

Kingston Project Surveillance Program

Baseline Medical Screening Results

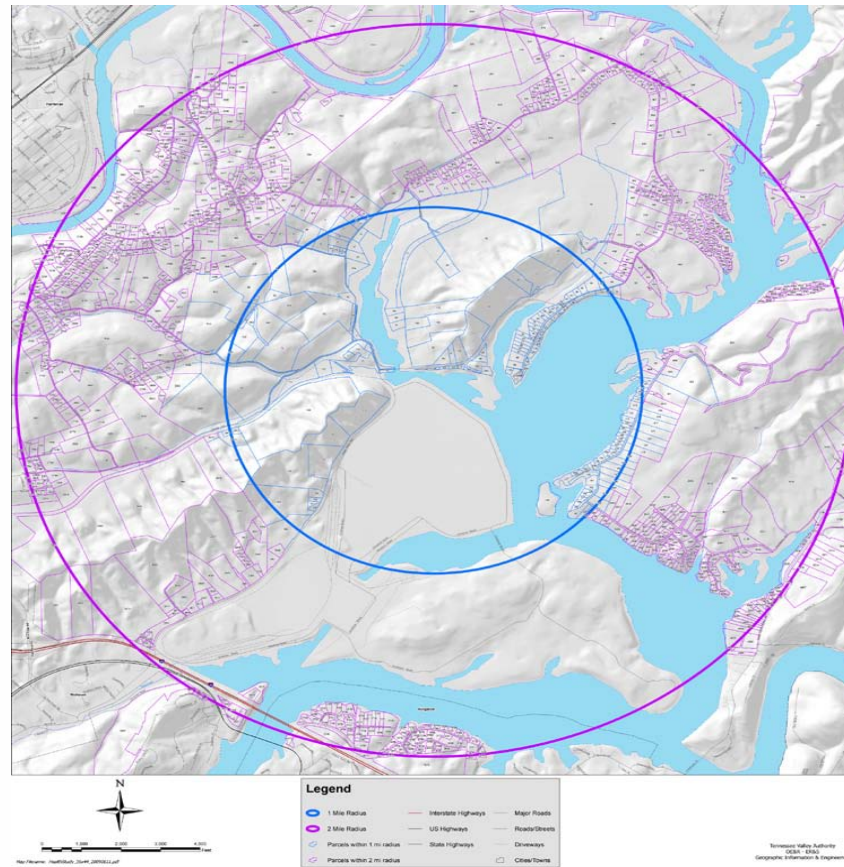


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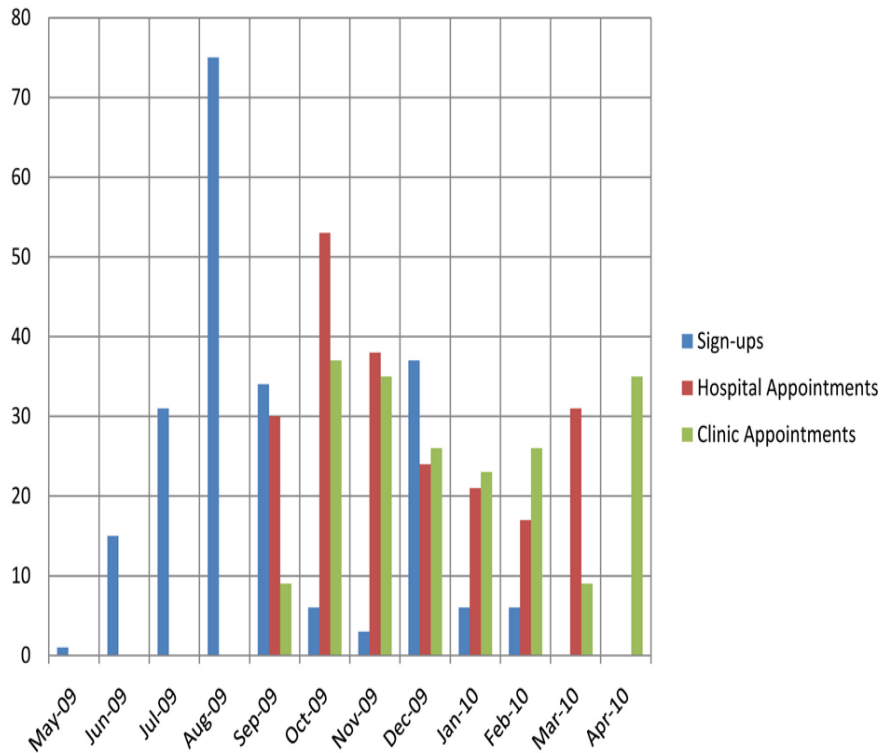


