RISK COMMUNICATIONS AND PUBLIC WARNINGS

"Brief-out from the July Workshop"

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WORKSHOP PURPOSE

- **Bring Together Experts:**
  - Researchers & Practitioners
- **Summarize Knowledge**
- **Catalogue Applications Needs**
- **Create Future Agendas for:**
  - Research
  - Applications
- **Develop Partnerships:**
  - Across Research Disciplines & DHS Centers
  - Between DHS & Other Federal Research Agencies

REGARDING….

- **Public Preparedness Education**
- **Public Warning Response**
- **Warning System Preparedness**
- **Adoption of State-of-the-art Warning Practices**
- **Pre-event Public Risk Perception**
- **Warning Delivery Technologies**

TODAY'S PRESENTATION

- **Summarize Some Highlights:**
  - I can't cover everything in 45 minutes
- **Review Research Findings for Public Risk Communication Practice:**
  - Evidence-based applications to support this aspect of emergency response practice
- **Emphasize Workshop Topics of Greatest Interest to First Responders**

WHAT TO GET FROM MY TALK

- **DHS is Funding Research to Support First Responder's Work**
- **Some Researchers are Generating Knowledge you can Use**
- **You have Researcher Colleagues you Probably Haven't Met**

FUNDAMENTAL QUESTION

- **How do you Help People to:**

STOP….

HEAR….

& TAKE ACTION FOR….

TECHNOLOGICAL EVENTS

NATURAL HAZARDS

TERRORIST ATTACKS

HAZARDOUS MATERIALS AND OTHER TYPES OF EVENTS

INCLUDING….

VEHICLE EVACUATION

SIDEWALK & STAIRWELL EVACUATION

SHELTER IN PLACE

PROTECT BREATHING

THE RESEARCH SETTINGS

- **Researched for 50+ Years**
- **Across Different Hazards, e.g.,**
  - **Natural:** e.g., Hurricane Camille, Mt. St. Helens Volcano
  - **Hazardous Material Accidents:** e.g., Mississauga, Nanticoke
  - **Technological Events:** e.g., Three Mile Island
  - **Terrorist Attacks:** e.g., 1993 & 9/11 World Trade Center
  - **Building Fires:** e.g., MGM Grand Hotel, Cook County Hospital
- **We Know:**
  - What works & why
  - And how to apply it in practice

RESEARCH ON PEOPLE IN COMMUNITIES

Natural Hazards Center
Institute of Behavioral Science
University of Colorado at Boulder
482 UCB
Boulder, CO 80309-0482

phone 303.492.6818
fax 303.492.2151

www.colorado.edu/hazards/

- **350 Page Annotated Bibliography:**
  - One page per publication includes key findings
- **Available at:** *http://www.colorado.edu/hazards/publications/informer/infrmr2/pubhazbibann.pdf*
- **"Varied" in Quality**

RESEARCH ON PEOPLE IN BUILDINGS

- **150 Entry Standard Bibliography**
- **"Varied" in Quality**
- **Available at:**

  insert reference here

"PEOPLE" KNOWLEDGE TRANSCEND HAZARDS

- **Why: People Stay People Across Hazards**
- **Same: Determinants of Public Behavior:**
  - Mathematically modeled & we know the equations
  - Equations (& the factors in them) are the same
- **Different: Public Behavior "Outcomes":**
  - Because of different "quantities" for the factors in the equations that determine behavior across events

TOPICS COVERED TODAY (workshop subset)

- **Topic 1: Myths**
- **Topic 2: Alert**
- **Topic 3: Diffusion**
- **Topic 4: Mobilization**
- **Topic 5: Notification & Response**
- **Topic 6: Warning System Preparedness**
- **Topic 7: What's Needed**

TOPIC 1: THREE MYTHS

MYTH 1: PANIC

- **Non-problem:**
  - Never occurred after a warning
- **Actual Problem:**
  - "We didn't issue a warning so we wouldn't cause a panic"
- **Panic Occurs When:**
  - In a confined space
  - Escape routes are available
  - Think: not enough time for everyone to reach safety
  - Think: non-escapees will die
- **Even then Panic is Rare**

MYTH 2: "KISS"

- **Definition:**
  - "Keep it simple stupid"
- **Myth:**
  - Applies to public warning information
- **Reality:**
  - Applies to advertising, not warnings
  - People become "information starved"
  - If you don't tell enough, they'll get it elsewhere

MYTH 3: CRY WOLF

- **Public Does Respond After False Alarms**
- **False Alarms are Productive if Explained**
- **Repeated False Alarms Anger Local Government because they Cost Money**
- **Non-response comes from Poorly Worded or Delivered Warnings, Not False Alarms**
- **Exception -- People Ignore Sirens:**
  - If sounded frequently, e.g., for siren tests

