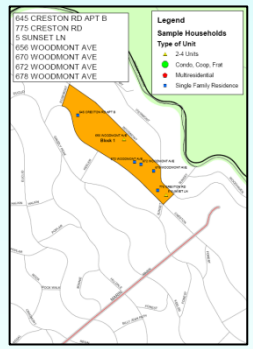
A Toolkit for Rapid Epidemiologic Assessment Using 30 by 7 Cluster Samples

The City of Berkeley
Public Health Division



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Background

- When Disaster Strikes
- Emergency Response

- Public Health Role
  - ✓ Support role in natural disasters
  - ✓ Lead in outbreaks/pandemics/ mass exposure to biologic agents
- How can emergency managers rapidly get valid population estimates of: 1) basic human needs and 2) acute illness/injury in a setting where infrastructure is severely compromised?

Rapid Epidemiologic Assessment

- AKA
  - ✓ Rapid needs assessment (RNA)
  - ✓ Community assessment for public health emergency response (CASPER)
- Well-established method based on household surveys coupled to multi-stage cluster samples
  - ✓ When population is geographically dispersed the logistics of simple random sampling are impractical
  - ✓ Balance of number of clusters and households/cluster (30 by 7, 40 by 10, etc.) to yield precision one can afford in time and effort (e.g. margin of error ±10%).
- Long history of use in countries where infrastructure underdeveloped to assess immunization coverage and health services, as well as human needs in the aftermath of natural disasters etc.

Uses of REA in a Disaster

- To provide timely, statistically valid information on households' and population health status, access to housing, food, water, public services and other services
- To improve the timeliness and targeting of disaster relief and demobilization.
- To monitor the effectiveness of disaster relief activities.

Berkeley's Rapid Epidemiologic Assessment Toolkit

- Sample design and selection methods using a parcel database and 2000 US Census blocks
- Instrument to assess basic human needs and conduct illness/injury surveillance
- Just-in-Time training materials
- Field Operations
  - ✓ Model for organization (ICS) and division of labor
  - Routing maps
  - Block maps with sample household locations
  - ✓ Daily Schedule
- Database and statistical analysis code for a cluster sample
- Report template for emergency managers
- Interface with community engagement and incident command system (ICS)

= Strong GIS component

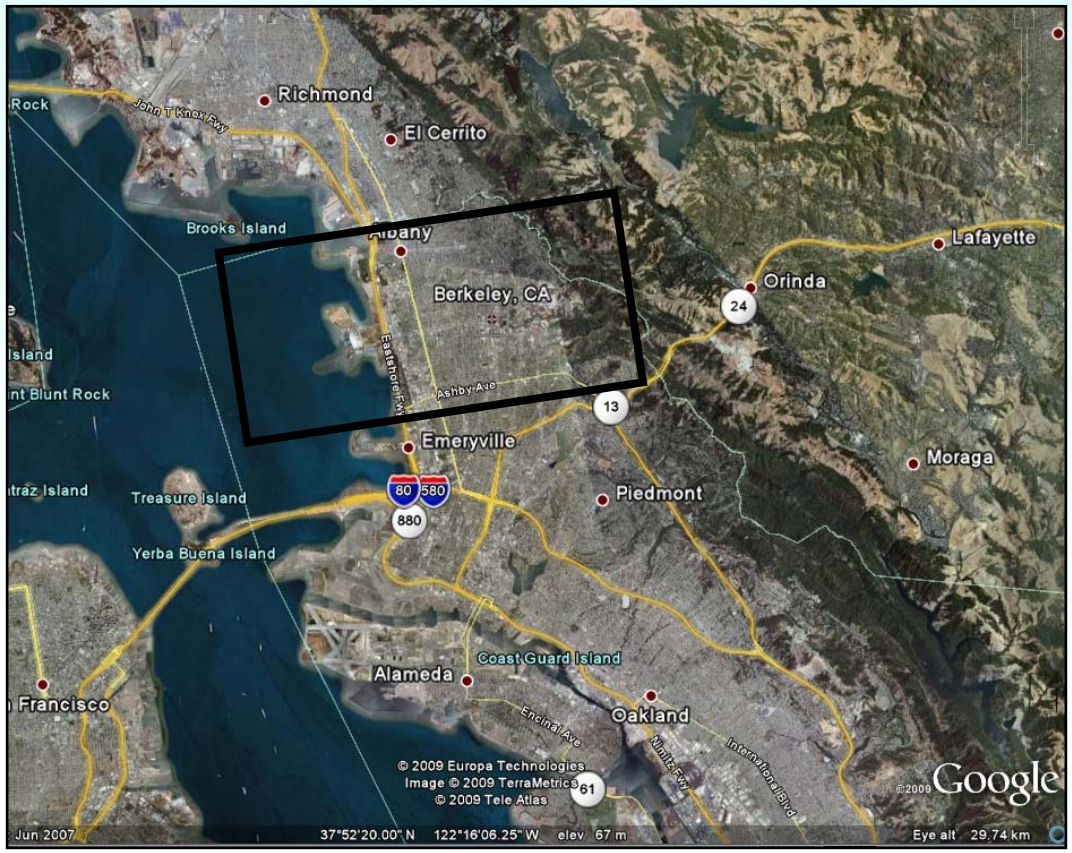
Steps in Selecting the Sample for an REA

1. Divide disaster site into mutually exclusive blocks or clusters
2. Get a preliminary estimate of the number of housing units in each block/cluster
3. Select a sample of 30 clusters with a probability proportional to the estimated number of housing units (PPS)
4. Within each cluster/block list all housing units, randomly select a fixed number (n=7) of housing units without replacement
5. Count the number of people in each selected housing unit and select one as a respondent to a household survey
6. If no one is at home, identify a proxy (neighbor) or do a follow-back visit to obtain information on the selected household

Source: Malilay J, Flanders WD, Brogan. A modified cluster-sampling method for post-disaster rapid assessment of needs. Bulletin WHO 1996;74:399-405.

