



**Family gathering in evacuations:  
the 2007 Angora Wildfire in South Lake  
Tahoe, CA**

**Thomas J. Cova and Marquessa N. van Drimmelen**

**Center for Natural & Technological Hazards  
Department of Geography  
University of Utah**

**National Evacuation Conference, New Orleans  
February 4<sup>th</sup>, 2010**

# Problem Statement

What does the process of household gathering look like in a wildfire evacuation, particularly from a geographic standpoint?

- What types of groups gather?
- Where is everyone prior to gathering?
- Where do they decide to gather and why?
- What trips (and pick-ups) are made?

How does this process affect evacuations?

# Households: to gather or not?

- Is there enough time?
- Who's in the group, where are they, and where should we meet?
- How many vehicles should we (can we) take?
- How should we get there (including stops)?
- Gather pre or post evac?

# Family Gathering in Evacs

## Behavioral focus

Families evacuate as a unit (Drabek, 1960s)

Assessing its effect on compliance:

- Families are less likely to comply when gathering not feasible
- Families together are more likely to believe and respond to a warning message

## Modeling focus

Gathering trips can affect evacuation time (Murray-Tuite and Mahmassani, 2003), as can decisions about where, when, and how to do it.

# Research needs

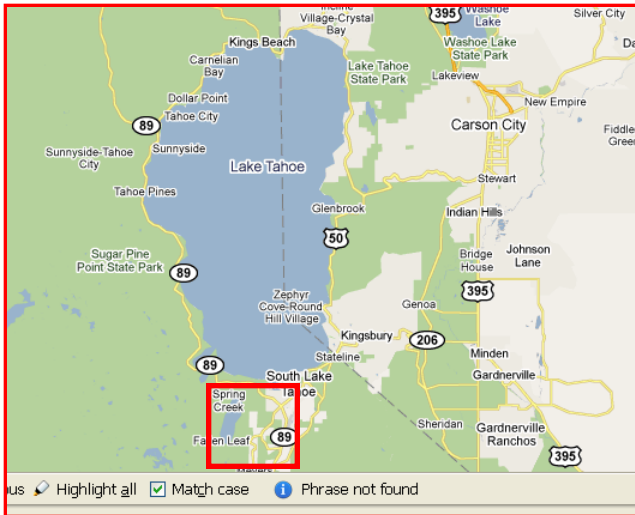
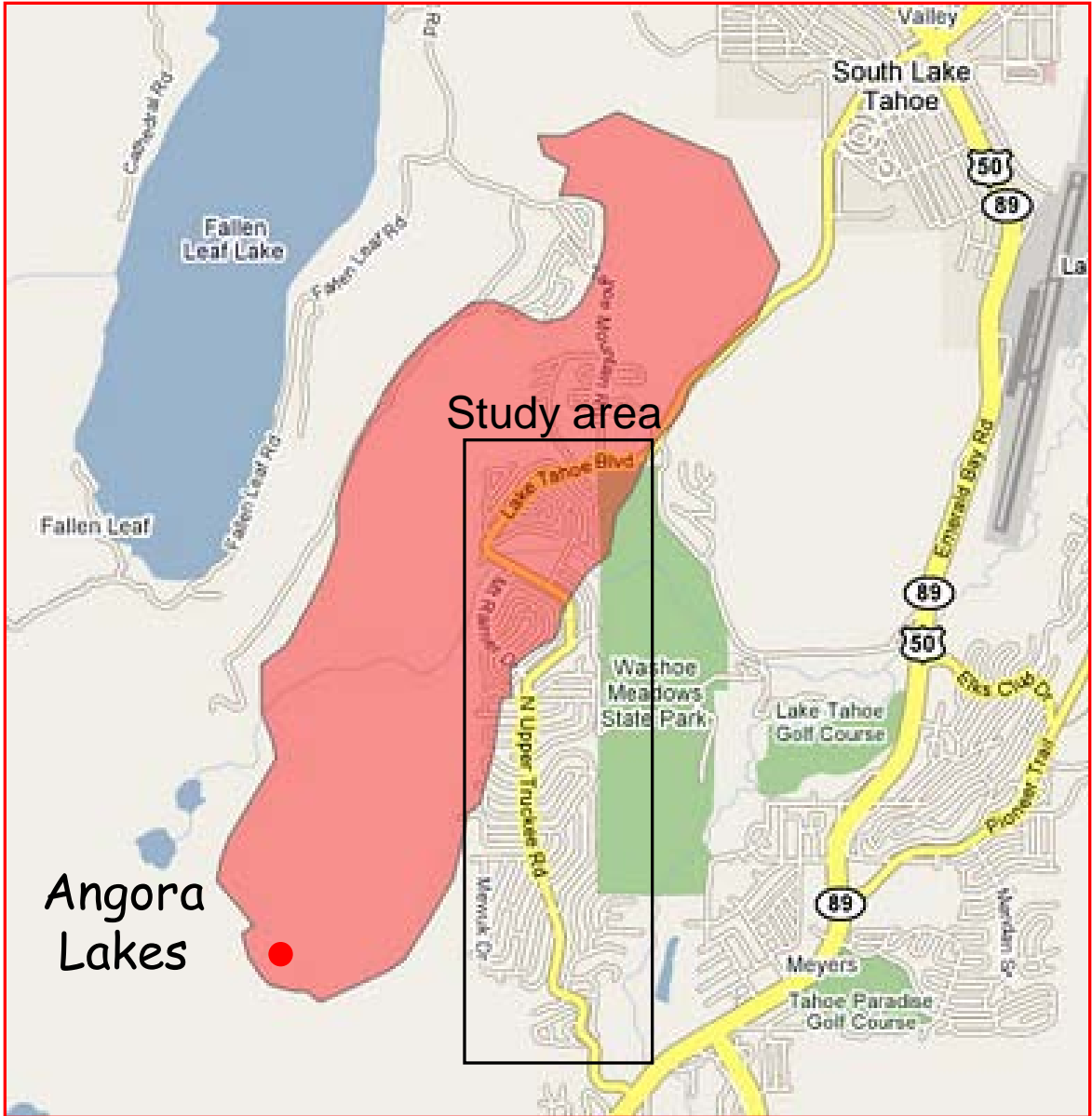
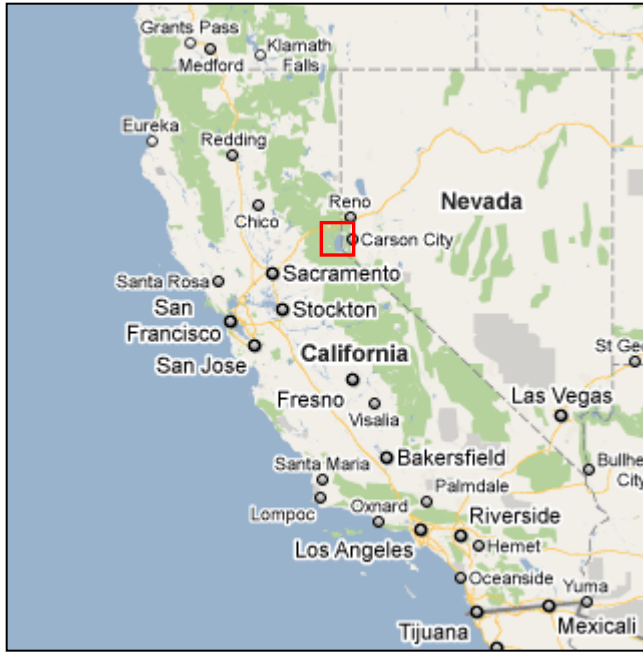
- Gathering in wildfires has not been studied
- The geographic dimensions of gathering have not been examined
- A clearer empirical picture of the gathering process needs to be developed, particularly its effect on traffic patterns and evacuation time