TOPIC 2: ALERT

- Inter-up Ongoing Life
- Get People's Attention
- Capture Your Audience

PEOPLE DON'T REMEMBER INDICATORS

- **People:**
  - Don't remember the meaning of:
    - Siren signals (wails, whoops, tones)
    - Color codes
  - Don't distinguish between:
    - Advisories, watches & warnings
- **Exception:**
  - When signals/codes are "drilled" into people, e.g., weekly fire drills in schools

ALERTING ISN'T SIMPLE

- **Many Isolate "Themselves" from Information**
- **Some are Isolated by Circumstance, e.g., Poor**
- **Even when Signals Blare, Many:**
  - Think they're "safe" &
  - Disasters happen to other people
- **Different Sub-populations Need Unique Alerts, e.g.,**
  - Hospitals in communities
  - Hearing impaired in buildings
  - Visitors & "out-of-towners"

USE "OBTRUSIVE" ALERTS

- **Grab People's Attention, e.g.,**
  - Turn up lights in a theater
  - Piercing sounds with TV crawlers
- **Wake People Up, e.g.,**
  - Sleeping children & older adults
  - People with hearing loss & under the influence
- **Outside Devices Loose Effectiveness if:**
  - Windows are shut & air/heat is on
  - A 3 minute sounding of a 10 dBC over ambient outdoor siren has a 62% chance of waking someone up
- **Indoor Devices for Rapid Alert at Night:**
  - Or "Special" outside devices
  - Important for, e.g.,
    - Fast moving community event
    - Fire in an apartment or hotel

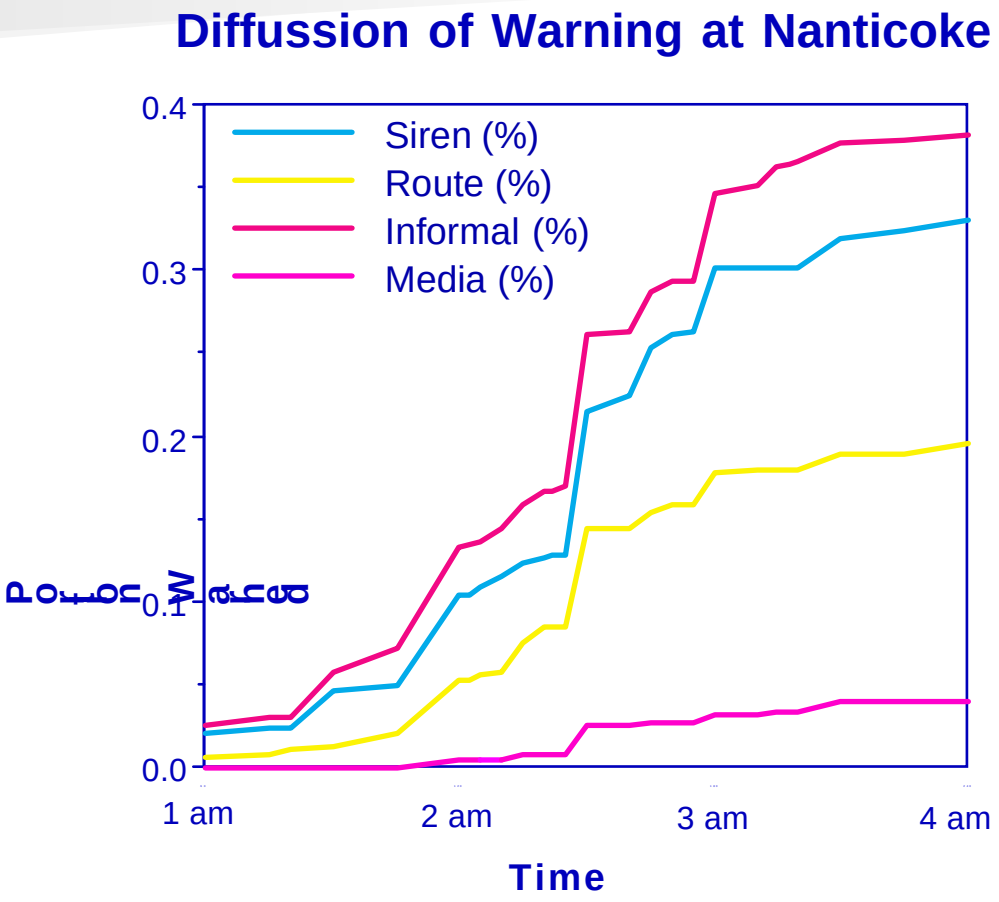
INFORMAL ALERTING

- **Diffusion of Warnings "Among the Warned"**
- **Always Happens, Count on It, Make Use of It**
- **9/11 Example:**
  - Most in country learned about attack in 1 hour
  - Many in Towers found out a plane hit from friends/relatives
- **Rule of Thumb:**
  - For every 2 formal 1st warnings, there's 1 informal 1st warning
- **Informal Alerting Increasing with New Technologies**