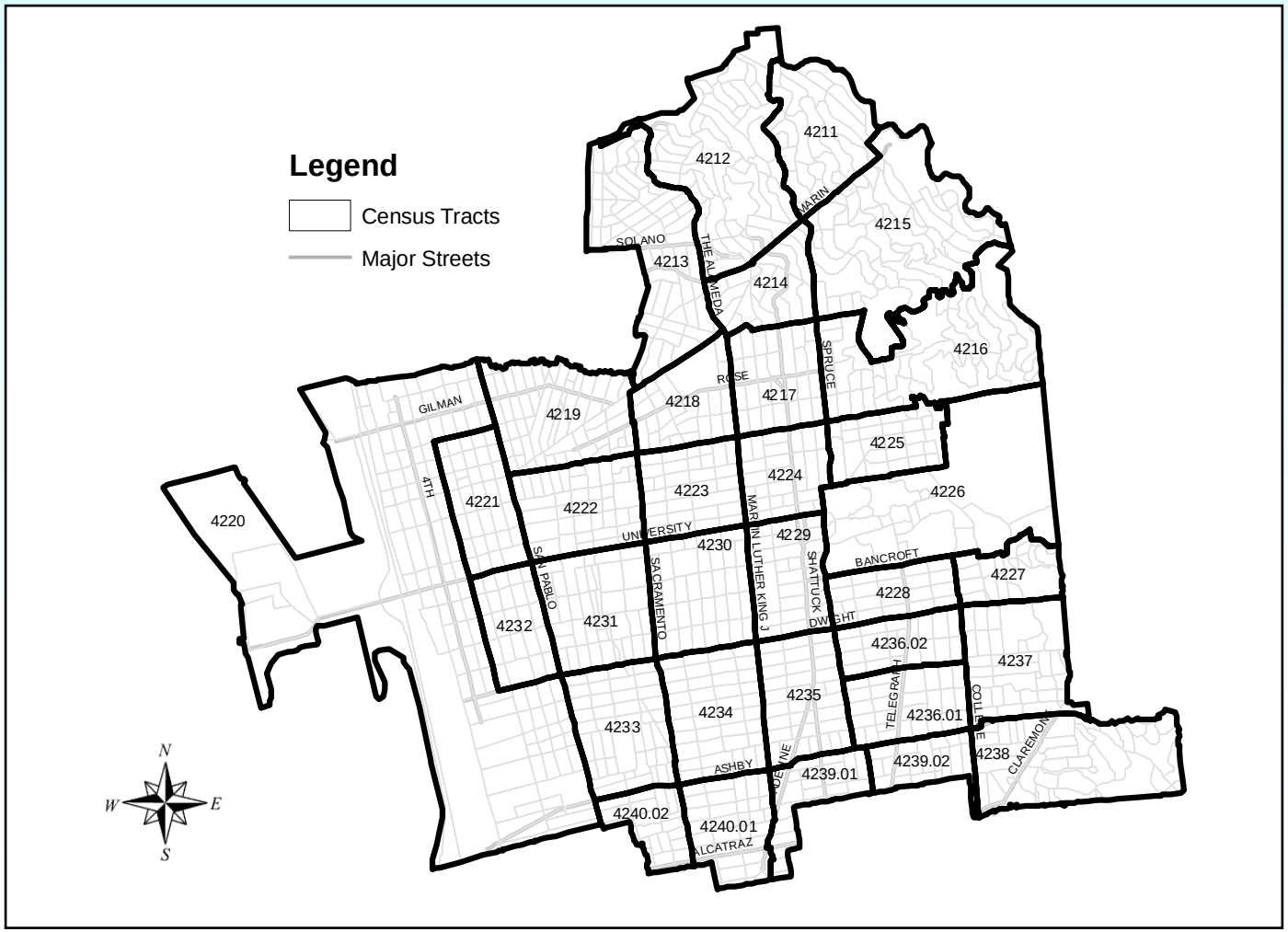
Target Population: Berkeley, CA

- Ethnically diverse population of 106,700 in 2008
- 10.5 square miles
- Coastal flatlands rising to 1,320 ft in hills



Sample Area

- Contours of disaster area are made up of all or any combination of Berkeley's 33 census tracts



Sample Design

- From the universe of 1029 residential census blocks, 30 census blocks (PPS) with 7 households per block = 210 households

