MEETING MATERIALS

3rd Annual Region 7
Radon Stakeholders' Meeting

March 4, 2009
Overland Park, KS
Doubletree Hotel

Third Annual REGION 7 RADON STAKEHOLDERS' MEETING




March 4, 2009 Doubletree Hotel Overland Park, Kansas

You are invited to the Third Annual Region 7 EPA/State Radon Stakeholders' Meeting. This meeting is being held **at no cost** for all those who have a stake in protecting the public from unnecessary exposure to radon in their homes, schools and businesses.

EPA Region 7 and its partners, Iowa Department of Public Health, Kansas Department of Health and Environment, Missouri Department of Health and Senior Services, Nebraska Department of Health and Human Services, and AARST seek to bring interested stakeholders together to discuss common issues and understand them from other perspectives, provide insight into the future, share, educate and network.

We believe that meetings such as this will better provide all of us with ways to assist the public and reduce radon exposures. We hope to see you in Overland Park, Kansas, on March 4, 2009.

Meeting Registration: There is no cost and registration is not required, but ***space is limited***. For planning purposes, we ask that you send an e-mail to james.linda@epa.gov indicating your attendance. Please put "Region 7 Radon Meeting" in the subject line. We can guarantee you a space **only** if you e-mail confirmation of attendance. Dress is casual.

★ This meeting has been approved for NEHA, NRSB, Nebraska, & Iowa continuing education credits.

Hotel Reservations:

Doubletree Hotel
10100 College Boulevard
Overland Park, KS 66210

For reservations, call toll-free at 800-445-8667 or the hotel directly at 913-451-6100. Please refer to the "Radon Stakeholders Meeting" to get the group rate of $85 per night plus 16.25% tax**.** We have 40 rooms held for this event.

Meeting Agenda

7:30 – 8:30	**Registration**	
	SESSION	**SPEAKER**
8:30 – 8:45	Welcome & Announcements	KDHE, AARST & EPA
8:45 – 9:05	Radon Mitigation System Moisture Study	Jack Hughes Radon Training Center
9:05 – 9:50	AARST Update/Heartland Chapter	Bill Angell President, AARST
9:50 – 10:20	**Break** (in vendor area, sponsored by AARST)	
10:20 – 10:40	EPA Update	Bill Long EPA
10:40 – 11:40	Houses From Heck	Panel from each state
11:40 – 1:00	**Lunch – on your own**	
	SESSION	**SPEAKER**
1:00 – 2:00	Condition of our Nation - Radon	Dr. Bill Field University of Iowa
2:00 – 2:30	State Breakout Sessions	State Radon Programs
2:30 – 3:00	**Break** (in vendor area, sponsored by AARST)	
3:00 – 3:20	Regional Awards	EPA & States
3:20 – 3:50	Granite Countertops	Tom Conley KDHE
3:50 – 4:30	Question and Answer Session	All Speakers
4:30 – 4:45	Wrap-Up	EPA

2009 REGION 7 "RADON STAKEHOLDERS' MEETING" - Overland Park, Kansas - MARCH 4, 2009

Last Name	First Name	Organization	Address	Email
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3rd Annual Region 7 Radon Stakeholders' Meeting
March 4, 2009
Overland Park, Kansas

Speaker Biographies

Jack Hughes

Jack Hughes entered the radon industry in 1989 after fifteen years in the construction business. He has provided instructional and technical support for the Regional Radon Training Centers since 1993 and has been Lead Instructor for the Southern Regional Radon Training Center (SRRTC) at Auburn University since 1996. He served on the NEHA-NRPP Education Advisory Committee and is currently the Educator Representative on the AARST Standards Executive Stakeholders Committee. He has served on several AARST Standards committees and is a member of the ASTM task group revising E-2121. He has been on the NRSB Board of Directors and is now on the AARST Board of Directors. Major research projects include investigation of the effects of karst geology on radon measurement and mitigation and the effects of ASD operation on building moisture.

William J. Angell

William J. Angell is a University of Minnesota Professor of Housing in the College of Design and Director of one of four U.S. Environmental Protection Agency (EPA)-founded Regional Radon Training Centers, the Midwest Universities Radon Consortium. He chairs the World Health Organization's (WHO) International Radon Project's Prevention and Mitigation Working Group and he is President of the American Association of Radon Scientists and Technologists. He has served as Chair of the National Environmental Health Association's National Radon Proficiency Program's Educational Advisory Board. Angell has been Principal Investigator on more than 90 EPA, state, tribal, association, industry, and other sponsored projects. In addition to his University work, he has been a Visiting Scientist at two national laboratories, the EPA's Radiation and Indoor Environments National Laboratory and the Lawrence Berkeley National Laboratory. Angell has testified before the U.S. Congress concerning the scientific and technical foundation for the U.S. radon policy. He has chaired two external peer review committees that assessed EPA's radon reduction research involving houses and large buildings including schools. Angell has directed the development of EPA's radon in schools radon measurement and mitigation training programs. He has received EPA's Exceptional Service Award for his work in radon training as well as Distinguished Faculty Awards from the University of Minnesota Extension and College of Human Ecology.

Bill Long

Bill Long is the Director of the Center for Radon and Air Toxics in EPA's Indoor Environments Program in Washington, DC. He has over 15 years of experience directing national environmental programs to improve air quality at the US EPA. Bill specializes in social marketing, leadership development, and the design of campaigns that enable organizations to accelerate results.

Sara Morgan

Sara Morgan is the Indoor Air Quality Program Manager for Nebraska Department of Health and Human Services. Her programs include radon, mercury, general indoor air quality, mold, and enforcement of the NE Clean Indoor Air Act. She previously worked for Creighton University as a laboratory manager in the area of osteoporosis research. Ms. Morgan received her B.S. degree in Environmental Studies from the University of Nebraska-Lincoln, and her M.A. in Biology from the University of Nebraska at Omaha.

Bill Goebel

Bill Goebel founded MB Radon Services in 2003, installing radon mitigation systems, quoting, selling and installing systems for homeowner, homebuyers and realtors. In 1999, he started MB Remodeling, doing remodeling and repairs, both residential and commercial. Bill obtained a BA in Industrial Education and Safety from Iowa State University in 1980 and has been a member of AARST since 2005. Bill completed the Radon Mitigation and Testing Classes and passed the proficiency exams in 2002. He has been very active doing numerous radon talks, interviews and information booths at various events. Bill met with the Iowa Legislators in 2009 to work on radon laws to be submitted to committee sessions.

Gary Hodgden

Midwest Radon (a division of AAIR Professionals, Inc.)

Since 1976, Gary's family has been serving the Kansas City area with home inspection services at the company "Midwest Home". During the 1980's, Gary's expertise in mechanical systems and electronics developed into the formation of "Midwest Radon" to specialize in addressing the public desire for radon services. Since 1987, Gary and his staff have served over 22,000 Kansas City consumers with radon testing or mitigation. Since 1996, Gary has also been active in volunteer work on the national level.

- Gary sits on the AARST Technical and Science Committee with five others. He has been a member of AARST and an associate member to CRCPD since 1988.
- Gary serves on NEHA-NRPP technical and policy boards and had similarly been involved during the initial formation of NRSB.
- At the AARST Consortium on National Radon Standards, Gary currently chairs the Executive Stakeholder Committee (which now consumes his deepest contribution of time for coordination at AARST, ASTM, IEEE, ICC, ANSI and ISO).

Locally, Gary has twice served as president of the Society of Professional Property Inspectors-Kansas City. Though he served in only an advisory capacity as a board member on the Kansas Association of Real Estate Inspectors, Gary observes, "This is another example of how change gets done. The hard work of that small handful of inspectors achieved a Kansas law. Home inspectors must now comply with nationally respected standards. Due to his breadth of experience, Gary is often called upon for consultation or services for radon training centers and for EPA outreach programs.

Speaker Biographies

Dr. R. William Field

Dr. R. William Field is a Professor with joint appointments in the Department of Occupational and Environmental Health and Department of Epidemiology within the College of Public Health at the University of Iowa. He also directs the National Institutes of Occupational Safety and Health's (NIOSH) funded occupational epidemiology training program at the University of Iowa. He received his Ph.D. in Preventive Medicine and Environmental Health from the College of Medicine at the University of Iowa and prior to entering the academic ranks worked as a Health Physicist at the University of California, Berkeley. Dr. Field has received numerous honors and awards for his work including the U.S. Environmental Protection Agency's (EPA)/National Environmental Health Association's (NEHA) Individual Achievement Award for Excellence in Radon Risk Reduction, the EPA's Children's Environmental Health Recognition Award, as well as other honorary society, professional association, and university awards. In addition to serving on 4 World Health Organization working groups, Dr. Field currently chairs the radon measurement working group for the World Health Organization's International Radon Project. He is also a member of the EPA's Science Advisory Board, Radiation Advisory Committee. Previous service includes activities with the National Academy of Sciences (NAS) and numerous national and international organizations. Over the past few months, Dr. Field served as one of the 3 final reviewers for the Department of Health and Human Services' toxicological profile for radon and also presented testimony on radon research needs to the President's Cancer Panel. Dr. Field is currently overseeing several large-scale occupational cohort studies involving munitions workers and nuclear bomb assemblers as well as pooled case-control analyses examining the health effects of prolonged radon decay product exposure.

Thomas A. Conley

Thomas A. Conley, CHP graduated from Oklahoma State University with a Bachelor's degree in Radiation and Nuclear Engineering Technology. He began his career with the Illinois Department of Public Health during the transition to the Department of Nuclear Safety in the radioactive materials licensing and inspection section. Next came a 15 year stint in nuclear power at the Wolf Creek Nuclear Generating Station where at the time of his departure he was the Radiation Protection Manager. Coming full circle he returned to public service and became the X-ray and Radioactive Materials Unit Chief in the Kansas Department of Health and Environment and is currently the Chief of the Radiation and Asbestos Control Section in the Bureau of Air and Radiation. Mr. Conley is certified by the American Association of Public Managers, National Registry of Radiation Protection Technologists and the American Board of Health Physics.

GOOD MORNING
Region 7

ASD Effects on Basement Moisture
An Air Flow Perspective

Partial Report on Continuing Analyses of Data from
USEPA-sponsored Radon/Moisture Study

Gene Fisher, Project Officer

Jack R. Hughes

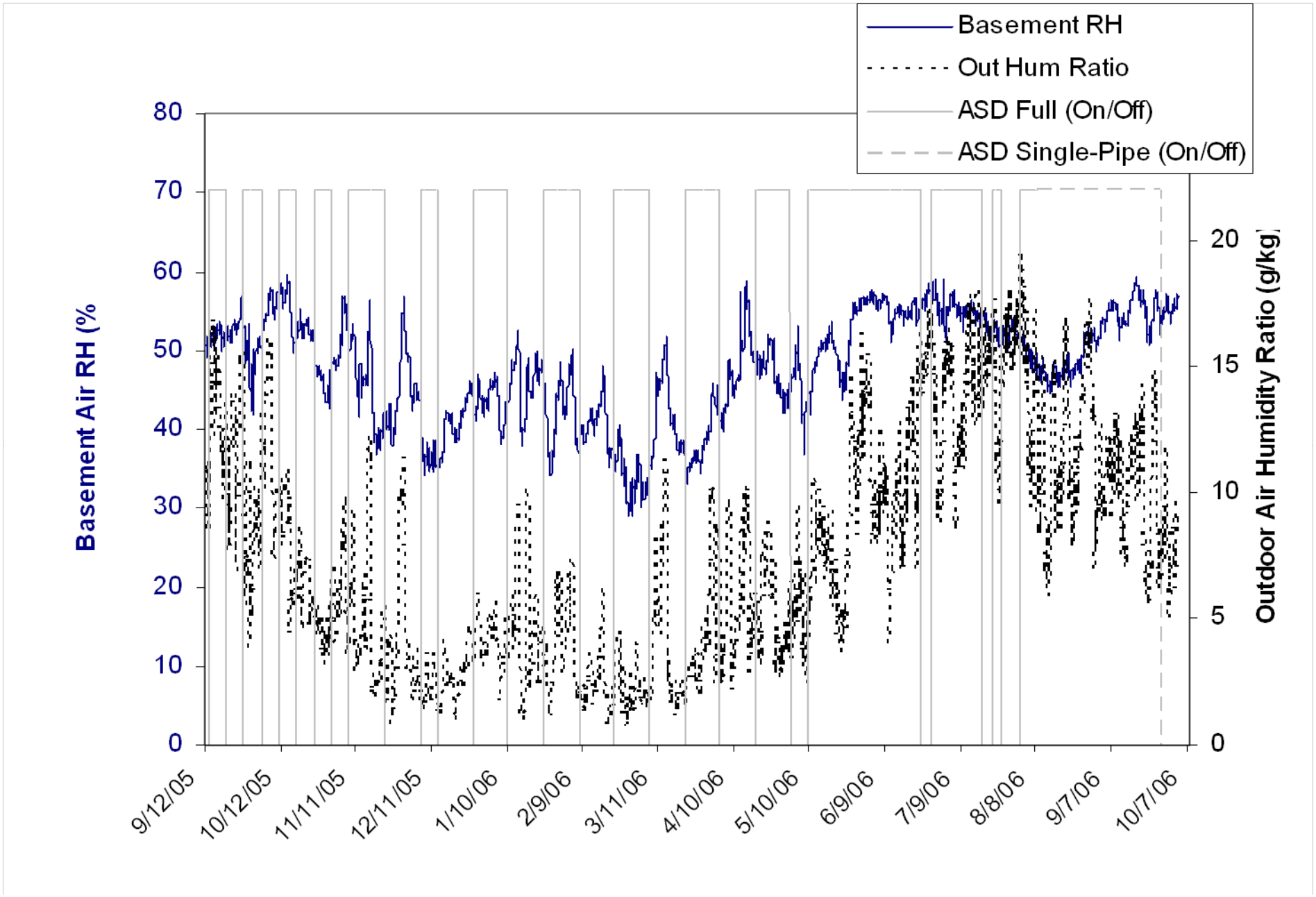
Southern Regional Radon Training Center

Brad Turk

Environmental Building Sciences, Inc

Field support by PA DEP
Mike Pyles, Bob Lewis, Matt Shields

PA01


Basement RH
Out Hum Ratio
ASD Full (On/Off)
ASD Single-Pipe (On/Off)
Basement Air RH (%
Outdoor Air Humidity Ratio (g/kg)
80
70
60
50
40
30
20
10
0
20
15
10
5
0
9/12/05
10/12/05
11/11/05
12/11/05
1/10/06
2/9/06
3/11/06
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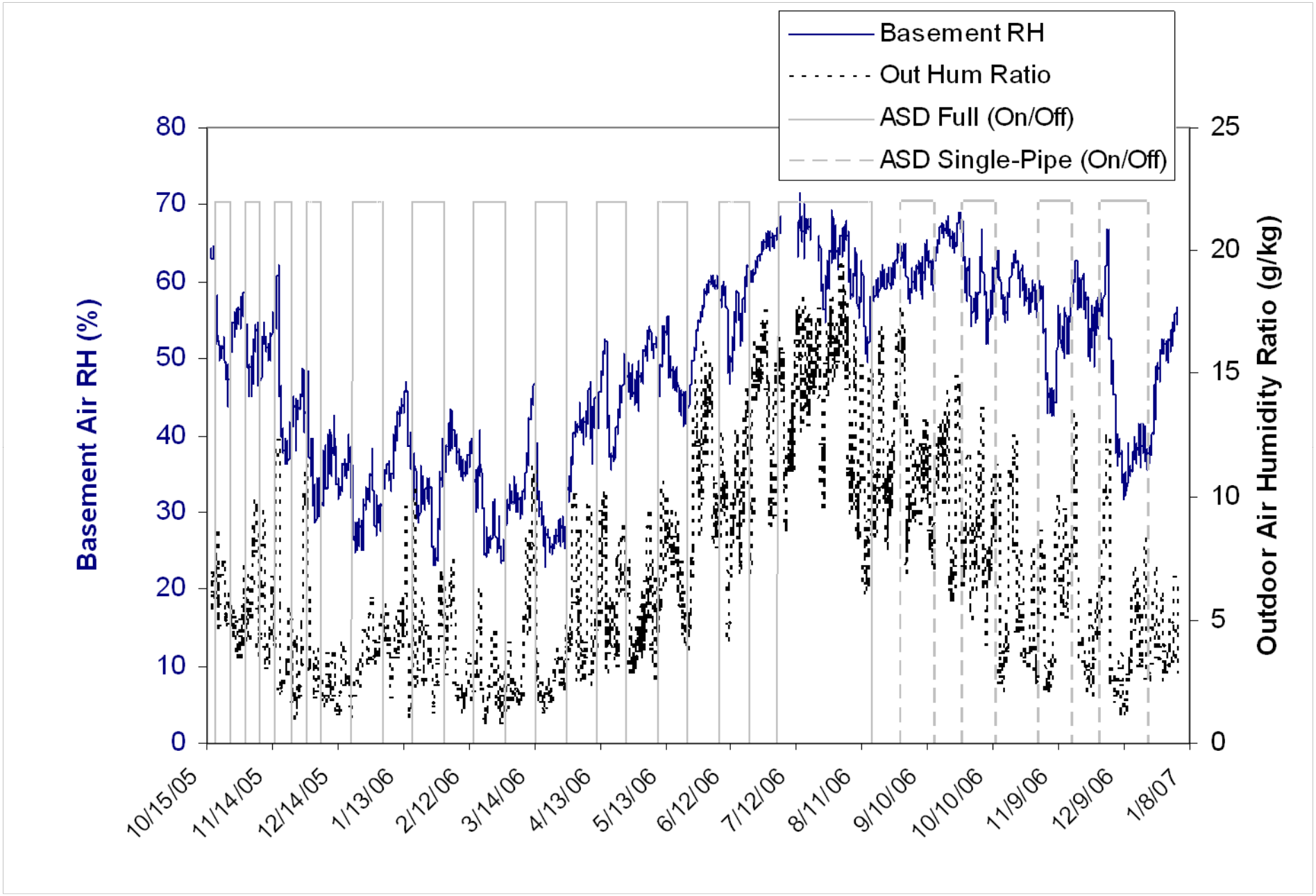
10/7/06

PA02


Basement RH
Out Hum Ratio
ASD Full (On/Off)
ASD Single-Pipe (On/Off)
Basement Air RH (%)
Outdoor Air Humidity Ratio (g/kg)
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25
10/15/05
11/14/05
12/14/05
1/13/06
2/12/06
3/14/06
4/13/06
5/13/06
6/12/06
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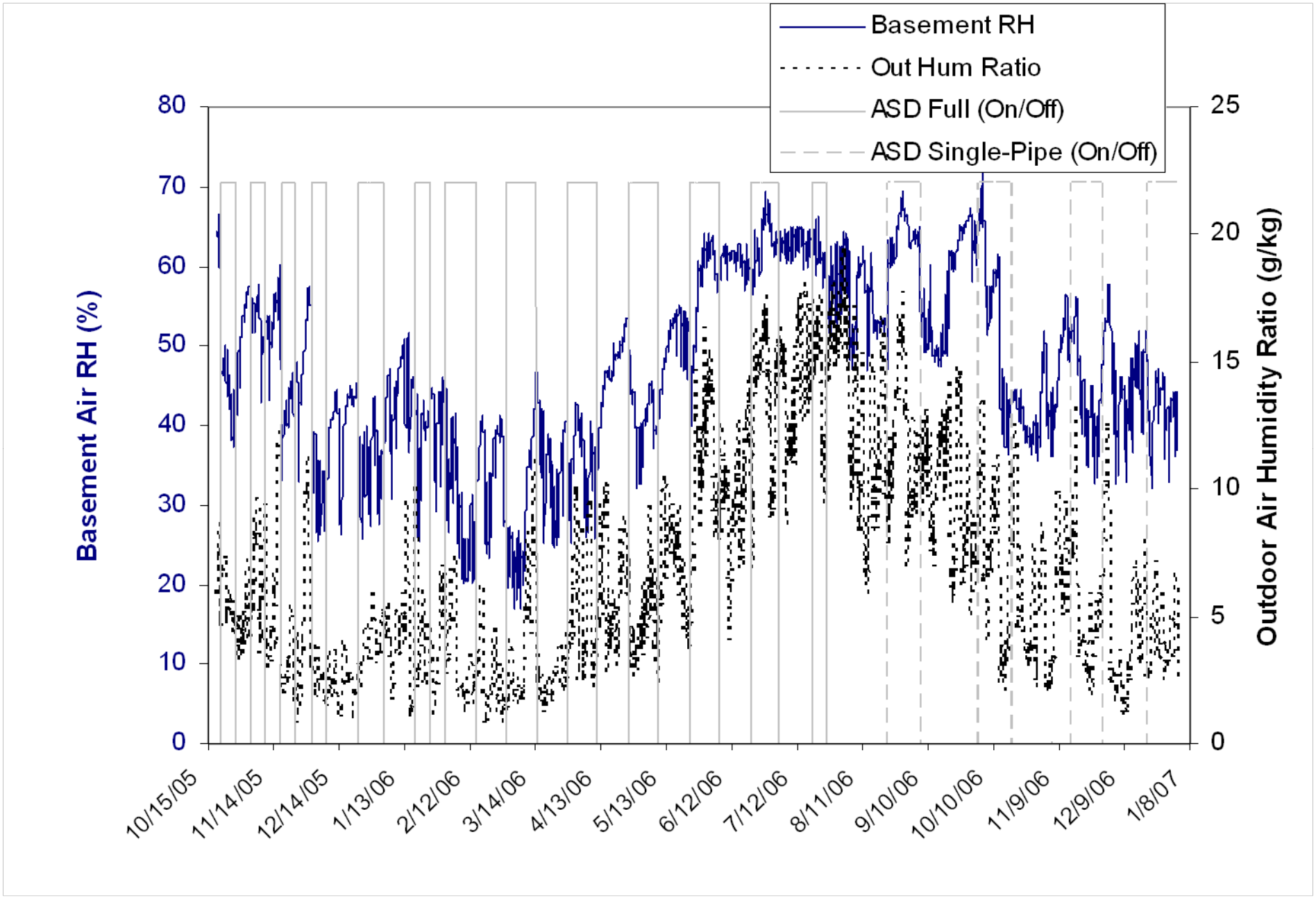
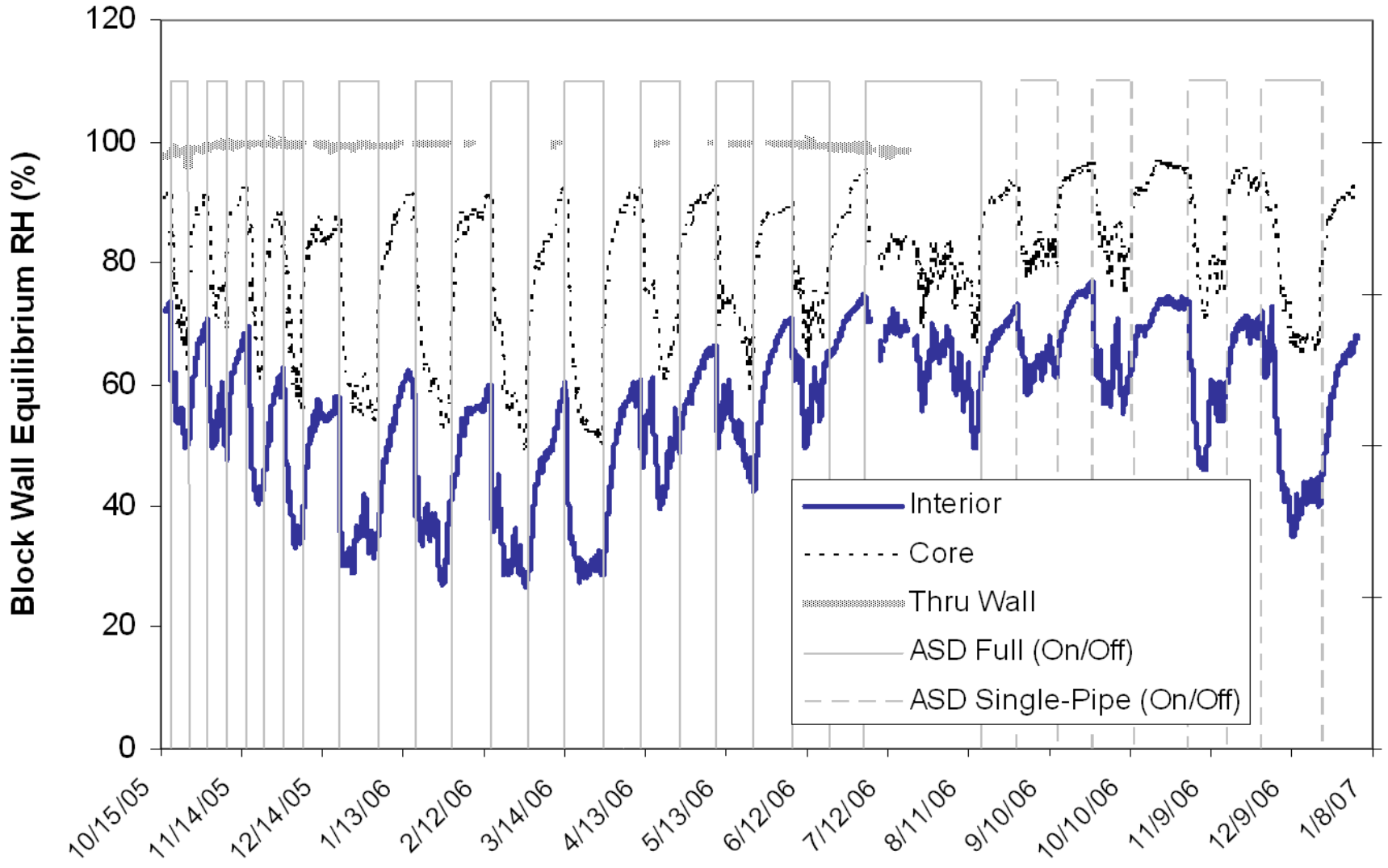
11/9/06
12/9/06
1/8/07

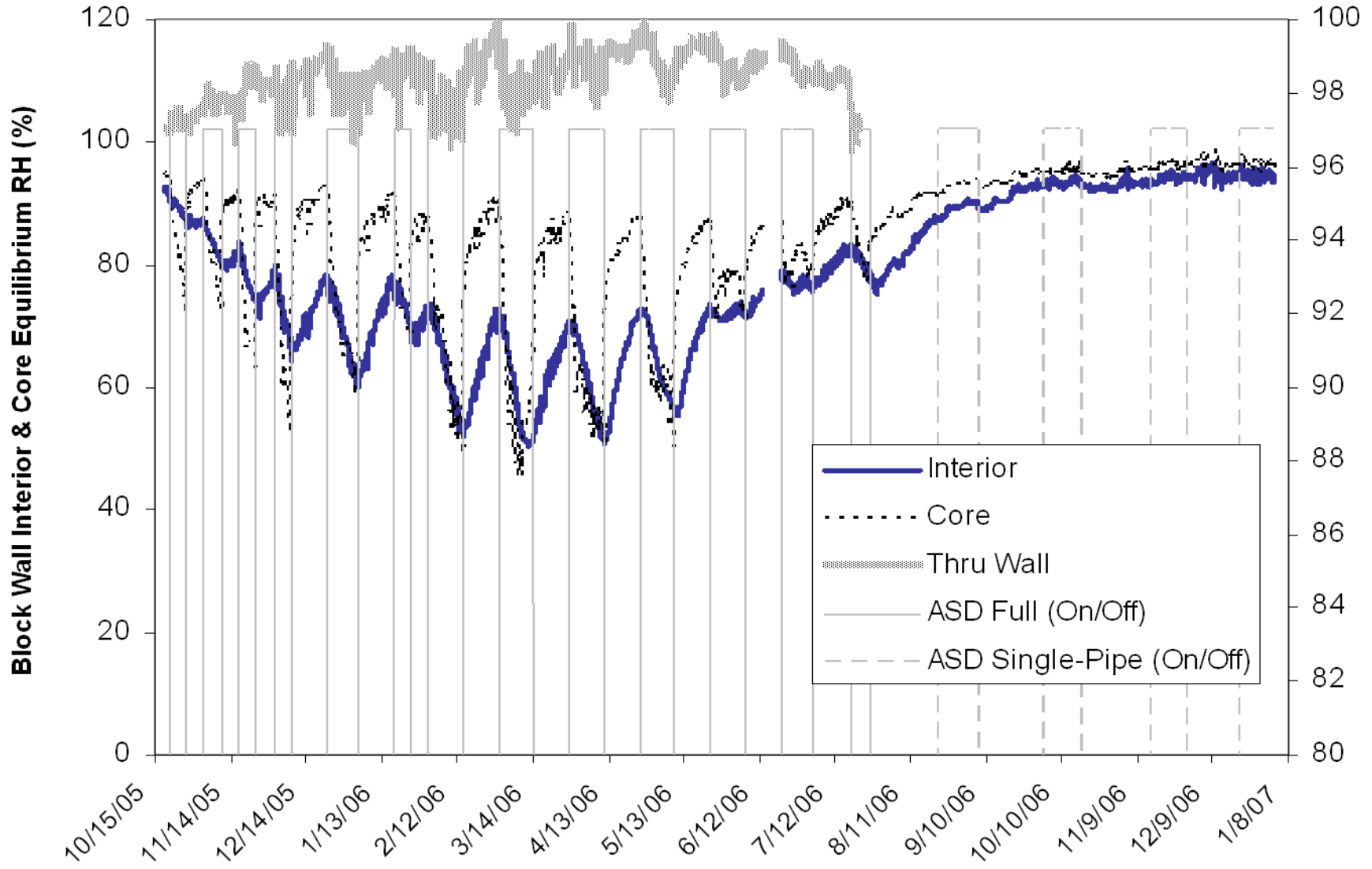
PA03


Basement RH
Out Hum Ratio
ASD Full (On/Off)
ASD Single-Pipe (On/Off)
Basement Air RH (%)
Outdoor Air Humidity Ratio (g/kg)
0
10
20
30
40
50
60
70
80
0
5
10
15
20
25
10/15/05
11/14/05
12/14/05
1/13/06
2/12/06
3/14/06
4/13/06
5/13/06
6/12/06
7/12/06
8/11/06
9/10/06
10/10/06
11/9/06
12/9/06
1/8/07

PA02 (PFE into block walls with slab suction)



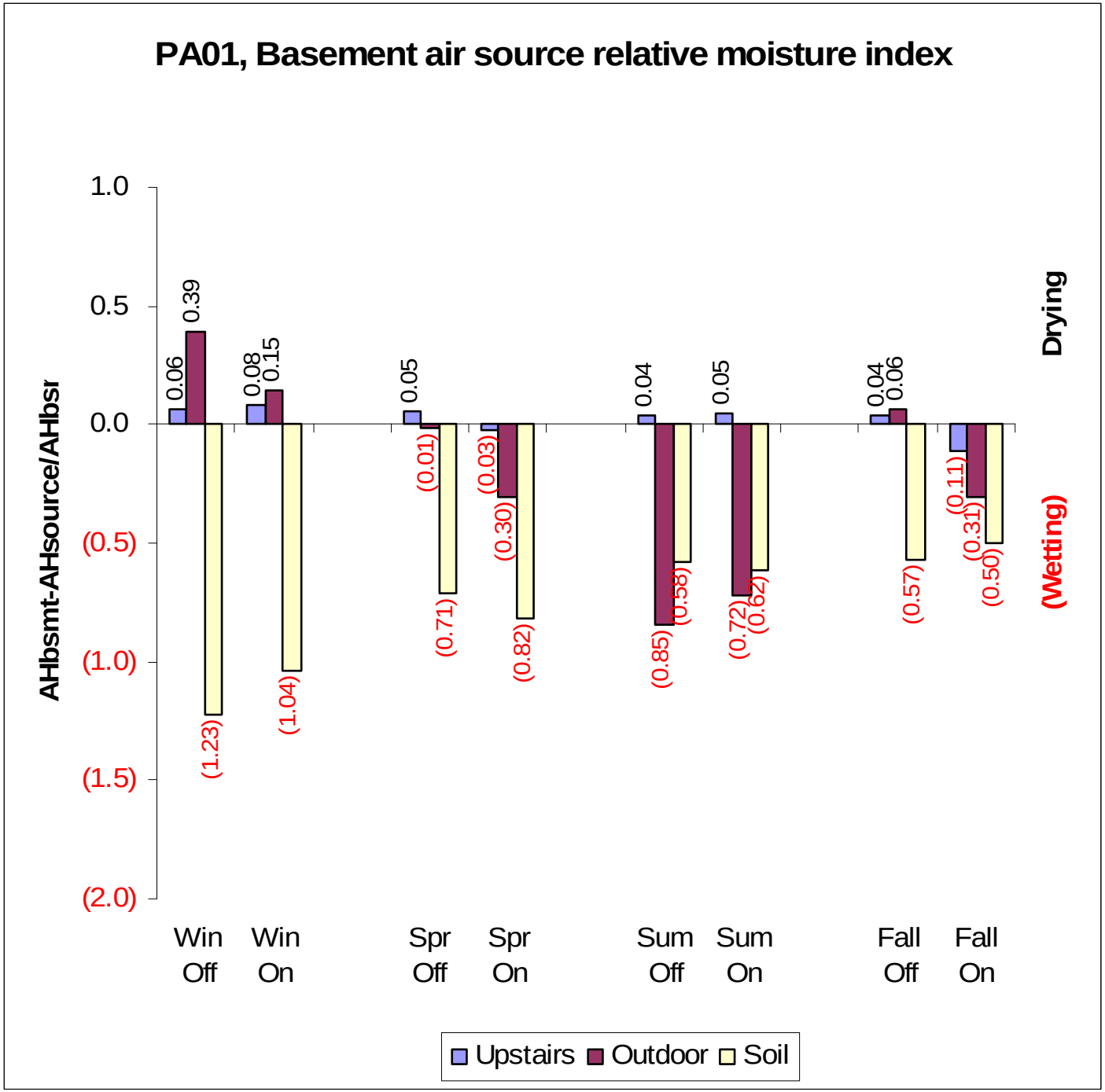
PA03 (no PFE into block walls with slab suction)

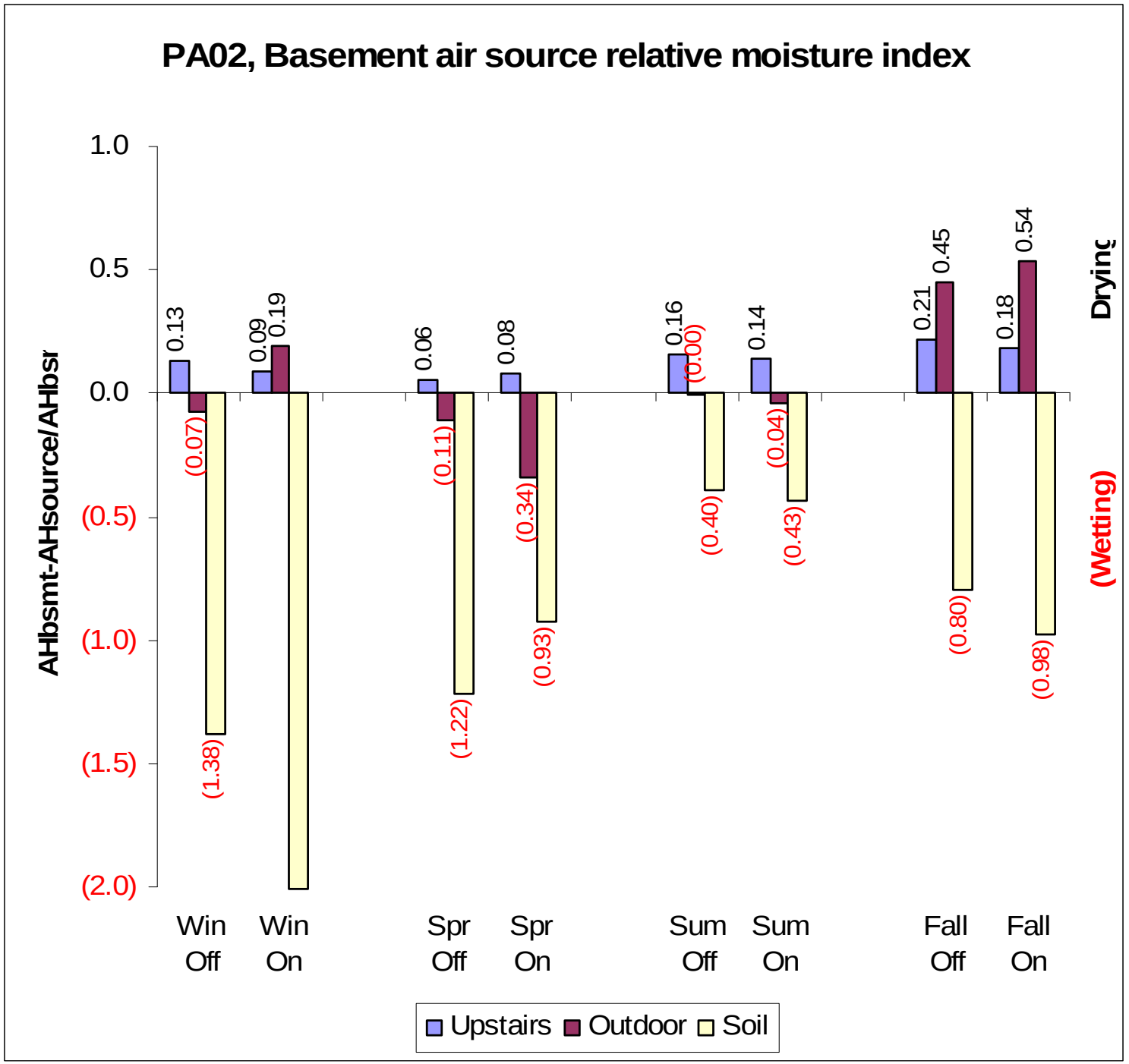


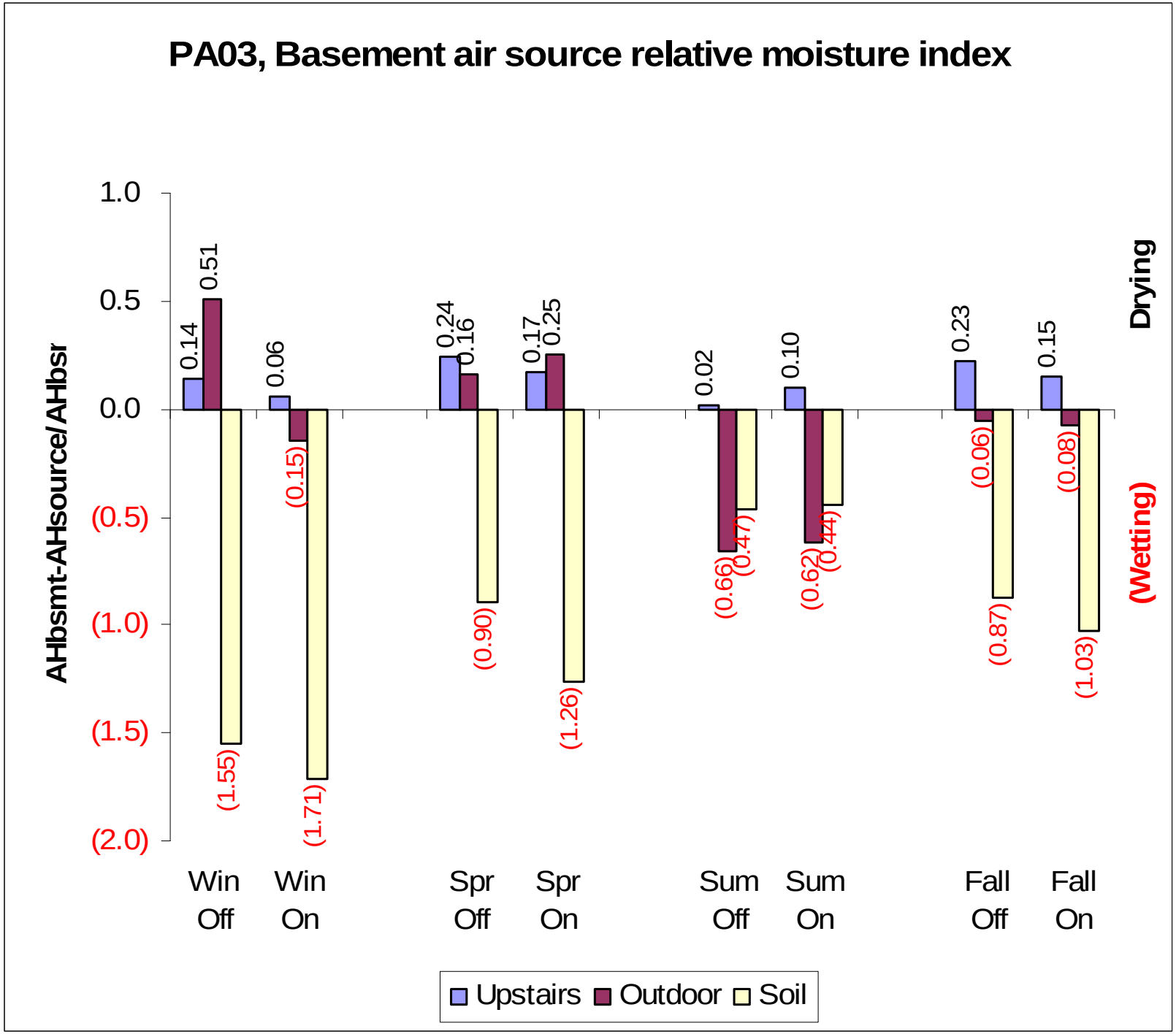
Air Entering Basement—How Wet Is It?