# Outline

1. 2007 Angora Wildfire, SLT, CA
2. Evacuee Survey
3. Results
4. Discussion and conclusion

# 2007 Angora Wildfire: Background

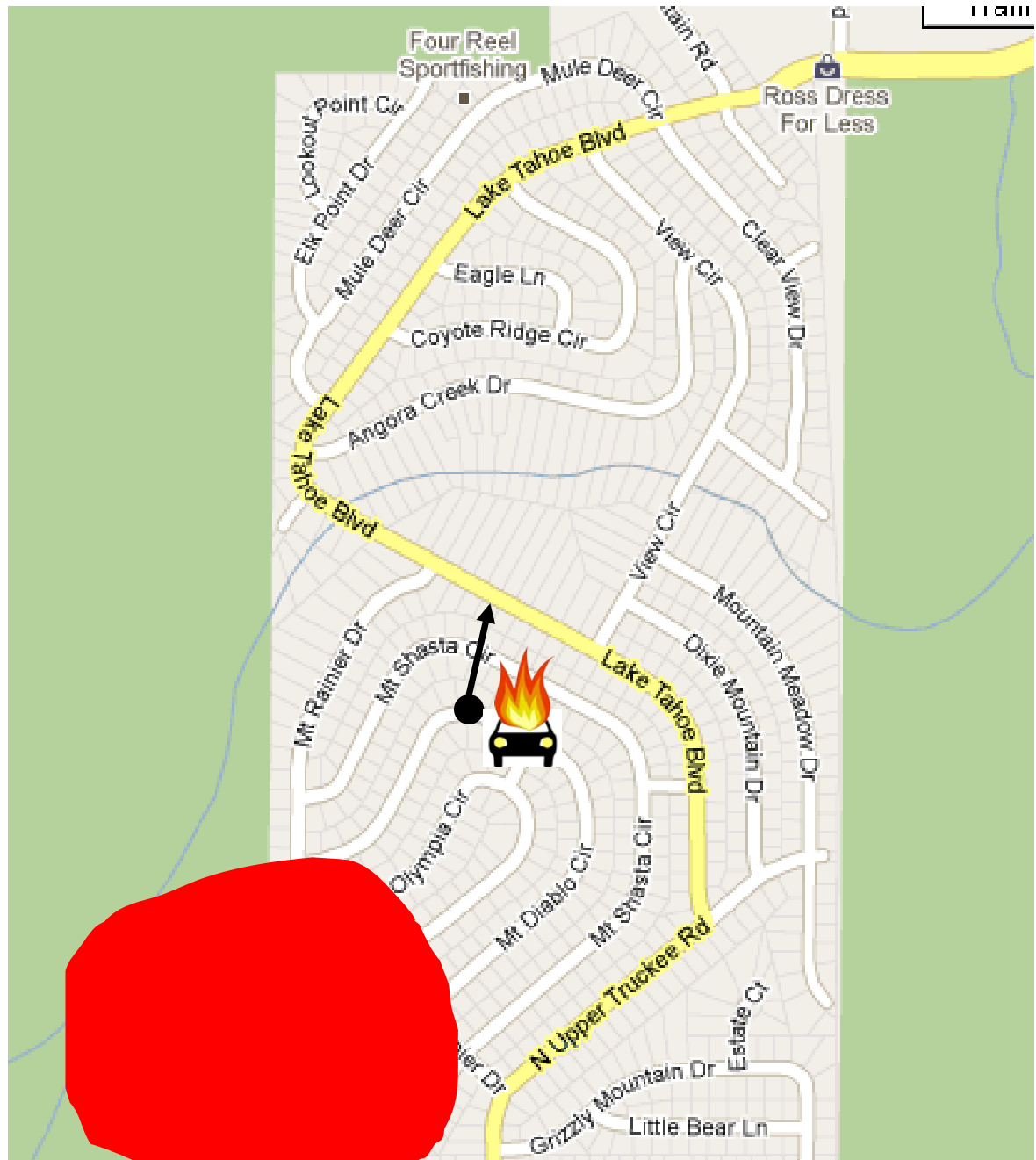
- On Sunday June 24 at 2:00 pm golfers at the Lake Tahoe Country Club called 911 to report smoke near Fallen Leaf Lake.
- Dispatchers dismissed an initial series of calls by incorrectly noting that it was a controlled burn, but the Forest Service responded to suppress it.
- Severe drought and weather conditions made controlling the blaze very difficult.
- The result was a fast-moving, wind-driven fire that immediately and imminently threatened neighboring communities.



us Highlight all Match case Phrase not found

“Many evacuating residents had to flee on foot, taking just what they could carry, as the fire devoured cars and homes in its path, House said.”