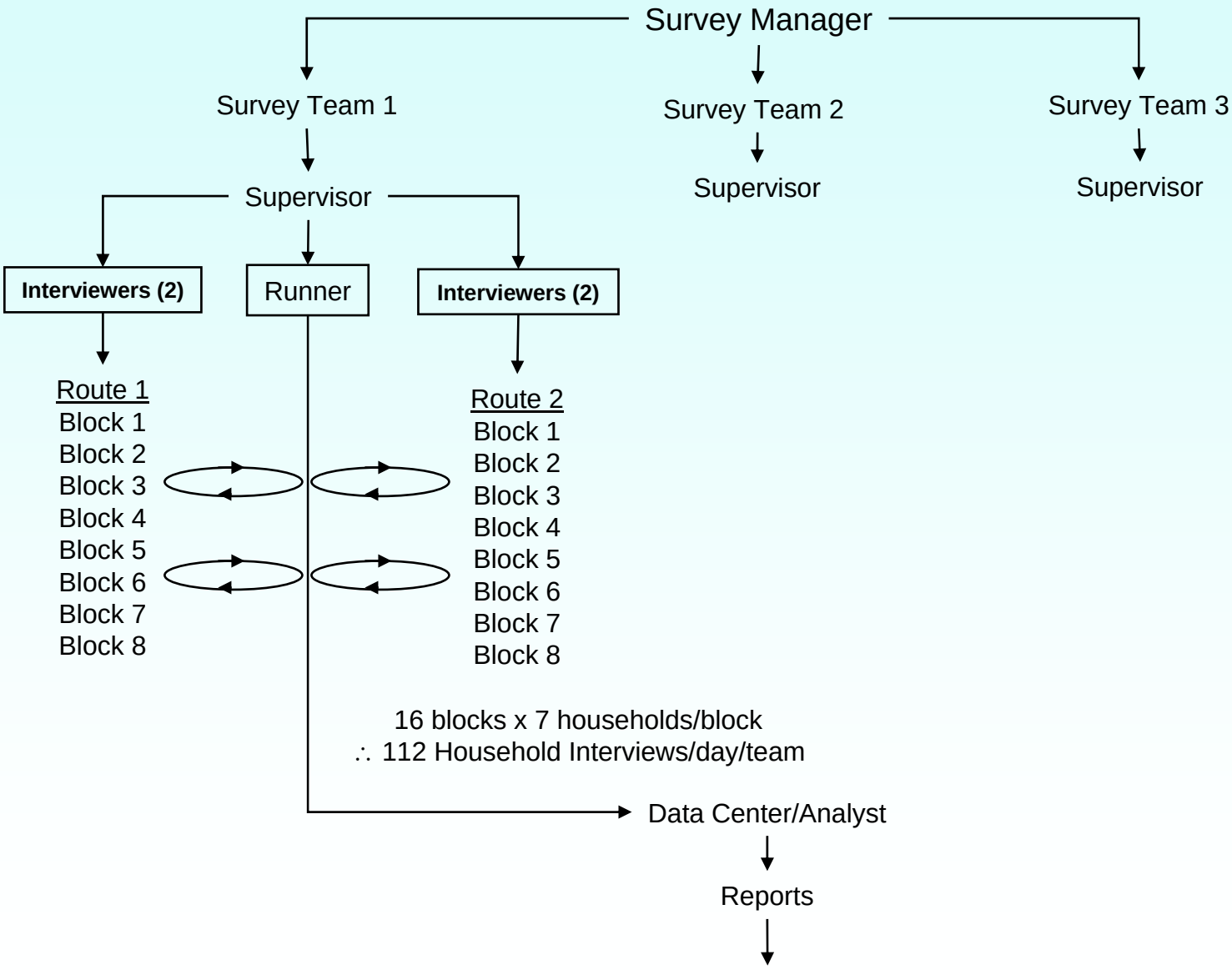
Data Sources

- US Census tracts and blocks (TIGER)
  - Census blocks are polygons and include only one side of a street
  - Reminder: Not a street segment with odd and even house numbers
- City of Berkeley geocoded parcel database (based in part on Alameda County tax assessment)
  - ✓ Address points of housing units, including apartment (operational definition of household)
    - May be unoccupied, destroyed, abandoned
  - ✓ Land use codes (residential, type of housing unit)