- Index of relative moisture content (Difference between Absolute Humidity, AH of air entering basement and AH of basement air, relative to AH of basement air)

AHbase-AHsource/AHbase

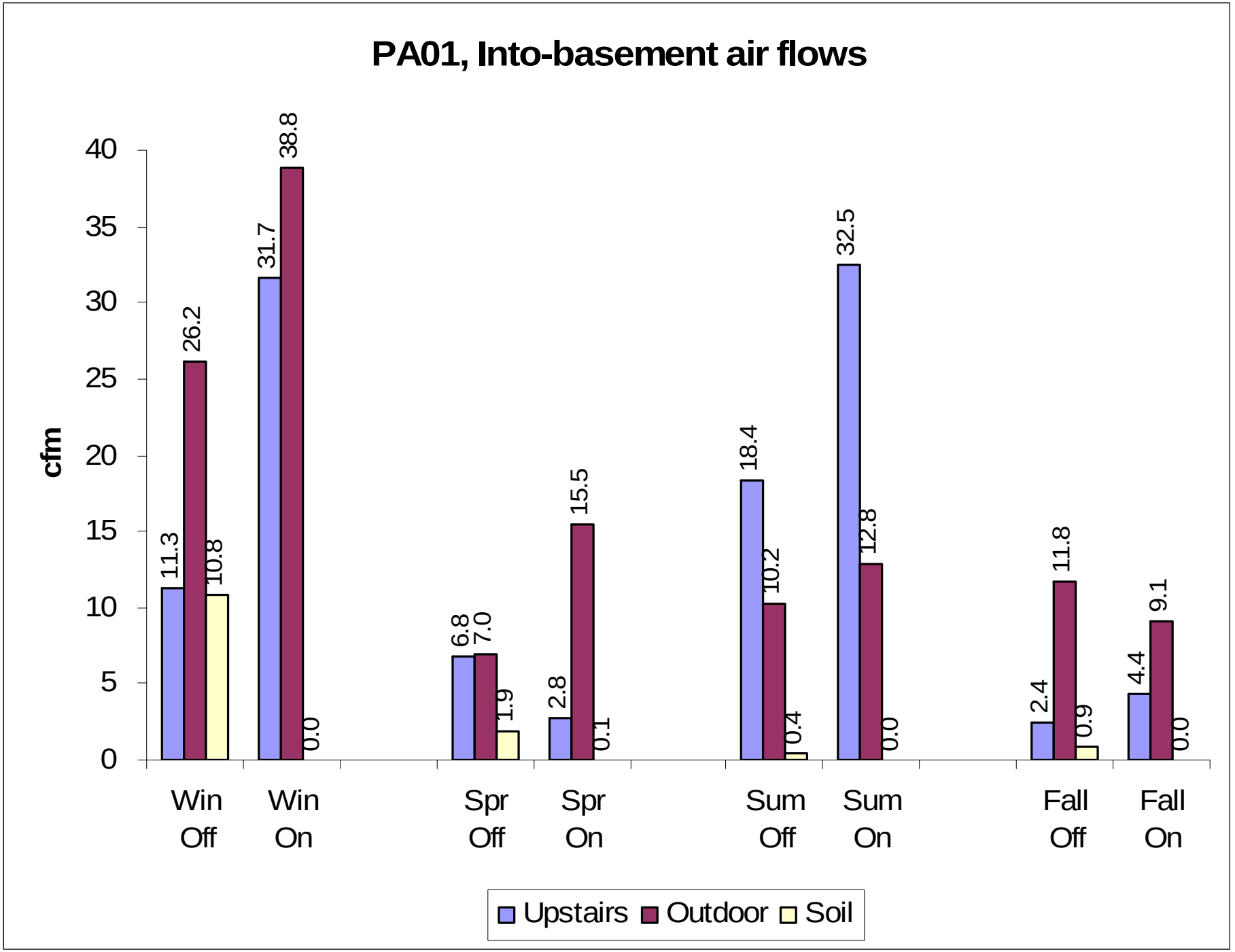

PA01, Basement air source relative moisture index
AHbsmt-AHsource/AHbsr
1.0
0.5
0.0
(0.5)
(1.0)
(1.5)
(2.0)
Drying
(Wetting)
0.06
0.39
(1.23)
0.08
0.15
(1.04)
0.05
(0.01)
(0.71)
(0.03)
(0.30)
(0.82)
0.04
(0.85)
(0.58)
0.05
(0.72)
(0.62)
0.04
0.06
(0.57)
(0.11)
(0.31)
(0.50)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

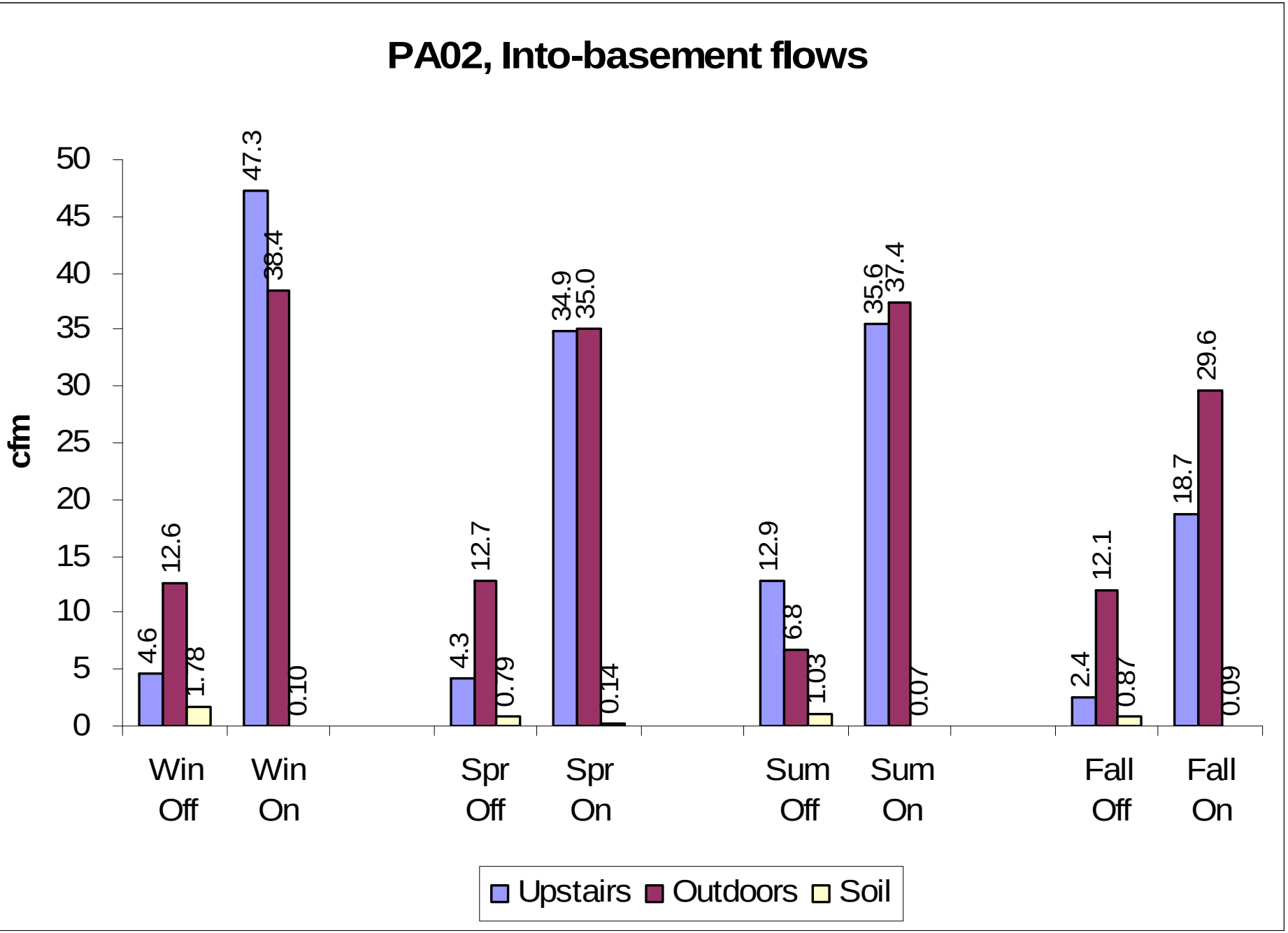

PA02, Basement air source relative moisture index
AHbsmt-AHsource/AHbsr
1.0
0.5
0.0
(0.5)
(1.0)
(1.5)
(2.0)
0.13
(0.07)
(1.38)
0.09
0.19
0.06
(0.11)
(1.22)
0.08
(0.34)
(0.93)
0.16
(0.00)
(0.40)
0.14
(0.04)
(0.43)
0.21
0.45
(0.80)
0.18
0.54
(0.98)
Drying
(Wetting)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

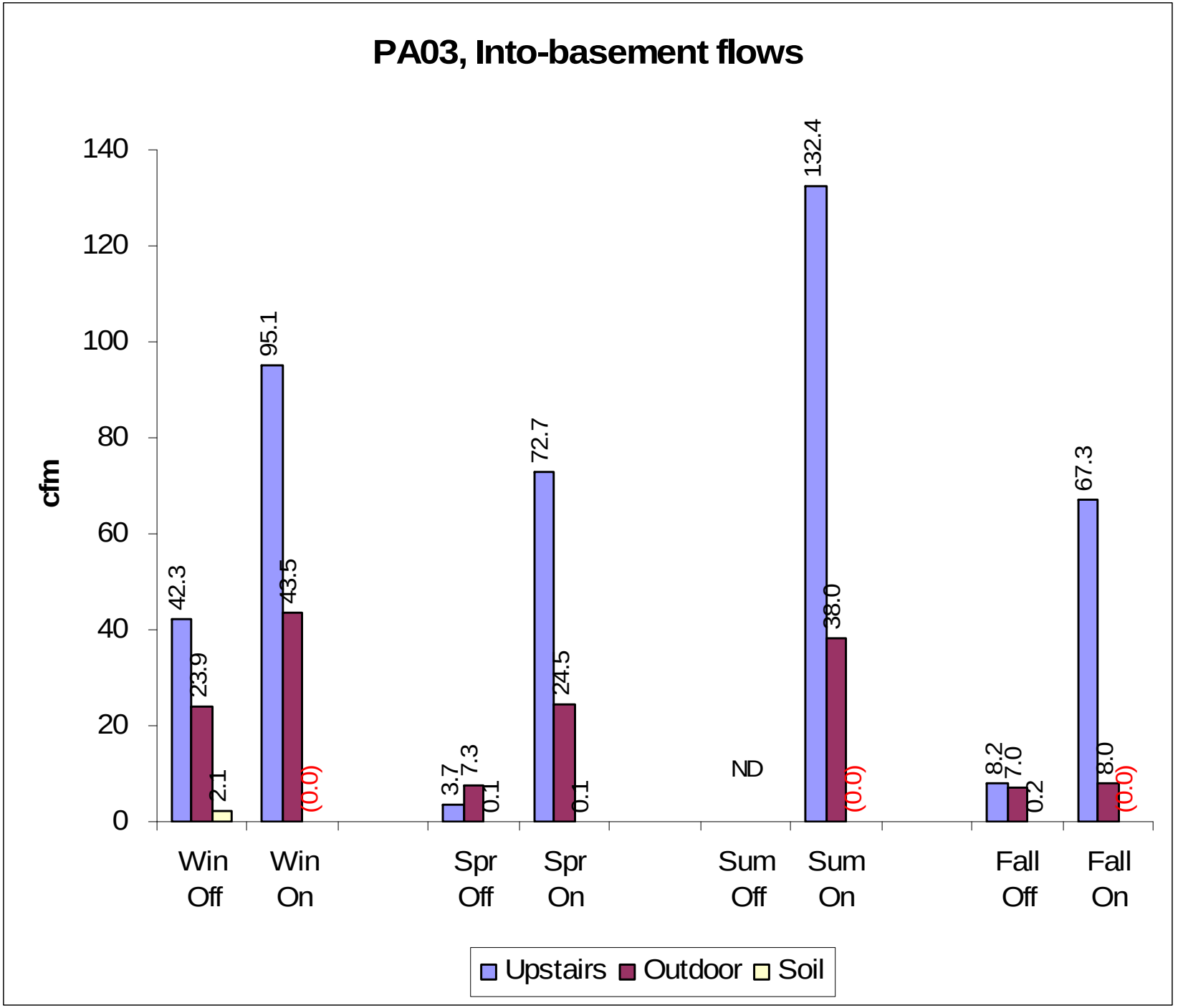

PA03, Basement air source relative moisture index
AHbsmt-AHsource/AHbsr
1.0
0.5
0.0
(0.5)
(1.0)
(1.5)
(2.0)
Drying
(Wetting)
0.14
0.51
(1.55)
0.06
(0.15)
(1.71)
0.24
0.16
(0.90)
0.17
0.25
(1.26)
0.02
(0.66)
(0.47)
0.10
(0.62)
(0.44)
0.23
(0.06)
(0.87)
0.15
(0.08)
(1.03)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

How Much of It Is There?

- Flow quantities into the basement from the three source locations

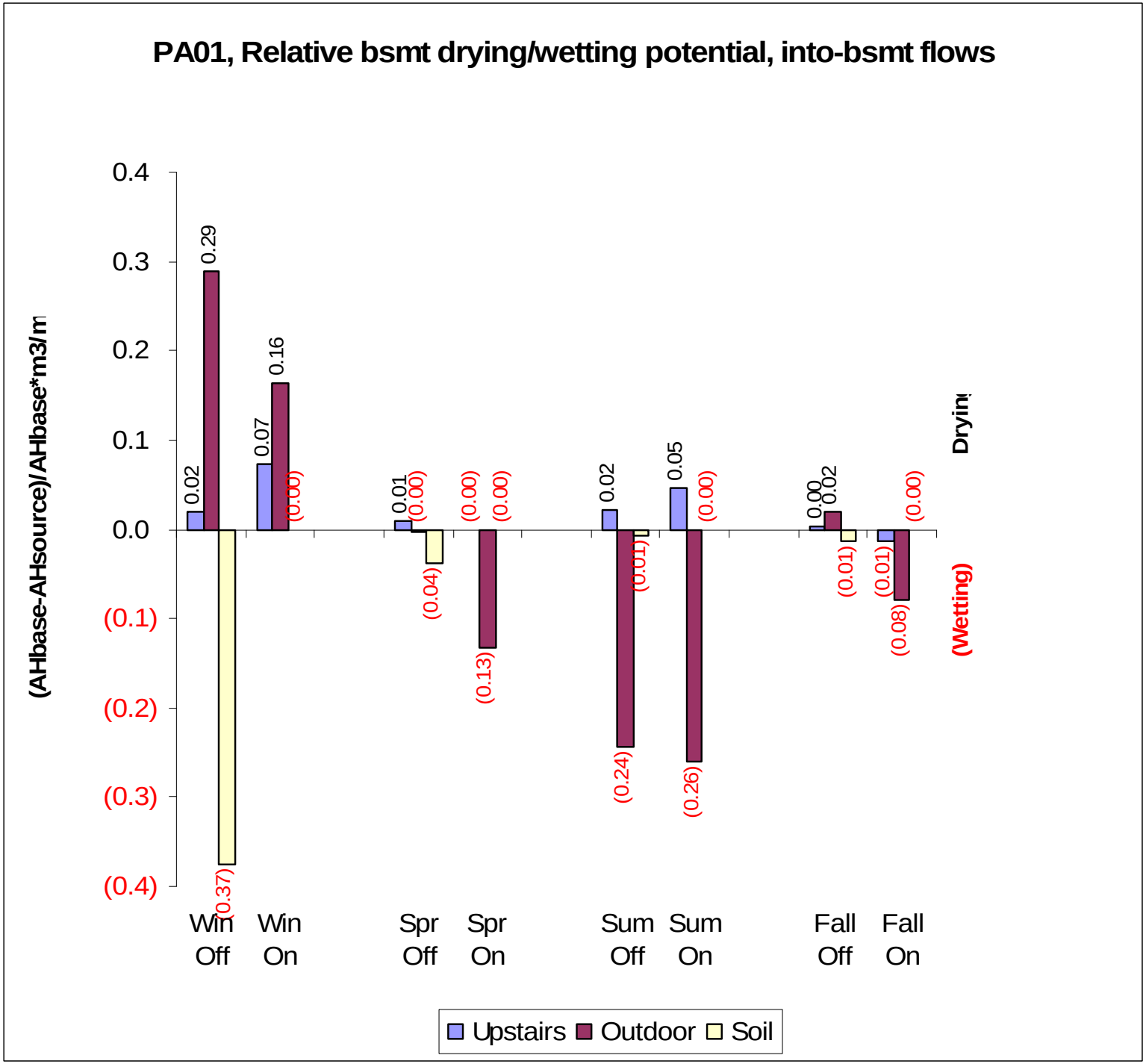

PA01, Into-basement air flows
cfm
40
35
30
25
20
15
10
5
0
11.3
26.2
10.8
31.7
38.8
0.0
6.8
7.0
1.9
2.8
15.5
0.1
18.4
10.2
0.4
32.5
12.8
0.0
2.4
11.8
0.9
4.4
9.1
0.0
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil


PA02, Into-basement flows
cfm
50
45
40
35
30
25
20
15
10
5
0
4.6
12.6
1.78
47.3
38.4
0.10
4.3
12.7
0.79
34.9
35.0
0.14
12.9
6.8
1.03
35.6
37.4
0.07
2.4
12.1
0.87
18.7
29.6
0.09
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoors
Soil

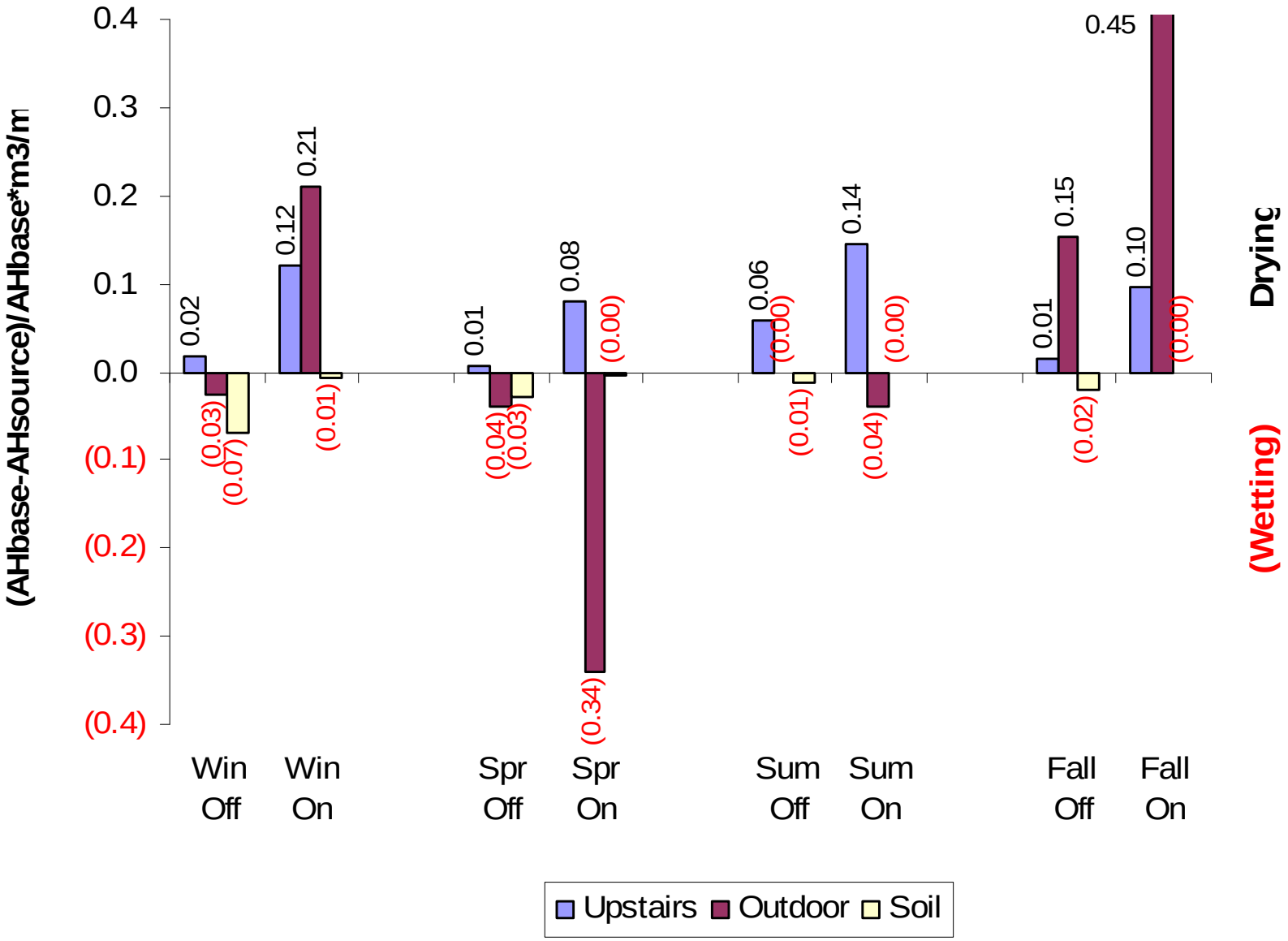

PA03, Into-basement flows
cfm
140
120
100
80
60
40
20
0
42.3
23.9
2.1
95.1
43.5
(0.0)
3.7
7.3
0.1
72.7
24.5
0.1
ND
132.4
38.0
(0.0)
8.2
7.0
0.2
67.3
8.0
(0.0)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

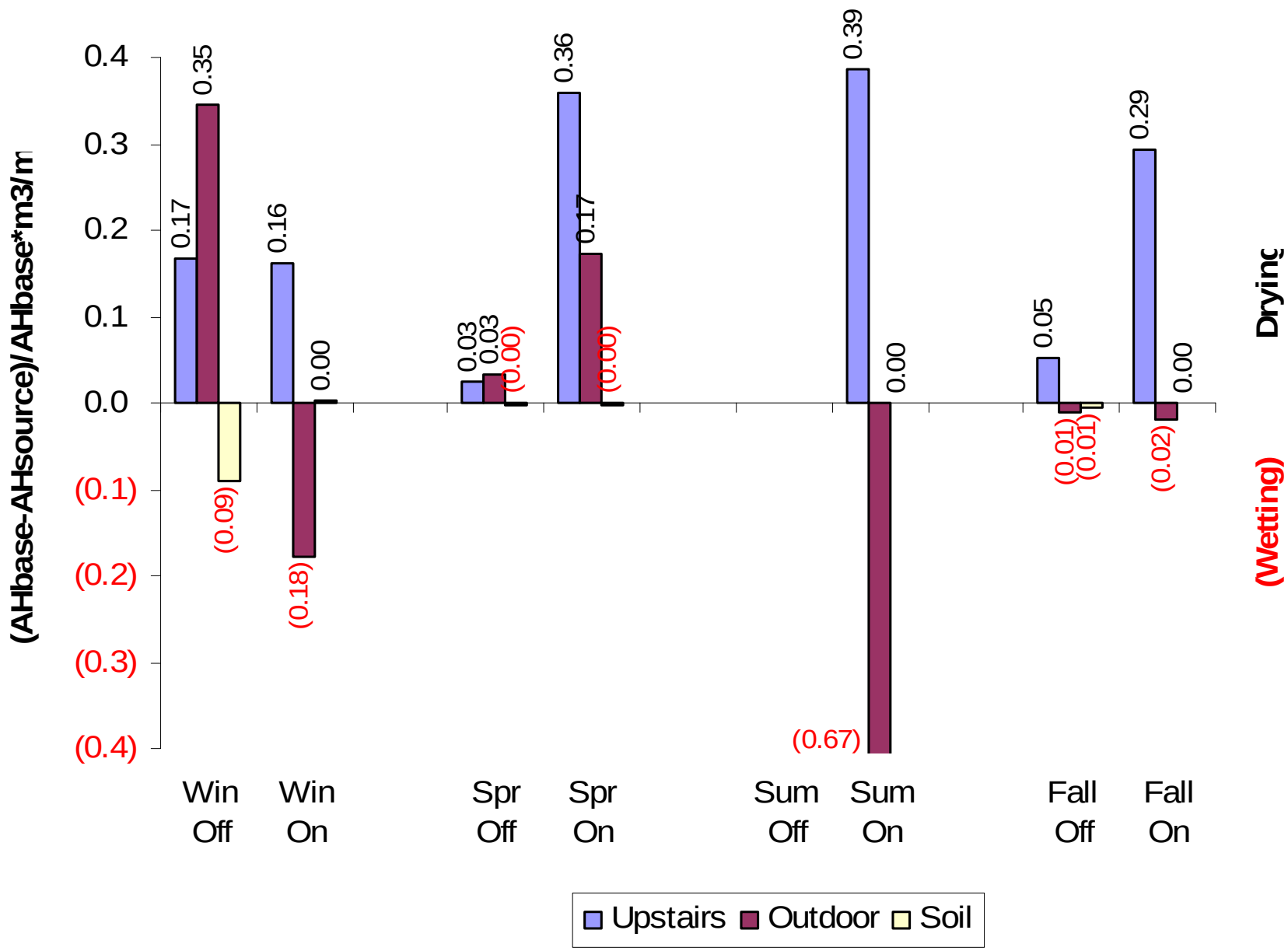
What Does That Mean?

- Combining flow rates and relative moisture content yields a relative index of amount of moisture delivered to basement by the flows from the three sources
- Note that the index represents drying/wetting *potential*, not actual drying/wetting


PA01, Relative bsmt drying/wetting potential, into-bsmt flows
(AHbase-AHsource)/AHbase*m3/m
0.4
0.3
0.2
0.1
0.0
(0.1)
(0.2)
(0.3)
(0.4)
0.02
0.29
(0.37)
0.07
0.16
(0.00)
0.01
(0.00)
(0.04)
(0.00)
(0.00)
(0.13)
0.02
(0.24)
(0.01)
0.05
(0.00)
(0.26)
0.00
0.02
(0.01)
(0.01)
(0.08)
(0.00)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

PA02, Relative bsmt drying/wetting potential, into-bsmt flows




PA03, Relative bsmt drying/wetting potential, into-bsmt flows
(AHbase-AHsource)/AHbase*m3/m
0.4
0.3
0.2
0.1
0.0
(0.1)
(0.2)
(0.3)
(0.4)
0.17
0.35
(0.09)
0.16
(0.18)
0.00
0.03
0.03
(0.00)
0.36
0.17
(0.00)
0.39
(0.67)
0.00
0.05
(0.01)
(0.01)
0.29
(0.02)
0.00
Drying
(Wetting)
Win Off
Win On
Spr Off
Spr On
Sum Off
Sum On
Fall Off
Fall On
Upstairs
Outdoor
Soil

Basement Drying Mechanisms

- Increase in upstairs to basement air flow (if upstairs air is drier)
- Increase in outdoor to basement flow (if outdoor is is drier)
- Reduction in soil gas entry

ASD Basement Air Removal

(ASD systems in ‘robust’ mode. CFM values in ‘normal’ mode were lower, but PFE values in ‘normal’ mode were still well in excess of that required for adequate control of soil gas entry, so basement air exhaust was still excessive.)

House	Basement air in ASD exhaust, %	Basement air exhausted, CFM
PA01	46	41
PA02	72	99
PA03	72	124

Upstairs to Basement Flow

- Increase in this flow is the major consistently drying influence on basement (assumes upstairs air is drier; in summer, actual dehumidification is due to AC operation)
- It is achieved by exhausting basement air
- But, the quantity of increase in upstairs to basement flow is not practically knowable even if total system air flow is known, or even if basement exhaust volume is known. Besides, it varies a lot.
- Basement drying effect less in summer (a clue?)

Outdoor to Basement (and Upstairs)

- Increase in outdoor air infiltration to both basement and upstairs is a consequence of basement exhaust
- Can be drying or wetting influence depending generally on climate and season
- Quantity of infiltration increase depends on ASD system operation, house structural (leakage) and mechanical operating characteristics and weather. Quite variable and not practically predictable
- Increase in OA ventilation may or may not be desirable for air quality. Even if needed, ASD-induced increase may not be appropriate
- Absent controlled pathways for make-up air entry (rare), ‘leakage’ infiltration may cause moisture problems in structural components, especially in warm humid climates in buildings with AC

Soil Gas Entry

- Reduction of soil gas entry is desirable for moisture control, but not likely to be a major (or adequate) basement drying influence in many cases
  - Elimination of convective moisture entry from soil does not account for degree of observed drying in these basements
  - Soil gas entry volumes with ASD off were 2 cfm or less, with one exception
  - Higher soil gas entry potential (more permeable soils, larger unsealed openings) could mean more soil gas entry and more moisture reduction benefit from entry control, but same characteristics could result in large basement air exhaust by overly robust ASD systems

ASD Design Considerations
The Good News

- Standard design ASD systems produced desirable basement moisture reductions in all three houses
- More robust systems produced somewhat better reductions in basement moisture and much better reduction in very wet block walls (with block wall suction)
- ASD very well suited to control soil gas entry in these houses

ASD Design Considerations
The Maybe Not-So-Good News

- Basement exhaust may not be most cost-effective way of increasing flow of upstairs air to basement
  - if it also increases OA infiltration, creates energy penalty and potentially other moisture problems
- Variable and unpredictable increase in OA ventilation, even assuming increase is known to be needed, would indicate that basement exhaust is not likely to produce appropriate increase.
- ‘Leakage’ ventilation is not preferable ventilation method.

What We Don’t Know

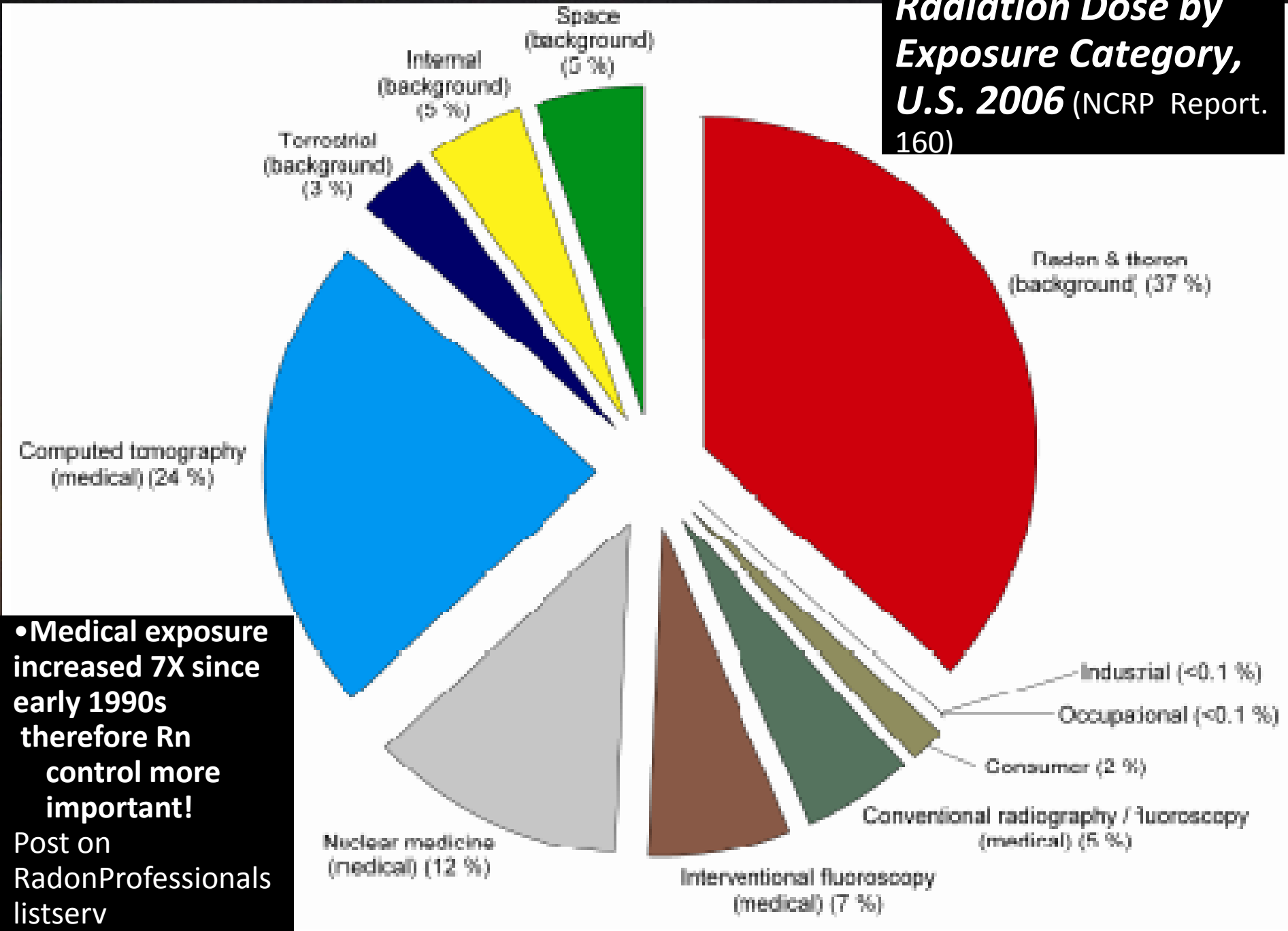
- Are standard ASD systems a cost-effective strategy for reducing basement moisture? The evidence suggests there are significant and generally unrecognized $$ costs and other potential problems associated with this approach.
- Much remains to be learned about optimizing ASD design for moisture control, but research needs extend well beyond that.
- May be that ASD is best employed as one limited component (soil gas control) of a more comprehensive moisture control strategy.

Facing Challenges:

AARST

William J. Angell
President

Radiation Dose by Exposure Category, U.S. 2006 (NCRP Report. 160)



- **Medical exposure increased 7X since early 1990s therefore Rn control more important!**

Post on RadonProfessionals listserv

What Do We Know About Radon?

- Radon in U.S. homes:
  - Causes 21,000 lung cancer deaths (LCD) each year
    - 1 LCD every 25 minutes
    - Compared to about
      - 300 accidental CO deaths each year in homes
      - 3,000 LCD each year due to environmental tobacco smoke
      - 29,000 prostate cancer deaths per year
      - 40,000 breast cancer deaths per year
  - The risk of dying from radon related lung cancer at EPA's Threshold for Action is 1:50

Where Are We At With Radon?

- There are more homes with elevated radon than any time in history!
- Standards of practice and protocols are
  - Old and in need of updating, e.g.,
    - 1992: *Indoor Radon and Radon Decay Product Measurement Device Protocols*
    - 1993: *Protocols for Radon and Radon Decay Product Measurements in Homes*
  - We have major gaps in standards that rely upon volunteers to fill
    -

Why Does It All Matter?

. . . Because There Victims







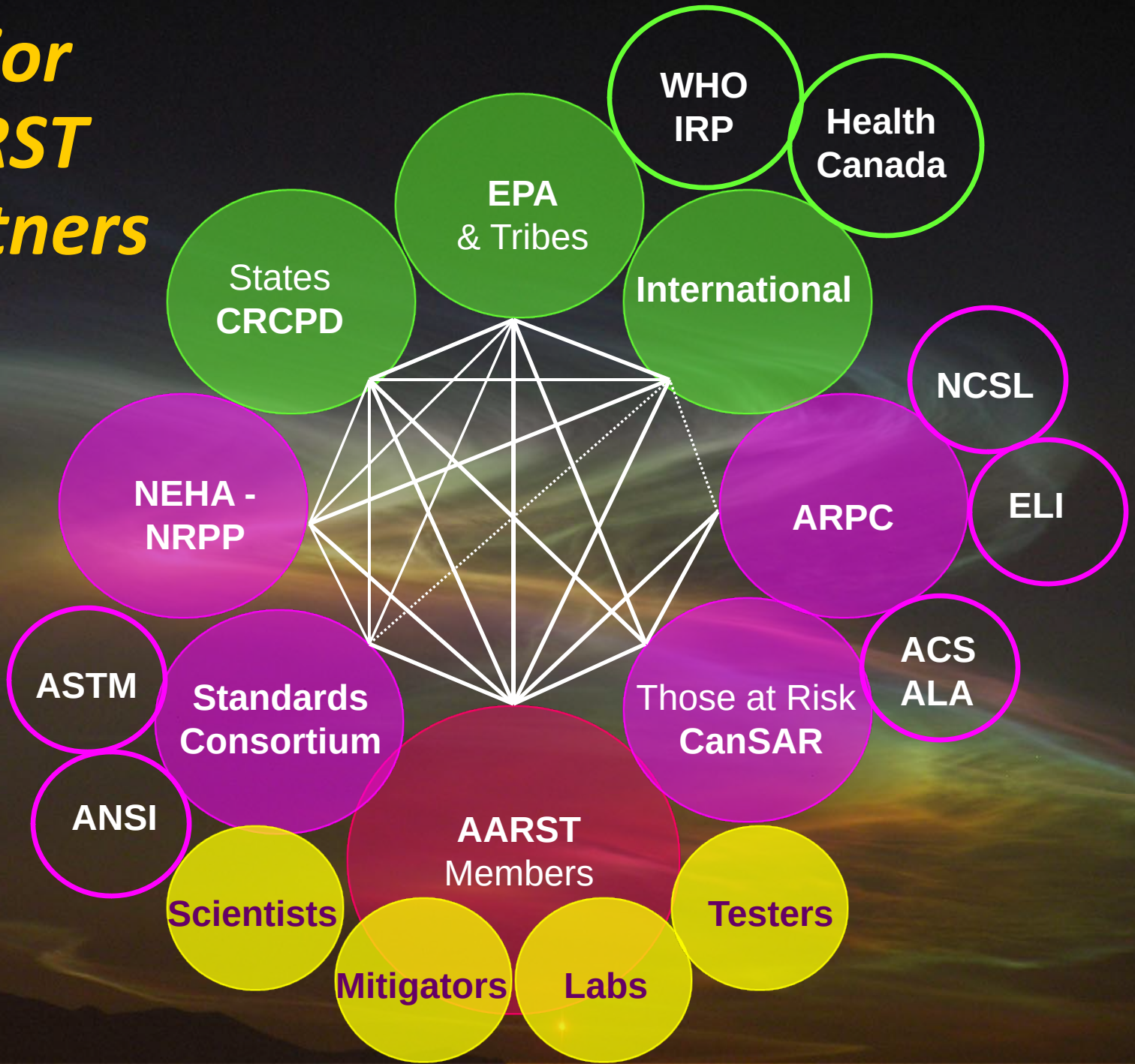


Cancer Survivors Against Radon (CanSAR) Founders

American Association of Radon Scientists and Technologists (AARST)

- Established in 1986, AARST is the world's largest nonprofit radon professional association
  - Dedicated to the highest standard of excellence and ethnical performance for the benefit of
    - Members, consumers and the public at large
  - 800 members who deliver
    - Radon risk reduction through their own financial investments
    - Scientific research-based training and policy options
  - Administers the world's largest proficiency program in collaboration with the National Environmental Health Association (NEHA)
    - National Radon Proficiency Program (NRPP)
      - 2,400 certified testers, mitigators, and labs

Major AARST Partners

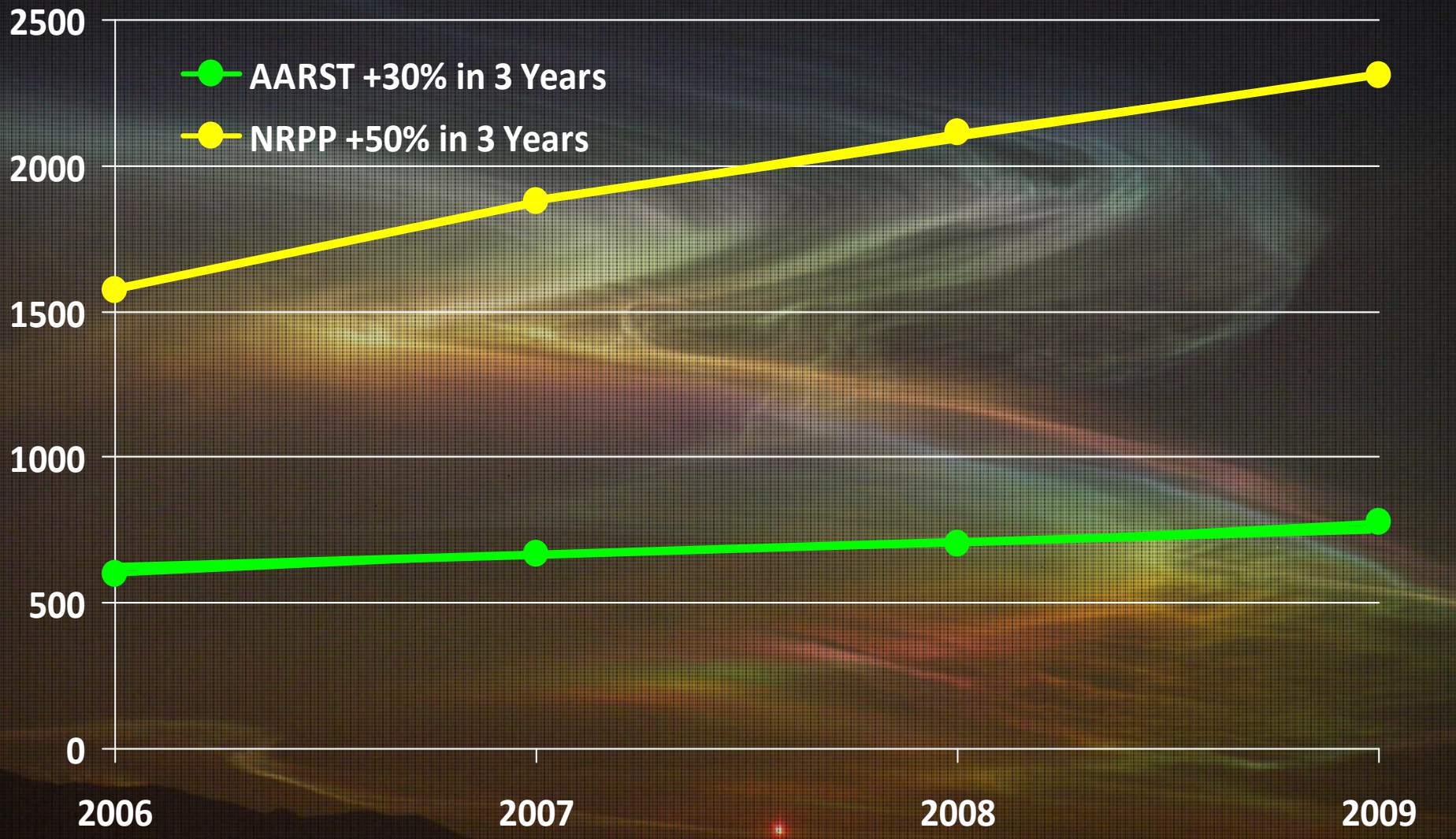


AARST Chapters

- Established
  - Blue Ridge (NC+)
  - Kentucky Area Radon Professionals
  - Midwest (IL+)
  - New England
  - Ohio Association of Radon Professionals
  - Tri – State (PA+)
- Formulizing
  - Georgia
  - Heartland (IA+)
  - New York

- To be successful, chapters need
  - 3 to 5 members
    - Committed to start up and
    - Dedicated to chapter program development
- AARST supports chapter establishment
  - $500 start-up funds
  - Articles of Incorporation
- Chapters have been key to
  - Policy initiatives
  - Member support

AARST & NEHA – NRPP Memberships: Growing Professionalism



National Radon Standards Consortium

Active

- Multi-Family Measurement
  - Final (?) public comment in next month or so (T. Smith)
- Home Measurement
  - Interim completed, ANSI revision needed
- Device Protocols
  - In process with ANSI and IEEE (P. Jenkins)
- Mitigation Harmonization
  - In process with ASTM (B. Brodhead)

In Need of Volunteers

- Large Building Measurement
- Large Building Mitigation
- Quality Assurance
- Mitigation of Radon in Water

Other Notes

- Radon Control in New Homes
  - Consortium is supporting revision of ASTM 1465

There must be serious discussion about how far a completely volunteer standards development effort can go. Resources are needed to strengthen the foundation of our nation's radon program - - - standards

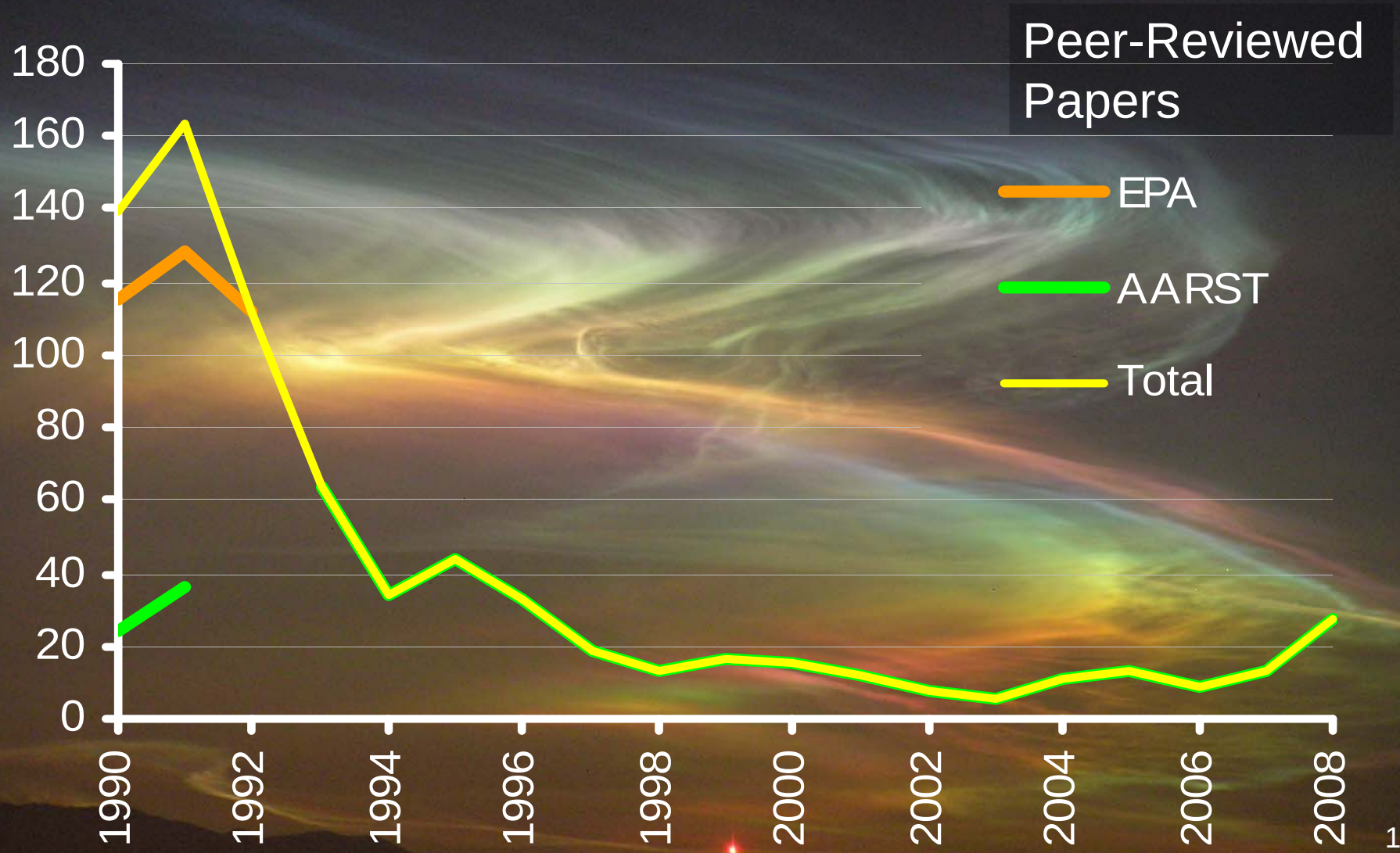
We Have Come a Long Way (Cumulative) - - -
Bill Long may have an update

Year	Units Mitigated	LCDP~ Mitigation	Zone 1 New with Rn Control	LCDP~ New Rn Control	Total LCDP
2000	397	2,412	589	513	3,036
2003	514	3,328	731	894	4,333
2006	714	4,573	935	1,384	6,068
2007					
2008					
2009e	1,007	6,326	1,163	1,994	8,432
2012e	1,451	8,839	1,482	2,772	11,722

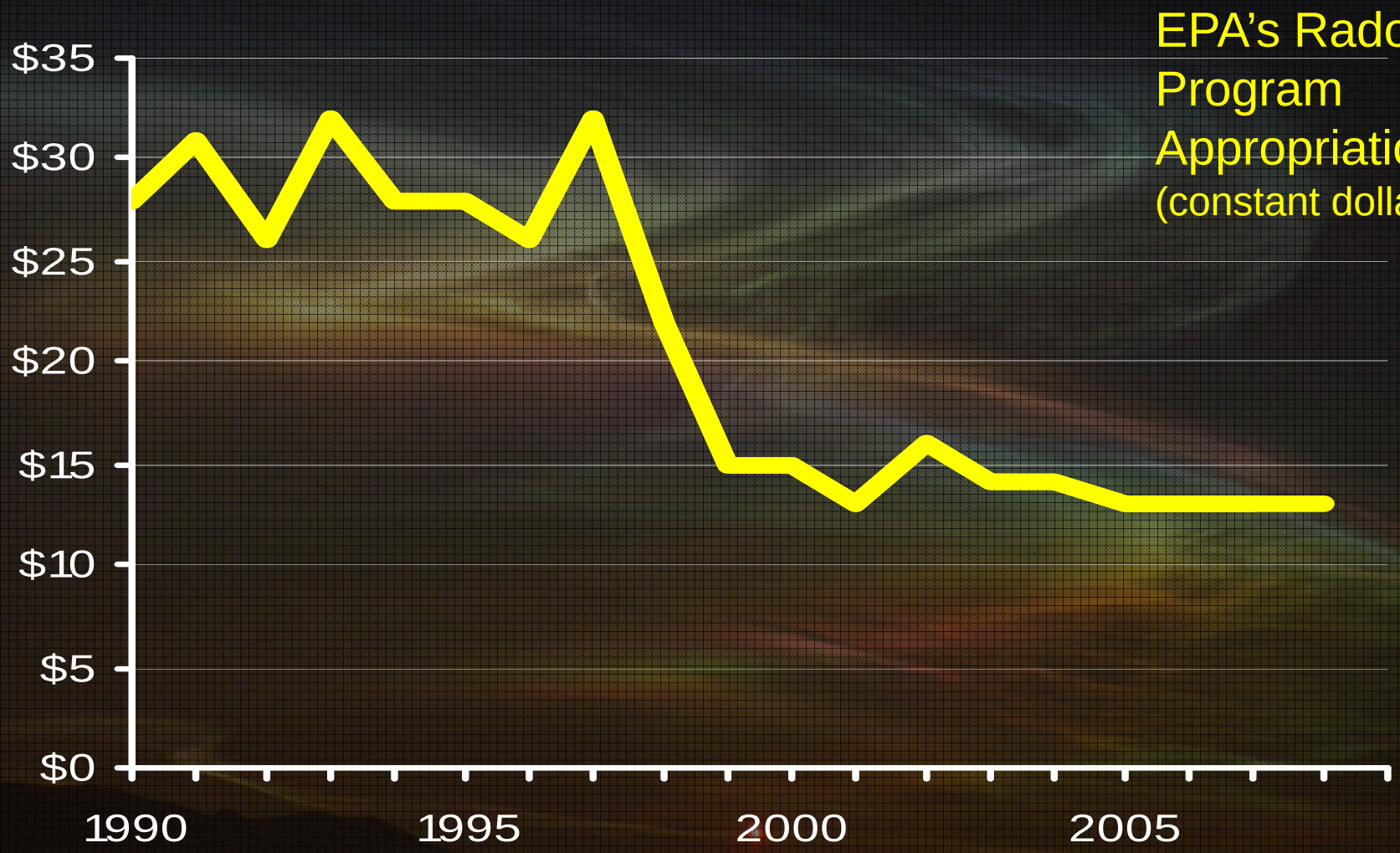
But We Have a Long Way to Go!