TOPIC 3: DIFFUSSION

- **Diffusion is "Getting the Word Out"**
- **Warning Diffusion:**
  - A "social process" no matter what technologies are used
  - Different technologies have differential effectiveness
  - Impacted by time of day/night
  - Includes formal & informal notification

DIFFUSSION DATA EXAMPLE



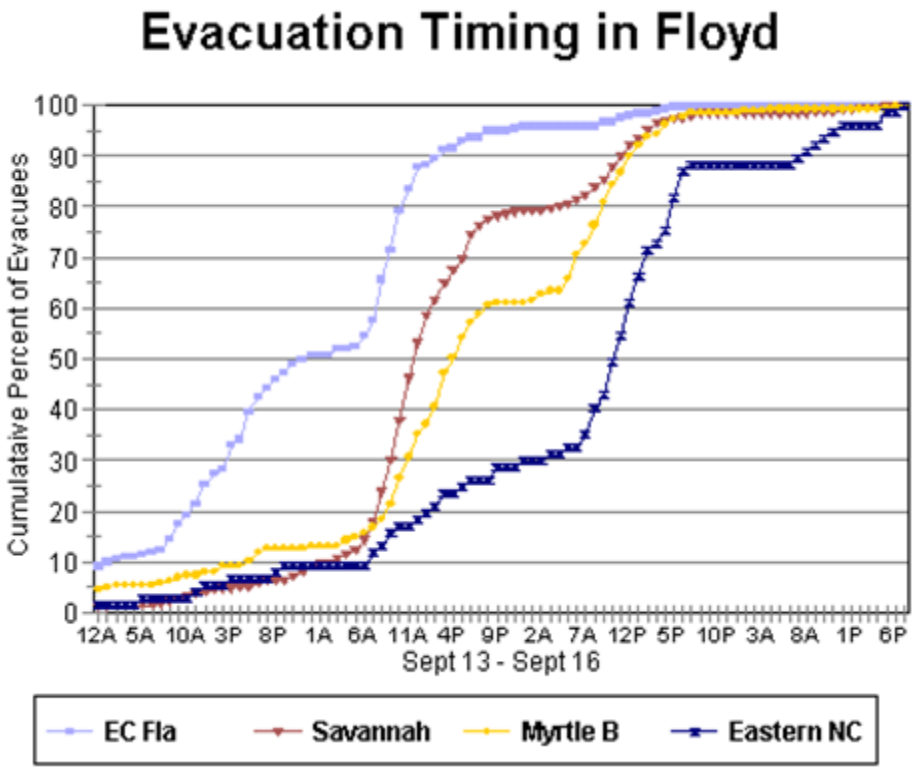
TOPIC 4: MOBILIZATION

- **Definition: "Time between Getting 1st Warning & Starting a Protective Action"**
- **People Don't All Act at Once**
- **Getting Ready to Respond Delays Response**
- **Why People Delay:**
  - Locate family
  - Gather possession
  - Confirm the warning &/or need to take action
  - Talk things over with others
- **A Few People don't Respond at All**

A VIEW OF MOBILIZATION

- **Varies by:**
  - Urgency of event
  - Severity of threat
  - Time of day/night
  - Time increases as message quality decreases
- **Non-linear (curved) Relationship between Time & Starting a Protective Action:**
  - Typically an “S” shaped relationship
  - Here’s an example….

HURRICANE FLYOD DEPARTURE TIMES



TOPIC 5: NOTIFICATION AND PUBLIC RESPONSE

PREDICTING PUBLIC RESPONSE

- **Predictions About it Work Best if:**
  - Made on basis of factors that determine behavior (e.g., "A" causes "B"), e.g., science
- **Predictions that Don't Work:**
  - Predicting from what people did in past events
    - Public behavior varies across events
  - Predicting from "behavioral intention" surveys conducted during non-emergency times
    - Opinions (intentions) & behavior are different
    - Factors that determine warning response behavior:
      - Not operating in a survey
      - Likely unknown to respondents

FACTORS THAT IMPACT PUBLIC RESPONSE

- **Many Statistically Significant Factors Documented by Research**
- **Variation in Importance:**
  - Strong vs. weak effects
  - Real vs. spurious effects
  - Elaborate vs. weak evidence
- **All that Follows is "Highly" Supported**

INFORMATION FACTORS

"About the Warning Message"

FACTOR 1: THE MESSAGE

- **Five Dimensions:**
  - Channel
  - Frequency
  - Content
  - Style
  - Source

FACTOR 1: THE MESSAGE (cont'd)

- **Number of Channels**:
  - The "more the better"
- **Type of Channel**:
  - Personal channels work best
  - The "more the better"
- **Communication Frequency**:
  - The "more" its repeated/heard "the better"
  - Repetition fosters confirmation

FACTOR 1: THE MESSAGE (cont'd)

