

Adverse childhood experiences

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Abstract

The long term poor health outcomes in people who have experienced multiple adverse events in childhood have been well documented since the original CDC-Kaiser study in the late 1990's. Those people who have experienced four or more adverse childhood experiences (ACE) are at significantly increased risk of chronic disease such as cancer, heart disease and diabetes as well as mental illness and health risk behaviours. The ACE pyramid is a model that describes the relationship between ACEs, disease and potentially early death. There is growing evidence of the ways in which adversity and toxic stress, cause these poor outcomes. Exposure to adversity has been shown to alter the molecular and genetic makeup of a child as well as changing the way the neurological, immune and endocrine systems develop and function. Adverse events in childhood are of great public health concern given the evidence of their long term impact on health. This article describes the significant impact of ACEs on the health of future generations outlining the research background to ACEs. It also explores how we are finding ways to mitigate their adverse effects by prevention and promotion of resilience against the effects of adversity.

Keywords adverse childhood experiences; child abuse; chronic disease; epigenetics; health risk behaviour; neglect; neuro-development; resilience

Introduction

Adverse Childhood Experiences (ACEs) were first described in relation to health outcomes by a large study by CDC-Kaiser in 1998. The findings have led to an explosion of interest in the impact of ACEs on health outcomes, both mental and physical and also the impact on behaviour, life opportunities and economic stability. ACEs are increasingly being recognized as a risk factor for health that should be addressed and tackled early and with as much effort as other risk factors that are known to have a direct impact on health such as smoking.

There is growing evidence of how toxic stress or repeated adverse experiences can cause permanent damage to the developing brain and also alter the functioning of the immune, neurological and endocrine systems in an individual, predisposing them to high risk of chronic diseases and early death.

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The next challenge will be for the health system to adapt to this growing evidence and respond in a way that changes these outcomes.

What are adverse childhood experiences?

Adverse childhood experiences have been described as potentially traumatic events that can have negative lasting effects on health and well-being. This includes maltreatment and abuse as well as living in an environment that is harmful to their development.

Background

The CDC-Kaiser ACE Study took place because US health provider Kaiser-Permanente found that there was a high prevalence of historical sexual abuse amongst their patients attending an obesity clinic. They wanted to investigate further the burden of unrecognized adverse childhood experiences. They developed a questionnaire which asked a patient if they experienced abuse, household challenges or neglect as a child (see [Box 1.](#)). The questionnaire was sent to over 17,000 patients who had attended for a standardized medical evaluation between 1995 and 1997. A total of 17,337 adults were included in the study, in two waves (neglect was added to the questionnaire in the second wave). All ACE questions refer to the respondent's first 18 years of life.

Subsequent studies looking at ACE prevalence have tended to divide ACEs into three broad types with 10 categories of adversity ([Figure 1.](#))

Prevalence

ACEs are common. The original CDC-Kaiser ACE study found 12.5% of respondents had experienced 4+ ACEs and 64% had experienced at least one ACE. In 2015 a survey of 2028 adults in Wales found that 47% had experienced at least one ACE and 14% 4+. The prevalence reported in other studies in the UK ranges from 9 to 14% for 4+ ACEs.

The diversity of adversity

It should be recognized that although these categories cover a lot of types of adversity the list is not complete and adversity varies in duration, and type. The majority of the respondents in the Kaiser study were white and college educated. Considering a broader description of adversity may demonstrate even greater correlation between adversity and ill health. Poverty, community deprivation and gang violence/peer victimization may cause chronic adversity. The impact of chronic versus acute adversity needs further research.

A study interviewed young people from deprived areas of Philadelphia, asking the participants to identify causes of childhood adversity and then rate them according to which were the most stressful. The most common cause of adversity identified by this group was problems within family relationships. They listed stressors not recognized by the original ACE list, such as lack of love in the family, and having to take on adult responsibilities. The young people also highlight lack of parenting skills, due to their parents' experience of adversity, recognising the cycle of suffering that can occur, as demonstrated by this quote: "My mom said, 'I ain't teach you nothing because I want you to go through the same thing I went through'...It's just like heartless,

Defining adverse childhood experiences

ACE definitions CDC-Kaiser ACE Study 1998

Abuse

Emotional abuse: A parent, step-parent, or adult living in your home swore at you, insulted you, put you down, or acted in a way that made you afraid that you might be physically hurt.

