Eagleton Science and Politics Workshop

Communicating Risk Regarding Science and Health: Lead Toxicity and Public Policy

April 18, 2018

Lead (Pb) and Water Supply in Urban Areas

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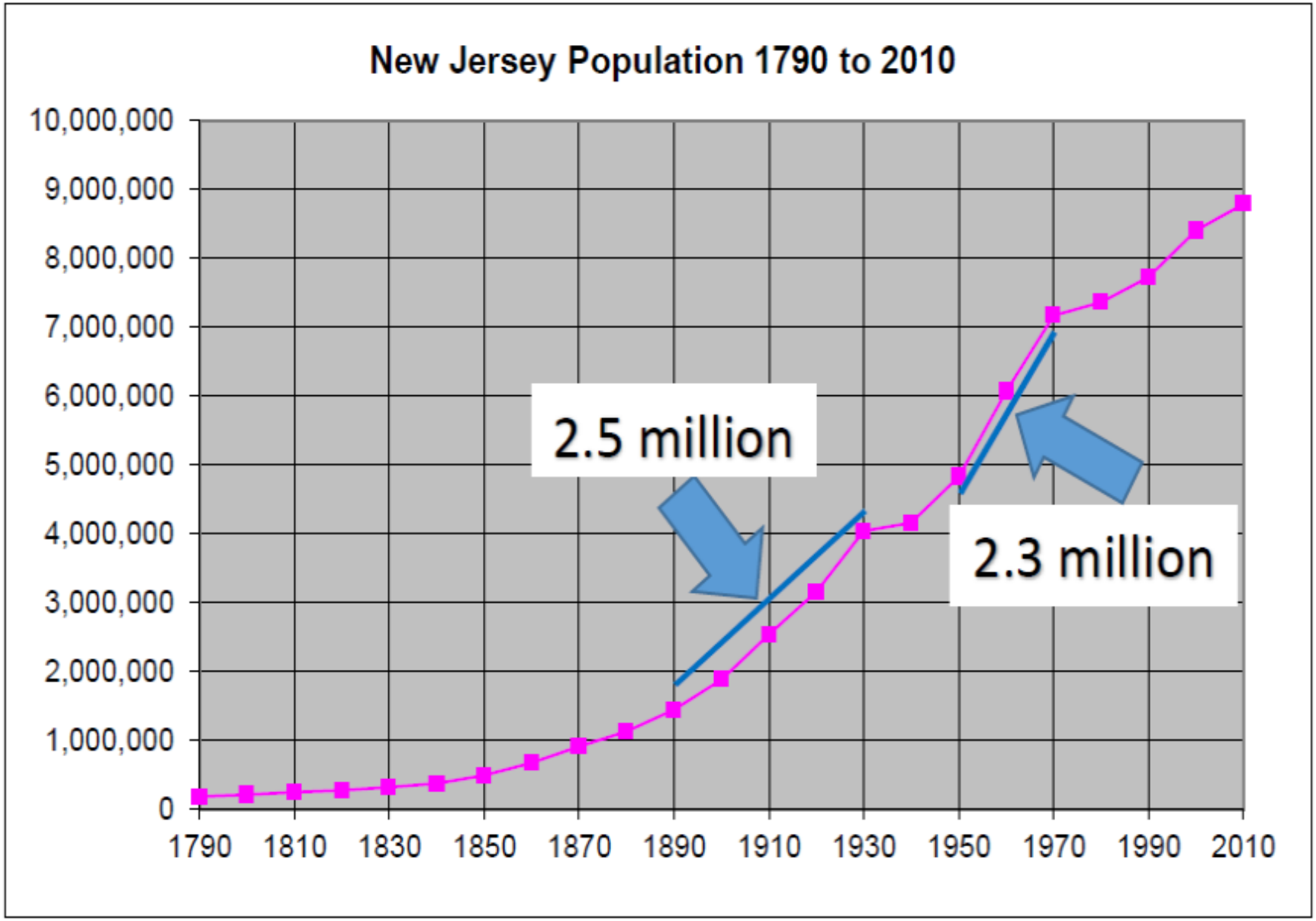
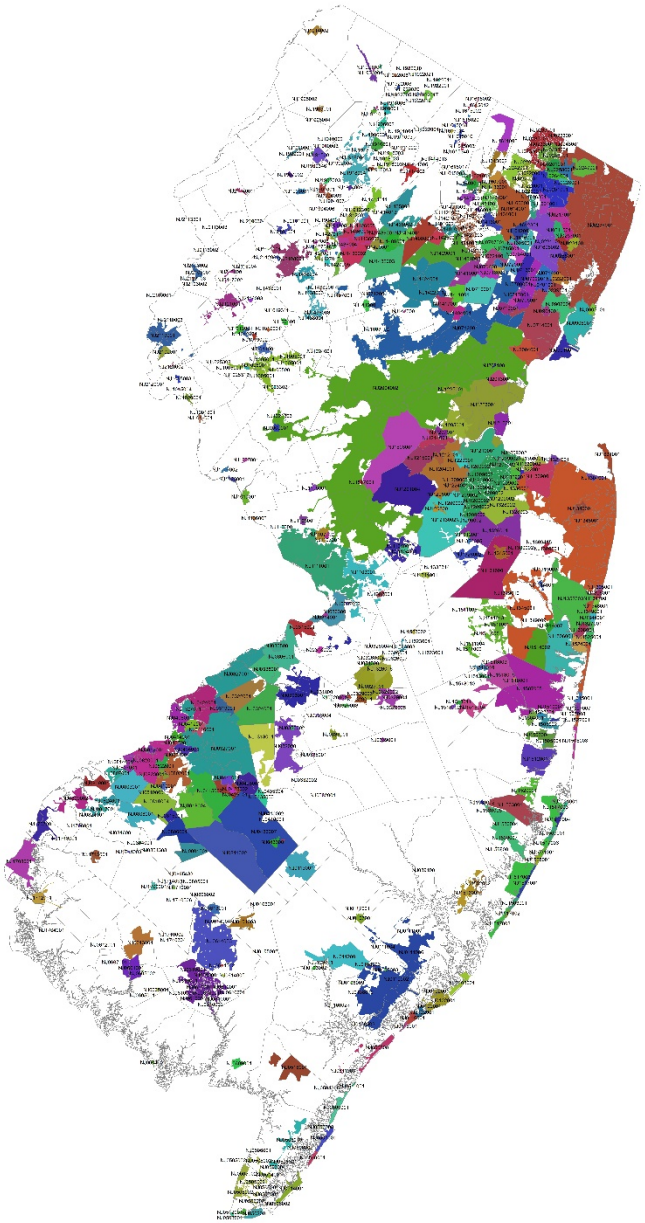
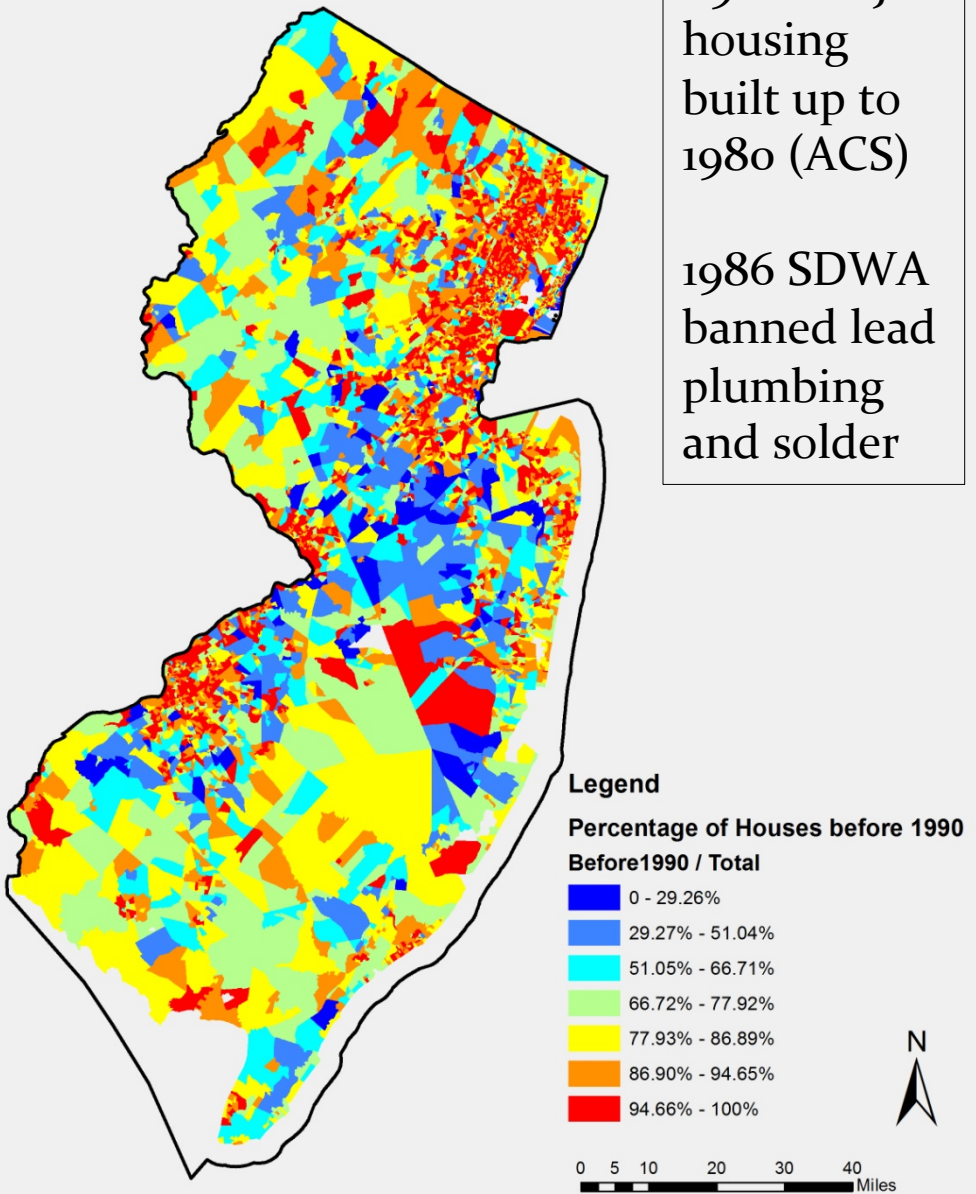

New Jersey Population 1790 to 2010
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
1790
1810
1830
1850
1870
1890
1910
1930
1950
1970
1990
2010
2.5 million
2.3 million

Water Supply Utilities and Housing Age

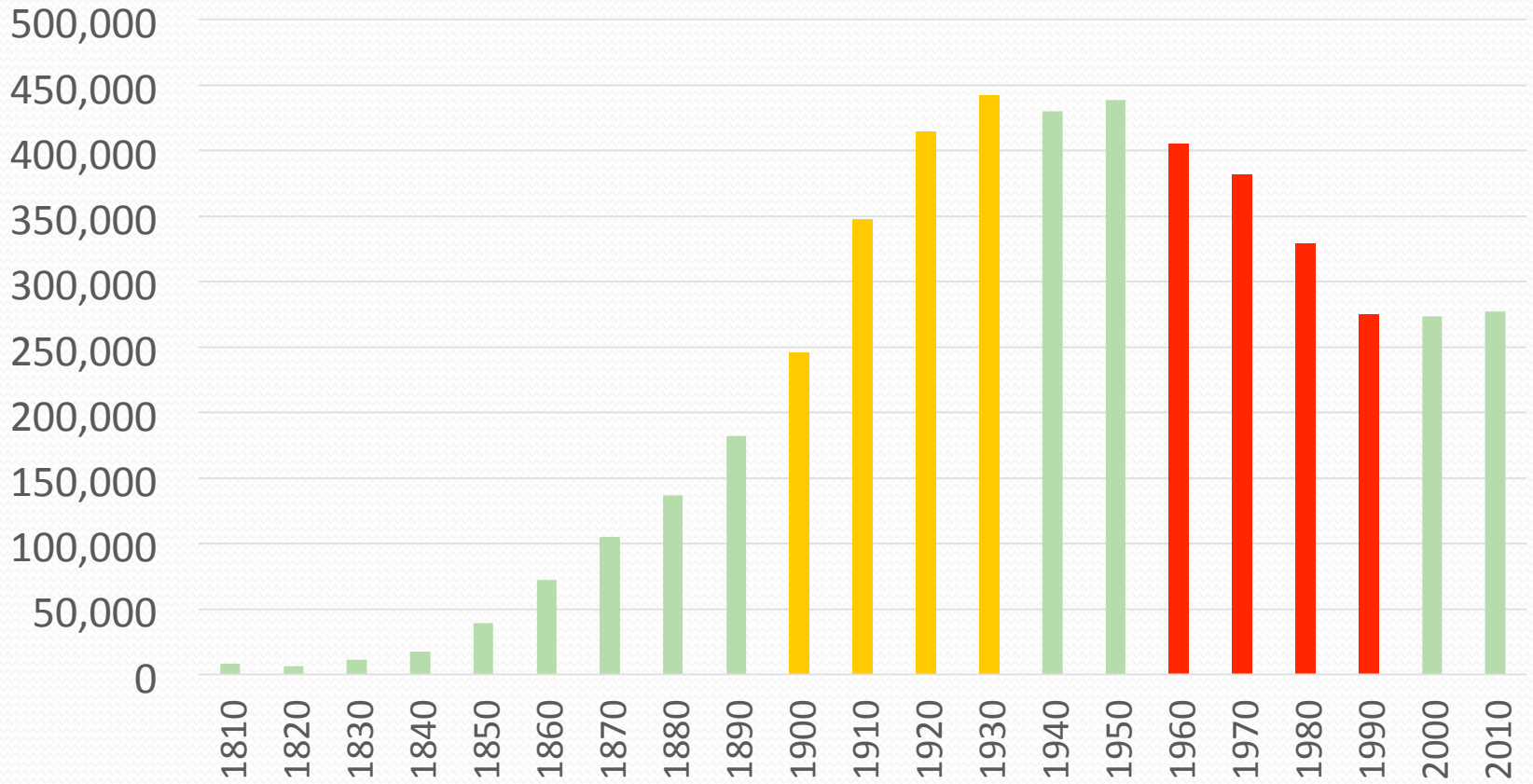




69% of NJ housing built up to 1980 (ACS)

1986 SDWA banned lead plumbing and solder

Newark, NJ Population (Census)



Loss of population and industry – **decreased demands**; water can stagnate within water mains and individual buildings, such as schools

"Safe" Drinking Water Act

Focus of the Act

- Minimize health risks, especially household uses
- Toxins – No Observable Adverse Effect Level (NOAEL)
- Carcinogens – Some risk at all positive levels. 1 in million risk level used as threshold
- **BUT** – if those levels can't be met by treatment technology or routinely measured in labs, the MCL is higher than the health thresholds

Lead (Pb) Action Level

- Neurological effects assumed at all positive levels
- Cannot measure "zero"
- Lead not in source water or treatment plant output
- If lead exists in the lines, cannot achieve "zero"
- Action Level – utility must act if >10% of samples exceed 15 ppb (*u*g/L), at "high risk locations"
- **Not a health-based MCL**

Implications for Lead (Pb)

- Under 10% of samples can exceed action level – what then?
- What if all samples are less than 15 ppb (*u*g/L)? Positive levels remain a health concern
- Once corrosion control treatment starts, it remains necessary essentially forever
- Replacing part of the lead lines increases risk temporarily – disturbance from construction (CDC)

Next Steps?

- **Service line replacements**: Lansing, MI (public); East Bay MUD, CA (1990s); Massachusetts. But inside plumbing remains.
- Replacing all lead lines and plumbing is **expensive**. A gradual approach is required, but extends the threat.
- Private responsibilities remain – who pays? How?
- Part of the larger issue of water and sewer service affordability
- Replicate household assistance programs for energy?

Contact Information

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Lead Measurement and Where to Measure

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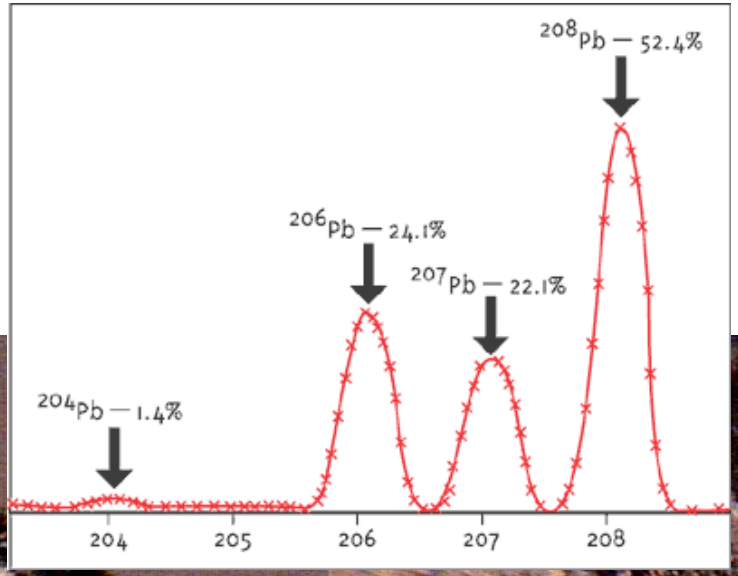
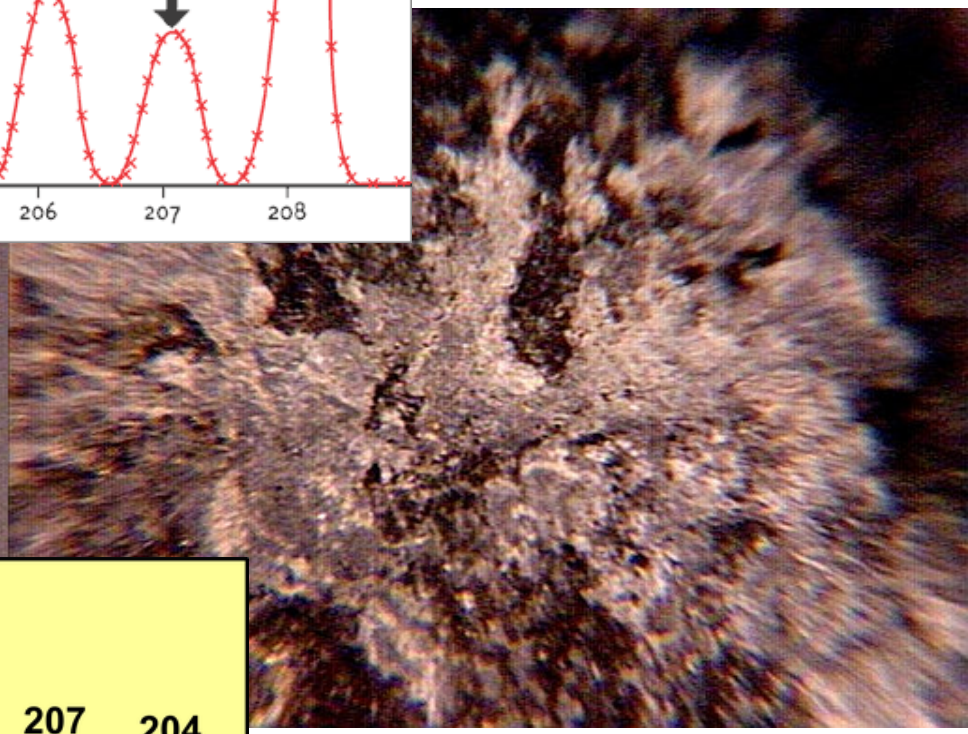
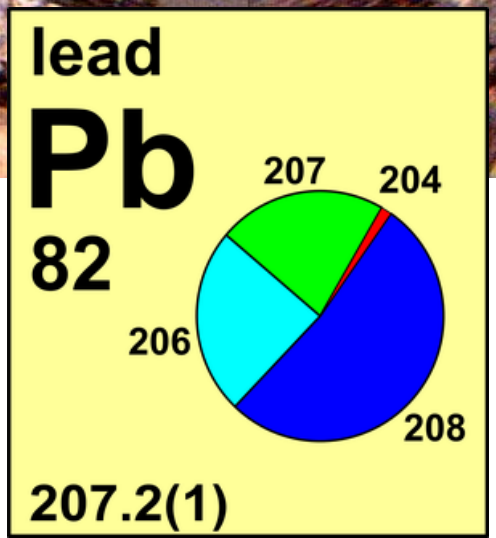
Lead

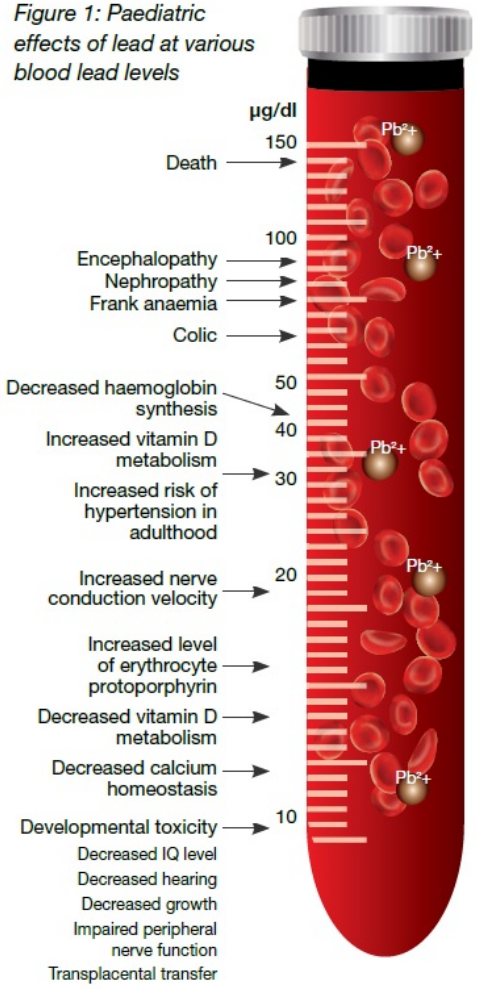

208Pb — 52.4%
206Pb — 24.1%
207Pb — 22.1%
204Pb — 1.4%
204
205
206
207
208




lead
Pb
82
207
204
206
208
207.2(1)

How much is too much?

