



ADVANCING HEALTH EDUCATION &amp; RESEARCH



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# AVA Research Review

## ADVANCING HEALTH EDUCATION & RESEARCH

**Review Title:** Evaluation of a Statewide Abusive Head Trauma Prevention Program

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**Article:** Zolotor, A. J., Runyan, D. K., Shanahan, M., Durrance, C. P., Nocera, M., Sullivan, K.; Klevens, J., Robert Murphy, R., Barr, M., & Barr, R. G. (2015). Effectiveness of a statewide abusive head trauma prevention program in North Carolina *JAMA Pediatrics*, 169 (12), 1126-1131. doi:10.1001/jamapediatrics.2015.2690

### Article Summary:

**Brief Overview:** Abusive head trauma (AHT), previously known as shaken baby syndrome (SBS), is a significant public health problem. Since infant crying is an important stimulus for AHT, one approach to prevention is to increase

caregivers' understanding and knowledge about crying and to reduce the incidence of AHT (Barr, 2014). The National Center on Shaken Baby Syndrome (NCSBS) has developed a statewide universal AHT prevention program utilizing an educational framework called the Period of PURPLE Crying (PURPLE) that educates parents specifically about the features of infant crying. However, very limited research has assessed the effectiveness of this prevention program on reducing AHT rates directly. This study was a timely one in assessing the effectiveness of the PURPLE program on reducing the incidence of AHT in North Carolina.

The PURPLE program models the child maltreatment prevention framework of the Triple P (Positive Parenting Program). With the main goal of preventing child maltreatment, Triple P has been designed to educate

parents and families by providing multi-level services, including media strategy, parenting advice, parenting skills training, and intensive parenting intervention (Bentovim and Gray, 2014). The PURPLE program, adopting parts of Triple P, was implemented in three doses in North Carolina, including universal intervention, reinforcing message, and media campaign. From June 1, 2009, to September 30, 2012, 88.29% of parents of newborns (n=405,060) received the universal intervention (Dose 1), including nurse-provided education and prevention materials (DVD and booklet). From January 2, 2010, to the end of the program, reinforcing message (Dose 2) was delivered in most primary care settings. Media campaign (Dose 3) including paid radio commercials in 3 of 6 large media markets in the state was implemented from January 1 to September 30, 2009.

The authors evaluated the effectiveness of the PURPLE intervention in North Carolina by assessing the change in caregiver's help-seeking behaviors and the change in state-level AHT rates after the intervention. The change in caregiver's help-seeking behaviors was measured as the change in the statewide number of telephone calls to an after-hours nurse advice line

for crying concerns without other reported symptoms from January 1, 2006, to December 31, 2010. The authors employed an econometric difference-in-difference analysis to assess the change in AHT rates per 100 000 infants in North Carolina and five comparison states (i.e., New York, Arizona, Colorado, Wisconsin, and Maryland) from January 1, 2000, to December 31, 2011. Two economic factors (i.e., midyear unemployment rates and mortgage foreclosure data) were controlled when assessing the change in AHT rates.

### Relevant Findings:

The study found a reduced proportion of parental telephone calls to the nurse advice line. Specifically, parental telephone calls declined by 20% for children younger than 3 months (rate ratio, 0.80; 95% CI, 0.73-0.87;  $P < .001$ ) and by 12% for children 3 to 12 months old (rate ratio, 0.88; 95% CI, 0.78-0.99;  $P = .03$ ). However, there were no significant differences between the mean AHT rates of children younger than 1 year in North Carolina and in five comparison states before and after the intervention. North Carolina had mean AHT rates of 34.01 per 100,000 person-years before the intervention and

36.04 per 100,000 person-years after the intervention. The comparison states had mean AHT rates of 33.22 per 100,000 person-years before the intervention and 33.41 per 100,000 person-years after the intervention. There was no obvious trend in AHT rates among different children in North Carolina.

### Authors's Conclusions

The authors also highlighted the strengths of the study. For example, both the large setting and sample size were reliable for assessing the change in the state-level AHT rates. Also, they suggested that the difference-in-difference analysis, which simulated an experimental research design by using observed data, was an important statistical technique to evaluate the effectiveness of child abuse prevention.

