Applications of Behavioral Theory to Injury Prevention Interventions

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What is a theory?

- A systematic way of understanding events or situations
- A set of concepts, definitions, and propositions that explain or predict these events or situations by illustrating the relationships between variables
- Theories must be applicable to a broad variety of situations

Why is theory important to health promotion and health behavior practice?

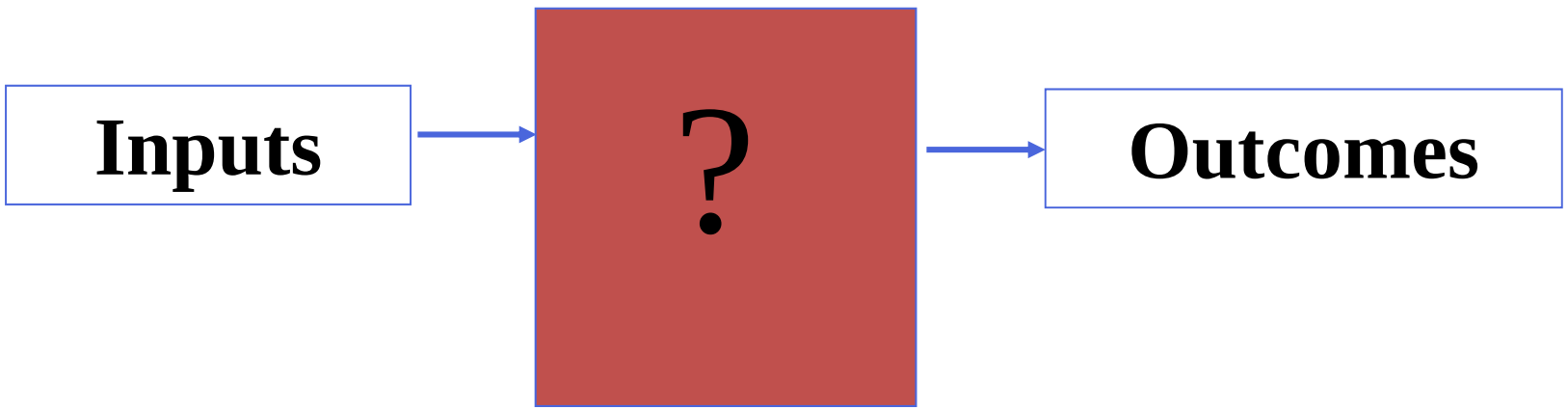
- Numerous products, practices and programs that can save lives
- Many people do not
  - See the need to change
  - Perceived themselves to be at risk
  - Have access to affordable safety products or programs

Key concepts of behavioral theories

- Behavior is mediated by cognitions; that is, what people know and think affects how they act
- Knowledge is necessary for, but not sufficient to produce, most behavior changes
- Perceptions, motivation, emotions, skills, and the social environment are key influences on behavior

Consequences of **NOT** using theory

- Programs fail to achieve their objectives
- Programs succeed, but we don't know why



Theories useful at different levels of influence

- **Individual Level**
  - Health Belief Model
  - Theory of Planned Behavior
  - Stages of Change (Transtheoretical) Model
  - Social Learning Theory/ Social Cognitive Theory
  - Precaution Adoption Process Model*
- **Community Level**
  - Diffusion of Innovations
  - Community Organization and other Participatory Models
  - Communication Theory