Figure 1: Paediatric effects of lead at various blood lead levels



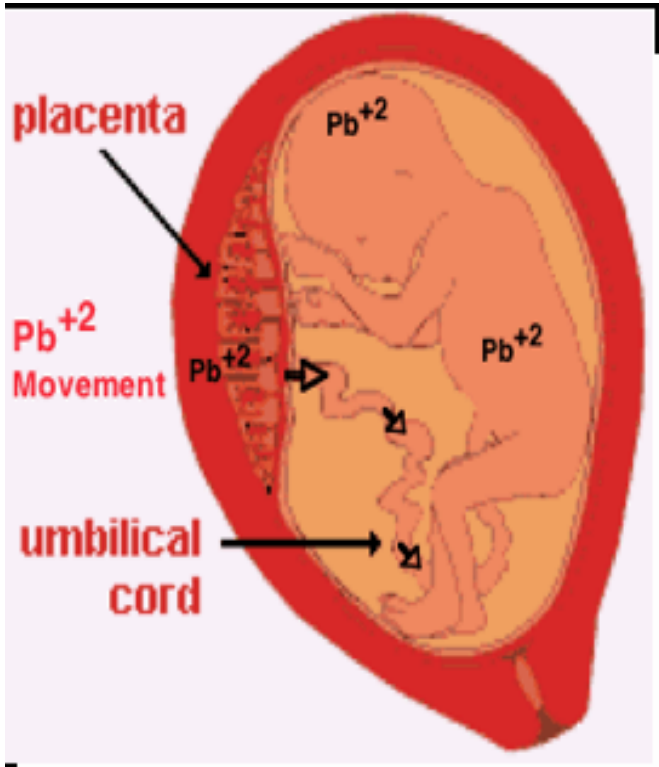
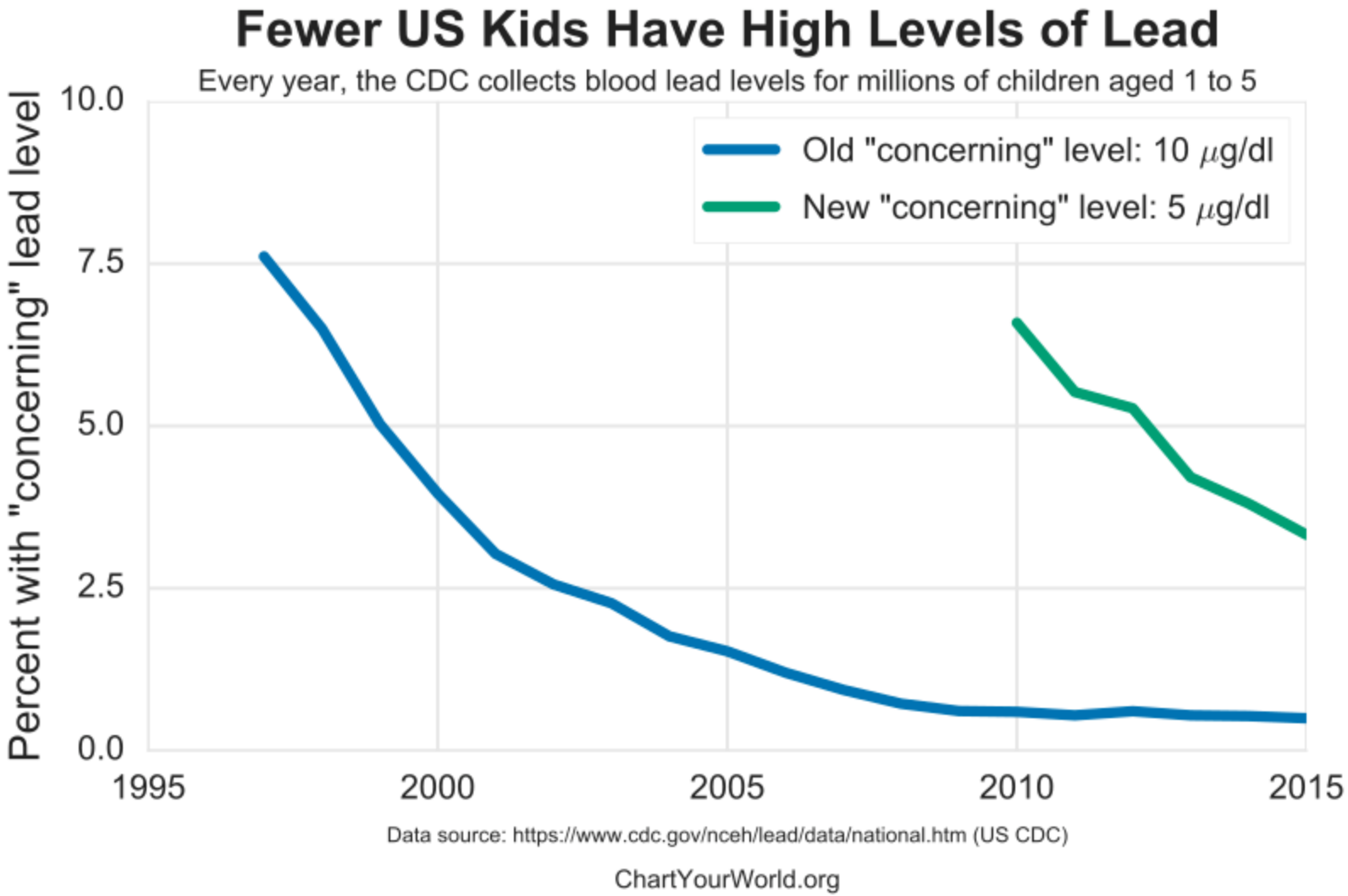
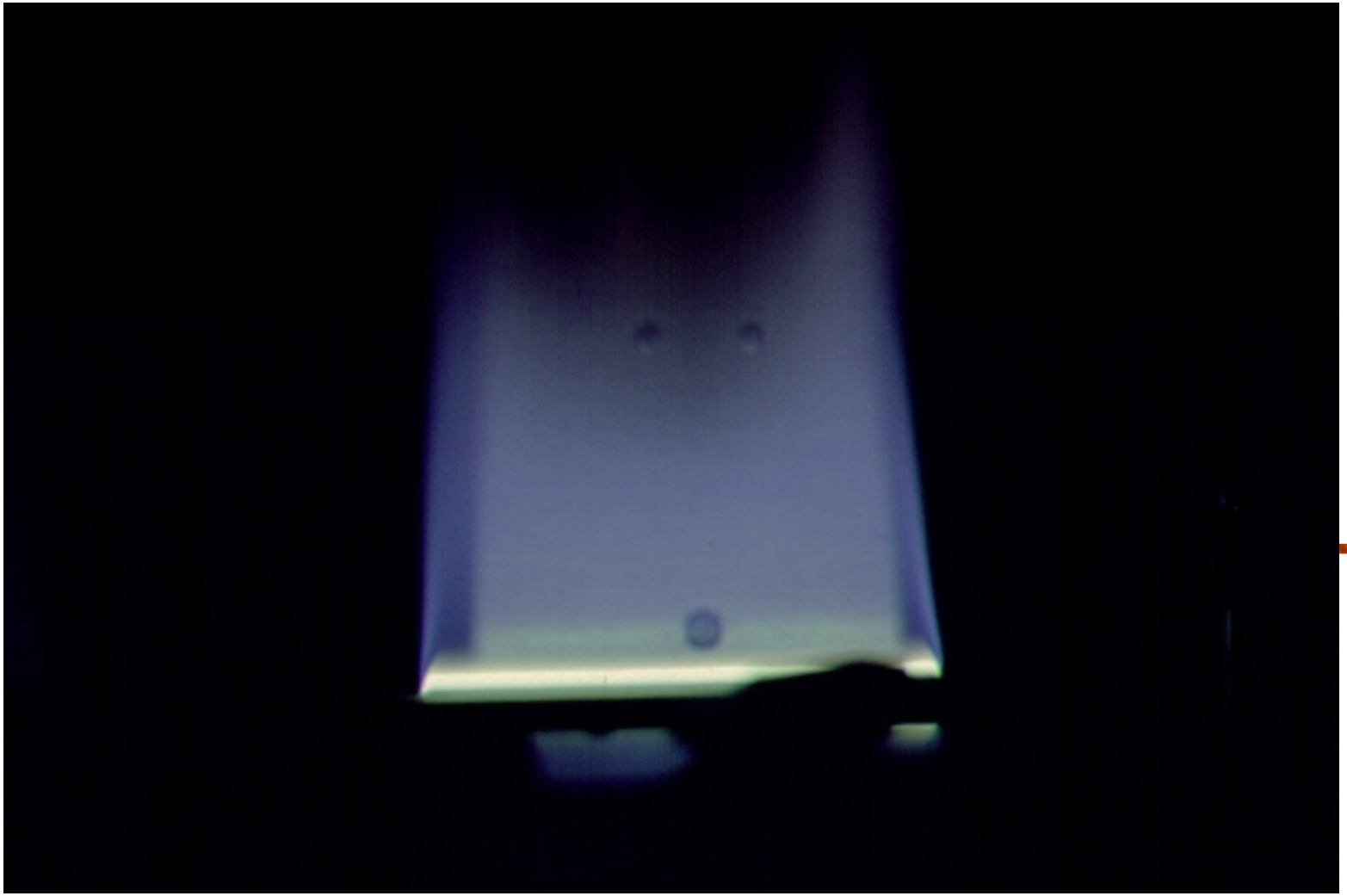


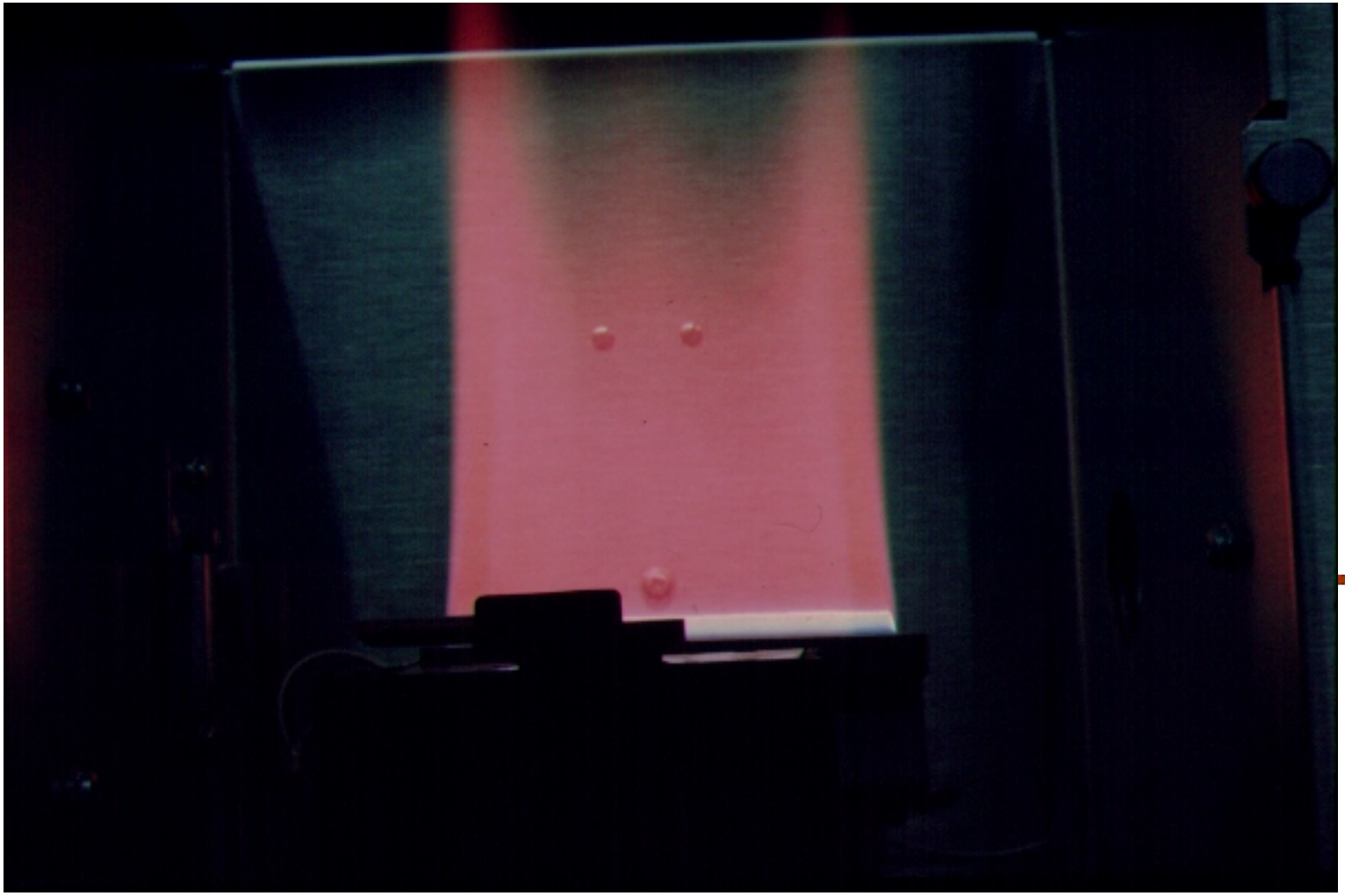
Figure 3
Lead movement into fetus. Lead in mother's blood enters fetus through the placenta and umbilical cord through passive transport. Lead ions eventually infiltrate the blood brain barrier leading to cognitive impairment.
Modified from: http://anthro.palomar.edu/blood/images/fetus_in_utero.gif


Fewer US Kids Have High Levels of Lead
Every year, the CDC collects blood lead levels for millions of children aged 1 to 5
Percent with "concerning" lead level
10.0
7.5
5.0
2.5
0.0
1995
2000
2005
2010
2015
Old "concerning" level: 10 μg/dl
New "concerning" level: 5 μg/dl
Data source: https://www.cdc.gov/nceh/lead/data/national.htm (US CDC)
ChartYourWorld.org

Measuring with flame



Measuring with flame



Measuring with flame

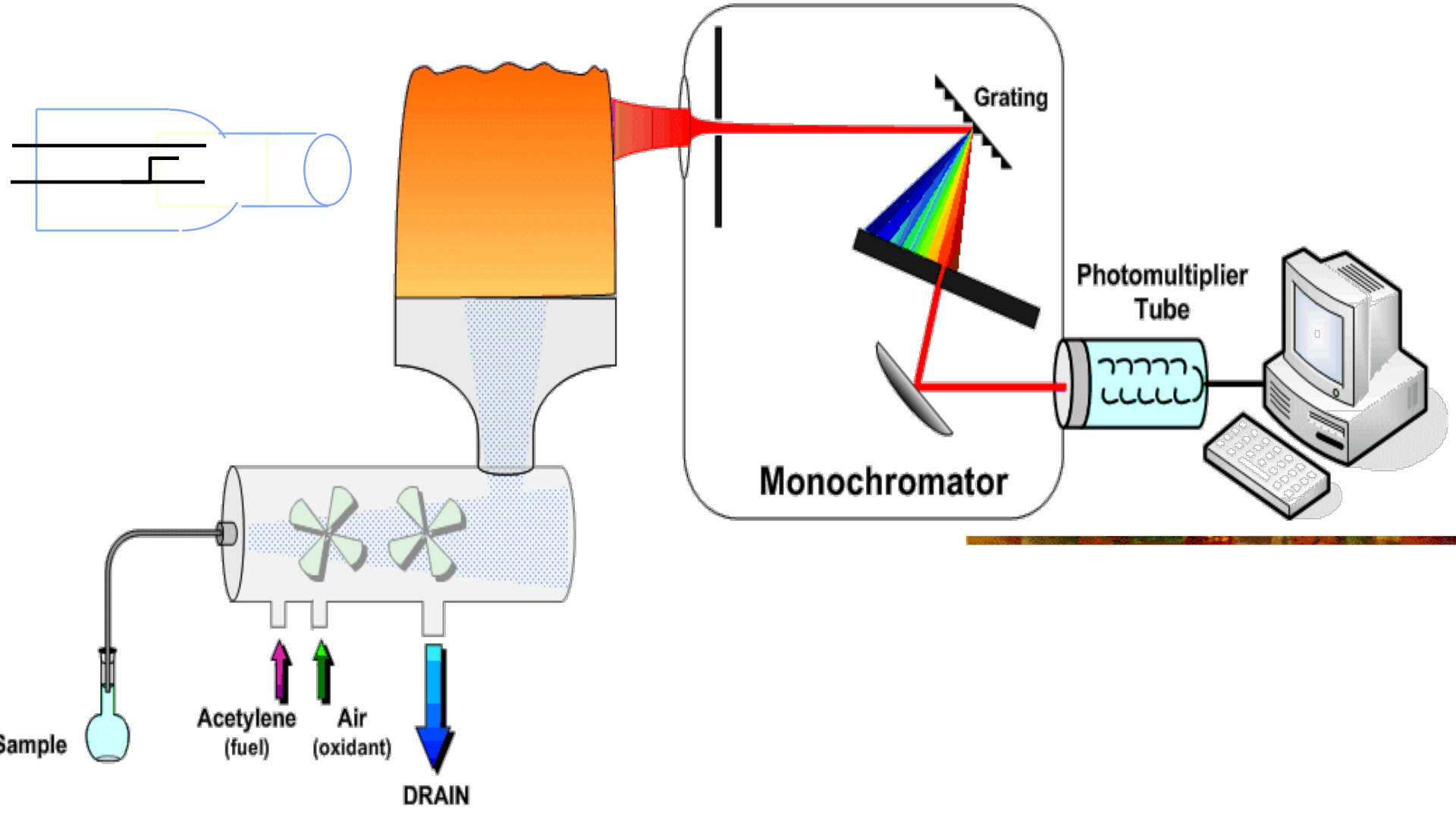
Metal Analysis

Blood Lead = 1 μg/dl = 10 ng/ml = 10ppb

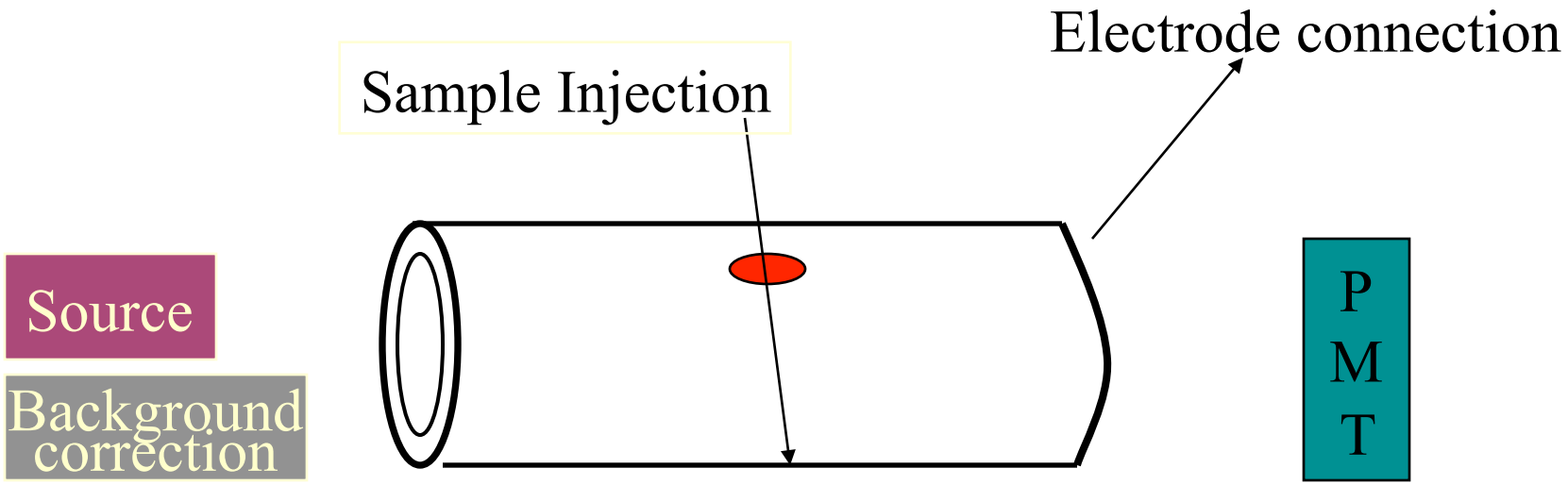
Trace = 1ppm- ppb

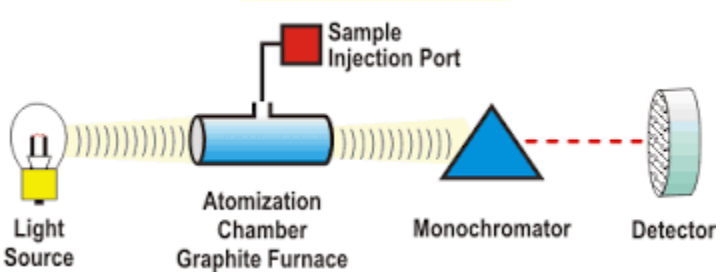
Ultratrace = ppb – ppq

Atomic Absorption Spectroscopy

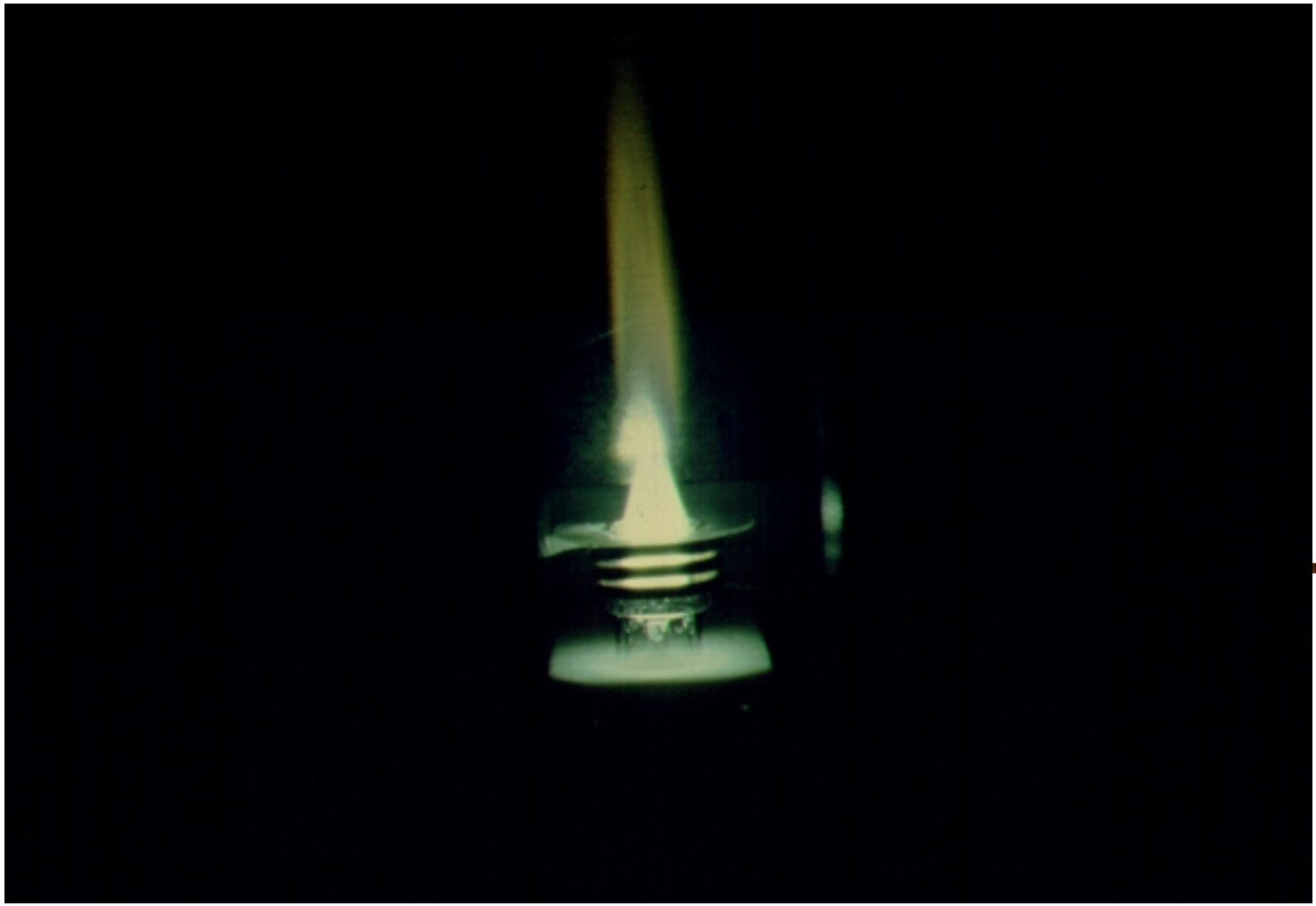


Graphite Furnace AA





Inductively Coupled Plasma



Types of Elemental Instrumentation

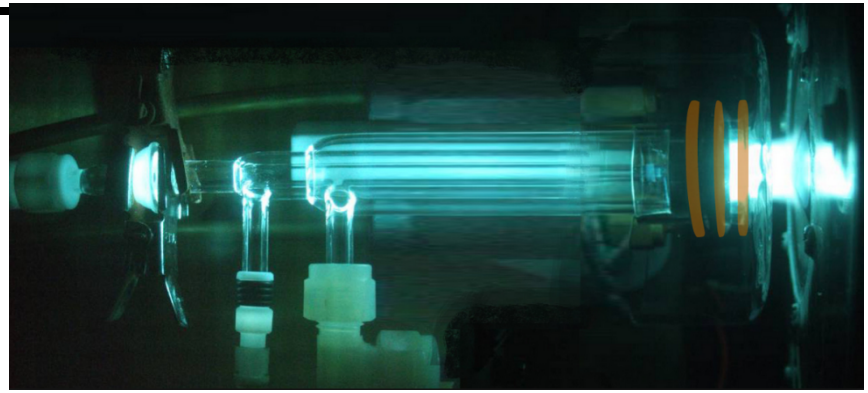
Mass Spectrometry

- Plasma/MS
- Glow Discharge/MS

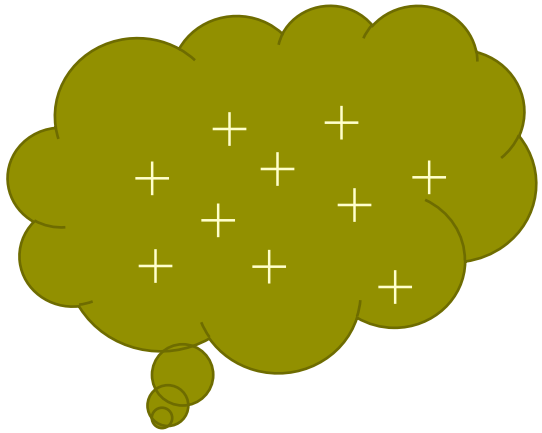
ICP-MS

Inductively Coupled Plasma – Mass Spectrometer

How does it work?