- We need to strengthen standards of practice
- We need to increase
  - Applied research
    - Our "seed corn"
  - Investment in cost-effective public sector radon programs
    - Our partners
  - Quality radon testing and mitigation in real estate transactions
    - Not the cheapest
  - Effective radon control options in new homes
    - Installed by certified and/or licensed radon professionals

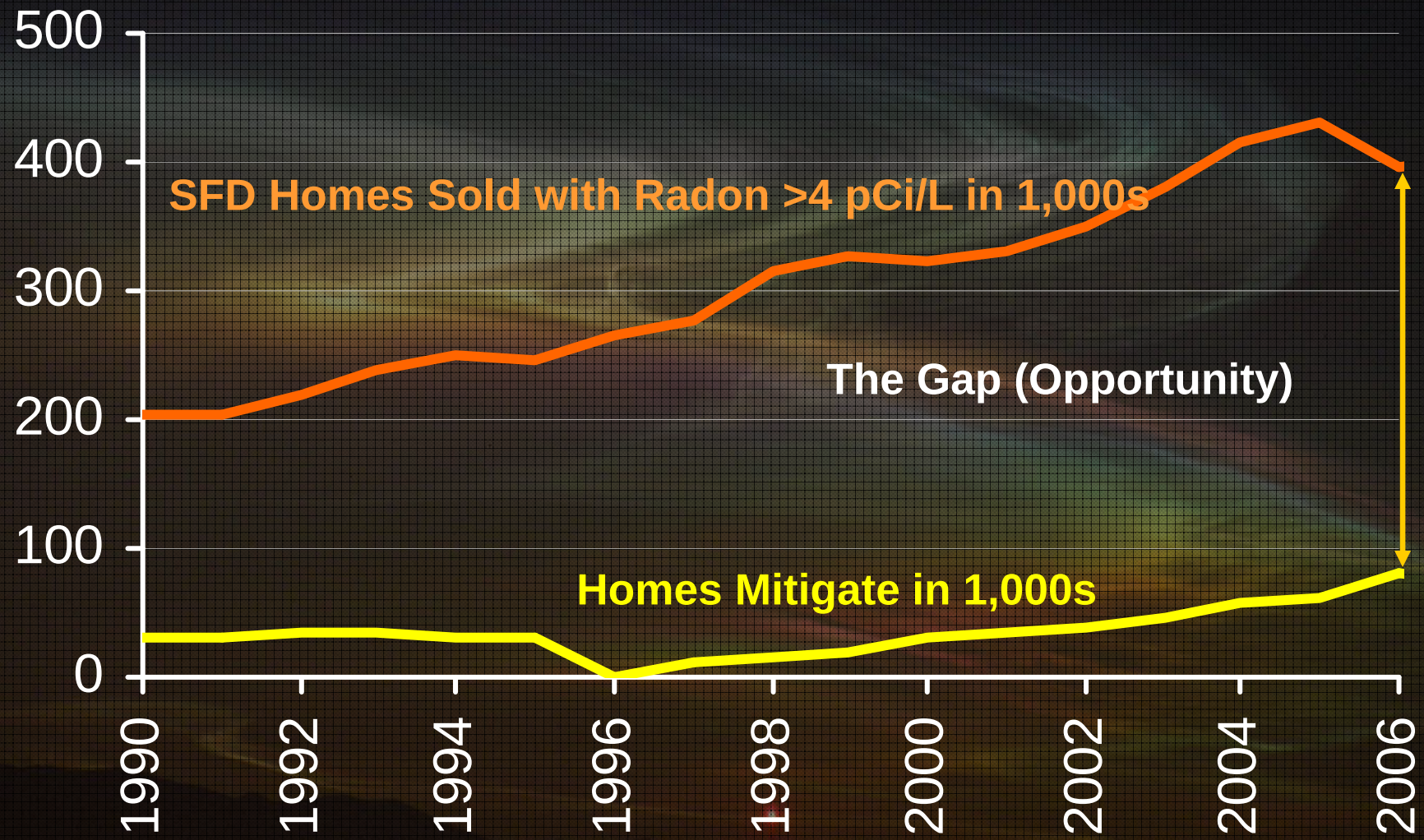
We Need to Increase Research and . . . its Application



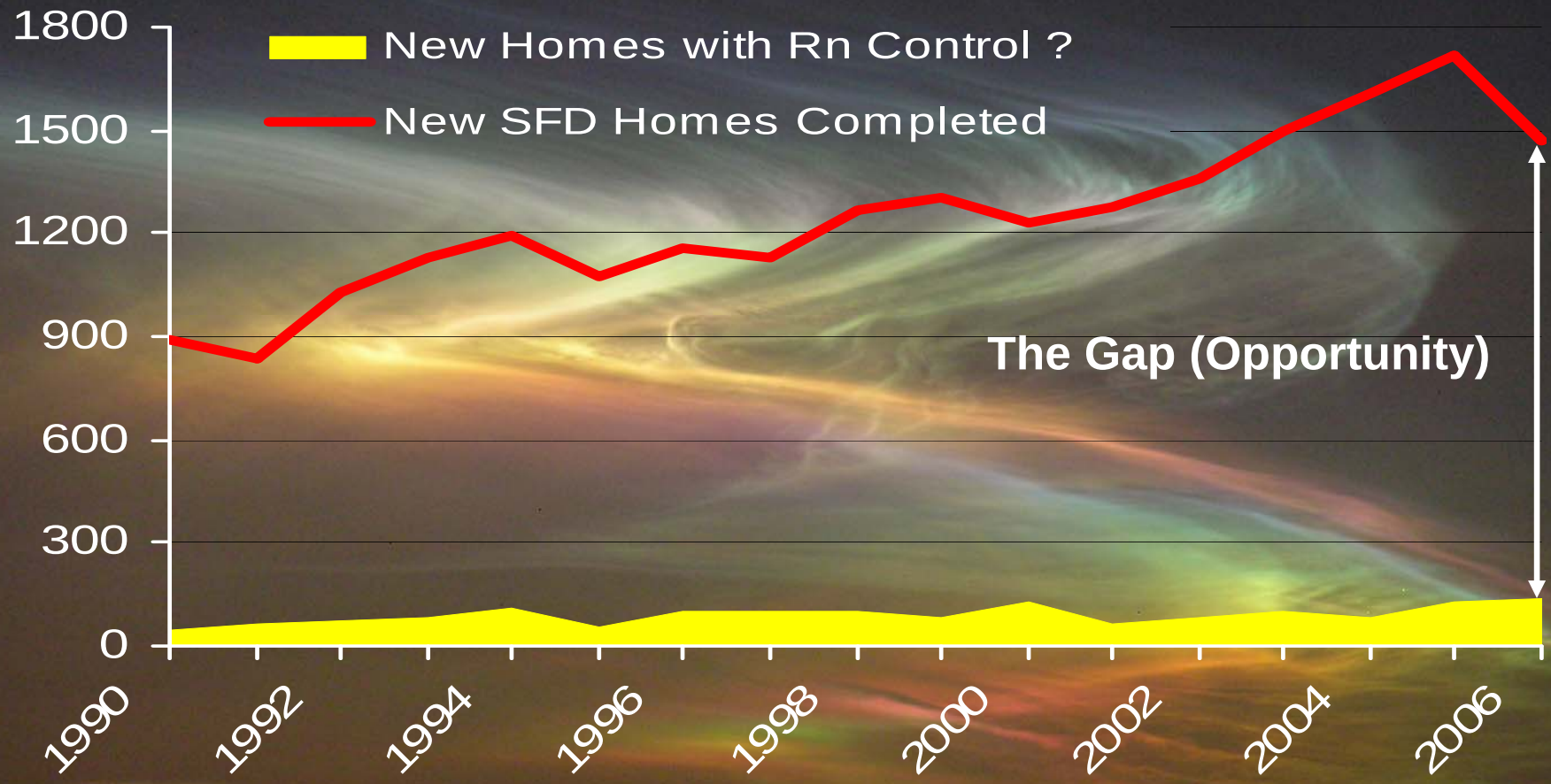
We Need to Increase Investments in Cost – Effective Public Sector Programs



We Need to Increase Testing and Mitigation in Real Estate Transactions



U.S. New Homes Completed versus New Homes with Rn Control Features? *(annual)*



The New Homes with Rn Control data are based on unqualified and unverified builder representations and therefore, should be suspect - - - in otherwords, most certainly these data overstate the number of new homes with effective radon control

AARST's 2009 National Legislation

- Indoor Radon Hazard Reduction Act (IRHRA) of 2009
- Based on the successful 1992 Lead Hazard Reduction Act
  - Sets clear mandates for HUD and EPA
  - Sets clear goals for development and reporting
- Action
  - AARST – CanSAR January visits Congressional offices
    - House, e.g., IL Roskam and Costello,
    - Senate, e.g., IL Durbin, WI Feingold, MA Kennedy, NJ Lautenberg, MN Klobuchar, AL Shelby, Salazar CO, OR Wyden
  - Currently finalizing IRHRA

2009 IRHRA Requires

- Radon testing for
  - Federal assisted mortgages, e.g., FHA
  - Mortgages sold on the secondary mortgage
- Radon notification for all mortgages
- Radon control in new homes financed with federal assisted mortgages (e.g., FHA)
- National certification or licensing of radon professionals
- Testing and mitigation of federally owned or assisted housing

2009 IRHRA Authorizes $100 Million in Funding

- Increased funding for
  - EPA's Radon Program including
    - State Indoor Radon Grants
- New funding for
  - HUD training and development
  - Low income testing and mitigation
  - Standards development
  - Research

AARST's 2009 Action Plan

- Currently, CanSAR and AARST are
  - Seeking Congressional sponsors
  - Seeking NGO supporters
- In late March, we will file the 2009 IRHRA
- In April, AARST will initiate $200,000 fundraising campaign
  - Email Campaign – please support
  - This campaign will allows Radon Professionals to hire staff to tell the radon story (lobby) the U.S. Congress

What's Coming

- WHO Radon Handbook will be released
  - Expect "some news"
- International Radon Symposium
  - September 20-23 in St. Louis
  - Held in tandem with CRCPD's National Radon Meeting
- Hopefully, additional resources from
  - Current year stimulus appropriations
  - FY 10 appropriation
- Remember, great things are possible through team work: AARST – CRCPD – EPA – **and YOU**

What We Need from You?

1. Your membership in AARST
2. Your participation and contributions through
   A. AARST and Standards Consortium committees and
   B. AARST chapters
3. Your contribution to the policy campaign
4. Your opinions on how to make our collective future as strong as we can
   - Helping each other succeed
5. Your continuing commitment to professionalism and high standards

NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

EPA Update
Bill Long

2009 Region 7
Radon Stakeholder Meeting

What I'll Cover Today

- The state of radon
- Some Good News/Some Bad News
- Priorities for 09
- Requests and Offers

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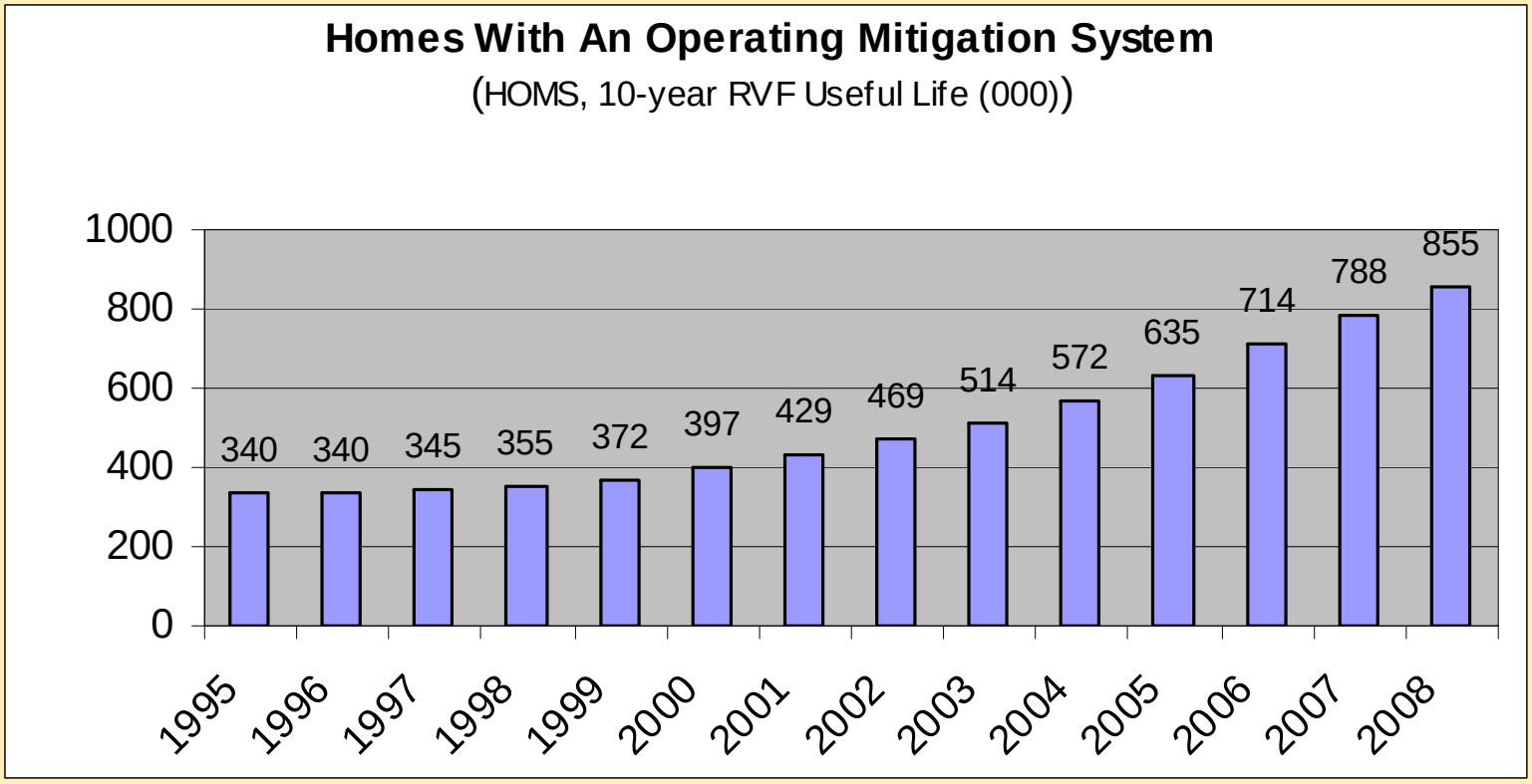
Radon Leaders Saving Lives



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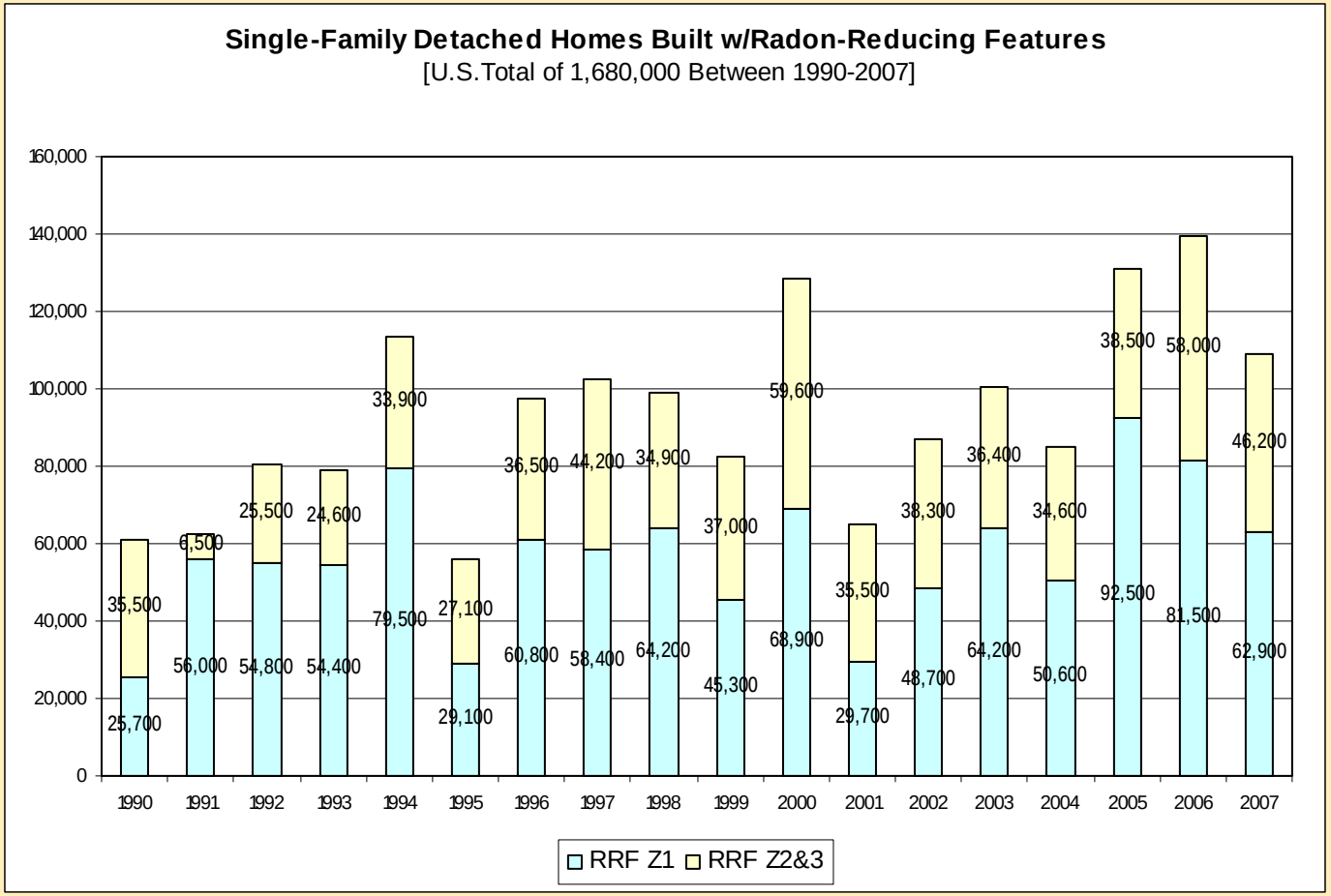

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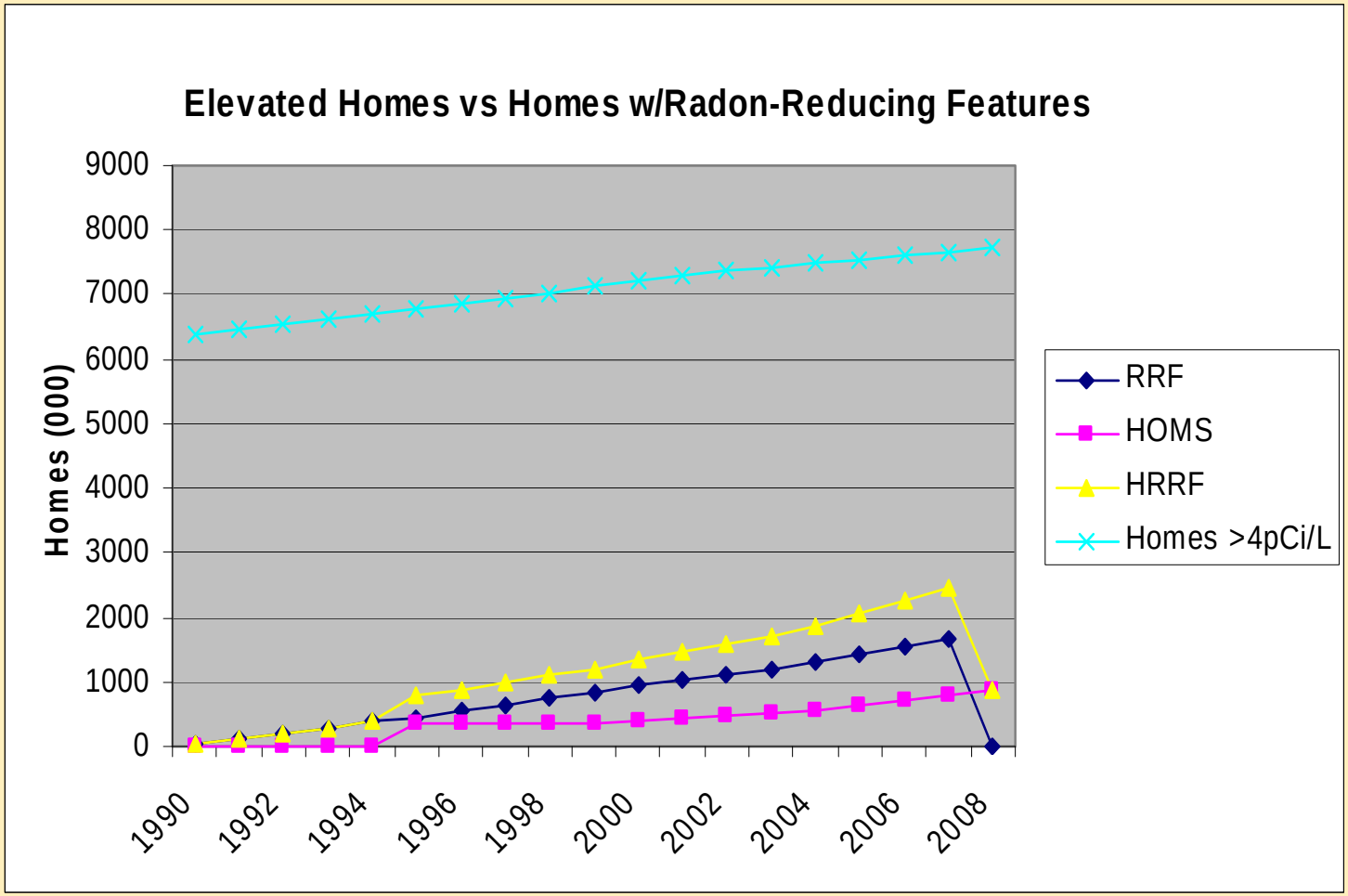


State of Radon

- More high homes now than ever
- Not keeping pace
- Housing market
- Need RLSL to work

Some Good News

- **Didn’t get cut!**
- **Portal**
- **National meeting**
- **Stakeholder dialogue**
- **RLSL**
- **Awards ceremony**
- **NRAM**

NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

EPA United States Environmental Protection Agency

Summary of 2009 National Radon Action Month Results

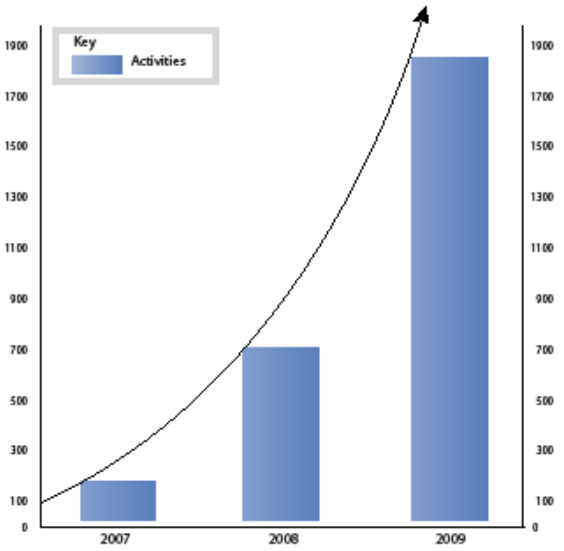
2009 activities increased by 169% over 2008!!

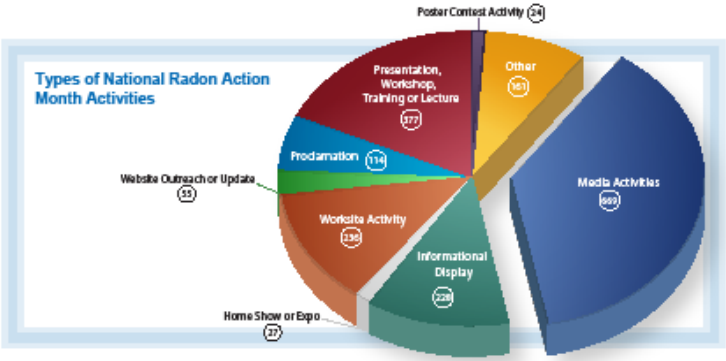
- Over 4 times as many radon presentations and lectures
- Over 50% more radon displays
- 178% increase in media activities
- Nearly 3 times as many media activities

Activities Conducted & Submitted to National Radon Action Month Website

- 1,891 activities in 2009
- 703 activities in 2008
- 164 activities in 2007
- In 2006, fewer than one dozen activities submitted

Region	Number of Activities
1	30
2	165
3	5
4	641
5	99
6	8
7	555
8	30
9	353
10	5





States With The Most 2009 National Radon Action Month Activities

States	Activities
Alabama	373
Nevada	352
Iowa	309
Kansas	167
New Jersey	134

VISIT THE NATIONAL RADON ACTION MONTH WEB SITE
WWW EPA GOV/RADON/NRAM/

Indoor Air Quality (IAQ)

Radon Leaders Saving Lives

Priorities for 09

- **Even better collaboration between feds, states, and industry**
- **More use “Results Acceleration” technology**
- **SIRG/mapping**
- **Increased use of web 2.0**
- **“Being Prepared” on legislation**

Requests/Offers

- **Join and participate on Portal**
- **Use the Change Package**
- **Come to national meeting – be open to process**
- **Always think how you can double**

Stakeholder Consensus Process

- **EPA, States, Industry**
- **AARST, NEHA/NRPP relationship**
- **Mitigation standard harmonization**
- **Device accuracy/lab referencing**

OIG Report

- **Overall program review**
- **2nd Evaluation Coming**

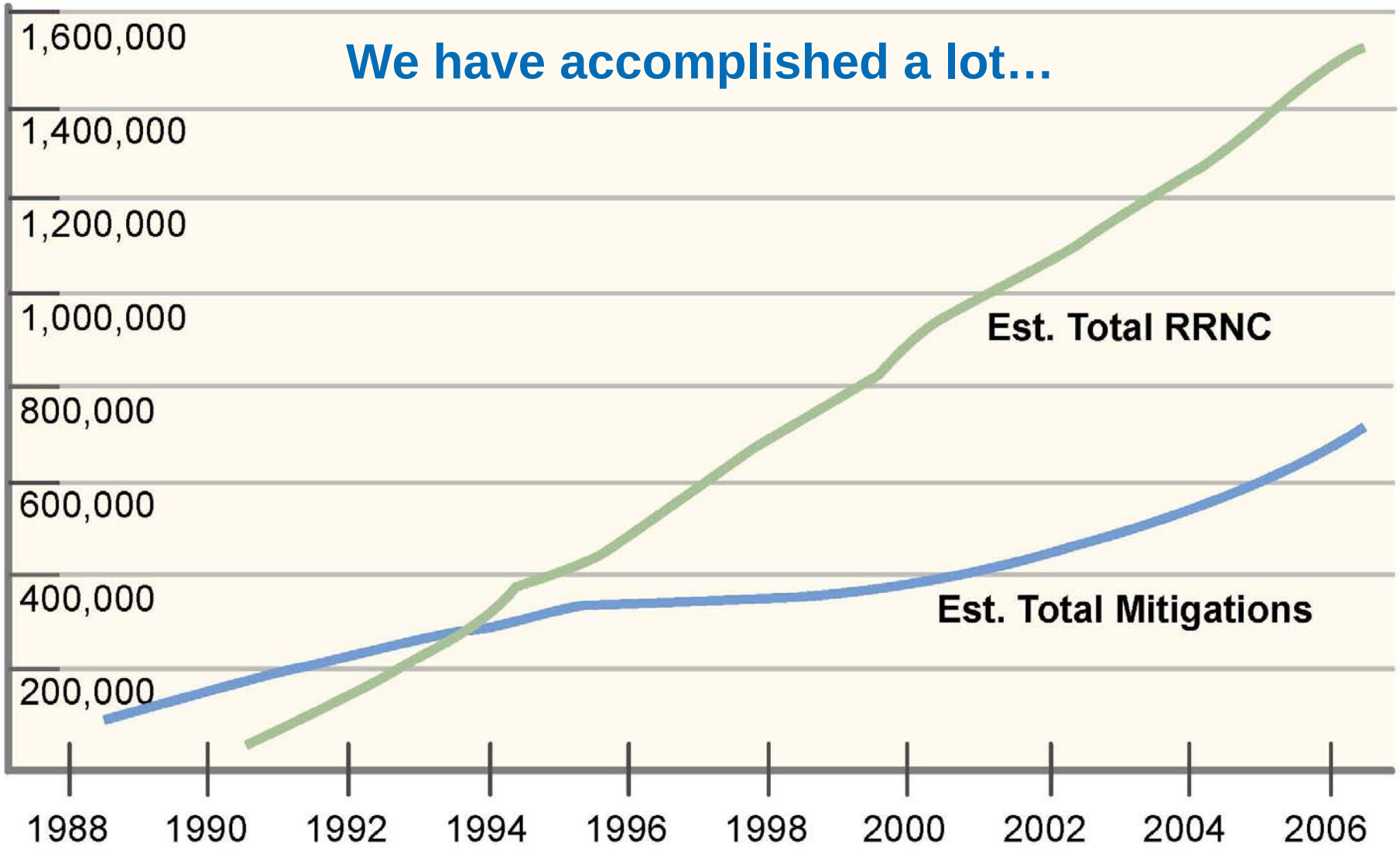
Radon Leaders Saving Lives Campaign

Launched in September 2007, by EPA, AARST, and CRCPD at the JAX Radon Meeting

NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

We have accomplished a lot…



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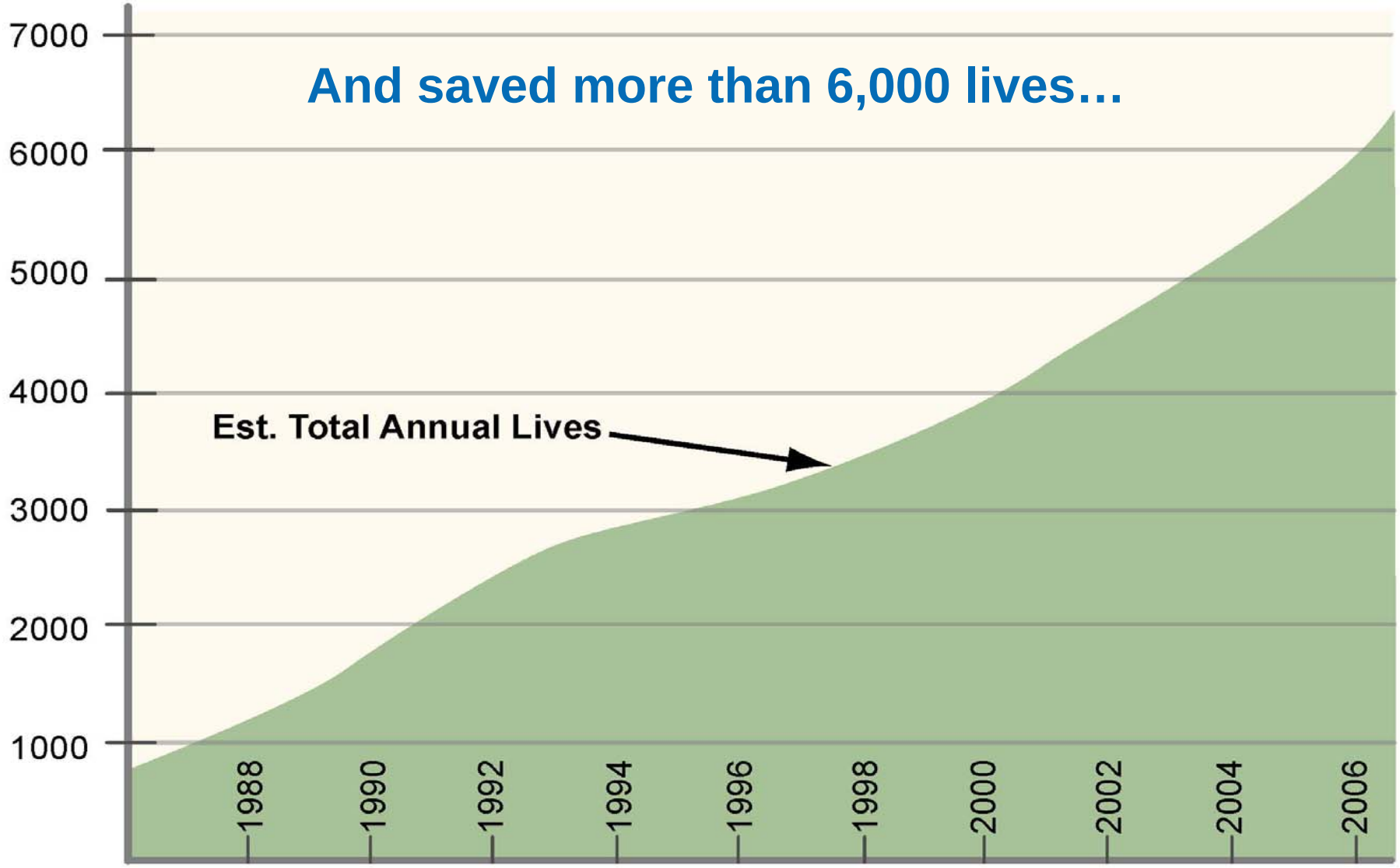
Radon Leaders Saving Lives



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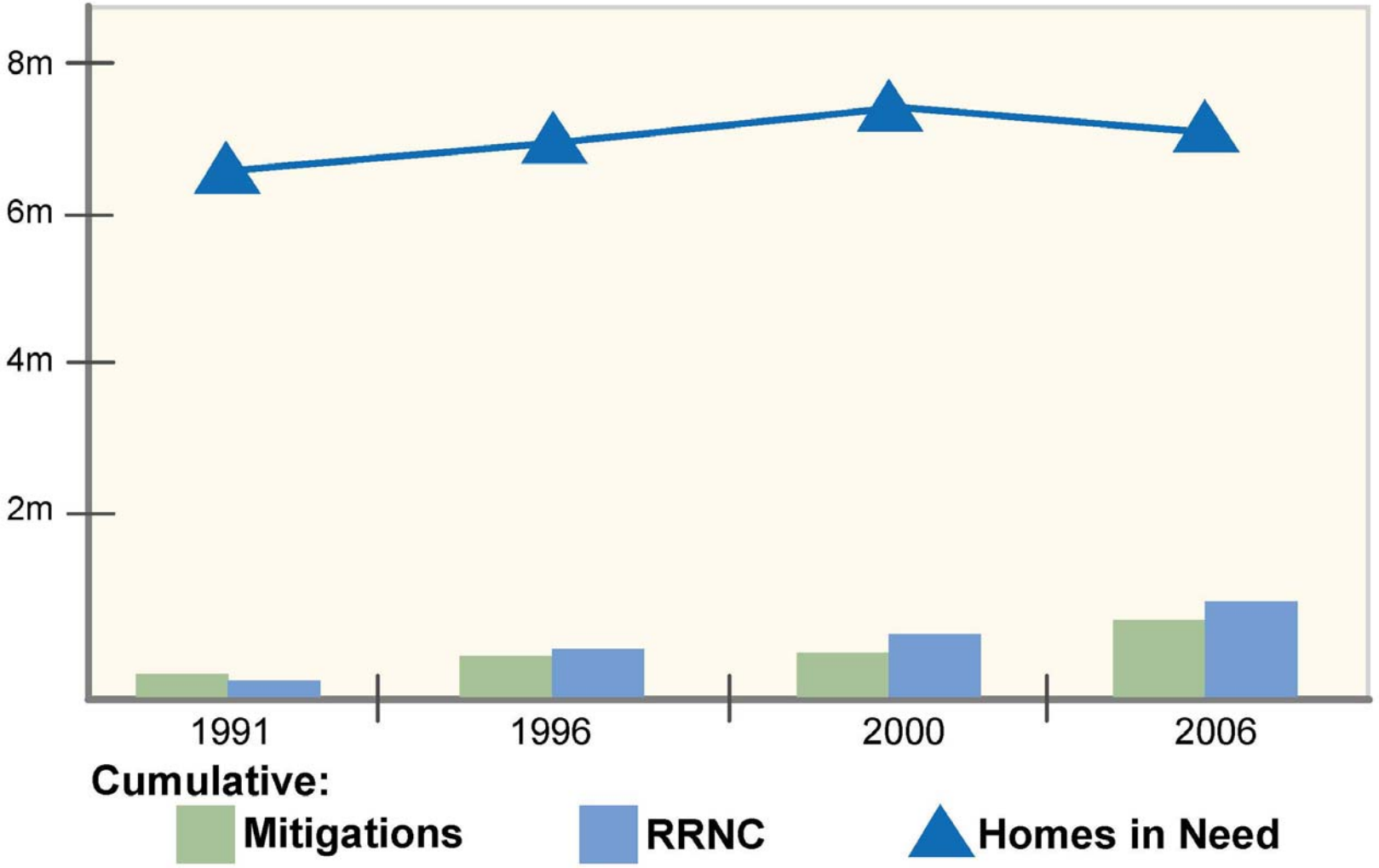
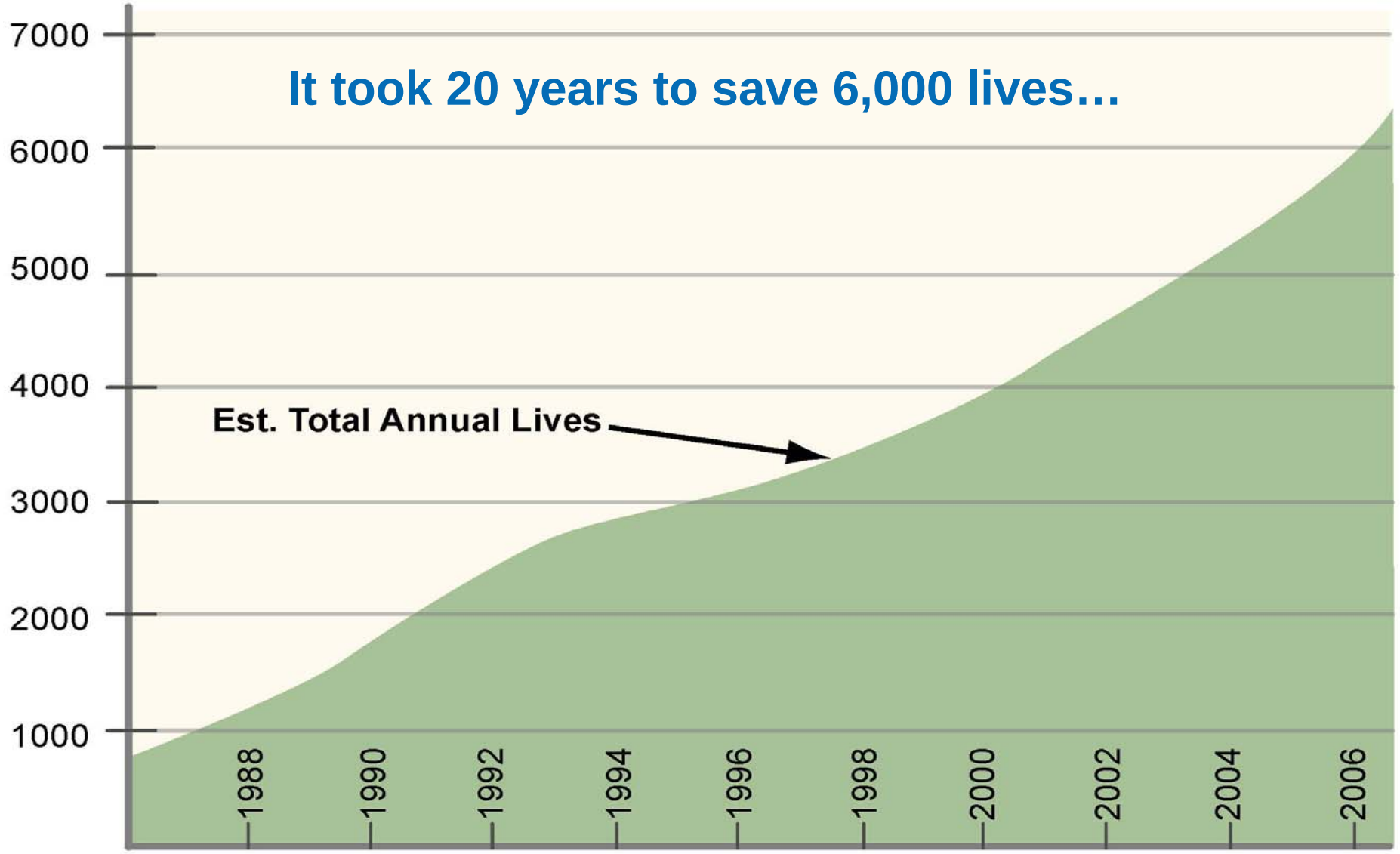
We still have much to do…