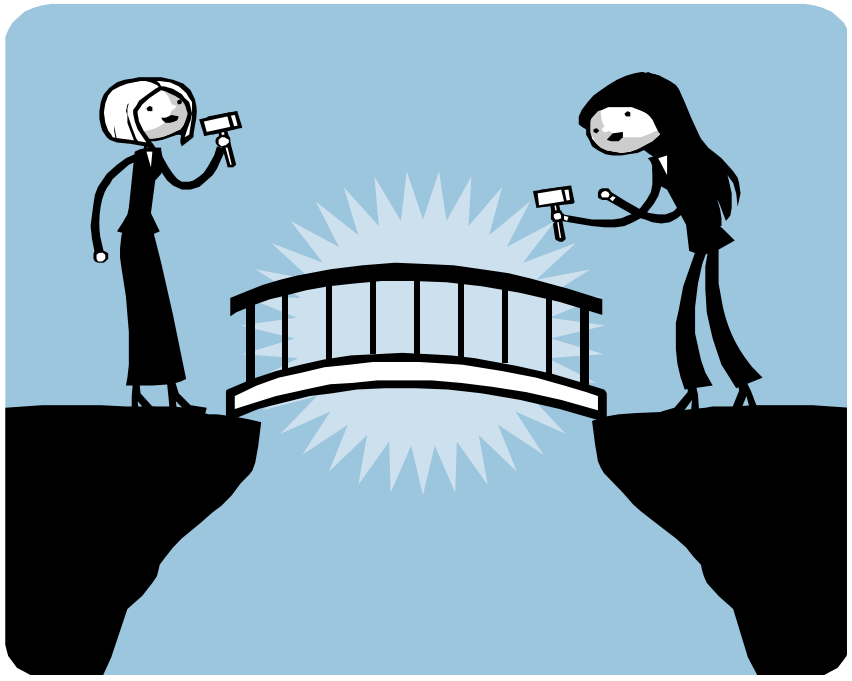
Why include behavioral theory at a TBI conference?

- Advances in the development of theory
- Platform for understanding why people engage in health-risk or health-compromising behavior and why/how they adopt health-protective behavior
- Understanding individual, familial, social, and cultural factors

Theories and Models

- **Theory**—set of interrelated concepts, definitions, and propositions
- **Concepts**—building blocks of theory or primary elements
- **Constructs**—key concept in a theory
- **Model**—generalized or hypothetical description used to analyze or explain something

A Bridge Between…



- Biomedical technology (e.g., vaccines, identification of risk-reduction practices) and the application of these advances to improving public health

Pros and Cons of Theory

- Injury risk factors (sex, age, race/ethnicity, SES)
- Knowledge, Attitudes, Beliefs
- "Obviously being a way of seeing, a theory can also be a way of not seeing, a potential drawback of theory-driven research. Theory can clearly bias or even blind the researcher."

The Three E's

- Education—mainstay of early injury prevention, consistent with an orientation to injury causation that focused on the individual's behavior)

- Ergonomics (engineering and product design)—modifying the built environment, equipment, homes, toys, and clothes

- Enforcement—involves safety legislation and regulations

Ergonomics—Modification of the Roadway Environment

An interstate with divided lanes, controlled entrances and exits, good signage, graded curves, and shoulders.

- Safety features built into interstate roads
  - Divided highways
  - Graded curves
  - Skid-resistant surfaces
  - Lighted signage
  - On- and off-ramps

Enforcement

- Safety legislation and regulations used to modify
  - Products
  - Environments
  - Individual behavior
- Opposed because it interferes with individual freedoms

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Bunk Bed-Related Injuries

ARTICLE

Bunk Bed–Related Injuries Among Children and Adolescents Treated in Emergency Departments in the United States, 1990–2005

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What's Known on This Subject

Bunk beds are common in homes across the United States. Children sustain bunk bed–related injuries from falls, jumps, bunk bed ladders, bed malfunctions, and striking the bed. Injuries associated with bunk beds are typically more severe than those associated with conventional beds.

What This Study Adds

Bunk bed–related injuries are common among pediatric patients of all ages, they can be severe (eg, fractures) and require hospital admission. This topic is relevant and important to practicing pediatricians, who are asked about bunk bed safety by parents.

ABSTRACT

OBJECTIVE. Our goal was to comprehensively examine bunk bed–related injuries in the United States by using a nationally representative sample.

METHODS. Using the National Electronic Injury Surveillance System database, cases of nonfatal bunk bed–related injuries treated in US emergency departments from 1990 through 2005 were selected by using the National Electronic Injury Surveillance System bunk bed product code (0661). Cases concerning individuals ≤21 years old were included.