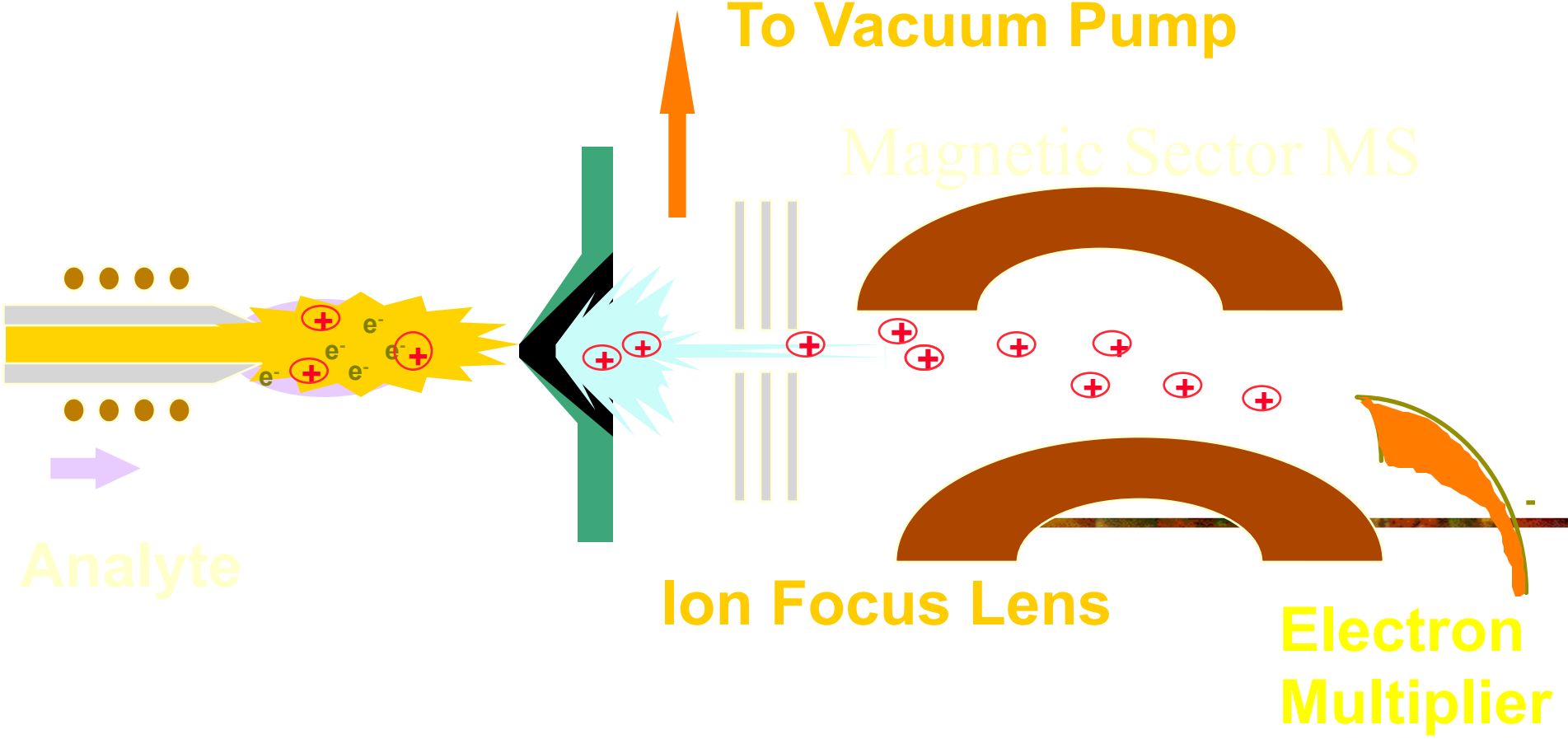


Sample +
Argon Gas →

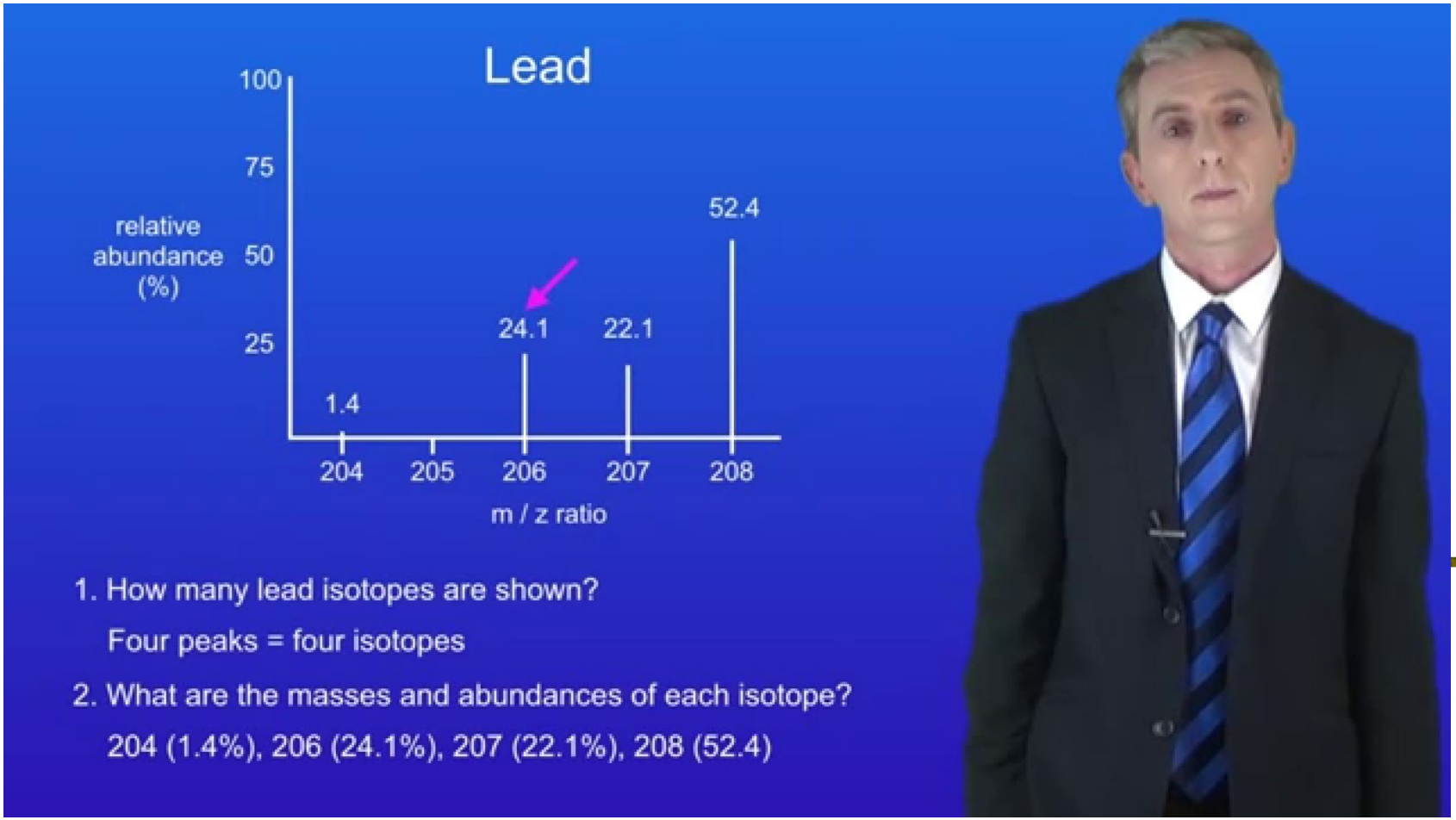


→ Ion Detector

High Resolution ICP/MS System



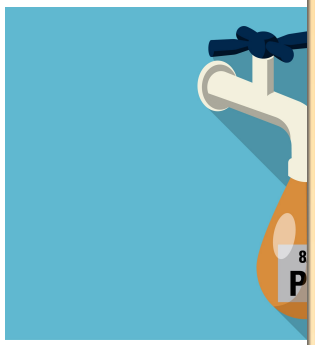
Isotopes of Pb

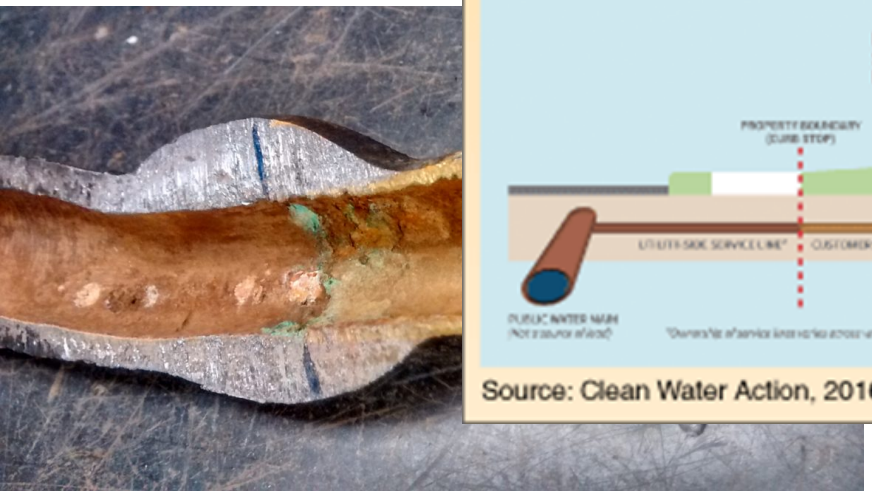


Yamanaka, Michiko,Removal of Molybdenum Oxide Interference on Cadmium. Agilent Technologies, Japan

Looking at our water

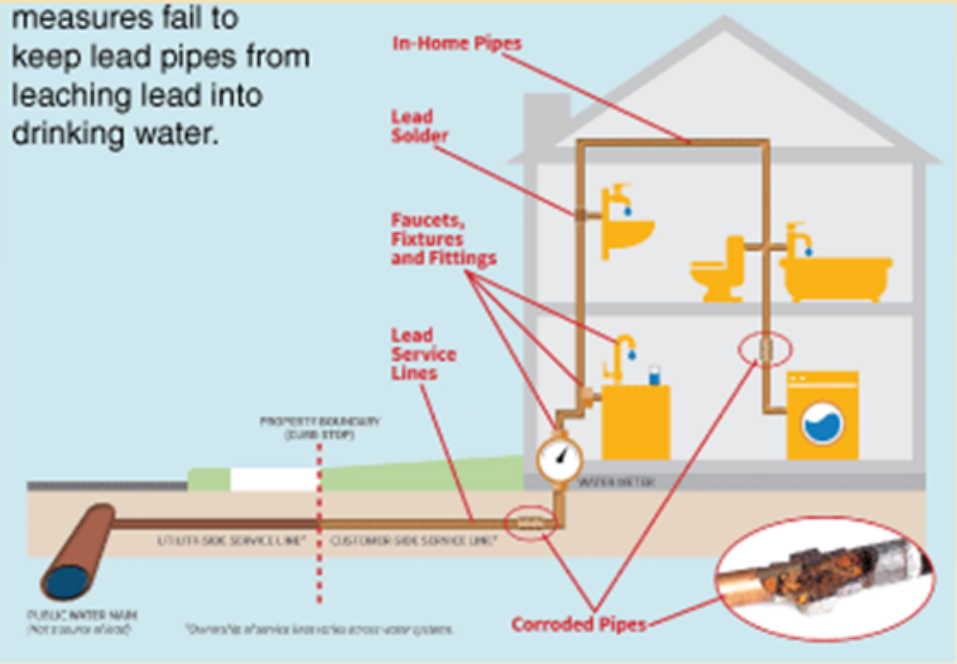
How does it get into the water?



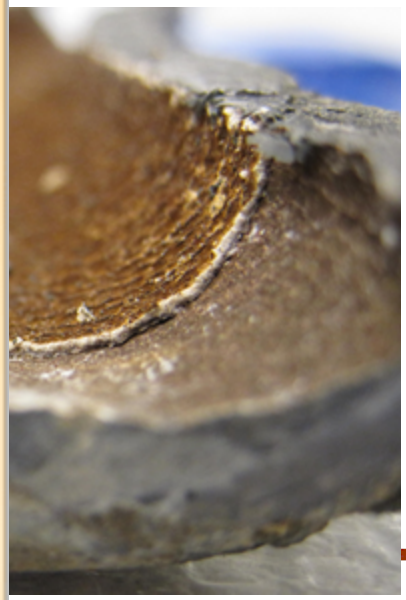


How Lead Gets Into Drinking Water

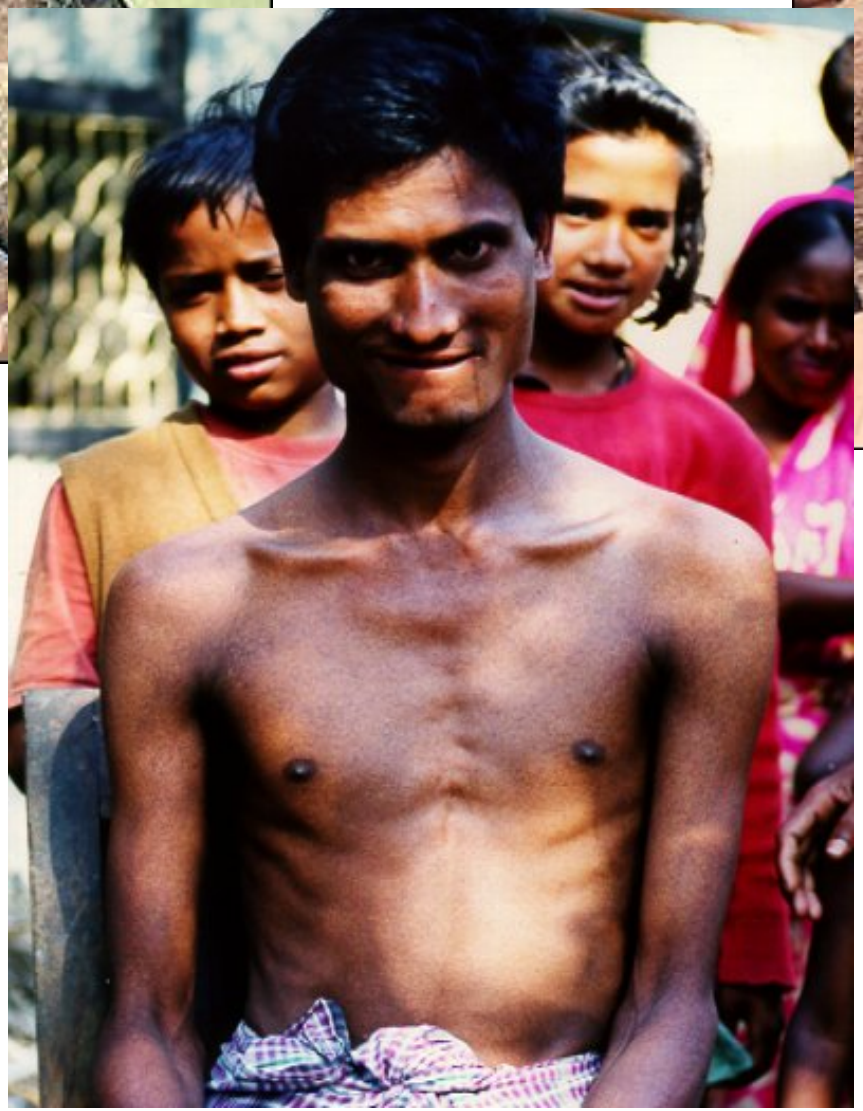
Drinking water in homes with old water pipes is more likely to contain lead than water in newer homes with lead-free pipes. When drinking water leaves municipal treatment plants, it is lead-free. But it can be contaminated with lead when corrosion-control measures fail to keep lead pipes from leaching lead into drinking water.

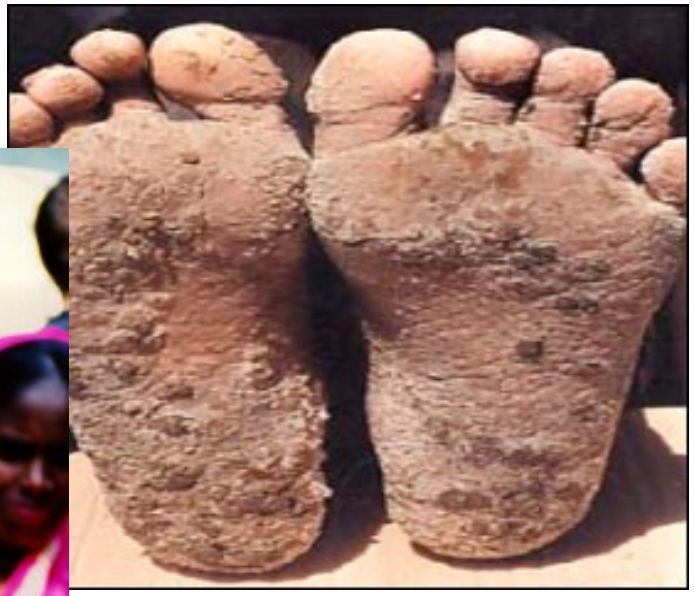


Source: Clean Water Action, 2016, http://tinyurl.com/hvjf2la

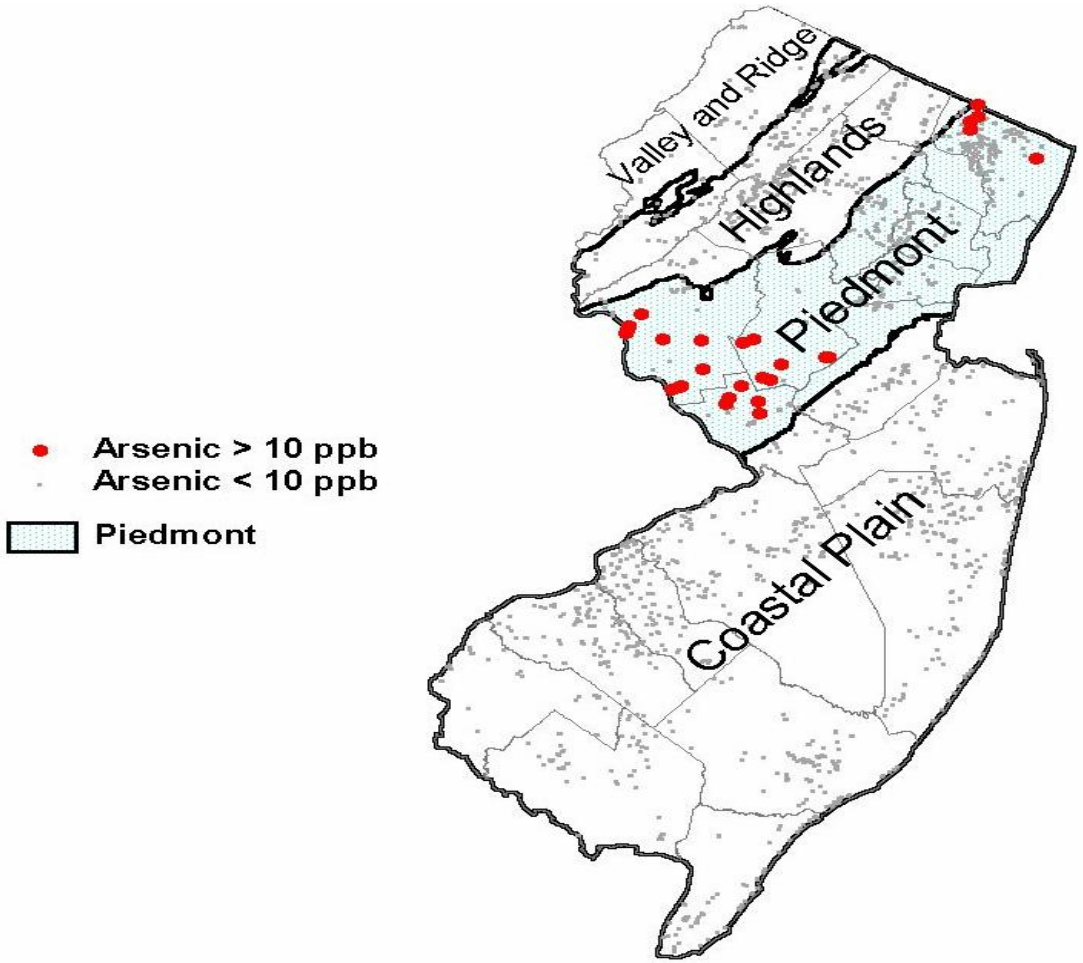


One bad element





Arsenic in NJ



- Arsenic in drinking water wells in the Piedmont region

What's in your water?

DAILY RECORD
MORRISTOWN, NJ
SUNDAY 65,711
MAR 30 2003
NEW JERSEY CLIPPING SERVICE

Water detectives search for poisons

Four-year study includes Rockaways

BY CHRIS GOSIER
DAILY RECORD

PISCATAWAY — In a lab at Rutgers University, researchers are using standard technology in novel ways to find more contaminants than ever in water that may look clean and clear.

Their four years of study have turned up hundreds of compounds in minute quantities in water systems all over New Jersey, including in Rockaway and Rockaway Township. The compounds are mostly artificial ones and may not be removed by conventional water treatment methods. Researchers say their long-term health effects, if any, could take years to pin down.

The compounds were found in trace amounts, and there's no sign that any are harmful, researchers say. But the head of the state Department of Environmental Protection says more study is needed just the same.

The study "will need to be followed up, not merely by further studies, but by a closer look at whether current treating and testing methods are adequate to protect public health," DEP Commissioner Bradley M. Campbell said in releasing the study March 10.

The study of 20 water systems around the state turned up 600 tentatively identified compounds, or TICs, that aren't easy to detect, identify or quantify.

That's compared to about 80 compounds that are regulated under state and federal standards, according to DEP.

Finding the TICs is a lot like detective work, said Brian Buckley, lab director at the Environmental and Occupational Health Sciences Institute, the DEP's partner in the study.

"We're using (the technology) in ways it's never been used before," he said.

He and his graduate assistants work out of a lab across from his office at EOHSI, which is co-sponsored by Rutgers University.

The room is cramped, full of test tubes, water samples and a sprawling machine with an equally sprawling name — gas chromatograph/ion trap mass spectrometer.

SEE POISON / A21

KAREN FUCITO / DAILY RECORD
Robert Stiles, a graduate assistant at Rutgers University, prepares water for processing in work that would more clearly identify chemicals found in water.

"Some of this ... is stuff that has been in your body. You've been eating them in your cereal since you could eat cereal."
— Brian Buckley, lab director at the Environmental and Occupational Health Sciences Institute

Poison

CONTINUED FROM / A19

Its targets are infinitesimally mall — compounds that might veigh a trillionth of a gram.

By putting it to creative use, uckley said, scientists are able o detect tinier amounts of com- ounds than before.

This new frontier of clean ater research has opened up in ecent years, thanks to new tech- ology and methods that have llowed scientists to spot hun- reds of poorly understood chem- cals with greater precision.

Buckley noted that more study s needed to give meaning to the indings. But he added, "I'm not vorried, because the concentra- ions are very low."

Concern isn't warranted, he aid, "until we find that one of hese guys accumulates in your ody over a lifetime."

Other studies in recent years ave focused on the growing umber of pharmaceutical and ersonal-care products that are eing washed down drains and nto rivers and streams.

A federal government study ast year showed that the ation's waterways — including he Whippany River in Morris ounty — are awash in chemical nd synthetic compounds such s caffeine, contraceptives, ainkillers, insect repellent, icotine and perfumes.

Hydrologists with the U.S. eological Survey looked for 95 ommon compounds, only 14 of hich were regulated.

The USGS is doing another ationwide study, focusing on harmaceuticals, hormones and ther products, said Eric Vowin- le, a drinking-water quality spe- cialist with the USGS in West Trenton.

"There's a lot of different things out there we've never looked for," he said. "There's a broad list of things that we haven't had the capability of looking at, and now we have some methods to do that."

Some of the most common compounds in Buckley's study were phthalates, a component of plastics, and a pair of compounds that are commonly added to food as preservatives — butylated hydroxyanisole and butylated hydroxytoluene.

Many of the compounds likely are things we've already ingested, he said.