- **Content:**
  - **WHAT**: Tell them what to do
  - **WHEN**: Tell them when (time) to do it
  - **WHERE**: Say who should do it & who shouldn't
  - **WHY**: Tell about the hazard's consequences
  - **WHO**: Say who's talking (source):
    - There is NO single credible source, so use a panel

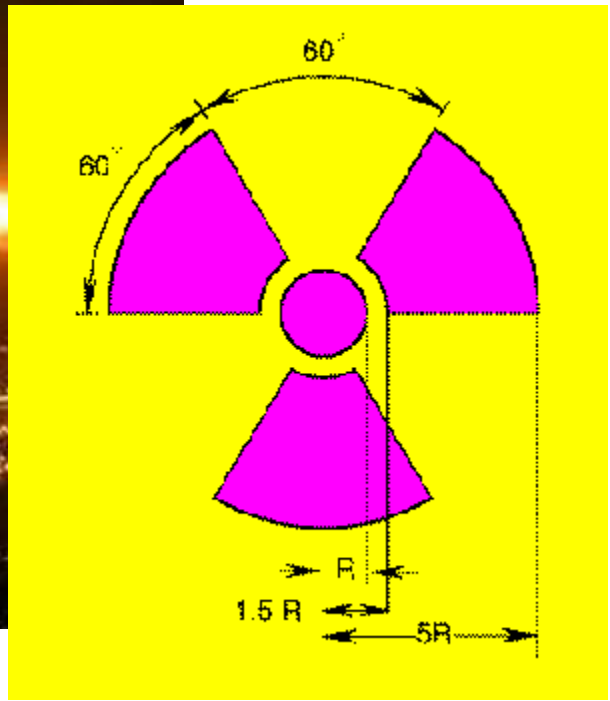
FACTOR 1: THE MESSAGE (cont'd)

- **Style:**
  - **CLEAR**: The more simply worded the better
  - **SPECIFIC**: Precise & non-ambiguous
  - **ACCURATE**: Errors cause problems
  - **CERTAIN**: Authoritative and confident
  - **CONSISTENT**:
    - Externally: Explain changes from past messages & differences from what others are saying
    - Internally: Never say "attack will occur soon, don't worry"

FACTOR 2: CUES (Non-verbal Information)

- **Social Cues Help**:
  - "Monkey see, monkey do"
    - People: Neighbors, Friends, & Relatives
    - Organizations: Government, Businesses, NGOs
- **Physical Cues Help too**:
  - If confirm the risk (rain in flood warnings)

SOME HAZARDS HAVE CUES & SOME DON'T



PEOPLE FACTORS

"About the Audience"

FACTOR 3: "STATUSES" (AS CONSTRAINTS)

- **Socio-economic Status**:
  - Having little money, education, employment
- **Age**:
  - Being young or old
- **Gender**:
  - Being male
- **Ethnicity**:
  - Being non-Anglo
- **Acculturation**:
  - Not speaking English, born in another country

FACTOR 4: "ROLES" (AS INCENTIVES)

- **Roles of Responsibility for Others:**
  - Having children
  - Larger family size
  - Having pets
  - More kin relationships
  - Family united
  - Greater community involvement

FACTOR 5: EXPERIENCE

- **People "Normalize" Risk Information Received Based on their Personal Experience:**
  - People are inclined to do what was appropriate in the "last" event experienced

PROCESS FACTORS

- **How Message & People Factors Interact**

FACTOR 6: BELIEF

- **There is "NO" Single Credible Spokesperson:**
  - STOP LOOKING FOR ONE
  - People have different ideas about who's credible
- **You're Asking the Wrong Question:**
  - Many "think" spokesperson credibility = message belief
  - They're different
- **Warning Belief is What's Important & Here's How to Achieve it:**
  - 1. Issue "one message" with "**MULTIPLE** spokespersons":
    - Officials, Red Cross, scientists, familiar newscaster, & others
  - 2. Use **MULTIPLE** dissemination channels
  - 3. Repeat the message **MULTIPLE** times:
    - Repetition fosters belief (discovered in 1952 in advertising research)
- **Here's as Good as Single Spokespersons Get….**

MOST CREDIBLE SOURCE IN AMERICA (for about 35%)

FACTOR 7: KNOWLEDGE

- **Multi-faceted Concept Including:**
  - Past: What people "import" into the event
  - Present: What people "think" based on the information/cues they get during the event
  - Natural Inclination: "I'm safe & I don't need to know anything else"
- **Its Not Static and Changes**
- **Manage it in Warning Messages:**
  - Provide warning information that "overcomes" differences in people's:
    - Past, present, & natural inclinations