### Potential Limitations:

The authors addressed several limitations of this study. For example, they were unsure whether or not the high-risk parents or families in North Carolina for AHT were involved in the intervention program. Also, although there was no statewide intervention in the comparison states, the possible existence of intervention programs in the regional or local level might have impacted the outcomes of this study.

Moreover, the data regarding the AHT rates were based on administrative claims data rather than data collected specifically for research use. Additionally, the analytic power of the intervention was limited by both the small sample size (72 observations) in the difference-in-difference analysis and the short-term (3 years) of data which were collected after implementation of the intervention. Therefore, authors suggested that more effective preventive interventions to AHT should be developed and more rigorous evaluation conducted in the future.

### Reviewers' Comments:

The study is important in the field of AHT and child abuse prevention. Although some previous research demonstrated an association of an increased caregivers' knowledge concerning crying and shaking with the PURPLE intervention (e.g. Fujiwara et al., 2002), the study makes a contribution by directly evaluating the effectiveness of a universal AHT prevention program in reducing AHT rates at the state-wide level. After all, to reduce the risk for AHT is the major purpose of child abuse prevention programs.

The results did not support the effectiveness of the PURPLE program in reducing the incidence of AHT in North Carolina. In fact, to evaluate such a large-scale program in a real-world context is very challenging because of the rare incidence of AHT and the large year-to-year variability (Barr, 2014). The study employed a pre- and post-intervention design, in which some unmeasured variables might confound the results of this study. For example, although two economic indicators were controlled when assessing the change in ATH rates, other economic factors, such as consumer price index or housing starts, might also impact the AHT rates within states during the period of economic recession. Also, the study measured the outcome by assessing the change in the number of telephone calls to a nurse advice line. However, the change of caregiver's help-seeking behaviors might occur because there was more supportive information available through other media such as the internet rather than through the program.

The authors indicated that the study was not designed as a randomized clinical trial (RCT). But they argued that a RCT design might not be feasible to evaluate the effectiveness of universal interventions on reducing rare illnesses.

In fact, a place randomization design employed in some Triple P population outcome studies (e.g., Every Family Study and U.S. Triple P System Population Trial) may be an appropriate method to evaluate the effectiveness of universal interventions. In a place randomization design, geographic areas, such as cities, counties, or states, would be randomized to either intervention or control (Bentovim and Gray, 2014). It may be more informative scientifically to include comparison groups when evaluating the effectiveness of child maltreatment prevention programs.

The ineffectiveness of the intervention might be the reason for the non-significant outcome of this study. Although infant crying is "the most significant trigger for AHT", causes of AHT may be more complicated in the context of the family. There are many risk factors for AHT, such as young and/or single parents, unwanted pregnancy, financial problems, domestic violence, and limited or no immediate support system. In order to develop an effective preventive intervention for a complex and elusive problem, there is an urgent need for interventions which mediate known risk factors for AHT, including, but not exclusive to, crying.

Additionally, since the main goal of an evaluation is to improve the program performance (Wholey et al., 2010), the study under review may highlight the need to provide additional strategies to improve the performance of the PURPLE intervention.

In summary, this is an important study which demonstrates the challenges in developing a unidimensional intervention to address a multidimensional problem. Evidence to support the effectiveness of prevention interventions in reducing AHT rates is still needed.

**References:**

- Barr, R. G., (2014). Crying as a trigger for abusive head trauma: a key to prevention. *Pediatrics*, 44 (4): S559-564.
- Bentovim, A. & Gray, J. (2015). *Eradicating Child Maltreatment: Evidence-Based Approaches to Prevention and Intervention Across Services*. Philadelphia, PA: Jessica Kingsley Publishers.
- Fujiwaraa, T., Yamadaa, F., Okuyamac, M., Kamimakid, I., Shikorod, N., Ronald, G., & Barre, R. G. (2012). Effectiveness of educational materials designed to change knowledge and behavior about crying and shaken baby syndrome: A replication of a randomized controlled trial in Japan. *Child Abuse & Neglect*, 36, 613-620.
- Wholey, J. S., Hatry, H. P., & Newcomer, K. E. (2010). *Handbook of Practical Program Evaluation (3rd Edition)*. San Francisco, CA: Jossey-Bass.