An Intervention to Reduce Kerosene-Related Injury in Low-Income South African Communities

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Children’s Unintentional Injuries

An international challenge.
Kerosene (Paraffin)

- Highly flammable, toxic fuel
- Used in appliances for heating, lighting, and cooking
- About 17-20 million South Africans use kerosene daily (40% of population)
- Rates are similarly high in much of Africa and South Asia
Poisoning Risk

- Young children mistakenly drink kerosene
- Stored in re-used water/soda bottles
- Looks and smells like water
Burn Risk

- Kerosene is highly flammable, both in liquid and vapor form
- Appliances malfunction
- Kerosene is polluted (e.g., with water or gasoline)
- Careless use of appliances (clothing, hair, tablecloths, curtains, intoxication)
- Aggressive acts
A few photographs of the environment
A few photographs of the environment
A few photographs of the environment
A few photographs of the environment
Talk Outline

- Baseline Situation
  - Knowledge of kerosene safety
  - Kerosene safety practices
  - Perceived risk of kerosene injury

- Intervention
  - Case-control study in two communities

- Next Steps
Baseline Research

- 238 individuals in two low-income Cape Town communities
  - 81.5% female
  - 99.6% Black African descent
  - Mean age of 30.2 years (SD = 8.7)
  - Mean education of 9.3 years (SD = 2.6)
  - Mean family income of 2.7 on 8-point scale (equivalent to about $80/month)
  - Mean of 2.3 adults and 1.3 children in home
  - Homes had mean of 2.0 rooms (SD = 0.93)
  - 0.4% had running water in home; all had running water in community
  - 82% had electricity in home, usually illegally tapped from community sources
Kerosene Use

- All participants used kerosene at least weekly; most used it daily
  - Most frequent use was for heat
  - Least frequent use was for light
Kerosene Safety Knowledge

- Oral “quiz” administered to participants in preferred language (English or Xhosa)
  - Questions covered very basic topics such as how kerosene can be dangerous, the ways to prevent kerosene-related injury, and the first aid to be used in response to kerosene-related injury

- Participants answered an average of 11.5 of 18 questions correctly (SD = 2.1), suggesting fairly poor knowledge of kerosene safety issues among at-risk citizens
Kerosene Safety Practices

- Researchers inspected participants’ home, searching for 17 kerosene safety practices (e.g., proper storage of kerosene, venting of fumes, placement of kerosene appliances)
- All items scored objectively, 1 for presence or 0 for absence
- Mean score = 6.3 (SD = 1.5), indicating very poor compliance with basic recommendations for kerosene safety
Perceived Risk of Kerosene Injury

- For intervention development, perceived risk is a critical factor: do citizens believe they or their children are at risk of injury?
- Asked, “In your opinion, what is the likelihood that a fire might occur in your neighborhood over the next 6 months?”
  - Mean answer (7-point scale): 4.8 (SD = 2.0), with a 4 referring to ‘possible’ and a 5 referring to ‘likely’
  - Realistic perception of risk
- Asked, “In your opinion, what is the likelihood that a fire might occur in your neighborhood over the next 6 months?”
  - Mean answer (7-point scale): 3.6 (SD = 2.0), with a 3 referring to ‘unlikely’ and a 4 referring to ‘possible’
  - Fairly realistic perception of risk
Intervention Study: Research Design

- Two communities, one randomly assigned to receive community-based intervention and the other to receive no intervention.
- Kerosene-related knowledge, practices, and perceived risk assessed prior to intervention and again after the intervention.
- For ethical reasons, the intervention was administered in the control community following data collection.
Intervention Study: Theoretical Background

- Health-related behavior change
  - Susceptibility to risk: injuries can occur
  - Individual actions can prevent injury
  - Make behavior change “normative”

- Sought theory-drive behavior change through:
  - Sharing of behavior change stories by neighbors
  - Relating stories of actual injury events
  - Role-playing and experiential learning to demonstrate real-life potential for injury
  - Training by knowledgeable local trainers using train-the-trainers model

- Sensitive to cultural background of target audience
  - Used local trainers familiar with the local culture and language
  - Intervention was accessible to individuals with low literacy levels – mostly verbal and pictorial
Consort flowchart of participant recruitment