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Health Study Target Area

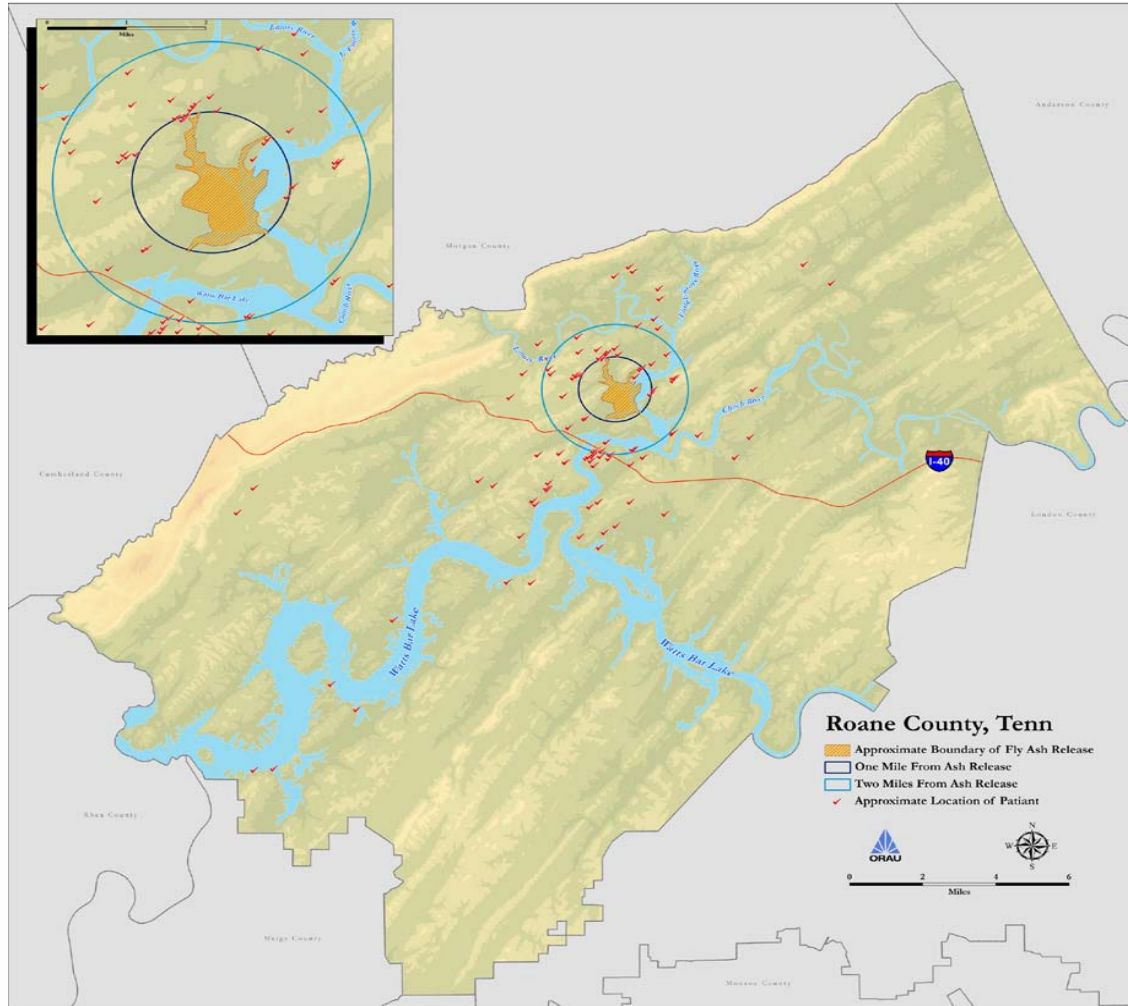


KPSP Participant Flow



- Sign-ups by:
 - Mail
 - Web-site
 - Call-in number
- Hospital appointments at Roane Medical Center:
 - Chest x-ray
 - Blood and urine
 - Breathing test (spirometry)
- Clinic Appointments:
 - Physical examination

Residential Locations of Kingston Project Participants: 112 households



<1 mile: 12/100 households

1-2 miles: 37/650 households

>2 miles: 63 households

Age Distribution of the 214 Participants

Age Group	Participants	Percent
<18 years	40	18.69%
18—44 years	43	20.09%
45—64 years	77	35.98%
65+ years	54	25.23%

Comparison of the 214 Participants with TDH Survey and Roane County Population

	Kingston Project Surveillance Program	Tennessee Department of Health (January 2009)	Roane County, Tennessee(9)
Persons under 5 years old	5.1 %	-----	5.0 %
Persons under 18 years old	18.7 %	24.1 %	20.4 %
Persons 65 years and older	25.2 %	16.7 %	17.5 %
Black	2.0 %	0.5 %	2.8 %
White	98.0 %	98.1 %	95.9 %
Female	53.0 %	53.4 %	51.4 %
