Correlates of Reported Smoke Detector Usage in an Inner-City Population: Participants in a Smoke Detector Give-Away Program

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Abstract: As part of a smoke detector give-away program, 388 adults were surveyed to characterize smoke detector ownership in a low-income population and to identify those who would acquire a free smoke detector following their child's visit to the hospital. Factors associated with smoke detector ownership included higher education, home ownership (vs public housing), knowledge of the city smoke detector law, and the practice of other injury prevention measures. Regardless of ownership, the great majority of parents (82 per cent) acquired a free smoke detector, but those previously without a smoke detector were more likely to do so. These characteristics of smoke detector usage and acquisition should be considered in targeting future intervention strategies. (*Am J Public Health* 1988; 78:650–653.)

Introduction

Residential fires are the leading cause of death from unintentional injury in the home for individuals from ages one through 64 years.[1] Two thousand deaths occur annually among children under the age of 15 years,[2] with those under four years of age being at highest risk.[3] The installation of smoke detectors is an inexpensive, reliable mechanism for reducing this risk.[3–5] Injury prevention theory suggests that the one-time process of installing a smoke detector is likely to be performed,[6,7] and thus be an effective strategy for injury prevention among children.[8,9] Despite recommendations of the American Academy of Pediatrics for anticipatory guidance in the prenatal or newborn visits and other public health strategies, smoke detectors are not used universally.[9–14]

Few investigators have examined the motives affecting smoke detector utilization. Parental age, education, and home ownership have been positively correlated with smoke detector usage in some studies,[10,11,13] but not in others.[15] Establishing the correlates of smoke detector use may be more important for low-income populations who are at high risk for residential fires.[16] However, existing surveys have generally under-represented such groups.[10,11,13,15]

Our study had two purposes: 1) to characterize reported smoke detector utilization in a low-income population at risk for residential fires; 2) to characterize those who would be reached in a hospital-based smoke detector give-away program.

Methods

The target population came from West and South Philadelphia, an area having four of the 10 districts with the highest fire mortality in the city. Previous fire department estimates revealed few dwellings with smoke detectors. In August of 1984, the City of Philadelphia passed a new law requiring all one-family and two-family dwellings to have smoke detectors. The law was followed by a publicity campaign throughout that fall consisting of public service messages on radio and billboards and the offer by the fire department to provide free smoke detectors through neighborhood citizen block captains. As an adjunct to this effort, the fire department provided smoke detectors for a children's hospital-based give-away program.

Subjects eligible for the study were recruited over a two-month period from one of two locations:

- *The Emergency Department Walk-in-Clinic*—Of the approximately 70,000 Emergency Department visits per year, about 70 per cent (determined to be non-emergent) are seen in this clinic. Approximately 60 per cent of the patients are on Medicaid.
- *The Pediatric General Medical Clinic*—Approximately 13,000 children are seen per year and approximately 80 per cent are on Medicaid.

For all children who were registered from 9:00 am to 3:00 pm on week days, the accompanying adults were asked to complete a confidential, anonymous questionnaire designed to help the physicians "to serve our patients better." The five-page questionnaire was self-administered although assistants were available to answer questions. We asked for demographic information, risk factors for fire or fire injury, health care practices, and knowledge and usage of smoke detectors.

Upon completion of the questionnaire, the respondents were offered a numbered coupon which corresponded to the number of the questionnaire. The respondents had no prior knowledge that they would be offered a coupon which was redeemable for a free, ionized, battery-operated smoke detector at a third location. The redemption site was the hospital security department, a point somewhat removed, but equidistant, from both clinic sites and open from 8:30 am to 4:30 pm on week days only.

Results

Four hundred ninety-six adults were asked to fill out the questionnaire; 6 per cent refused to participate and 16 per cent did not complete the questionnaire. Of the 388 (78 per cent) who completed a questionnaire, six (2 per cent) left before receiving a coupon for a free smoke detector.

Characteristics Associated with Reported Smoke Detector Ownership

Most of the families were of low socioeconomic status as indicated by a relatively high proportion who received medical assistance, who had annual incomes <$12,000 per year, who did not finish high school, and who lived in public housing (Table 1). Those with smoke detectors were more

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TABLE 1—Socioeconomic Characteristics by Reported Smoke Detector Ownership vs Non-Ownership

Characteristics	Percentage				
	Total n = 388	Had Smoke Detector n = 257	No Smoke Detector n = 131	Difference	95% Confidence Interval
Live in public housing	21	16	31	15	25, 5
Did not complete high school	26	22	37	15	25, 5
Monthly income < $1,000	71	66	82	16	25, 7
Residence with ≤ 4 rooms	39	35	47	12	23, 1
Ownership of home	30	33	22	(−)11	(−)1, (−)21
Medicaid insurance	75	72	81	9	18, 0
Lived in home ≤1 year	29	28	29	1	11, (−)9
Apartment dwellers	20	18	24	6	15, (−)3
Black race	88	87	89	2	9, (−)5