- **Enrollment**
  - Assessed for eligibility (n = 250)
    - Excluded (n = 12)
      - Not meeting inclusion criteria; head of household is minor (n = 5)
      - No eligible adult home after 3 attempts (n = 5)
      - Home of research assistant (n = 2)
    - Randomized (n = 238)

- **Allocation**
  - Allocated to control group (n = 124)
  - Allocated to intervention group (n = 114)

- **Follow up**
  - Lost to follow up (n = 18)
    - (original participant not home after 3 attempts)
  - Lost to follow up (n = 14)
    - (original participant not home after 3 attempts)

- **Analysis**
  - Analyzed (n = 106)
  - Analyzed (n = 100)
Participants

- Demographically similar to baseline sample (sample is subset of baseline data)
- Very similar across the two communities

Measures:
- Kerosene knowledge “quiz”
- Kerosene practices home inspection
- Perception of risk questions
# Results

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Posttest</th>
<th>Mean Change</th>
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</thead>
<tbody>
<tr>
<td><strong>Kerosene Safety Knowledge</strong></td>
<td></td>
<td></td>
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<tr>
<td>Control Group Mean (SD)</td>
<td>11.83 (1.81)</td>
<td>12.89 (2.02)</td>
<td>1.07 (2.33)</td>
</tr>
<tr>
<td>Intervention Group Mean (SD)</td>
<td>11.03 (2.32)</td>
<td>14.39 (2.22)</td>
<td>3.28 (2.70)</td>
</tr>
<tr>
<td><strong>Between Groups F (partial $\eta^2$)</strong></td>
<td>8.89 (0.34)**</td>
<td>25.53 (0.11)**</td>
<td>39.41 (0.16)**</td>
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<tr>
<td><strong>Kerosene Safety Practice</strong></td>
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<tr>
<td>Control Group Mean (SD)</td>
<td>0.41 (0.10)</td>
<td>0.46 (0.13)</td>
<td>0.05 (0.16)</td>
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<tr>
<td>Intervention Group Mean (SD)</td>
<td>0.38 (0.09)</td>
<td>0.49 (0.17)</td>
<td>0.10 (0.18)</td>
</tr>
<tr>
<td><strong>Between Groups F (partial $\eta^2$)</strong></td>
<td>4.88 (0.02)*</td>
<td>1.16 (0.01)</td>
<td>4.53 (0.02)*</td>
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<tr>
<td><strong>Perception of Risk</strong></td>
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<tr>
<td>Control Group Mean (SD)</td>
<td>3.76 (1.85)</td>
<td>3.53 (1.82)</td>
<td>-0.24 (2.36)</td>
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<tr>
<td>Intervention Group Mean (SD)</td>
<td>4.54 (1.72)</td>
<td>3.65 (1.51)</td>
<td>-0.87 (1.99)</td>
</tr>
<tr>
<td><strong>Between Groups F (partial $\eta^2$)</strong></td>
<td>11.24 (0.05)**</td>
<td>0.26 (0.00)</td>
<td>4.35 (0.02)*</td>
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</table>
Results: Intervention Dissemination

- 84% of participants saw kerosene safety materials
- 63% of participants had kerosene safety materials in their home
- 68% of participants looked at kerosene safety materials
- 86% of participants spoke with someone about kerosene safety in their home
  - Average number of visits = 3.4 (SD = 2.1)
  - Average total time of visits = 116.5 minutes (SD = 163.2)
- Quality of Education rated 4.3 (SD = 0.9) on 5-point scale, where 4 is “above average” and 5 is “excellent”
Conclusions

- At baseline, citizens had fairly low levels of knowledge about kerosene safety and very low levels of safe practice.
- The community-based intervention created a substantial increase in kerosene-related safety knowledge.
- The community-based intervention created a small, but statistically significant increase in kerosene-related safety practices.
Next Steps

○ Test the intervention in a larger-scale study that:
  • Includes several different at-risk cultures
  • Tests the community-based intervention against an alternative training mechanism rather than a no-contact control group
  • Assesses retention of safety-related knowledge and practices over time

○ If the intervention remains effective in further testing, large-scale dissemination across Africa, South Asia, and other areas would be indicated
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