RESULTS. An estimated 572 580 children and adolescents aged ≤21 years were treated in US emergency departments for bunk bed–related injuries during the 16-year study period, yielding an average of 35 790 cases annually. An average of 42 per 100 000 population were treated annually. Bunk bed–related injuries occurred more frequently among males (60.6%). Lacerations were the most common type of injury (29.7%), followed by contusions and abrasions (24.0%) and fractures (19.9%). The body parts most frequently injured were the head and neck (27.3%) in all age groups. Falls were the most common mechanism of injury (72.5%). Of the cases for which locale of injury was recorded, 93.5% occurred at home. Approximately half of the bunk bed–related injuries that occurred at schools involved individuals aged 18 to 21 years (50.9%). An estimated 2.9% of injuries resulted in hospitalization or transfer to another hospital or required additional observation. The number of bunk bed–related injuries showed no significant trend from 1990 to 2005.

CONCLUSIONS. Bunk beds are a common source of injury among children and adolescents, and these injuries mostly involve the head and face. Given the continuing large numbers of bunk bed–related injuries at homes and in schools, increased efforts are needed to prevent bunk bed–related injuries among children and adolescents. *Pediatrics* 2008;121:e1696–e1702

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Key Words
bunk bed, bed (MeSH), accidental falls (MeSH), wounds and injuries (MeSH), child (MeSH), adolescent (MeSH), emergency department, National Electronic Injury Surveillance System

Abbreviations
CPSC—Consumer Product Safety Commission
NEISS—National Electronic Injury Surveillance System
ED—emergency department
RR—relative risk
CI—confidence interval

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BUNK BEDS ARE common in homes across the United States and other industrialized countries.[1] While playing or sleeping, children sustain bunk bed–related injuries that result from falls, jumps, bunk bed ladders, bed malfunctions, and striking the bed.[1–3] Injuries associated with bunk beds are typically more severe than those associated with conventional beds.[2] Lacerations and contusions are the most common injuries from beds of conventional height.[1,2,3–8] Children younger than 6 years sustain the majority of bunk bed–related injuries.[1,2,4,5,7] Because children younger than 6 years are at the highest risk for death resulting from head entrapment and collapsing mattresses, the US Consumer Product Safety Commission (CPSC) has promulgated mandatory standards for bunk beds to prevent injuries.[10–12] College students are also at higher risk for bunk bed–related injuries.[13] Although most studies of bunk bed–related injuries have focused on pediatric populations, only 1 assessed bunk bed–related injuries among college students.[13] The majority of published studies of bunk bed–related injuries have examined

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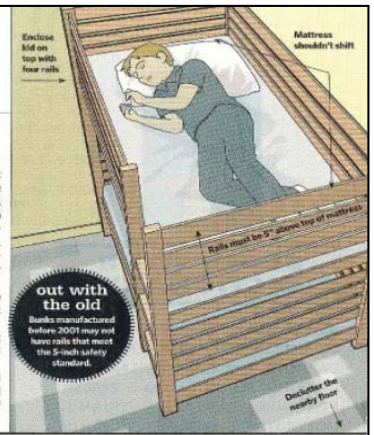
kids' health
by Cheryl Cook

rest easy

Young kids aren't the only ones who fall out of bunk beds. About 43% of bunk bed–related injuries in the U.S. happen to children between the ages of 6 and 17, report researchers at the Center for Injury Research and Policy at Nationwide Children's Hospital in Columbus, Ohio. Kids who tumble off the top suffer cuts, bruises, fractures and concussions. Follow these safety tips from Lara McKenzie, Ph.D., assistant professor at the hospital and senior author of the study:

1. Box them in Add guardrails along the sides of the upper bed. The tops of the rails should be at least 5 inches above the mattress, so kids don't roll off.
2. Secure the foundation The top mattress should fit in the frame snugly. If it doesn't, buy a larger one or fill the gaps with soft padding like bunched-up sheets.
3. Beware of hidden hazards Position the bunk bed away from ceiling fixtures and hard furniture. Remind your kid to keep the surrounding floor area clear of toys or sharp objects, so she doesn't fall on them.



out with the old
Bunks manufactured before 2001 may not have rails that meet the 5-inch safety standard.