TABLE 2—Injury Prevention Practices by Reported Smoke Detector Ownership vs Non-Ownership

Injury Prevention Practices	Percentage				
	Total n = 388	Had Smoke Detector n = 257	No Smoke Detector n = 131	Difference	95% Confidence Interval
For children 9 mos to 5 yrs					
Use of safety plugs	43	49	32	(−)17	(−)6, (−)28
Always keep medicines, sharp objects locked up	79	83	68	(−)15	(−)5, (−)25
Have ipecac in house	19	23	12	(−)11	(−)3, (−)19
For children <13 yrs					
% having MD visit for injury in past year	29	24	38	14	24, 4
For all ages					
Correct use of car restraint devices for child	43	48	34	(−)14	(−)3, (−)25

educated, had higher incomes, were more likely to own larger homes, and less likely to live in public housing.

The respondents were predominantly female (91 per cent) and single parents (75 per cent). Although most were in their twenties (58 per cent), a relatively large number were adolescents at the time when the child being seen was born (33 per cent). Most of the children seen were preschoolers (69 per cent). Families with infants were more likely to have smoke detectors (44 per cent vs. 33 per cent; 95% confidence interval of the difference: 0, 22%).

Injury Prevention, Health Care Practices (Table 2)

The great majority of respondents claimed never to leave their children who were under age 13 years alone (85 per cent) or with a baby sitter less than 13 years of age (93 per cent), to keep their medicines and sharp objects always locked up (79 per cent), to have screens or bars on their windows (84 per cent), and that their child's immunizations were up to date (89 per cent).

Other injury prevention practices were not as popular: 43 per cent reported using safety plugs in electrical outlets and 19 per cent had ipecac in the house (only 3 per cent of the 19 per cent knew how to use ipecac correctly). The great majority (98 per cent) did not know what temperature their hot water was or should be to prevent burns. Although close to half (43 per cent) reported correctly using car restraint devices for the child being seen, few (14 per cent) reported consistent use of seatbelts themselves.

Those with smoke detectors were more likely to practice injury prevention and reported that their children had fewer physician visits for injuries than those without smoke detectors.

Risk Factors for Fire, Fire Injury (Table 3)

Almost two-thirds of the families lived in one of the top 10 fire districts in Philadelphia as determined by zip codes; half reported that there had been a fire in their neighborhood, 8 per cent had had fires in their current homes, and 33 per cent had a friend or relative who had been in a fire. The majority of the households had smokers; many used wood stoves or space heaters, with half of the latter using kerosene heaters. Only a third reported having practiced fire drills.

Those without smoke detectors had more risk factors for fire injury than those with detectors.

Use and Knowledge of Smoke Detectors

Nearly all respondents believed that smoke detectors saved lives (98 per cent); most (66 per cent) reported having smoke detectors and 70 per cent knew there was a smoke detector law in Philadelphia. The most frequent sources of information concerning smoke detectors were: television (93 per cent), newspapers or magazines (58 per cent), and the radio (52 per cent). The majority (54 per cent) had purchased smoke detectors at a store and reported that they were in working condition (93 per cent). Only awareness of the smoke detector law discriminated those who had smoke detectors (75 per cent vs 60 per cent; 95% CI of the difference: 4, 26).

TABLE 3—Personal Risk Factors for Fire or Fire Injury by Reported Smoke Detector Ownership vs Non-Ownership

Factors	Percentage				
	Total n = 388	Had Smoke Detector n = 257	No Smoke Detector n = 131	Difference	95% Confidence Interval
Smoker(s) in family	64	64	65	1	12, (−)10
Smoke in bed	27	22	35	13	23, 3
Disabled family member					
Trouble hearing	7	6	8	2	8, (−)4
Trouble seeing	7	4	12	8	15, 1
Trouble walking	10	8	13	5	12, (−2)
Practiced a fire drill	31	35	25	(−)10	0, (−)20
Use space heaters/wood stoves	32	31	34	3	13, (−)7
Live in high-risk fire districts	63	62	65	3	14, (−)8
Have had a home fire	8	8	8	0	6, (−)6
Have been in a fire	16	14	20	6	15, (−)3
Report neighborhood fires	53	55	50	(−)5	6, (−)16

TABLE 4—Characteristics Associated with Participation or Non-Participation in a Smoke Detector Give-Away Program

