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Abstract

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Keywords: Economic evaluation; Cost-e ectiveness analysis; Programmatic cost analysis; Behavioral problems; Attention-de cit hyperactivity disorder

Introduction

For the more than 15 million children living in poverty in the United States, there is an increased risk for poor health and developmental outcomes [1-8]. Poverty is associated with developmental delays, special education placement, and academic failures [9-13], along with poor hhyperactivity disorder (ADHD) [2,33,34]. ADHD prevalence is disproportionately high among children living in poverty [2] and is associated with impaired educational performance, delinquency, and increased use of school-based services [33]. Children and adolescents with ADHD cost have associated costs that are $38 to $72 billion more than others, primarily through increased health care and education costs [34]. In adulthood, ADHD is associated with increased absenteeism [35]; productivity losses of $87 billion to $138 billion (2010 US$) in the United States [34]; and higher rates of incarceration, psychiatric disorders, and death [36].

Recent research indicates the strong relationship between adverse experiences among low-income children and families and poor child development and health outcomes [37-41]. Research also documents the mitigating e ects of early prevention and intervention programs on the relationship between the adverse experience of poverty and child development and health outcomes [42-45]. However, it is less clear how much these interventions cost or how the costs of these interventions compare to their outcomes. For example, in the Elmira Prenatal/Early Infancy Project (PEIP), families receiving home visits were found to save the government $1772 (1980 US$) per family compared to a randomized control group, with low-income families saving the government $3498 per family [44]. When program costs in this study were compared to savings in government expenditures, such as food stamps and Medicaid, and tax revenue from maternal employment, the savings was $180 per family. In the Chicago Child-Parent Centers (CPC) program, a bene t-cost analysis found a return to society of $7.14 (1998 US$) for every dollar invested in the program by improving economic well-being, increasing tax revenues, and decreasing government expenditures in education and crime [45].

e purpose of this research is to conduct a cost-e ectiveness analysis of the Legacy for Children™ program, which was developed as a public health strategy to improve child health and development [46]. e program was developed using federal funds and resides within the public domain. Using data from a recent evaluation of Legacy [47], we describe the approach for collecting and analyzing the programmatic costs and we determine the cost-e ectiveness of the program to reduce referable levels of behavioral concerns and risk for ADHD among participant children. is research is an important step towards the dissemination of an evidence-based public health intervention aimed at improving the developmental health of children born into poverty [48].

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Methods

e legacy intervention

e Centers for Disease Control and Prevention (CDC) developed the Legacy program in collaboration with the University of California - Los Angeles (UCLA) and the University of Miami (UM) to focus on preventing the negative consequences of poverty on children. Perou et al. [46] previously described the methods and sample characteristics. e primary focus of the intervention is to provide a supportive, group environment that fosters self-e cacy and a sense of community, while providing developmentally appropriate information about child development. e anticipated outcome of the group intervention is improved quality of interaction between participating mothers and their children, which should serve to promote developmental outcomes. Legacy provides a unique approach compared to other early childhood interventions as it focuses on developing self-e cacy and a sense of community among mothers, rather than providing case management for the mother or child. Legacy has undergone testing of its e ectiveness at two sites, Miami and Los Angeles (LA). In Miami, 300 participants were recruited in the hospital shortly a er the child's birth and randomized to either intervention or comparison groups; in LA 306 participants were recruited and randomized prenatally. Inclusion criteria included Medicaid-eligibility, living within the servable catchment area, having had some prenatal care, and being conversant in English.

Each site used the same intervention model (core components and goals), while developing a site-speci c curriculum to t their population's needs. Intervention specialists who were trained in the intervention goals and delivery facilitated the sessions. At both sites, the curriculum included a segment each week on a topic of relevance to mothers with a child of a certain age. e intervention specialists also allowed time for unstructured discussion among the group members to build a sense of community among the mothers, and time each week for facilitated parent-child interaction. In Miami, mothers were invited to meet weekly for 1.5-hour sessions from a few weeks a er birth until the time their child was 5-years of age. In LA, the structure of the program incorporated ve 1-hour prenatal sessions followed by nine blocks of ten 1.5-hour sessions between birth and the child reaching 3 years of age. e group sessions alternated between mother-only sessions and sessions when the mother and child attended.

e Institutional Review Boards conducted human subject reviews at the CDC, Research Triangle Institute, UCLA, UM, and at Western IRB between 2005 and 2008 when UM contracted with them to conduct human subjects protection reviews.

E ects

Programmatic e ects and costs were prospectively assessed for N=381 (N=194 in Miami and N=187 in LA) mother-child dyads that participated in the Legacy trial and were followed-up through 5 years of age. A complete description of the Legacy intervention design [46] and results of the evaluation of socio-emotional and behavioral

separately comparing the Legacy program implemented in each site to the comparison scenario when e ects were at least marginally signi cant. For this study, the ICER compares the di erence in costs of Legacy and the control group (assuming costs for the control group were zero) to the di erence in e ects of these two groups. e interpretation of the ratio is the additional cost needed to produce a one percent reduction in the outcome and a smaller ICER implies a lower cost to achieve an outcome. Families randomly enrolled in the comparison arm of the study received the same developmental assessments of the intervention

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therefore the ICER is $91,100 per child at high risk for ADHD avoided, comparing Legacy families to comparison families.

Sensitivity analyses

Figure 1 presents the CEACs for severe behavioral problems in Miami and high risk for ADHD in LA with the probability that Legacy was cost-e ective, plotted from a willingness to pay of $0 to $500,000. ere is greater than a 50% probability of cost-e ectiveness by $100,000 in Miami and $200,000 in LA. erefore, if a decision maker's threshold is greater than $100,000, there is a greater than 50% probability that Legacy

ADHD avoided may be closer to $400,000. One-way sensitivity analyses of analysis assumptions did not significantly impact the interpretation of the study results.

While typical willingness to pay thresholds for severe behavioral

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