NATIONAL RADON PROGRAM

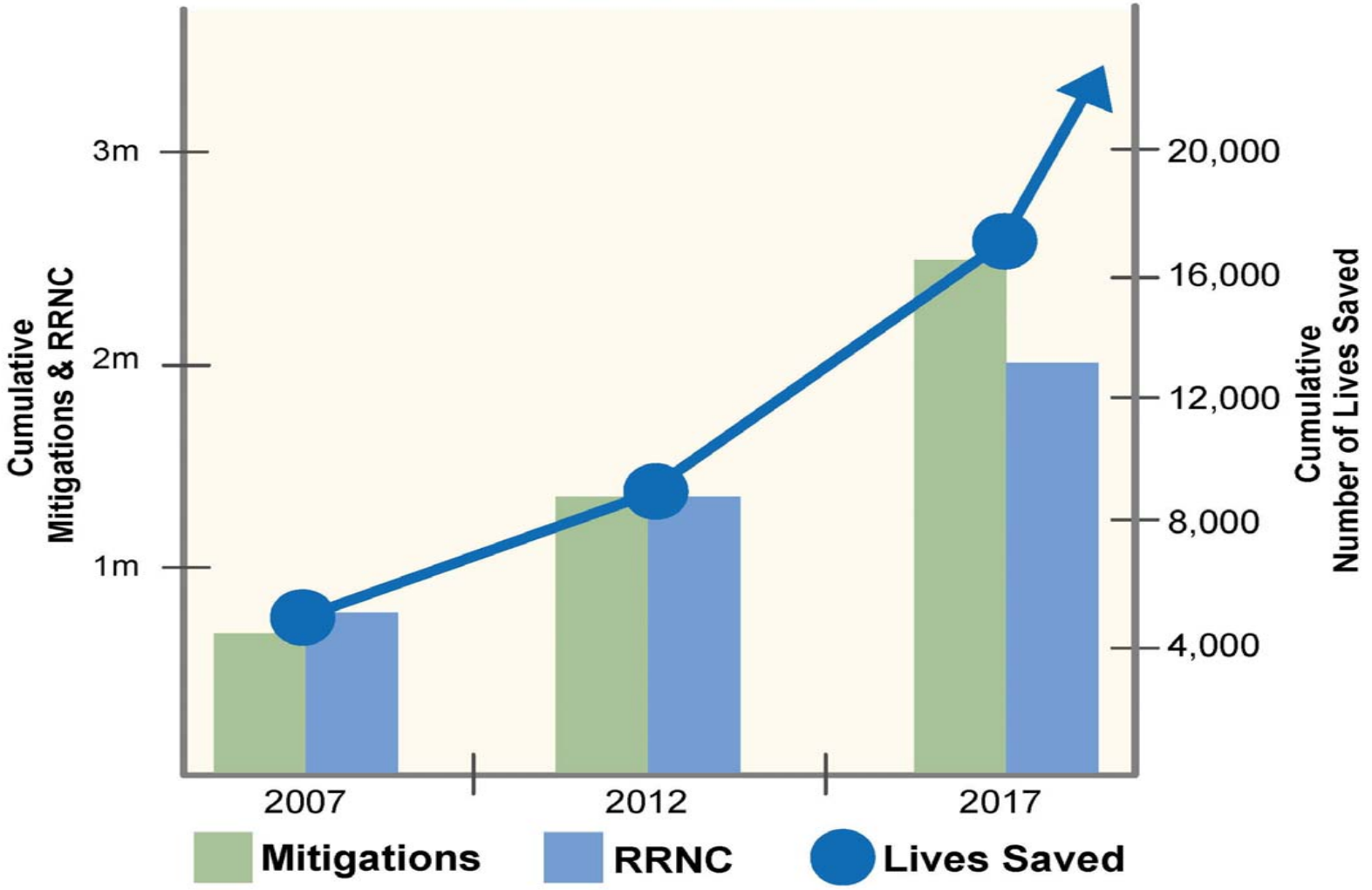
Radon Leaders Saving Lives



NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

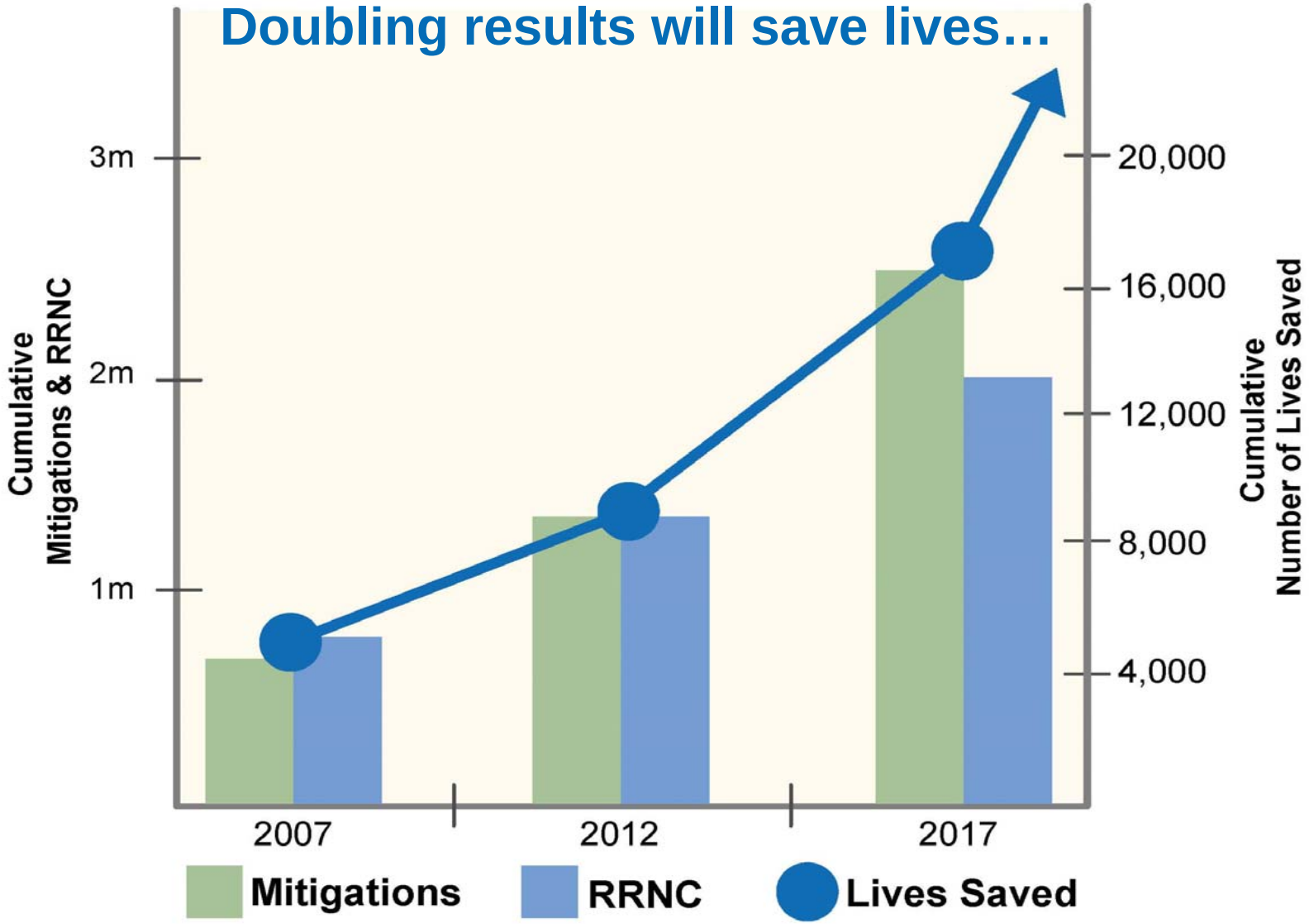
We can double our results in 5 years…



NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

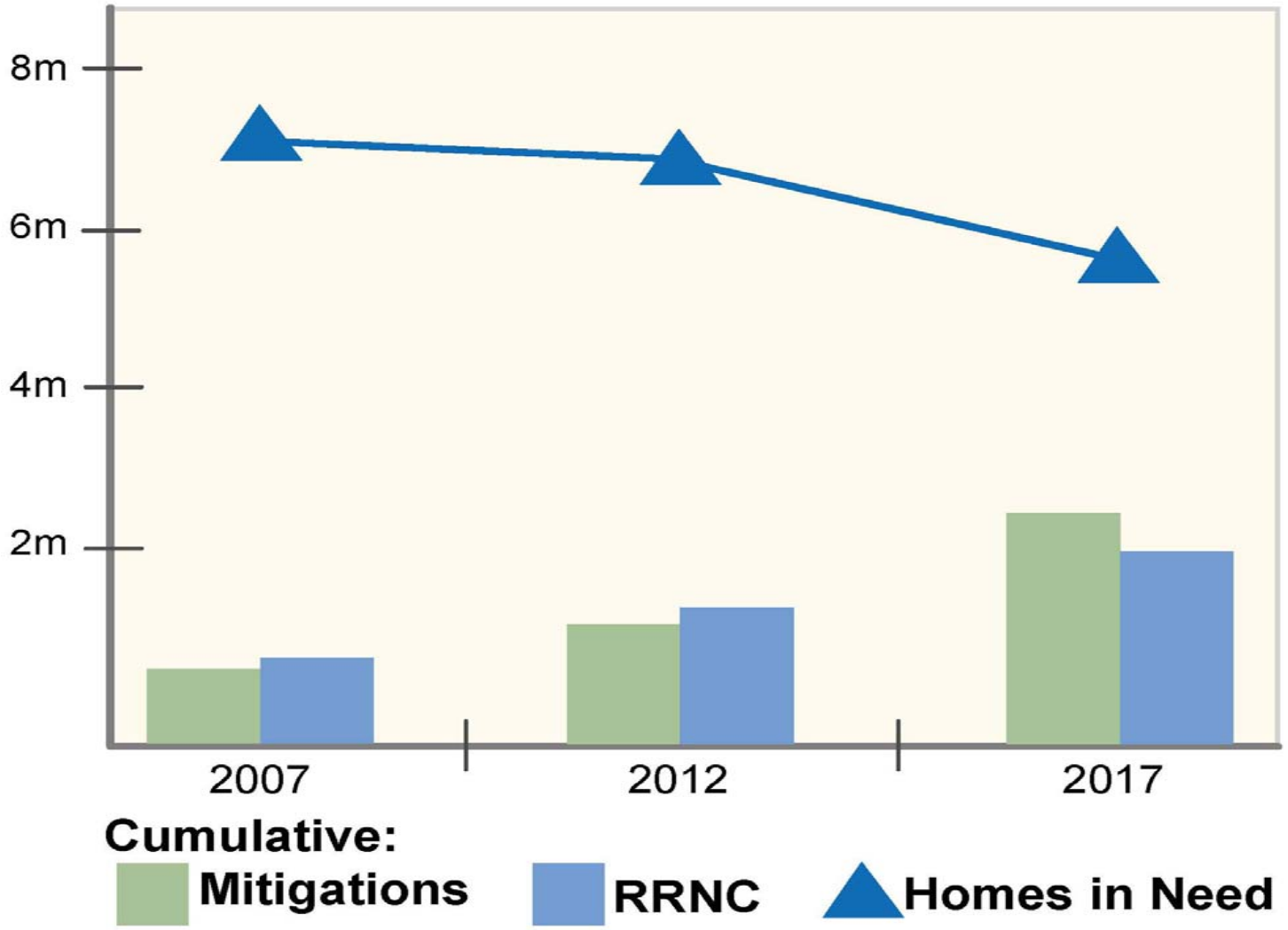
Doubling results will save lives…



NATIONAL RADON PROGRAM

Radon Leaders Saving Lives

And close the radon risk gap…



The Chemistry of a Nightmare

2009

Contribution by

Gary Hodgden

Kansas City

Houses from Heck come in all forms.

Topics:

- A range of system failures and related concepts.
  - *Probably universal.*
  - *Some experienced a 100 times.*

Classrooms provide us tools

- Training Courses: Diagnostics = Sizing
  - Jack Hughes – EXCELLENT Course
  - Tomorrow!!
- Advanced Evaluation Skills:
  - Air flow capacity,
  - Fan capacity,
  - Tough homes and much more ….

Classrooms can't provide:

- The Temperament
- Determination
- Imagination
- Creativity

  - If not careful, blind reliance on classroom skills can allow you to *fool yourself!*
    - I've been there.

Statistics (Pennsylvania)

- 90% of all systems go below 4 pCi/L on the first retest.
  - Very good statistic!

Statistics (Pennsylvania)

- 90% go below 4 pCi/L on first retest.
- But this means 10% don’t.
- …I concur (from experience).

Why?

- Is it shoddy work?
  - We see lots of photos on this …..
  - Usually such photos don't relate to success or failure.

Why?

- In Reality:

  It’s the nature of the beast.

Costs of 10% failure

- With Care:
  - You can drop that to 5%,
  - more often get below 2 pCi/L
  - save money
    - Mitigator pays either way for this 10%
    - Not the consumer

Costs of 10% failure

Still:

- The line between good practice and a consumers choice for the lowest bidder?

….. It’s a very, very thin line.

- Note: $3800 would be the average cost if charged at Health care rates. *(*Tom Heine)*

A look at

the Chemistry of a Nightmare.

Components of a Nightmare

- What I can’t see
- What I can’t change
- What I can’t control

Mix any two for a nightmare

- Components.

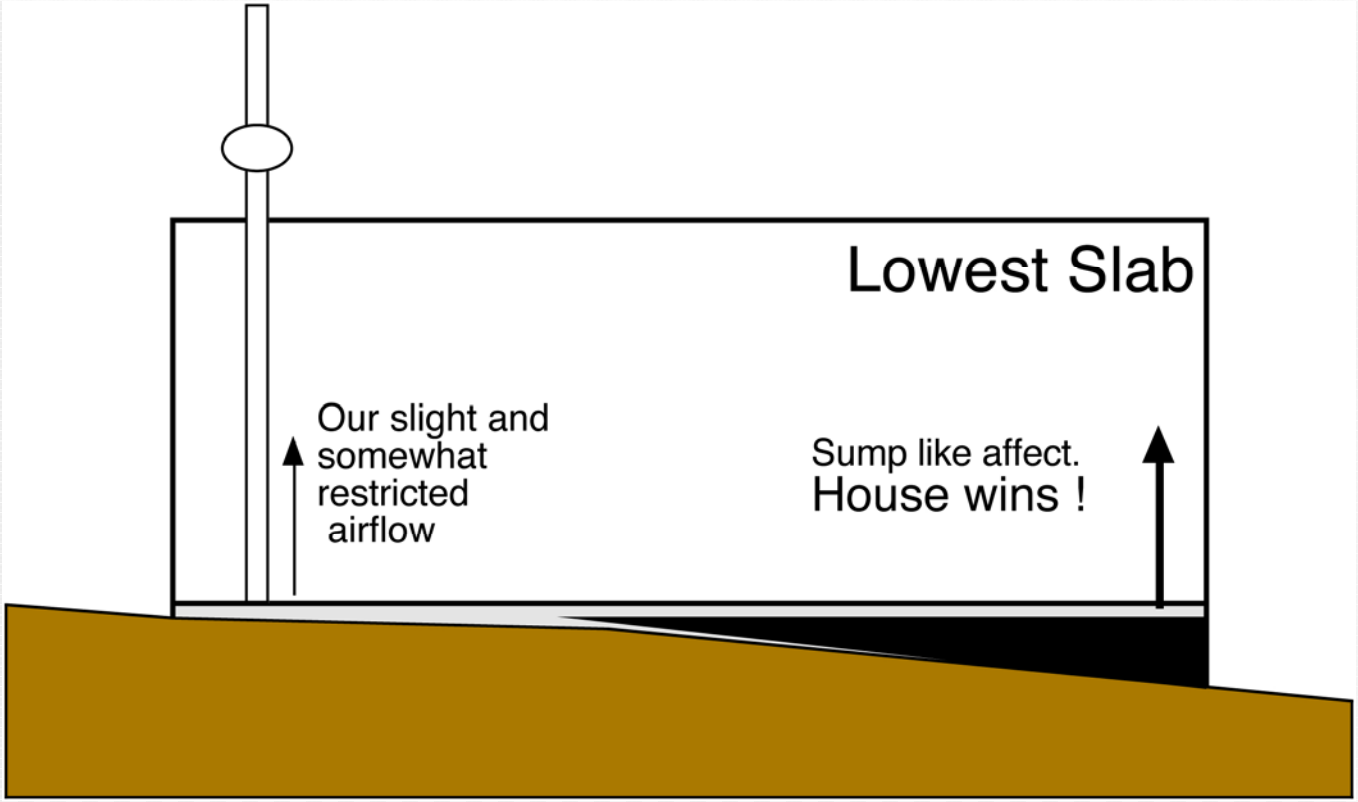
  Can’t see, Can’t change or Can’t control

- Explosive Catalysts
  - Insane Client
  - Insane Building

- Mix MORE than two and your standing in a ~~Clusterf@!k~~ House from Heck.

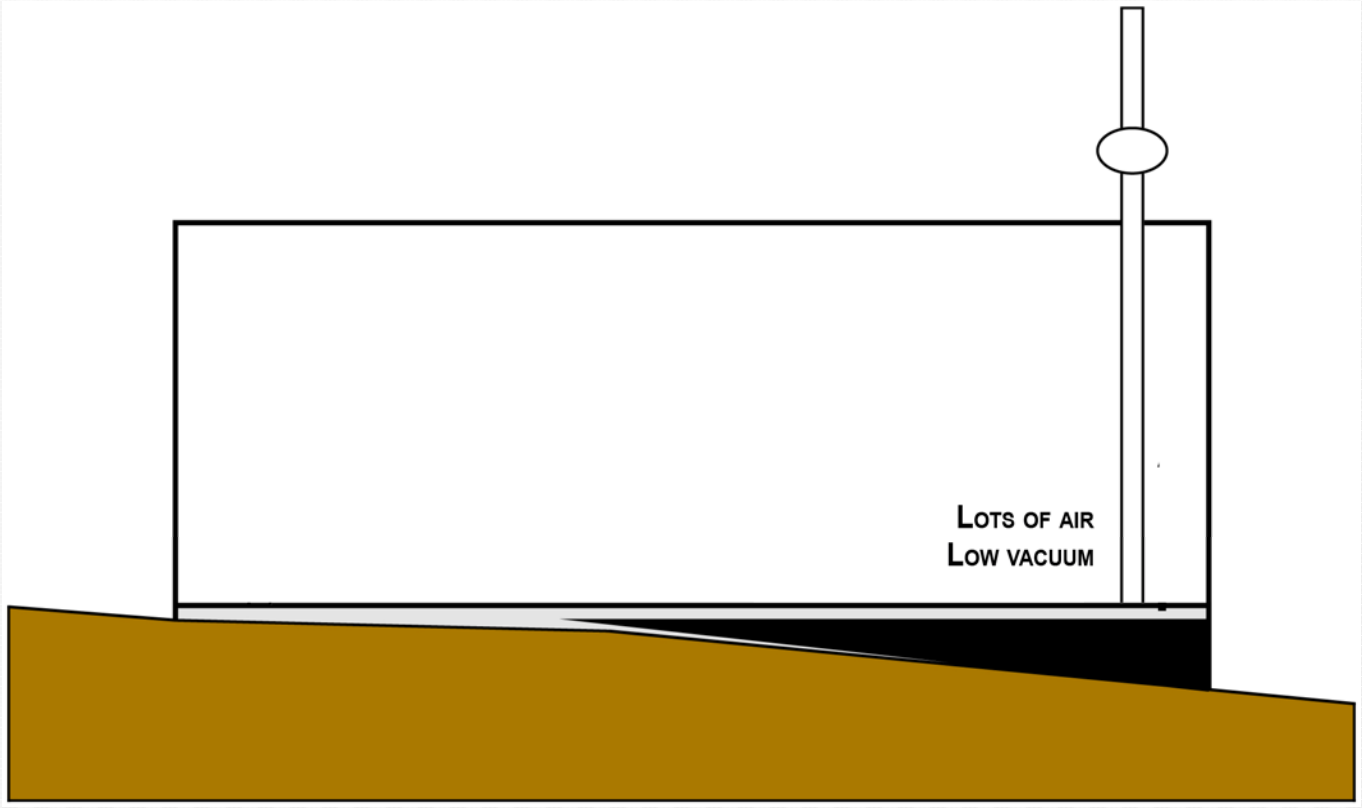
What we can't see:

- Voids! (where do we drill?)



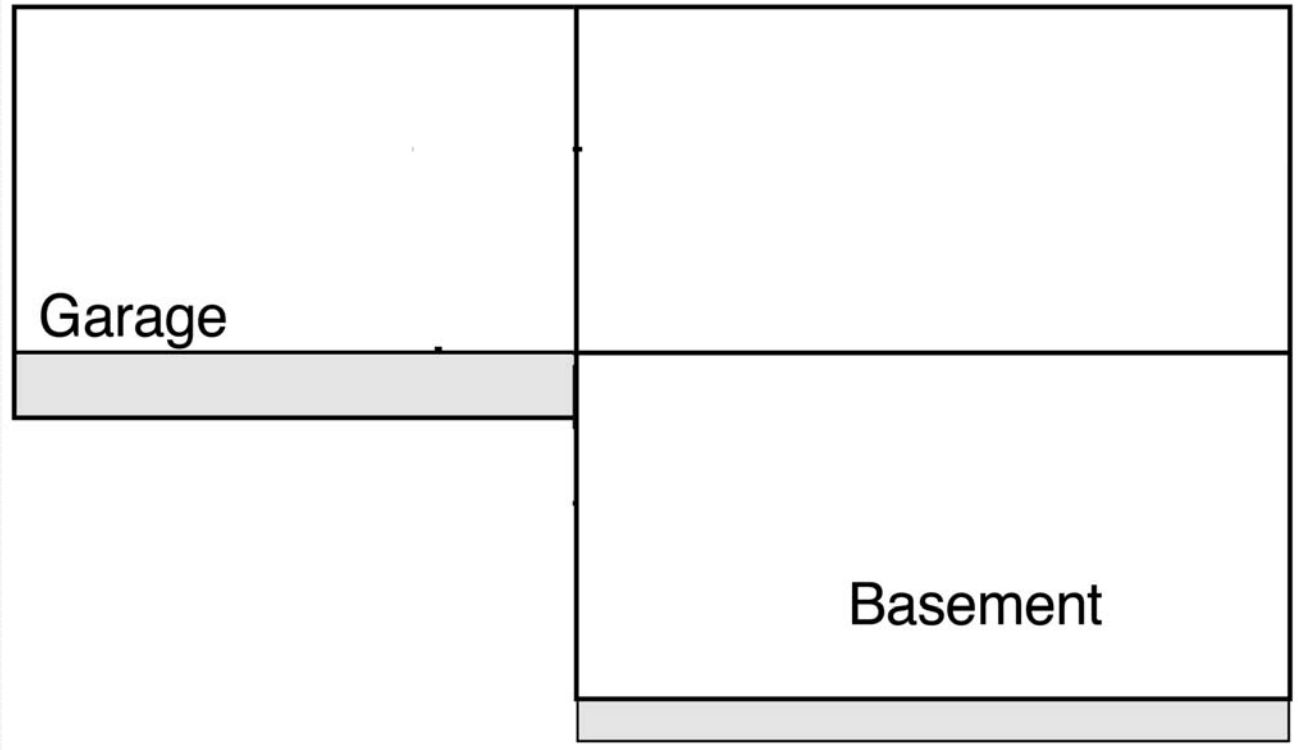
What we can’t see:

- Voids! (If you’d only known?)



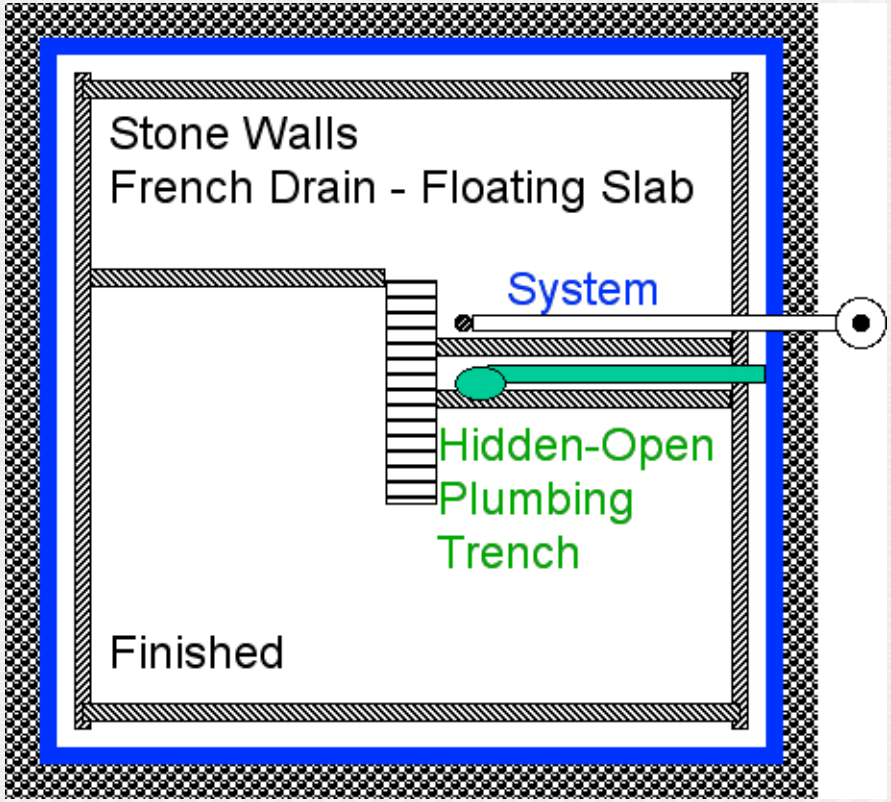
What we can't see:

- No indication of any suction!
  - Sand, Dirt, Silt, Clay.



What we can’t see:

- Loss of pressure (behind finished walls)



What we can't see:

- Loss of pressure
  - Open Exterior drain tile. (Under rocks-other).
    - *Frozen water in sump pit with open drain tile 4 feet outside in window well.)*
  - 10 feet deep gravel
  - Jack Hughes: ….. Cave on the other side of block wall.

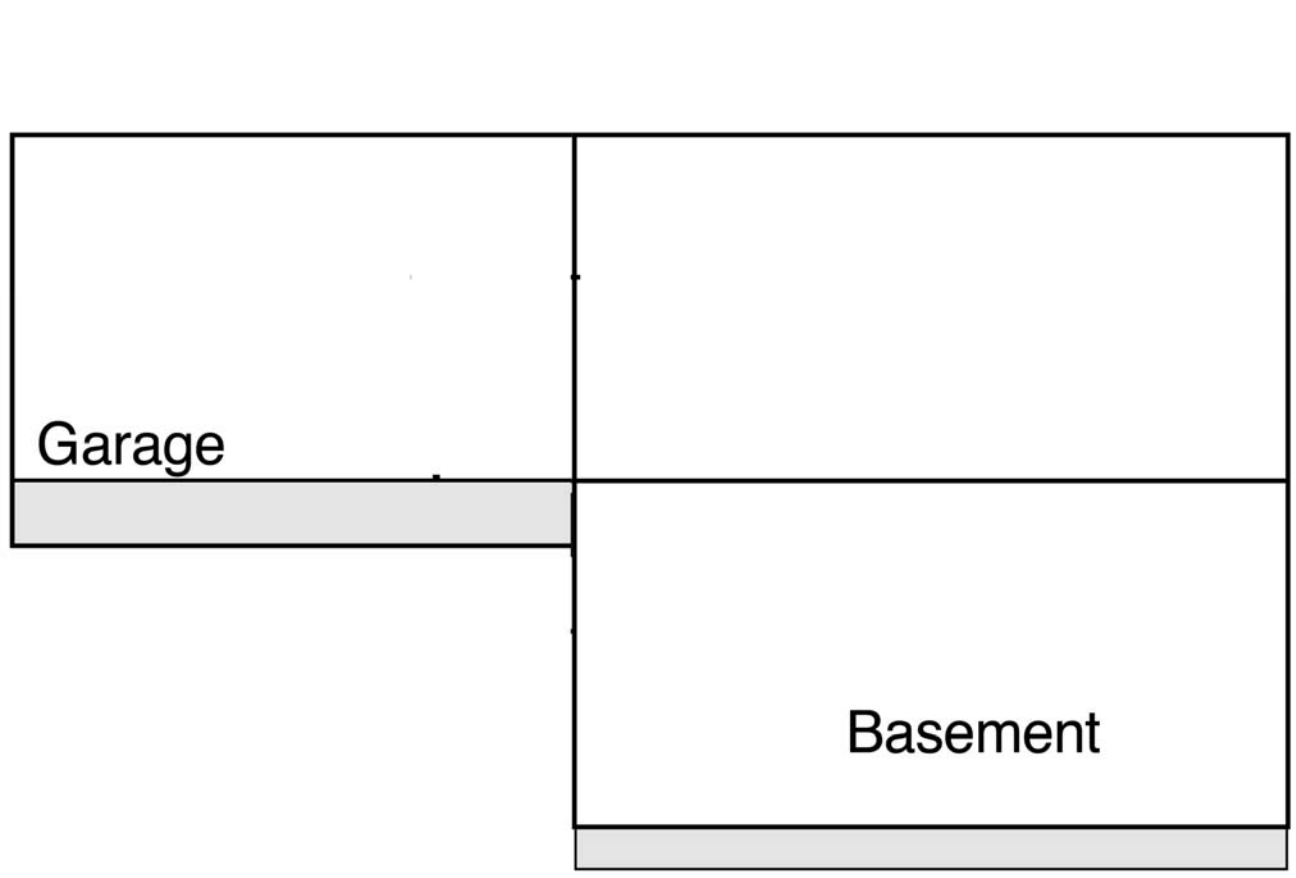
What we can’t see:

And:

- **How much radon is coming from somewhere else?**

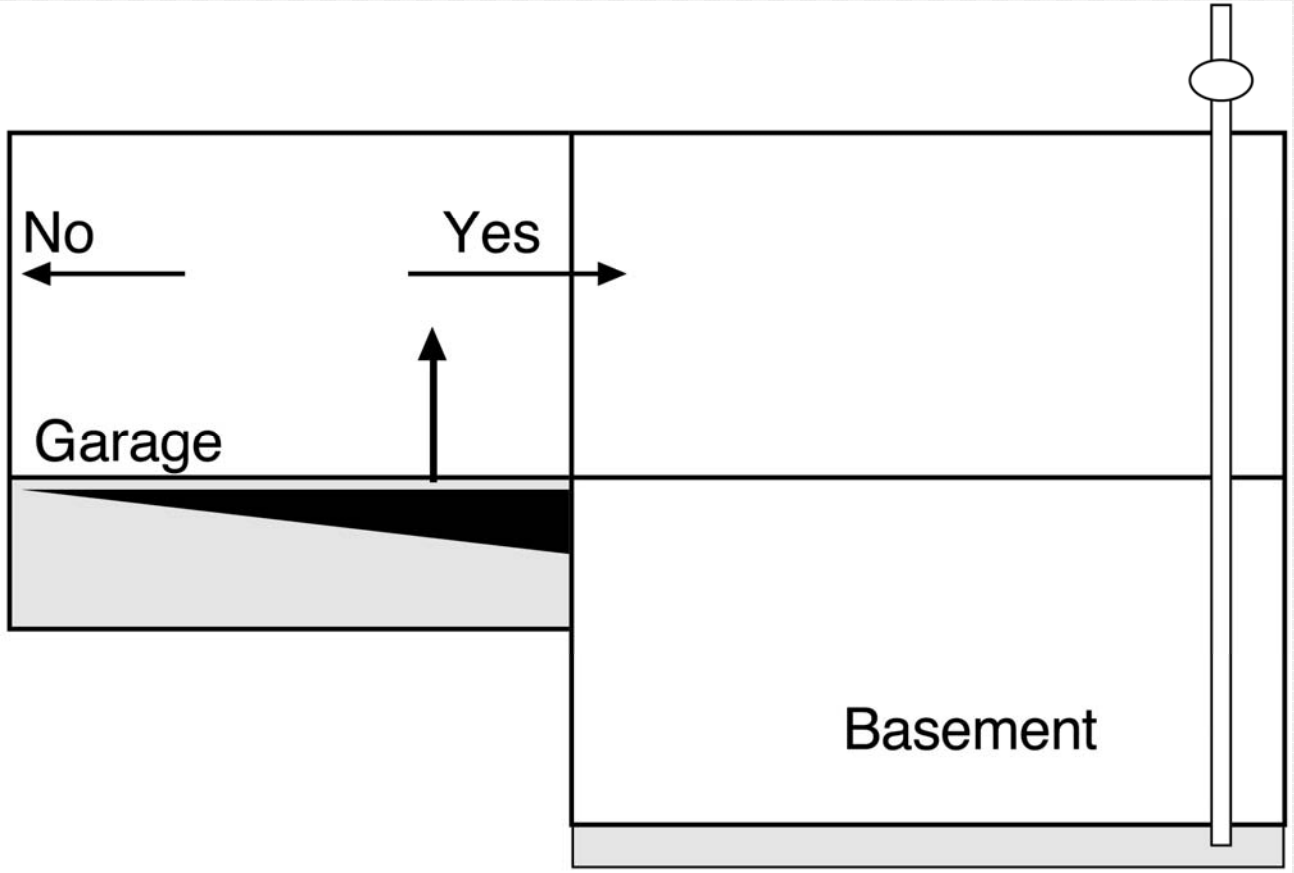
What we can't see:

- Real Example: 120 pCi/L (initial test)



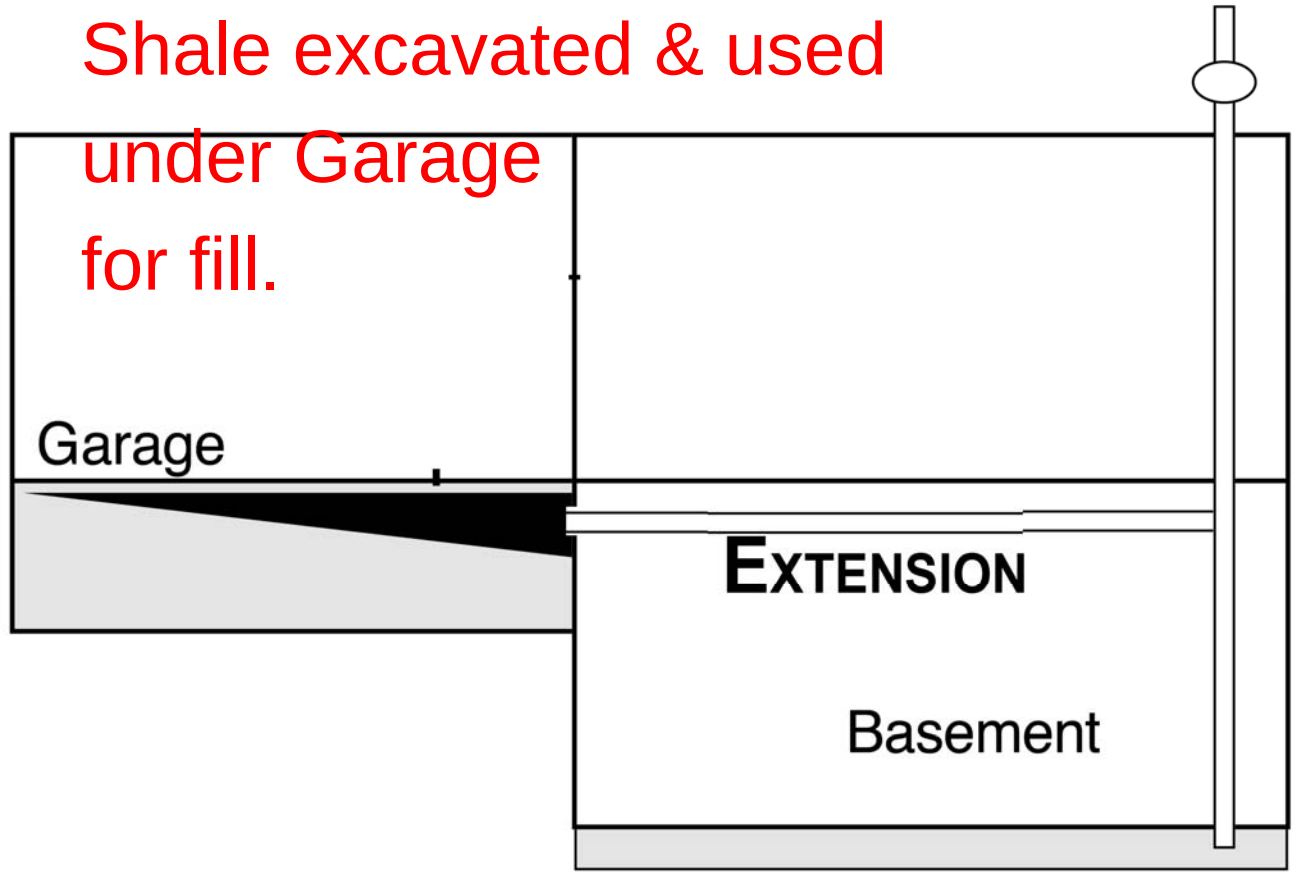
What we can't see:

- 128 pCi/L (after system)



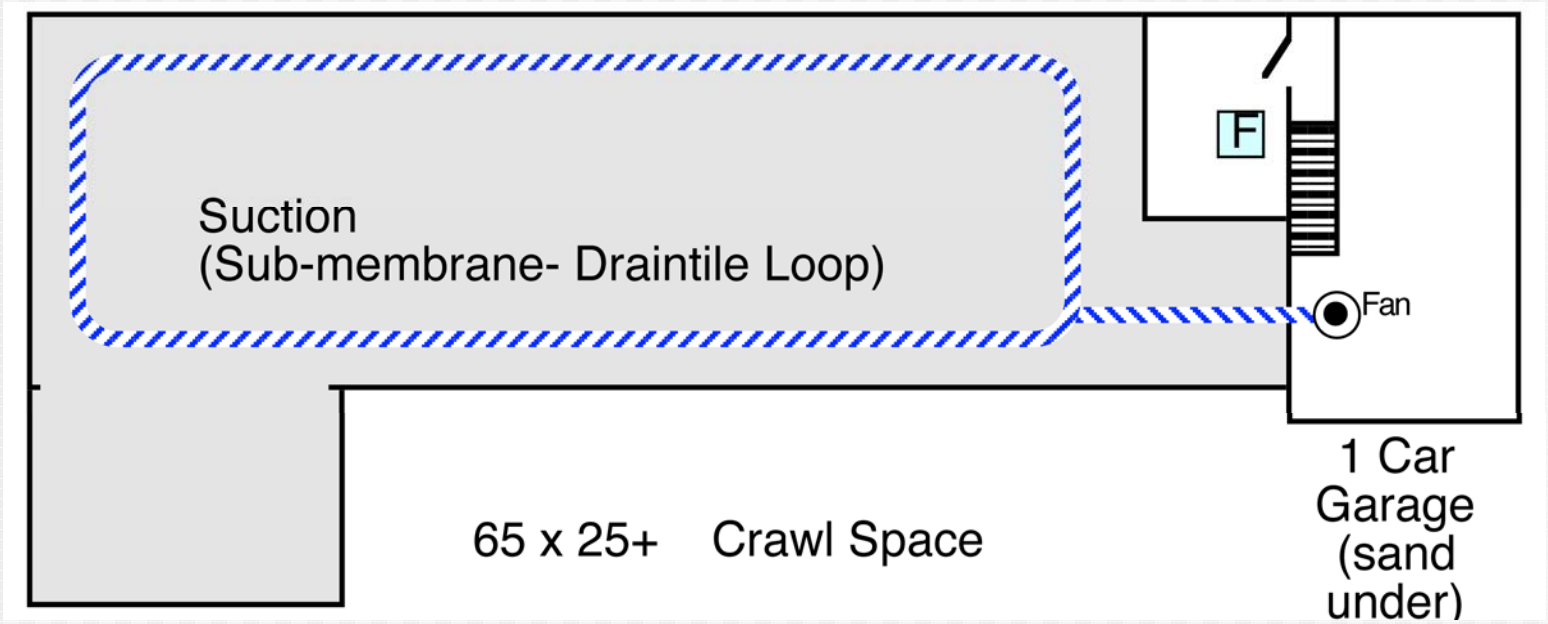
What we can't see:

- 0.8 pCi/L (after extension).

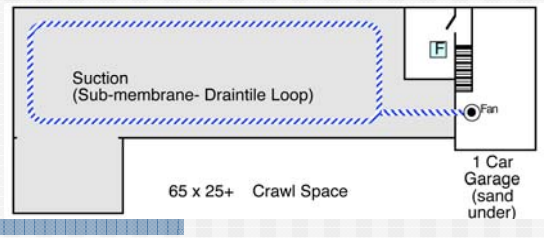


What we can't see:

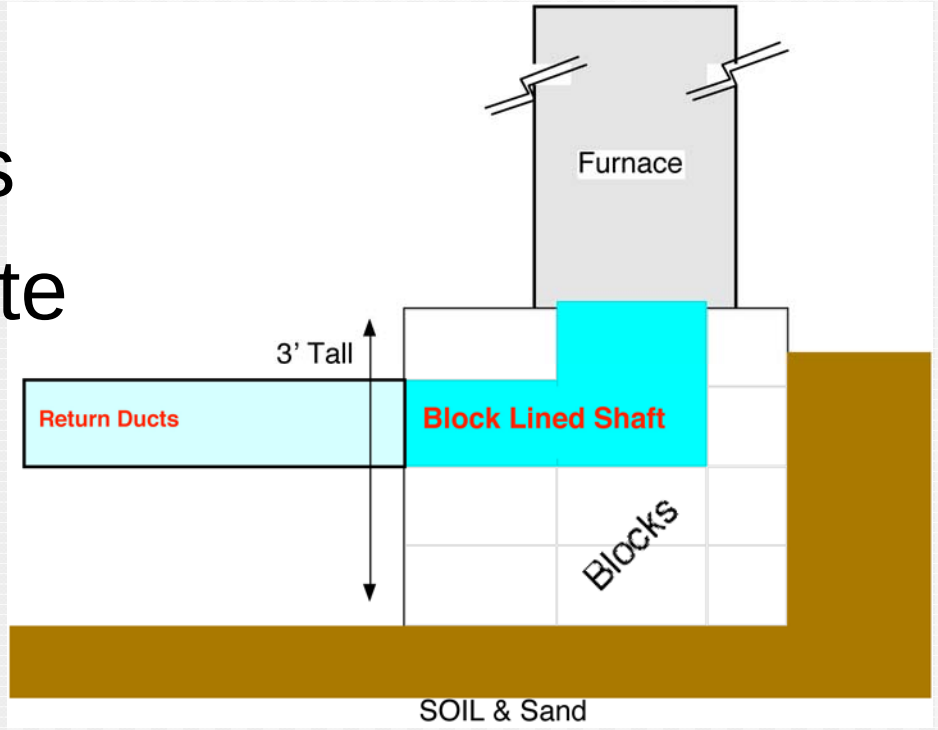
- Because WE didn't look!
- 6 pCi/L



What we can't see:

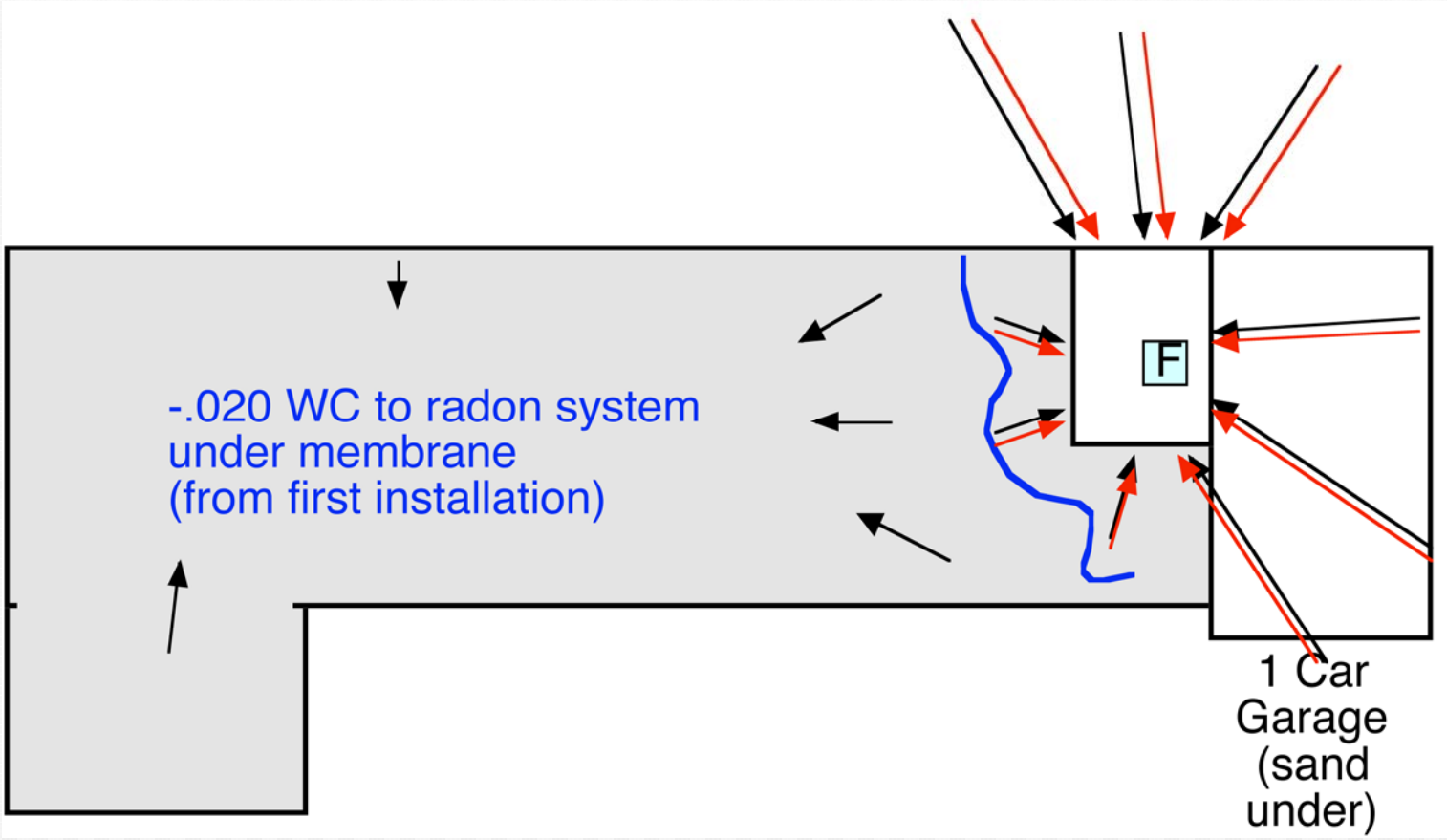


- $1000 income
- $1680 Materials
- 101 hours on-site
- 72 travel hours
- -$7600 (1993)



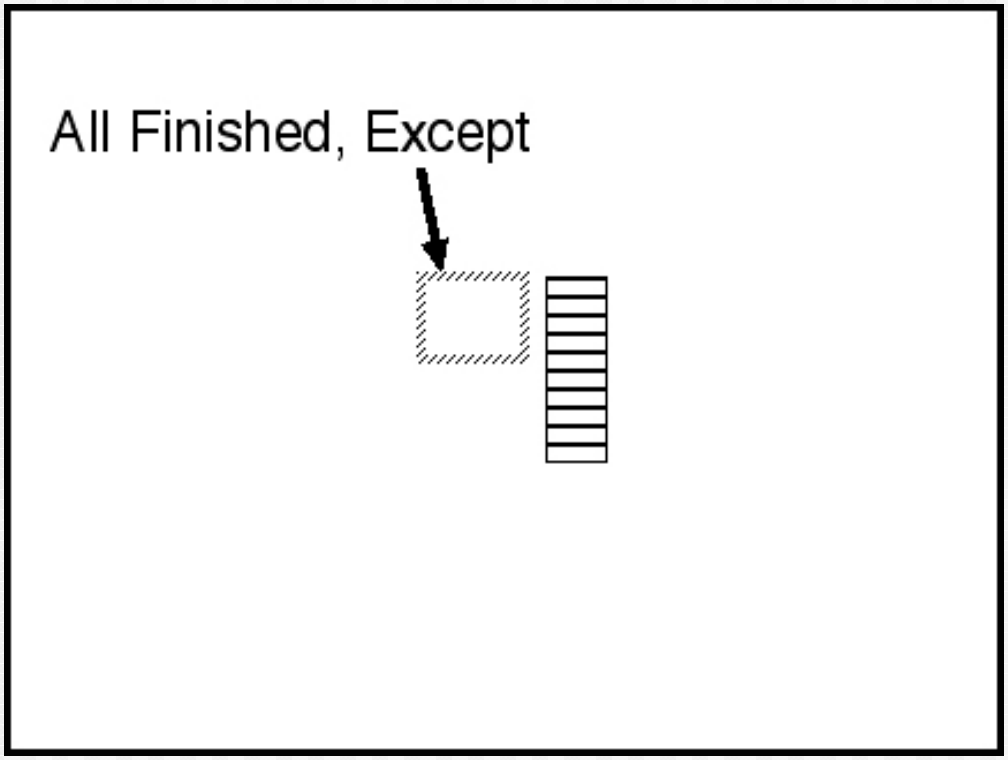
What we can't see:

- Didn't expect ….. so WE didn't look!