- CNN, 2007

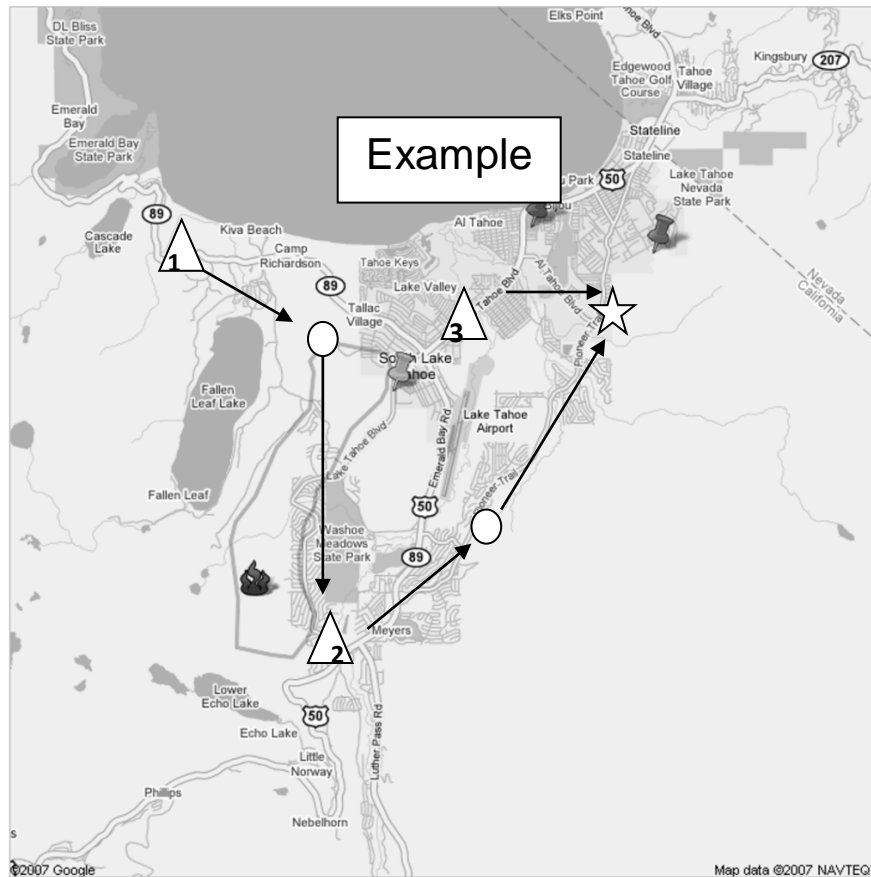


# Angora Wildfire Response

- Mandatory evacuations were immediately undertaken, and many nearby households were given little to no prep time.
- Major roads were closed to incoming traffic while local authorities urged residents to leave.
- On the 26<sup>th</sup> (day 3) the blaze jumped a fire line, and residents of the Tallac Village subdivision were evacuated.
- By July 2nd the fire was contained after burning 3,100 acres, destroying 242 residences (67 commercial structures), and displacing 3,000 evacuees.

# Household Survey

- In early 2008 a mail-out survey was sent to 500 households in the evac zone using an address list provided by El Dorado County.
- The survey consisted of questions regarding the geographic, demographic and transportation dimensions of the gathering process.
- Respondents were also asked to trace the route of each group member to their gathering place on a map.
- The resulting quantitative data, gathering map, and qualitative descriptions were used to piece together each group's gathering story.



1. Father at work when evacuation notice was received
  - left work to go home, refueled car en route
2. Father arrived at home, picked up child
  - they stopped for food at grocery store
3. Mother met father and child at motel (star).

# Response Rate

- Of the 500 surveys, 25 were returned as undeliverable, and 129 of the remaining 475 were completed and sent back for a response rate of 27%.
- Of those 129, 70 were from households that were not in South Lake Tahoe at the time of Angora fire (a popular second home area with forwarded mail).
- The remaining 59 surveys were analyzed regarding the geographic dimensions of the gathering process.

# Example Gathering Stories

"My husband was home when the fire started, and the children and I were in Reno."

"We were all at home at the time of the fire."

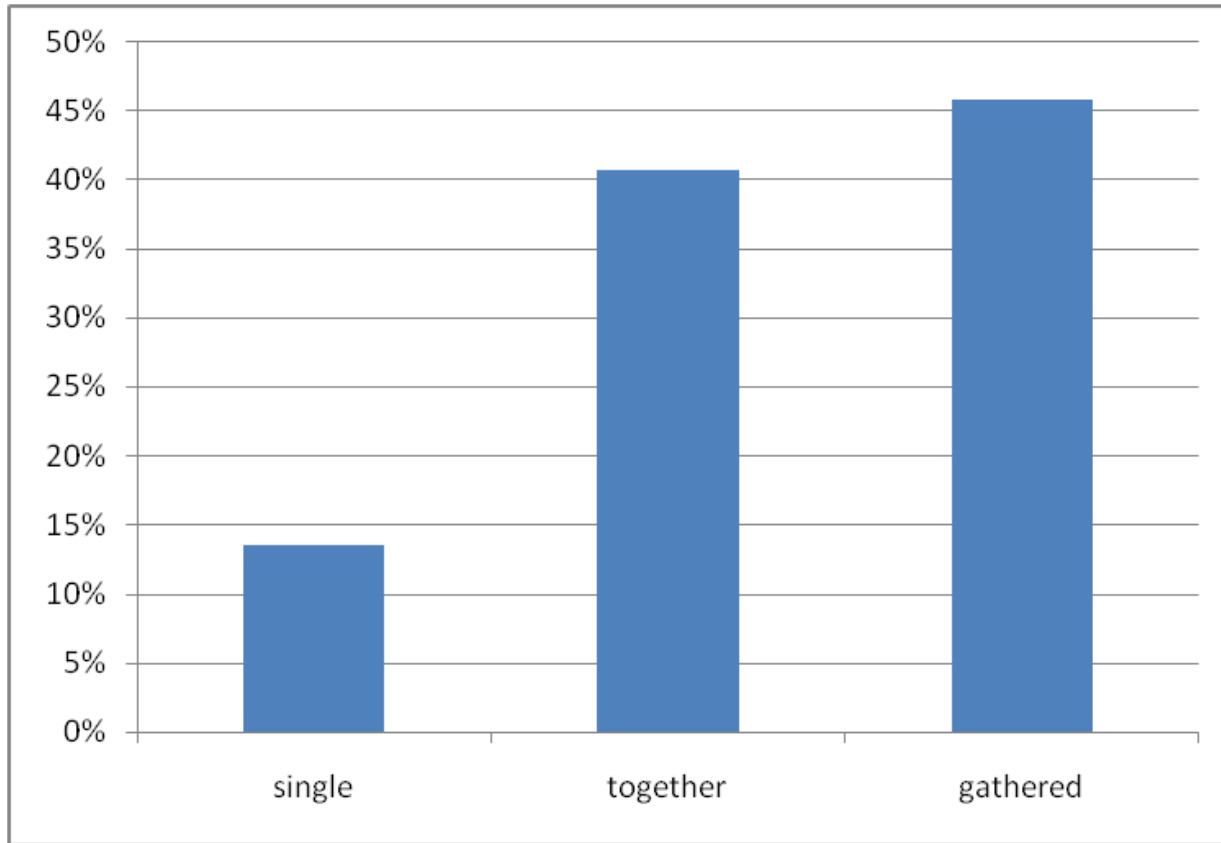
"We were in Reno, got a call from a neighbor, rushed home but were not allowed back."

