated cases		$584,998,146,000	$272,407,298,580

Abbreviations: NIS, National Incidence Study; CPS, child protective services.

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Discussion

Using an incidence-based approach, the lifetime economic burden of CM resulting from an estimated 579,000 new cases of nonfatal CM and 1,740 cases of fatal CM that occurred in the United States in 2008 is approximately $124 billion. On average, the lifetime cost is estimated to be $210,012 per victim of nonfatal CM and $1,272,900 per victim of fatal CM. These estimates are significant new contributions that use a consistent, robust approach in incidence-based costing methods, which improve significantly upon the limitations of past estimates of the burden of CM. Our estimates also represent the most recent and up-to-date figures for accurate, contemporary policy analysis. Furthermore, our use of a consistent, incidence-based approach directly facilitates comparisons with other health conditions and enables economic analyses of CM-specific policies. Such evaluation was impossible in the past based on previous work. We also provide sensitivity analyses on our estimates to reflect the facts that the measure of burden is dependent on assumptions about discounting for present value and CPS data underestimate the total incidence of CM.

Our new estimates cannot be compared directly to previous estimates of the economic impact of CM because of significant differences in our methods, as discussed earlier. However, for context, we cautiously make comparisons to the most widely cited report and to estimated costs of some other public health problems, which are measured using incidence-based costing approaches. Using a mix of methods, but primarily a prevalence-based approach, Wang and Holton (2007) report an estimate of $103.8 billion (2007 dollars) in annual costs; because it is primarily prevalence-based, their estimate is approximately the burden in a single year. In contrast, our estimate of $124 billion (2010 dollars)—while seemingly similar—represents the lifetime cost of new CM cases that occur in a single year.

We also estimated the lifetime burden of a new case of nonfatal CM to be $210,012 per victim. This estimate is comparable to that of many other high profile public health problems, indicating the impact and seriousness of the issue of CM. For example, the discounted lifetime costs (discounted at a 5% rate) of stroke per person were estimated at $159,846 (2010 dollars) (Taylor et al., 1996), whereas the total lifetime costs (discounted at a 3% rate) associated with type 2 diabetes were estimated between $181,000 and $253,000 (2010 dollars) per case (Zhuo, Zhang, & Hoerger, 2010). Although stroke and diabetes are clearly different from CM, we reference them to indicate that CM costs and prevalence are high enough for policy makers to justify allocating resources to effective prevention and mitigation strategies for CM.

Like any estimates of economic burden, our study has several limitations. First, we used an estimate of 579,000 new substantiated cases per year as the baseline to calculate the total lifetime economic burden of CM. This number underestimates the total incidence of CM because some of the maltreated cases may not have been reported to CPS or were reported but not substantiated for various reasons, implying that our baseline results are probably conservative, lower-bound estimates of the total lifetime economic burden of CM. Since many states are now facing fiscal crises and significantly trimming social service budgets, it is possible that budget cuts may have artificially reduced the number of substantiated cases. If so, our estimates based on substantiated cases may not represent a "steady state" burden of CM as much as estimates based on investigated cases, which may be less affected by budget cuts than substantiation. A number of papers (e.g., Drake, 1996; Fallon et al., 2011; Hussey et al., 2005; Kohl, Jonson-Reid, & Drake, 2009; Leiter, Myers, & Zingraff, 1994) have shown that risk of maltreatment, which we capture more broadly through investigations, is strongly associated with adverse CM-related outcomes, including risk of CM fatalities (Putnam-Hornstein, 2011). Second, the costs of several adverse outcomes associated with CM were not measured. Research has suggested that CM may be associated with reduced life expectancy, decreased quality of life, and negative parenting behaviors, which can lead to negative intergenerational outcomes, including conduct, peer, and emotional problems (Brown et al., 2011; Corso & Fertig, 2010; Corso et al., 2007; Roberts, O'Connor, Dunn, & Golding, 2004). We were unable to locate sufficient data on the magnitude of these effects or their costs and were therefore unable to include them in this study. As a result, our findings undercount the full costs of CM. Third, the assessment and definitions of CM differed somewhat among the studies we used to estimate different categories of costs. Some used CPS substantiated cases to identify CM (e.g., Currie & Widom, 2010; Widom & Maxfield, 2001), whereas others used CPS investigations (e.g., Florence et al., 2012) to measure CM or used self-reported surveys and questionnaires (e.g., Bonomi et al., 2008) to measure the retrospective abuse history. Fourth, most of the studies we used for component costs did not estimate the impact of psychological abuse because of the lack of data on psychological abuse. The long-term medical cost estimates in Bonomi et al. (2008) do not include psychological abuse or neglect. Excluding psychological abuse or neglect from some cost areas associated with CM may lead to an underestimation of the economic burden of CM.