Supermarket Smarts

Grocery shopping with the kids can feel like a losing battle. "You're fighting against about $10 billion a year worth of marketing directed at your children," says Marion Nestle, R.D., professor of nutrition, food studies and public health at New York University and author of *What to Eat* (North Point Press). To avoid coming home with junk food, try Nestle's strategies.

Get in, get out — Research shows that the longer you shop, the more you and your child will be enticed to buy items you don't need. Create a list before you go, and stick to it.

Reward good behavior — Encourage your kid to read nutrition labels by allowing her to add a bonus item to the cart. The only catch? She must make sure it has at least 5 grams of fiber per serving.

Stick to the perimeter — The freshest foods are found along the outer aisles, so avoid the middle of the store, where most of the processed, fattening products are shelved.

Q: Is it a good idea to give kids flat ginger ale when they have an upset stomach?

A: Probably not, says new research. While the ginger spice may help ease tummy troubles, most ginger ales do not contain it. "Carbonated drinks, flat or not, do replace some of the fluids lost from diarrhea or vomiting, but they don't replenish much needed sodium and potassium," says Ashley Reece, M.D., a pediatrician at Watford General Hospital in Hertfordshire, England, and lead author of the study. Energy drinks like Gatorade and Powerade aren't ideal either because they have too much sugar, which can make diarrhea worse. **Your best bet: an over-the-counter oral rehydration solution like Pedialyte,** which contains the ratio of electrolytes and sugar that your kid needs to recover.

***tip** This Halloween remember that some treats may be better for your kid's pearly whites than others. "Gummy sweets like taffy are the biggest cavity culprits because they stick to teeth," says Gina Prokosch-Cook, D.D.S., a dentist in New Windsor, New York. "Encourage your child to opt for chocolates, which melt and get washed away by saliva, or candies that don't require chewing, like lollipops or mints."

Photos (from left): Don Farrall/Getty Images; Image source/Jupiter Images
Illustrations: Chris Pidgeon

Hot Tub, Whirlpool and Spa-Related Injuries

Author's personal copy

Hot Tub, Whirlpool, and Spa-Related Injuries in the U.S., 1990–2007

Maya Alhajj, BS, Nicolas G. Nelson, MPH, Lara B. McKenzie, PhD, MA

Background: Recreational use of hot tubs, whirlpools, and spas has increased within the past 3 decades. Injuries due to hot tubs, whirlpools, and spas can affect people of all ages and can result in serious disabilities.

Purpose: This study examines nonfatal hot tub, whirlpool, and spa-related injuries on a national level.

Methods: The National Electronic Injury Surveillance System database was used to examine cases of nonfatal hot tub, whirlpool, and spa-related injuries treated in U.S. emergency departments from January 1, 1990, through December 31, 2007. Analysis was conducted from November 2008 to March 2009.

Results: An estimated 81,597 patients, aged <1–102 years, were treated in U.S. emergency departments for hot tub, whirlpool, and spa-related injuries, with the number increasing 160% over the 18-year study period ($p<0.001$). Nearly 73% of injuries occurred in patients aged ≥17 years. Lacerations were the most common diagnosis (27.8%) and accounted for 58% of all head injuries. Slips and falls were the most common mechanism of injury (47.6%); were more likely to result in an injury to the trunk than other body parts (OR=2.49, 95% CI=1.83, 3.39); and were more likely to result in concussions and fractures/dislocations than any other diagnosis (OR=7.813, 95% CI=2.194, 27.823 and OR=3.017, 95% CI=2.057, 4.425, respectively).

Conclusions: Given the increase in hot tub, whirlpool, and spa ownership and the 160% increase in injuries during the study period, more research is needed to identify the cause of the increase in hot tub, whirlpool, and spa-related injuries and what injury-prevention solutions and policies may be appropriate.