Characteristics	Percentage			
	Picked up Free Smoke Detector n = 312	Did not Pick up Free Smoke Detector n = 70	Difference	95% Confidence Interval
Respondent's age ≤ 20 years	8	19	11	22, 0
Mother's age ≤ 20 years	13	23	10	21, (−)1
Child at CHOP ≤ 1 year of age	38	53	15	29, 1
Apartment dwellers	18	30	12	24, 0
Lived in current home 2–10 years	54	41	(−)13	1, (−)27
Report neighborhood fires	50	70	20	33, 7
Have practiced a fire drill	34	18	(−)16	(−)5, (−)27
Already have a smoke detector	63	76	13	25, 1
Heard about smoke detectors on radio	49	65	16	29, 3

Multivariate Analysis

When factors determined to be of importance were entered into a multiple regression equation, the strongest predictors of smoke detector ownership were: 1) *not* living in public housing; 2) higher education; 3) younger maternal age (but not teenagers); 4) the practice of fire drills; and 5) larger homes. Other injury prevention practices were analyzed separately, as appropriate for each age group, and retained an association with reported smoke detector ownership. Analysis by site of care (ED versus clinic) revealed similar patterns of relationship (data and analysis available on request to author).

Characteristics Associated with Participation in Smoke Detector Give-Away Program (Table 4)

The great majority of respondents (82 per cent) picked up a free smoke detector. Within this group, those without smoke detectors were more likely to pick one up. Other predictors included: residence in their home more than one year, but less than 10 years; the practice of fire drills; and failure to hear about smoke detectors on the radio. Individuals less likely to pick up a free smoke detector included: teenage mothers, mothers with infants less than one year old, apartment dwellers, and those who reported a fire in their neighborhood. The limited hours for smoke detector pick-up did not appear to influence participation in the give-away program as there was no difference between those who did or did not obtain a smoke detector and the time their child was registered. In addition, 3 per cent of the participants returned the next day to pick up the smoke detector.

The few respondents (n = 17) who neither had a smoke detector nor picked up a free one were less likely to practice fire drills (6 per cent vs 32 per cent), reported having more fires in their homes (25 per cent vs 8 per cent), and claimed not to know about the Philadelphia smoke detector law (50 per cent vs 71 per cent). Their children were more likely to have had more than one emergency department visit in the last year (86 per cent vs 55 per cent) (95% CI of the difference: 11, 51).

Discussion

In contrast to previous reports which indicated that smoke detector ownership is relatively rare among the poorer segment of the population,[10,12] we found a surprisingly high number of participants who reported having smoke detectors (66 per cent). Moreover, very few had obtained them from the fire department during the concurrent smoke detector campaign. Previous studies were conducted in the 1970s and early 1980s, and may not reflect the more recent rapid acceptance of smoke detectors.[17]

The best predictor of failure to have a smoke detector was residence in public housing. This important finding

argues for straightforward remedies such as requiring city officials to install smoke detectors. Such intervention programs by community groups and cities have proven successful with regard to other types of injuries.[6]

Higher education was the single most predictive characteristic of smoke detector ownership, with income and home ownership related to education. This result is consistent with nationally representative samples,[10,18] but not usually found in studies involving populations more homogeneous for socioeconomic status.[11,15] We found that smoke detector usage is associated with knowledge of the city smoke detector law and the practice of other safety behaviors. The former confirms another study which found that passage and belief in smoke detector laws is associated with higher smoke detector usage.[15] Room for improvement is indicated by the finding that very few parents reported hearing about smoke detectors from their primary care physicians.

Our results suggest another way in which these preventive services could be supplemented by primary care providers. The great majority (82 per cent) of participants acquired a free smoke detector in this program, even though for 3 per cent this required a return visit. Although a large percentage reported having a smoke detector, those who did not already have one were more likely to pick up a free smoke detector. Such programs may be particularly important for subgroups such as our older mothers and individuals who might not have been reached by radio publicity. We also identified a group resistant to such efforts (teenage mothers and apartment dwellers) who were less likely to take advantage of such a program.

Our results support the findings in a previous study of a city-wide smoke detector give-away program in Baltimore[19] that these programs, requiring active participation, are feasible in low socioeconomic populations which are at apparently high risk for fire. In contrast to the findings of the Baltimore smoke detector program, however, our participants who had increased *personal* risk factors for fire or fire injury were not more likely to acquire a free smoke detector. Different methods may account for this discrepancy: ours was an observational, prospective study design which investigated characteristics of participants in an injury prevention program; the Baltimore study was retrospective and used locations and population averages. Associations developed through this latter approach may be misleading, a situation described as the ecologic fallacy.[20] However, our results may not be generalizable to all populations; our reliance on self-report and our inability to confirm installation of the smoke detectors in order to maintain confidentiality were limitations. Nevertheless, other data support the premise that the one-time act of installing a smoke detector correctly is highly likely to occur; eight to 10 months after a give-away program by the Baltimore Fire Department, 92 per cent of smoke detectors were installed and 88 per cent operational in a low socioeconomic population.[19]

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