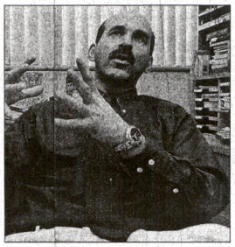
"Some of this ... is stuff that has been in your body," he said. "You've been eating them in your cereal since you could eat cereal."

The study looked at water utilities that are close to contaminated sites and that have high levels of volatile organic compounds, or VOCs, before treatment.

Those sites were chosen because VOCs often indicate the presence of nonvolatile or semi-volatile organic compounds, which have gotten less attention than the VOCs themselves over the years, according to the DEP.

The number of TICs found in water samples ranged from 164 in Fair Lawn, Bergen County, to two in Rocky Hill and zero in Rosemont. Rockaway Township had 35; the borough had 22.

Nearly all contaminants in all the systems were found at concentrations of less than one part per billion, DEP officials said.



KAREN FUCITO / DAILY RECORD
Lab director Brian Buckley talks in his office

The Rockaway systems clean VOCs from water with aerators, using a tower in which air is blown through the water to evaporate the volatile compounds. Those are backed up with carbon filtration devices.

The devices date from the 1980s, when both systems' well fields were named to the federal Superfund program because of high levels of VOCs. Thirteen volatile organic compounds were found in the borough's wells; the township wells had widespread contamination by chlorinated solvents and fuel components, according to the U.S. Environmental Protection Agency.

The township had no contaminants above allowed levels in 2001 according to its water quality report for that year, the latest one available.

The borough had a high reading that year for tetrachloroethene, also known as tetrachloroethylene or TCE, a chemical used in paints and pesticides or as a metal degreaser. Tests on March 28, 2001, found 18 parts per million, compared to the allowed level of one part. Three more tests that year found no more violations, the report says.

Buckley said it's too soon to say if water utilities will eventually have to test for any of the TICs turned up by his study because there's too much work yet to be done.

He and his team still need to test the rest of the state's water systems, for instance, moving on to the ones that draw from surface water such as rivers and streams. The current study looked mostly at ground water systems.

Finding any danger in the chemicals is another matter — toxicology tests for any one of them could take years, he said.

That means more experimenting — filtering the water in different ways, for instance, or using different temperatures and even an "ion box" with a magnetic field that separates the chemicals into hundreds of "fingerprints."

"We're getting fingerprints where we didn't have them before," Buckley said. "Only at our crime scene, there are hundreds and hundreds and hundreds of fingerprints, and we identify them all."

Those are only some of the possible methods.

"To me, it's detective work, coming up with a new method being able to problem-solve and trouble-shoot, and see less and less of something," Buckley said. "It's exciting."

Chris Gosier may be reached at (973) 428-6667 or cgosier@gannett.com.

Ill Yang of South Korea, a graduate assistant at Rutgers, looks over a printout of his work identifying chemicals in water.

The Characterization of Tentatively Identified Compounds (TICs) in Samples from Public Water Systems in New Jersey

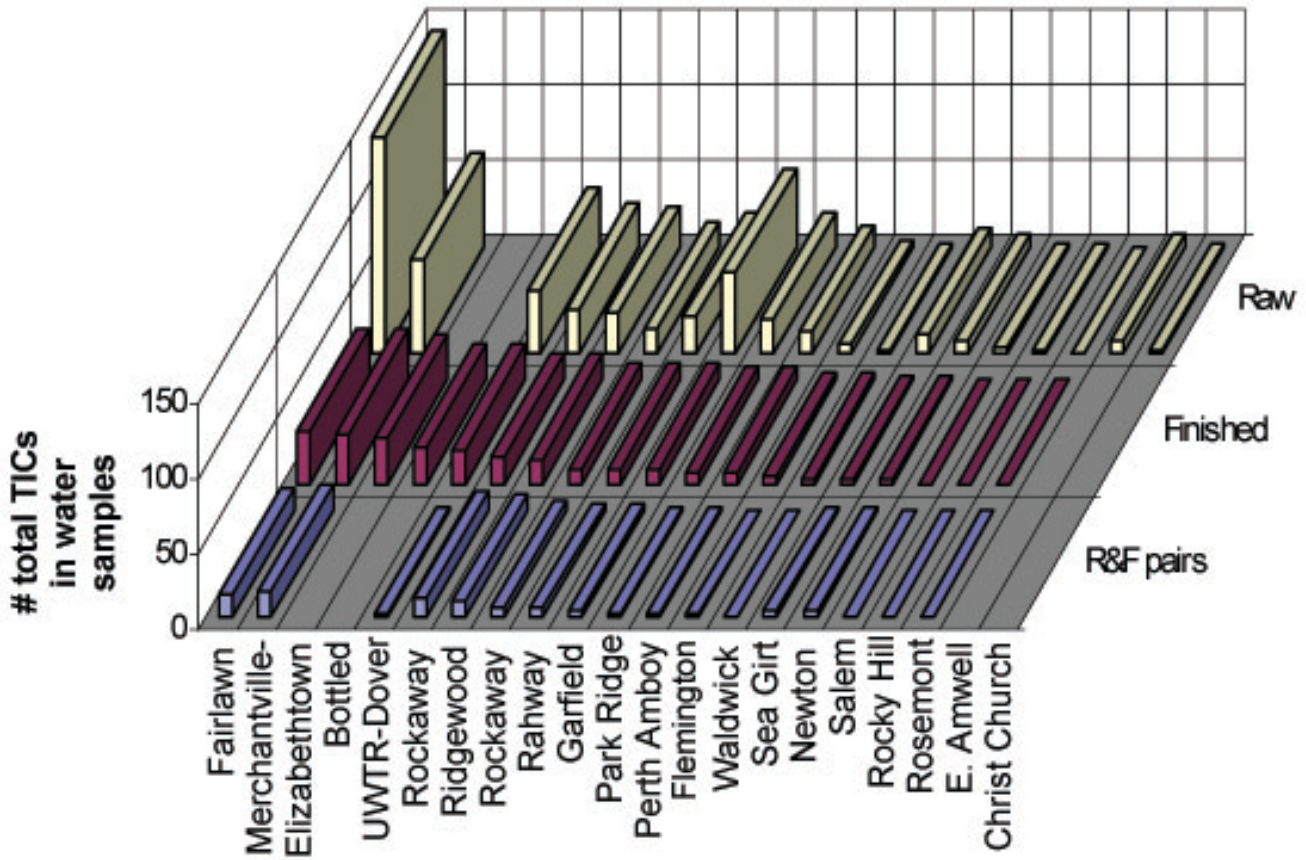
March, 2003

New Jersey Department of Environmental Protection

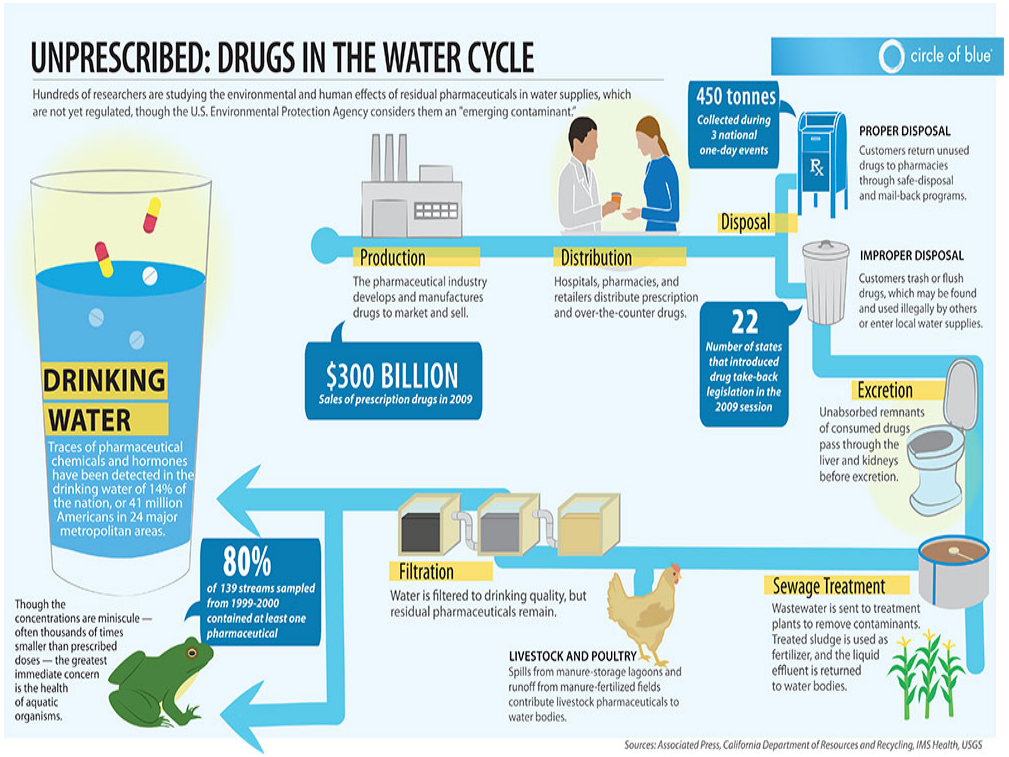
Division of Science, Research & Technology

Lots of unregulated compounds

Figure 2 TICs in Water Samples (not including TICs that were detected in blanks)




drugs
on tap

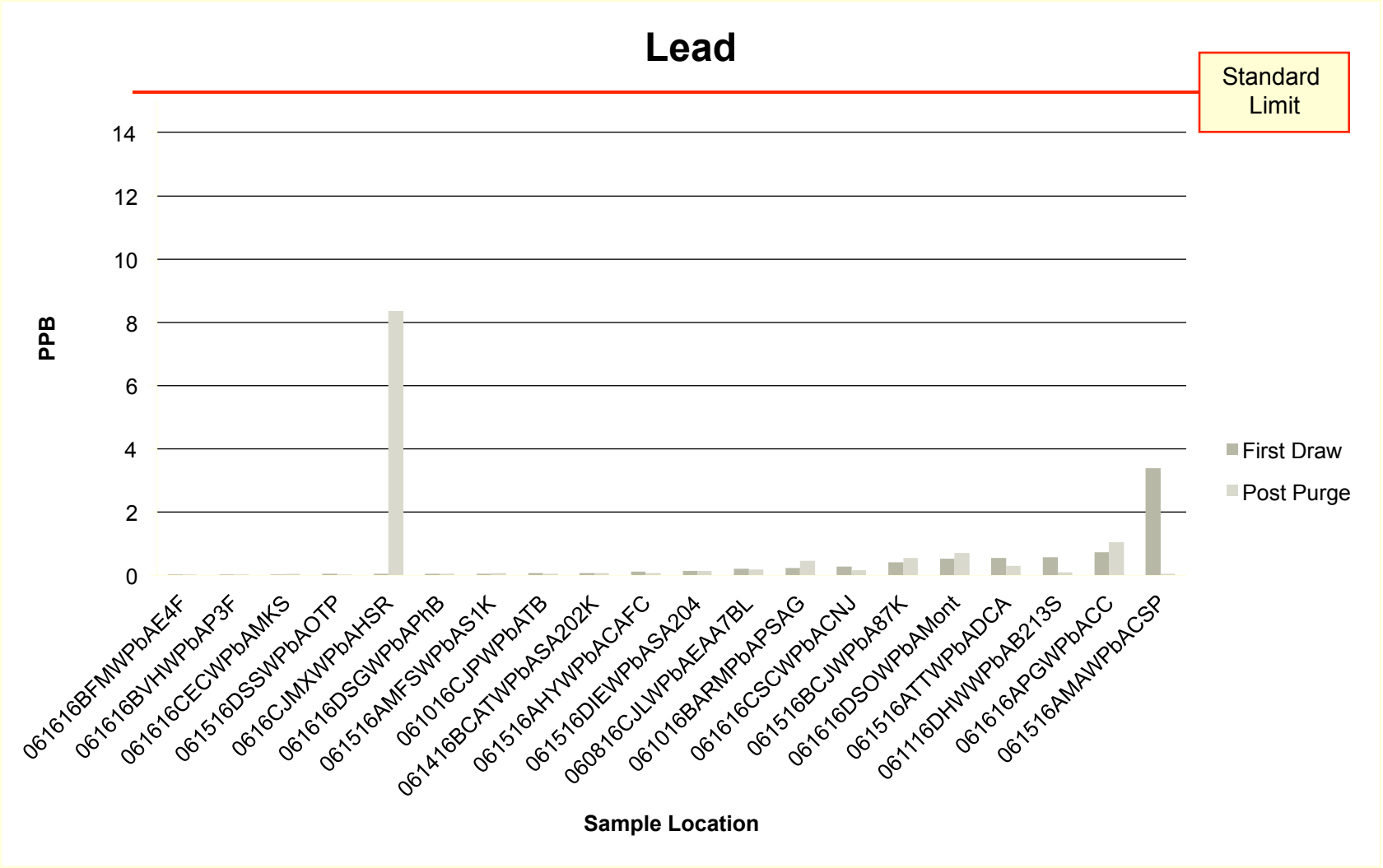

UNPRESCRIBED: DRUGS IN THE WATER CYCLE
circle of blue
Hundreds of researchers are studying the environmental and human effects of residual pharmaceuticals in water supplies, which are not yet regulated, though the U.S. Environmental Protection Agency considers them an "emerging contaminant."
450 tonnes
Collected during 3 national one-day events
PROPER DISPOSAL
Customers return unused drugs to pharmacies through safe-disposal and mail-back programs.
Disposal
IMPROPER DISPOSAL
Customers trash or flush drugs, which may be found and used illegally by others or enter local water supplies.
Production
The pharmaceutical industry develops and manufactures drugs to market and sell.
Distribution
Hospitals, pharmacies, and retailers distribute prescription and over-the-counter drugs.
$300 BILLION
Sales of prescription drugs in 2009
22
Number of states that introduced drug take-back legislation in the 2009 session
Excretion
Unabsorbed remnants of consumed drugs pass through the liver and kidneys before excretion.
DRINKING WATER
Traces of pharmaceutical chemicals and hormones have been detected in the drinking water of 14% of the nation, or 41 million Americans in 24 major metropolitan areas.
80%
of 139 streams sampled from 1999-2000 contained at least one pharmaceutical
Though the concentrations are miniscule — often thousands of times smaller than prescribed doses — the greatest immediate concern is the health of aquatic organisms.
Filtration
Water is filtered to drinking quality, but residual pharmaceuticals remain.
LIVESTOCK AND POULTRY
Spills from manure-storage lagoons and runoff from manure-fertilized fields contribute livestock pharmaceuticals to water bodies.
Sewage Treatment
Wastewater is sent to treatment plants to remove contaminants. Treated sludge is used as fertilizer, and the liquid effluent is returned to water bodies.
Sources: Associated Press, California Department of Resources and Recycling, IMS Health, USGS


SINCE THE PHARMACY IS CLOSED, THE DOCTOR SAID YOU SHOULD TAKE THREE GLASSES OF WATER...
NEWS
PHARMACEUTICALS FOUND IN TAP WATER


Mike Keefe THE DENVER POST 3-27-08
I THOUGHT THERE WERE ENOUGH DRUGS IN THE TAP WATER TO KILL THE SALMONELLA.
ALAMOSA
www.cagleartoons.com

Sometimes you miss your target

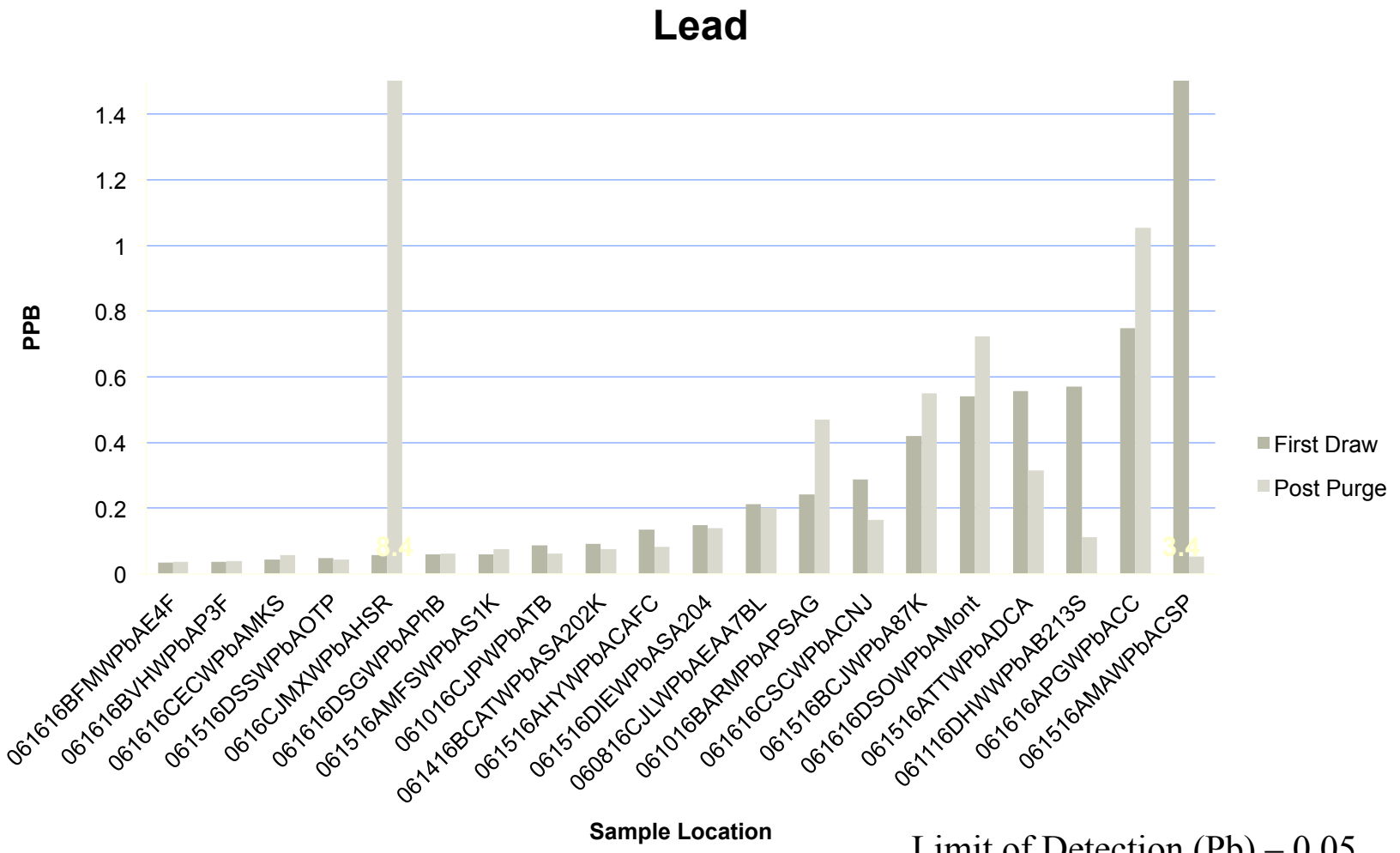
Drinking Water Samples: First Draw Vs. Post Purge
New Brunswick or Piscataway, NJ
NJDEP Drinking Water Quality Standard for Lead: **15 PPB**



NJDEP - New Jersey Dept. of Environmental Protection
PPB – Parts Per Billion

Limit of Detection (Pb) – 0.05 ppb

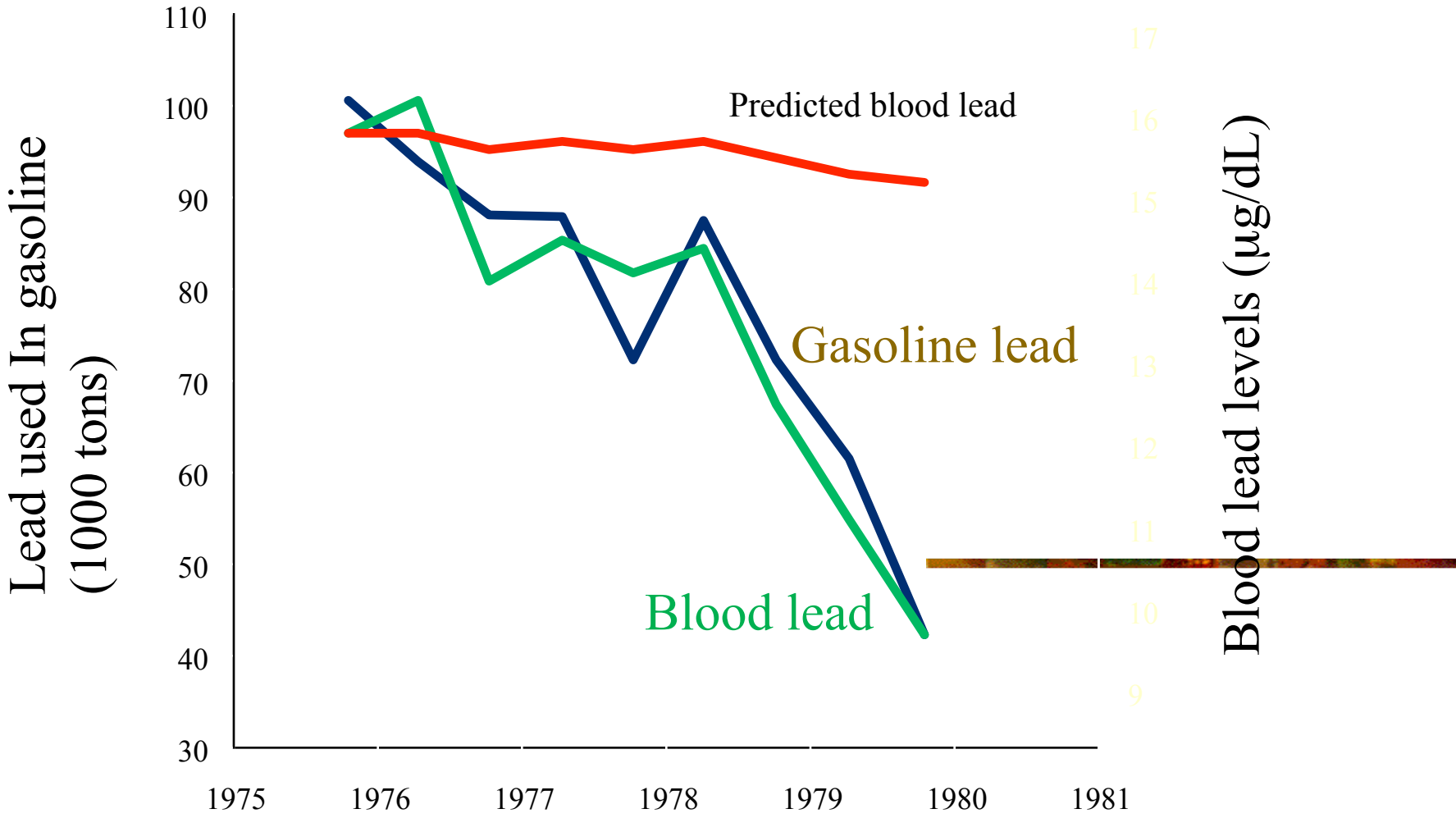
Drinking Water Samples: First Draw Vs. Post Purge
New Brunswick or Piscataway, NJ
NJDEP Drinking Water Quality Standard for Lead: **15 PPB**