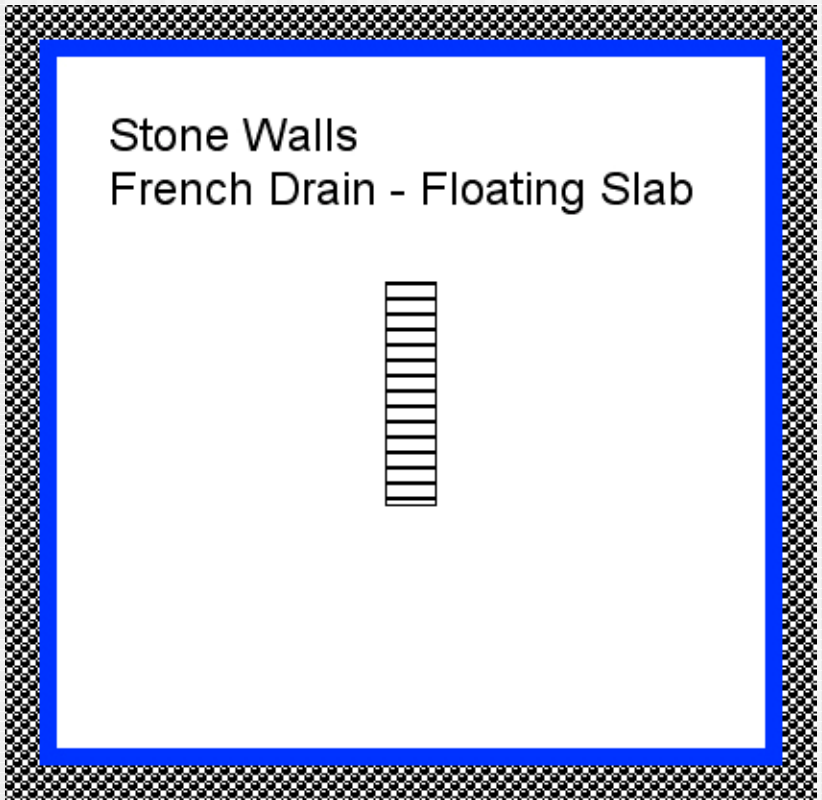
What we can't change:

- Finished areas



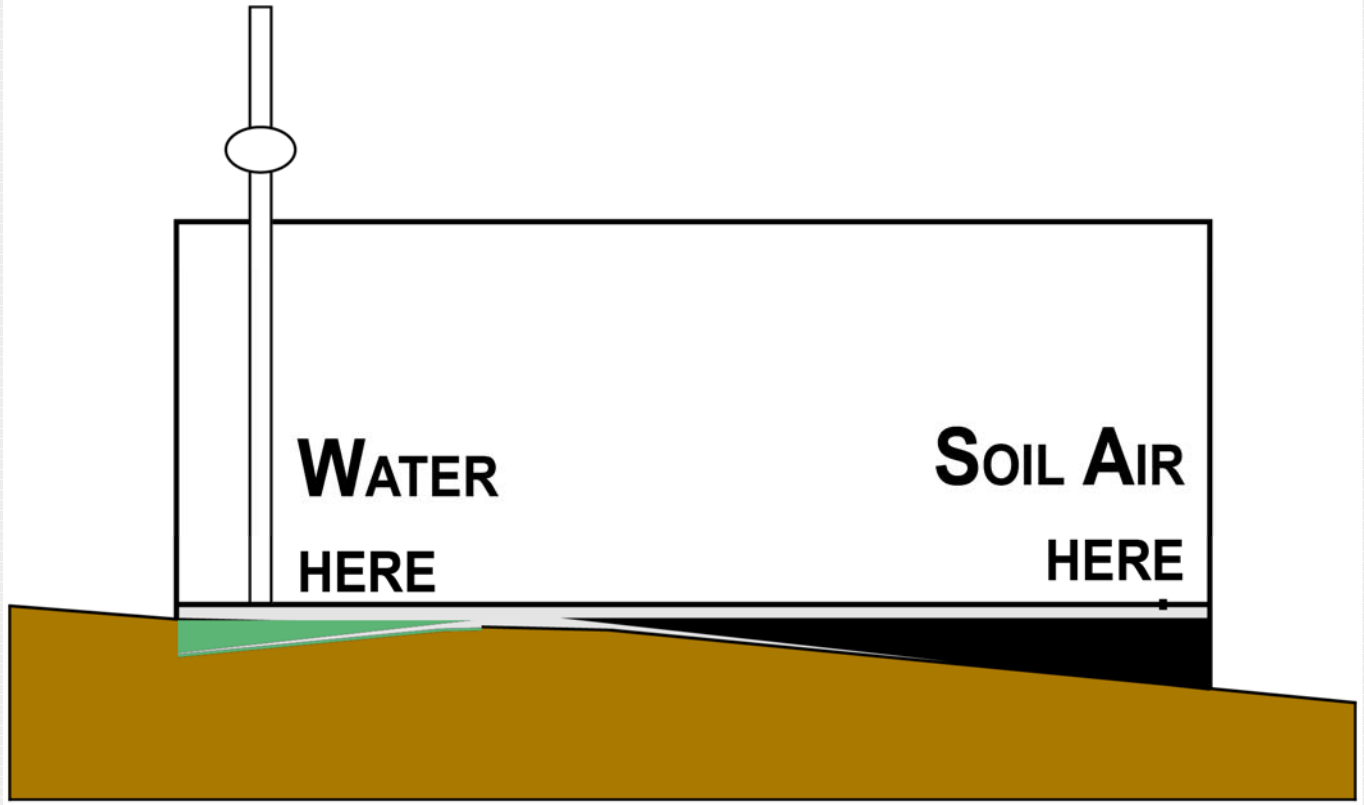
What we can’t change:

- Building Practice (Those years, That day) … or everything that’s happened since.



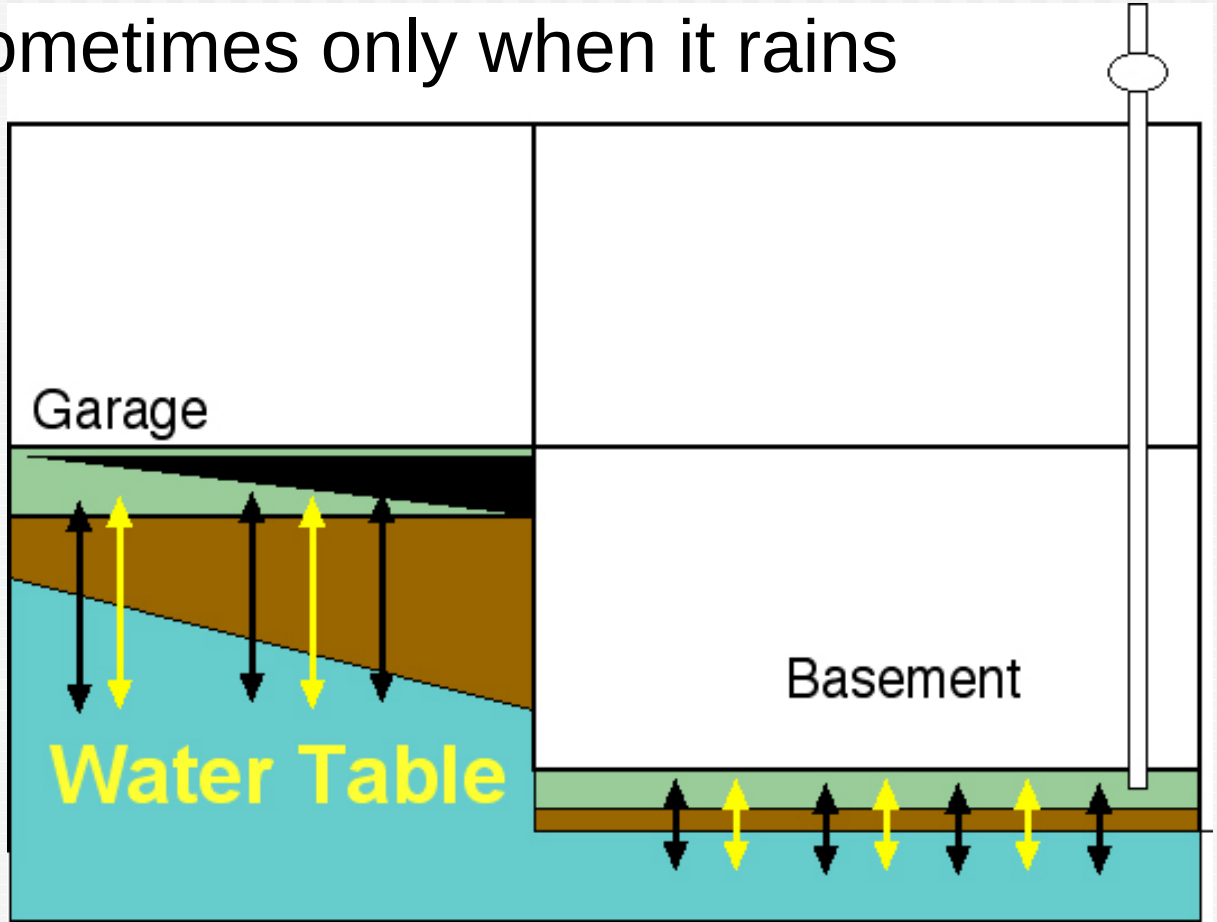
What we can’t change:

- Water: Grading/settlement under slab



What we can't control:

- Wet conditions (Now - or – Later)
- Sometimes only when it rains



What we can’t control:

- Foundation changes
  - Loss of pressure: Squirrels dug a hole under the foundation.
  - Pipe that should drain but fill with water. A “level” showed the house was tilted 6”.
  - Attic pipes pulled apart.

Explosive Catalysts
Nutty Clients

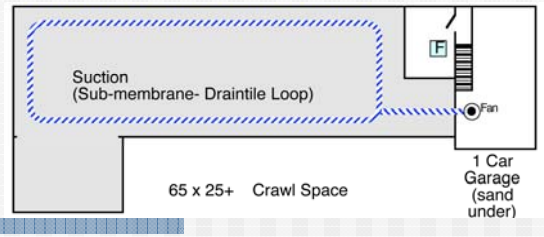
- Follows you on every screw ……you drive away ….. fan unplugged.
- Those that knows nothing….. and demand the impossible.

Nutty Clients

- Knows everything and demands a design that won't work. **
  - Owners/Engineers/Contractors
  - And you must also guarantee it.

- Less than 2?

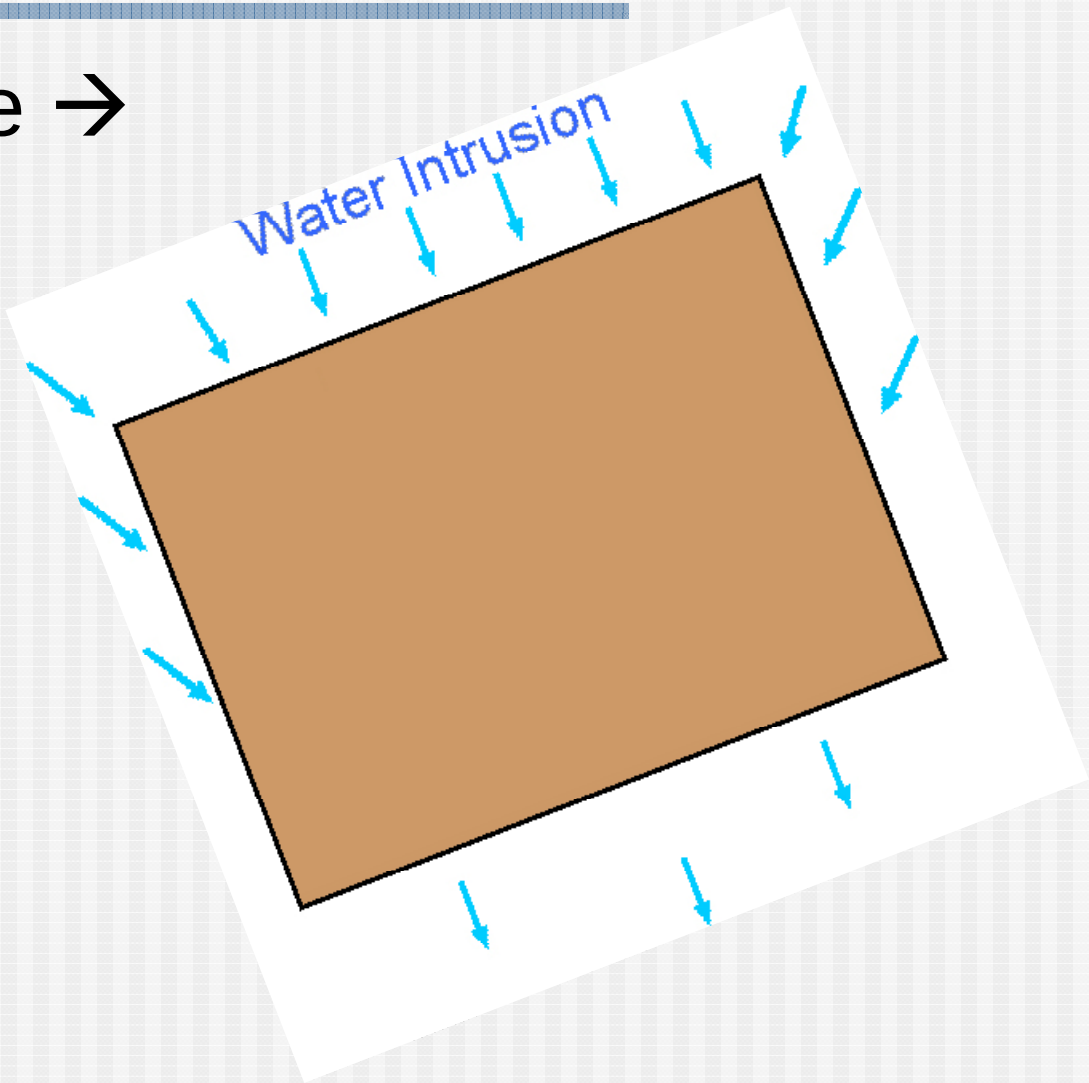
Nutty Buildings



- Built on railroad ties
- Brick basement floors
- Radiant heat –*water pipes under homes.*
- Berm homes (with no pipe exit pipe)
- Asbestos coated crawlspace.
- Subslab return ducts made of asbestos.

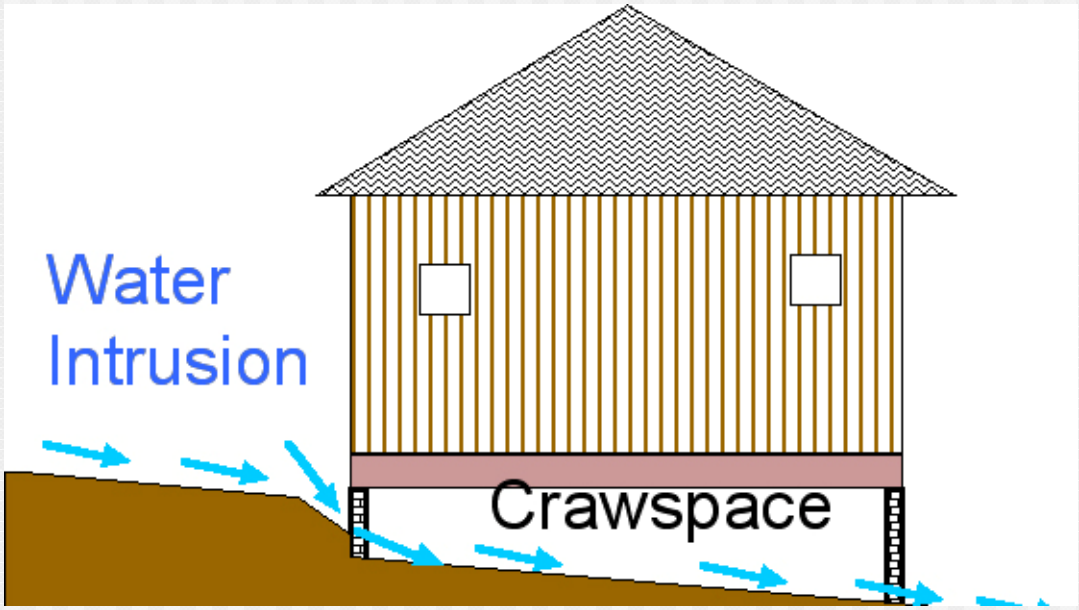
Add two or more
Can’t control + Nutty Client

- Crawl Example →



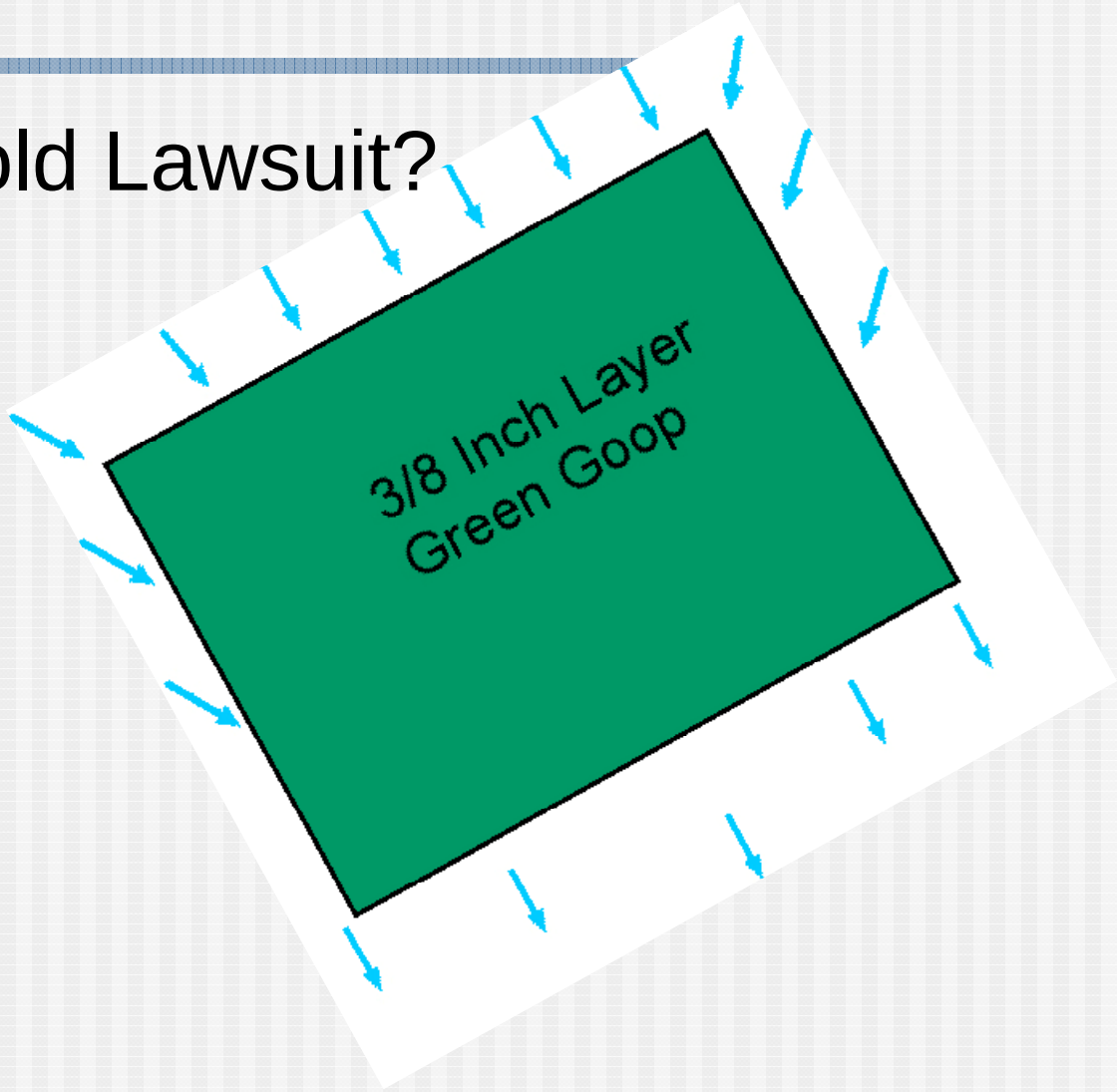
Can’t control + Nutty Client

- Homeowner won’t fix drainage ($5000).
  Foundation getting bad.



1 year later

- SMELLS - Mold Lawsuit?



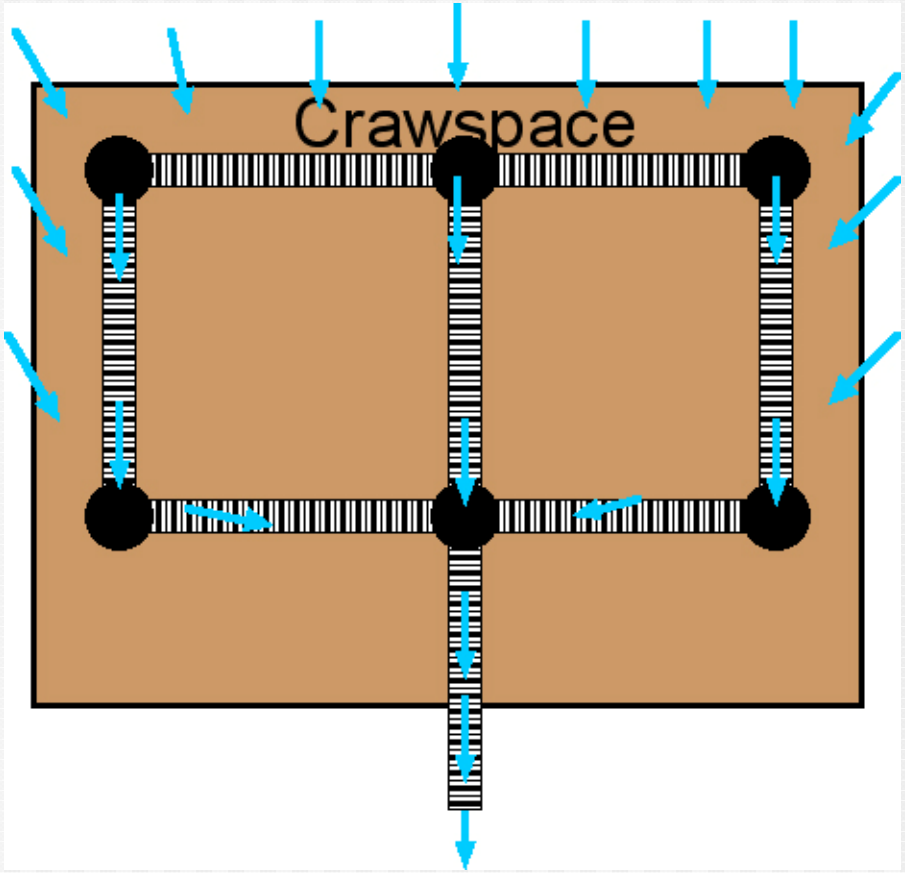
What do you do?

So …..

- Rip out old
- Trench and Pits
- Passive Water

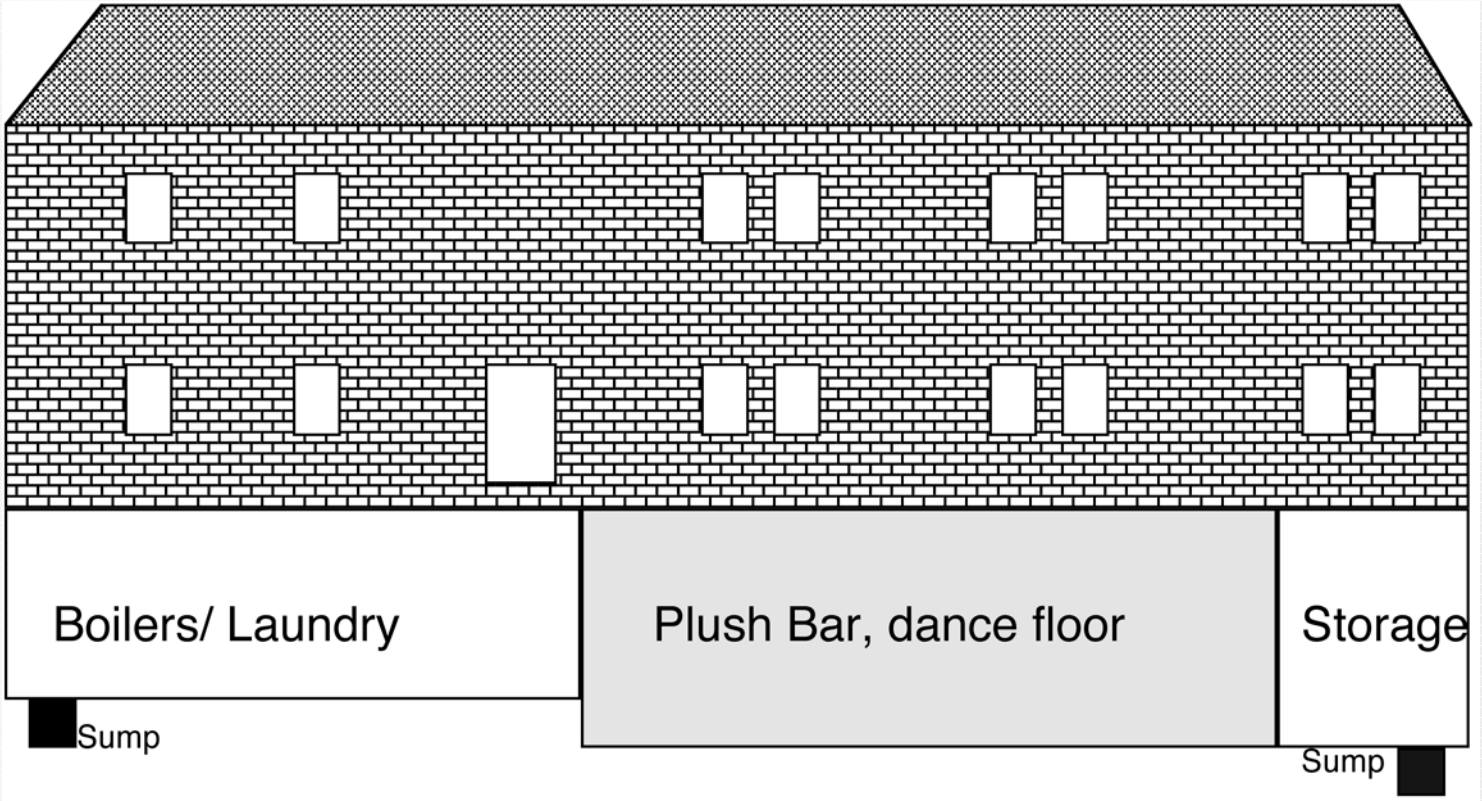
Control Complete!

- For free

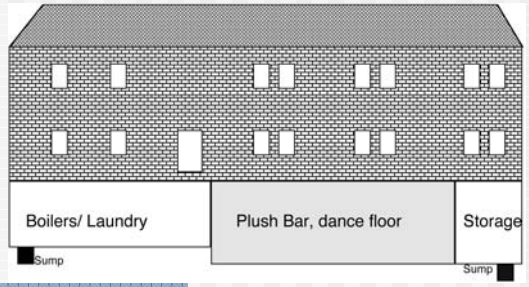


Can't See + Can't Change

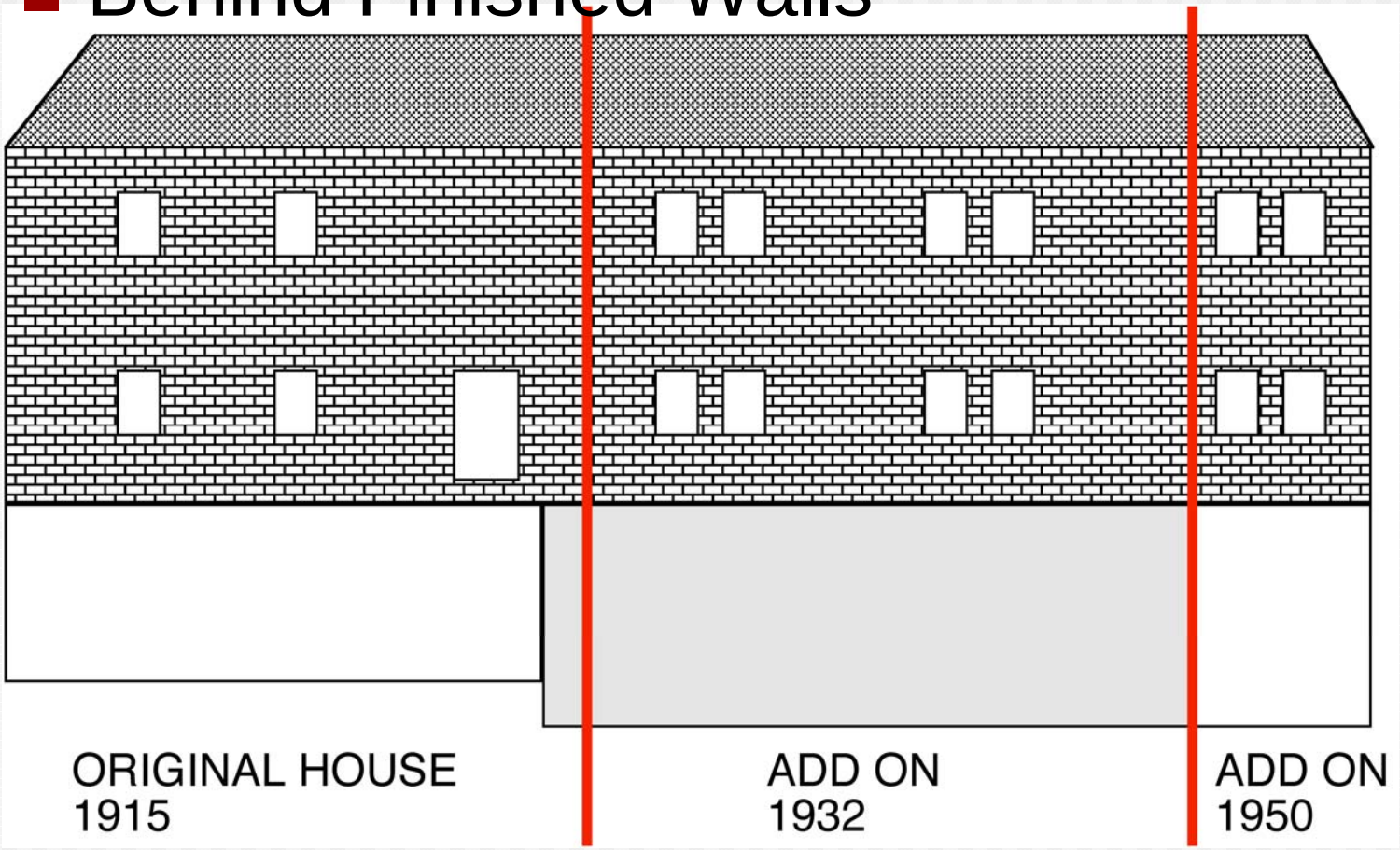
- 4 Million Dollar Home



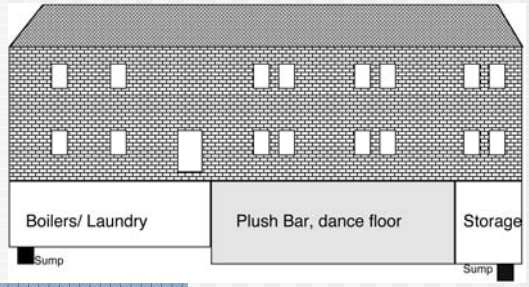
Can’t See + Can’t Change



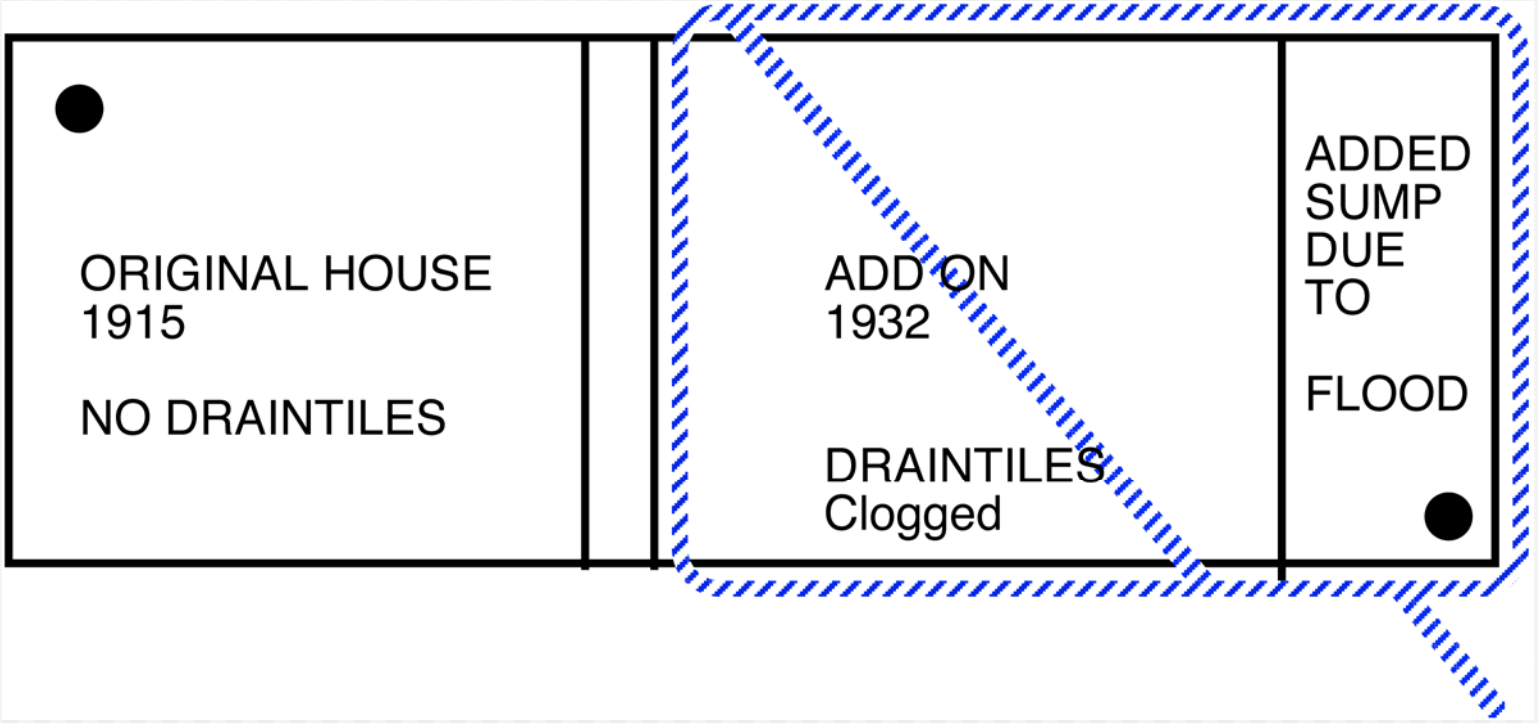
- Behind Finished Walls



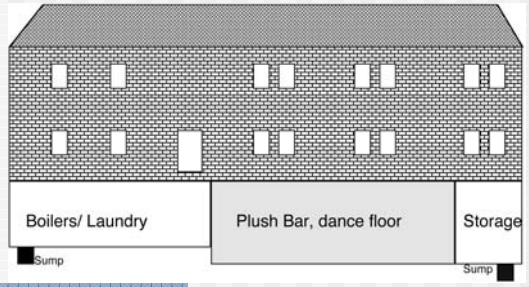
Can't See + Can't Change



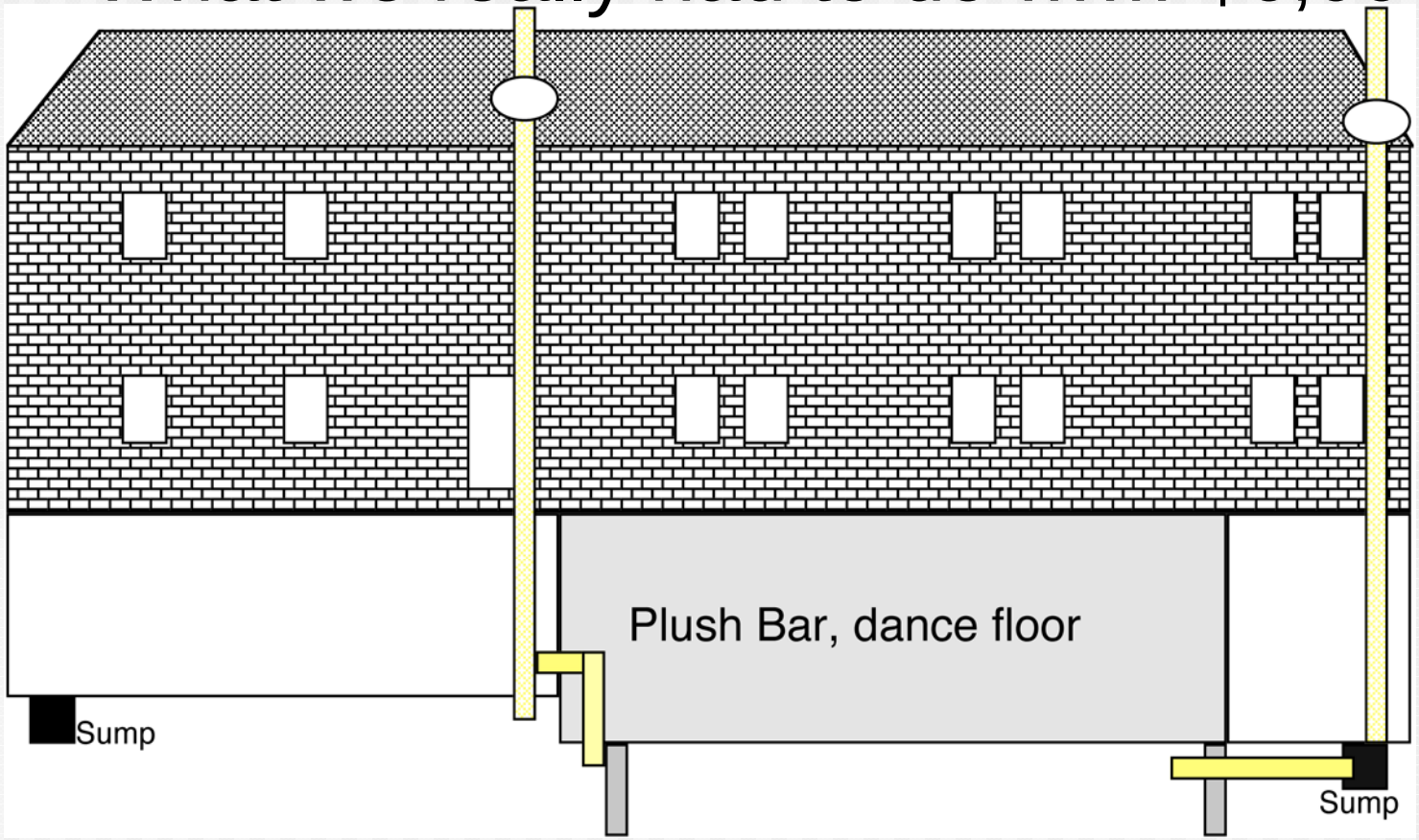
- Under Slabs (and water)



Can't See + Can't Change



- What we really had to do …… $6,000



Can't See + Can't Change + Can't Control

- RRNC?

Can’t See + Can’t Change + Can’t Control

- **INSTEAD**
  - Add Nutty client

How many mitigators are here?

Heart Booming Phone Calls?

"There's water everywhere!"

- Water is 95% of all construction lawsuits

Heart Booming Phone Calls?

"There's water everywhere!"

A House from Heck

Job Nightmares?

- Ever cut through the Air Conditioner Freon line?
  - Woooshhh

Job Nightmares?

- Ever hit a water line?

Job Nightmares?

- Ever had a rusty gas pipe fall off the house? ….while mounting the fan”

Job Nightmares?

- “Someone in the attic just fell through the kitchen ceiling”

Job Nightmares?

Closing Diagnostic Question:

- "Light is coming out of the suction hole.

  What does that mean, Boss?"

The Chemistry of a Nightmare
5%-10% Houses from Heck?

- It's the nature of the beast.

Contribution by
Gary Hodgden
Kansas City

HUMONGOUS

HISTORIC

HULK

from

HECK

(and that's just the occupant!)