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Introduction

In the U.S., private sales of hot tubs, whirlpools, and spas (for the purpose of this paper, hot tubs will refer to hot tubs, whirlpools, and spas) began increasing in the early 1980s. In 1988, there were an estimated 1.8 million hot tubs in use in the U.S., with approximately 250,000 spas being sold annually across the nation.[1] Today, hot tubs are a ubiquitous feature in homes, hotels, fitness centers, health spas, and pools. Previous studies of hot tubs have predominantly focused on infectious diseases associated with use such as *Pseudomonas aeruginosa* dermatitis, folliculitis, and "hot tub lung" caused by aerosolized *Mycobacterium avium* complex.[2–5]

In addition to the risk of infection, use of hot tubs carries the risk of unintentional injury. Some of the most severe injuries associated with hot tubs include hair entanglement, body entrapment, disembowelment or evisceration, and drowning.[6] These severe injuries are predominantly seen in the pediatric population and are typically associated with suction drain covers. From 1980 through 1996, the U.S. Consumer Product Safety Commission (CPSC) reported more than 700 deaths associated with hot tubs, with approximately one third of those incidents occurring in children aged <5 years.[6] The CPSC recorded 35 body entrapment incidents involving a spa drain from 1990 to 2002 in children aged 2–14 years, with at least five of those cases resulting in drowning.[6,7] The CPSC reported 49 incidents between 1980 and 1996 related to hair entanglement in a drain suction cover for a hot tub.[6]

Despite the increasing demand for hot tubs and the risk potential for injury, little research has been conducted to determine national estimates and trends

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Development and evaluation of an innovative, educational tool to increase booster seat use

Booster Seat Use

- Booster seat use, compared to infant and toddler seat use is low
- No legal requirement for booster seat use in Ohio*
- Partnership with and funding from a national insurance company
- Develop, evaluate, and disseminate an innovative educational tool using the Precaution Adoption Process Model (PAPM) to guide families toward correct and consistent booster seat use until their children can safely use an adult restraint system

Safety Boost—Step 1

- Panel of Child Passenger Safety Experts
  - Purpose was to receive information from Child Passenger Safety Experts who work with Ohio families on a daily basis
  - Suggestions for information to be incorporated into the tool included:
    - 5-step test
    - height/weight/age table
    - who needs a booster
    - why a booster seat is important
    - injuries that can occur without a booster seat
    - how the belt should be threaded/fit with the booster

Safety Boost—Step 2

- Two focus groups with booster seat users and non-users
  - Focus Group Findings:
    - Users acknowledge booster seats are necessary but also inconvenient. Stressing the positive benefits and reinforcing the importance of consistent use are critical tactics to encourage continued/consistent use.
    - Non-users are not aware of the safety benefits of booster seats. The tool should include simple, credible statistics regarding injury and risk rates for children in boosters vs. seatbelts. Non-users also need basic information about boosters, including height/age recommendations and instructions for use/troubleshooting.
    - Pediatricians and the Internet are two primary sources of information to parents.

Safety Boost—Step 3

- Develop concept designs with graphic design firm
  - To assist our team in creating an engaging, handheld tool that insurance agents can distribute to their clients
  - We wanted the tool to require user participation—like a slide rule, or an information wheel

Safety Boost—Step 4

- Input from Insurance Agents
  - Agents were receptive to the idea of the tool
  - Creative ways they could use the tool to increase loyalty of current and potential clients
  - Concerned about cost of purchasing the tool and delivering them
  - Most likely to use the tool if it was part of a safety campaign or incentive program implemented and supported by the funder

Safety Boost—Step 5

- Focus groups with booster seat users and non-users
  - Focus Group Findings
    - Although both designs were received positively, the "pull tab" was received more positively. When participants compared the two, participants perceived the "car" tool to be more attractive and the "pull tab" to be more useful
    - Participants reacted positively to Children's and Nationwide as the sponsors

Safety Boost—Step 6

- In-house photography and printing
  - Cost for photography was <$150
  - Cost of printing tool $3.23 with measuring tape
  - Protecting kids and saving lives…priceless

Safety Boost Tool

SAFETY BOOST

A booster seat is the safest way for children 4 to 8 years old to travel.

Here are some tips to keep your child safe.