"I was hiking in the mountains nearby with my girlfriend and two dogs and saw the smoke. We raced home to pick up whatever we could."

"Parents took dog to place of employment."

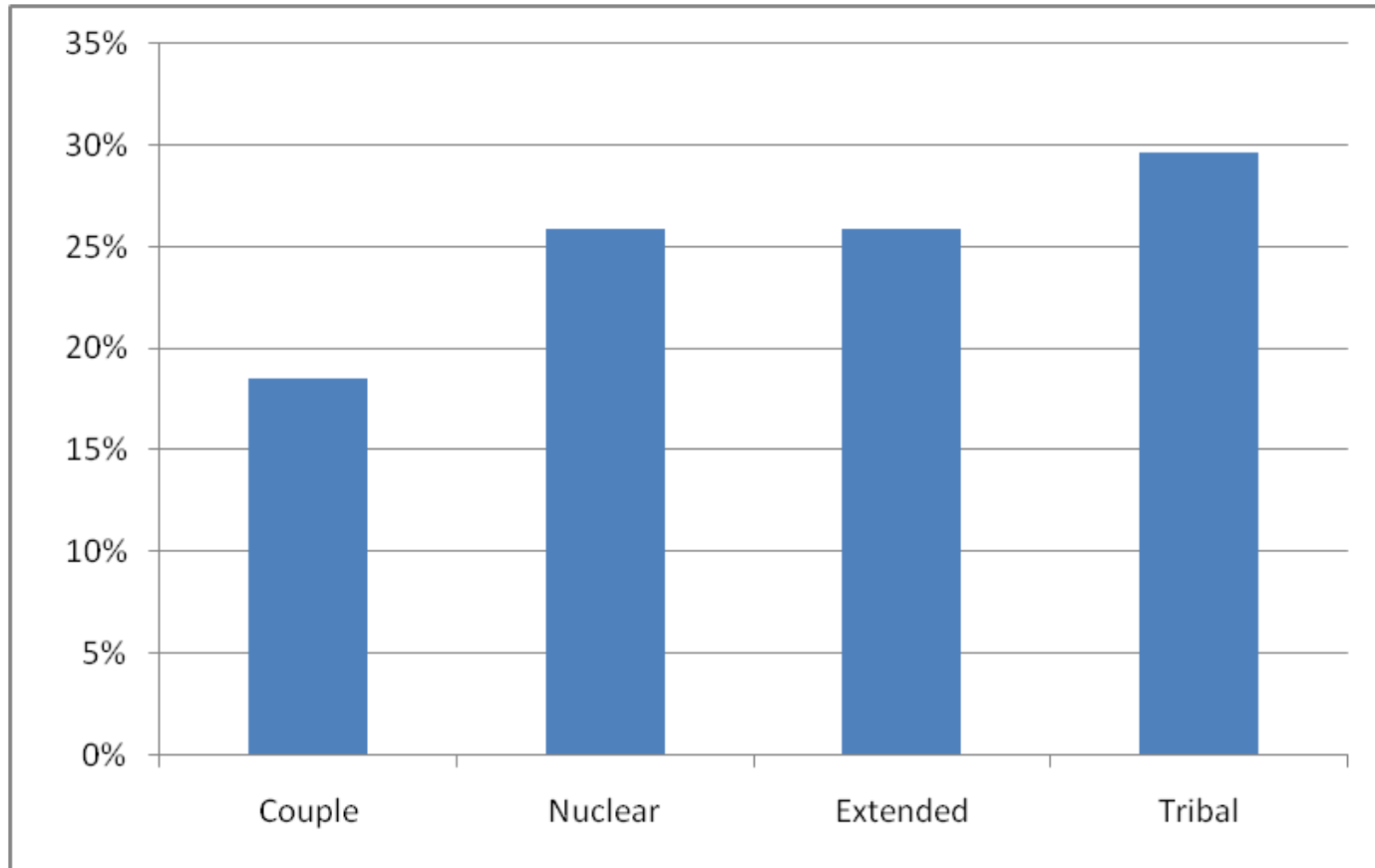
"Our problem was we didn't have time to meet."