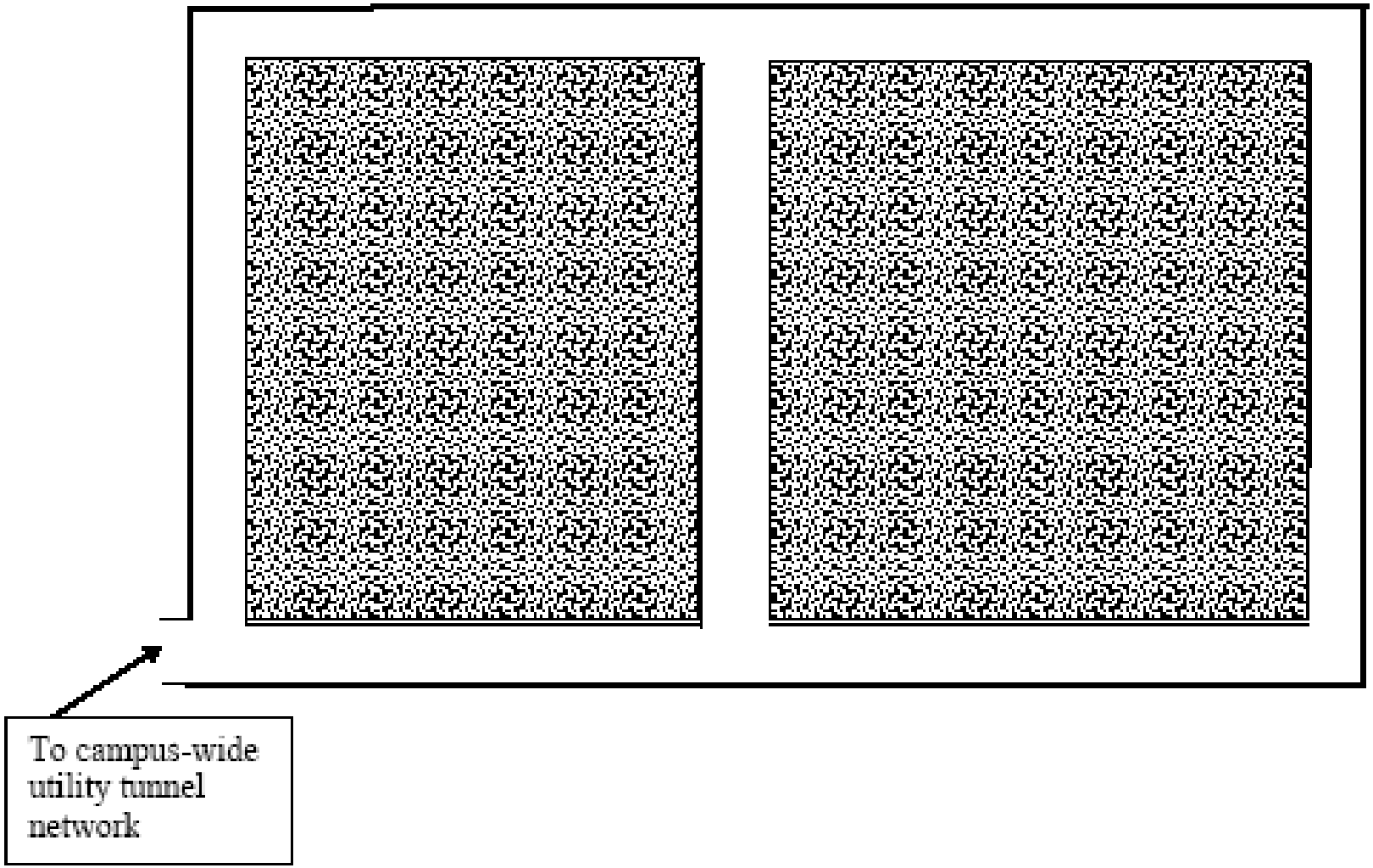
Sometimes the Building Isn't the Only Problem

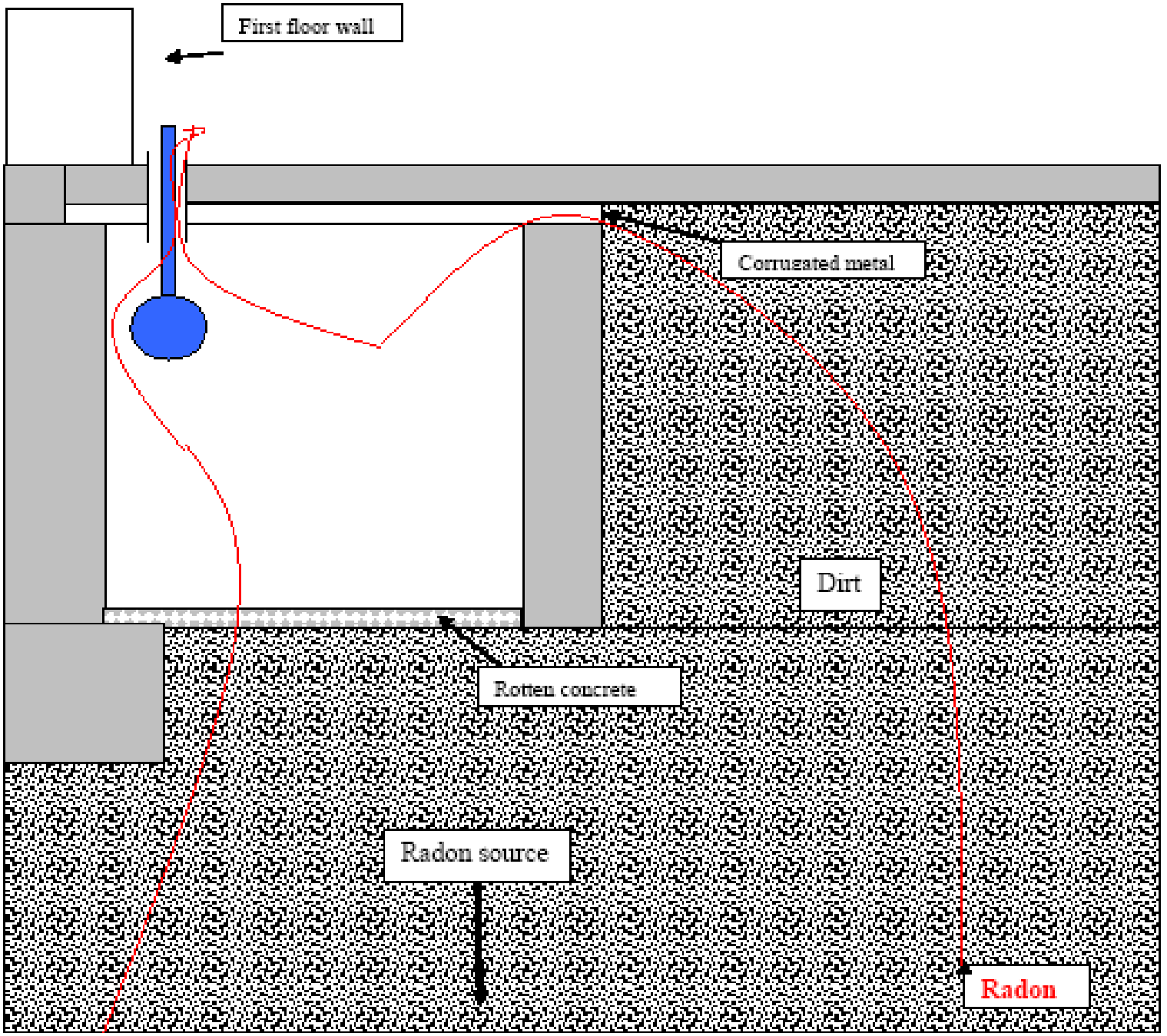
- State Museum on University Campus
- Building on Historic Register
- Museum Director with Attitude
  - *You boys won't make noise or dust, will you?*
  - **You can't (drill, run pipe, lay tools down, set tools up, let visitors see you, let me see you, talk about radon, eat lunch) there!!**
  - ***Radon is a crock, and the University Health and Safety Department is run by commie pinko tree huggers!!!***

But the Building is Always Part of the Problem

- 100+ pCi/L in several occupied rooms
- Historic status precludes many diagnostic procedures and mitigation possibilities
- Massive masonry construction complicates installation procedures, even if allowed
- Museum operations cannot be compromised
  - Exhibits
  - Material preparation and storage
  - Strict indoor environment requirements
  - Function as public building, including PR

Utility Tunnel (simplified)




First floor wall
Corrugated metal
Dirt
Rotten concrete
Radon source
Radon

Brilliant Mitigation Strategies Instantly Rejected

by

Museum Director

Increase Building Ventilation

Hire an Architectural Consultant

Hire an Engineering Consultant

Divert
Occupant
Attention

Divert Your Own Attention

Let’s Seal It Out!

- Several access panels to tunnel
- Utility penetrations from tunnel to occupied space include:
  - Steam
  - Water
  - Sewer
  - Power
  - Telephone
  - Computer (recent retrofit)

OK, Let's Seal What We Can

- University employees sealed many utility penetrations from above and below (after $60k asbestos abatement project)
- Gasketed covers installed on access points
- Bulkhead installed at tunnel entrance to building
- Amazingly, did not solve problem

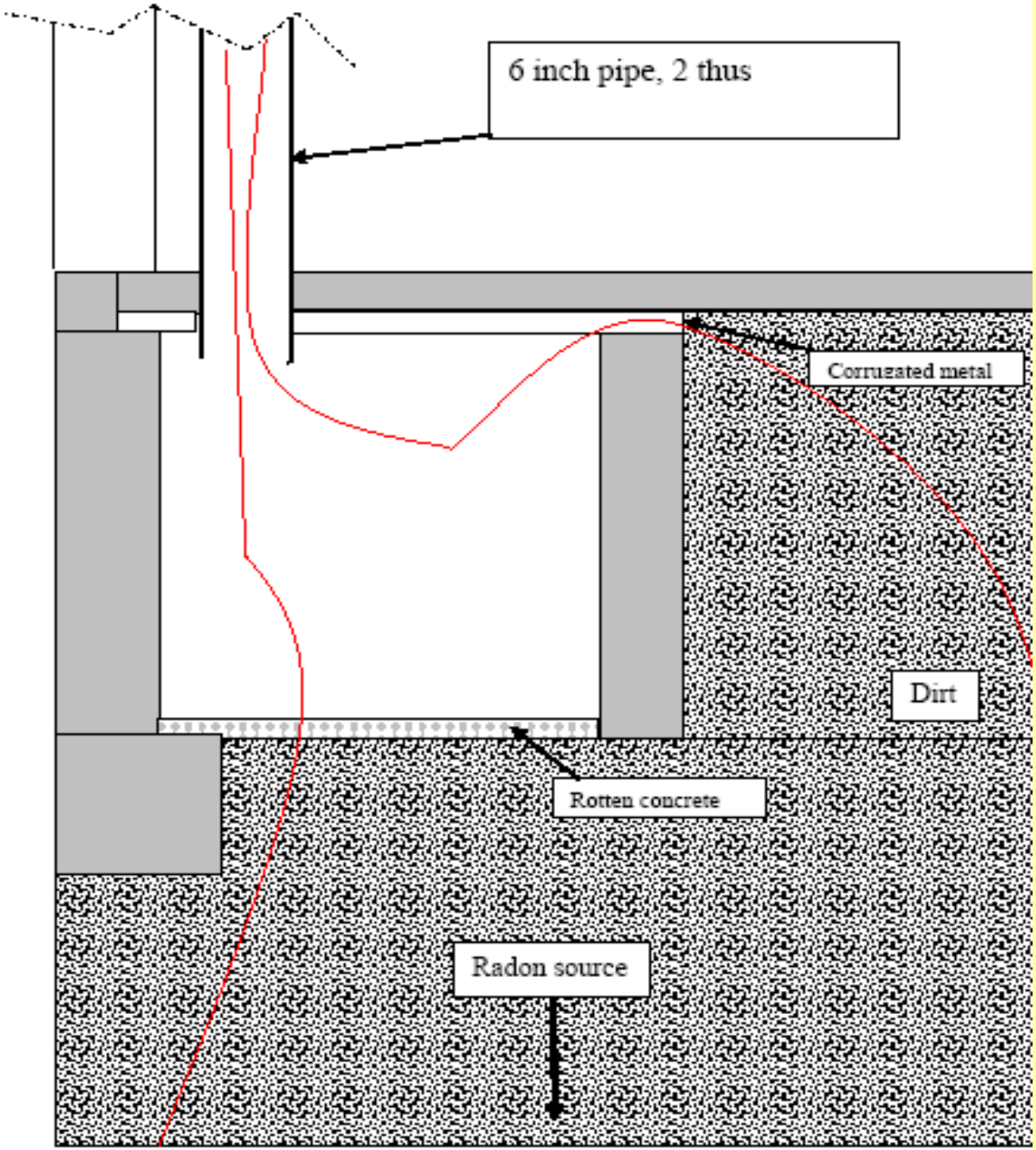
I Wonder Why

Lots of These

Duh, May Need More Than Sealing

- We knew that
- ASD to the rescue!
- It'll work because WE SUCK!!

But what and where will they let us suck?


6 inch pipe, 2 thus
Corrugated metal
Dirt
Rotten concrete
Radon source

When You Need Really Big Air Flow, There's Only One Place to Go

NOTE:

USE OF LOGO DOES NOT IMPLY ENDORSEMENT OF COMPANY PRODUCTS OR ADVERTISING TASTE BY PRESENTER

Only Permissible Location

reckon it is somewhat industrial

I'll Be Dipped, It Worked!!!

- Occupied spaces less than 3.0 pCi/L
- Building indoor environment preserved
- Historic status not impacted
- Best of all, Museum Director actually

THANKED US

Some days it's great to be a

MITIGATOR

Houses from Heck

Bill Goebel


Day Care

2008 President's Cancer Panel Report

"Few in this country have been untouched by cancer—whether due to their own diagnosis, or that of a relative, friend, or coworker. Yet somehow we have become complacent about this fearsome disease and have lacked the will to change aspects of our cancer-fighting enterprise that are preventing significant and rapid reductions in cancer mortality and morbidity. In effect, we are allowing a "bioterrorist within" to attack almost a million and a half Americans and kill more than 560,000 of us each year. With our population aging, these casualties will increase rapidly in the coming years, despite encouraging but small decreases in cancer mortality and longer survival for some patients."

3rd Annual EPA/State Region 7 Radon Stakeholders' Meeting

State of the Nation: Radon

Bill Field
Professor
Department of Occupational and Environmental Health
Department of Epidemiology
College of Public Health
The University of Iowa

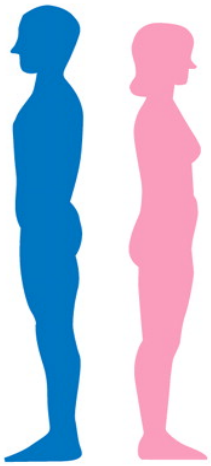
What We Know !

Lung Cancer Incidence
has Peaked

Ten Leading Cancer Types for the Estimated New Cancer Cases and Deaths, by Sex, United States, 2008

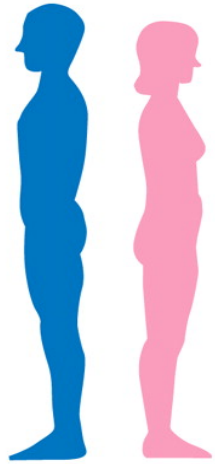
Estimated New Cases*

Males			Females		
Prostate	186,320	25%	Breast	182,460	26%
Lung & bronchus	114,690	15%	Lung & bronchus	100,330	14%
Colon & rectum	77,250	10%	Colon & rectum	71,560	10%
Urinary bladder	51,230	7%	Uterine corpus	40,100	6%
Non-Hodgkin lymphoma	35,450	5%	Non-Hodgkin lymphoma	30,670	4%
Melanoma of the skin	34,950	5%	Thyroid	28,410	4%
Kidney & renal pelvis	33,130	4%	Melanoma of the skin	27,530	4%
Oral cavity & pharynx	25,310	3%	Ovary	21,650	3%
Leukemia	25,180	3%	Kidney & renal pelvis	21,260	3%
Pancreas	18,770	3%	Leukemia	19,090	3%
All Sites	**745,180**	**100%**	**All Sites**	**692,000**	**100%**



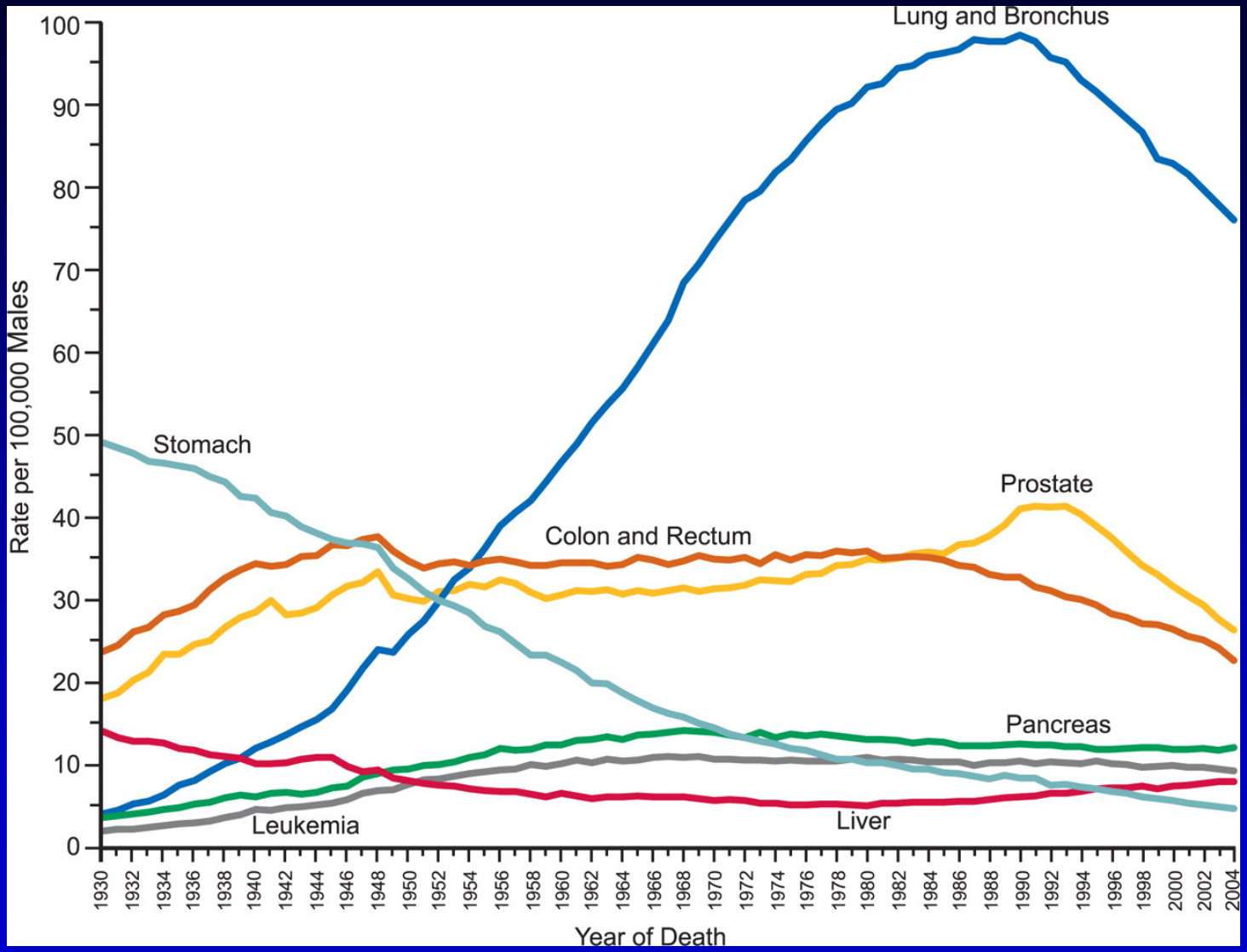
Estimated Deaths

Males			Females		
Lung & bronchus	90,810	31%	Lung & bronchus	71,030	26%
Prostate	28,660	10%	Breast	40,480	15%
Colon & rectum	24,260	8%	Colon & rectum	25,700	9%
Pancreas	17,500	6%	Pancreas	16,790	6%
Liver & intrahepatic bile duct	12,570	4%	Ovary	15,520	6%
Leukemia	12,460	4%	Non-Hodgkin lymphoma	9,370	3%
Esophagus	11,250	4%	Leukemia	9,250	3%
Urinary bladder	9,950	3%	Uterine corpus	7,470	3%
Non-Hodgkin lymphoma	9,790	3%	Liver & intrahepatic bile duct	5,840	2%
Kidney & renal pelvis	8,100	3%	Brain & other nervous system	5,650	2%
All Sites	**294,120**	**100%**	**All Sites**	**271,530**	**100%**



From Jemal, A. et al. CA Cancer J Clin 2008;58:71-96.

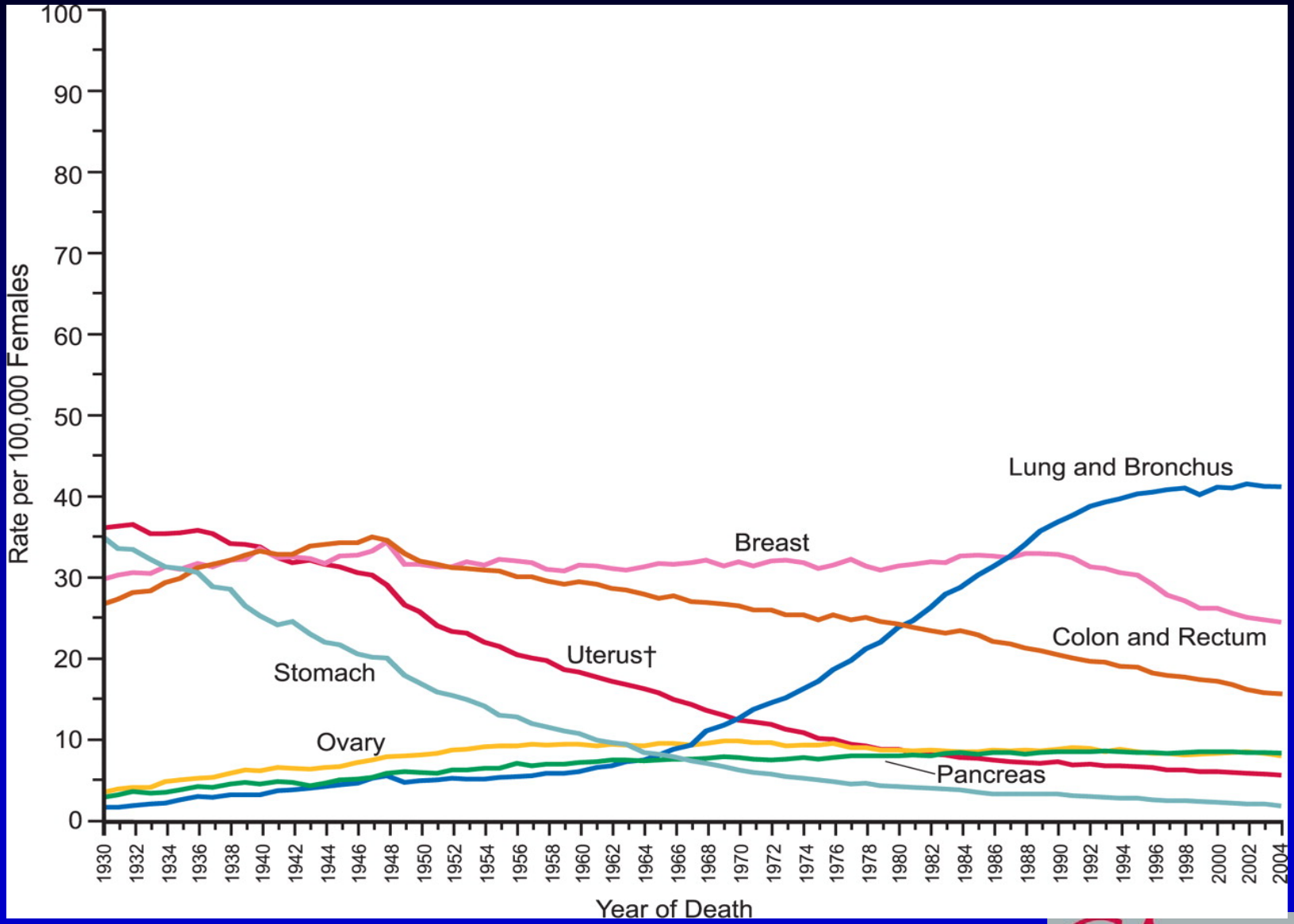
Annual Age-adjusted Cancer Death Rates* Among Males for Selected Cancers, United States, 1930 to 2004



CA
A Cancer Journal for Clinicians

From Jemal, A. et al. CA Cancer J Clin 2008;58:71-96

Annual Age-adjusted Cancer Death Rates* Among Females for Selected Cancers, United States, 1930 to 2004

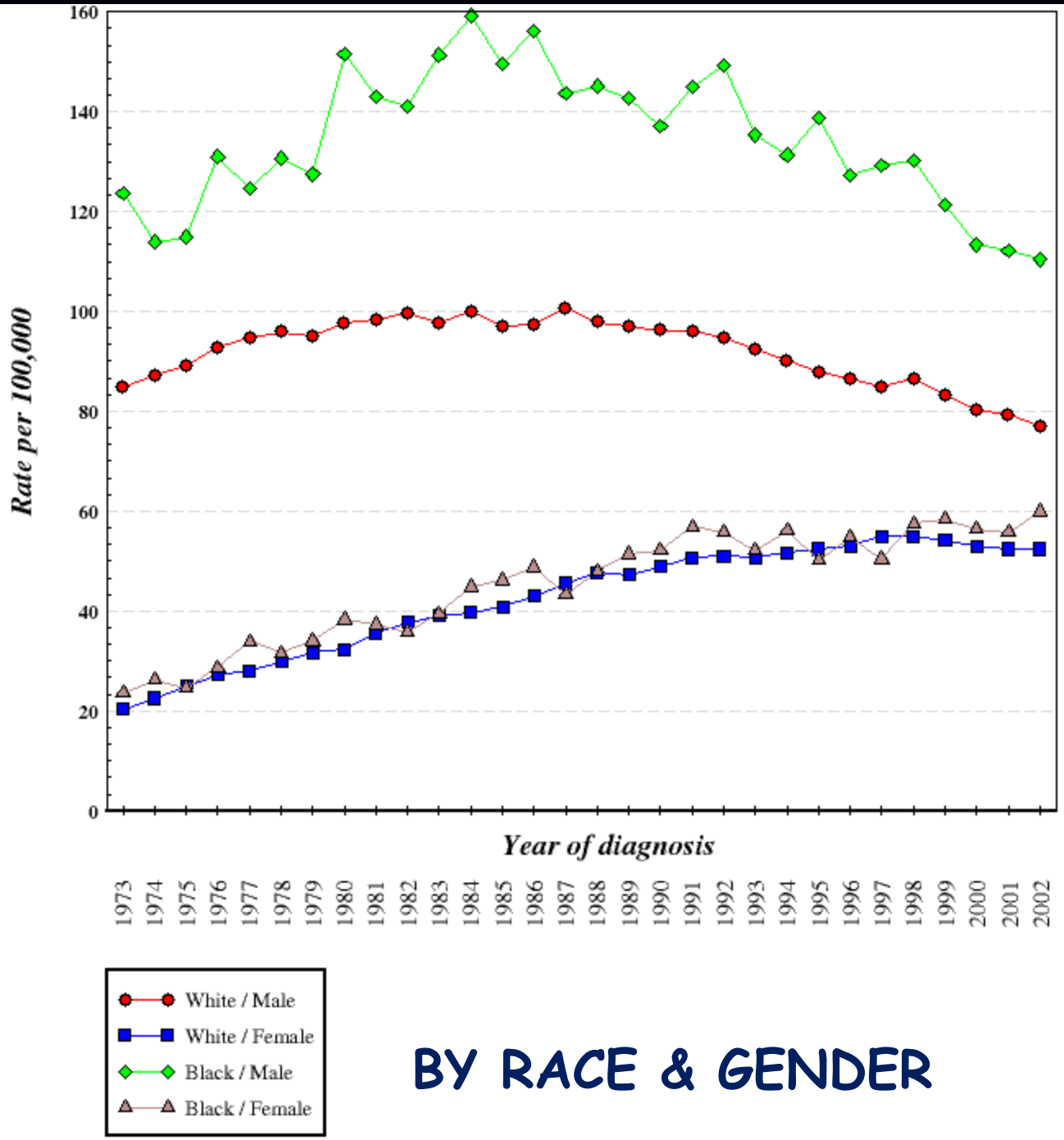


From Jemal, A. et al. CA Cancer J Clin 2008;58:71-96.

CA
A Cancer Journal for Clinicians

LUNG CANCER INCIDENCE RATES PER 100,000 PEOPLE

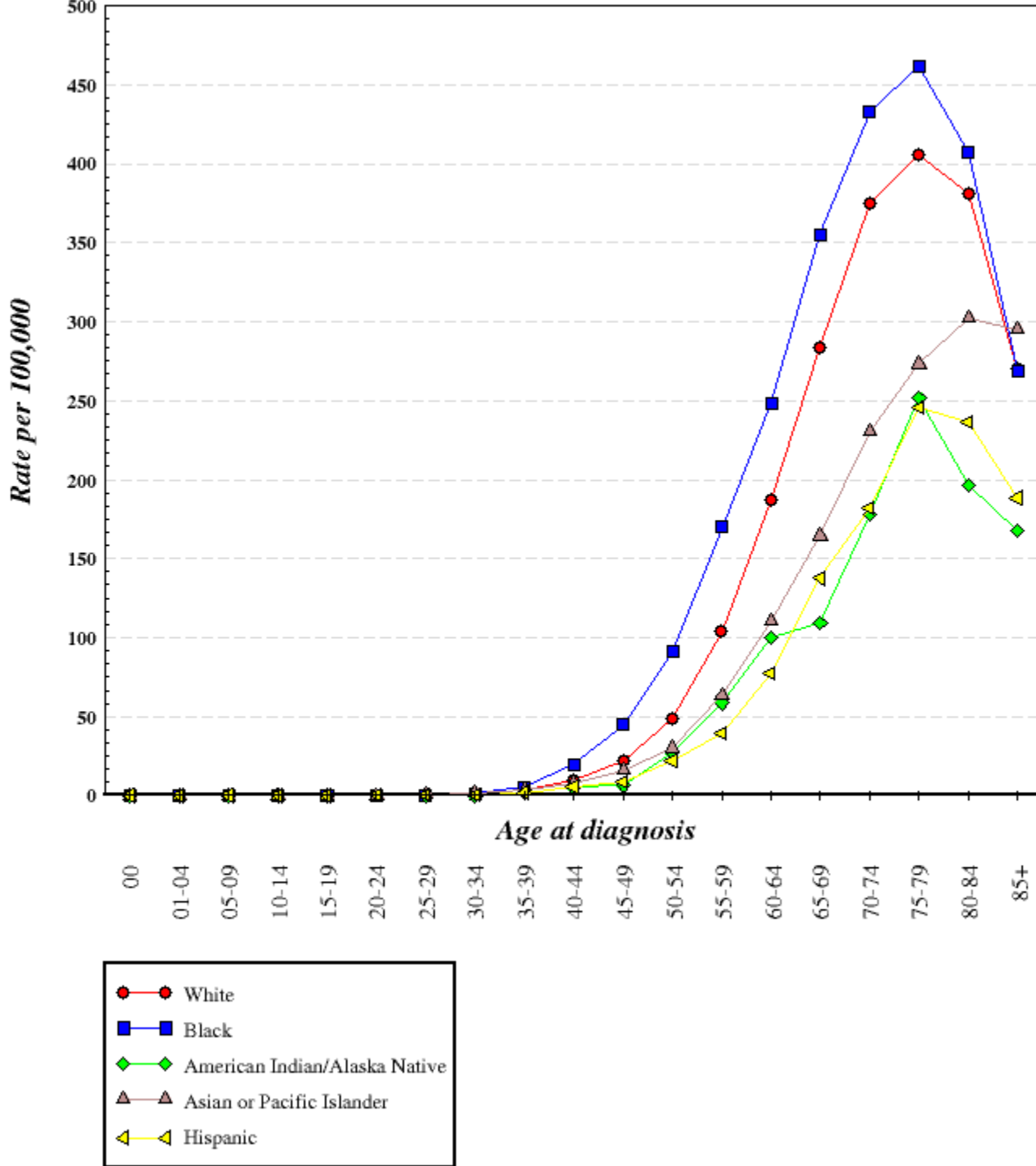
1973 -2002

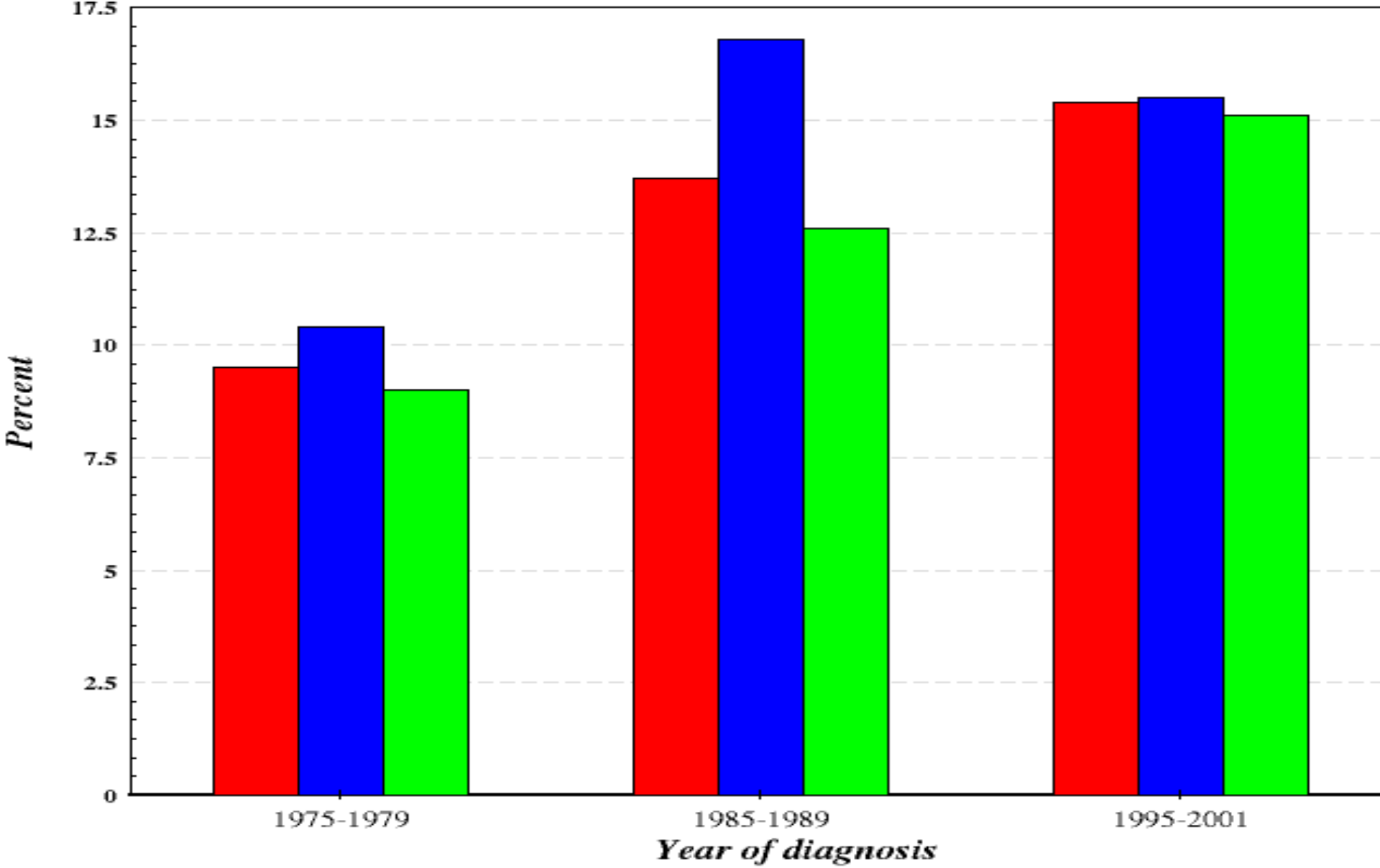


BY RACE & GENDER

LUNG CANCER DIAGNOSIS By AGE

1997 - 2002



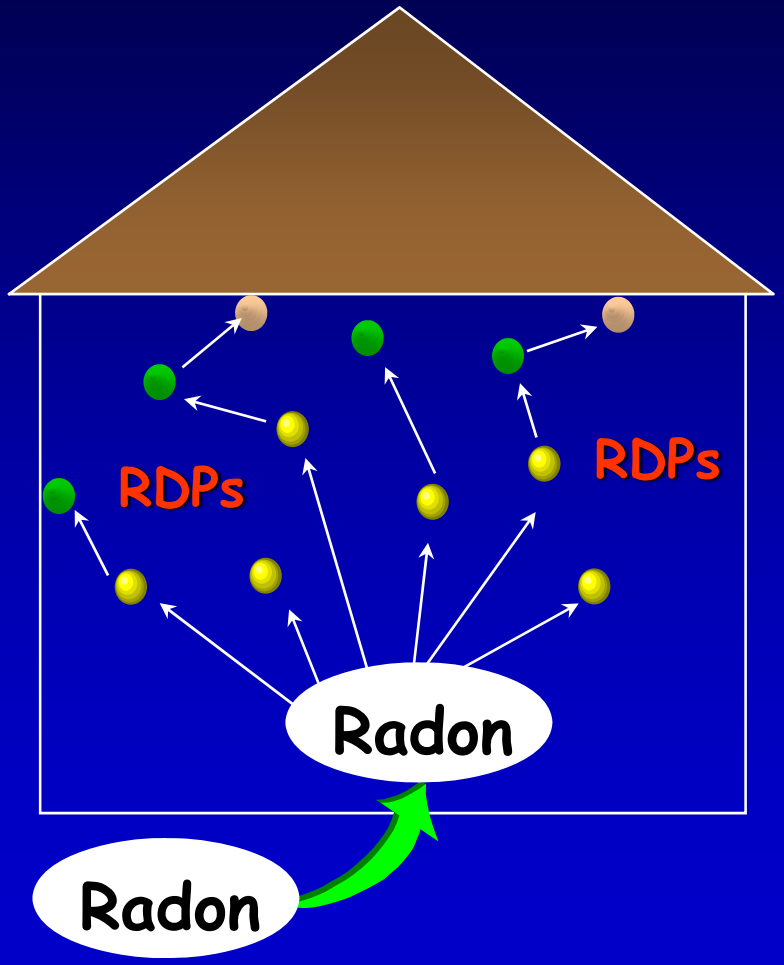


5 Year Survival Rates for Lung Cancer

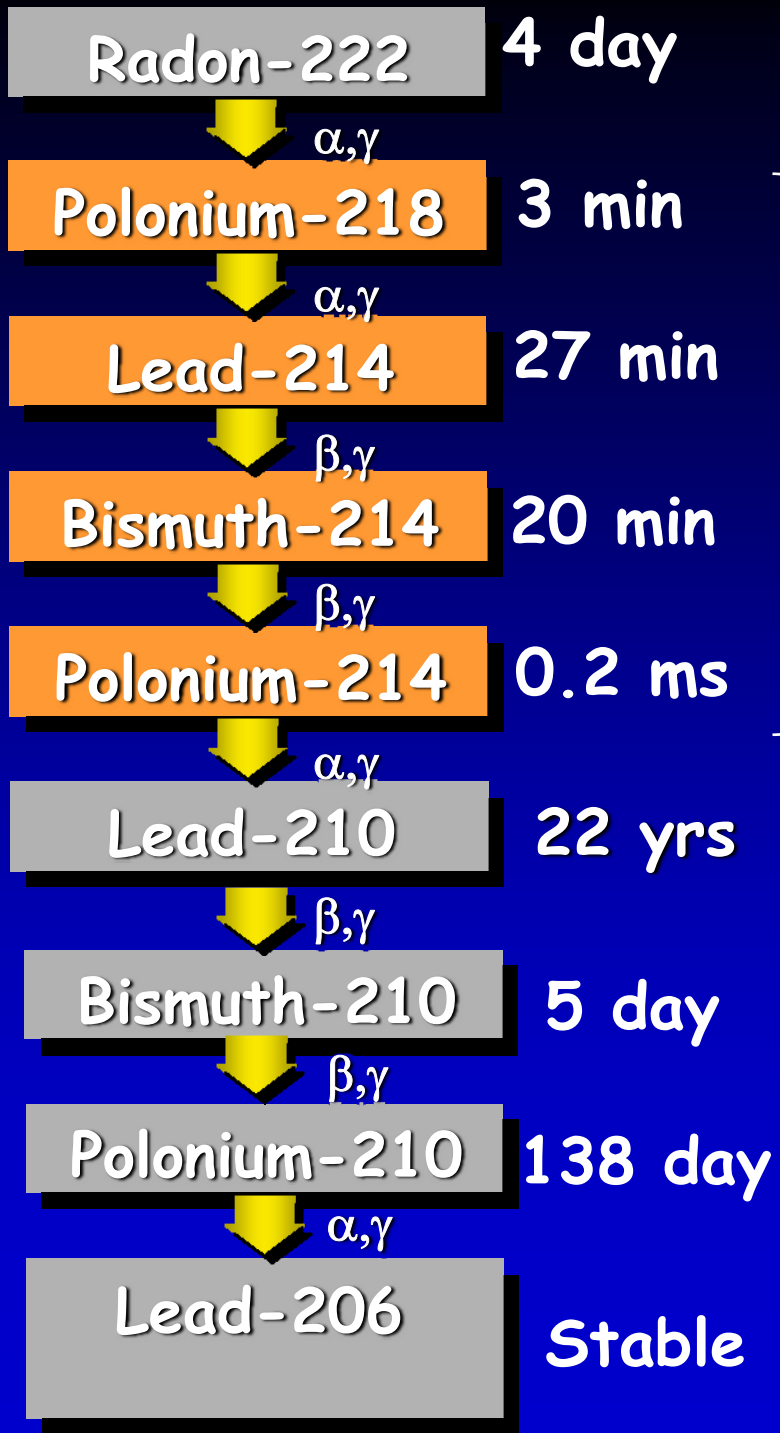
What We Know !

Alpha Particle Exposure from Radon Decay Products Cause Lung Cancer

Radon Progeny Cause the Lung Cancer

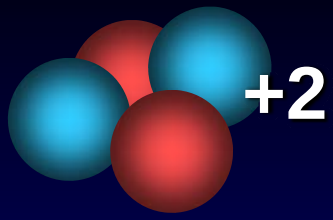


- Radon enters home.
- Radon radioactively decays into RDPs in the air.
- Some RDPs remain in the air.
- Some RDPs plate out on surfaces.



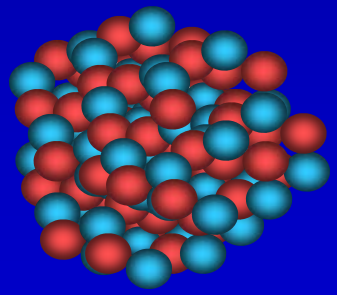
^{218}Po and ^{214}Po deliver the radiologically significant dose to the respiratory epithelium.