- Children are safest in the back seat.
- There are two types of booster seats, high-back and backless booster seats. You can buy a booster seat at most toy stores, department stores, and other retail outlets for as little as $14.00.
  - ★ Use high-back booster seat if the car's seat does not have a headrest or if the back of the car's seat is below your child's ears.
- Ask a car seat technician to check your child's seat. Call **1-866-SEATCHECK** to find a technician near you.

Keep your child safe by using the right seat every time.

FITTING CHART

Age	Weight/Height	Seat Type
Birth to ***at least*** 1 year AND	***Up to*** 20 pounds ***minimum**** (check the weight limit listed on seat)	Rear-facing Infant or convertible seat
1 to 4 years AND	***At least*** 21 pounds ***up to*** 65 pounds*	Rear-facing convertible ***OR*** forward-facing seat with internal harness
4 to 8 years AND	***At least*** 40 pounds and ***up to*** 4 feet 9 inches tall*	Booster seat (booster seats do not have an internal harness)
8+ years AND	***At least*** 4 feet 9 inches tall*	Take the 5-STEP TEST to see if your child is ready for a seat belt alone.

Backless Booster Seat
High-back Booster Seat

* Always follow the seat's weight and height guidelines.

Congratulations! By learning about booster seats you can give your child a SAFETY BOOST.

I like my booster seat. It lifts me up so I can see out the window.

Shoulder belt fits snugly across the chest, crossing the shoulder between the neck and arm.

Lap belt fits snug and low over the hips and thighs.

To find out more about booster seats and child passenger safety, visit www.boosterseat.gov or www.aap.org.

To learn more about SAFETY BOOST please call the Center for Injury Research and Policy at 614-722-4343 or visit www.injurycenter.org.

Nationwide® Foundation

Children's CENTER FOR INJURY RESEARCH AND POLICY

IS YOUR CHILD IS READY FOR THE SAFETY BELT, TAKE THIS 5-STEP TEST:

Step 1: Does your child sit all the way back against the car's seat?
Step 2: Do your child's knees bend comfortably at the edge of the car's seat?
Step 3: Does the shoulder belt fit snugly across the chest, crossing the shoulder between the neck and arm?
Step 4: Is the lap belt as low as possible, snug over the hips or upper thighs?
Step 5: Can your child stay seated like this for the whole ride?

If you answered YES to ALL 5 questions, your child is ready for the safety belt.
If your answered NO to ANY of the questions, then your child needs a booster seat.
Use the chart to find the best seat for your child.

PULL

Emergency department brief intervention to increase carbon monoxide detector use

Project CODE is supported by Grant R01HD057155 from the National Institute of Child Health and Human Development

Background and significance

- Carbon Monoxide (CO) is a poison that is a naturally occurring by-product of the incomplete combustion of carbon-based fuels
- CO is colorless, tasteless, odorless and non-irritating
- CO cannot be detected by a smoke alarm
- 40,000-50,000 emergency department (ED) visits annually
- Children and adolescents <15years account for 26% of non-fatal, unintentional, non-fire-related CO exposures
- 29% of homes nationally report having CO alarms (Runyan, 2005)
- **First study to rigorously test an intervention to increase CO alarm use in an ED**

Specific aims

- Determine whether a brief intervention will increase carbon monoxide (CO) alarm use and Precaution Adoption Process Model (PAPM) stage
- Determine whether and to what extent socioeconomic status moderates the effect of the intervention

Research design and methods

- Randomized controlled trial
- Recruiting 300 parents of children ≤ 18 years old
- Eligibility (parent/guardian, residence, lives with child, responsible for health and safety, English on computer)
- Randomization
  1. Control Group– receives a CO flyer from the Central Ohio Poison Control Center
  2. Intervention Group – receives a Project CODE educational tool and a carbon monoxide alarm
- Participants complete enrollment survey in ED on tablet computer

