



THE EFFECTS OF CHILDHOOD STRESS ON HEALTH ACROSS THE LIFESPAN



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION



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THE EFFECTS OF CHILDHOOD STRESS ON HEALTH ACROSS THE LIFESPAN

Stress is an inevitable part of life. Human beings experience stress early, even before they are born. A certain amount of stress is normal and necessary for survival. Stress helps children develop the skills they need to cope with and adapt to new and potentially threatening situations throughout life. Support from parents and/or other concerned caregivers is necessary for children to learn how to respond to stress in a physically and emotionally healthy manner.

The beneficial aspects of stress diminish when it is severe enough to overwhelm a child's ability to cope effectively. Intensive and prolonged stress can lead to a variety of short- and long-term negative health effects. It can disrupt early brain development and compromise functioning of the nervous and immune systems. In addition, childhood stress can lead to health problems later in life including alcoholism, depression, eating disorders, heart disease, cancer, and other chronic diseases.

The purpose of this publication is to summarize the research on childhood stress and its implications for adult health and well-being. Of particular interest is the stress caused by child abuse, neglect, and repeated exposure to intimate partner violence (IPV). We hope this publication provides practitioners, especially those working in violence prevention, with ideas about how to incorporate this information into their work.

TYPES OF STRESS

Following are descriptions of the three types of stress that The National Scientific Council on the Developing Child has identified based on available research:¹

Positive stress results from adverse experiences that are short-lived.

Children may encounter positive stress when they attend a new daycare, get a shot, meet new people, or have a toy taken away from them. This type of stress causes minor physiological changes including an increase in heart rate and changes in hormone levels. With the support of caring adults, children can learn how to manage and overcome positive stress. This type of stress is considered normal and coping with it is an important part of the development process.

Tolerable stress refers to adverse experiences that are more intense but still relatively short-lived. Examples include the death of a loved one, a natural disaster, a frightening accident, and family disruptions such as separation or divorce. If a child has the support of a caring adult, tolerable stress can usually be overcome. In many cases, tolerable stress can become

Stress is internal or external influences that disrupt an individual's normal state of well-being. These influences are capable of affecting health by causing emotional distress and leading to a variety of physiological changes. These changes include increased heart rate, elevated blood pressure, and a dramatic rise in hormone levels.

positive stress and benefit the child developmentally. However, if the child lacks adequate support, tolerable stress can become toxic and lead to long-term negative health effects.

Toxic stress results from adverse experiences that may be sustained for a long period of time. This type of stress can disrupt early brain development, compromise the functioning of important biological systems, and lead to long-term health problems.

Child maltreatment, a source of toxic stress, is a significant public health problem in the United States. An estimated 8,755,000 juvenile victims live in this country.² That means that more than 1 of 7 children between the ages of 2 and 17 years have experienced maltreatment.² This includes physical abuse, sexual abuse, psychological or emotional abuse, neglect, and custodial interference or family abduction. The perpetrators are family (77%), acquaintances (23%), and strangers (2%).²

Toxic stress results from intense adverse experiences that may be sustained over a long period of time—weeks, months or even years. An example of toxic stress is child maltreatment, which includes abuse and neglect. Children are unable to effectively manage this type of stress by themselves. As a result, the stress response system gets activated for a prolonged amount of time. This can lead to permanent changes in the development of the brain. The negative effects of toxic stress can be lessened with the support of caring adults. Appropriate support and intervention can help in returning the stress response system back to its normal baseline.

THE EFFECTS OF TOXIC STRESS ON BRAIN DEVELOPMENT IN EARLY CHILDHOOD

The ability to manage stress is controlled by brain circuits and hormone systems that are activated early in life. When a child feels threatened, hormones are released and they circulate throughout the body. Prolonged exposure to stress hormones can impact the brain and impair functioning in a variety of ways.

- Toxic stress can impair the connection of brain circuits and, in the extreme, result in the development of a smaller brain.¹
- Brain circuits are especially vulnerable as they are developing during early childhood. Toxic stress can disrupt the development of these circuits. This can cause an individual to develop a low threshold for stress, thereby becoming overly reactive to adverse experiences throughout life.¹
- High levels of stress hormones, including cortisol, can suppress the body's immune response. This can leave an individual vulnerable to a variety of infections and chronic health problems.¹
- Sustained high levels of cortisol can damage the hippocampus, an area of the brain responsible for learning and memory. These cognitive deficits can continue into adulthood.¹

The National Scientific Council on the Developing Child has been studying the effects of toxic stress on brain development. Papers summarizing the scientific literature can be found on-line at www.developingchild.net.