Radon Progeny

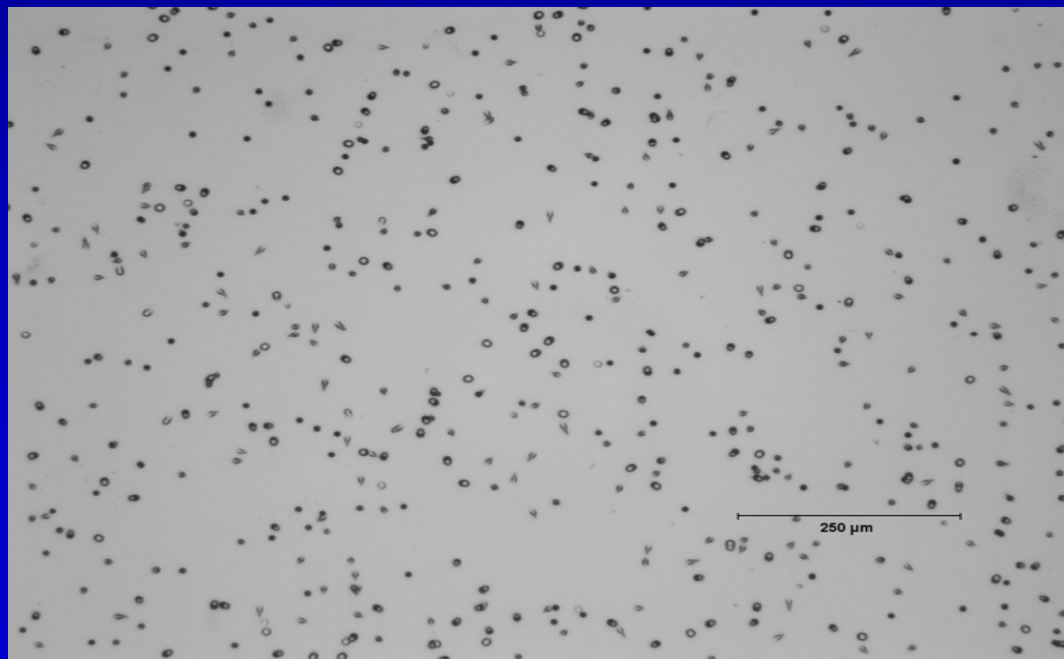


$^{4}He + {}^{218}Po$

^{4}He Nucleus Ejected from ^{222}Rn Nucleus



Radon - 222



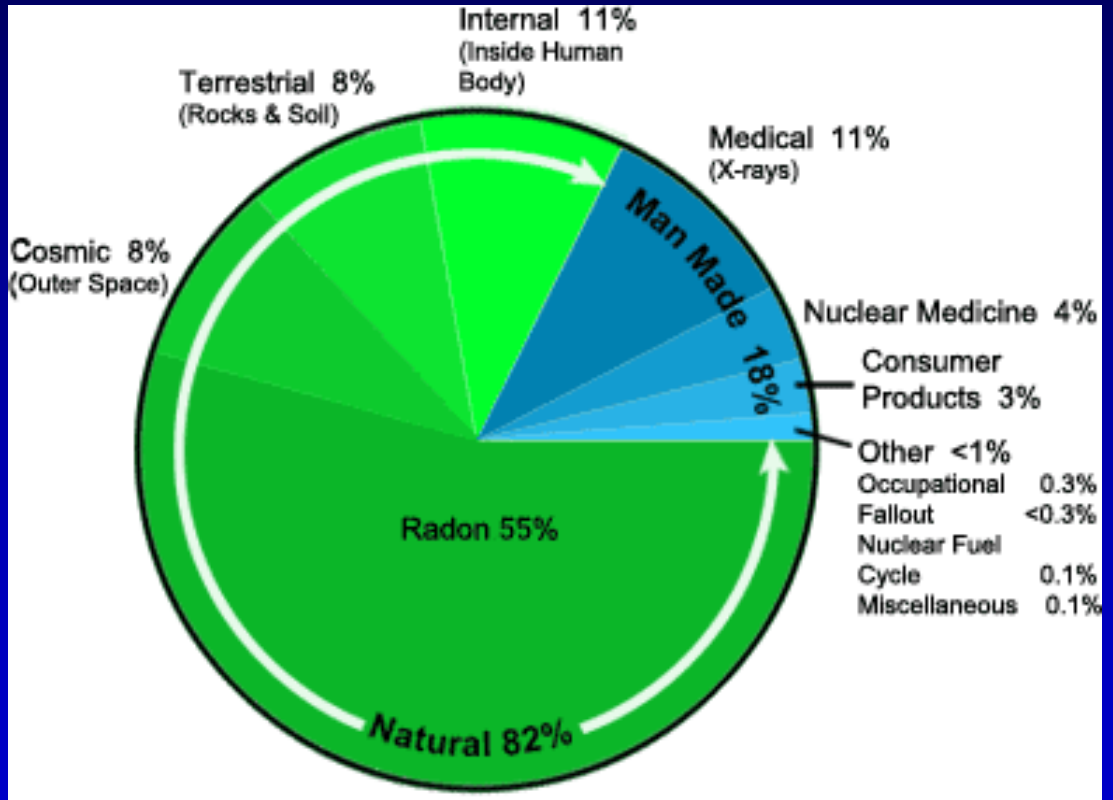
What Happens When Radon Decay Products Are Inhaled?

Double Strand Breaks

- **Highly radioactive particles adhere to lung tissue, where they can irradiate sensitive cells.**
- **Radiation can alter the cells, increasing the potential for cancer.**

What We Thought We Knew

~~Radon contributes over half of the radiation exposure to the average member of the public in the U.S.~~

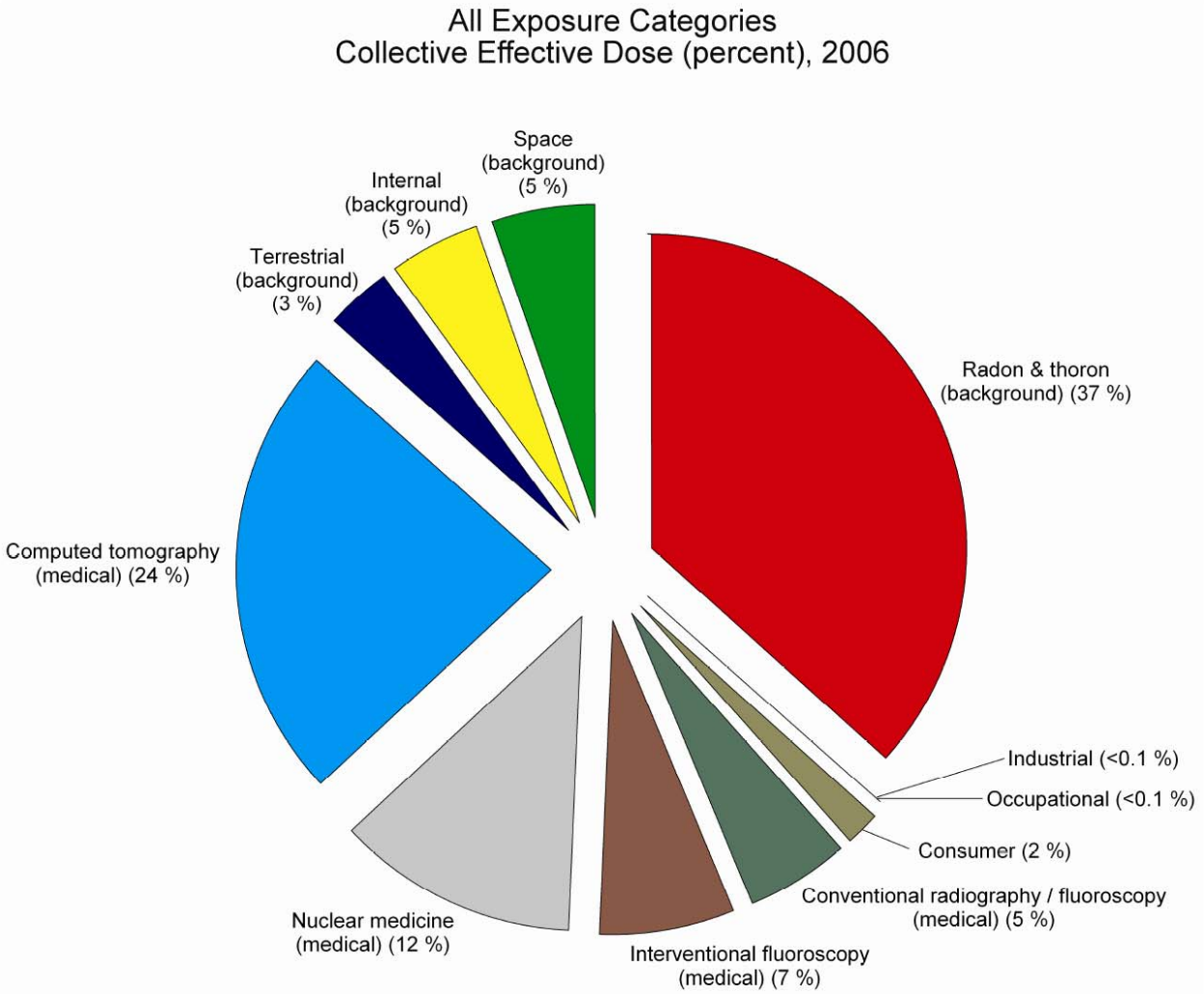


Sources of Radiation Exposure in the U.S. Population

[NCRP Report No. 93, Ionizing Radiation Exposure of the Population of the United States,National Council on Radiation Protection and Measurements, Bethesda, MD, (1987), Copyrighted NCRP, 1987]

For immediate release:
March 3, 2009 (12:00 PM)

NCRP 1929 2009



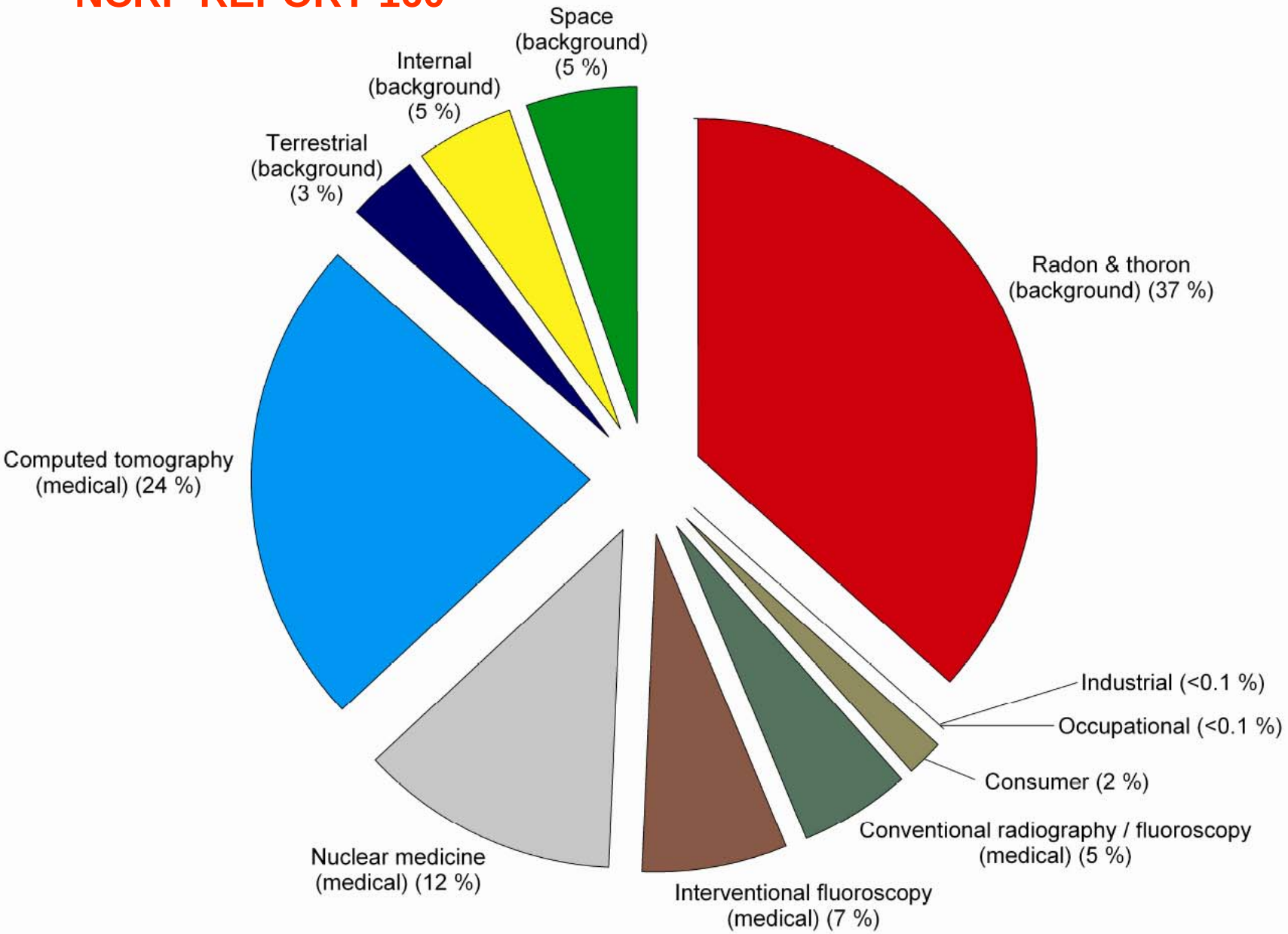
NCRP – March 3 Press Release

In 2006, Americans were exposed to more than seven times as much ionizing radiation from medical procedures as was the case in the early 1980s, according to a new report on population exposure released March 3rd by the National Council on Radiation Protection and Measurements (NCRP) at its annual meeting in Bethesda, Maryland. In 2006, medical exposure constituted nearly half of the total radiation exposure of the U.S. population from all sources.

The increase was primarily a result of the growth in the use of medical imaging procedures, explained Dr. Kenneth R. Kase, senior vice president of NCRP and chairman of the scientific committee that produced the report. "The increase was due mostly to the higher utilization of computed tomography (CT) and nuclear medicine. These two imaging modalities alone contributed 36 percent of the total radiation exposure and 75 percent of the medical radiation exposure of the U.S. population." The number of CT scans and nuclear medicine procedures performed in the United States during 2006 was estimated to be 67 million and 18 million, respectively.

All Exposure Categories
Collective Effective Dose (percent), 2006

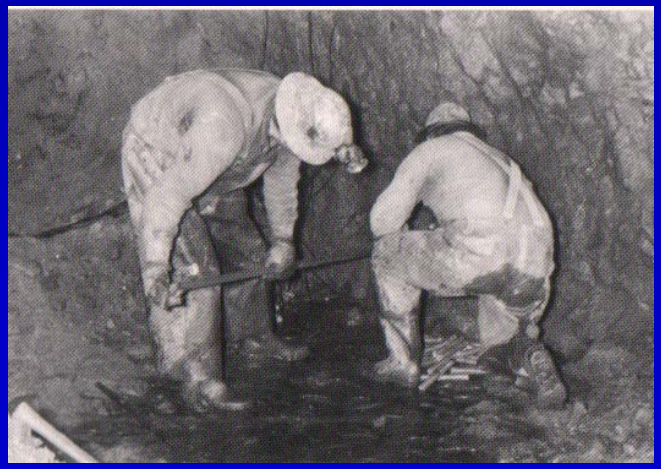
NCRP REPORT 160



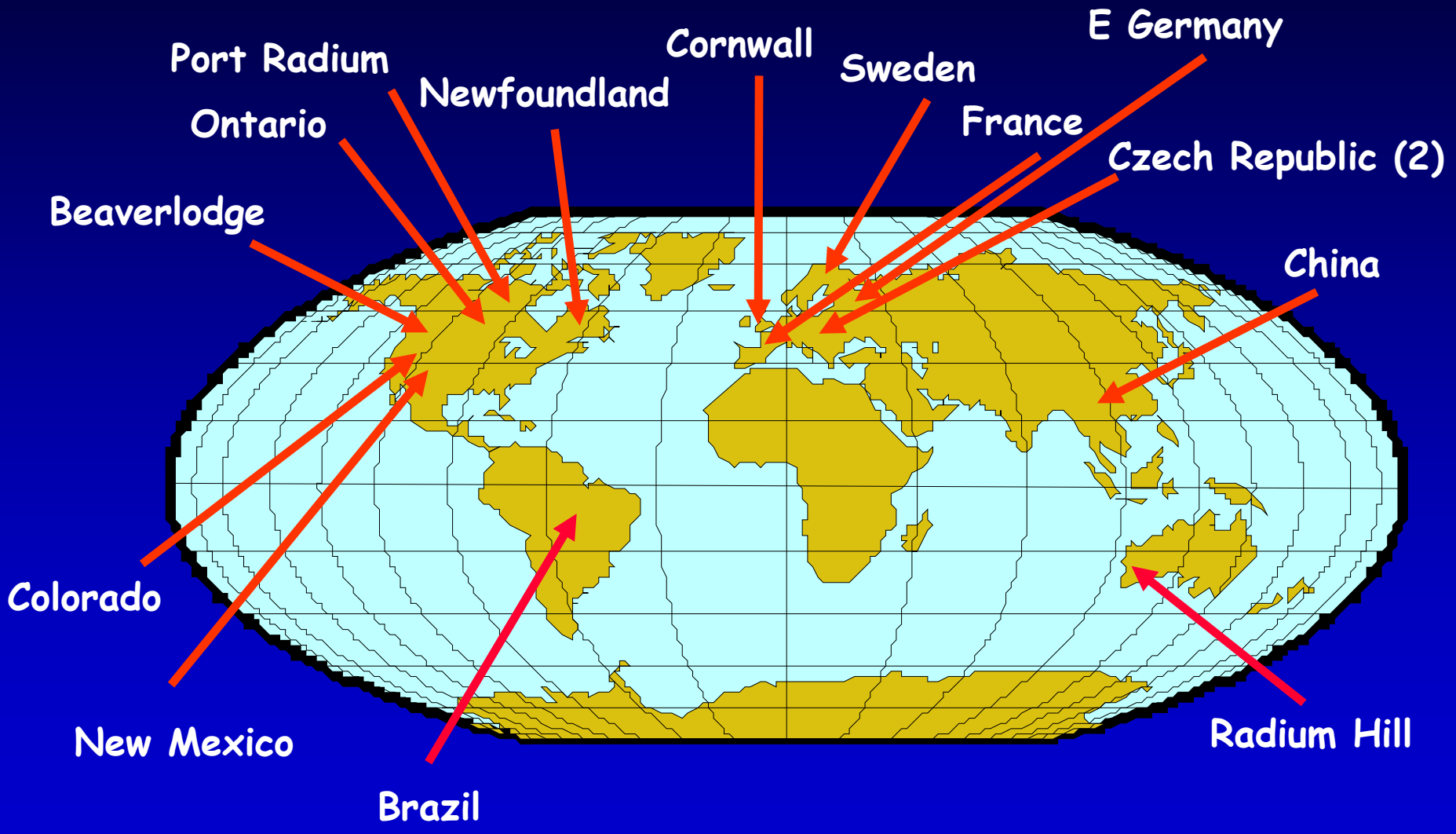
Radon Epidemiology

What We Know !

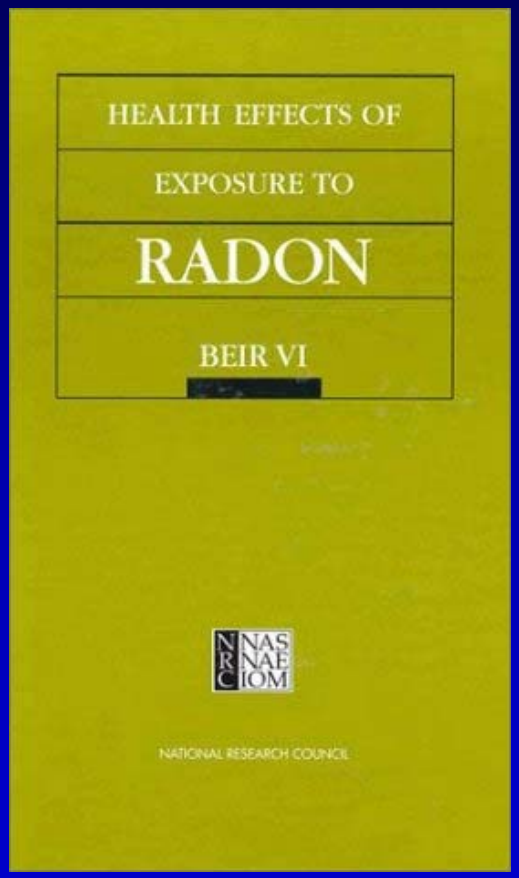
Current EPA Risk Estimates are Based on Studies of Radon-Exposed Underground Miners



Cohort Studies (15) of Radon-Exposed Miners



National Academy of Sciences
BEIR VI 1999



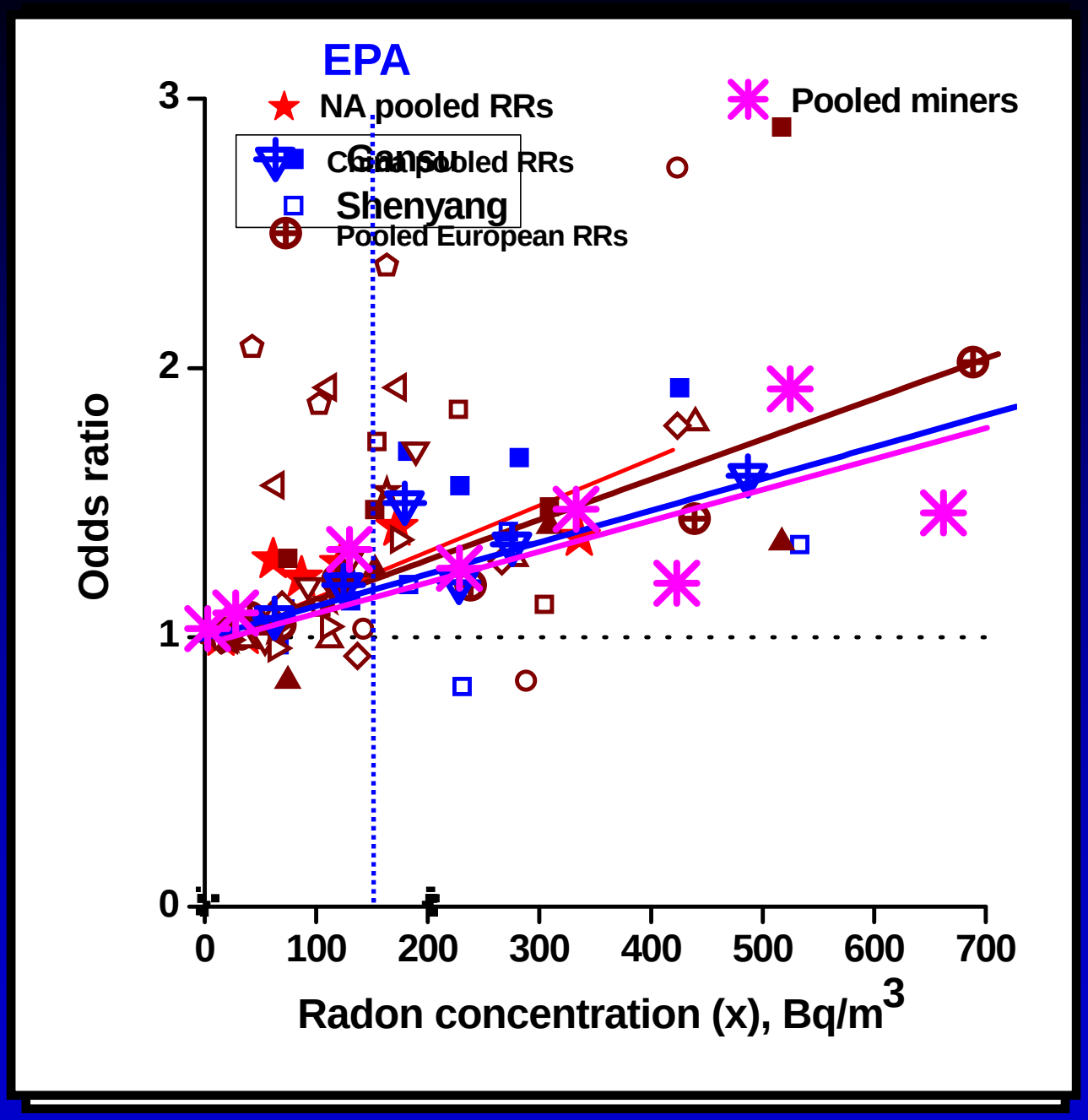
- **Estimated 18,600 lung cancer deaths each year in the U.S. from residential radon exposure**

U.S. EPA Estimates
21,100

What We Know !

The Findings From the Residential Radon Pooled Epidemiologic Studies Support the Interpolated Projections from the Miner-Based Studies.

Summary Results of Radon Studies

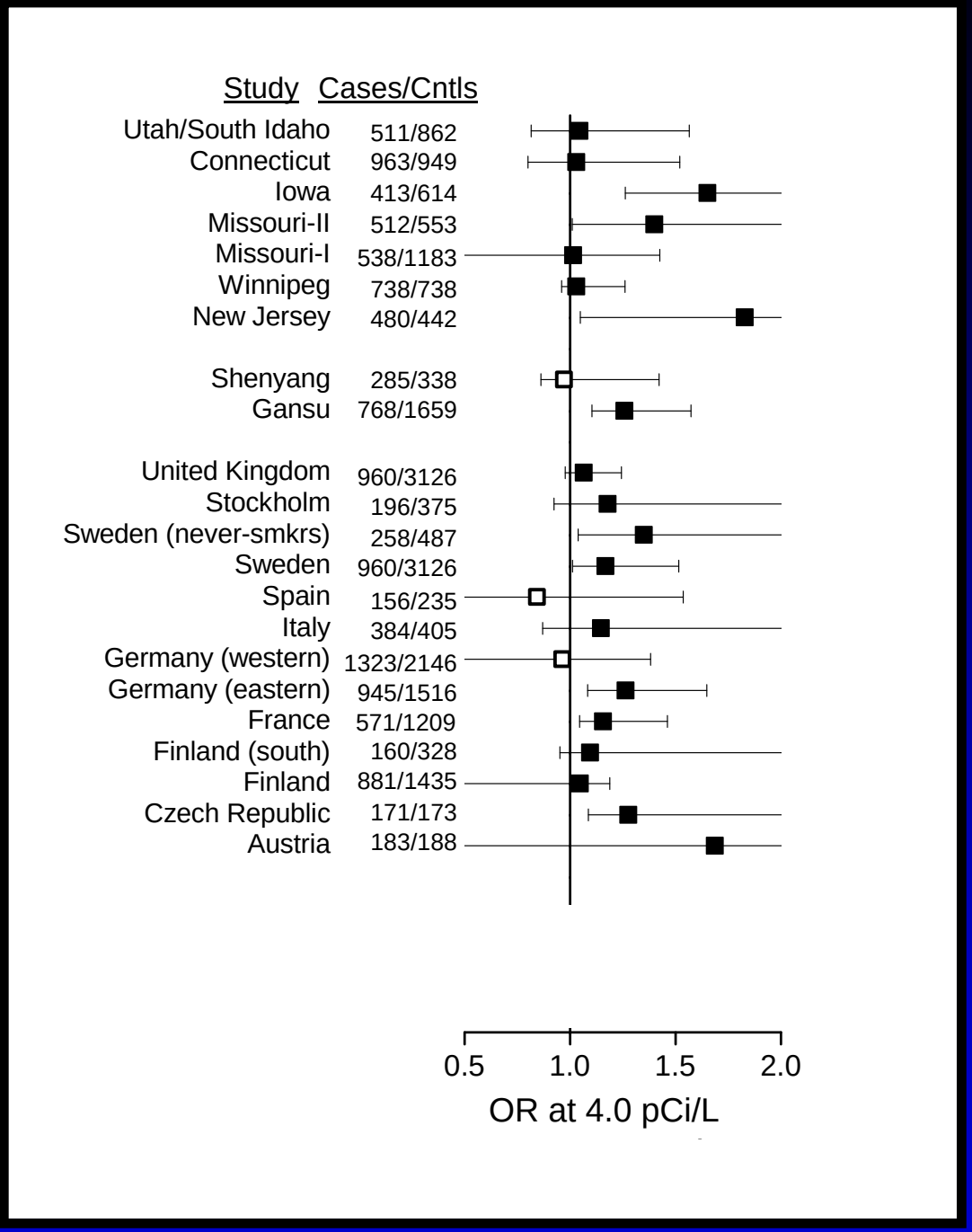


What We Know !

Protracted Radon Exposure Causes Lung Cancer Even Below the U.S. EPA's Action Level

Residential Radon Studies - Odds Ratios at 4.0 pCi/L

Data from the pooled analyses



Residential radon studies clearly indicate that radon causes lung cancer even below the U.S. EPA's radon action level

Residential Epidemiologic Study	# of studies pooled	# of lung cancer cases/controls	Increased risk per 100 Bq/m^3 (95% CI)
North American Pooled Analysis	7	3,662/4,966	11% (0% - 28%)
European Pooled Analysis	13	7,148/14,208	8% (3% - 16%)
Chinese Pooled Analysis	2	1,050/1,995	13% (1% - 36%)

What We Know !

Pooled Residential Risk Estimates Underestimate the True Risk Posed by Protracted Radon Exposure

1. Errors in radon detector measurement
2. Failure to consider temporal and spatial radon variations within a home
3. Missing information on radon exposure from other sites, such as prior homes
4. Failure to properly link radon concentrations with subject mobility
5. Measuring radon gas as a surrogate for radon progeny exposure

Summary Risk Estimates from the Pooled Residential Radon Studies

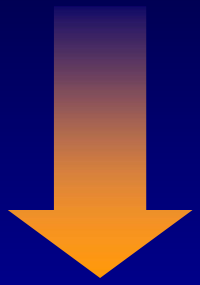
Residential Epidemiologic Study	Increased risk per 100 Bqm^{-3} (95% CI)	Increased risk at 100 Bq/m^3 Analyses based on improved radon concentration data (95% CI)
North American Pooled Analysis	11% (0% - 28%)	**18% (2% - 43%)**

Analysis restricted to individuals who resided in either one or two homes for the period 5 to 30 years prior to recruitment and also had at least 20 years covered by a year-long radon measurement.

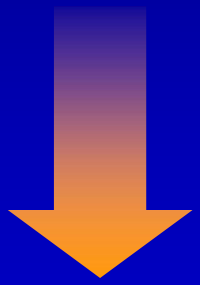
Iowa Radon Lung Cancer Study (IRLCS)

- The NIEHS\NCI funded IRLCS collected historical information on participant mobility within the home, time spent outside the home, and time spent in other buildings.
- Numerous yearlong radon measurements were performed on each level of the participant's home.
- Outdoor radon measurements were also conducted in addition to workplace radon exposure assessments.
- All these spatially diverse measurements were linked to where the participant spent time, for at least the proceeding 20 years, in order to obtain a cumulative radon exposure for the individual.

^{222}Rn CONCENTRATION



^{222}Rn EXPOSURE

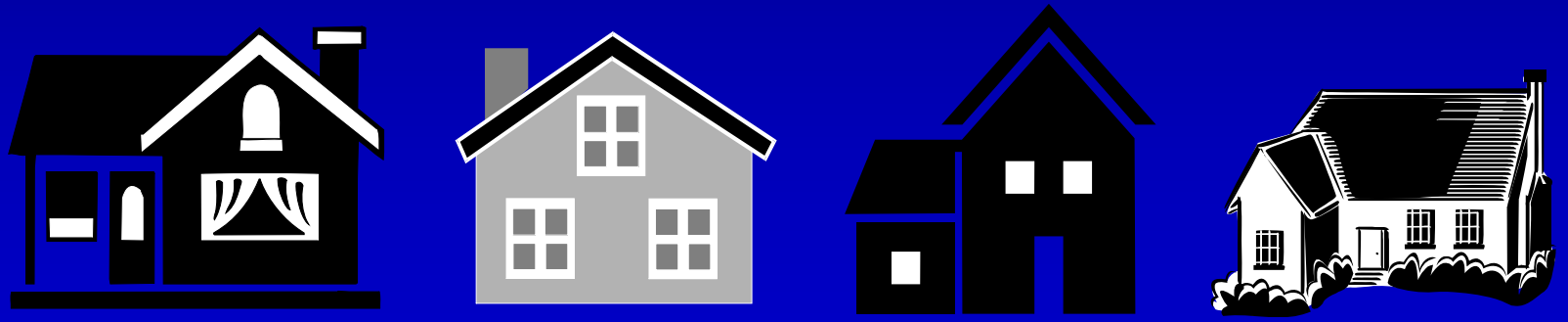


^{222}Rn PROGENY DOSE

A Problem Facing Most Residential Radon Studies

Long Residency in Current Home

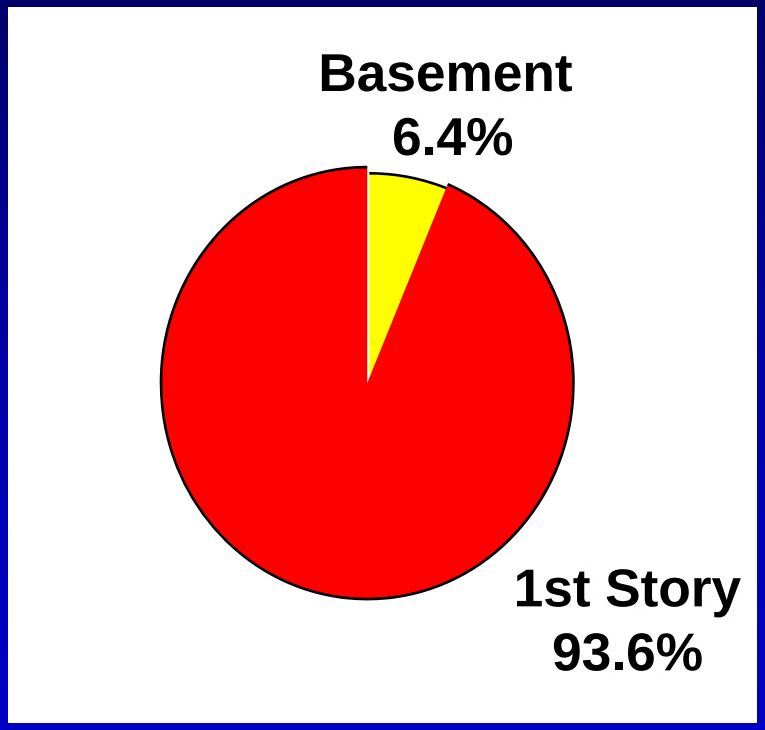
versus



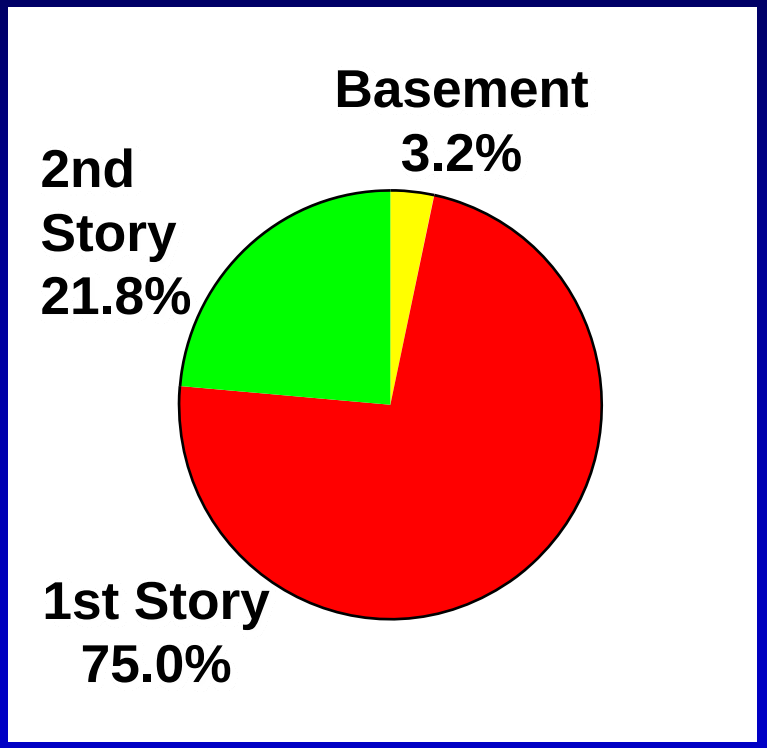
Missing Data with Missing Homes

SPATIAL HOME MOBILITY

One Story Homes (N=494)

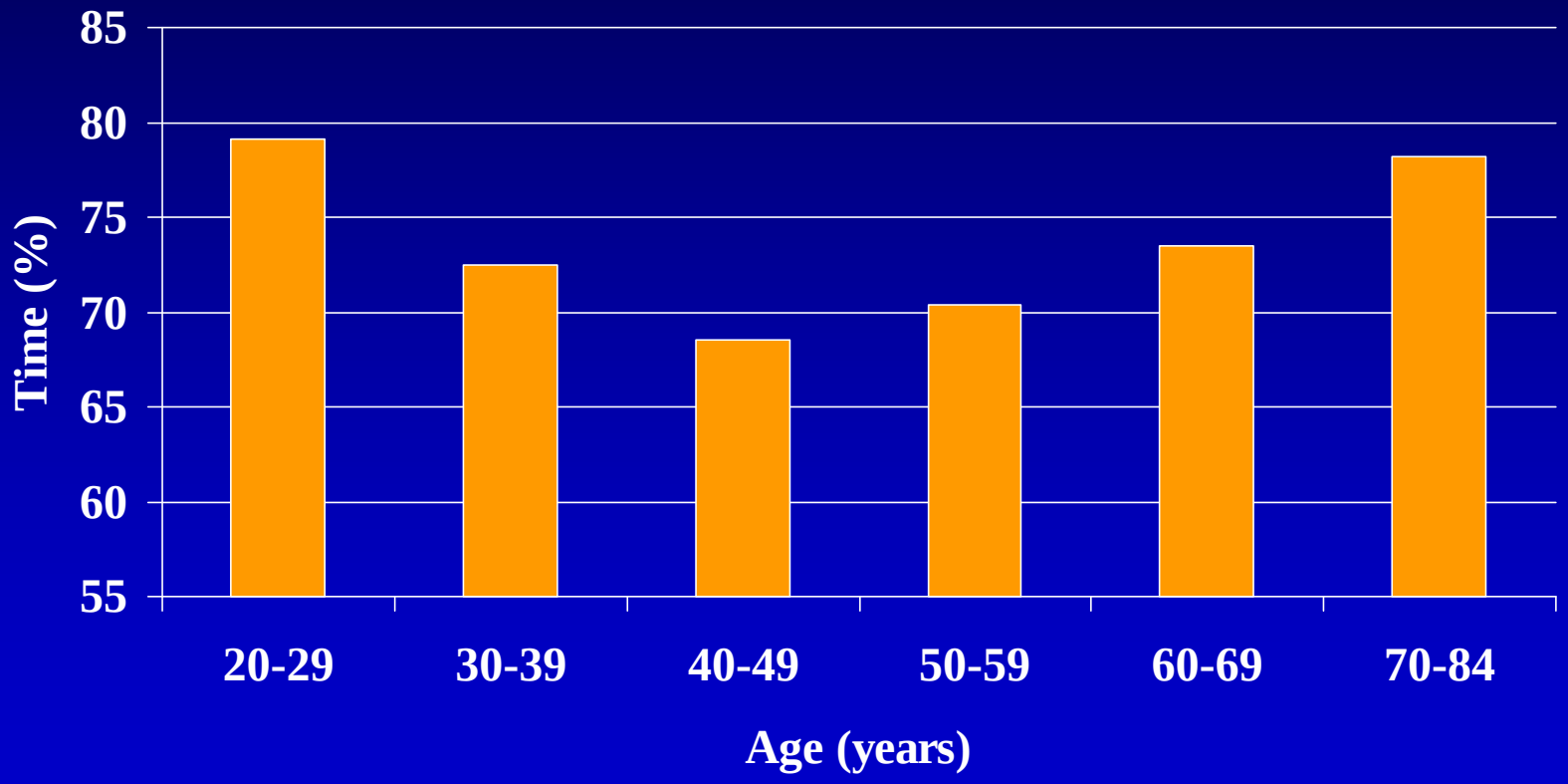


Two Story Homes (N=437)



Field RW et al. Risk Analysis: An International Journal 18(5): 575-584, 1998

PERCENT OF TIME IN HOME BY AGE



(Field RW et al. Risk Analysis: An International Journal (18(5):575-584, 1998)

Radon Measurement Devices (ATDs) Installed

Total ATDs placed	4,626
Mean number/home	4.0
Percent retrieved	97.2%
Duplicates placed	515
Percent duplicates	12.5%
Mean COV (S.D.)	6.9%(7.2)

Exposure Model Combining Radon Levels and Subject Mobility

Working level month cumulative exposure model:

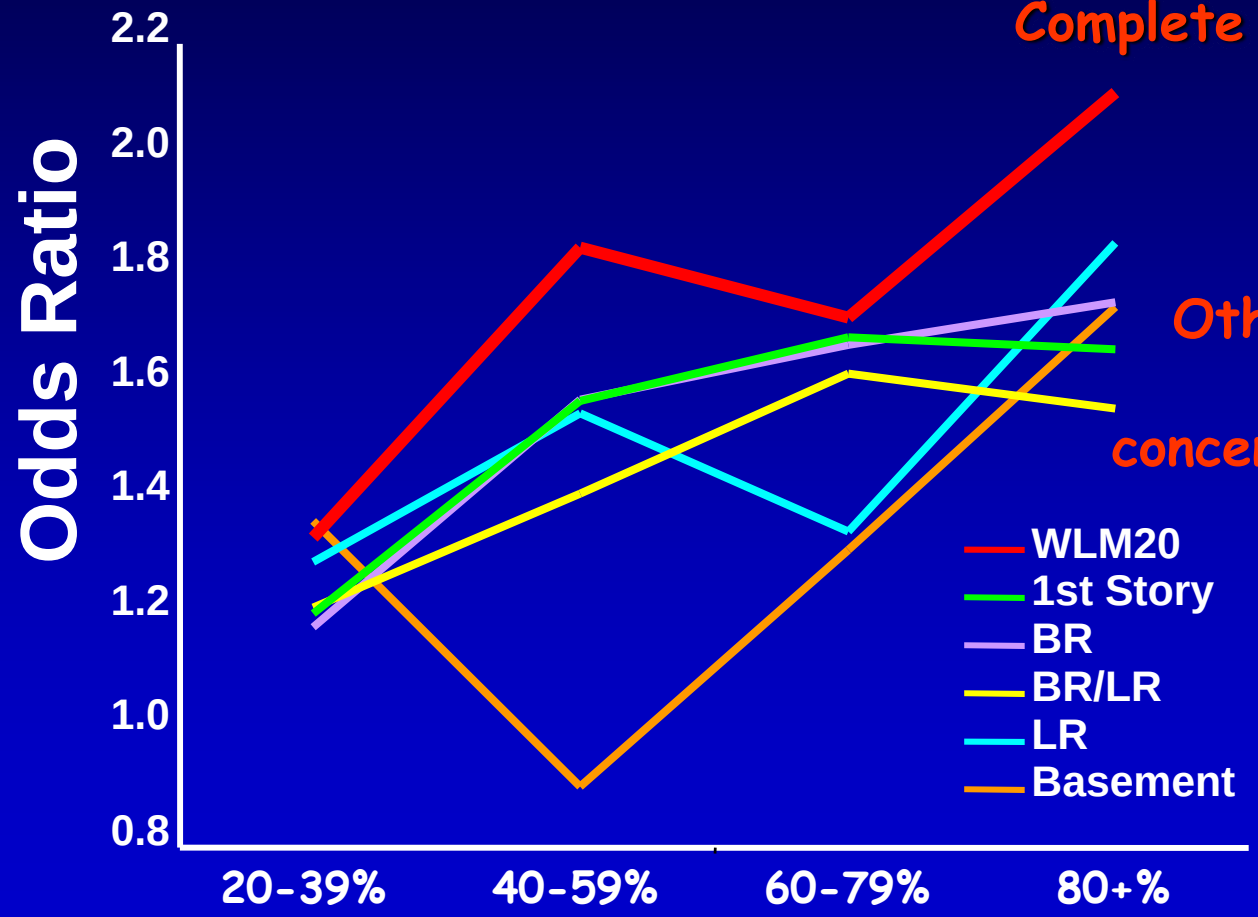
$$WLM_{5\text{-}19} \propto \sum time_l \times radon_l$$

where the sum is over the years 5-19 prior to enrollment and includes the following locations:

Home (individual floors, bedrooms, work area), Outside, Another Building, Away on Vacation/Business

Risk Estimates for Alternative Models

(live cases and controls)



Complete exposure

Other location radon concentrations only

JEAEE 12(3): 197-203, 2002

What We Know !

All Types of Lung Cancer are Caused by Residential Radon Exposure

Protracted radon exposure increases the risk of all types of lung cancer

Residential Study	Histologic type most associated with radon exposure
North American Pooled Analysis	Small Cell
European Pooled Analysis	Small Cell
Iowa Radon Lung Cancer Study	Large Cell Squamous

What We Know !

Smoking is One of the Top Public Health Concerns in Our Nation.

Radon should not be far behind !

"Mr. President, this report recommends three crucial actions to reduce the terrible toll of cancer:

- Make reducing the cancer burden a national priority.
- Ensure that all Americans have timely access to needed health care and disease prevention measures.
- End the scourge of tobacco in the United States.

We already know how to vanquish much of the epidemic of suffering and death caused by cancer. If no one in America used tobacco, we could avoid one-third of all cancer deaths."