Fifth, we did not estimate the economic burden of CM by type and severity of maltreatment because several of the cost studies we used (e.g., Currie & Widom, 2010; Widom & Maxfield, 2001) did not provide the effects of CM by type of maltreatment and none of the studies have estimated the effects by severity of CM. However, for the studies which *did* investigate the effects by type, results indicate that different types of maltreatment may be associated with different magnitude of these effects. For example, Jonson-Reid et al. (2004) found that children reported for physical abuse had nearly a 50% higher risk of later special education entry than those reported for sexual abuse. Bonomi et al. (2008) estimated that long-term annual health care costs were 22% higher for women with a history of physical abuse and 16% higher for women with a history of sexual abuse compared to women without physical or sexual childhood abuse. In contrast, sexual abuse can be more significantly associated with some other health consequences such as reproductive and sexual health problems. A literature review indicates that childhood sexual abuse can be associated with a myriad of serious reproductive and sexual health problems including unplanned or adolescent pregnancies, infertility, menstrual problems, and painful intercourse (Bohn & Holz, 1996). Severity of maltreatment is another important factor that may affect economic costs. Some

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previous studies have shown a relationship between severity of CM and psychological and/or functional outcomes (e.g., Manly, Cicchetti, & Barnett, 1994; Romans, Martin, Anderson, O'Shea, & Mullen, 1995), but little has been done to examine the associations of CM severity with the outcomes included in this study for the estimation of CM costs. Furthermore, the field has not achieved consensus on how to best measure the severity of CM. The lack of the studies and consensus on the operational definitions of severity did not allow us to conduct finer calculations by severity.

Sixth, we were unable to include any long-term medical costs for adults aged 65 or older. Because other research has shown that health consequences of CM may continue beyond age 65 (Felitti et al., 1998), any associated costs in this age group further imply that we underestimate total costs of CM. Seventh, productivity losses for CM morbidity were not adjusted to include household productivity, although for mortality, household productivity losses were included in the Corso et al. (2007) estimates. Short-term productivity losses such as missed school days due to CM were excluded as well. Excluding these losses implies that our estimates underestimate the actual burden of CM. Eighth, we used the median age (6 years) in CPS reports (USDHHS, 2010) to calculate the average lifetime cost per victim. More severe cases of CM tend to occur in early childhood, so the unbalanced age distribution in terms of the severity of CM could bias our estimates. (For example, in most cases of abusive head trauma, victims are infants younger than 1-year old (Brown et al., 2011).) Ninth, most of our component costs estimates were based on data from single studies. In most cases there were few alternatives from which to choose. Given the sensitive nature of CM, we did not find any relevant studies of CM costs that were based on an experimental design. Instead, as a second best approach with the available data, we relied on studies which applied quasi-experimental longitudinal, prospective designs whenever possible. For almost all the cost categories for which existing data are available, only one study with prospective quasi-experimental design has been found for each category. Given the lack of additional valid studies in these areas, we were not able to use methods like meta-analysis or a sensitivity analysis of high and low estimates to arrive at more valid estimates for each cost category. Finally, although we include a range of estimates based on discount rate and incidence rate sensitivity analysis, we are unable to provide statistical confidence intervals in this study because of the large number of input sources used and the fact that several estimates included in our study did not report standard errors.

Although our study provides several important innovations over past estimates, a few areas should be highlighted for future research. First, as discussed above, we were unable to include economic estimates of a few impacts, which may have monetary costs. Future studies that quantify the costs of reduced life expectancy, decreased quality of life, or negative parenting behaviors and negative intergenerational outcomes could be included as updates to our estimates as they are available using the same framework. Second, if additional data on unsubstantiated cases were to be made available by CPS agencies or other sources, we could expand our sensitivity analysis and the potential range of estimates in this study. Developing more consistent definitions of CM and adding confidence intervals to inputs would strengthen our findings. Third, we were unable to estimate the economic burden of CM by type and severity of maltreatment due to the lack of sufficient data. This gap inhibits the evaluation of interventions which may be specific to certain types of maltreatment and our understanding of cost impacts of maltreatment. Where possible, we recommend that future researchers make efforts to investigate the costs of maltreatment by type and severity, as this will facilitate improved economic evaluations.

In summary, we estimate that the approximately 579,000 new substantiated cases of nonfatal CM and 1,740 cases of fatal CM per year in the United States result in a total economic burden of $124 billion. This estimate is based on discounted lifetime costs of $210,012 per victim of nonfatal CM and $1,272,900 per victim of fatal CM. These estimates are based on an incidence-based approach, which facilitates economic analysis for public health interventions. Compared with other health problems, the burden of CM is substantial, even after conservative assumptions are used, indicating the importance of preventing and treating CM. Although the evidence base for effective strategies to address CM is limited, a promising array of prevention and response programs have great potential to reduce the economic burden of CM. Included among effective programs are Nurse-Family Partnership, Early Start, and Triple P System (Macmillan et al., 2009; Prinz, Sanders, Shapiro, Whitaker, & Lutzker, 2009). For such programs to be successful, an ongoing commitment to implementation science will be needed to ensure that the full programs—upon which the positive results rest—are imparted with fidelity and include ongoing monitoring and supervision, and sustained resourcing (Cohen, Mannarino, & Murray, 2011; Toth & Manly, 2011). Given the substantial economic burden of CM, the benefits of prevention will likely outweigh the costs for effective programs.

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