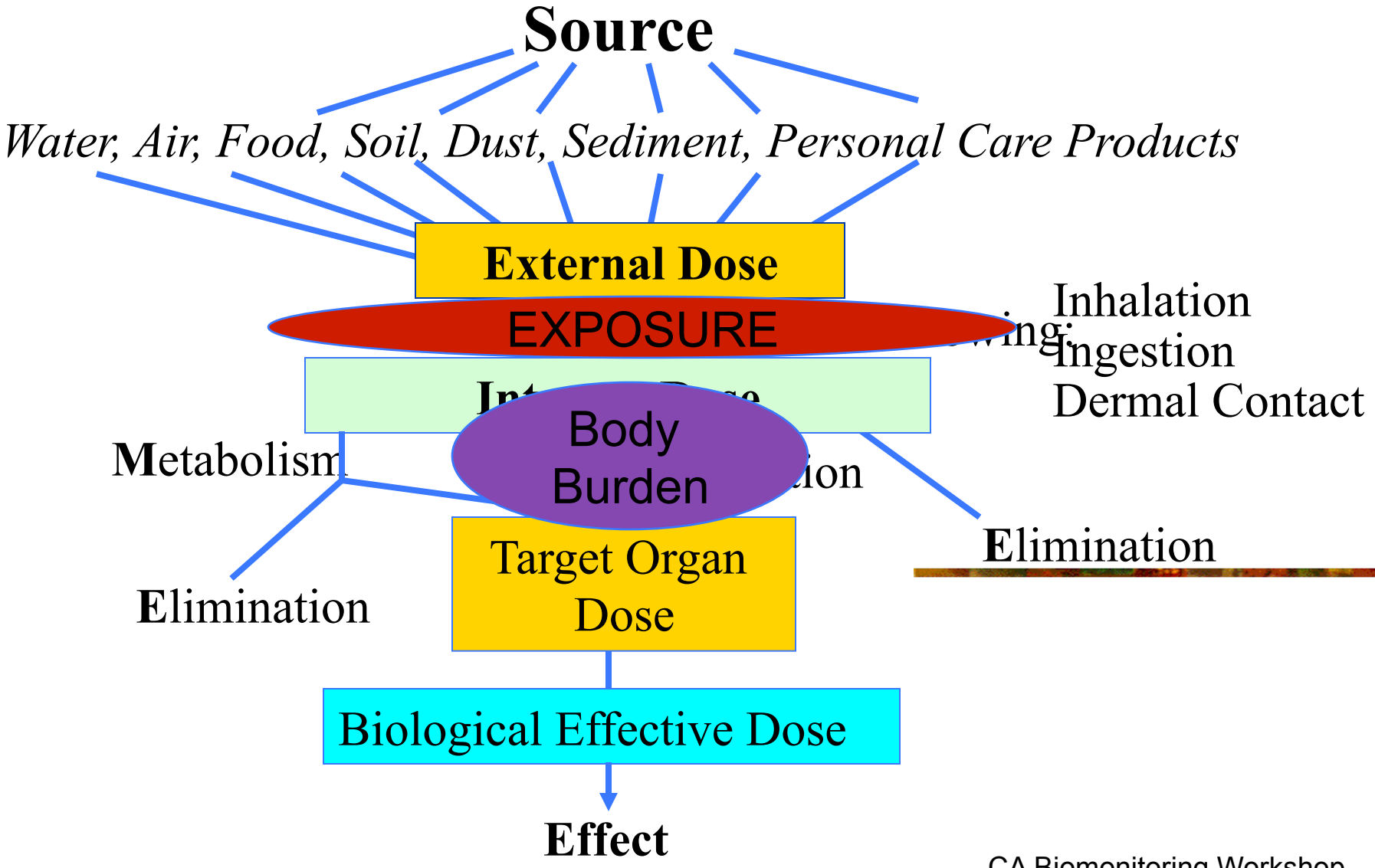
Limit of Detection (Pb) – 0.05 ppb

NJDEP - New Jersey Dept. of Environmental Protection
PPB – Parts Per Billion

Lead in gasoline and lead in blood
NHANES II, 1976-1980



Exposure Science



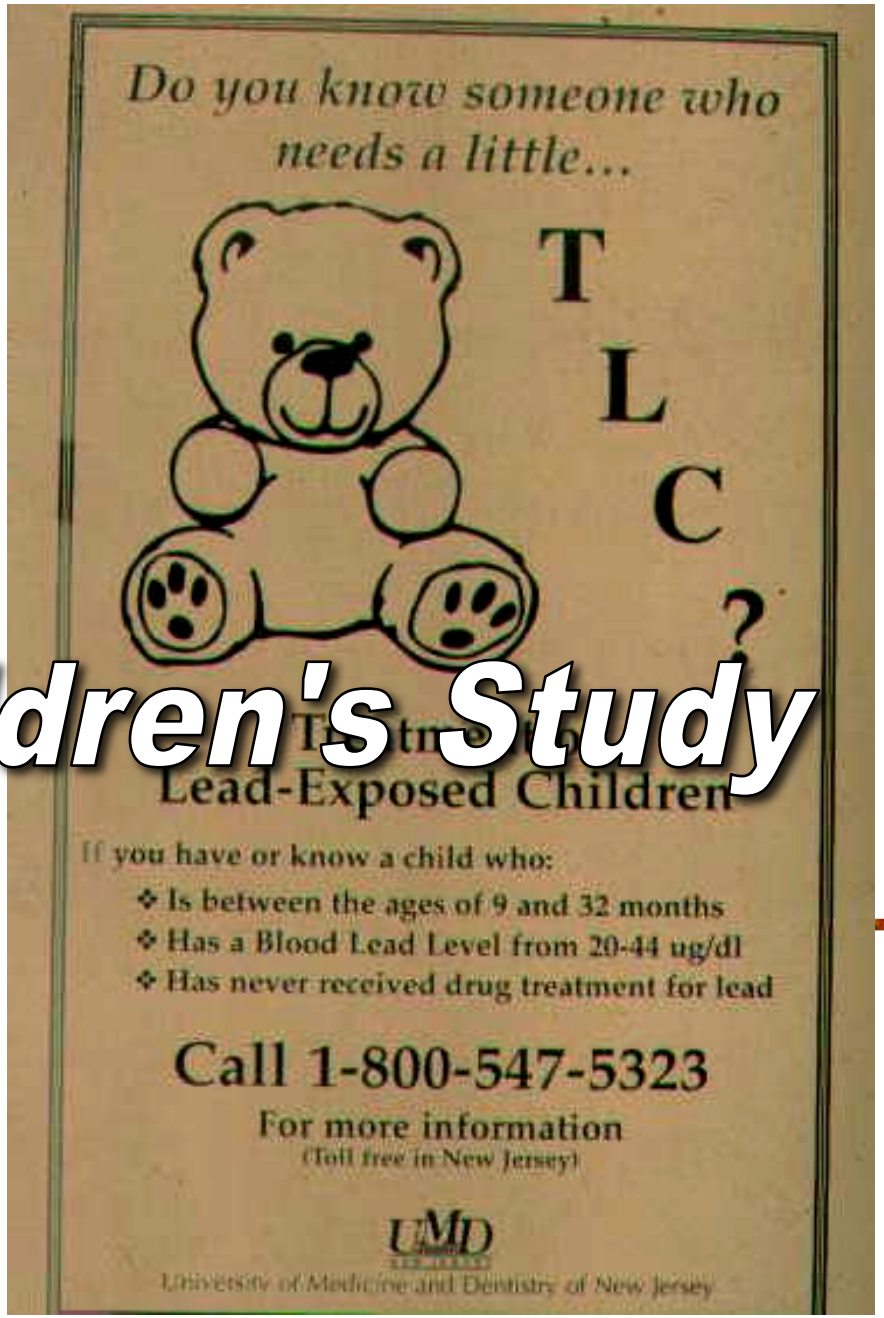
Our Studies

NHEXAS

National Children's Study

Autism Center

CLEARS



Is Your Home Lead Safe?

Was your home built before 1978?

Do you have a child younger than age 6?

Are you worried about lead in your water?

If you answered yes to any of these questions, read more below to learn how to keep your home and children safe.

https://isles.org/services/healthy-homes-lead-asthma/videos

11 NJ Cities Have More Children with Elevated Blood Lead Levels (EBLLS) Than Flint, MI

City	Total Number of Children Under Six*	Children Tested**		Children with EBLLs ≥ 5	
		#	%	#	%
Flint, MI	**8,657**	**3,389**	**39.1**	**112**	**3.3**
Atlantic City	3,677	1,738	47.3	177	**10.2**
Irvington	4,993	2,705	54.2	229	**8.5**
East Orange	5,543	1,896	34.2	147	**7.8**
Trenton	7,998	3,421	42.8	214	**6.3**
Newark	24,831	14,030	56.5	800	**5.7**
Paterson	13,987	6,407	45.8	310	**4.8**
Plainfield	4,961	2,802	56.5	127	**4.5**
Jersey City	20,393	8,605	42.2	347	**4.0**
Elizabeth	11,792	4,921	41.7	195	**4.0**
New Brunswick	4,753	1,747	36.8	64	**3.7**
Passaic	8,226	4,433	53.9	163	**3.7**

* "Children" defined as under six years of age (most susceptible to harmful effects of lead)
"EBLLs" defined as greater than or equal to 5 mg/dL (the national lead reference level)

** US Census 2010

*** New Jersey data from 2014 (latest available data)
www.state.nj.us/health/fhs/documents/childhoodlead2014.pdf
Flint data from 2015 (during the crisis, before water treatment)
www.mi.gov/flintwater

Prepared by Isles, Inc.

LEAD

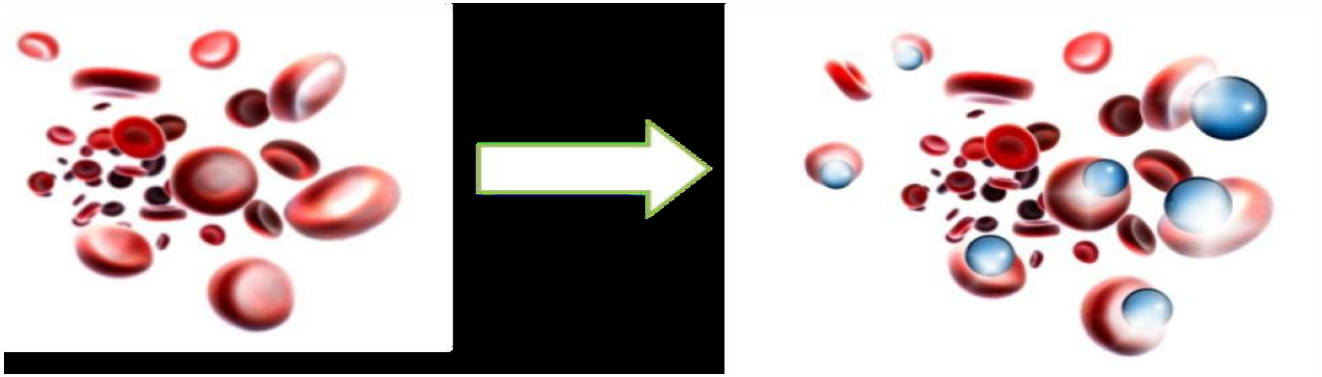
- 900,000 children between ages 1 and 5 have PbB above level of concern in US (EPA).
- Currently, PbB elevated if exceeding 5 ug/dL.
- Lead more dangerous to children than adults:
  - Higher absorption of lead.
  - More likely to put hands and other object with lead dust in mouth.
  - Brain and nervous systems not yet developed.

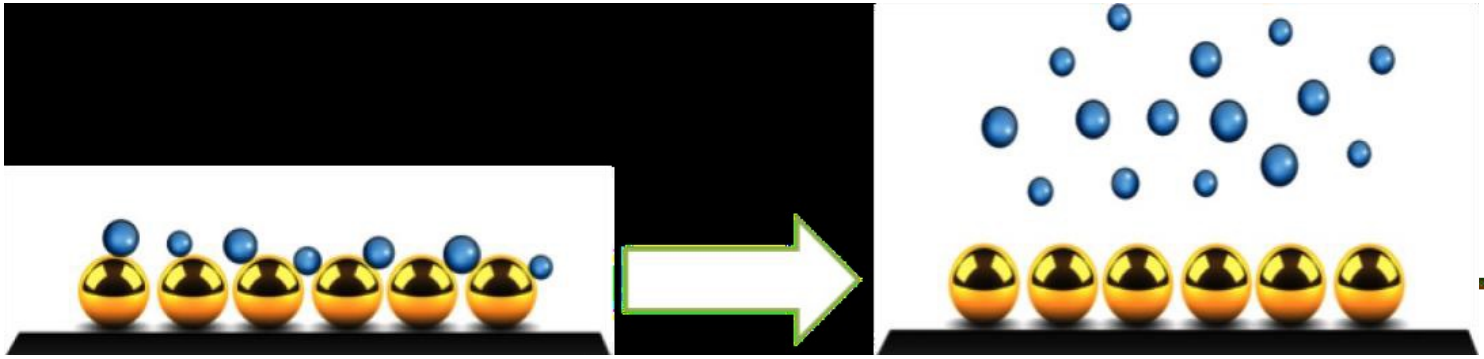
Kids put things (like their hands) in their mouths

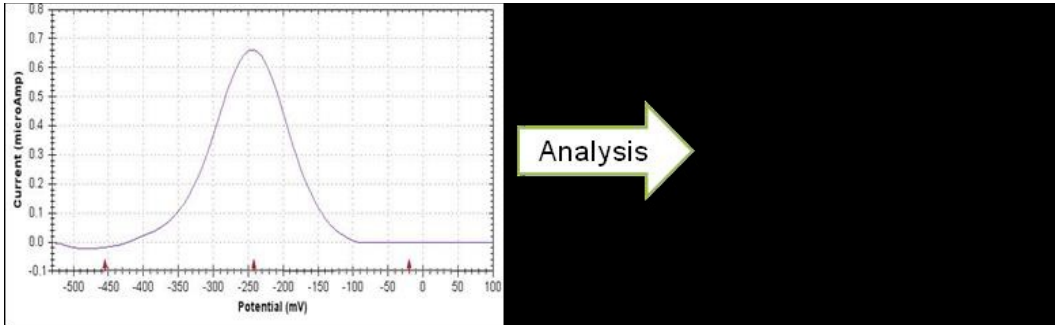
Pb and Cr in High Concentrations in Big Bird's Nose fabric

Lead Care (electrochemical)monitoring

Electrochemical Detection

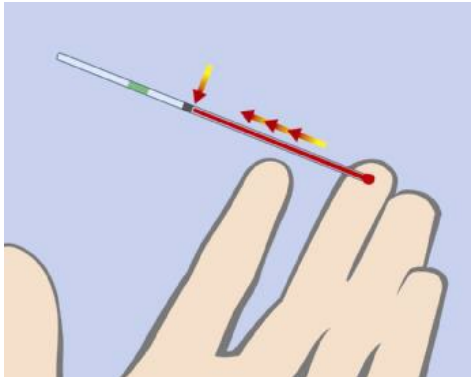


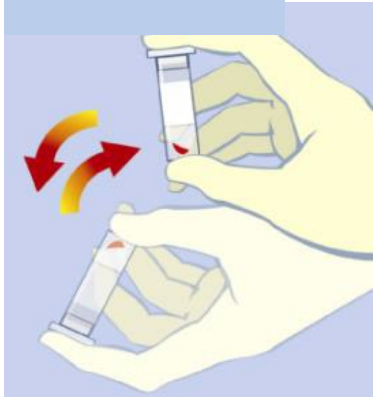




Electrochemical Lead Care ???

Food and Drug Administration and Centers for Disease Control and Prevention are warning Americans that certain lead tests manufactured by Magellan Diagnostics may provide inaccurate results for some children and adults in the United States …with blood drawn from a vein





EPA

If lead concentrations exceed an action level of 15 ppb or copper concentrations exceed an action level of 1.3 ppm in more than 10% of customer taps sampled, the system must undertake a number of additional actions to control corrosion. Lead and Copper Rule

natural levels of lead in soil range between 50 and 400 parts per million EPA

CDC

No *safe blood lead level* in children has been identified. CDC

4 million households have children living in them that are being exposed to high levels of lead.

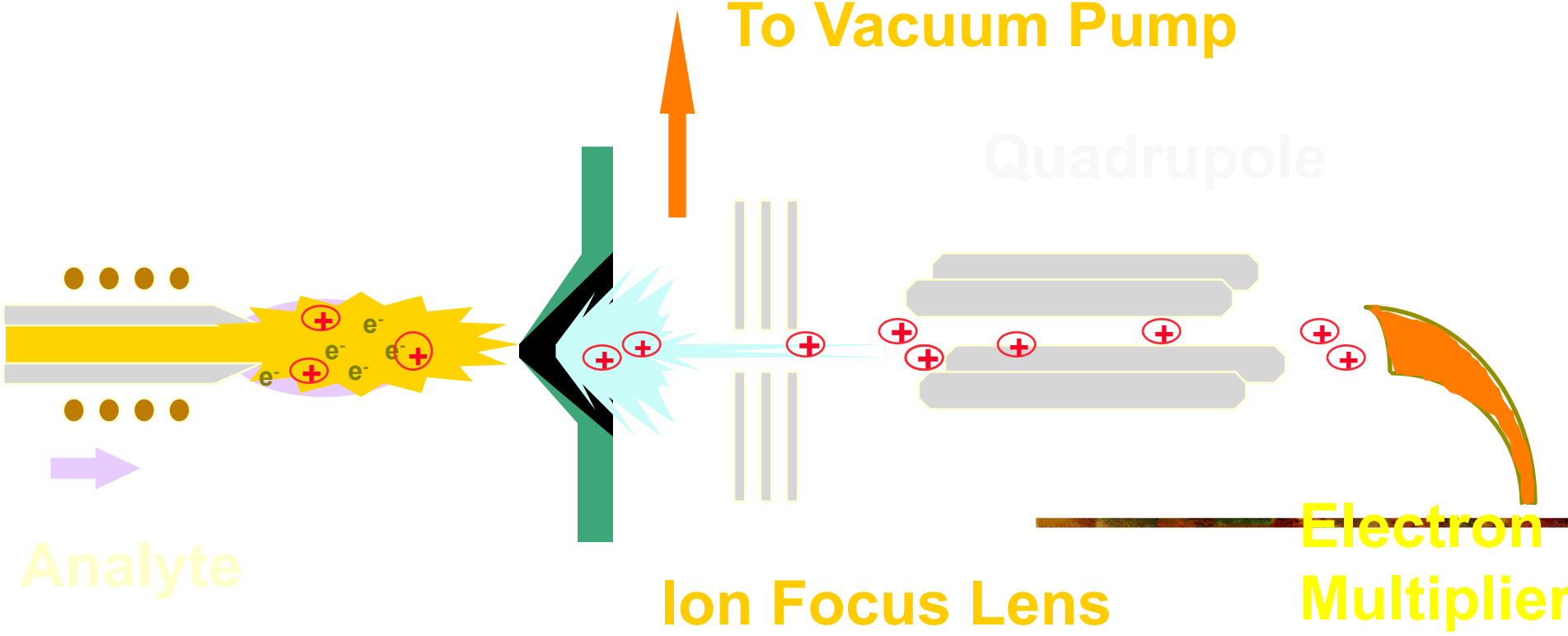
There are approximately half a million U.S. children ages 1-5 with blood ***lead levels above 5*** micrograms per deciliter (µg/dL), the reference level at which CDC recommends public health actions be initiated.


3M
Lead Check™
Swabs
RED MEANS LEAD™
Instant Lead Testing
WARNING!
MAY CAUSE EYE AND SKIN IRRITATION.
Read carefully other cautions on the side/back panel.
¡ADVERTENCIA!
PUEDE CAUSAR IRRITACIÓN EN LOS OJOS Y PIEL.
Lea cuidadosamente otras precauciones en el panel lateral y trasero.
Cont. 8 Swab Kit
Kit de 8 Hisopos

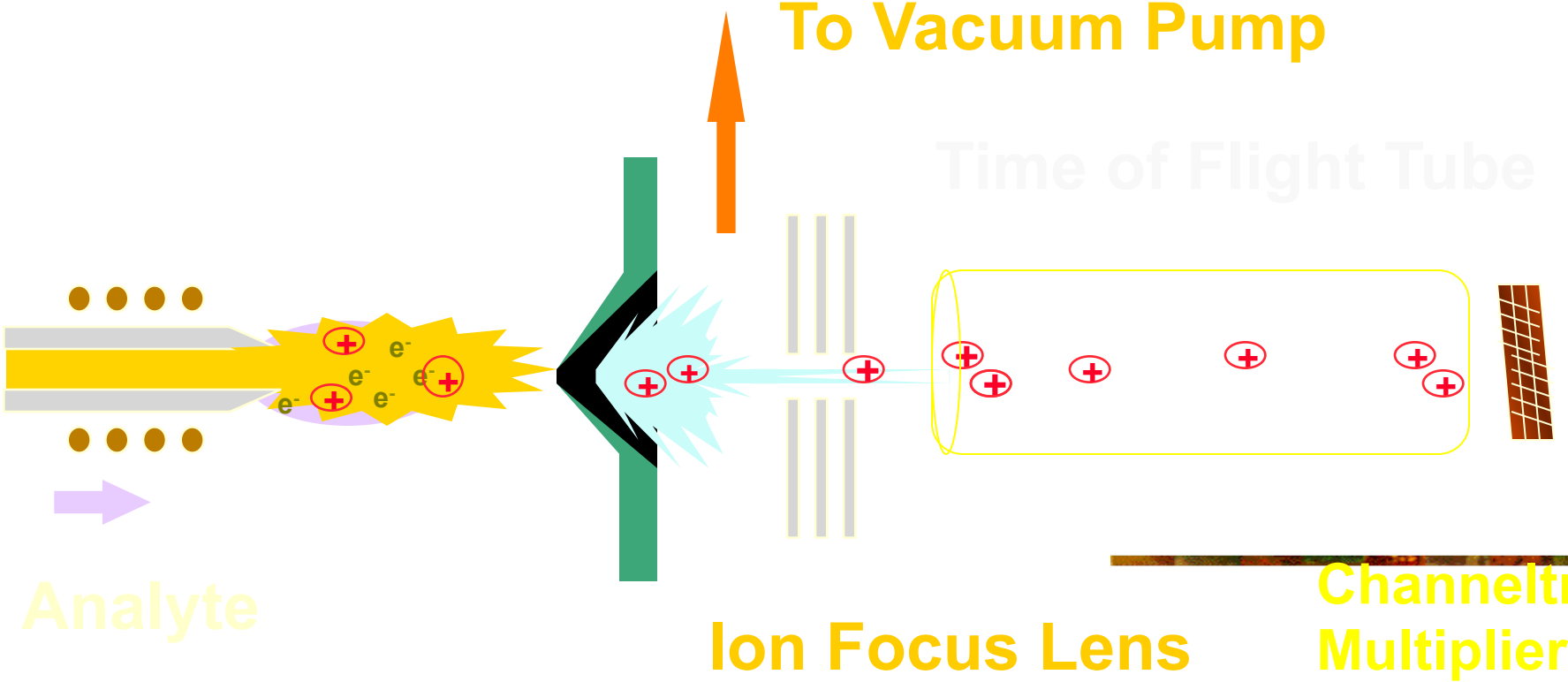
Guess Who?

