

Review Article

The Importance of Public Health Intervention Programs in Childhood Cancer Prevention

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Abstract

A childhood cancer diagnosis can be devastating for both children and their parents; however, most cancers can be prevented early in life. The pediatric cancer rate in the USA among children under 20 years of age increased by 34% between 1975 and 2017. Experts in oncology have suggested several behaviors that may lower the risk of cancer in children, such as monitoring folic acid during pregnancy, physical activity, breastfeeding, and maintaining a healthy environment. Exposure to certain harmful substances could predispose children to cancer. Exposure can include a mother's alcohol and tobacco use during pregnancy, air pollu-

tion, exposure to diethylstilbestrol (DES) in utero, CT scans or X-rays, and secondhand smoke, among other chemical substances. In this commentary article, we aim to evaluate the efficacy of the STAR Act program in reducing the pediatric cancer rate in Washington, DC.

Keywords: Pediatric Cancer; Childhood Cancer Prevention; STAR Act Program

1. Introduction

In the District of Columbia, the probability of developing a specific type of cancer depends on several

factors, including demographics, the prevalence of risk factors, such as smoking or obesity, and multifactorial events. Childhood leukemia is a product of many molecular changes in stem-like cells that can divide while maintaining an immature state. Meta-analyses of parental tobacco smoking and childhood acute lymphocytic leukemia revealed that 6 out of 13 studies showed significant positive associations. Women smoking had an odds ratio (OR) of 1.24 with a 95% confidence interval (CI) 1.07-1.43 during pregnancy, an OR = 1.25, 95% CI = 1.08-1.46 at preconception, and an OR = 1.24, 95% CI = 0.96-1.60 after birth [1]. Researchers at the University of California, Berkeley's School of Public Health, found that children with acute lymphoid leukemia (ALL) had received three or more X-rays, especially chest X-rays, compared with children who were not diagnosed with leukemia [2]. Ionizing radiation, which is also present in the soil and the air we breathe, is a source of irradiation that can result in a high incidence of leukemia in young children due to the rapid division of cells at this age. Recent studies have shown that healthcare providers are cautious in their use of these diagnostic X-rays in children and only use them when necessary, such as diagnosing respiratory diseases and bone fractures.

Computed tomography (CT) scans also emit rays while producing a 3-D image. A 2009 study carried out by the National Cancer Institute (NCI) projected that 72 million CT scans received by Americans would lead to 29,000 cases of cancer. Therefore, only ultrasound diagnostics are used with children under one year of age according to the American Board of Pediatricians. Several types of planning models are used in modern public health practices. Planning models are used as an organizing framework in any health promotion effort aimed at reducing a given disease in the population [3]. A few important steps

are necessary in health promotion planning. The two planning models used in the plan to reduce the rate of pediatric cancer in the District of Columbia are the STAR Act program and Mobilizing Action Towards Community Health (MATCH).

2. STAR Act Program

The STAR Act was signed into law on June 5, 2018. The program is designed to support research and pediatric-focused cancer treatments, improve surveillance of childhood cancer, and provide the necessary resources for cancer survivors. The STAR Act program aims to ensure that no child dies from cancer by funding advanced research studies. Organizations, such as pharmaceutical companies and medical scientists, execute studies to discover the various causes of cancer affecting both children and adults and to publish approaches toward protecting young children from exposure to carcinogenic agents. Between 2019 and 2023, the legislative arm of the government authorized an annual amount of \$30 million toward programs and research to help bring a cure to childhood cancer through the National Institute of Health (NIH) and the Centers for Disease Control and Prevention (CDC).

The National Cancer Institute's (NCI) surveillance in 2014 predicted that 1 in 285 children in the United States would receive a cancer diagnosis before their 20th birthday. Worldwide, there is an annual estimate of 175,000 cancer diagnoses in children under 15 years of age. Through already existing programs, 90% of childhood cancer patients have received treatment in clinical trials through the NCI's pediatric oncology branch, which has been successful, with a cancer survival rate reaching 80% [4]. Some childhood cancers are not caused by lifestyle-related risk factors, such as smoking or other risky adult behaviors; most

childhood cancers result from environmental factors, such as radiation exposure during radiation therapy for other cancer treatments, making them unavoidable and unpreventable. In some cases, childhood cancer could be the result of an inherited gene that predisposes kids to certain cancers, such as the genes TP53 and Rb among others; in this situation, a doctor would recommend a preventive surgery to remove an organ before it becomes cancerogenic [5].