THE EFFECTS OF TOXIC STRESS ON ADULT HEALTH AND WELL-BEING

Research findings demonstrate that childhood stress can impact adult health. The Adverse Childhood Experiences (ACE) Study is particularly noteworthy because it demonstrates a link between specific 1) violence-related stressors, including child abuse, neglect, and repeated exposure to intimate partner violence, and 2) risky behaviors and health problems in adulthood.

The ACE Study

The ACE Study, a collaboration between the Centers for Disease Control and Prevention (CDC) and Kaiser Permanente's Health Appraisal Clinic in San Diego, uses a retrospective approach to examine the link between childhood stressors and adult health. Over 17,000 adults participated in the research, making it one of the largest studies of its kind. Each participant completed a questionnaire that asked for detailed information on their past history of abuse, neglect, and family dysfunction as well as their current behaviors and health status. Researchers were particularly interested in participants' exposure to the following ten ACE:³

Abuse

- Emotional
- Physical
- Sexual

Neglect

- Emotional
- Physical

Household Dysfunction

- Mother treated violently
- Household substance abuse
- Household mental illness
- Parental separation or divorce
- Incarcerated household member

General ACE Study Findings

The ACE Study findings have been published in more than 30 scientific articles. The following are some of the general findings of the study:

Childhood abuse, neglect, and exposure to other adverse experiences are common. (See table 1.) Almost two-thirds of study participants reported at least one ACE, and more than one in five reported three or more.³ (See table 2.)

The ACE score is the total number of ACE that each study participant reported. It is used to assess negative experiences during childhood. For example, experiencing physical neglect would be an ACE score of one. Experiencing physical neglect and witnessing a parent being treated violently would be an ACE score of two.

The short- and long-term outcomes of ACE include a multitude of health and behavioral problems. As the number of ACE a person experiences increases, the risk for the following health outcomes also increases:³

- alcoholism and alcohol abuse
- chronic obstructive pulmonary disease
- depression
- fetal death
- illicit drug use
- ischemic heart disease
- liver disease
- risk for intimate partner violence
- multiple sexual partners
- sexually transmitted diseases
- smoking
- suicide attempts
- unintended pregnancies

ACE are also related to risky health behaviors in childhood and adolescence, including pregnancies, suicide attempts, early initiation of smoking, sexual activity, and illicit drug use.³

As the number of ACE increases, the number of co-occurring health conditions increases.³



Table 1: Prevalence of Individual Adverse Childhood Experiences³

ACE Category		Women (N = 9,367)	Men (N = 7,970)	Total (N = 17,337)
Abuse				
	Emotional Abuse	13.1%	7.6%	10.6%
	Physical Abuse	27.0%	29.9%	28.3%
	Sexual Abuse	24.7%	16.0%	20.7%
Neglect				
	Emotional Neglect*	16.7%	12.4%	14.8%
	Physical Neglect*	9.2%	10.7%	9.9%
Household Dysfunction				
	Mother Treated Violently	13.7%	11.5%	12.7%
	Household Substance Abuse	29.5%	23.8%	26.9%
	Household Mental Illness	23.3%	14.8%	19.4%
	Parental Separation or Divorce	24.5%	21.8%	23.3%
	Incarcerated Household Member	5.2%	4.1%	4.7%

* Collected during the second survey wave only (N=8,667).

Table 2: ACE Score³

Number of Adverse Childhood Experiences (ACE Score)	Women	Men	Total
0	34.5%	38.0%	36.1%
1	24.5%	27.9%	26.0%
2	15.5%	16.4%	15.9%
3	10.3%	8.6%	9.5%
4 or more	15.2%	9.2%	12.5%

Violence-Related ACE Study Findings

Findings from the ACE Study confirm what we already know—that too many people in the United States are exposed early on to violence and other childhood stressors. The study also provides strong evidence that being exposed to certain childhood experiences, including being subjected to abuse or neglect or witnessing intimate partner violence (IPV), can lead to a wide array of negative behaviors and poor health outcomes. In addition, the ACE Study has found associations between experiencing ACE and two violent outcomes: suicide attempts and the risk of perpetrating or experiencing IPV.³

The following section will summarize some of the ACE Study findings relevant to violence. Some findings relate to participants' past history of abuse, neglect, and IPV exposure, while others involve the link between ACE and adult behaviors and health status.