Male	47.0 %	46.6 %	48.6 %

Basis of the Medical Screening

Coal Ash Constituent	Residential Property Ash Concentration (mean, range, mg/kg) [TDEC, Jan 6-7, 2009]	Regional Soil Background Concentration (mean, range, mg/kg) [EPA Jan 2, 2009]
Aluminum	14,109 (1000 – 22,000)	4308 (2170 - 6190)
Arsenic	75 (26 – 100)	8 (1 – 16)
Barium	357 (180 – 1100)	47 (25 -95)
Beryllium	3 (1.5 – 7.9)	0.8 (0.2 – 2.5)
Cadmium	0 (0 – 0.2)	0.17 (0.04 – 0.36)
Chromium	25 (16 – 43)	16 (4 – 31)
Cobalt	13 (6.7 – 29)	5.5 (3.2 – 8.0)
Copper	46 (25 – 76)	9.9 (4.3 – 23)
Iron	13,000 (10,000 – 21,000)	12,875 (4880 – 23,100)
Lead	19 (9.8 – 29)	16.7 (6.6 – 27.2)
Manganese	102 (56 – 260)	389 (61 – 1230)
Mercury	0 (0 – 0)	0.13 (0.12 – 0.14)
Nickel	23 (13 – 37)	6.1 (<4.9 – 8.5)
Selenium	0.2 (0 – 2.2)	1.9 (1.0 – 2.0)
Thallium	0.16 (0 – 1.8)	< 5.5
Uranium	2.89 (93 – 1,000)	< 9
Vanadium	77 (42 – 150)	17 (5 -36)
Zinc	40 (25 – 67)	33(18 – 69)

RESULTS

Public perceptions

- VERY toxic
- ...even Erin Brockovich is coming...
- No information...
- Physicians didn't know who to call
- Poison center ready...
- No calls!!!!



