

## BRIEF REPORT

# Impact of a community based fire prevention intervention on fire safety knowledge and behavior in elementary school children

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The objective of this study was to determine the impact of a community based fire prevention intervention directed only to parents on the fire safety knowledge and behavior in elementary school children. This was a prospective, quasi-randomized controlled study in which third and fourth grade students from two elementary schools in an urban, poor, minority community completed knowledge/behavior surveys at baseline and following completion of the intervention. The intervention group received an in-home visit from fire department personnel who installed free lithium smoke detectors and provided a fire escape plan. After accounting for a small difference in baseline summary scores of knowledge and behavior between the control and intervention groups, this study found a modest improvement in fire safety behavior among children whose families received a fire prevention intervention reflecting a change in household fire safety practices. However, there was no significant change in fire safety knowledge.

Fires are a leading cause of unintentional injury deaths among children in the United States. Each year, nearly 500 children die and 40 000 children are injured in fires.<sup>1</sup> Young children, in particular those under 5 years old, have a 2.5 times higher risk of dying in a fire compared to any other childhood age group.<sup>2</sup> Targeted educational efforts have been instituted and include school based programs directed towards children. These programs have been shown to improve fire safety knowledge among elementary school children.<sup>3–7</sup> However, they have not specifically assessed changes in fire safety behavior among households with children. We hypothesized that a community based fire prevention intervention directed only to parents has the potential to impact on children's knowledge and behavior.

## METHODS

We conducted a prospective, quasi-experimental study assessing the impact of a community based fire prevention intervention on fire safety knowledge and behavior in elementary school children. This study was a collaborative effort that included the SAFE KIDS Coalition of Southeastern Pennsylvania, The Children's Hospital of Philadelphia, the Philadelphia Fire Department, and the School District of Philadelphia.

Eligible subjects consisted of third and fourth grade students from two elementary schools that reside in a single census tract in an urban, poor, minority community in Philadelphia, PA previously identified by the Philadelphia Fire Department as a high risk area for fire related deaths and injuries. The study period included March through June 2003.

The parent/guardian of each student was given a two part consent form asking for (1) their child's participation in a

baseline and follow up survey regarding the child's fire safety knowledge and behavior, and (2) an in-home fire prevention intervention. The intervention group consisted of a sample of those students whose parent/guardian consented for the in-home fire prevention intervention. The control group consisted of children consented for the surveys but not for the intervention, as well as those children potentially eligible for the intervention who were not sampled.

Baseline and follow up surveys consisted of fire related "behavior" and "knowledge" questions (see online appendix at <http://www.injuryprevention.com/supplemental>). Knowledge questions were adapted from a previously validated survey instrument used for safety education in school children.<sup>7</sup> Answers to each question were assigned a frequency count which would be used to calculate a summary fire safety score for each student. This score was subdivided into "knowledge" and "behavior" subscores.

Baseline surveys were administered to all consented students in both control and intervention groups on a single day in the classroom supervised by the teacher and/or investigator. The intervention group then received the intervention which consisted of an in-home visit during school hours from fire department personnel who installed free 10 year lithium smoke detectors on each level of the residence. In addition, personnel provided a fire escape plan verbally and on a dry erase board placed on the refrigerator.

Four weeks after the baseline survey was administered, follow up surveys were completed by both control and intervention groups. All children received in-school fire prevention education at the completion of the study using *Risk Watch*, a previously validated safety education curriculum developed by the National Fire Protection Association.

The primary analysis consisted of a comparison of follow up summary scores as well as knowledge and behavior subscores between intervention and control groups. Analysis of covariance (ANCOVA) was used to assess the difference in mean follow up scores between the groups. In addition, the proportion of children who reported specific behaviors (that is, practicing a fire escape plan) at follow up was compared between groups using Fisher's exact test. All analyses were performed using Stata 7.0 (Release 7.0, Stata Corporation, College Station, TX, USA).

This study was approved by the Institutional Review Board of The Children's Hospital of Philadelphia and the Research Review Committee of The School District of Philadelphia.

## RESULTS

Of 436 third and fourth grade students enrolled at the target elementary schools, 179 consented to participate in the study. Those that did not consent shared similar demographic characteristics as the consented students. Of the consented students, 58 consented for participation in the surveys only and 121 consented for participation in both the surveys and the in-home fire prevention intervention. Twenty eight