Child Maltreatment and its Impact on Health and Behavior

- 25% of women and 16% of men reported experiencing child sexual abuse.⁴
- Participants who were sexually abused as children were more likely to experience multiple other ACE.⁴
- The ACE score increased as the child sexual abuse severity, duration, and frequency increased and the age at first occurrence decreased.⁴
- Women and men who experienced child sexual abuse were more than twice as likely to report suicide attempts.⁵
- A strong relationship was found between frequent physical abuse, sexual abuse, and witnessing of IPV as a child and a male's risk of involvement with a teenage pregnancy.⁶
- Women who reported experiencing four or more types of abuse during their childhood were 1.5 times more likely to have an unintended pregnancy at or before the age of twenty.⁷
- Men and women who reported being sexually abused were more at risk of marrying an alcoholic and having current marital problems.⁵

Witnessing Intimate Partner Violence (IPV) as a Child and its Impact on Health and Behavior

- Study participants who witnessed IPV were two to six times more likely to experience another ACE.⁸
- As the frequency of witnessing IPV increased, the chance of reported alcoholism, illicit drug use, IV drug use, and depression also increased.⁸
- Exposure to physical abuse, sexual abuse, and IPV in childhood resulted in women being 3.5 times more likely to report IPV victimization.⁹
- Exposure to physical abuse, sexual abuse, and IPV in childhood resulted in men being 3.8 times more likely to report IPV perpetration.⁹

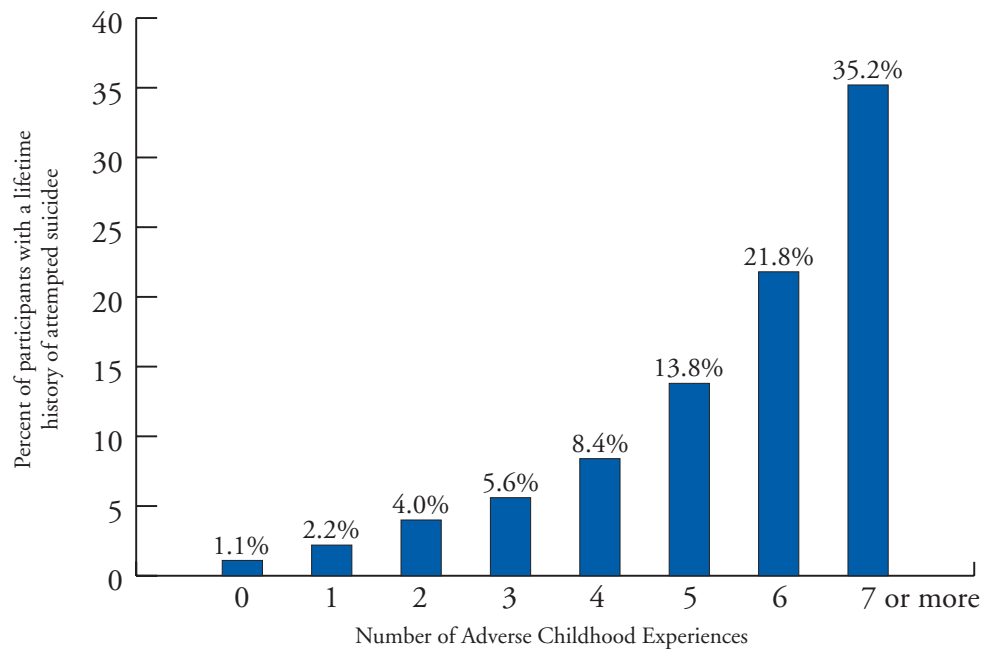
The Link between ACE and Suicide Attempts

- 3.8% of study participants reported having attempted suicide at least once.¹⁰
- Experiencing one ACE increased the risk of attempted suicide two to five times.¹⁰
- As the ACE score increased so did the likelihood of attempting suicide.¹⁰ (See Figure 1.)
- The relationship between ACE and the risk of attempted suicide appears to be influenced by alcoholism, depression, and illicit drug use.¹⁰