FACTOR 8: PERCEIVED RISK

- **Perceived Risk "During the Event"**:
  - Different from pre-event risk perception
  - Major roadblock to taking action:
    - "I'm safe" & I'll find information that confirms it, that's what I'll believe, and I'll ignore the warning"
  - People dichotomize risk:
    - Do something/do nothing
    - Its not in proportion to probability estimates
  - Remember:
    - People "Normalize" Communicated Risk

FACTOR 9: MILLING

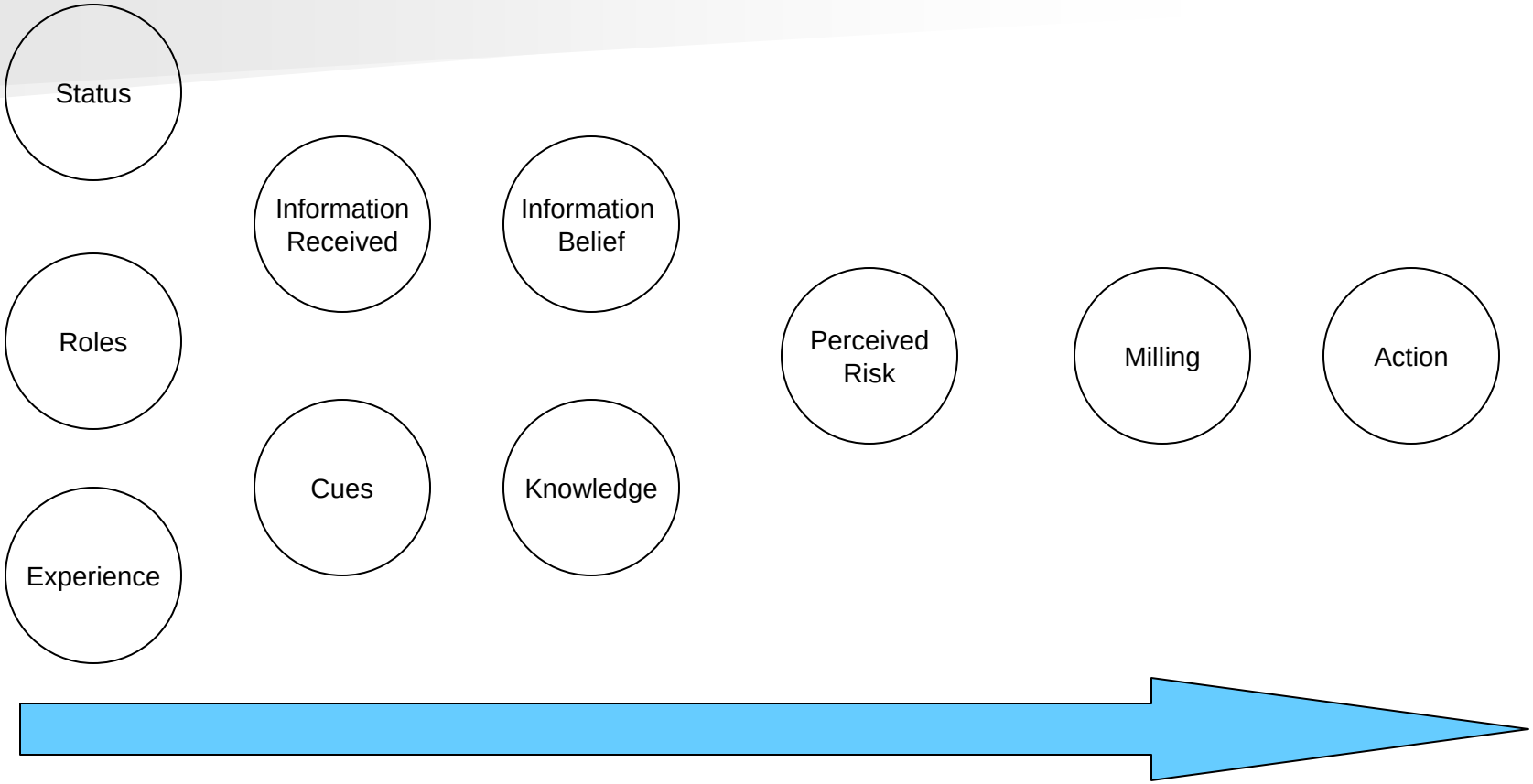
- **Milling/Confirmation**:
  - "Key" to warnings that work
  - Nobody does something because someone tells them to do it
  - People have to think its their own idea
  - Comes from milling (talking about it with others & getting confirming information):
    - Risk & what to do about it needs to be "confirmed" through additional information & talking it over with others