EPA ADVISORY EMORY RIVER SECTION

THE PUBLIC IS CAUTIONED TO AVOID RECREATIONAL USE OF THE LOWER EMORY RIVER IN THE VICINITY OF THE ASH RELEASE DOWN TO THE CONFLUENCE OF THE EMORY & CLINCH RIVERS, WHICH INCLUDES ADJACENT COVES, INLETS, ISLANDS, & SAND BARS. SMALL VESSEL TRAFFIC IS CURRENTLY CHanneled THROUGH A WELL-MARKED NAVIGATIONAL LANE, BUT SWIMMING, JET SKIING, WATER SKIING, & TUBING ARE NOT ADVISED AT THIS TIME IN THESE AREAS. IN ADDITION TO CONSTRUCTION RELATED RISKS, CONTACT WITH SUBMERGED or FLOATING ASH SHOULD BE AVOIDED, & IF ASH IS CONTACTED IT SHOULD BE WASHED OFF WITH SOAP & WATER. CHRONIC EXPOSURE BY INCIDENTAL INGESTION & INHALATION SHOULD ALSO BE AVOIDED.

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Risk from what?

- Heavy Metals
- Dusts
 - Ash dust
 - Gravel dust



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Protocols

- No previous data on fly ash
- Three medical toxicologists from VUMC/Tennessee Poison Center
 - Donna Seger, MD
 - Saralyn Williams, MD
 - John G. Benitez, MD, MPH
- Looked at TN DOH, EPA data to determine risks

Protocol

- Medical history
- Physical Exam
- Laboratory evaluation
- Chest radiograph
- Pulmonary function

Laboratory screening

- Blood/serum or urine tests for metals
- Basic metabolic markers
 - Complete blood count
 - Chemistry panel 20
 - Urinalysis

Final Heavy Metal Screening

- What is in fly ash
 - What was higher in fly ash than in background soil
 - Although selenium and thallium were not elevated in the fly ash, they were added to the testing due to their potential health risks
- Aluminum
 - Arsenic
 - Beryllium
 - Chromium
 - Cobalt
 - Copper
 - Nickel
 - Selenium
 - Thallium
 - Vanadium

Results - Medical History

- Past medical history reviewed
- Compared with current complaints
- Grouped similar symptoms

Medical problems related to:	Pre-spill	Post-spill
Head, eye, ear, nose, and throat (HEENT)	48 (23%)	133 (65%)
Pulmonary (Lung)	77 (38%)	106 (52%)

