



JOHNS HOPKINS
BLOOMBERG
SCHOOL *of* PUBLIC HEALTH

Radon Research at Hopkins EHE

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Protecting Health, Saving Lives—*Millions at a Time*

Overview of Research

- **Outgrowth of a data sharing agreement, Commonwealth of Pennsylvania (PA DEP) and dedicated students**
- **RRNC studies:**
 - