Global Environmental Health Problem Analysis

Lead Exposure

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Introduction

Lead has been used for centuries for a wide range of applications; the effects of lead contamination went undetected for years. The use of lead in gasoline and paints led to a vast distribution that resulted in environmental and household contamination (Frumkin, 2016). Children exposed to low levels of lead can result in lead poison that can cause cognitive, physical, and neurological disorders. At elevated levels lead poisoning can cause multiple organ failures, seizures, renal damage, and death. Globally lead exposure results in 2.5 million disability-adjusted life years (DALY) for intellectual disability, 1.3 million DALY's for renal disease, and 20.6 million DALY's for vascular diseases. Children are at higher risk of lead toxicity due to increased intake per body weight compared to adults (a 50% uptake compared to 10-15% in adults) and the rate of physical development. In 1991 the Centers for Disease Control and Prevention (CDC) defined blood lead levels more than ten ug/dl as being of concern in children under five years of age. Further studies revealed that even lower levels of blood lead levels can still result in adverse effects on children's health, leading to the conclusion that there is no save level of lead for children (Barbara Nussbaumer-Streit, 2020).

Population Affected

Lead poisoning has been linked with physical and cognitive impairment in children and adults. Efforts have been made to reduce or eliminate potential exposure, unfortunately children living in areas of lower socioeconomic status typically are near industrial areas that are lacking in preventative measures to effectively prevent lead exposure. Older households, built before 1987, are more likely to have sources of lead including paint and lead pipes (Frumkin, 2016). Exposure to lead dust from old paint and contaminated drinking water from lead pipes are the most common source of exposure in children in these areas. Lead is more damaging to younger

individuals causing physical and neurological disorders, higher levels of blood levels are associated with more severe physical and mental damage. Interventions aim to reduce the exposure of children to domestic lead sources by specialized cleaning, identification of lead containing objects within the household, and the removal of lead dust. The potential impact of implementing these interventions would be a reduction in secondary exposure to lead preventing further harmful effects to the health of children. Reduction in the blood lead levels would improve the quality of life for children and potentially reduce the rate of childhood cognitive and neurological impairment in lower socioeconomic areas (Barbara Nussbaumer-Streit, 2020). Identification of at-risk areas is important and with increased implementation of interventions rates of lead poisoning in children will be potentially significantly reduced. With this preventative intervention future generations of children will not have to experience the health impairing effect and danger of lead leading to a potentially better quality of life (Kennedy, 2014).

Geographical Area

Institute for Health Metrics and Evaluations (IHME) for 2019 estimated lead exposure accounts for 900,000 deaths worldwide. The burden of disease is higher in low- and middle-income countries. In the U.S. 535,000 children ages 1-5 have blood lead levels high enough to cause health deterioration. Homes built before 1978 have a higher risk of containing lead pipes and paint that has deteriorated and become inhalable dust particles (World Health Organization, 2021). In the U.S. it is estimated that twenty-four million homes contain deteriorated lead-based paint and increased levels of lead contaminated house dust (Centers for Disease Control and Prevention, 2012).

Sustainable Development Goals

The World Health Organization (WHO) has classified lead as one of ten chemicals in public health needing action to protect the health of workers, children, and pregnant women. Public health authorities and health professionals utilize evidence-based guidance to protect the health of children and adults from lead exposure. The WHO joined the United Nations Environment Programme to form the Global Alliance to Eliminate Lead Paint. The WHO partnered with projects funded by the Global Environment Facility to support forty countries in enacting lead paint controls (World Health Organization, 2021). The Clean Air Act regulates the release of lead into the atmosphere, with the phasing out of leaded gasoline in 1986 this has significantly reduced the amount of lead released into the air. The Clean Water Act and Safe Water Act protects and regulates the use of lead pipes, under this act the U.S. Government has implement fifteen billion to remove and replace the aging lead pipes use for drinking water. The Environmental Protection Agency (EPA) regulates and provides guidance for the removal of residential and industrial sources of lead. The Occupational Safety and Health Administration established standards and surveillance programs to prevent occupational exposure to lead sources (Frumkin, 2016).

Discussion

Cultural backgrounds and traditions are a major component of how people understand and accept information. Public health communication may distribute information that may be contrary to a culturally established norm. Understanding cultural difference is important otherwise any efforts put forth may be less successful or end in complete failure. The diversity of the community does make communicating information to everyone in an equal manner more difficult. Public health communication may challenge the established norms for a community, in the case of lead poisoning

prevention and education gaining an effective understanding of the information should be the main goal of interventions (Frumkin, 2016). Educating parents on the dangers lead presents to children is especially important as understanding the most common and uncommon sources of lead exposure may be a surprise. Using a fear communication approach is not advisable as overall the effects will be short lived and stopping a practice will only cease for a brief time. Communication in an honest and clear fashion is the best approach to help parents gain a true understanding of keeping their children safe from sources of lead. Communicating the dangers of lead exposure to the homeowners needs to be done with the understanding that they may not have a high health literacy, meaning using scientific and confusing terms will only confuse and frustrate those being educated. Detailing the protective measures that can be done to prevent unnecessary exposure to lead, particularly for those of the community living in households at elevated risk of containing lead paint and those restoring historic homes are needed in the education design process. Communicating the information in an easily understood manner would yield the best retention of what was taught (Barbara Nussbaumer-Streit, 2020).

Intervention Strategy

Utilizing focus groups from the target population we can determine what level of understanding and acceptance the community is willing to accept before proposed interventions in educational and environmental efforts are implemented. The focus groups will collect qualitative data on attitude and beliefs the community has toward the interventions. Utilizing this information, it can be used to determine if interventions will be successfully implemented and more importantly that educational and environmental interventions will continue to be reinforced within the community (AN, 2014). Educating about the dangers of lead exposure and methods of removing the sources of lead are the subject of intended interventions. The interventions focus

on secondary prevention in children who have already been exposed to a lead source. The interventions target to reduce existing lead exposure or prevention of further lead exposure in children with low levels of blood lead levels. Interventions utilize environmental and educational methods. The educational interventions are intended to provide knowledge to parents and caregivers to understand the pathways of lead exposure and household measures to remove lead sources. The environmental interventions focus on prevention of lead exposure and cost-effective lead hazard reduction techniques and procedures. Environmental and educational interventions are used in combination with each other to educate and reduce environmental lead contamination. Several studies published review the effectiveness and safety of these interventions, the overall effectiveness of these interventions varies by location as variations in the intervention results in various levels of success (Barbara Nussbaumer-Streit, 2020).

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