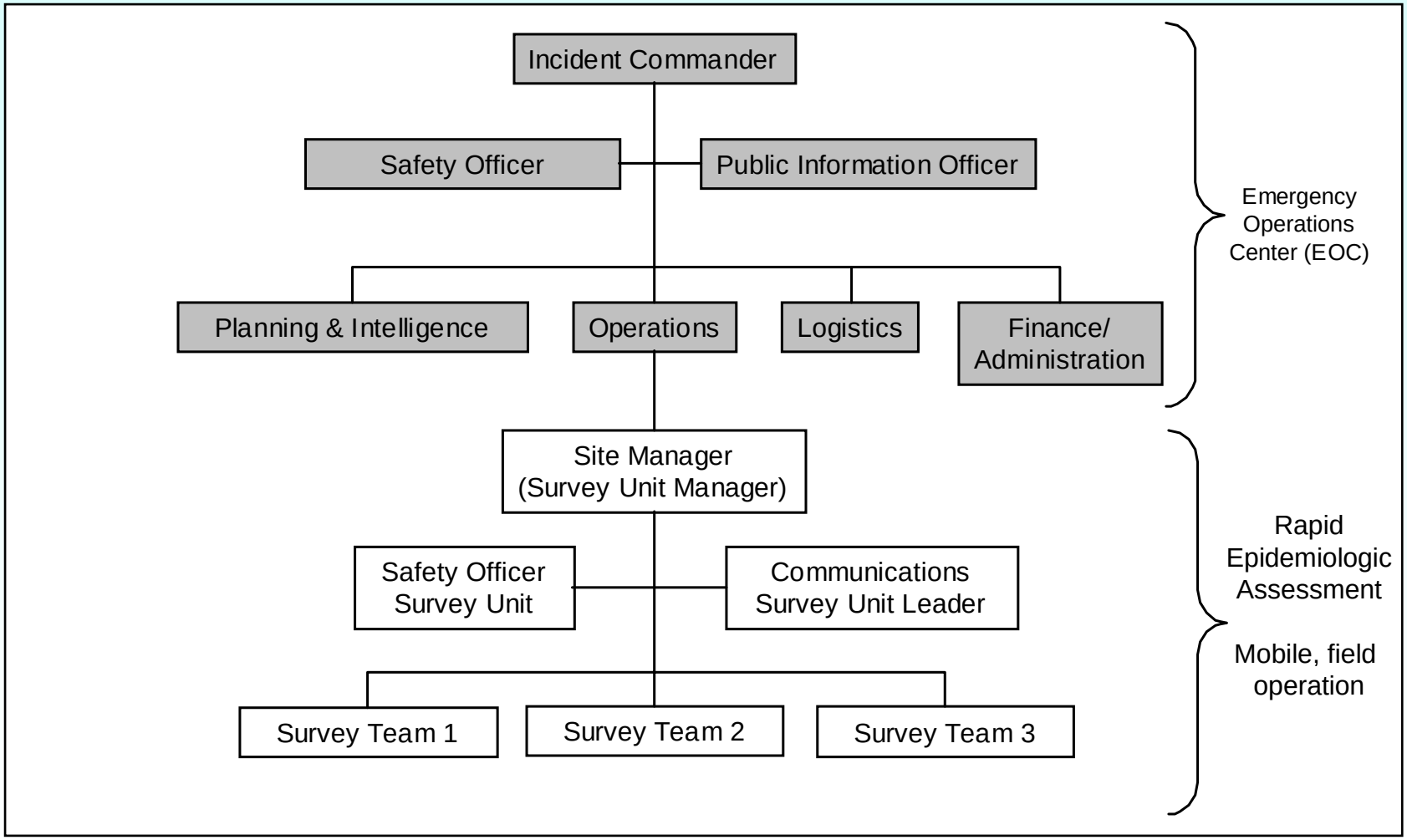
Mechanics of Selection

- STATA batch program
  - ✓ Selectable census tracts in disaster area (*Step 1*)
  - ✓ Counts housing units per block (*Step 2*)
  - ✓ Takes systematic PPS sample of 30 blocks (*Step 3*)
  - ✓ Randomly selects 7 housing units in each of the sampled blocks (*Step 4*)
  - ✓ Creates list of all housing units on sample block (validation of sample frame)
- ArcGIS 9.3
  - ✓ Table join to census tract to visualize selection
    - Basis of creating routes by visual inspection
  - ✓ Individual block maps for survey team