Exposed Populations: Romania

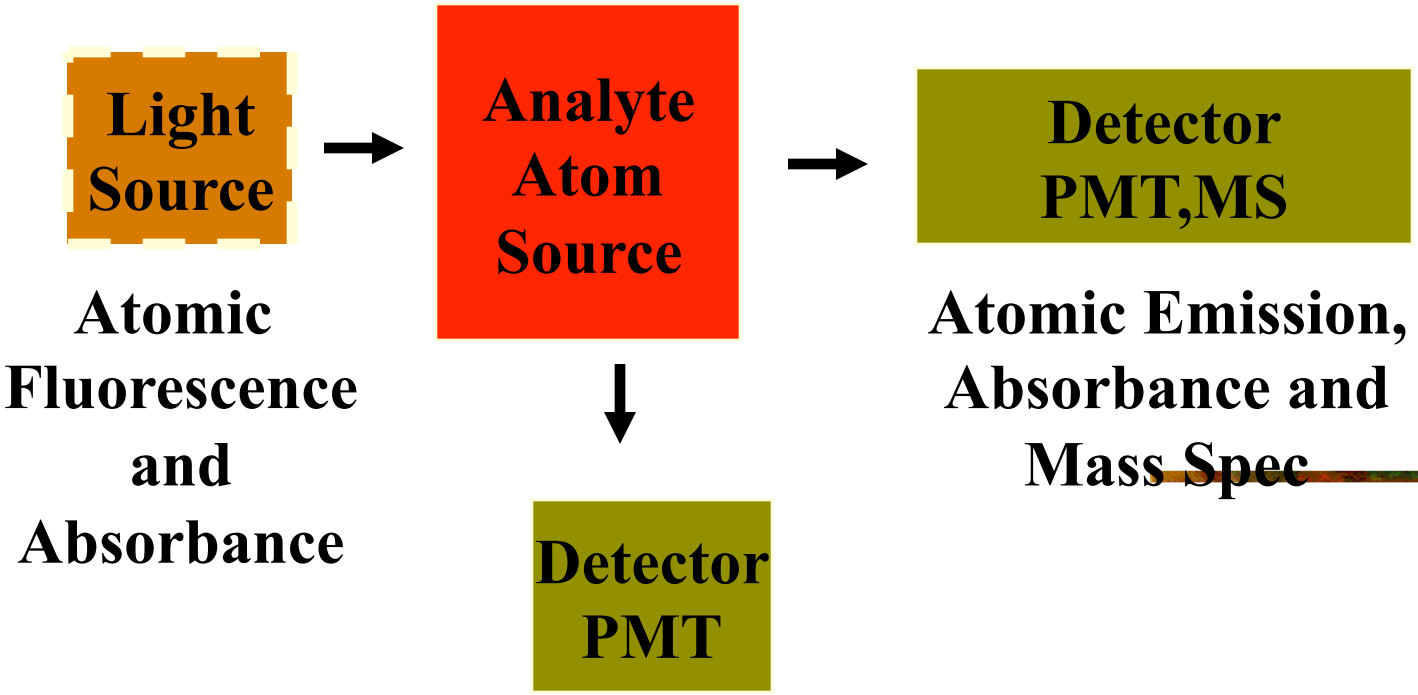
ICP/MS System



ICP/MS Time Of Flight System



Atomic Spectrometry

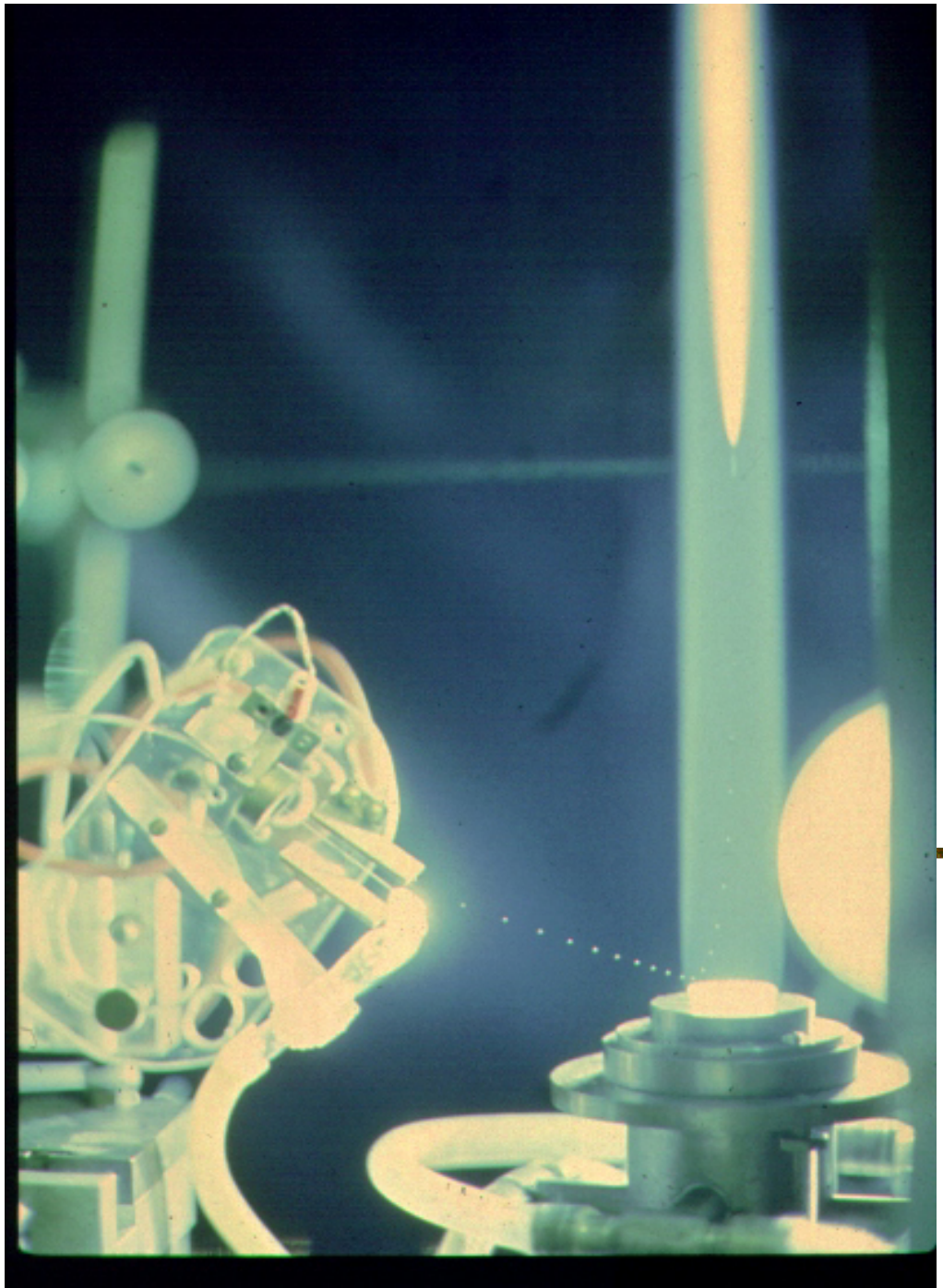


Types of Elemental Instrumentation

Optical

- Absorption
- Emission
- Fluorescence

Droplets in the Flame



Atomic Spectroscopy

Flame Spectroscopy

Atomic Absorption (T)

Atomic Emission (T)

Atomic Fluorescence (U)

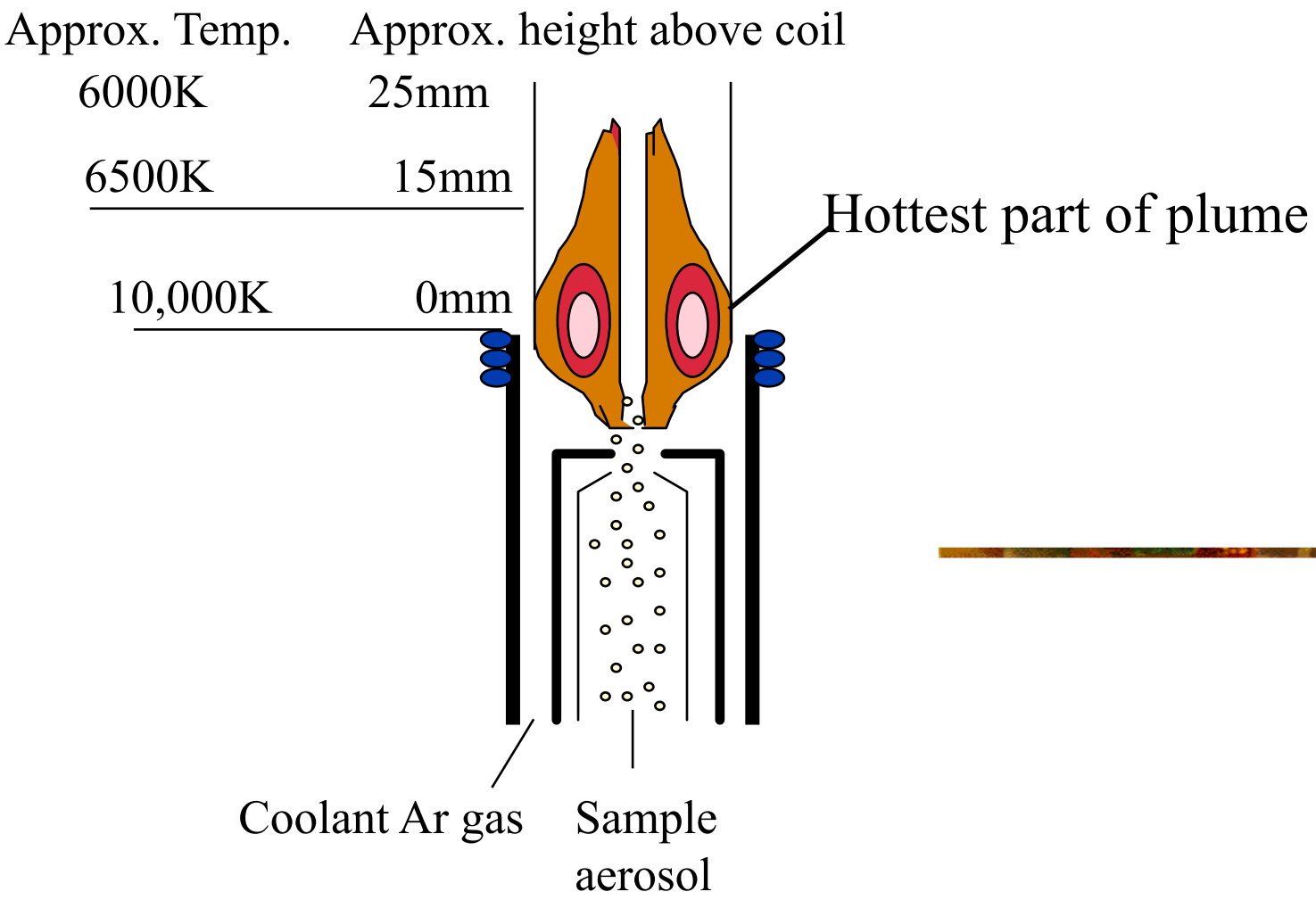
Plasma Spectroscopy

Atomic Emission (T)

Atomic Mass Spec (U)

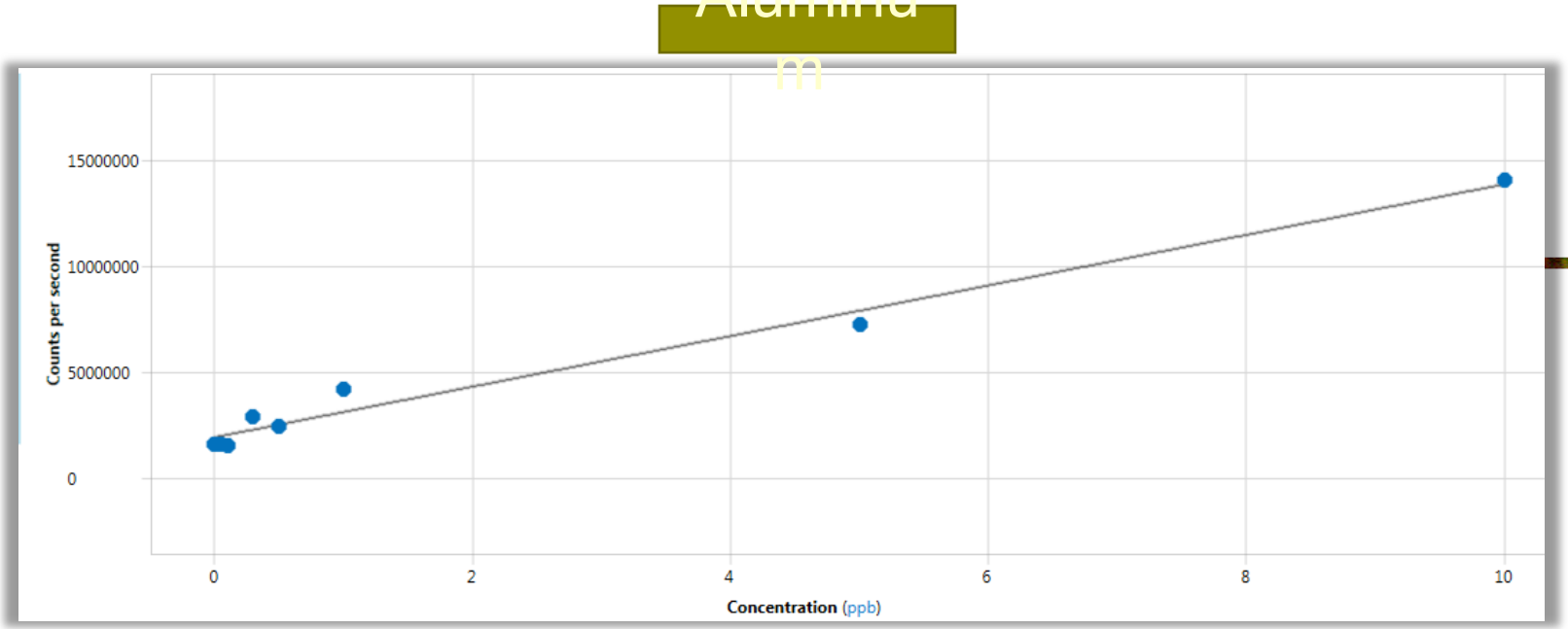
In common:
Aerosol Sample Introduction.
(Droplets)

Inductively Coupled Plasma



Detection Limits

The detection limit (LOD) is the smallest quantity of analyte of which it can be said, with a given level of confidence, that it is present in the sample.

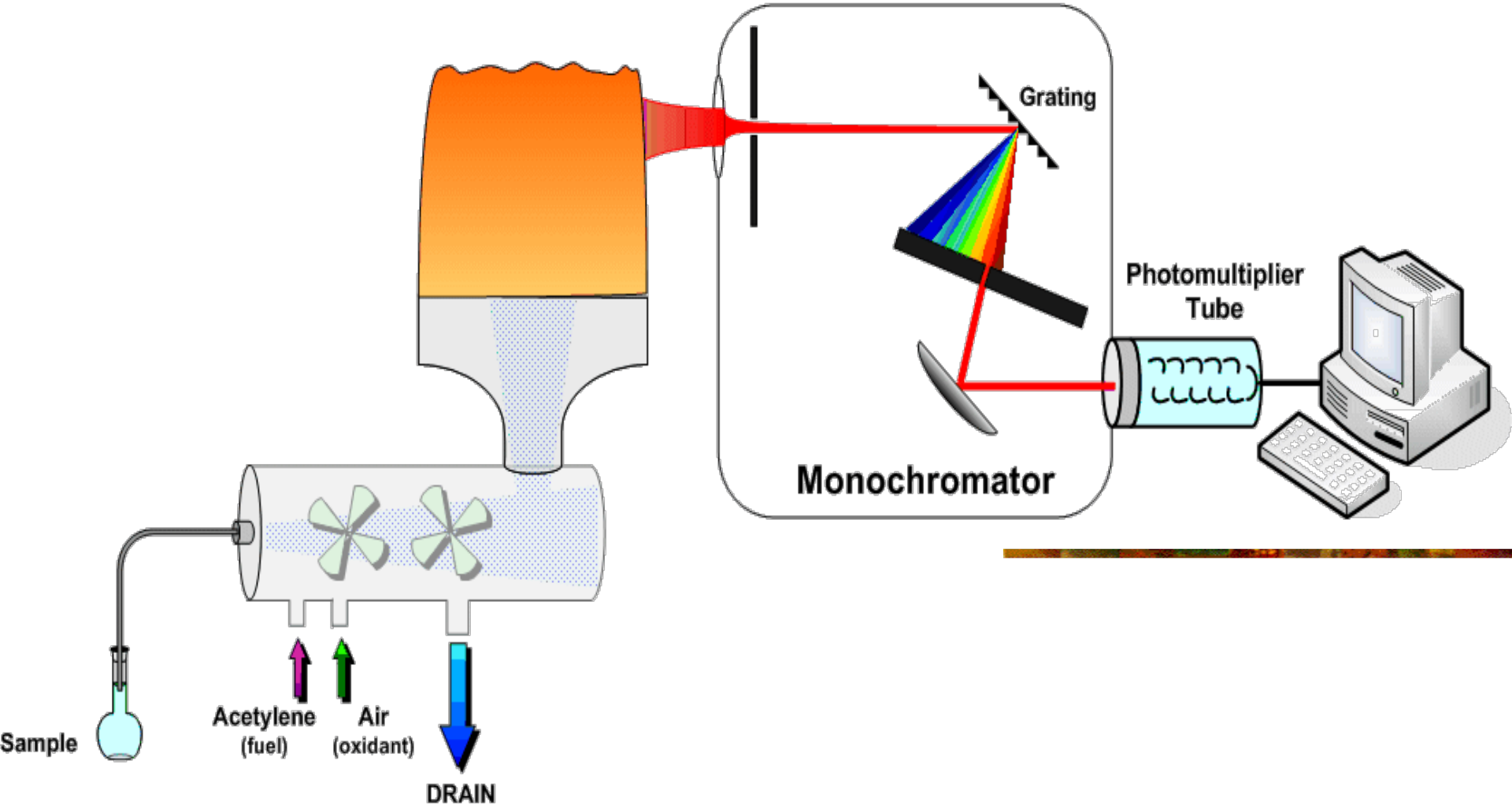


Drinking Water Standards by Constituent

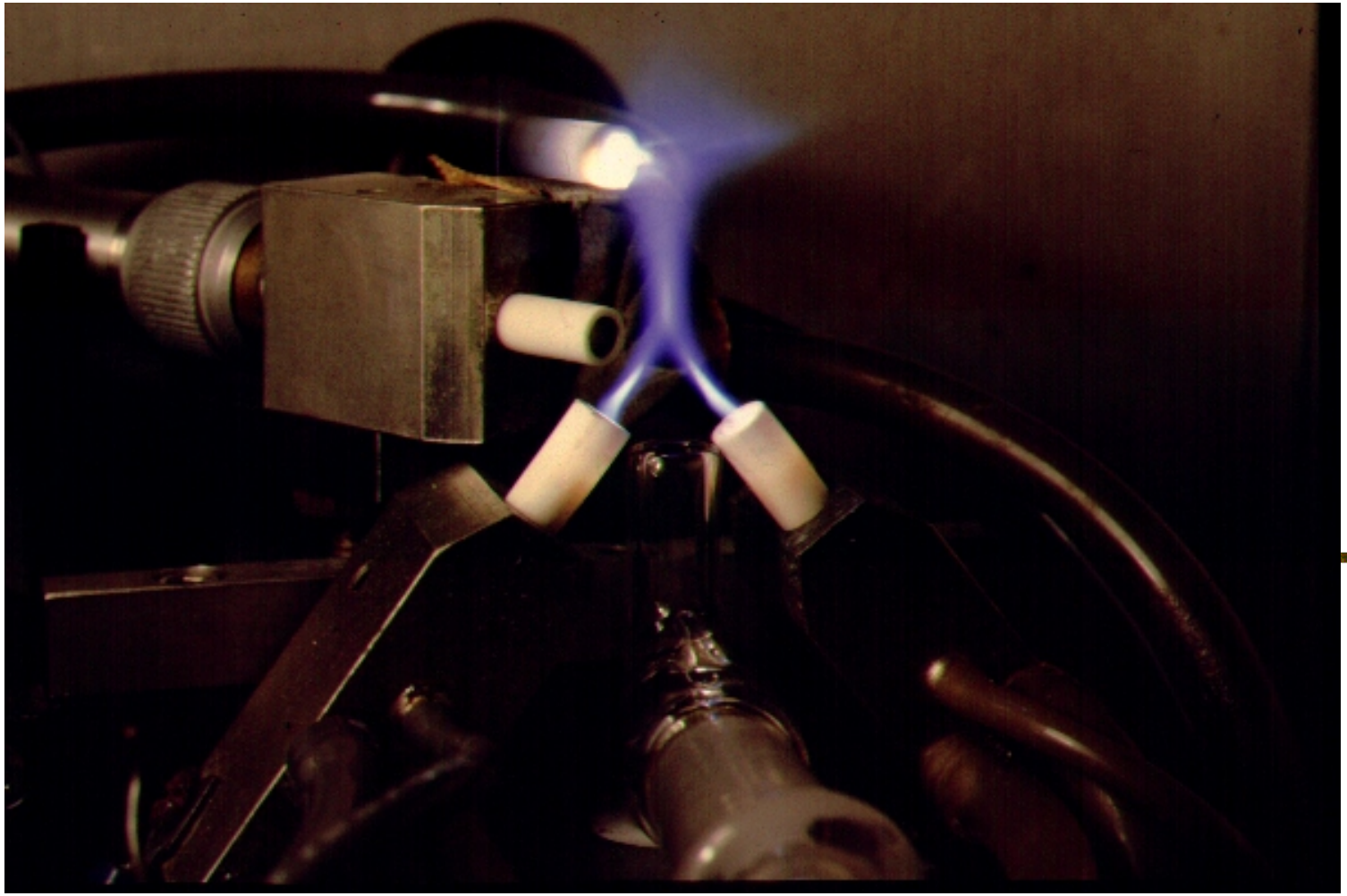
constituents name	casrn	standard µ g/l or ppb (unless otherwise specified)	type	comment
Aluminum	7429-90-5	200	Secondary	FEDERAL MCL - Recommended upper limit
Antimony (Total)	7440-36-0	6	Primary	FEDERAL MCL
Arsenic (Total)	7440-38-2	5	Primary	STATE MCL
Asbestos	1332-21-4	$7x10^6$ fibers/l >10 um	Primary	FEDERAL MCL
Atrazine	1912-24-9	3	Primary	FEDERAL MCL
Barium	7440-39-3	2000	Primary	FEDERAL MCL
Benzene	71-43-2	1	Primary	STATE MCL
Benzo(a)pyrene(BaP)	50-32-8	0.2	Primary	FEDERAL MCL
Beryllium	7440-41-7	4	Primary	FEDERAL MCL
BHC (gamma-HCH/Lindane)	58-89-9	0.2	Primary	FEDERAL MCL
Bis(2-ethylhexyl) phthalate (DEHP)	117-81-7	6	Primary	FEDERAL MCL
Bromate	15541-45-4	10	Primary	FEDERAL MCL
Bromoacetic Acid	79-08-3	See Haloacetic Acids	Primary	FEDERAL MCL
Bromodichloromethane(Dichlorobromomethane)	75-27-4	See Trihalomethanes	Primary	FEDERAL MCL
Bromoform	75-25-2	See Trihalomethanes	Primary	FEDERAL MCL
Cadmium	7440-43-9	5	Primary	FEDERAL MCL

MCL – Maximum Concentration Limit
Primary – Regulated for Health
Secondary – Regulated for Aesthetics (color, smell, taste etc)

Atomic Emission Spectroscopy



Direct Current Plasma



RUTGERS
Robert Wood Johnson Medical School

THE BOGGS CENTER ON DEVELOPMENTAL DISABILITIES
New Jersey's University Center for Excellence in Developmental Disabilities Education, Research, and Service

The Effect of Lead Poisoning on Children's Development

Eagleton Science & Politics Workshop

Communicating Risk Regarding Science and Health: Lead Toxicity and Public Policy

Deborah M. Spitalnik, PhD
Professor of Pediatrics, RWJMS
Executive Director, The Boggs Center

April 18, 2018

A Cascade of Disparities

Lead is a Neurotoxin

- Prenatal & Postnatal Exposure
- The Nature of Development
- Neuropsychological Effects
- School Performance
- Life Long Consequences- Adverse life outcomes

Intervention and Treatment

- Medical intervention only for VERY High Lead Levels
- Prevention is the Best Treatment
- Educating & Supporting Families
- Health and Developmental Screening & Monitoring
- Education: Evaluation & Interventions
- Community Support

Public Policy~ Lead ~Children's Health

- Importance of Evidence:
  - Basic Science, Clinical Data, Surveillance & Epidemiology
- Accountability in Educational Outcomes: ESSA
- The Social Determinants of Health and Access to Care
- Medicaid as a Public Health Program
- Views on the Role & Responsibilities of Government

Risk Perception and Audience Approaches

William K. Hallman, Ph.D.
Professor /Chair
Department of Human Ecology
School of Environmental and Biological Sciences

RUTGERS

What are you trying to Accomplish?

Establishing Your Goals

Overall Goal of Risk Communication:

- Help people respond appropriately to risks.
  - What people?
    - With whom should we be communicating?
      - Who needs to know about the risk?
  - What risk?
    - Which risks are worth considering?
  - What is the appropriate response?
    - Who decides?
    - On what basis?
  - Who has the authority, means, and responsibility to act?
    - What are the ethical implications of warning people about a risk without also giving them the means to address it?

U.S. National Research Council

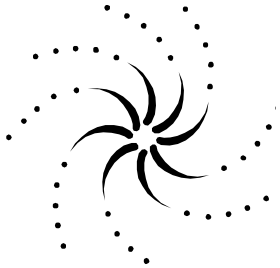
- 3 common objectives for risk communication:
  - Education
  - Advocacy/Persuasion
  - Fostering Partnerships for Decision Making

Improving Risk Communication (1989), National Academy Press

Key Assumptions:

- For each goal, the assumed roles of the communicator and audience differ
  - Who has information worth sharing?
  - Who should be part of the process of deciding?
- Trouble comes when the answers to these questions are not shared between the communicator and audience

Key Mistake: Not making it clear why you are communicating



- Are you
  - providing information?
  - collecting information or insights?
  - trying to persuade?
- Make sure people know your purpose for communicating

Education ≠ Action

How do People think about Risk?

