

# Smoke Alarm Giveaway and Installation Programs

## An Economic Evaluation

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### Appendix A

#### Projection of annual fire, fire death, and fire injury rates in target community

##### Data

Number of homes (Nh): 706<sup>a</sup>

Average number of reported home fires (Nf): 4<sup>b</sup>

Average number of reported home fire deaths (Nd): 0.038<sup>b</sup>

Average number of reported home fire injuries (Ni): 0.066<sup>b</sup>

Percentage of home fires without a functional alarm (Pf): 0.41<sup>2</sup>

Percentage of deaths occurring in home fires without a functional alarm (Pd): 0.62<sup>2</sup>

Percentage of injuries occurring in home fires without a functional alarm (Pi): 0.43<sup>2</sup>

##### Projections

Average number of fires in homes without a functional alarm (Nfna):  $Nf \times Pf = 4 \times 0.41 = 1.64$

Average number of home fire deaths without a functional alarm (Ndna):  $Nd \times Pd = 0.038 \times 0.62 = 0.0236$

Average number of home fire injuries without a functional alarm (Nina):  $Ni \times Pi = 0.066 \times 0.43 = 0.028$

Annual home fire incidence rate:  $\frac{Nf}{N_h} = 0.0057$

Deaths per home fire without a functional alarm:  $\frac{N_{dna}}{N_{fna}} = 0.0142$

Injuries per home fire without a functional alarm:  $\frac{N_{ina}}{N_{fna}} = 0.0167$

<sup>a</sup> Authors' estimate based on a population of 1836 and an average household size of 2.6

<sup>b</sup> National average values of communities (2004–2008) of population 2500–4999 and communities of population 0–2499<sup>1</sup>

## Appendix B

Effectiveness of targeted smoke alarm giveaway and installation programs: summary results from a systematic literature review of controlled trials since the early 1990s<sup>a,b</sup>

Identified studies to inform short-term (≤12 months) program-effectiveness estimates

Study	Program type	Follow-up period (months)	% homes with FSAs		Reduction in homes without FSAs (B-A), %	Percentage reduction (B-A)/(1-A), %
			Before program (A)	After program (B)		
Douglas (1998) <sup>3</sup>	Giveaway	3	71	81 <sup>b</sup>	10	34
Poehlman (2010) <sup>4</sup>	Installation	6	59	90 <sup>b</sup>	31	76
Thompson (2004) <sup>5</sup>	Installation	12	37	80	43	69
Yang (2008) <sup>6</sup>	Installation	12	72	99	27	96
<b>Average for installation programs</b>						<b>80</b>

FSA, functional smoke alarm

Identified studies to inform the smoke alarm annual functional rate estimates

Study	Program type	Follow-up period	% installed alarms functional
Harvey (2004) <sup>7</sup>	Giveaway	6-12 months	65
	Installation		90
Shults (1998) <sup>8</sup>	Giveaway	3-4 years	
	Minnesota		62
	North Carolina		73
	Oklahoma	58	
Mueller (2008) <sup>9</sup>	Installation	15 months	84
Peek-Asa (2010) <sup>10</sup>	Installation	3.5 years	90
Jackson (2010) <sup>11</sup>	Installation	10 years	33

<sup>a</sup> Systematic Review Protocol

Search terms: A AND (B OR C OR D), where A = *smoke alarm OR smoke detector OR fire alarm OR fire detector*; B = *ownership OR prevalence OR use OR coverage OR presence OR functionality OR protection*; C = *injury OR burn OR safety OR risk OR loss OR death OR incidence*; D = *promotion OR installation OR giveaway OR expansion OR intervention OR program OR strategy*

Databases searched: PubMed, PsycINFO, CINAHL, and ERIC. Other sources: CDC and National Fire Protection Association publications

Timeframe: January 1, 1990 to December 31, 2010

Language: English only

Inclusion/exclusion criteria: controlled trials or trials with before- and after-program comparison; targeted smoke alarm giveaway or installation programs using canvassing methods.

Results: 858 titles screened; 122 abstracts screened; 24 full-text articles screened; data from eight studies extracted

<sup>b</sup> Authors' estimates based on a conservative assumption of 75% coverage rate for programs

## Appendix C

Estimation of program costs<sup>a</sup> for targeted installation and giveaway programs,<sup>12</sup> \$ unless otherwise noted

	Program site			
	A	B	C	D
Adjusted total local costs <sup>b</sup>	178,556	190,464	255,805	227,803
Number of completed visits, <i>n</i>	779	771	968	1,035
Labor costs	154,405	155,231	221,785	196,810
Share of labor costs (%)	84	79	83	81
Cost per completed visit	229	247	264	220
Average cost per completed visit (Sites A–D):	240			

Note: Giveaway program was assumed to have similar cost as the installation program with the exception of only incurring 50% (low: 20%; high: 80%) of the labor cost for the installation program.

<sup>a</sup> Updated to 2011 U.S. dollars

<sup>b</sup> Local costs minus facility costs

## Appendix D

### One-way sensitivity analysis results

Uncertain variable changed	Net benefits for variable changed over plausible range <sup>a</sup>		ACER for variable changed over plausible range <sup>b</sup>		ICER for variable changed over plausible range <sup>b</sup>	
	Giveaway	Installation	Giveaway	Installation	Giveaway	Installation
Annual home fires per 100 homes	8-89	27-243	23-130	19-119	Ref	16-113
Death per home fire without functional alarms	23-58	66-161	44-88	39-80	Ref	35-75
Injury per home fire without functional alarms	49 <sup>c</sup>	137 <sup>c</sup>	51 <sup>c</sup>	46 <sup>c</sup>	Ref	— <sup>c</sup>
Proportion of homes without functional alarms	0-124	26-304	4-163	15-116	Ref	32-113
Effectiveness of giveaway program	-3-102	—	25-185	—	Ref	27-81
Effectiveness of installation program	—	90-184	—	41-60	Ref	36-68
Functional alarm against deaths	17-106	53-287	20-99	16-90	Ref	14-84
Functional alarm against injury	49 <sup>c</sup>	137 <sup>c</sup>	51 <sup>c</sup>	46 <sup>c</sup>	Ref	— <sup>c</sup>
Functional alarm against property loss	46-53	128-146	51 <sup>c</sup>	46 <sup>c</sup>	Ref	— <sup>c</sup>
Cost of giveaway program	32-67	—	12-90	—	Ref	19-66
Cost of installation program	—	111-163	28-75	24-68	Ref	21-63
Cost of incomplete visit/cost of complete visit (%)	31-62	107-157	25-92	28-71	Ref	31-59
Property loss per fire without functional alarms	0-124	26-304	4-163	15-116	Ref	32-113
Alarm annual nonfunctional rate	11-146	37-385	1-119	4-109	Dominated	0-103

Note: The sensitivity analysis results reflect changes in ACERs associated with variable changes over plausible range as specified in the third column of Table 2.

<sup>a</sup> 2011 dollars in thousands

<sup>b</sup> 2011 dollars in thousands per QALY

<sup>c</sup> Change of <\$1000

ACER, average cost-effectiveness ratio; ICER, incremental cost-effectiveness ratio; QALY, quality-adjusted life-year

## References for Appendixes A–D

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## Appendix E

Probability sensitivity analysis: Monte Carlo simulation results of the average cost-effectiveness ratios