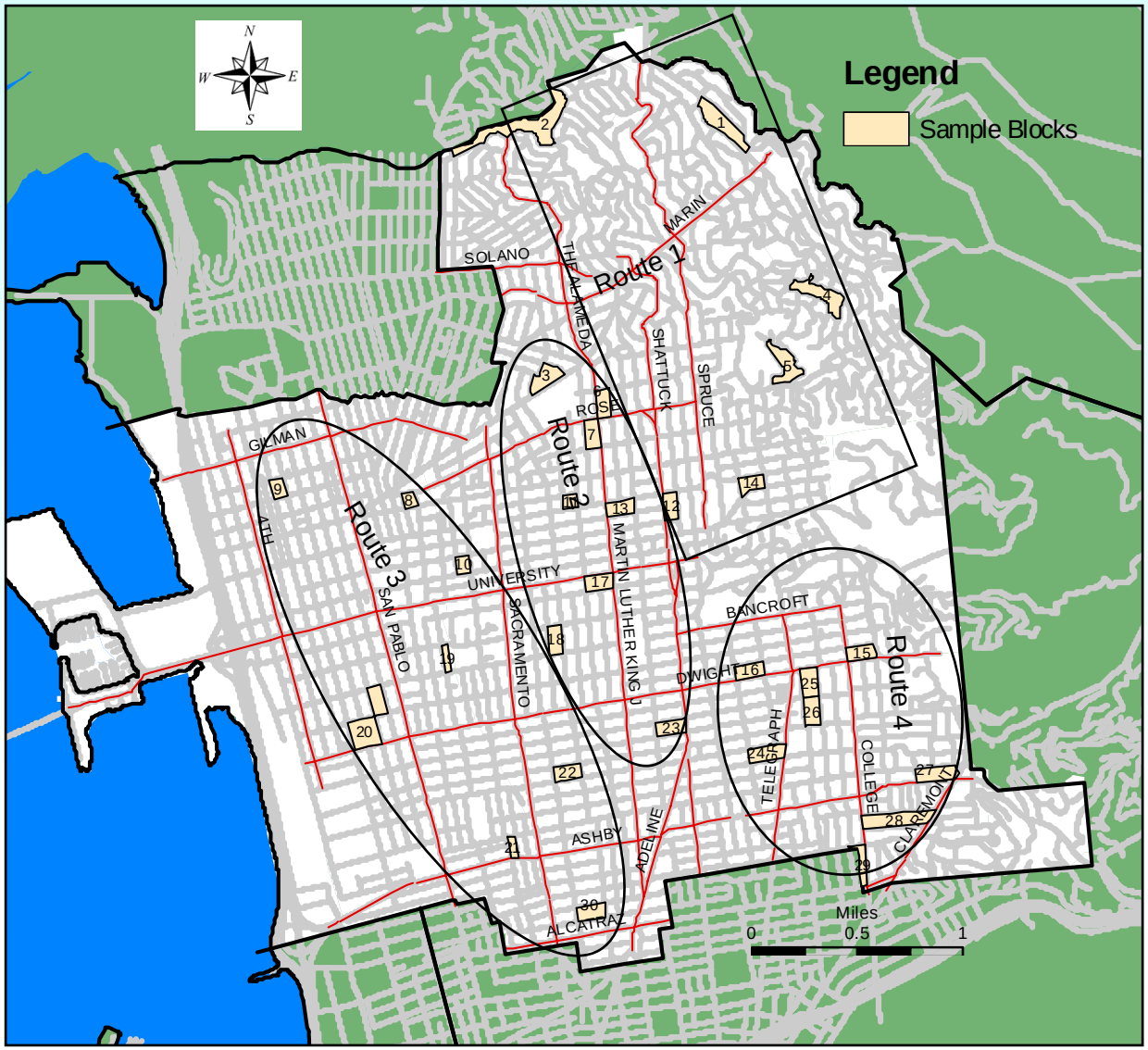
Field Operations: Survey



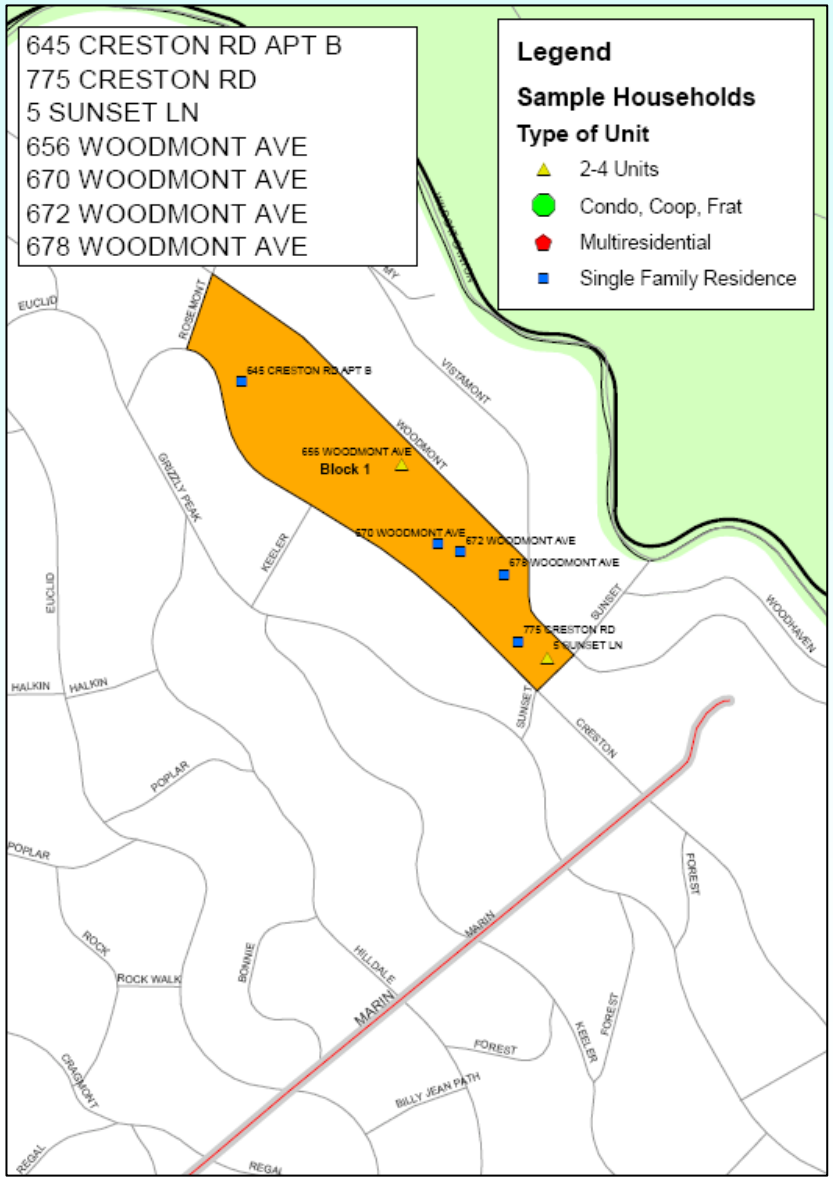
Field Operations: Incident Command System