Figure 1¹⁰

**NUMBER OF ADVERSE CHILDHOOD EXPERIENCES
AND LIFETIME HISTORY OF ATTEMPTED SUICIDE**



ACE and Associated Health Behaviors

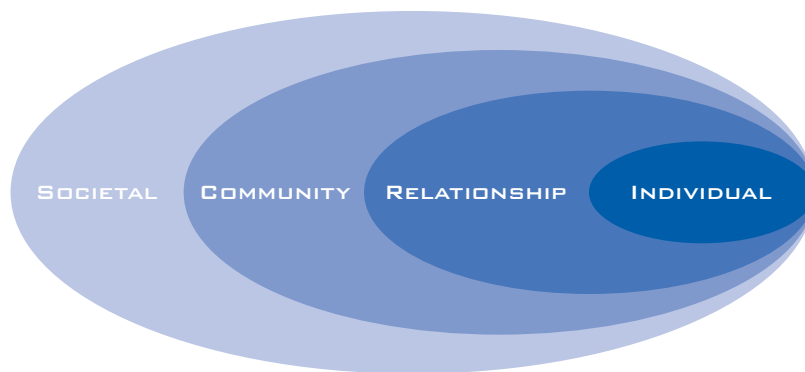
Associations were found between ACE and many negative health behaviors. A partial list of behaviors is included below. For a complete list, see the ACE Study web site at www.cdc.gov/nccdphp/ace/index.htm.

- Participants with higher ACE scores were at greater risk of alcoholism.¹¹
- Those with higher ACE scores were more likely to marry an alcoholic.¹²
- Study participants with higher ACE scores were more likely to initiate drug use and experience addiction.¹³
- Those with higher ACE scores were more likely to have 30 or more sexual partners, engage in sexual intercourse earlier, and feel more at risk of contracting AIDS.^{14,15}
- Higher ACE scores in participants were linked to a higher probability of both lifetime and recent depressive disorders.¹⁶

IMPLICATIONS FOR CHILD MALTREATMENT PREVENTION

Child maltreatment is one example of toxic stress. CDC works to stop maltreatment, including abuse and neglect, before it initially occurs. Prevention of child maltreatment requires understanding the circumstances and factors that cause it. CDC uses a four-level social ecological model to better understand potential strategies for prevention. This model considers the complex interplay between individual, relationship, community and societal factors. (See Figure 2.)

FIGURE 2: THE SOCIAL-ECOLOGICAL MODEL



Individual Level Strategies

Parent Education

Educational programs that occur in group settings are used to reduce the risk factors and enhance the protective factors that are associated with the perpetration of child maltreatment. Often, these programs contain multiple components that include training on parenting topics (e.g., discipline), moderated discussions with the children, and facilitated parent-child interactions. This model provides parents with new skills and gives them an opportunity to apply the skills in a safe environment. There is some scientific research showing that programs of this type are effective. The evidence base continues to grow.¹⁸

Some of these parent education programs occur in clinical settings. For example, a hospital-based program has been developed to teach new parents about the dangers of violently shaking an infant. This program was found to reduce the rates of abusive head trauma to infants.¹⁹

Child Education

Most schools in the United States provide curricula to help children avoid or report abuse. Research has shown that this method is effective in teach-

Risk Factor

A characteristic that increases the likelihood of a child becoming a victim of or a parent/caregiver becoming a perpetrator of abuse and/or neglect.

Protective Factor

A characteristic that decreases the likelihood of a child becoming a victim of or a parent/caregiver becoming a perpetrator of abuse and/or neglect because it provides a buffer against risk.

Safe, Stable, and Nurturing Relationships: A Framework for Prevention

Children's experiences are defined through their relationships with parents, teachers, and other caregivers.¹⁷ Healthy relationships act as a buffer against traumatic childhood experiences. They are necessary to ensure the long-term physical and emotional well-being of children. CDC's platform for child maltreatment prevention includes the promotion of Safe, Stable, and Nurturing Relationships (SSNRs). The agency is in the process of defining SSNRs and undertaking a variety of related research and program activities.

ing children about safety and providing them with skills that may reduce their risk of abuse.¹⁸ However, the research has also shown that children are less likely to believe they are at risk from parents or caregivers, the same people who are most likely to abuse them.¹⁸ Additional information is needed about how these skills transfer in abusive situations where the perpetrator is someone the child knows well and trusts.