What percent gathered (n = 59)?

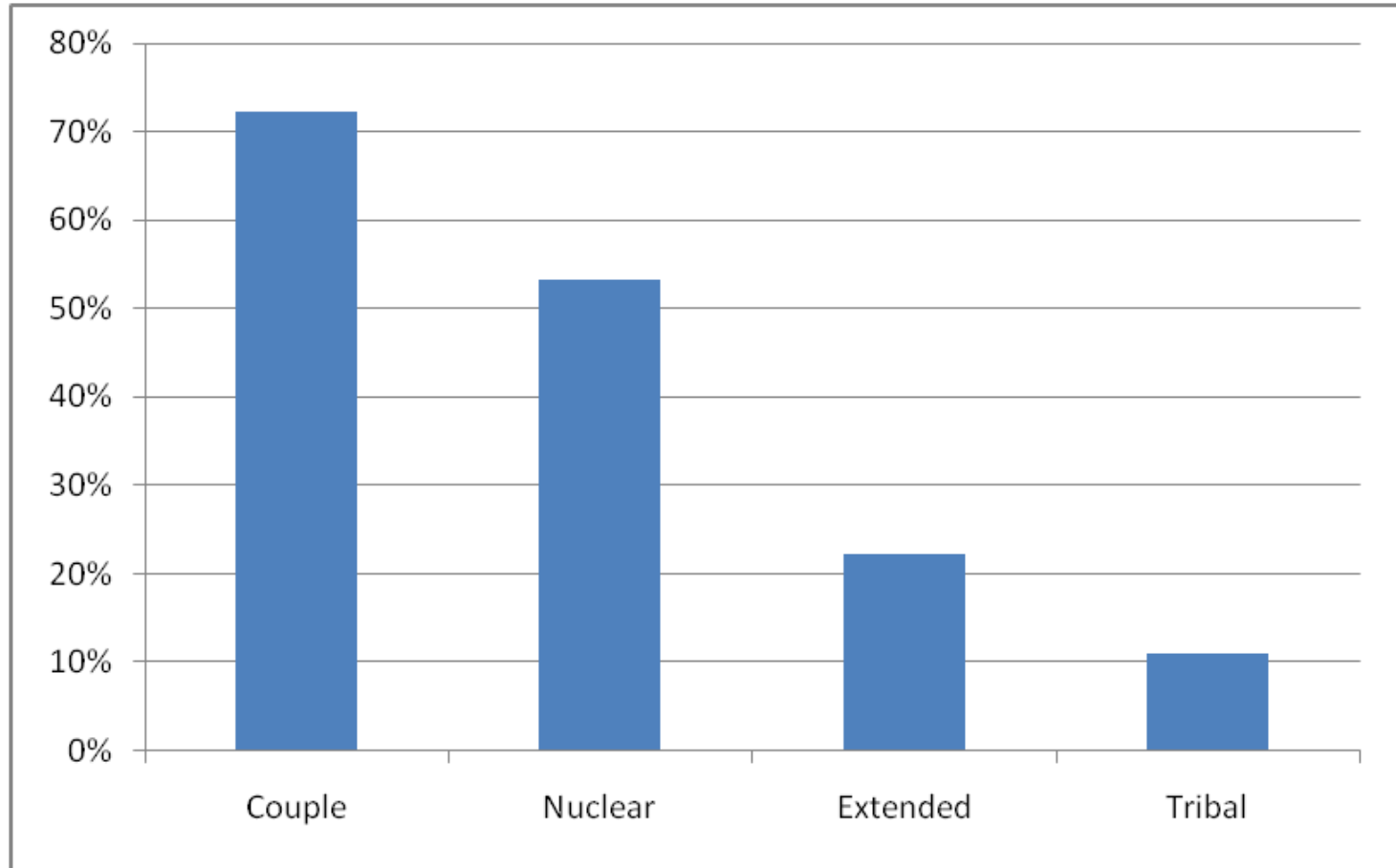


$$n_g = 27$$