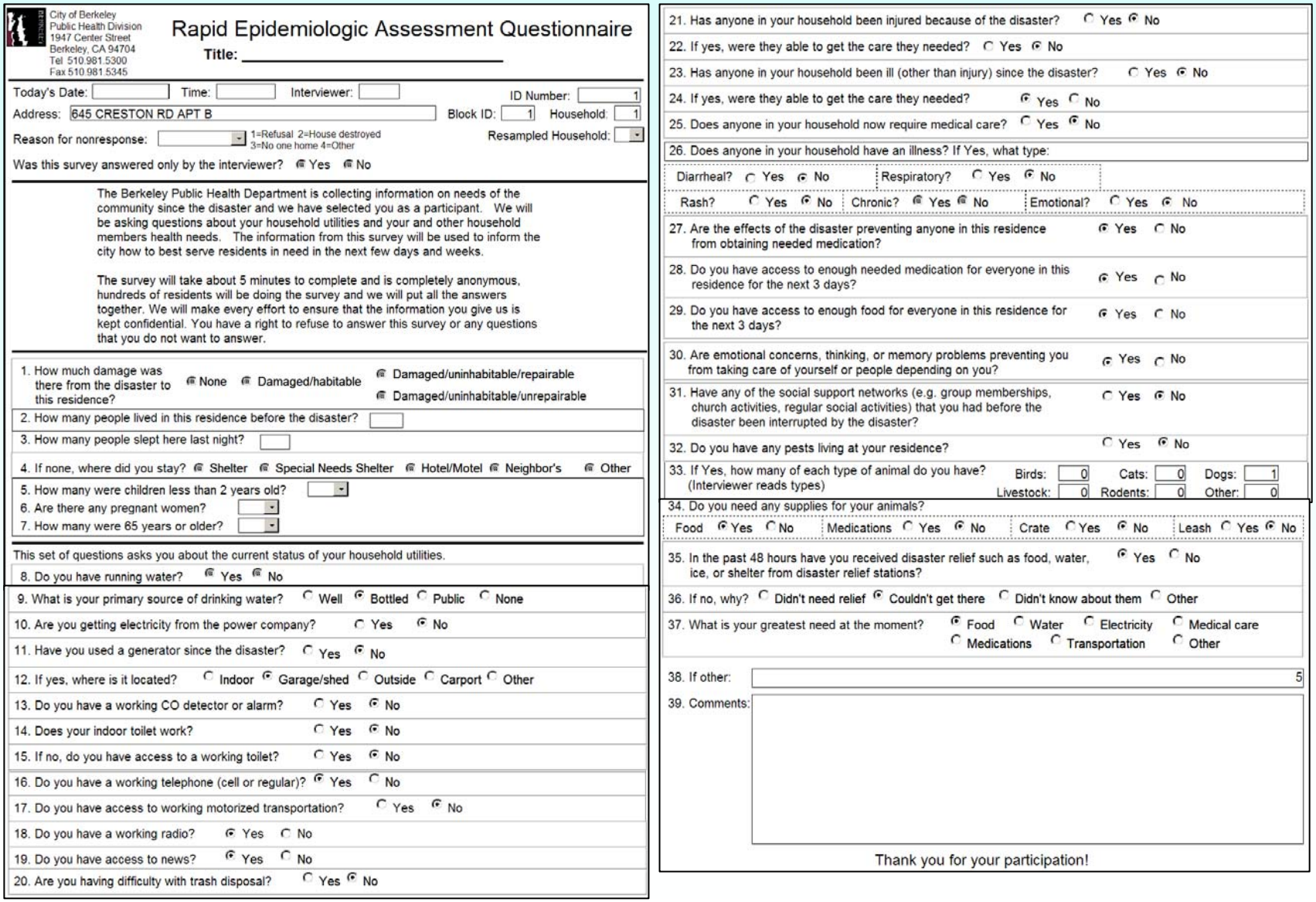
Routing (visual inspection, not GIS algorithm)



Individual Block Map



Survey: Population, Shelter, Food Water, Health, Utilities, Sanitation, Health, Medication, Pets, Disaster Services



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Rapid Epidemiologic Assessment Questionnaire

Title: _____

Today's Date: | Time: | Interviewer: | ID Number: 1

Address: 645 CRESTON RD APT B | Block ID: 1 | Household: 1

Reason for nonresponse: | 1=Refusal 2=House destroyed 3=No one home 4=Other | Resampled Household:

Was this survey answered only by the interviewer? Yes No

The Berkeley Public Health Department is collecting information on needs of the community since the disaster and we have selected you as a participant. We will be asking questions about your household utilities and your and other household members health needs. The information from this survey will be used to inform the city how to best serve residents in need in the next few days and weeks.

The survey will take about 5 minutes to complete and is completely anonymous, hundreds of residents will be doing the survey and we will put all the answers together. We will make every effort to ensure that the information you give us is kept confidential. You have a right to refuse to answer this survey or any questions that you do not want to answer.

1. How much damage was there from the disaster to this residence? None / Damaged/habitable / Damaged/uninhabitable/repairable / Damaged/uninhabitable/unrepairable
2. How many people lived in this residence before the disaster?
3. How many people slept here last night?
4. If none, where did you stay? Shelter / Special Needs Shelter / Hotel/Motel / Neighbor's / Other
5. How many were children less than 2 years old?
6. Are there any pregnant women?
7. How many were 65 years or older?

This set of questions asks you about the current status of your household utilities.

8. Do you have running water? Yes / No
9. What is your primary source of drinking water? Well / Bottled / Public / None
10. Are you getting electricity from the power company? Yes / No
11. Have you used a generator since the disaster? Yes / No
12. If yes, where is it located? Indoor / Garage/shed / Outside / Carport / Other
13. Do you have a working CO detector or alarm? Yes / No
14. Does your indoor toilet work? Yes / No
15. If no, do you have access to a working toilet? Yes / No
16. Do you have a working telephone (cell or regular)? Yes / No
17. Do you have access to working motorized transportation? Yes / No
18. Do you have a working radio? Yes / No
19. Do you have access to news? Yes / No
20. Are you having difficulty with trash disposal? Yes / No
21. Has anyone in your household been injured because of the disaster? Yes / No
22. If yes, were they able to get the care they needed? Yes / No
23. Has anyone in your household been ill (other than injury) since the disaster? Yes / No
24. If yes, were they able to get the care they needed? Yes / No
25. Does anyone in your household now require medical care? Yes / No
26. Does anyone in your household have an illness? If Yes, what type:

Diarrheal? Yes / No | Respiratory? Yes / No

Rash? Yes / No | Chronic? Yes / No | Emotional? Yes / No

27. Are the effects of the disaster preventing anyone in this residence from obtaining needed medication? Yes / No
28. Do you have access to enough needed medication for everyone in this residence for the next 3 days? Yes / No
29. Do you have access to enough food for everyone in this residence for the next 3 days? Yes / No
30. Are emotional concerns, thinking, or memory problems preventing you from taking care of yourself or people depending on you? Yes / No
31. Have any of the social support networks (e.g. group memberships, church activities, regular social activities) that you had before the disaster been interrupted by the disaster? Yes / No
32. Do you have any pests living at your residence? Yes / No
33. If Yes, how many of each type of animal do you have? (Interviewer reads types) Birds: 0 | Cats: 0 | Dogs: 1 | Livestock: 0 | Rodents: 0 | Other: 0
34. Do you need any supplies for your animals?