Physical abuse: A parent, step-parent, or adult living in your home pushed, grabbed, slapped, threw something at you, or hit you so hard that you had marks or were injured.

Sexual abuse: An adult, relative, family friend, or stranger who was at least 5 years older than you ever touched or fondled your body in a sexual way, made you touch his/her body in a sexual way, attempted to have any type of sexual intercourse with you.

Household challenges

Mother treated violently: Your mother or stepmother was pushed, grabbed, slapped, had something thrown at her, kicked, bitten, hit with a fist, hit with something hard, repeatedly hit for over at least a few minutes, or ever threatened or hurt by a knife or gun by your father (or stepfather) or mother's boyfriend.

Household substance abuse: A household member was a problem drinker or alcoholic or a household member used street drugs.

Mental illness in household: A household member was depressed or mentally ill or a household member attempted suicide.

Parental separation or divorce: Your parents were ever separated or divorced.

Criminal household member: A household member went to prison.

Neglect

Emotional neglect: Someone in your family helped you feel important or special, you felt loved, people in your family looked out for each other and felt close to each other, and your family was a source of strength and support.¹

Physical neglect: There was someone to take care of you, protect you, and take you to the doctor if you needed it.¹ You didn't have enough to eat, your parents were too drunk or too high to take care of you, and you had to wear dirty clothes.

¹Reverse scored

<https://www.cdc.gov/violenceprevention/cestudy/about.html>

Box 1

like you just don't care. My parents couldn't show me [love]. They made me feel like I was just there for a check."

Economic hardship was also recognized and is probably a key point missing from the original ACE study, given the strong links between poverty and ill health. This can lead to lack of resilience

within communities to protect children from the effect of an adverse event.

Factors outside the immediate family, that affect the community as a whole are another source of adversity influencing children's health, as in the case of historical abuse and discrimination, or for example, the existence of child labour or prostitution in the community.

The majority of research into ACE and health has been carried out in high income countries. The WHO has recognized the need to get international data particularly from low and middle income countries to raise the profile of ACE as a global issue of public health concern. They have developed an Adverse Childhood Experiences International Questionnaire (ACE-IQ). In addition to the usual ACE questions it recognizes other factors such as war, peer, community and collective violence.

How do ACEs influence health and well-being

Adverse childhood experiences can affect the developing brain, immune and endocrine systems. Due to the high level of stress in their environment, children who experience more adverse events are more likely to develop behaviours that are harmful to health, such as smoking, drinking alcohol or antisocial behaviour. This then puts the individual on a pathway to poor adult health with higher risk of many diseases including cancer, cardiovascular, liver and lung diseases.

The life trajectory of a person who has experienced ACEs and how they impact on their development and health is illustrated in [Figure 2](#). Public Health Wales and Blackburn with Darwen Local Authority have produced an animation which shows how this may play out in someone's life – see the link in further reading.

Research has focused on the adverse experiences occurring in childhood and the resulting poor health occurring in adulthood. However, the impact on physical health can start as young as 6 years of age, with exposure to one ACE doubling the likelihood of poor health. Children with exposure to four or more ACEs showed almost 3 times the rate of poor health compared to those with no ACEs.

Allostasis

Our bodies are highly developed to be able to respond to the ever changing environment around us and provide physiological and behavioural stability – the process of "allostasis". This includes physiological changes to enable us to deal with stressful circumstances.

When we are faced with a stressful experience, the example of facing a "bear in the woods" is often used, our body responds by activating the sympathetic nervous system – causing heart rate to increase, pupils to dilate etc. The hypothalamic-pituitary-adrenal (HPA) axis is also activated releasing cortisol, triggering the production of glucose for immediate utilization by cardiac and skeletal muscle in preparation to escape from the danger posed.

This is an appropriate response when faced with a "bear in the woods" as it prepares us to either flee or fight. However, it occurs in any situation which we perceive as stressful and sympathetic overactivity and activation of the HPA-axis are not always beneficial. Following a stressful event we usually have a period of recovery and return to a healthy level of activation of these pathways. If the stress is severe, we may still be able to

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