Physical Examination Results

- Only abnormalities or variations due to preexisting conditions

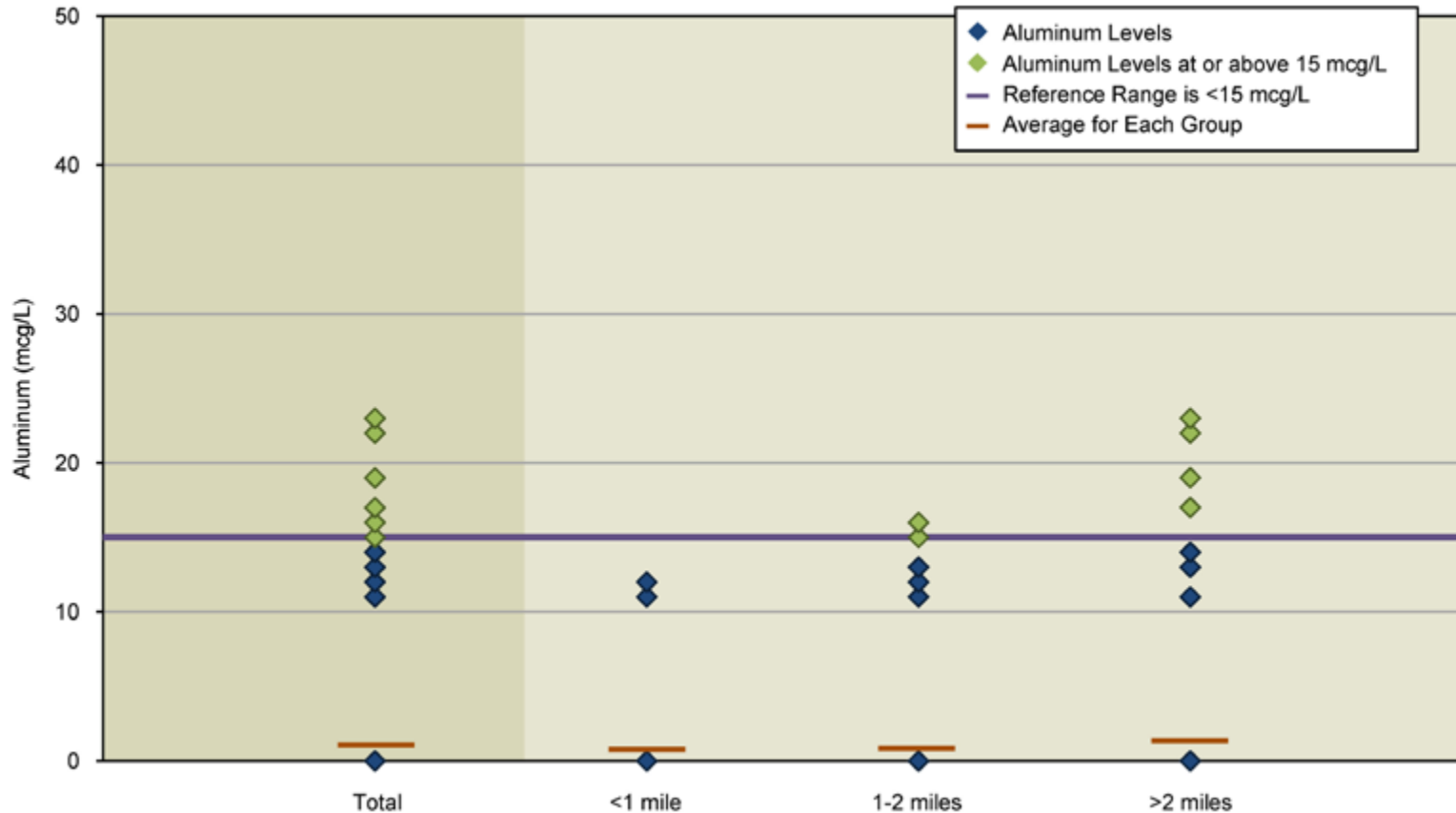
General laboratory results

- Anemia (low hematocrit) in ~43%
- Blood sugar elevated in 18% (not fasting)
- Liver function tests elevated in 1.5% (3 people)
- Kidney function tests elevated in 1%