Food Yes / No | Medications Yes / No | Crate Yes / No | Leash Yes / No

35. In the past 48 hours have you received disaster relief such as food, water, ice, or shelter from disaster relief stations? Yes / No
36. If no, why? Didn't need relief / Couldn't get there / Didn't know about them / Other
37. What is your greatest need at the moment? Food / Water / Electricity / Medical care / Medications / Transportation / Other
38. If other: 5
39. Comments:

Thank you for your participation!

Pilot Study

- Sampling
  - ✓ Two residential sample blocks
  - ✓ Validation of all housing units on block
  - ✓ Simulate re-sampling and block activity forms
- Logistics
  - ✓ Time to walk to farthest and highest sample blocks
    - Planning data for routing
  - ✓ Time to walk to 7 sample households
  - ✓ Function of walky-talkies in hilly terrain
  - ✓ Function of hand-helds (PDA) to administer survey
- Analysis and Reporting
  - ✓ Made-up dataset for 210 respondents
  - ✓ Populate Database
  - ✓ STATA analysis code to two-stage 30 by 7 cluster sample
  - ✓ Report Templates with made-up data

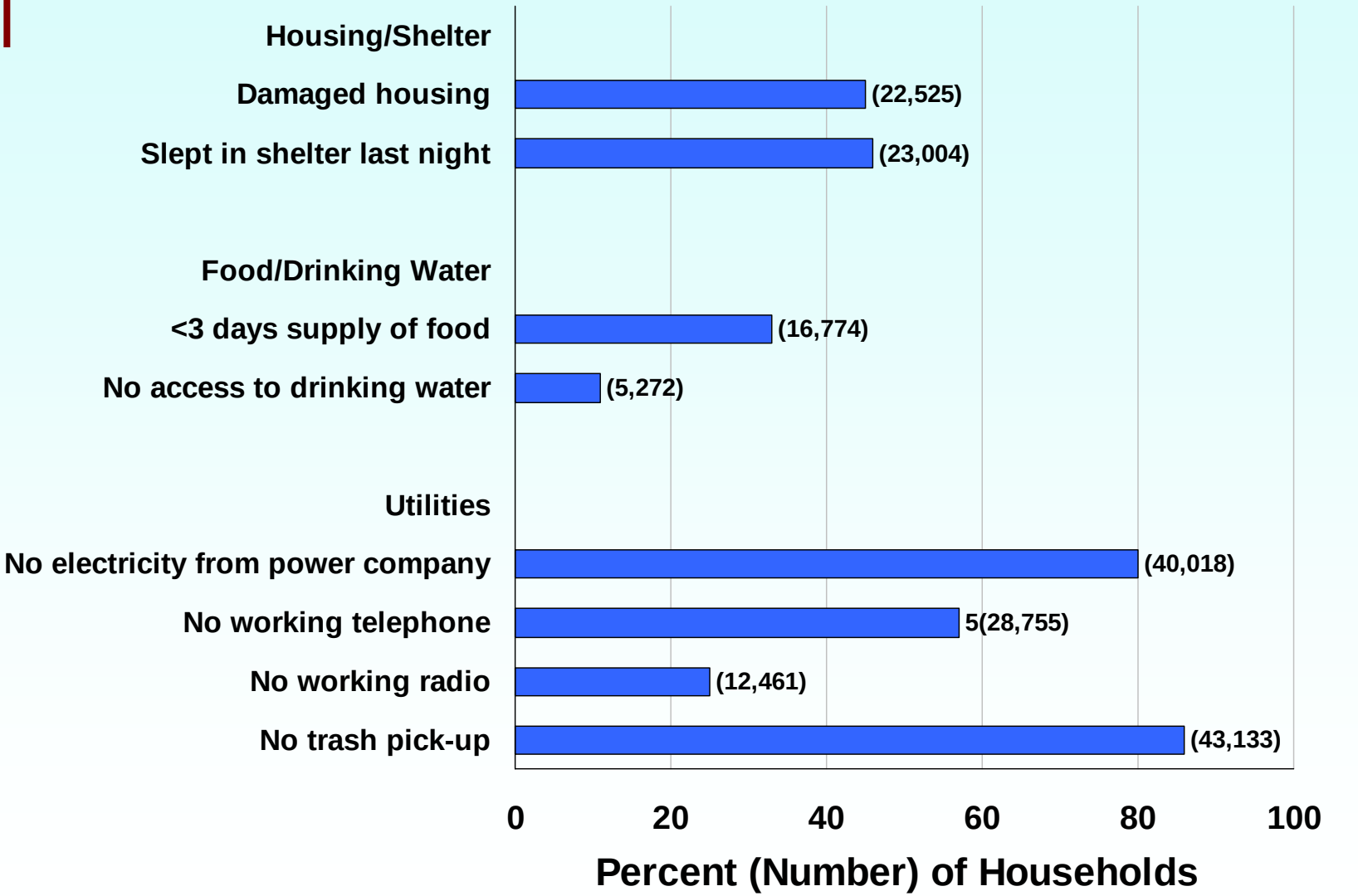
Hypothetical Results: Number and Percent of Berkeley Households' and Residents' Post-Disaster Status on Food/Water, Shelter, and Services

	Households		Population	
Characteristic	Percent	N	Percent	N
Total	100	50,322	100	91,538
Housing/Shelter				
Damaged housing	45	22,525	45	40,976
Slept in shelter last night	46	23,004	46	41,935
Food/Drinking Water				
<3 days supply of food	33	16,774	65	59,188
No access to drinking water	11	5,272	11	10,304
Utilities				
No electricity from power company	80	40,018	81	74,045
No working telephone	57	28,755	55	50,562
No working radio	25	12,461	25	22,765
No trash pick-up	86	43,133	86	79,077