HOW ALL THESE FACTORS RELATE TO EACH OTHER

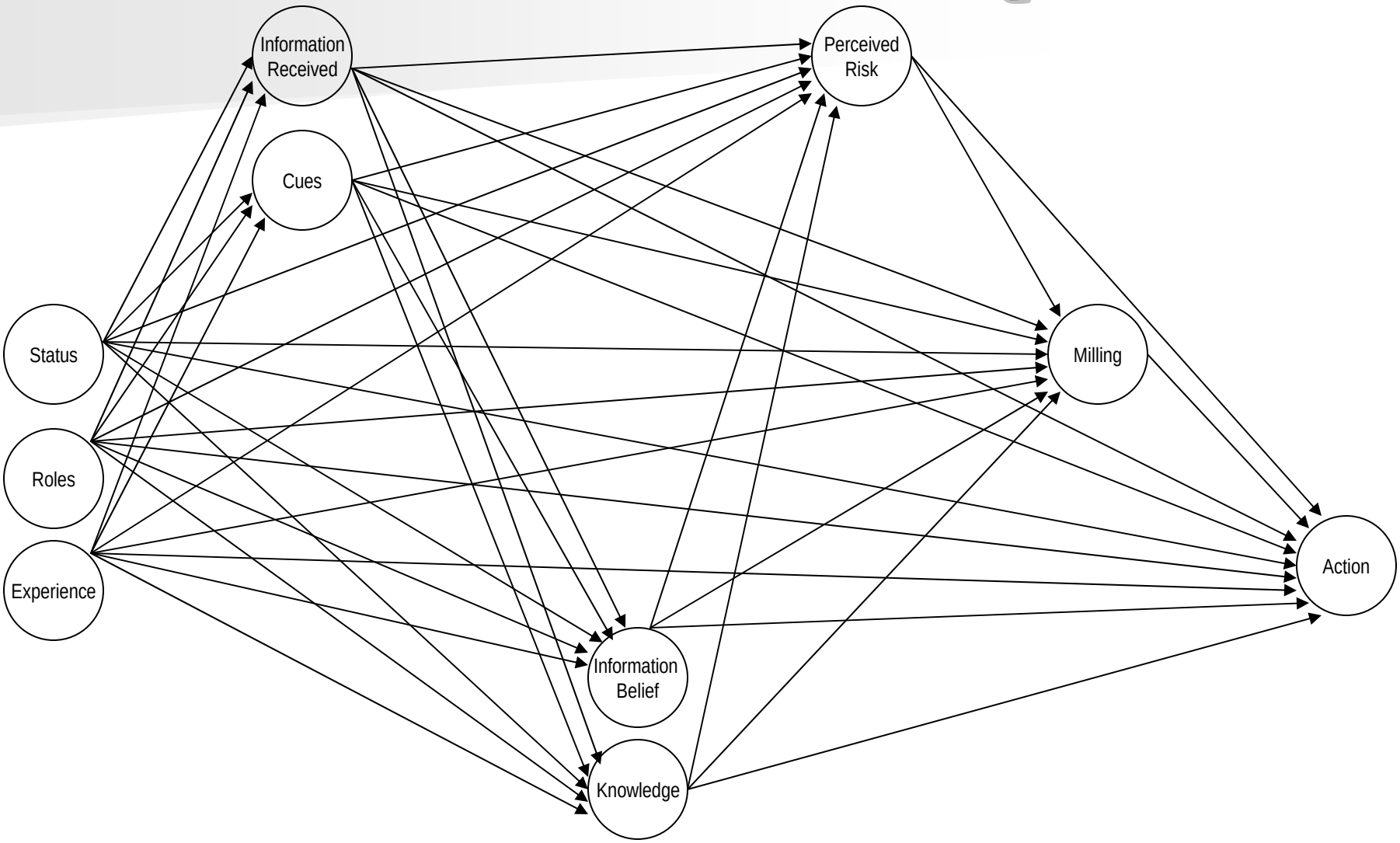
SEQUENCED CUMMULATIVE EFFECTS OF FACTORS, e.g.,

- **Perceived Risk Determined by:**
  - Multiple communications
  - Multiple channels
- **Milling Determined by:**
  - Multiple communications:
  - Multiple channels
  - Perceived risk
- **Warning Response Behavior Determined by:**
  - Multiple communications
  - Multiple channels
  - Perceived risk
  - Milling

SEQUENCING THE FACTORS



MODELLING THE SEQUENCE



CONVERTING THE MODEL TO MATHEMATICS

- **Represented by Equations:**
  - Called a “series of simultaneous multiple regression equations”
- **Can Determine:**
  - The effect of every factor in the model on other factors while controlling for the effects of all other factors (“good” science)
- **Result is:**
  - Can distinguish between what’s really important and what isn’t
- **When to Get Excited:**
  - When different studies reach the same conclusions
  - That’s where we are with research on public response to warnings for hazardous events

EXAMINE SOME EQUATIONS (WTC Evacuation on 9/11)

$$X4 = \beta 41X1 + \beta 42X2 + \beta 43X3 + e4$$
$$X5 = \beta 51X1 + \beta 52X2 + \beta 53X3 + \beta 54X4 + e5$$
$$X6 = \beta 61X1 + \beta 62X2 + \beta 63X3 + \beta 64X4 + \beta 65X5 + e6$$
$$X7 = \beta 71X1 + \beta 72X2 + \beta 73X3 + \beta 74X4 + \beta 75X5 + \beta 76X6 + e7$$

(cf. Averill, J. D., D.S. Mileti, R.D. Peacock, E.D. Kuligowski, N. Groner, G. Proulx, P.A. Reneke, and H.E. Nelson. 2005. Federal Building and Fire Safety Investigation of the World Trade Center Disaster: Occupant Behavior, Egress, and Emergency Communications. *Report NCSTAR 1-7*, National Institute of Standards and Technology, Gaithersburg, MD.)