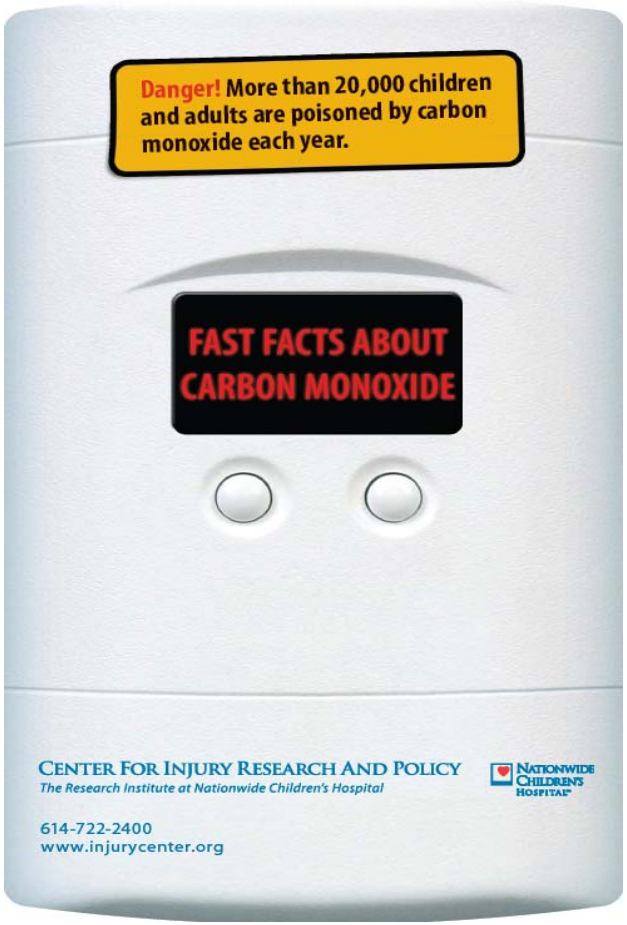
Home visits

- A home visits (survey and observation) 2 weeks and 6 months following the ED visit
- At the conclusion of the six-month visit control group receives tool and CO alarm
- Participant payments
- Referrals
- Equipment (cell phone, GPS, step stool, pole, booties, logo shirts)

Outcomes

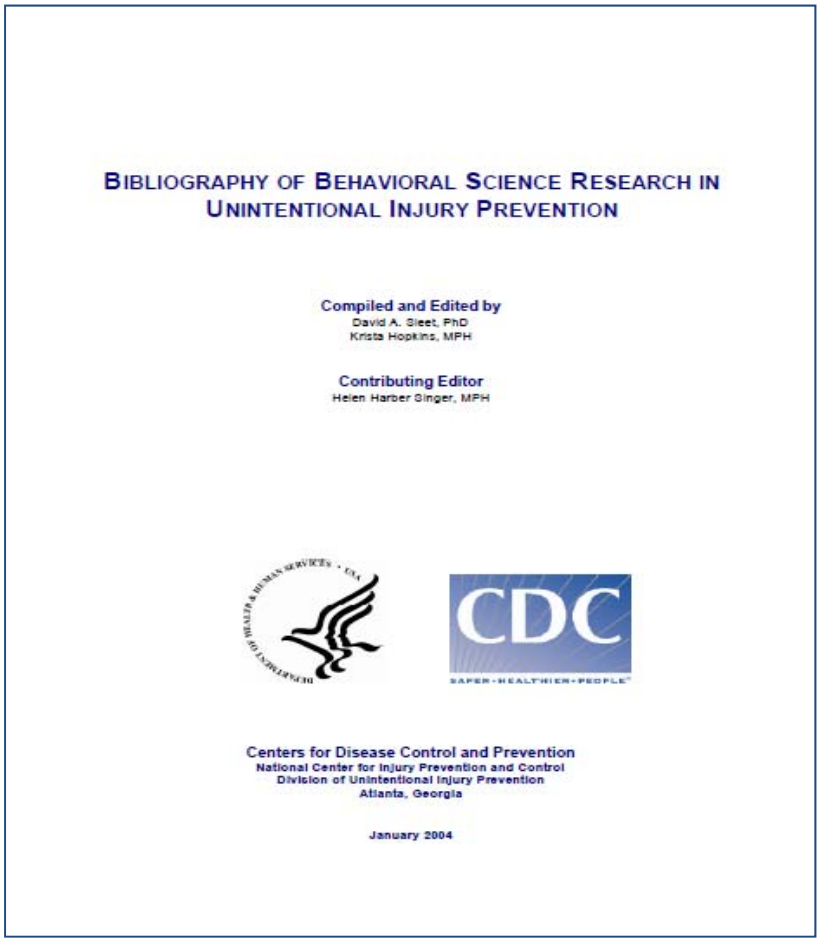
- Knowledge
- Behavioral profile and PAPM stage
- Observed behaviors (smoke alarms and CO alarm use)