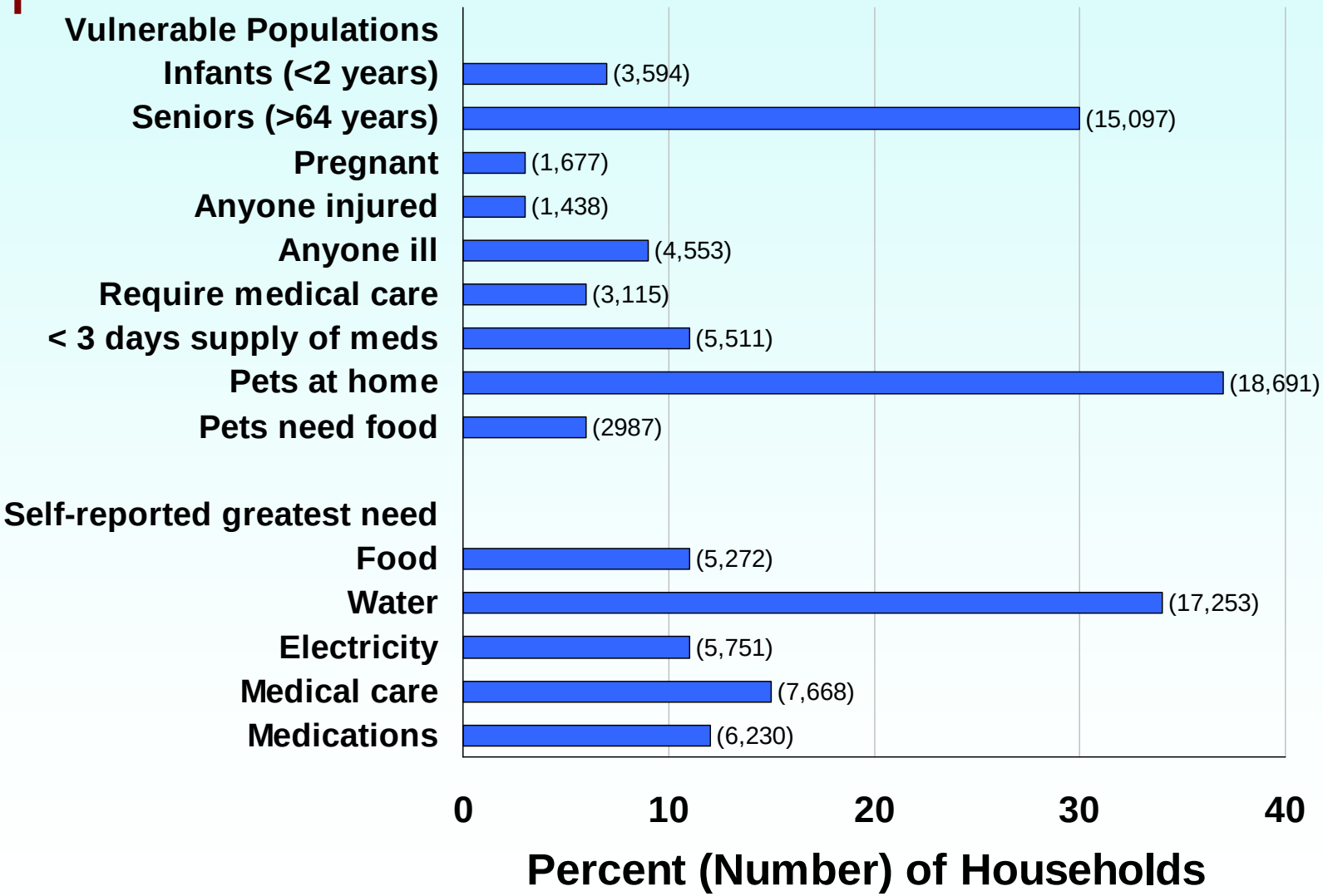
Hypothetical Results: Number and Percent of Berkeley Households' and Residents' Post-Disaster Status on Food/Water, Shelter, and Services

	Households		Population	
Characteristic	Percent	N	Percent	N
Vulnerable Populations				
Infants (<2 years)	7	3,594	6	5,032
Seniors (>64 years)	30	15,097	26	24,202
Pregnant	3	1,677		
Anyone injured	3	1,438		
Anyone ill	9	4,553		
Require medical care	6	3,115		
< 3 days supply of meds	11	5,511		
Pets at home	37	18,691		
Food	6	2,876		
Self-reported greatest need				
Food	11	5,272	11	9,585
Water	34	17,253	35	32,350
Electricity	11	5,751	12	10,544
Medical care	15	7,668	15	13,659
Medications	12	6,230	11	10,304

Hypothetical Results: Percent (Number) of Berkeley Households: Housing, Food/ Water, and Utilities



Hypothetical Results: Percent (Number) of Berkeley Households with Vulnerable Populations and Self-Reported Needs



Discussion

- Berkeley's small and compact geography facilitates 30 by 7 cluster sample using census blocks and walking to sample locations
- Need analyst with statistical and GIS skills to draw sample
  - ✓ Could be Achilles heel if analyst not available
  - ✓ Paper toolkit back-up (citywide emergency)
- Generalizable in California for urban counties with parcel databases
- Experience is that REA is often not rapid enough, so need to balance methodological rigor with practicality

Acknowledgements

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