Screening and Treatment

The early identification and treatment of toxic stress, including child maltreatment, can lessen the associated long-term negative health and behavioral outcomes. Daycare providers, teachers, and other adults who interact frequently with children should have sufficient knowledge and skills to identify and care for children who have been exposed to traumatic childhood experiences. They should be familiar with support services to meet the needs of children whose problems cannot be adequately addressed by front-line staff.²⁰ Social service agencies that are responsible for investigating suspected cases of abuse and neglect should include a thorough assessment of a child's developmental status.²⁰ This assessment should include the measurement of cognitive, linguistic, emotional, and social competence.¹ Individuals who have experienced ACE should receive help. This may involve psychotherapy, theater workshops, movement therapy, hypnotherapy, expressive writing, diary programs or some combination.²¹

RELATIONSHIP LEVEL STRATEGIES

Parent-Child Centers

Parent training and education is often delivered within comprehensive parent-child centers. These centers provide a stable learning environment in which parents and their children can interact. Studies have found that families participating in these centers have lower levels of child maltreatment.²²

Home Visitation

This type of program involves trained personnel visiting families in their homes to deliver training, education, and support. The trained personnel can be nurses, social workers, paraprofessionals, or peers. Home visits often begin before birth and continue past a child's second birthday. These programs include training on prenatal and infant care as well as child development. They also enhance problem solving skills, assist with educational and work opportunities, and provide referrals to community services. A systematic review conducted by the non-federal Task Force on Community Preventive Services found that early childhood home visitation results in a 40% reduction in episodes of abuse and neglect.²³ Not all home visitation programs were found to be equally effective. Those deemed to be successful in preventing child maltreatment were specifically aimed at high-risk families, lasted two years or longer, and were conducted by professionals (as opposed to trained paraprofessionals).²³

COMMUNITY, ORGANIZATIONAL, AND SOCIAL LEVEL STRATEGIES

Public Awareness Campaigns

Public awareness campaigns have long been used as a prevention strategy for a variety of health issues, including child maltreatment. These campaigns include a variety of public service announcements involving television, radio, the Internet, print media, and billboards. Research has shown that these campaigns are effective in raising awareness about the existence of child maltreatment and its devastating impact on victims.¹⁸ However, there is not yet conclusive evidence to show that public awareness campaigns change the attitudes and behaviors of parents.¹⁸ Research in this area is ongoing.

USING THIS INFORMATION

Many violence prevention practitioners are unaware of the research on toxic stress and Adverse Childhood Experiences. The following suggestions are meant to help CDC's partners make the case that stopping violence before it occurs can reduce risky behaviors, prevent chronic disease, and foster adult health.

1. Share Knowledge

There are many ways you can share the research with your partners and constituents:

- Incorporate the research into presentations for professional and lay audiences.
- Invite a Subject Matter Expert to give a conference keynote address, participate in Grand Rounds, or provide staff training.
- Work with reporters to highlight the issue on the Internet, television, radio or in print media, including newspapers and magazines.
- Reference the research in scholarly journal articles.
- Use the data in a mayoral or gubernatorial proclamation to prevent child maltreatment or intimate partner violence.
- Work with local colleges and universities to incorporate the research into the curricula of psychology, nursing, medicine, social work, and public health programs.

2. Collect Data

Survey instruments are available on-line (www.cdc.gov/NCCDPHP/ACE/questionnaires.htm). These can be used to assess the prevalence of ACE in populations that are of interest to you. The data can be incorporated into any of the strategies mentioned in “Share Knowledge.”

3. Secure Additional Resources

The data can be incorporated into grant applications or used when other opportunities to secure additional resources become available. Several CDC partners have used the data to demonstrate that violence prevention leads to overall health and well-being.

ADDITIONAL INFORMATION

- The National Center for Injury Prevention and Control
www.cdc.gov/ncipc
- The National Scientific Council on the Developing Child
www.developingchild.net
- The Adverse Childhood Experiences (ACE) Study
www.cdc.gov/nccdphp/ace/index.htm