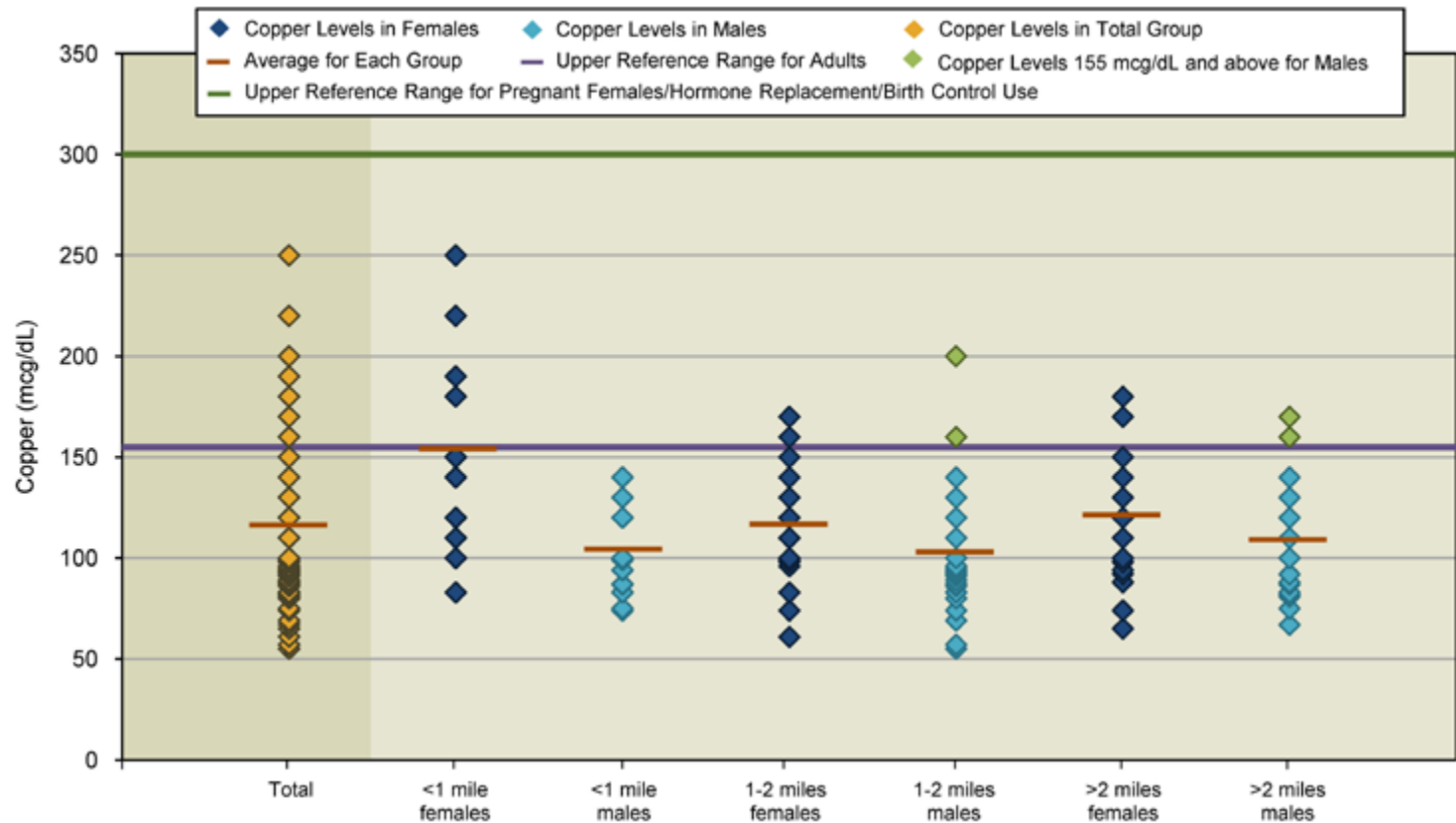
Metal evaluations

- Testing on blood or urine
- No one level that defines toxicity. Each person must be evaluated in conjunction with the laboratory testing to determine if exposure has caused a problem.
- Aluminum (3.0%) and copper (8.3%) slightly elevated in some, no toxicologic concern
- Selenium elevated in 27% (55 people)