Available at: http://wtc.nist.gov/NISTNCSTAR1-7.pdf

CONCLUSIONS FROM THE MATHEMATICS

- All Factors **AREN'T** Equally Important
- Some Factors are **REALLY** Important:
  - What the message says:
    - Especially telling what actions to take
  - Hearing the same thing many times
  - Cues
  - Milling
- Some Factors are **LESS** Important:
  - Demographics (unless information is poor)
- Some Sequences **MORE** Important than Others

GENERAL OBSERVATIONS

- **Information (Message) Factors:**
  - Largest impact of all factors on public response
- **If Information Factors are High Quality:**
  - Influence of other factors "decrease"
  - Ability to manage public response can be high
  - Example: Nanticoke
- **If Information Factors are Low Quality:**
  - Influence of other factors "increases"
  - Ability to manage public response can be lost
  - Example: Three Mile Island

GENERAL CONCLUSIONS

- **Sound Public Warning Response is not Likely to Happen Naturally:**
  - Due to innate difference between the people being warned
- **Differences between People being Warned:**
  - Can be overcome by providing good warning information
- **Good Warning Information won't Happen Naturally either:**
  - Requires adequate warning preparedness planning
- **Sufficient Research Evidence Exists to Know What Adequate Warning Preparedness should Include**

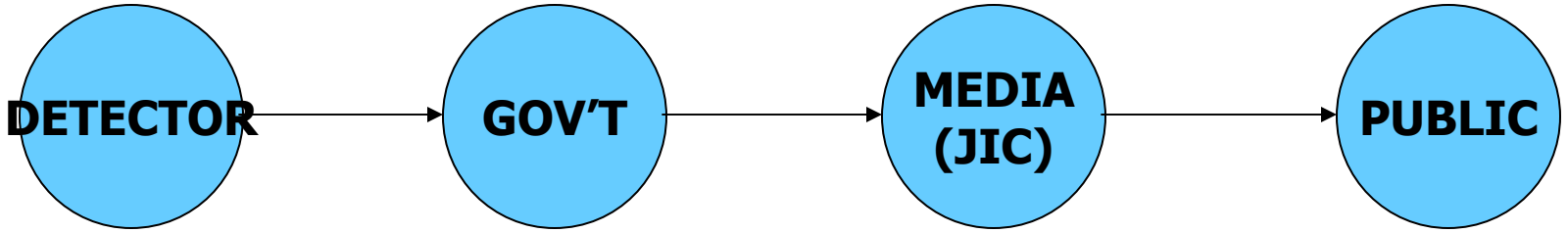
TOPIC 6: WARNING SYSTEM PREPAREDNESS

- Warning System Preparedness May be Out of Date
- Why?:
  - Society changed
  - Warning preparedness hasn't
- Here's What Changed……