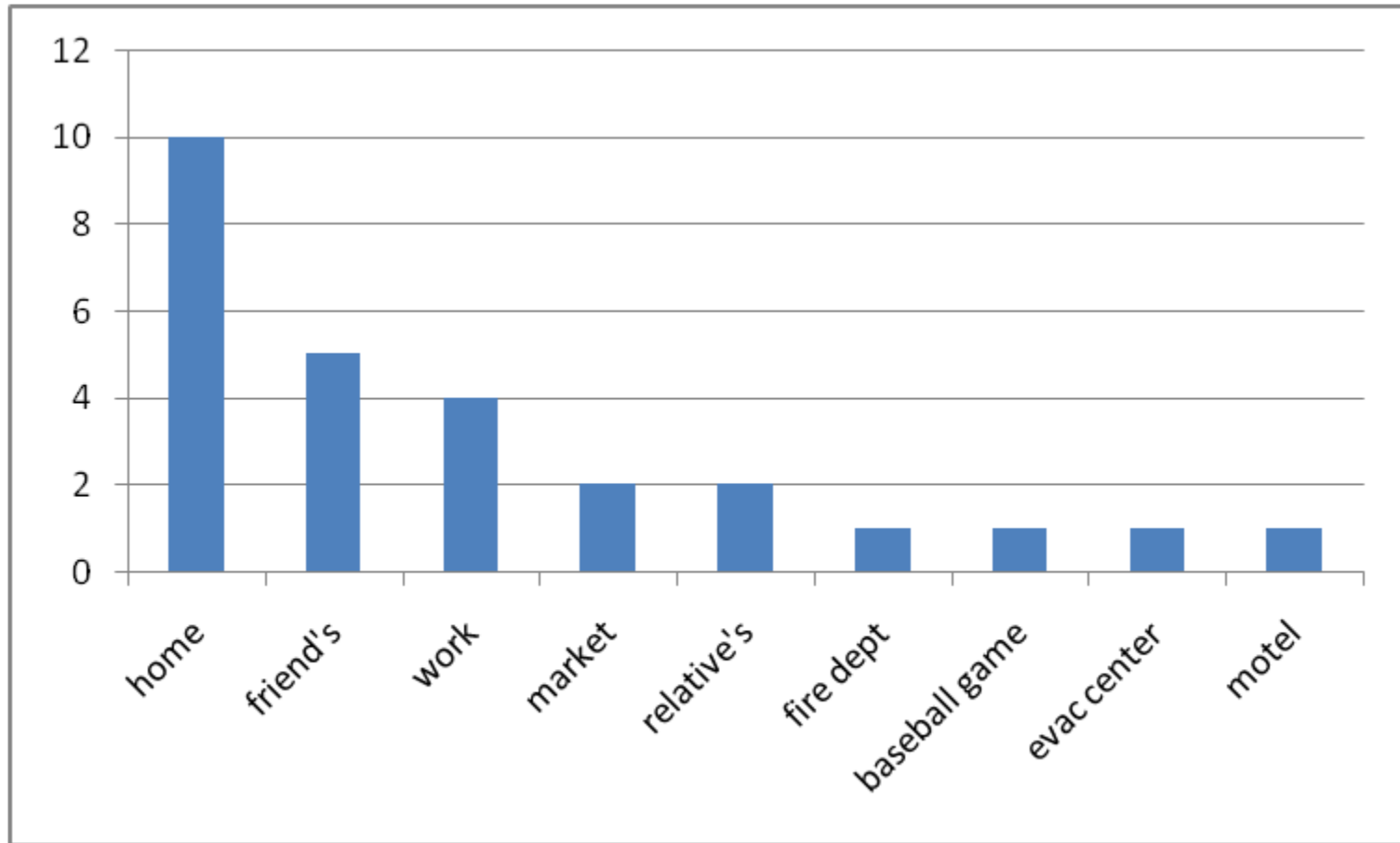
# What types of groups gathered (n=27)?