CANCER MORTALITY

CANCER TYPE	ESTIMATED U.S. DEATHS/YR
1. Lung and Bronchus	**161,840**
2. Colon and Rectum	49,960
3. Breast Cancer	40,930
4. Pancreas	34,290
5. Prostate	28,660
6. Leukemia	21,710
7. Non-Hodgkin Lymphoma	19,160
8. Liver and Bile Duct	18,410
9. Ovary	15,520
10. Esophagus	14,280
11. Urinary Bladder	14,100
12. Kidney and Renal Pelvis	13,010
13. Stomach	10,880
14. Myeloma	10,690
15. Melanoma	8,420

Radon is one of our major environmental toxicants in the United States

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>> **Radon Induced Lung Cancer**	**21,000**
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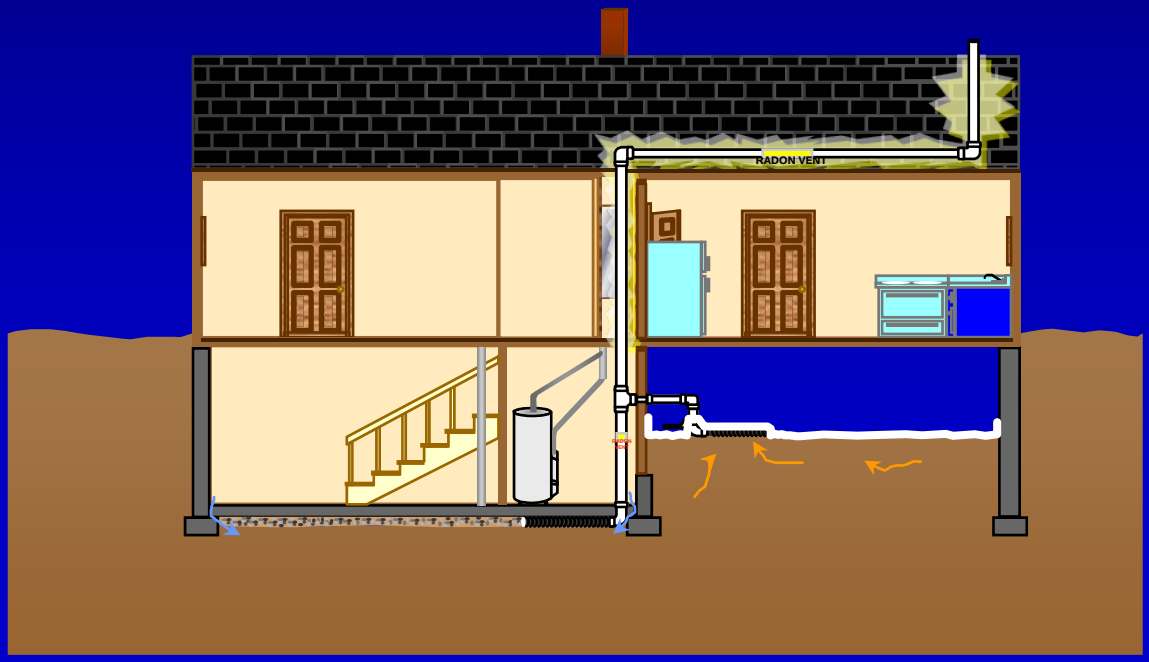
11. Urinary Bladder	14,100
12. Kidney and Renal Pelvis	13,010
13. Stomach	10,880
14. Myeloma	10,690
15. Melanoma	8,420

What We Know !

Most Homes Can be Mitigated to Below 2 pCi/L.

Mitigation and Radon Resistant New Construction (RRNC) methods are available to reduce the risk

For example, a recent study reported that the pre-mitigation radon concentrations in a survey of 166 homes averaged 380 Bq/m^3 (10.3 pCi/L), while post mitigation radon concentrations averaged 44 Bq/m^3 (1.2 pCi/L).



What We Know !

The Attributable Risk from Radon is Greatest for Never Smokers, But the Magnitude of Deaths is greatest for Smokers.

AR of Lung Cancer from Indoor Radon in the US
(BEIR VI)

	AR	Deaths/yr 95% Uncertainty intvl
Total	10-14%	16K-23K (3K-39K)
Ever-smokers	9-13%	12K - 18K
Never-smokers	19-26%	4K – 6K

Estimated lung cancer deaths for 2008:

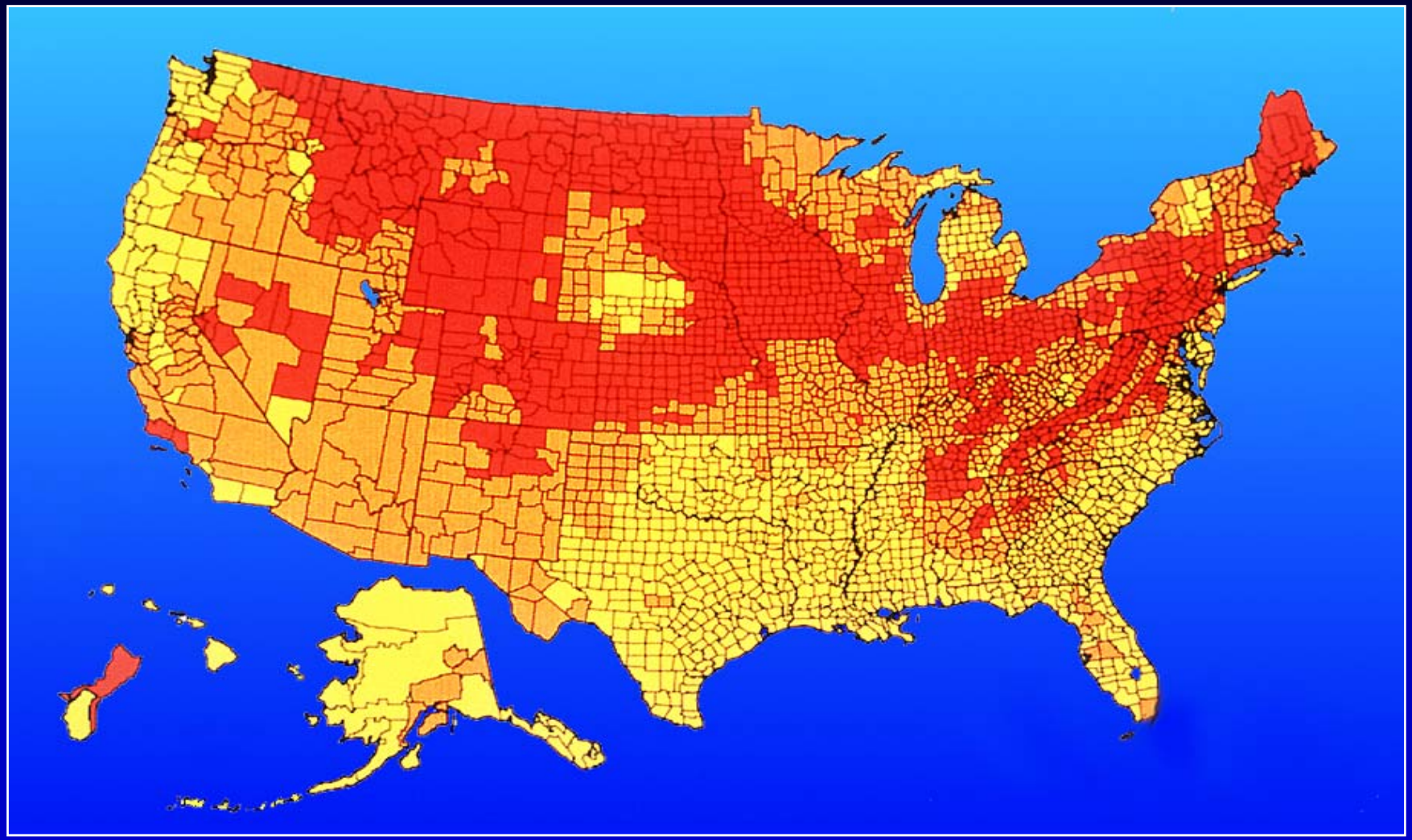
161,840

Why is it important that homes can be mitigated to below 2 pCi/L ??

What We Know !!!

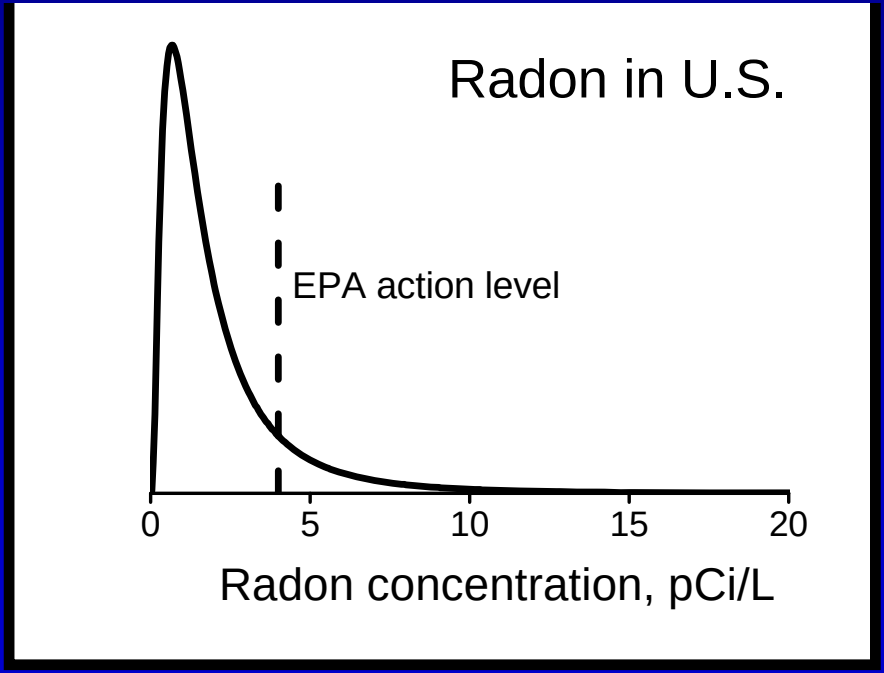
The Majority of Radon-Induced Lung Cancers Occur Below 4 pCi/L.

Most radon-induced lung cancers occur below the U.S. EPA's radon action level



Zone 1 - Predicted average indoor screening level > than 4 pCi/L
Zone 2 - Predicted average indoor screening level between 2 and 4 pCi/L
Zone 3 - Predicted average indoor screening level less than 2 pCi/L

“Effective” AR for Radon



Approximately 2/3 of lung cancers from residential exposure occur below the U.S. EPA’s action level

What We Know !

Susceptibility to Radon-Induced Lung Cancer Varies

Susceptibility to radon-induced lung cancer

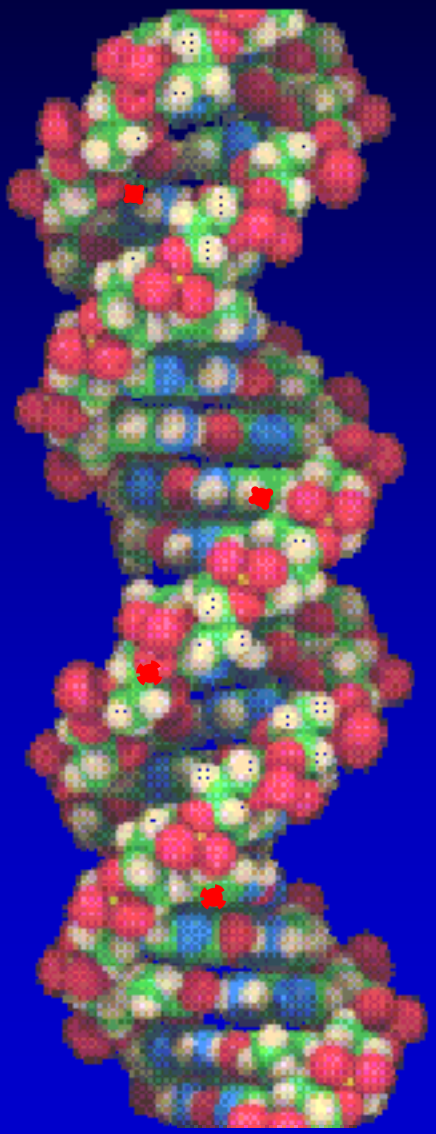
- Smokers and ex-smokers
- Individuals with lower socioeconomic status
- Infants and Children ?
- Individuals who have mixed exposures to occupational lung carcinogens
- Individuals who have a history of medically-related radiation exposure (x-ray therapy, CT, etc.)
- Variation by genotype

Genetic Variation in Susceptibility

Alpha Particle

Free radical formation

Double –strand DNA breaks



Defects in tumor suppressor genes – p53

At risk individuals–$GSTM_1$

(glutathione S-transferase M1)

What We Would Like to Know !

What is the Distribution of Workplace Radon Concentrations in the United States ??

Nationwide assessment of work place exposures warranted

- Mine workers, including uranium, hard rock, and vanadium
- Workers remediating radioactive contaminated sites, including uranium mill sites and mill tailings
- Workers at underground nuclear waste repositories
- Radon mitigation contractors and testers
- Employees of natural caves
- Phosphate fertilizer plant workers
- Oil refinery workers
- Utility tunnel workers

- Subway tunnel workers
- Construction excavators
- Power plant workers, including geothermal power and coal
- Employees of radon health mines
- Employees of radon balneotherapy spas (waterborne 222Rn source)
- Water plant operators (waterborne 222Rn source)
- Fish hatchery attendants (waterborne 222Rn source)
- Employees who come in contact with technologically enhanced sources of naturally occurring radioactive materials
- Incidental exposure in almost any occupation from local geologic 222Rn sources
- Agricultural exposures

What We Would Like to Know !

Does Radon Cause Other Adverse Health Outcomes ??

Adverse health outcomes related to protracted radon exposure other than lung cancer

Miner-based epidemiologic studies

Suggestive evidence for stomach cancer, liver cancer, skin cancer, and leukemia

Miner-based incidence study of leukemia

Incidence of all leukemia combined as well as chronic lymphocytic leukemia (CLL) was positively associated with cumulative radon exposure

Non-statistically significant increases were also noted for myeloid leukemia and Hodgkin's lymphoma

Darby et al (1995); Kreuzer et al. (2008) Řeřicha et al. (2007)

Radiation Exposure and Leukemia

A recent methodologically advanced Bayesian analysis in Iowa using the Iowa SEER cancer registry also noted an increased risk for CLL.

Several other recent studies have also suggested a potential association with radiation exposure and CLL. Until recently, CLL was the only subtype of leukemia not thought to be radiogenic.

Smith, Zhang, Field (2007); Linet et al. (2007)

RESEARCH NEEDS
Epidemiologic Studies

1. Assess risk factors affecting individual susceptibility (e.g., genetic polymorphisms) to radon-induced lung cancer

2. Assess the possible associations between radon exposure and extrapulmonary cancers (e.g., leukemia, lymphoma, chronic myeloid neoplasms, stomach, melanoma, breast)

Radon could be included as an exposure of interest under future funding for understudied rare cancers

National Cancer Institute
U.S. National Institutes of Health | www.cancer.gov

Epidemiology and Genetics Research
Cancer Control and Population Sciences

About the Program | Key Research | Funding Opps | Our Grantees | Workshop Reports | Training Opps | More Resources

EGRP Hosts Workshop on Understudied Rare Cancers

2nd NCI Epidemiology Leadership Workshop:
Understudied Rare Cancers
Boston, MA • September 11-13, 2005

Left to right: Dr. Robert Croyle, DCCPS Associate Director; Dr. Nancy Mueller, Professor, Harvard University; and Dr. Ed Trapido, EGRP Associate Director.

The Epidemiology and Genetics Research Program (EGRP) sponsored its second leadership workshop bringing together investigators to identify ways to stimulate research on understudied rare cancers on September 11-13, 2005, in Boston. EGRP is responsible for managing NCI's extramural epidemiology research portfolio.

EGRP-funded investigators conducting research on understudied rare cancers were invited to the workshop to identify gaps in epidemiologic and genetic research on the cancers, and to discuss ways to foster collaborations and partnerships among basic, clinical, and population scientists within the extramural and intramural communities. The National Institutes of Health's Office of Rare Diseases also cosponsored the workshop.

"The four major cancers, lung, breast, prostate, and colorectal cancer, comprise the lion's share of our portfolio, but there are other cancers – some of them highly lethal – that need more study," said Ed Trapido, Sc.D., EGRP Associate Director. "We sought the help of our investigators to identify the gaps and stumbling blocks and suggest new approaches to move forward epidemiologic research on these diseases."

Focus of Workshop

The workshop focused on cancers of the brain, eye, oral cavity, pharynx, head, neck, endometrium, ovary, testis, digestive and urinary systems, larynx, bones, joints, soft tissues, thyroid, and other cancers of the endocrine systems, non-Hodgkin's lymphoma, Hodgkin's disease, leukemia, myeloma, and Kaposi's sarcoma. Pancreatic cancer was excluded because it is addressed in a trans-NCI Program Announcement that EGRP currently is cosponsoring (PA for Pilot Studies in Pancreatic Cancer (PA 05-116)).

Assembled at Harvard Medical School Conference Center

Nancy Mueller, Sc.D., of Harvard University and Dana-Farber Cancer Institute, gave the keynote address on lessons that she has learned in studying Hodgkin's lymphoma over the past 30 years. Dr. Mueller has been an EGRP grantee for 28 years. She has found the research experience richly rewarding but spoke of times when funding for epidemiologic research was a problem, and there were few advocates for such research, few epidemiologists with whom to share data, and few basic scientists interested in collaboration. The reward of rare cancer research lies in the opportunity to make a difference, she said. "It's really a labor of love...you do it because you care."

Consortia and Transdisciplinary Science

Working groups discussed advancing research on understudied rare cancers in the context of consortia and transdisciplinary science. The consortia approach is an emerging paradigm in which large interdisciplinary teams of scientists think and work collaboratively using common questions, protocols and methods, and perform coordinated parallel or pooled analyses. EGRP currently is supporting or assisting in the development of epidemiological research consortia on 15 types of cancer. Technology and team science are changing the landscape of research, said Dr. Trapido.

Cost effectively include radon exposure assessment as a component of on-going prospective cohort studies

Last Reviewed: 10/3/2008
Last Updated: 10/3/2008

IN THE SPOTLIGHT

Today the National Children's Study announced the 2008 Study Centers that will manage operations in 39 additional locations... Read More

What's New

National Children's Study Announces New Centers

National Children's Study Response to the NAS Review of the Study's Research Plan (August 2008)

National Children's Study Tour Pages

Study Locations

Find out more about the Study locations. View maps and lists of locations... Read More

What is the National Children's Study?

The National Children's Study will examine the effects of environmental influences on the health and development of 100,000 children across the United States, following them from before birth until age 21. The goal of the Study is to improve the health and well-being of children.

Watch this video and learn more about the Study.

The Study defines "environment" broadly, taking a number of natural and man-made environmental, biological, genetic, and psychosocial factors into account. By studying children through their different phases of growth and development, researchers will be better able to understand the role these factors have on health and disease. Findings from the Study will be made available as the research progresses, making potential benefits known to the public as soon as possible.

Ultimately, the National Children's Study will be one of the richest research efforts geared towards studying children's health and development and will form the basis of child health guidance, interventions, and policy for generations to come. For more details on the Study, see the Study Overview.

The National Children's Study is led by a consortium of federal partners including: the U.S. Department of Health and Human Services (including the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development and the National Institute of Environmental Health Sciences, of the National Institutes of Health and the Centers for Disease Control and Prevention), and the U.S. Environmental Protection Agency.

Agricultural Health Study

Iowa
Study Update 2008

The Agricultural Health Study seeks to identify factors that promote good health

AHS Scientists Begin Study of Lung Health

Agricultural Health Study (AHS) scientists have begun a large study of asthma and respiratory health among participants, including applicators and their spouses.

The Lung Health Study was developed because research shows that farmers and their families may be more likely than the general population to have asthma and other respiratory problems.

In the AHS, for example, farmers and commercial pesticide applicators who used specific pesticides or raised animals were more likely than others to report wheezing, which is a common symptom of asthma.

For women who grew up on farms, there are two interesting findings: 1) they report less asthma than women who didn't grow up on farms. 2) if they applied chemicals, they report more allergic asthma than others in the group.

"We hope to find out if specific pesticides contribute to asthma, as well as to evaluate the role of other farming exposures" said Dr. Jane Hoppin, the scientist who is leading this study.

The Lung Health Study will look at lung function, allergic status, and genetic characteristics associated with asthma and other respiratory illnesses.

"This study will give us better information about the onset of asthma and whether there are any associations with the use of pesticides," said Dr. Hoppin.

"If you are one of the 6,000 AHS participants we contact over the next four years, we hope you will agree to take part in the Lung Health Study."

What is asthma? Asthma is a serious chronic illness that causes inflammation of the airways and increased production of mucus in them. In addition to wheezing, symptoms include coughing and tightness in the chest.

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A Message from our Director

As I write this note, farmers in Iowa and North Carolina are struggling to rebound from major natural disasters in 2008. Many Agricultural Health Study participants have been impacted by unprecedented flooding in Iowa and severe drought in North Carolina.

On behalf of the entire AHS team, I would like to express our sincere concern for the welfare of the agricultural communities in both states. The economic loss and psychological impact of these events are undoubtedly great. Our thoughts and prayers are with you and your family as recovery is underway.

You are central to the success of our research. Without you, we would not be able to make new discoveries that may help to improve the health of future generations of farm families. Even if you are no longer farming, we appreciate your continued help.

We have now completed nearly 30,000 interviews to update information on health status and farming practices. Be assured that your confidentiality is always protected.

This newsletter will give you a glimpse of recent findings. For more information, please visit **www.aghealth.org** or call us at **1-800-217-1954**.

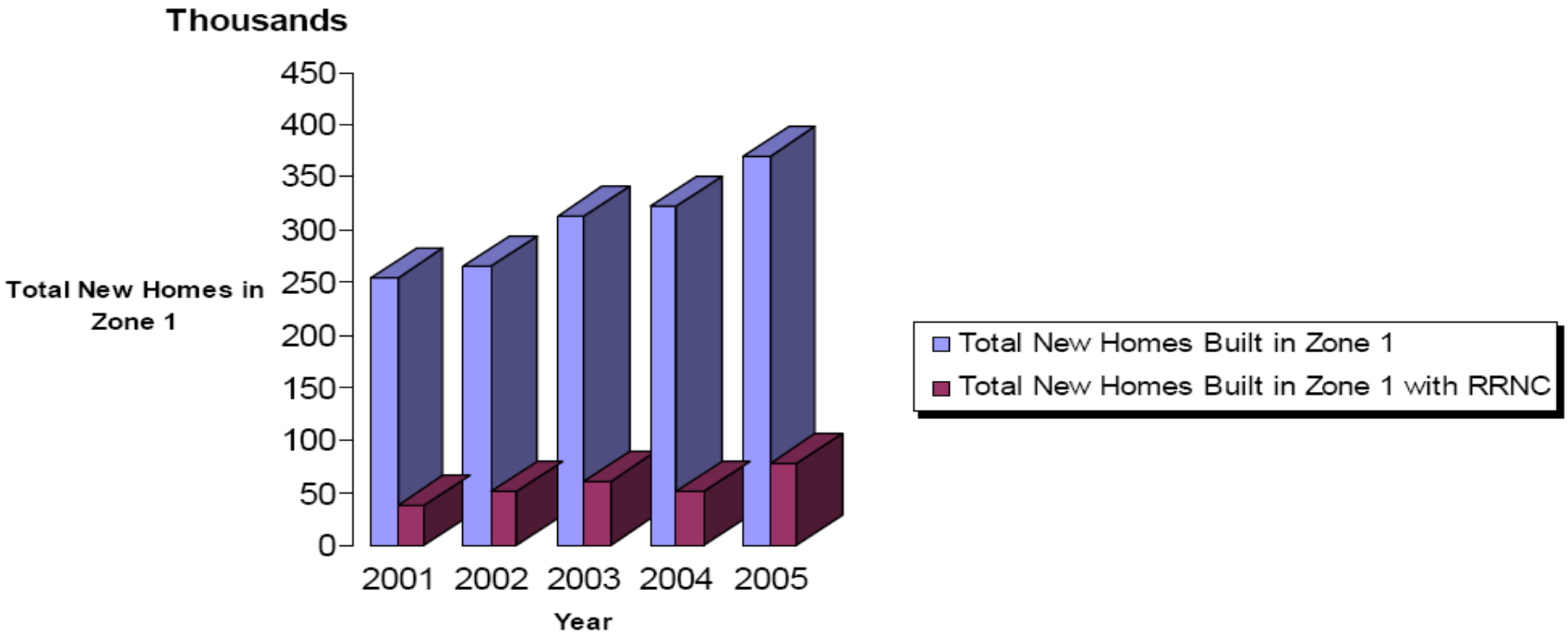
My sincere best wishes to you and your family,

Michael C.R. Alavanja, Dr PH
Principal Investigator
Agricultural Health Study
National Institutes of Health

What We Need !

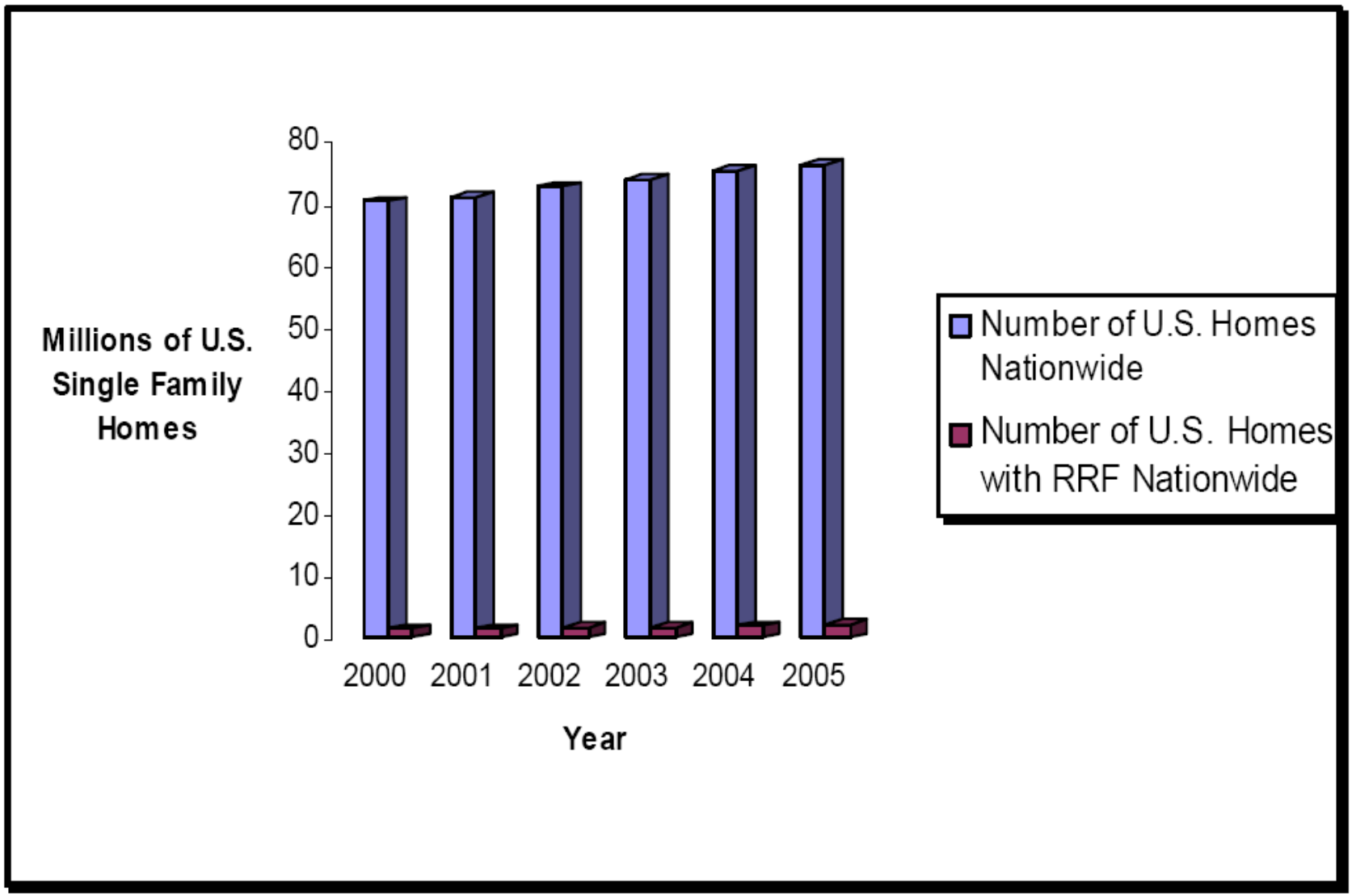
New ideas on how we can promote policy development and legislation at the local, state, and Federal level to require radon testing during real estate transactions and Radon Resistant New Construction

Total number of homes built in high radon areas compared to number of homes constructed with radon resistant features



[a] New homes built with RRNC in Zone 1 is based on EPA's estimate that 60 percent of all homes built with RRNC are in Zone 1.

Number of single family homes and number with radon reduction features



Source: OIG analysis of U.S. Census Bureau data on homes and gross annual radon fan sales data supplied by fan manufacturers to EPA's Indoor Radon Team.

Other Considerations

- Numerous cost/benefit analyses have clearly indicated that both mitigation of existing homes and adopting radon resistant new construction features can be justified on a national level (WHO 2008, Steck 2008).

- In order to reduce the number of radon-related lung cancers by half, we need to strive to reduce radon concentrations to less than 2 pCi/L .

    - Implications for a focus on new methods to reduce radon dose?

3rd Annual EPA/State Region 7 Radon Stakeholders' Meeting

State of the Nation: Radon

Bill Field
Professor
Department of Occupational and Environmental Health
Department of Epidemiology
College of Public Health
The University of Iowa
Bill-field@uiowa.edu

THANK YOU !!

OOPS….

Examples of poorly installed systems

Sara Morgan
NE Dept of Health and Human Services
Radon Program

Nebraska Regulations

180 NAC 11-012 Mitigation System Installation Requirements

Not covered:

- -permits, licenses (covered by local ordinances)
- -warranties, customer service (business choice)

Covered:

- Materials used, sealing, pipe support, monitor use, and labeling.

Inspections

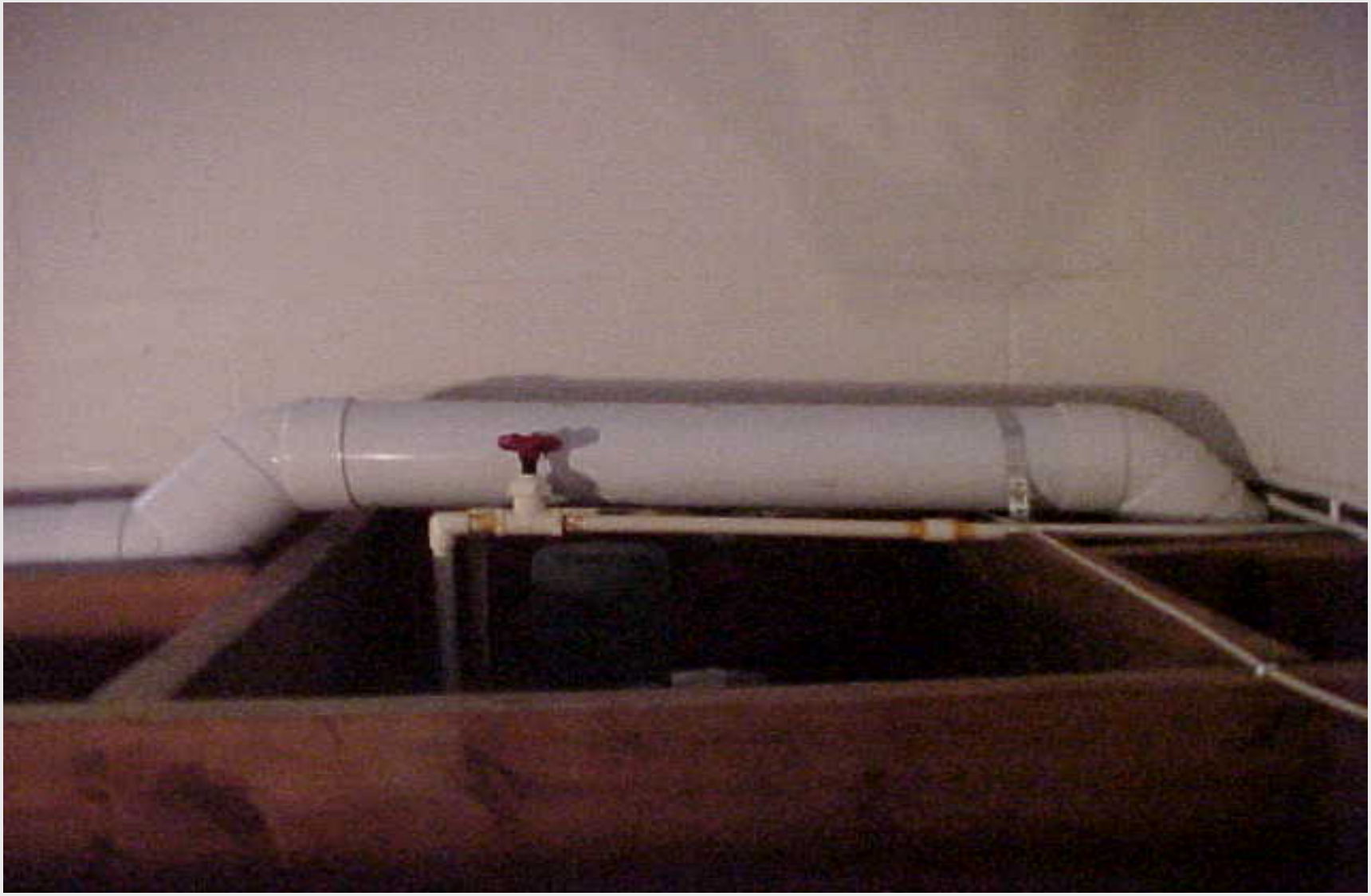
Two types:

- Four times a year send letter to homeowners offering a free inspection of recently installed system.
  - Means of “auditing” licensed businesses
- Complaint-based

Poorly Installed Systems

Following pictures are not indicative of overall quality of work in Nebraska.

We are lucky to have an industry that generally does good work at a fair price and provides excellent customer service.



Thank you!

Sara Morgan

Nebraska Radon Program

3rd Annual Region 7 Radon Stakeholders' Meeting
March 4, 2009
Overland Park, Kansas

Region 7 2009 Radon Award Winners

Iowa

The Iowa Radon Program would like to introduce Aimee Devereaux as a special radon worker in the state of Iowa. Currently Aimee is the Environmental Health Specialist for O'Brien County. Prior to serving O'Brian County, she was the Environmental Health Supervisor for Pocahontas County. Aimee is NEHA registered as both an Environmental Health Specialist and a Healthy Homes Specialist. She began her public health career in NY State 10 years ago before coming to Iowa in 2000.

For the past 9 years, she has been a member of the Iowa AIR Coalition and has been very involved with radon education for constituents in both Iowa counties she has served. Aimee has been instrumental in assisting nearby counties in the Northwest Iowa Sanitarian group, with developing their own public health radon programs.

Aimee is an active member of the Iowa Environmental Health Association. She has held several positions with that organization and currently serves on the professional development committee.

One of the characteristics that make Aimee stand out is her willingness & ability to spread radon awareness beyond the traditional boundaries of her job responsibility. As one of her volunteer duties, Aimee maintains the Iowa Environmental Health Association website. Through this website, she is able to provide radon information, updates on Iowa AIR Coalition activities, training opportunities, and notice of meetings, to Public Health Agencies statewide. This may be the best, if not the only, radon communication for some public health workers in Iowa.

Aimee has done a lot for advancing the cause of radon in Iowa, and we are very pleased to choose her for this honor.

Kansas

During the Kansas legislative session of 2008, radon legislation was successfully passed which requires information on radon to be included on all residential real estate contracts. On the contracts, all homebuyers in Kansas will be provided information that includes a radon warning statement, a recommendation to have the home tested for radon, and a website link to the Kansas Radon Program for more information. We believe that this action will result in a greatly increased number of homes being tested during residential real estate transactions in Kansas.

This legislation was the result of one courageous woman, a never-smoker who contracted lung cancer and subsequently passed away from that disease, and the man who learned of her story, researched the issue of radon, and made the legislation a reality.

This man is Jim Barnett, a physician from Emporia Kansas and a member of the Kansas Senate. In 2007, Senator Barnett came to the Kansas Department of Health and Environment with the desire to pass legislation addressing radon in Kansas. He was instrumental in the design of the original bill. He put his name on the bill and introduced it with a press release. By dedicating his time and effort to the negotiations, Senator Barnett was able to see his radon bill pass the Kansas Senate. Through use of his political influence, Senator Barnett was able to save the radon bill when it was tabled by the Kansas House. He successfully attached it to another bill and gained Senate approval once again. Senator Barnett's radon bill passed both the Kansas House and the Senate and was signed by the Kansas Governor on May 18, 2008.

As a direct result of the actions taken by Senator Barnett to pass radon legislation, more homes will be tested for radon in Kansas. This will lead to more homes with elevated radon levels being mitigated. This will lead to less cases of radon-induced lung cancer in Kansas.

We therefore recognize Senator Jim Barnett, as a Kansas Radon Hero.

Missouri

Traci Lewis was selected from among nine nominees for the Missouri Radon Hero award. Traci teaches art to 6th, 7th, and 8th graders at Savannah Middle School in Savannah, Missouri.

As part of National Radon Action Month, the Missouri Department of Health and Senior Services (DHSS) participated in the National Radon Poster Contest. Letters and brochures were sent to more than 400 middle schools around the state. In response, 109 posters were submitted to us for judging. A panel of judges reviewed the posters, not knowing where they were from, since all identifying information was located on the back of the posters. When all the votes were tabulated, we were amazed to find that our first, second, and third place winners had all been submitted by the same teacher.

Some of our radon poster contest entries are submitted by science classes that have incorporated radon into their curriculum. Others are submitted by art classes, such as those of Ms. Lewis. Because these posters are used as educational tools in a national campaign to raise awareness about radon, the factual content of the posters is as important as the quality of the artwork. The fact that all three winning posters were submitted by Ms. Lewis' classes demonstrates that she took extra effort to educate her students on radon so that their posters were not only attractive, but educational.

We appreciate Traci and her dedication to her students, and for going the extra mile to educate herself and her students on radon. For that reason, the radon/indoor air staff of the

Missouri Department of Health and Senior Services voted Ms. Traci Lewis as a Missouri Radon Hero.

Nebraska

Before someone can mitigate a home, they must test. And before someone tests, they must be educated. This initial step is for many people the introduction to an issue that is both complex and extremely important. It is also crucial in that it can impact the future steps a homeowner takes.

At the Nebraska Radon Program, we realize that local partners are essential in providing quality radon education to homeowners. Local partners not only expand our resource base, but also provide a trusted source for the information we want to get out. One of the most dedicated radon educators in Nebraska is Becky Versch, of the Washington County extension office within the University of Nebraska system.

Since taking the initial radon measurement and mitigation training courses in 2000, Becky has educated thousands of people across the state about radon issues. This education has taken place through classroom instruction, phone calls, and a document that she co-authored called "Radon In Nebraska Homes"; a Neb Guide for the University of Nebraska (Goo-1404-A, revised October 2003). She has provided technical assistance to other county extension offices; and traveled across the state to give presentations when asked.

In addition to educating the general public, Becky has also focused on the high-priority areas of real estate transactions and Radon Resistant New Construction (RRNC). Extensive work in realtor education began for Becky in 2004 when she assisted in developing a web-based continuing education course accepted by the NE Realtors Association (NRA) for credit. Realtor education continued with a classroom based radon education course which was also given approval for continuing education credits with the NRA. Through a series of contracts with the Department of Health and Human Services during 2005 - 2007, Becky assisted in developing the course and educating hundreds of professionals in the real estate industry.

Becky's RRNC work has included educating builders and promoting RRNC in her area, as well as a demonstration project in 2003-2004. This project utilized a Conference of Radiation Control Program Directors (CRCPD) minigrant to encourage Nebraska builders to construct homes with radon resistant features, use the homes as training sites, provide incentives for their efforts, and recognize those who have participated.

In her efforts, Becky has at times worked with financial support from the state or national level, at times as part of her work with the county extension office, and at times with no additional support, on her own time and using her own resources. She is an excellent teacher with extensive knowledge and goes above and beyond for her programs. A colleague of hers at the University of Nebraska has called her "a true team player", and at the Nebraska Radon Program we see in her a valuable asset to our radon community.

Her passion and dedication to radon education are at the highest level, and for all of these reasons we recognize her as a Radon Leader.

Granite Countertops

3rd Annual

Region 7 Radon Stakeholders' Meeting

Thomas A. Conley, CHP

Kansas Department of Health and Environment

Is my granite countertop increasing radon levels in my home?

- What are we really asking?
- Is the issue radium in granite or radon in air?
- What are the exposure pathways?

Is my granite countertop radioactive?

- Simple answer:
  - Yes
- Complex answer:
  - Yes
  - But that is not the real question

The real question

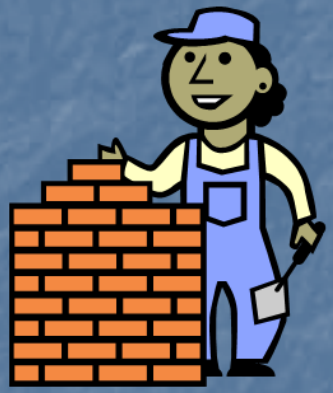
- Am I being exposed to harmful levels of radiation from my granite countertop?
- To answer this we need to ask ourselves more questions.

What are the pathways

- First, external
  - Exposure to gamma rays from
    - Naturally Occurring Radioactive Material (NORM)
- Second, internal
  - Exposure to gaseous NORM decay products
  - Ingestion of NORM

External radiation

- Gamma rays from outside the body
- Building materials and soils
  - Granite countertops
  - Brick
  - Masonry
  - Marble
  - Gypsum
- Not typically a significant exposure



Internal Sources

- Radioactive material inside the body
- Inhalation
  - Radon released from building materials
  - Radon entering the home from soil gas infiltration
  - Potential for chronic exposure
- Ingestion
  - Ingestion of dust and dirt
  - Not considered a significant pathway

To answer the question What do we need to know

- How much radon is in the air the person is breathing?
- How?
  - Calculate
  - Measure

Calculate Radon from Granite

- Need to know
  - Radium-226 concentration (pCi/g)
  - Density of the granite (g/cm^3)
  - Countertop volume (cm^3)
    - Countertop area (cm^2) times
    - Countertop thickness (cm)
  - Room volume (liters)
  - % of room that is air
  - # Room air changes per hour

So now the calculation

- Assume:
  - Radium-226 concentration = 8 pCi/g
    - Average based on Health Physics Society measurements
  - Countertop volume = 1.5E4 cm^3
    - 1 X 5 meter countertop 3 cm thick
  - Room volume = 5.09E4 liters
    - 15’ X 15’ X 8
  - % Room volume that is air = 75%
  - Air changes per hour = 0.5

How much Rn from granite

Assuming the radon is uniformly mixed in the room:

0.13 pCi/l

Compared to the EPA guidance:

4 pCi/l

Can granite produce enough Rn to approach 4 pCi/l

- Yes, given the same scenario the concentration in the granite would need to be:
- 245 pCi/g
- The dose rate from this granite would be over 300 uR/hr on contact

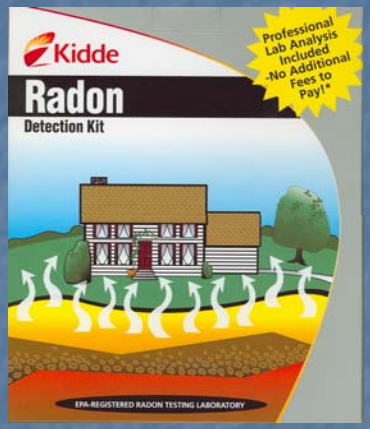
Is this calculation accurate?

- NO.
- To be accurate:
  - Analyze samples of the granite
    - Radium-226
    - Very expensive
    - Concentration varies greatly within slab
      - Difficult to get accurate measure of total Radium-226
  - Precisely measure the room air volume and exchange rates
    - Need very expensive equipment
  - Does not take into account the occupancy factor
  - Many other variables also come into play

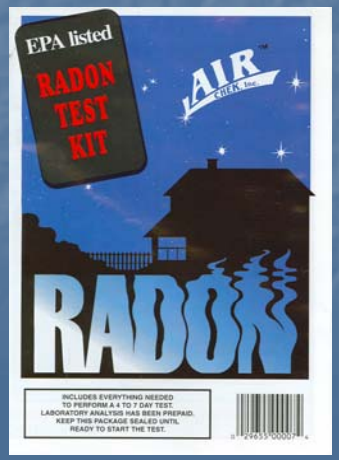
Can I measure radon from a countertop?

- NOT IN A MEANINGFUL WAY!!!!!
- There are no standard protocols
- Procedures you find on the internet:
  - Only get data from a small area
  - Granite is not homogeneous
  - Cannot be related to room air concentration
- These “measurements” only
  - Mislead the client
  - Cause unnecessary concern for the client
  - Increase cost with no benefit

Ok, so what do I do?



- Follow standard test protocols
  - Use standard test kits
  - At least
    - 20 in. off floor
    - 20 in. from suspect building material
  - Test lowest livable area in the home
  - At the same time, perform another test in the room where the granite countertop or other suspect building material exists.



My Client's Radon is high, now what?

- If either of the previous two tests are >4 pCi/l
- First recheck, if the average of two tests in any one room is still >4pCi/l
- Install an active soil depressurization system
  - 95% of indoor radon comes from surrounding soils
  - It is unlikely the source of the radon is a granite countertop

What do the States say?

- Testing granite countertops for radiation or radon is not a reliable measure of the radon in the air you breath
- To determine exposure to radon test the air in the home
- If >4pCi/l then install an active soil depressurization system
- Removing the granite is not normally an effective means to reduce radon levels

Questions

Kansas Radon Program

www.kansasradonprogram.org

1-800-693-5343

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