Serum Aluminum by Distance from the Spill



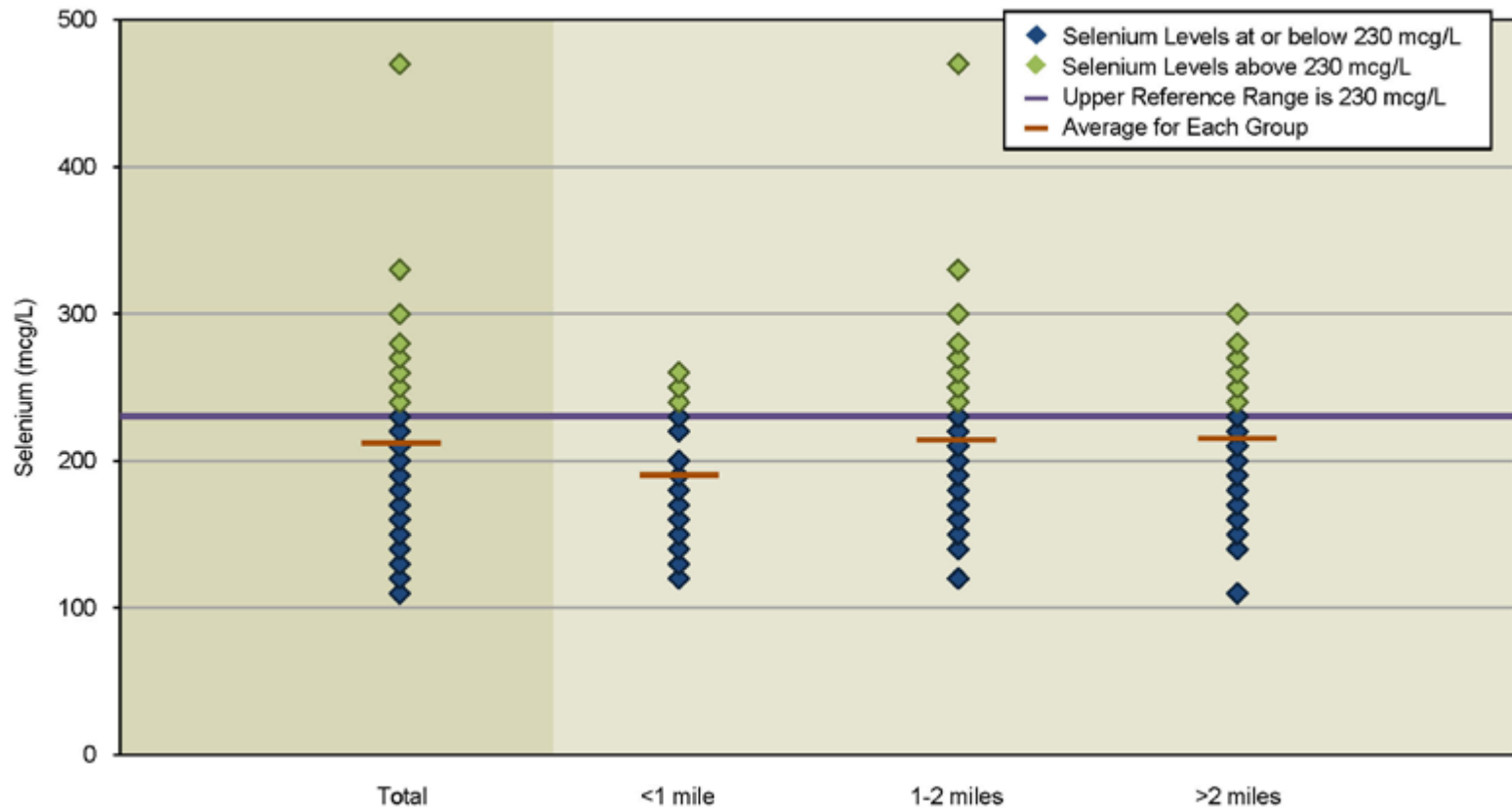
Serum Copper Levels by Distance from the Spill