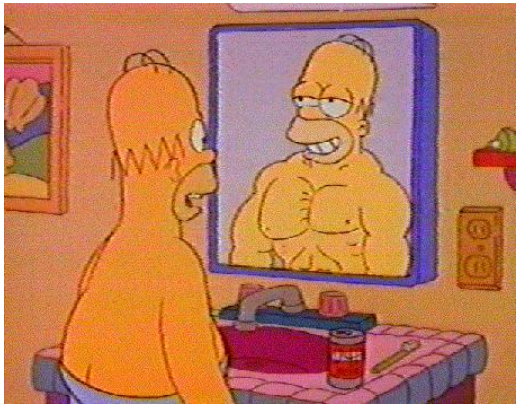
Understanding Risk Perception

Risk Perception

- To effectively communicate about risk, you need to understand how people *perceive* risk.

Perception

- Perception is reality
  - People act or fail to act based on their perceptions
  - People will incorporate new information that is consistent with their perceptions
  - People tend to reject new information that is inconsistent with their beliefs



Two Components of Public Risk Perception

- Cognitive components – thoughts
  - Understanding of the likelihood/consequences of the hazard
  - Mental models of how/why the particular hazard poses a threat
  - Understanding of the contexts surrounding the hazard

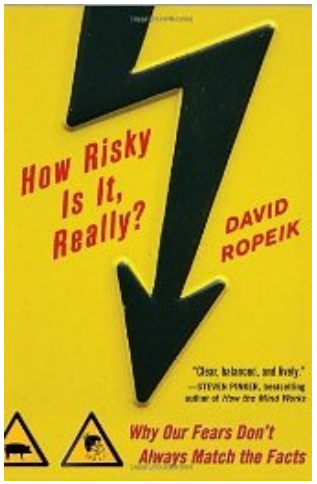
- Affective components – feelings
  - Not just Dread or Outrage
    - Fear
    - Worry
    - Frustration
    - Sadness
    - Anger
    - Disgust
    - Protectiveness
    - Others. . .

Risk Perception

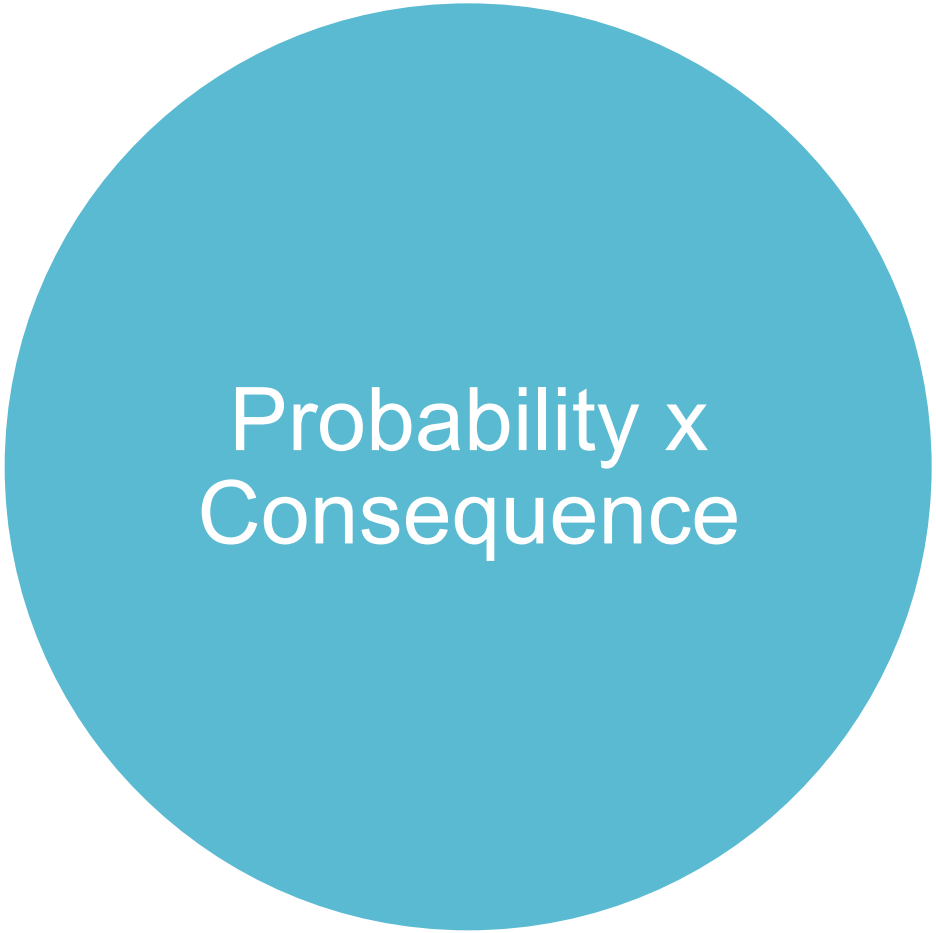
- “Risk perception is a mix of facts and feelings, intellect and instinct, reason and gut reaction. And in many cases, the feelings/instinct/gut have the greater influence.”

  - David Ropeik

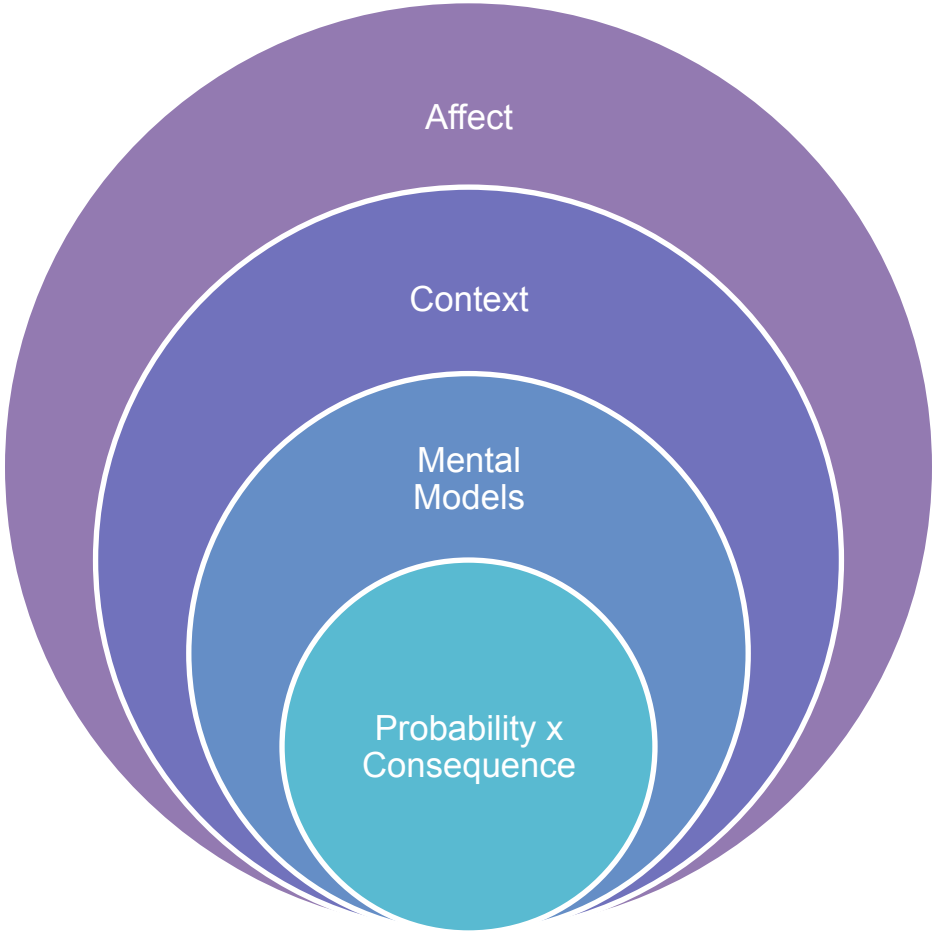
Risk communication must address each of these influences



Professional Assessment of Risk



Public Conceptions of Risk



Mental Models

How Do People Think Lead Affects Them?

Mental Models

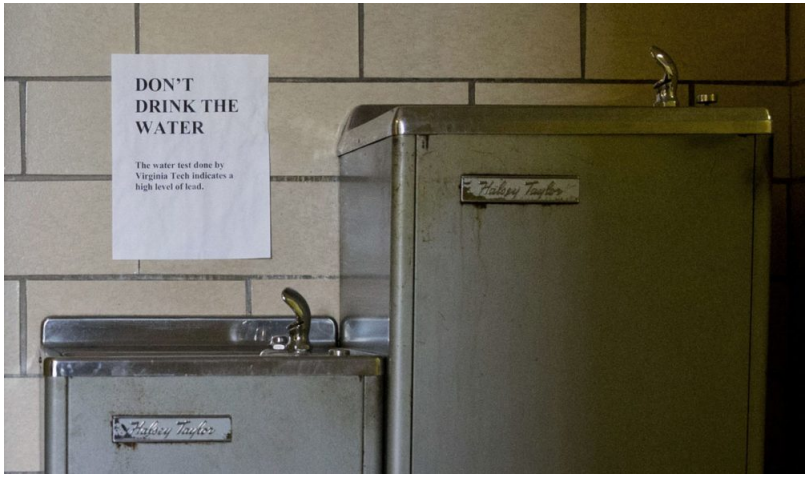
- What comes to mind when people think about the problem of lead poisoning?
- Who do people believe are affected?
- What are the sources of lead with which people are familiar?
- What sources are problematic with which people are unfamiliar?
- What do people think is necessary/adequate to address their risks?

Key Contextual Factors

Understanding the Importance of Context

Key “Contextual Factors”

- Voluntariness
- Control
- Perceptibility of Exposure



Key “Contextual Factors”

- The ability to blame someone

Key “Contextual Factors”

- Familiarity

Key “Contextual Factors”

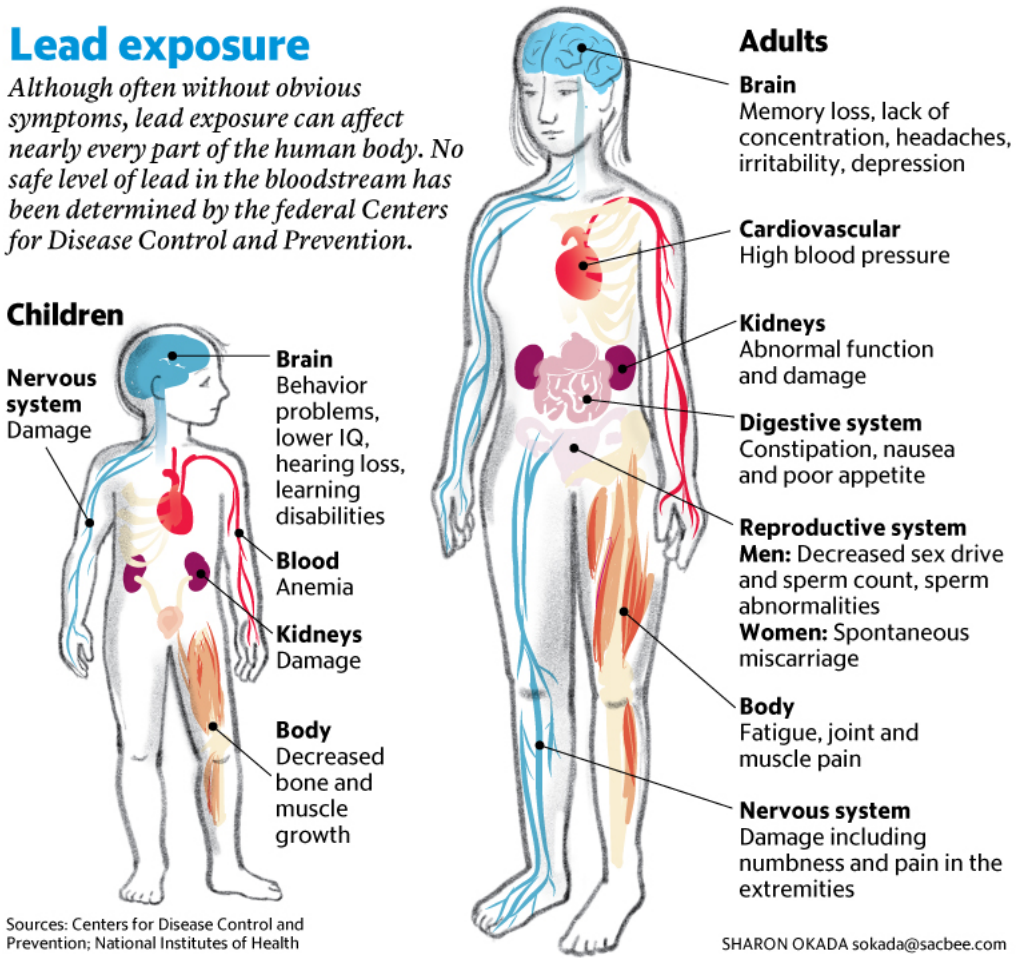
- Natural or Industrial?
- Purposeful or accidental?

Key “Contextual Factors”

- Can empathize with victims
- Risk to Future Generations

More “Contextual Factors”

- Dreadfulness of the Consequences
- Immediate consequences
- Irreversible consequences



More “Contextual Factors”

- Memorable
- Catastrophic
- Ability to imagine the consequences

More “Contextual factors”

- Equitable distribution of risks
- Moral dimensions

More “Contextual factors”

- Known to experts
- The possibility of alternatives

More “Contextual Factors”

- Trustworthy sources
- Responsive process

Understanding your audience

- There is no such thing as “the public”
- People differ in terms of their:
  - interest in your message
  - experience and education
  - responsibilities / ability to respond
  - needs and concerns
  - cultural background

Reaching your audiences

- You must tailor messages and channels to meet the needs of your audiences
  - Marketing professionals refer to this as “market segmentation”
- To do this, you must get to know your audiences

Who should be part of your audience?

- Consider the need to communicate with people who:
  - would be affected
  - are likely to *perceive* that they will be affected

Consider including people who:

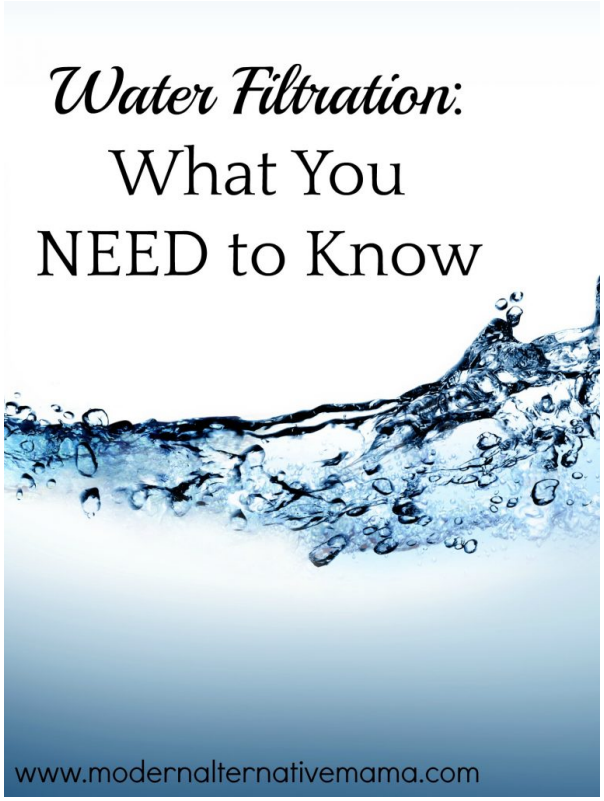
- are already involved in issues related to health, safety, or the environment
- would feel insulted, angry, or ignored if you did not communicate with them
- have useful information, ideas or insights
- are in official or unofficial positions of leadership, responsibility, or authority

What Do You Want to Say?

Constructing your messages

Key Mistake: Focusing only on what people “need to know”

- Begin your communications with answers to what people *want* to know
- Once people have their questions answered, they are more likely to listen to additional information



What Do People Want to Know?

- What happened?
  - When?
  - Where?
  - How?
- Who is affected?
  - Am I affected?
  - How will I know?
- How long will the threat last?
  - How will I know when it is over?
- What are the consequences?
  - Immediate
  - Long-term
- Can I do anything about it?
  - Do I know what to do?
  - Do I have what I need?
  - Can I do it by myself?
- Who caused the problem?
  - How?
  - Why?
  - Could it have been prevented?
- Who will solve the problem?
  - What can be done?
  - How long will it take?
  - How effective will the solution be?
  - Who will pay for it?
- How will we know that the problem has been solved?
  - Can I trust that it has been solved?
- What will be done to make sure the problem does not happen again?

Finding Ways to Deliver Your Messages

Choosing the right channel

Communication in only in English is Inadequate

- Most communications to consumers including about threats to health are issued in English, yet:
  - More than 175 languages are spoken in the United States
  - At least 30 others are spoken by large groups of Americans
  - Nearly 1 in 5 (18%) speaks a language other than English at home
  - Spanish is most common secondary language

Written Notices not Enough

- US Department of Education estimates that:
  - More than 30 million adults (14% of the adult population) have "no more than the most *simple* and *concrete* literacy skills"
  - An additional 63 million adults (29% of the adult population) can perform only simple, everyday literacy activities
- Bottom Line:
  - Complex written information is incomprehensible to many

One-Way Versus Two Way Communication

- Can you effectively meet the needs of your audience through one-way communication?
  - A brochure, fact sheet, or other written information piece
  - A Public Service Announcement (PSA)?
  - A YouTube video
  - An editorial
  - A blog posting
- Does the issue that demands communication require interaction with your audience?
  - A meeting
  - A press conference
  - An interview

Selecting the right channel for your message

- How complicated is the issue about which you need to communicate?
  - In general, the more
    - Complicated the issue
    - Controversial the topic
    - The risk impacts people

  The more interaction (two-way communication) that is required.

Selecting the right channel for your message

- What are the channel preferences of your audiences?
  - In what languages do they communicate?
  - What newspapers or magazines do they read?
  - To what radio stations do they tune in?
  - What TV programs do they watch?
  - To what cable TV networks do they subscribe?
  - In what social networks do they participate?
  - What blogs do they read?

Selecting the right channel for your message

- How likely is it that people seeking information will find your message?
- How likely is it that people *not* seeking information but who need to hear it will find your message?

- What are the lives of your audiences your like?
  - Where do they shop?
  - Where do they go to school?
  - Where do they receive health care?
  - What outdoor, public transit, or other advertising media are they likely to see?

Who Will Communicate?

- The particular audience for whom the message is intended also matters in selecting the right communicator
  - Is the audience the public at large?
    - A group of residents?
    - A group of landlords?
    - A group of parents whose children have already been affected?
    - A group of teachers, PTA, or school administrators?
    - Legislators or public officials?
    - People in the local water utility? Local contractors?
    - A group of journalists, or doctors, or lawyers, or . . .
  - Is English the most appropriate language in which to communicate?

For More Information:

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Promoting Evidence-Informed Policies: A Strategic Communication Approach

Itzhak Yanovitzky, Ph.D.

RUTGERS
School of Communication and Information

EPIK
epik.rutgers.edu

William T. Grant FOUNDATION

Presentation Roadmap

1

The Science-Policy Chasm

- The science perspective
- The policy perspective
- The communication perspective

2

Strategic Communication

- Downstream applications
- Midstream applications
- Upstream applications

3

Planning Process & Tools

- Audience analysis
- Message design
- Dissemination plan

The Science Perspective on Evidence Use

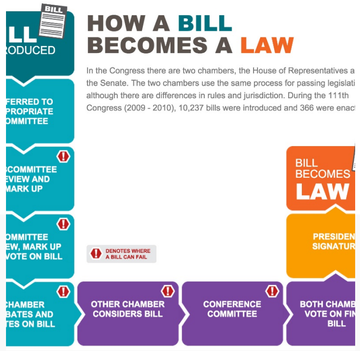
TWO COMMUNITIES

ACCESSIBILITY

RELEVANCE & TIMING

ALTERNATIVE FACTS

The Policy Perspective on Evidence Use



PROCESS-DEPENDENT

CONTEXT-DEPENDENT

STRATEGIC

RELATIONSHIP-BASED

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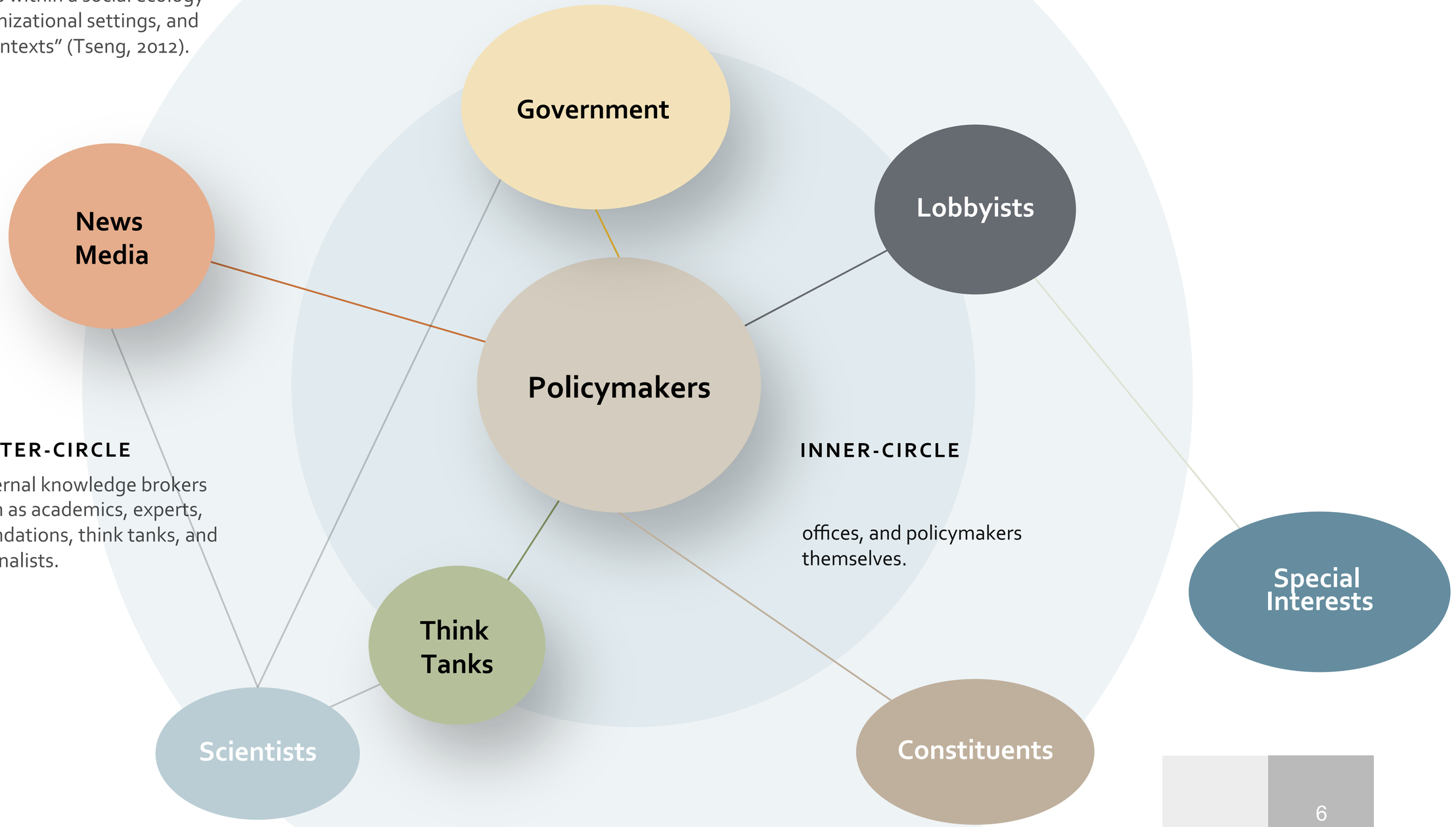
Tseng, V. (2012). The uses of research in policy and practice. Washington, DC: Society for Research in Child Development.

The Social Ecology of Research Use

"Research use unfolds within a social ecology of relationships, organizational settings, and political and policy contexts" (Tseng, 2012).