2.1 Prospective outcomes of the STAR Act program

The vision of the STAR Act program, in collaboration with the American Cancer Society, is to execute behavioral research that will reveal cancer risk behaviors and improve the outcomes of cancer treatment as well as the quality of life among survivors, their caregivers, and the population at large. The STAR Act has an Epidemiology Research program whose function is to reduce the rate and impact of cancer on people by conducting a wide range of prospective studies to better understand cancer origins, survival rates, long-term survivorship, provide information on available cancer prevention, and control programs, policies, and guidelines. Studies have illuminated some preventative measures, and a few risk factors have proven to be contributing factors toward childhood cancer:

- Maternal alcohol use while pregnant could result in leukemia in the baby.
- Benzene chemicals could cause childhood acute lymphoblastic leukemia.
- Carbon tetrachloride could cause Neuroblastoma.

Further, vaccinating children against HPV (Human Papilloma Virus) at age 11 or 12 can prevent, or at

least lower the risk, of acquiring some childhood cancers. Encouraging parents to vaccinate their children against HPV can protect children's health. HPV is a virus that passes from person to person either through sex or bodily fluids, and, when not prevented, could cause cervical cancer, vulvar cancer, cancer of the penis, and cancer of the oropharynx [6]. Additionally, the STAR Act works with other local health promotion organizations to educate parents about the need to talk to their children about smoking. Studies have shown that one in every four high school students and about one in every 14 middle school students have used tobacco products in the past month. Therefore, it is important to inform parents of the need to share the dangers of smoking with their children.

Another mission of the childhood cancer prevention program is to inform parents about the need to protect their children's skin while exposed to the sun, for instance, at the beach. Prolonged sun exposure can result in melanoma, which is a dangerous skin cancer. Only a few serious sunburns can increase the risk of skin cancer later in life. Each stage of a child's life has unique features that warrant different approaches and strategies to decrease their cancer risk. Thus, it is imperative to promote protective factors, such as avoiding X-ray radiation, avoiding head CT scans of children's developing brains (which are at increased susceptibility to cancerous growth), ensuring baby bottles are BPA-free, vaccinating all children, and using sunscreen.

2.2 Effective public health intervention

Actions need to be taken to ensure that people understand these risk factors and to adopt the current information into public health practice. It is important to strengthen cancer epidemiology, its surveillance

based on the existing information, and to apply new findings into practice through multidisciplinary partnerships [7]. The CDC has provided funding to several cancer registries to speed up the tracking of both pediatric and young adult cancer cases and to increase the availability and accessibility of all corresponding surveillance data at the national, state, and local levels. On the community level, the CDC has made efforts to communicate information from recent research about opportunities for cancer prevention through the CPAL workgroup.

3. Mobilizing Action Toward Community Health (MATCH)

The MATCH model is used in most health promotion programs to guide and demonstrate the program's major activities, to create county health rankings in each individual state, to evaluate partnerships and increase involvement of the population in the health improvement plan, and to encourage and support communities that implement evidence-based programs and policies to improve community health [8].

4. Logic Model

The Logic Model can be used to identify certain health programs and the short-term, intermediate, and long-term outcomes of a health promotion program. The Logic Model links the outcomes of a health promotion program to the activities of the program, which indicates a program's importance and details the expected intermediate outcomes before the program's future outcomes can be known [9]. The main components of the Logic Model are:

- 1) Inputs: These are resources needed for the health promotion program, in this case, the STAR Act program. These inputs may include public donations, healthcare professional volunteers, private organization support, advisory boards, legislation, rules, regulations, and equipment.
- 2) Activities: These are events and individual efforts that occurred during the program. Activities needed in this program include developing a coalition, writing a health plan for the target community, developing a detailed and integrated surveillance system, developing appropriate media advertisements to resonate with and educate the population on pediatric cancer, and developing programs to educate the public on the best practices to reduce exposure to carcinogenic agents.
- 3) Outcomes: These are the intended results of the program. In this case, outcomes include a reduction of child X-rays for diagnostic testing, a decrease in secondhand smoke, the elimination of toys, spoons, and plates which are not BPA-free, and media campaigns on carcinogenic agents, especially secondhand smoke and chemicals.
 - Short-term outcomes: These explain the instant effects of a program focusing on the understanding and knowledge of the target population, attitudes, and skills gained by the target audience. Examples include a decrease in tobacco smoking around children, increased use of BPA-free kids' products, a decrease in child X-rays, increased use of environmentally friendly chemicals for cleaning in residential areas, schools, and hospitals, and an increase in public exposure to information regarding carcinogenic agents.

- Intermediate outcomes: These are behavioral or policy changes following program implementation. Examples include the prohibition of tobacco smoking in public places and an improvement of the population's attitudes and behaviors toward the prevention of pediatric cancer.
- Long-term outcomes: These take time to accomplish. In this case, a decrease in the death rate from childhood cancers and a decrease in morbidity due to chemotherapy are the ultimate goals of every health promotion program.

In my opinion, the Logic Model is the best tool for program implementation because it completely outlines the steps which will guide the STAR action plan from start to finish. Using the Logic Model will enable program transparency to diverse stakeholders, help create common and equal understanding of the program and its prospective outcomes, document the processes of the health promotion program, and predict short-term, intermediate, and long-term outcomes [10]. The Logic Model for the STAR Act program serves as an evaluation tool which allows program planners to make decisions that will impact the projected outcome. After completing the evaluation processes and identifying their activities, the program planners will then be able to determine which data needs to be collected, allowing the stakeholders to revisit the Logic Model as often as needed. The Logic Model emphasizes evaluation, as it helps ensure accurate and meaningful data collection for the duration of the program. The Logic Model is useful to a selected program due to its dependence on data. Accurate health data of the target community

is important for a better understanding of the community. Further, the Logic Model provides information on the effectiveness of the health program and which areas require improvement. Evaluation of a program can be conducted through surveys via phone calls, emails, and postcards to all community residents for feedback to determine which aspects of the program require improvement.

The Logic Model provides an illustration of steps in which the STAR Act program executes effective health promotion to end paediatric cancer.

- Step 1: social assessment
- Step 2: epidemiological assessment
- Step 3: behavioral and environmental assessment
- Step 4: educational and ecological assessment
- Step 5: administrative and policy assessment
- Step 6: implementation of the plan
- Step 7: process evaluation of the newly implemented plan
- Step 8: evaluation of the new plan's impact
- Step 9: evaluation of the plan's outcomes

4.1 Advantages of STAR Act logic model

- 1) It helps to integrate planning, program implementation, performance tracking, and program evaluation.
- 2) It prevents confusion between activities and effects.
- 3) It helps clarify the purpose of the health program to its target audience.
- 4) It helps keep staff and stakeholders focused on the outcome.

- 5) It helps health program planners create a scale of priority for proper resource distribution.
- 6) It uses evidence-based models to create and refine the health program.
- 7) It helps indicate which areas or parts of the health program require amendment.

4.2 Disadvantages of STAR Act logic model

- 1) It does not adequately clarify the health program.
- 2) It is time consuming.
- 3) It relies heavily on data collection and, thus, is useless without data.
- 4) It raises the fear threshold in the hearts of people.
- 5) It focuses heavily on perfection, which can disrupt the stages of behavioral changes in the population and can feel like chore in people's minds.
- 6) Its program evaluation suggests people are specimens rather than collaborators [11].

5. Conclusion

Childhood cancer is a continuous health problem in the U.S and worldwide., and so, efforts necessary for cancer prevention in children requires an integrated and comprehensive approach by addressing Nutrition (obesity, DM, etc), environmental factors (air pollution, radiation), and individual factors (genetic counselling, second-hand smoking) that influence cancer risk. Several health promotion programs described in this study have shown promising results in reducing cancer risks in children. We hope this commentary will be useful to all health professionals especially those working in health promotion and cancer prevention programs for children.

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The authors report there are no competing conflict of interests to declare.

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