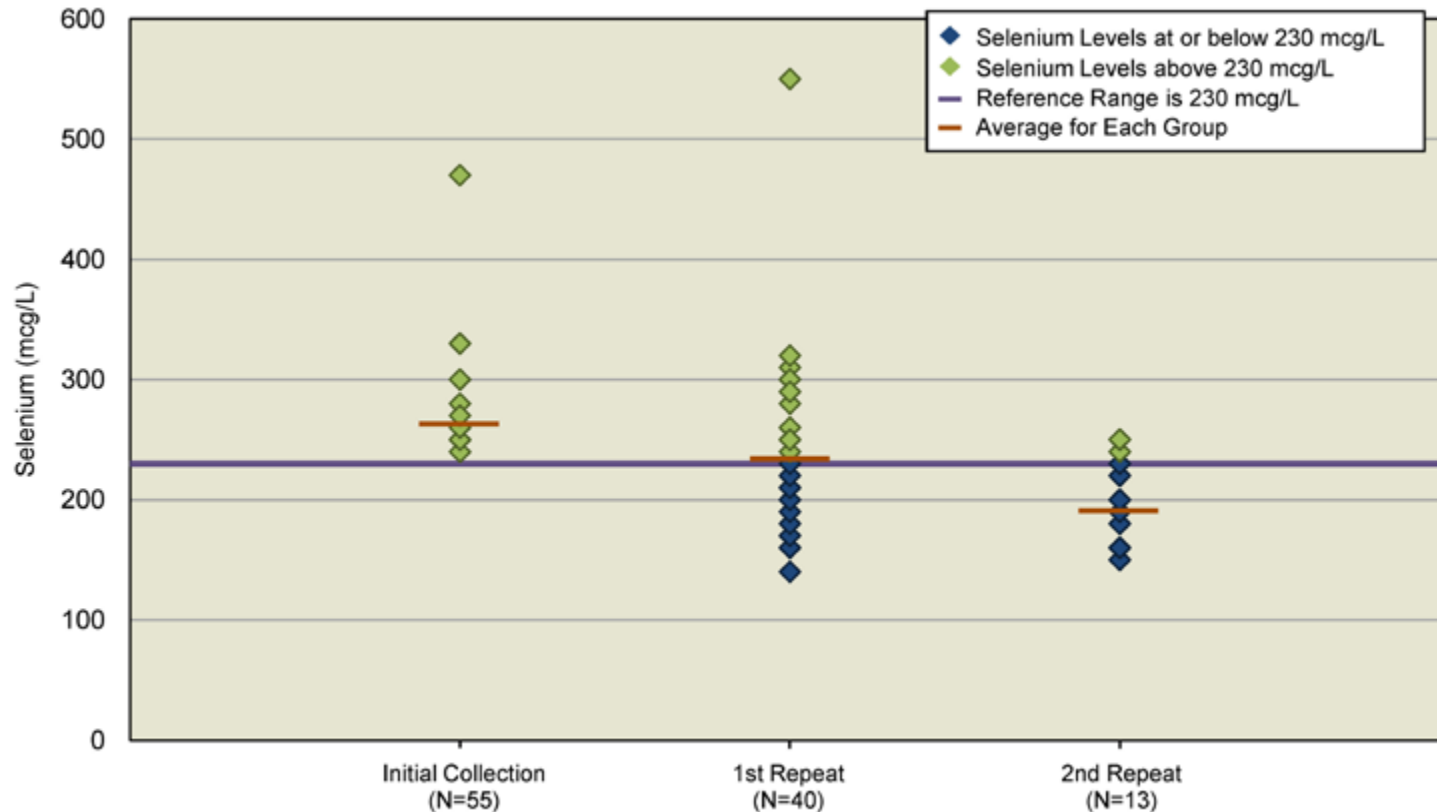
Selenium

- Normal nutrient
- Almost every plant and animal has it
- Vitamins/supplements frequently have it
- Protocol asked that people discontinue certain plants and medications/supplements

Blood Selenium by Distance from the Spill



Repeat Selenium Testing: After Dietary and Supplement Restrictions



Chest radiograph results

- 208 people had chest x-rays
 - 2 people with lung mass (unrelated to fly ash)
 - Otherwise, normal with a variety of unrelated findings: emphysema, enlarged heart, hernia, atherosclerosis, aneurysm, etc.

Pulmonary Test (PFT) Results

- 194 people completed PFT
- 75% with normal results
 - 11% mild abnormalities
 - 6% moderate abnormalities
 - 7% moderately severe-very severe abnormalities
 - 1% undetermined
- 63% of abnormal PFTs were in smokers

Medical Evaluation Findings

- Baseline levels measured at this time
- HEENT complaints and pulmonary (breathing) complaints following the spill
- Unrelated medical conditions diagnosed
- Zero values of some metals (blood Arsenic, cobalt, nickel; urine beryllium, thallium, and vanadium) which indicates exposure to fly ash was minimal
- Elevated blood values observed for copper and selenium, which are micronutrients and influenced by diet, dietary supplements, and medications
- Findings are compatible with conclusions of the Public Health Assessment prepared by the Tennessee Department of health in 2009
- A repeat evaluation could determine whether there has been any change in health in the future that may be related to the fly ash spill



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