Policy Ecosystems



OUTER-CIRCLE

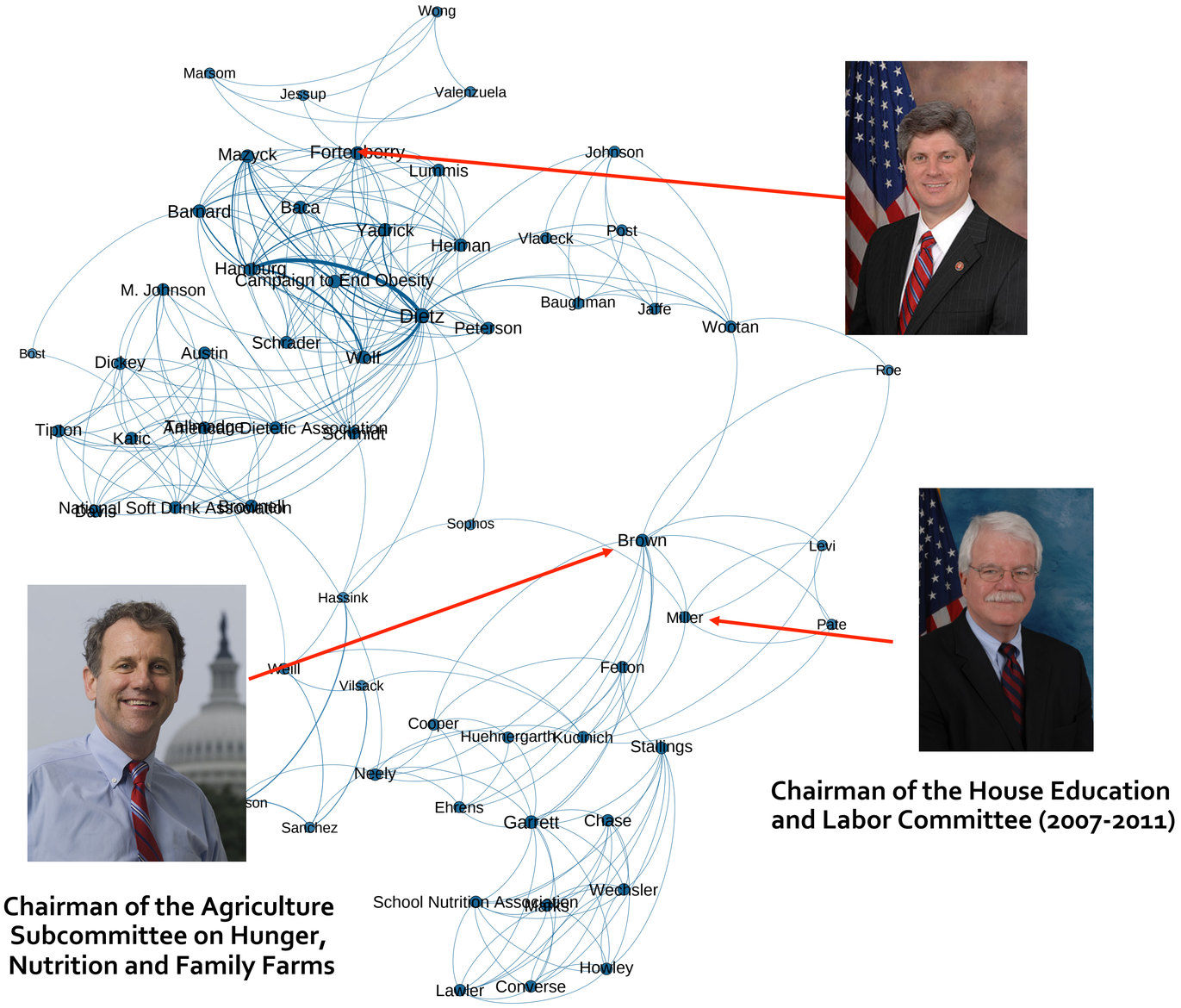
External knowledge brokers such as academics, experts, foundations, think tanks, and journalists.

INNER-CIRCLE

offices, and policymakers themselves.

Knowledge Brokers

107th – 113th Sessions
Research Evidence Introduced



Chairman of the Agriculture Subcommittee on Hunger, Nutrition and Family Farms

Chairman of the House Education and Labor Committee (2007-2011)

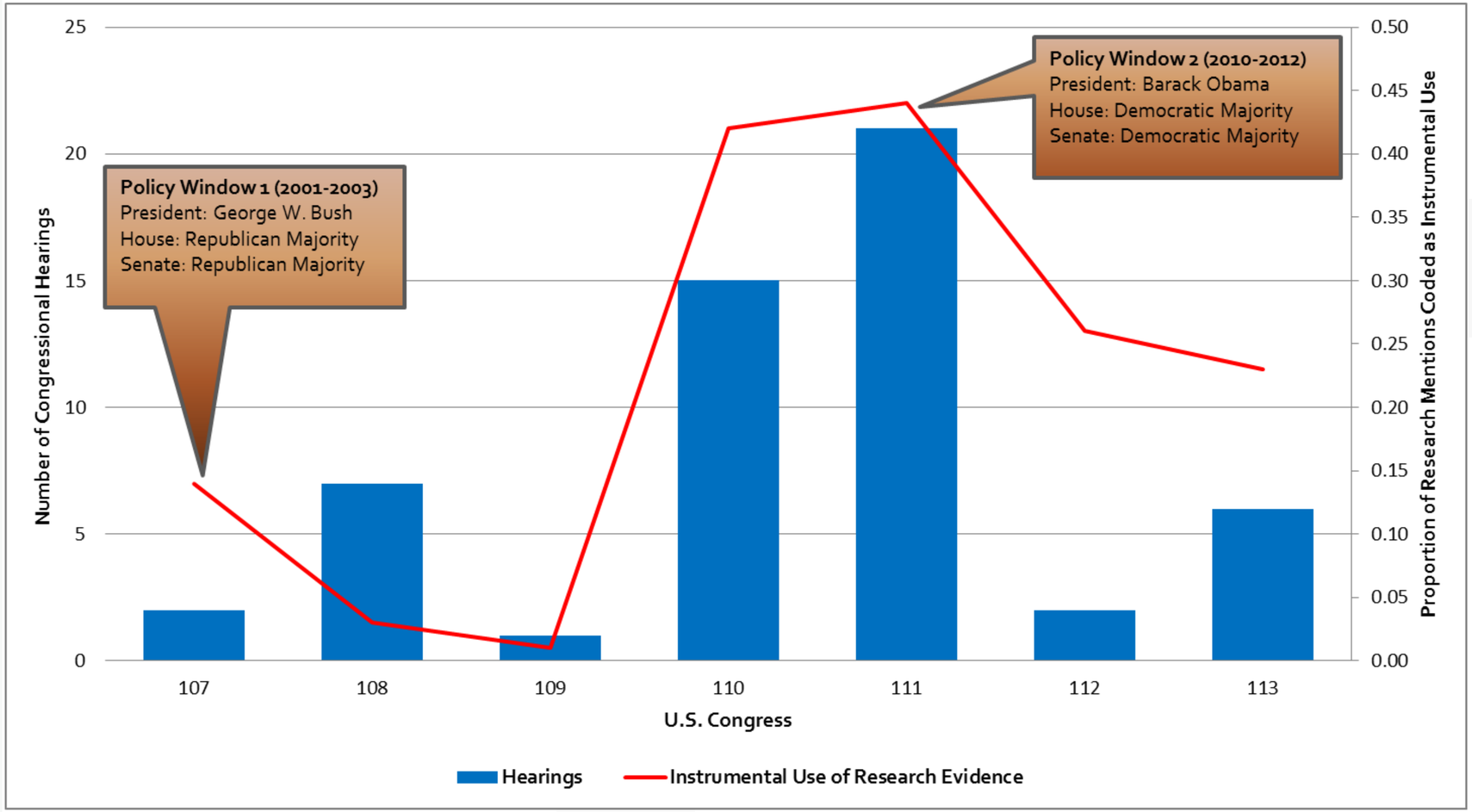
- In this network, two actors are connected if they introduced the same piece of research evidence during congressional hearings. Brokers identify or introduce key pieces of research evidence that others also view as critically important to a particular policy debate

- The knowledge brokers in this network may be individuals such as Rep. Jeff Fortenberry (Republican, Nebraska) or organizations (e.g., *Campaign to End Obesity* and *School Nutrition Association*).

- Some knowledge brokers are active within a specific group or cluster (e.g., Fortenberry), whereas others broker knowledge across groups or clusters (e.g., George Miller, D-California and Sherrod Brown D-Ohio).

TIMING OF RESEARCH EVIDENCE USE

Instrumental use of research evidence in U.S. Congressional hearings on the topic of childhood obesity, 2000-2014



Strategic Communication Principles

AUDIENCE-CENTERED

Match strategy to the unique characteristics and circumstances of the target audience.

ENGAGEMENT-FOCUSED

Focus is on getting target audience involved.

ACTION-ORIENTED

Goal is to promote action (individual, social, or institutional)

RELATIONSHIP-BASED

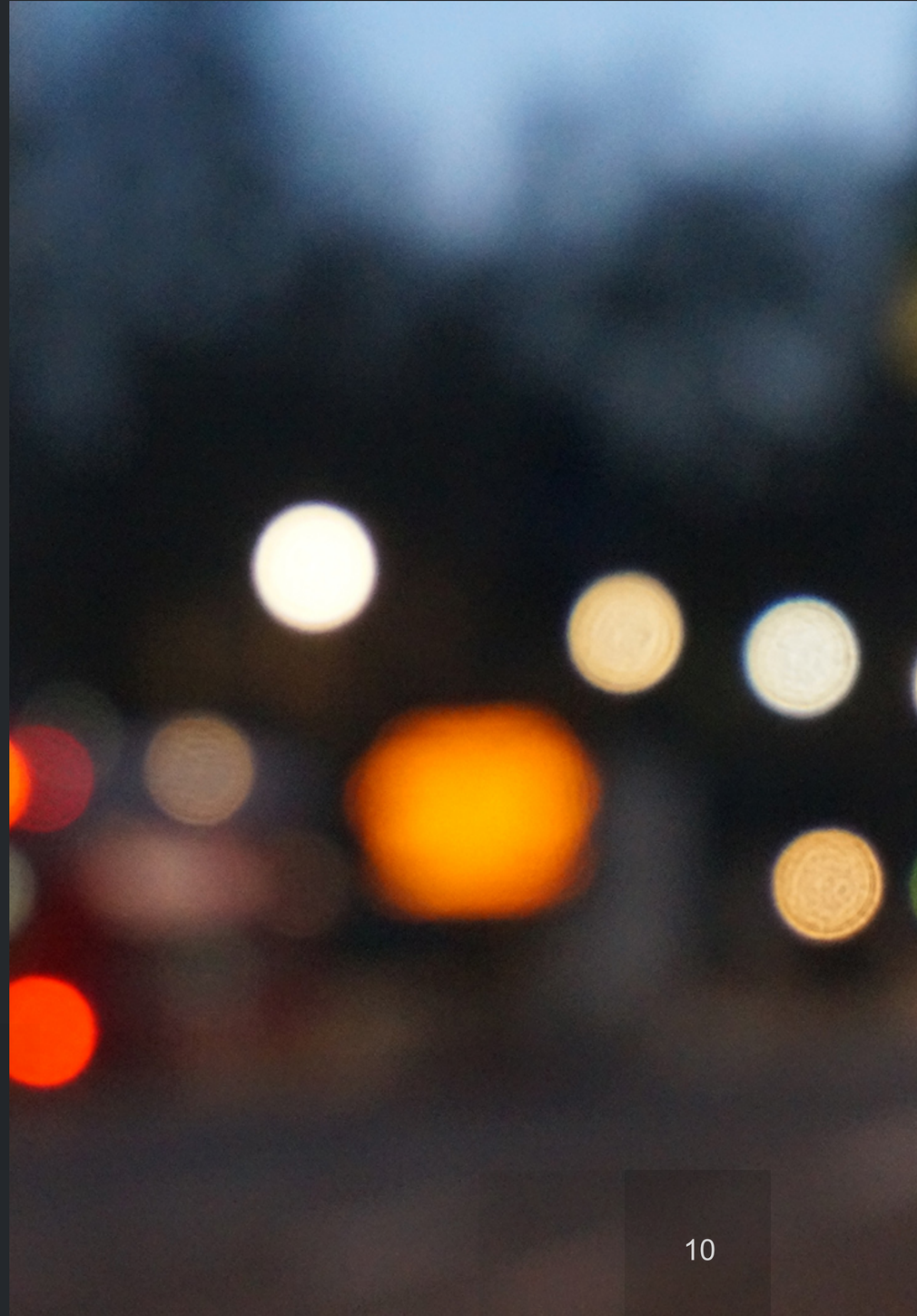
Sustainable and consistent outcomes are a function of building or leveraging relationships with target audience.

Downstream Strategies

- Individual-focused.
- Approach: inform, remind, influence.
- Intended outcomes: awareness, knowledge, beliefs, attitudes, perceptions.

Communication Strategies:

- Education
- Risk communication
- Persuasion
- Social norms messaging
- Alerts and reminders

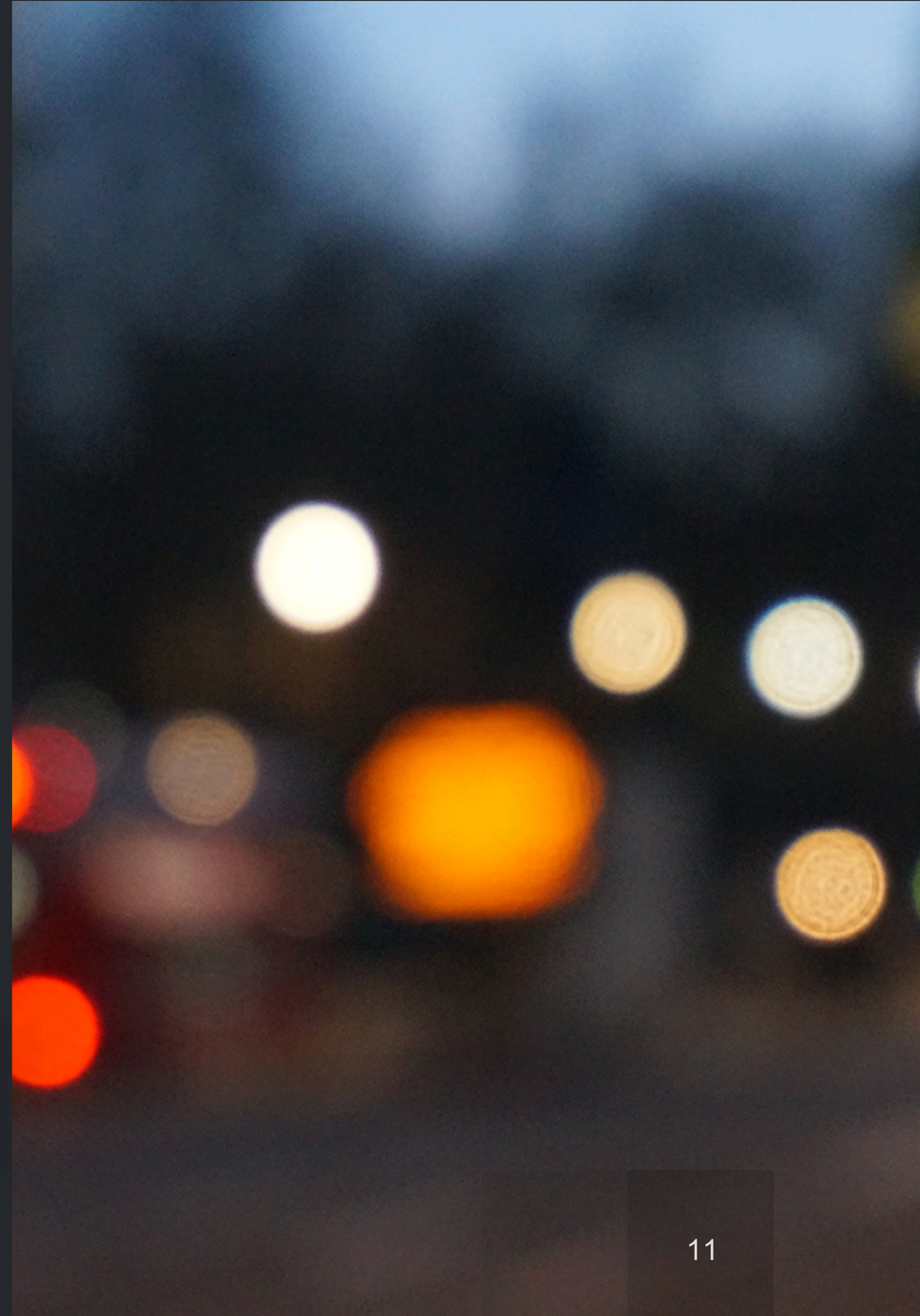


Midstream Strategies

- Influential or enabler-focused.
- Approach: engage, influence, activate, pressure (influentials).
- Intended outcomes: educate, influence, regulate, support, or enable target audience.

Communication Strategies:

- Education
- Persuasion
- Linkage / referral
- Diffusion
- Mobilization

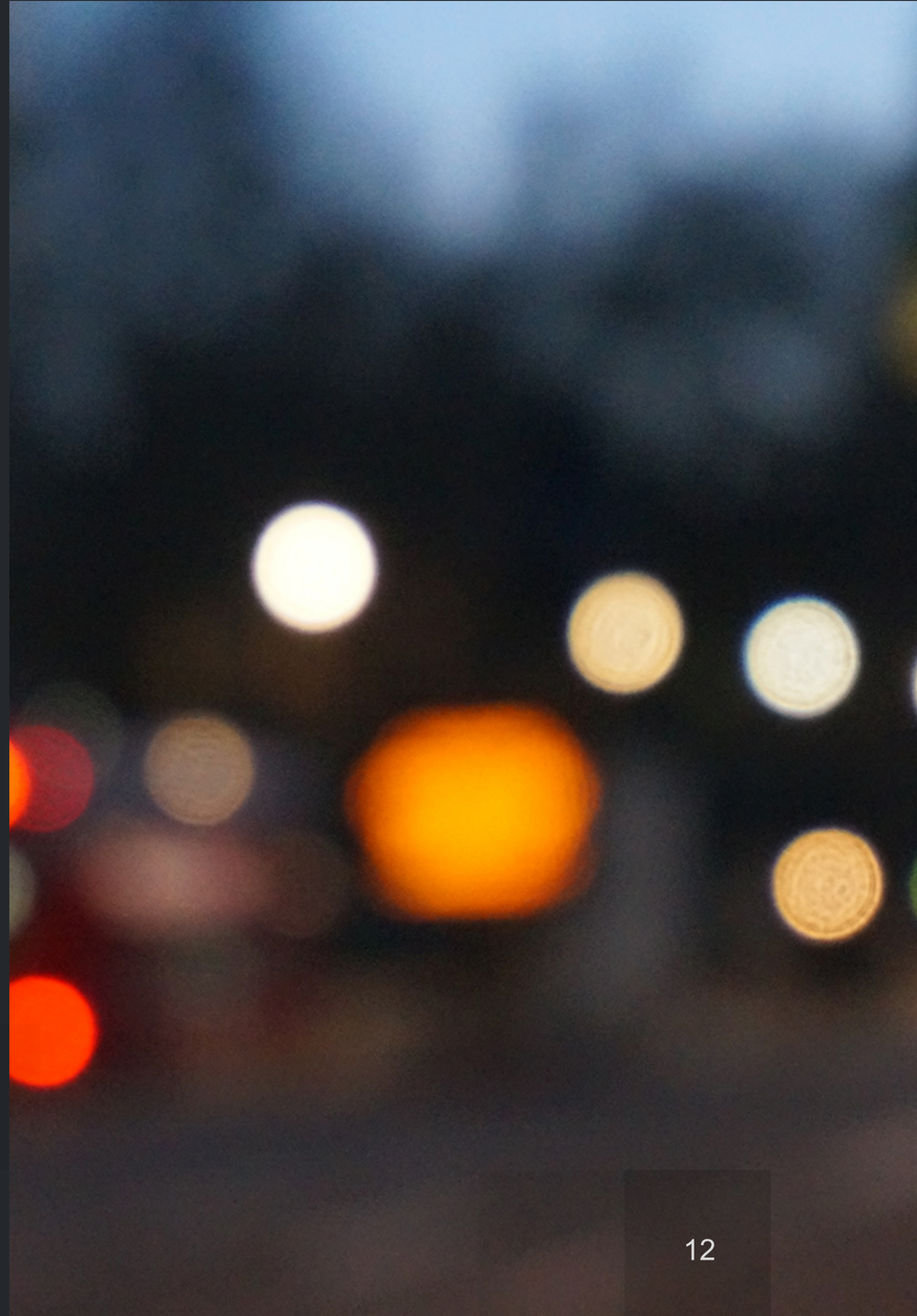


Upstream Strategies

- Focused on the environment (barriers / facilitators to action).
- Approach: lobbying, advocacy, social and political mobilization.
- Intended outcomes: policymaking (laws, regulations), enforcement, incentives, social norms.

Communication Strategies:

- Campaigns
- Issue advocacy
- Media advocacy
- Social marketing



Planning Process

Problem Analysis

Determine who needs to do what, where, and when to impact the problem.

Audience and Behavioral Analysis

Generate insights about your target audience – their needs, aspirations, values, interests, habits, etc. as they relate to the action you chose to promote – that can inform the choice of communication strategy (including segmentation and tailoring).

Message Design and Testing

Design and pretest core themes, messages, and delivery features that has the greatest potential to engage your target audience in action.

Dissemination

Example

Goal: Influence state legislators to offer low-income families subsidized supply of fresh fruits and vegetables.

Objectives:

- Determine legislators' position on this issue and the factors associated with that position.
- Identify gaps in legislators' existing knowledge, ability, and/or motivation to support this initiative.
- Formulate a communication strategy to close this gap.

Audience Analysis

What do we know about state legislators' position regarding subsidized supply of fresh fruits and vegetables for low-income families?

- A recent survey by the center for state health policy found that legislators are aware of the nutritional and health benefits of children's FV consumption and recognize this is a problem for this population.

- Almost all have previously supported legislative initiatives that are designed to help low-income families (e.g., access to health insurance, affordable child services, playgrounds).

Audience Analysis

What are the gaps in knowledge/ability/motivation that will need to be addressed to secure state legislators' support?

- The same survey found that a majority of state legislators believe that the needs of low-income families are met through SNAP, and there is no need in additional subsidies – the problem is with parents using food stamps to buy unhealthy foods .

- Legislators representing more affluent communities in the state were significantly more likely place the blame on low-income parents and therefore be less supportive of this proposal.

Audience Analysis

What should be the focus of the communication strategy?

- Educate state legislators about the objective barriers that challenge low-income parents who wish make FV available to their children (access, cost, competing demands, etc.)

- Tell them about the benefits – to low-income families, to their political career, and to important constituent groups – that they can expect if they support this legislation.

- Emphasize that they have moral responsibility to help and that others expect them to do the right thing.

Communication Strategy

Core message targeting attitude change: "SNAP is not enough"

- A recent study by the University of Kentucky Center for Poverty Research found that a substantial fraction of SNAP-eligible households (more than 60%) must spend an amount that is greater than what they get from the program to feed their kids, and that large families spend less on food to be able to pay for other basic needs.

- Findings from the most recent National Household Food Acquisition and Purchase Survey show Lack of access to food retailers that sell a wide range of healthy and affordable foods.

Communication Strategy

Core message targeting attitude change: "There is an opportunity here for political gain"

- SNAP is already connected with local farmers market. You can mandate by law that the additional FV subsidy may only be spent to purchase fresh produce and dairy products in farmers markets. We can bring farmers markets to low-income communities.

- This will also help our local farmers. The subsidy will go directly to benefit them and sustain farming on the state.

Communication Strategy

Core message targeting responsibility: "We must and can do better to enable low-income families and children be healthy"

- CDC's morbidity and mortality data ranks NJ lower than most states on key health and wellness indicators among low-income families and children. We simply cannot have that.

- This population disproportionally burden our health care system, which is costing us a fortune in Medicaid payments; prevention is much cheaper and has high return on investment; there is scientific consensus that healthy diet is critical for preventing chronic diseases in low-income children and adults.

Communication Strategy

Message "packaging"

- Logical appeal (use credible evidence to support claims).
- Use gain (opportunity) rather than loss (threat) frame.
- Use statistics (perceived to be more authoritative and persuasive evidence than stories)

Messenger (Whom do legislators perceive as credible on this issue?)

- Experts (particularly those they have established relationships with)
- NJDA officials
- Other legislators
- Important constituent group (e.g., farmers).

Thank you!

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