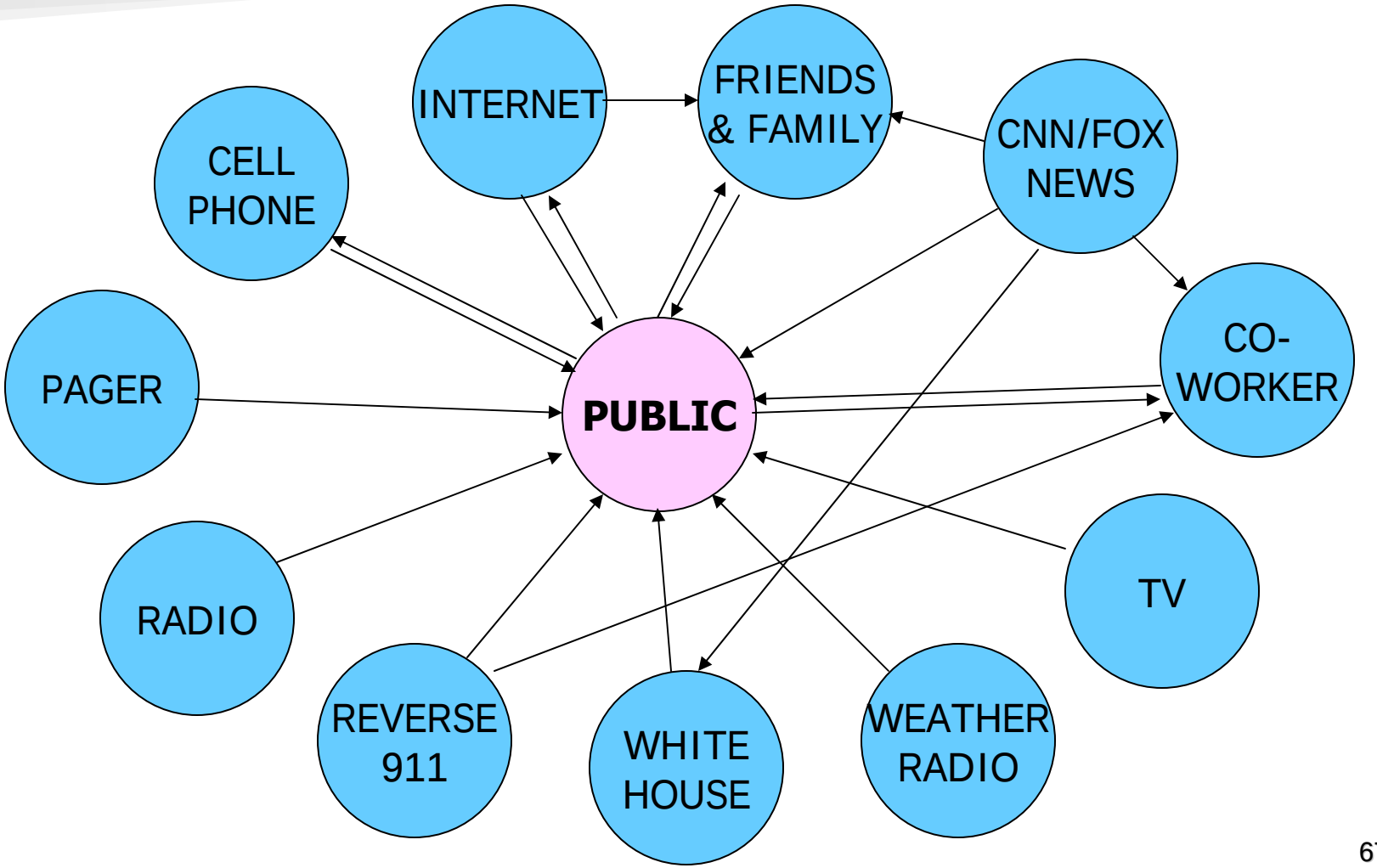
PUBLIC COMMUNICATION HAS CHANGED "SHAPE"

- **Public Warning Systems of Old:**
  - "Linear" communication systems
- **What's Changed:**
  - Innovations in communication technology
  - Shifts in communication practices
- **Requires Warning Systems Change to:**
  - "Non-linear" communication systems
- **Here's What it Looks Like….**

YESTERDAY: "LINEAR" PUBLIC WARNINGS



TODAY: EVERYONE'S WARNING EVERYONE ELSE



WARNING SYSTEM PREPAREDNESS

- **Yesterday….Prepare for:**
  - Emergency alert system messages
  - Press briefings at a joint information center
  - Fire fighter's messages in buildings
- **Today….Be Able to:**
  - Manage a complex public conversation in which everyone is giving/getting information to/from everyone else

ONE THING HASN'T CHANGED

- **Public's Need for Warnings that are:**
  - CLEAR (simply worded)
  - SPECIFIC (precise and non-ambiguous)
  - ACCURATE (no error)
  - CERTAINTY (authoritative and confident)
  - CONSISTENT (within and between messages)
- **About:**
  - WHAT (what to do)
  - WHEN (when to do it)
  - WHERE (who should & shouldn't do it)
  - WHY (the hazard & consequences)
  - WHO (who's giving the message)
- **That are Confirmed:**
  - Same message heard many times

AN EXAMPLE OF BRINGING RESEARCH TO PRACTICE

- **Converting All the Research, Data, and Mathematics into Practice……**

TOPIC 7: WHAT'S NEEDED

MAJOR RESEARCH NEEDS

- **National Public Response Data Repository**
- **Meta-analysis of Existing Survey Data:**
  - Within & across disciplines & hazards
- **Studies of Public:**
  - Non-evacuation protective actions
  - Response in large urban areas
  - Response to no notice/short notice events
  - Exploration of variation in mobilization times
  - Ending events/all clears
  - Evacuation vs. migration vs. abandonment
- **Penetration of New Warning Technologies**

MAJOR APPLICATION NEEDS

- **Evidence-based Guidance:**
  - How to write effective warning messages
  - Inter-organizational warning preparedness
- **Prototype Warning Messages**
- **Modernize Existing Warning Systems:**
  - New technologies
  - Societal changes since plan development
- **Evidence-based Behavior Assumptions in Protective Action Models**

THANK YOU

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