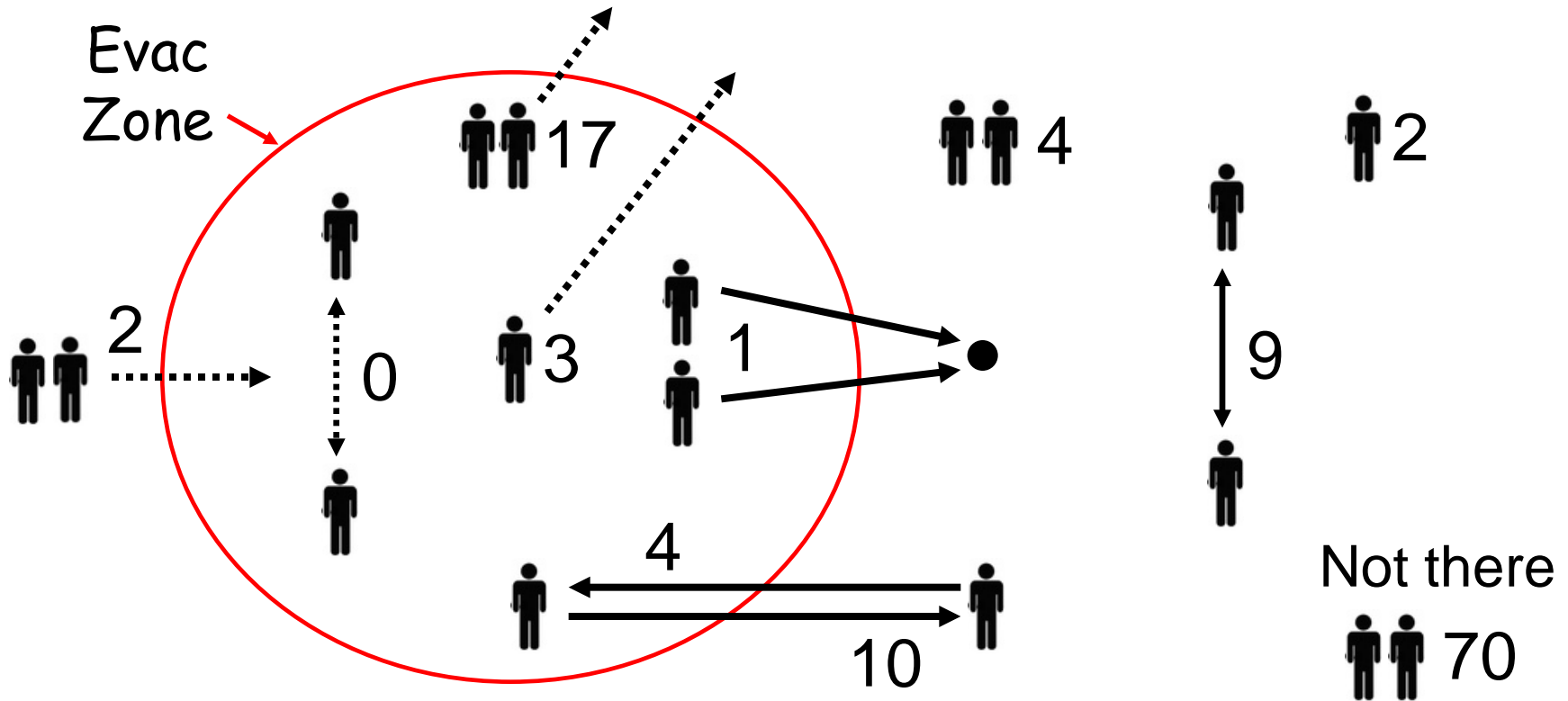
# What group types were already together?



# Where did groups gather (n = 27)?



# Gathering geography and traffic



$n = 122$

(7 ambiguous)

Gathering traffic flow



Non-gathering traffic flow



# Evaluating Gathering Traffic Impact (n = 129)

<u>No clear traffic effect on evac from gathering</u>	<u>Groups</u>
Not there on June 24 <sup>th</sup>	70
Already together (inside or out*)	23
Single (inside or out)	5
Started outside and gathered outside	9
Started in and/or out and met outside (post evac.)	<u>11</u>
	118 (97%)
<u>Possible traffic effect on evac from gathering</u>	
Started inside and out and met inside	4 (3%)
Not classified (ambiguous/incomplete geo-details)	7

*\*Inside and outside are in reference to the evacuation zone.*

# Discussion - Angora Fire Case

- The majority of groups were either single, already together, or chose to gather outside the threat area (i.e. started outside or gathered post evac).
- Few groups (3% of responses, 7% of groups there) traveled into the evac zone to rescue family members.
- Gathering traffic appears to be negligible in terms of disrupting or impeding the Angora Wildfire evacuations.
- Date (June 24), Day (Sunday), time-of-day (2-6 pm) played a significant role, as did area demographics.

# Current Modeling Assumptions

- Gathering is a nuclear family issue?
  - Couples, extended family, and tribal groups gather (single evacuees don't need to).
- All households gather prior to evacuating?
  - Groups that are not home, single, already together, or choose to gather outside the threat area do not generate gathering trips that affect the evac.
- Families pick an optimal (median) gathering location (Murray Tuite and Mahmassani 2003)?
  - Locational attraction factors are more relevant (home, family member's home, friend's home, familiar landmark, shelter, ...)

# Conclusions

- Gathering traffic can have little to no influence on a wildfire evacuation (more to do here).
- Modelers should consider the: 1) timing, 2) demographics, and 3) full breadth of starting conditions (and gathering locations) in generating realistic scenarios.

RQ: What gathering trips **genuinely** affect evacuation traffic flow (and time), and under what conditions do they occur?

# Acknowledgments

- National Science Foundation (NSF) for grant CMMI-0653752 on Protective Actions in Wildfires.
- El Dorado County Assessor's Office for Parcel Address Data
- Laura Siebeneck for help in analyzing the data