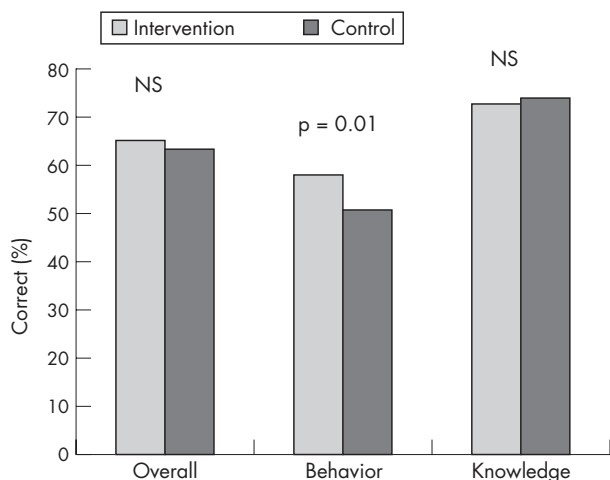


Figure 1 Adjusted follow up scores.

students were absent at the time surveys were distributed and one was excluded for protocol violation leaving 72 and 78 students in the control and intervention groups, respectively.

There was a small difference in baseline summary scores of knowledge and behavior between the control and intervention groups (control: 62.5% v intervention: 58.6%). The intervention group demonstrated a modest improvement in the summary follow up score, improving by nearly 5.9% versus 1.4% in the control group resulting in similar summary follow up scores. The results of the intervention group were largely due to an improvement in their behavior subscores. After accounting for baseline scores, there was a significant improvement in the adjusted follow up scores for behavior among the intervention group by 7.0%; 95% CI 1.5 to 12.5% (see fig 1).

Compared to the control group, at follow up the children in the intervention group were more likely to report fire escape plans written on paper (OR 2.3; 95% CI 1.1 to 4.7) and the identification of a meeting place outside of the home if the smoke detector alarmed (OR 1.9; 95% CI 1.0 to 3.8). There was no difference between control and intervention groups at follow up regarding the presence of smoke detectors in the home, lighting of matches or lighters, the child cooking on a stove, or having a fire extinguisher in the home.

**DISCUSSION**

This study aimed to determine the impact of a fire prevention intervention directed at parents on the fire safety knowledge and behavior of elementary school children. The evaluation of fire prevention programs has been recognized and is clearly important in order to assess change in knowledge and behavior regarding fire and burn prevention.<sup>8-9</sup> For example, *RiskWatch*, which was initiated at the participating elementary schools at completion of the study, is a previously validated safety education curriculum for preschool through eighth grade that targets eight different injury prevention areas including fire prevention. A three year analysis revealed that there were significant gains in children’s knowledge of important safety behaviors when the group that received the *RiskWatch* curriculum was compared with a control group. However, from previous reports it cannot be assessed whether students gained an increase in knowledge specifically regarding fire safety. In addition, it is not known how any increased knowledge might translate into positive changes in fire safety behavior in the home. This may be particularly limited with regard to fire safety because many

behavior changes require participation or input from other family members who may not have received the education.

Other school based programs that focus primarily on fire and burn prevention have demonstrated improvement in fire safety knowledge among students.<sup>3-7</sup> However, all of these programs were aimed at directing fire prevention education towards children themselves, and thus it is not surprising that they demonstrated improvements in their knowledge of fire prevention. The students in our study did not receive any direct education on fire prevention from the investigators until completion of the study. This may explain why students did not demonstrate an improvement in the knowledge portion of the survey.

It was beyond the scope of the current study to evaluate whether this community based fire prevention intervention will result in lower morbidity and mortality secondary to fires. The use of smoke detectors has been shown to be a cost effective strategy to decrease morbidity and mortality caused by fires.<sup>10</sup> However, surveillance studies of residential fires in the United States demonstrate that poor socioeconomic status, among other factors, has been associated with both lack of smoke detectors and inoperable smoke detectors.<sup>11-12</sup> The choice of using 10 year lithium battery operated smoke detectors as part of our intervention was aimed at overcoming this challenge.

Several limitations to our findings should be considered. This was not a true randomized controlled trial as students were distributed, in part, based on whether parents consented for the intervention or not. Thus, there is potential for bias in that households who consented for the intervention may have been more motivated to learn more about fire prevention. Baseline summary scores were indeed better for the control compared to the intervention group. Our analyses were able to account for this difference in baseline scores and still demonstrated an improvement among children in the intervention group. However, an additional limitation is that scores were based on student surveys and not actual observed behavior, and thus results of reported behavior may not be as reliable.

In conclusion, this study provides insight on how a community based fire prevention intervention directed to parents can affect elementary school children. The improvement in behavior subscores among the students suggests that families who received the fire prevention intervention positively changed some household fire safety practices. A combined approach in which children receive fire prevention education at school and households receive an intervention similar to what was provided in our study may be the most effective way for improving both fire prevention knowledge and behavior in households with children.

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**Key points**

- Fires are a leading cause of unintentional injury deaths among children in the United States.
- Fire prevention strategies have been shown to reduce fire related injuries.
- Fire safety behavior among households improves with an in-home fire prevention intervention.



An appendix to this article is available on our website

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