REFERENCES

1. National Scientific Council on the Developing Child. Cambridge: The Council: 2005 [cited 2007 April 9]. Excessive stress disrupts the architecture of the developing brain. Working Paper No. 3. Available from: http://www.developingchild.net/pubs/wp/Stress_Disrupts_Architecture_Developing_Brain.pdf.
2. Finkelhor D, Ormrod, R, Turner H, Hamby S. The victimization of children and youth: a comprehensive, national survey. *Child Maltreatment*. 2005;10(1):5-25.
3. Centers for Disease Control and Prevention. Atlanta: CDC; 2006 [cited 2007 April 9]. Adverse Childhood Experiences Study Available from: <http://www.cdc.gov/nccdphp/ace/index.htm>.
4. Dong M, Anda RF, Dube SR, Giles WH, Felitti VJ. The relationship of exposure to childhood sexual abuse to other forms of abuse, neglect and household dysfunction during childhood. *Child Abuse Negl*. 2003;27(6):625-39.
5. Dube SR, Anda RF, Whitfield CL, Brown DW, Felitti VJ, Dong M, et al. Long-term consequences of childhood sexual abuse by gender of victim. *Am J Prev Med*. 2005;27(5):430-8.
6. Anda RF, Felitti VJ, Chapman DP, Croft JB, Williamson DF, Santelli JS, et al. Abused boys, battered mothers, and male involvement in teen pregnancy. *Pediatrics*. 2001;107(2), E19.
7. Dietz PM, Spitz AM, Anda RF, Williamson DF, McMahon PM, Santelli JS, et al. Unintended pregnancy among adult women exposed to abuse or household dysfunction during their childhood. *JAMA*. 1999;282(14):1359-64.
8. Dube SR, Anda RF, Felitti VJ, Edwards VJ, Williamson DF. Exposure to abuse, neglect and household dysfunction among adults who witnessed intimate partner violence as children: Implications for health and social services. *Violence Vict*. 2002;17(1):3-17.
9. Whitfield CL, Anda RF, Dube SR, Felitti VJ. Violent childhood experiences and the risk of intimate partner violence in adults: assessment in a large health maintenance organization. *J Interpers Violence*. 2003;18(2):166-85.
10. Dube SR, Anda RF, Felitti VJ, Chapman D, Williamson DF, Giles WH. Childhood abuse, household dysfunction and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *JAMA*. 2001;286(24):3089-96.
11. Anda RF, Whitfield CL, Felitti VJ, Chapman D, Edwards VJ, Dube SR, et al. Adverse childhood experiences, alcoholic parents, and later risk of alcoholism and depression. *Psychiatr Serv*. 2002;53(8):1001-9.
12. Dube SR, Anda RF, Felitti VJ, Edwards VJ, Croft JB. Adverse childhood experiences and personal alcohol abuse as an adult. *Addict Behav*. 2002;27(5):713-25.
13. Dube SR, Felitti VJ, Dong M, Chapman DP, Giles WH, Anda RF. Childhood abuse, neglect and household dysfunction and the risk of illicit drug use: the Adverse Childhood Experience Study. *Pediatrics*. 2003;111(3):564-72.
14. Dube SR, Felitti VJ, Dong M, Giles WH, Anda RF. The impact of adverse childhood experiences on health problems: evidence from four birth cohorts dating back to 1900. *Prev Med*. 2003;37(3):268-77.
15. Hillis SD, Anda RF, Felitti VJ, Marchbanks PA. Adverse childhood experiences and sexual risk behaviors in women: a retrospective cohort study. *Fam Plann Perspect*. 2001;33:206-211.
16. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*. 2004;82(2):217-25.
17. National Scientific Council on the Developing Child. Cambridge: The Council: 2004 [cited 2007 april 9]. Young children develop in an environment of relationships. Working Paper No. 1. Available from: http://www.developingchild.net/pubs/wp/Young_Children_Environment_Relationships.pdf

18. Daro D, McCurdy K. Interventions to prevent child maltreatment. In: Doll L, Bonzo S, Sleet D, Mercy J, Hass E, editors. *Handbook of Injury and Violence Prevention*. New York: Springer; 2007.p.137-56.
19. Dias MS, Smith K, deGuehery K, Mazur P, Li V, Shaffer ML. Preventing abusive head trauma among infants and young children: a hospital-based, parent education program. *Pediatrics*. 2005;115(4):470-7.
20. National Scientific Council on the Developing Child. Cambridge: The Council: 2006 [cited 2007 April 9]. Children's emotional development is built into the architecture of their brains. Working Paper No. 2. Available from: http://www.developingchild.net/pubs/wp/Childrens_Emotional_Development_Architecture_Brains.pdf.
21. Edwards VJ, Anda RF, Felitti VJ, Dube SR. Adverse childhood experiences and health-related quality of life as an adult. In: K. Kendall-Tackett, editor. *Victimization and Health*. Washington, D.C.: American Psychological Association;2003.
22. Reynolds AJ, Temple JA, Ou SR. School-based early intervention and child well-being in the Chicago longitudinal study. *Child Welfare*. 2003;82:633-56.
23. Centers for Disease Control and Prevention. First reports evaluating the effectiveness of strategies for preventing violence: early childhood home visitation and firearms laws. Findings from the Task Force on Community Preventive Services. *MMWR* 2003; 52(No. RR-14):1-9.



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