Intervention



Bibliography of Behavioral Science Research

- To document the contributions of behavioral & social sciences research to unintentional injury and to increase awareness about the impact and importance of behavioral science in the field of injury control
- References ***by subject*** (bicycle injuries, child occupant protection, drowning, falls, fire and burns, impaired driving, motor vehicle injuries, motorcycle safety, pedestrian injuries, playground injuries, seat belts, sports injuries, etc.)



BIBLIOGRAPHY OF BEHAVIORAL SCIENCE RESEARCH IN UNINTENTIONAL INJURY PREVENTION

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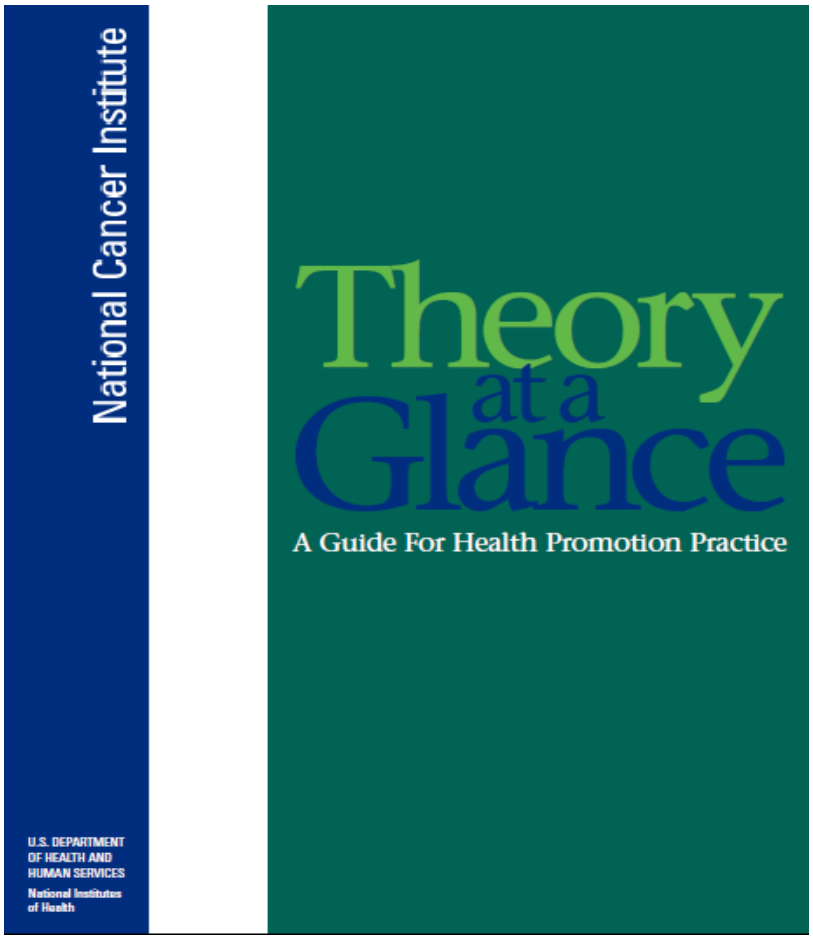
CDC

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control
Division of Unintentional Injury Prevention
Atlanta, Georgia

January 2004

Theory at a Glance

- Describes influential theories of health-related behavior, process of shaping behavior, and the effects of community and environmental factors on behavior
- What is theory?
- How can theory help plan effective programs?



Conclusions

- The connection between behavioral science, theory and injury prevention
- Models, theories and behavior change have been underfunded, underused, and underrepresented in injury prevention research and practice
- Future challenges—application and testing of behavior change theories to different problems in diverse communities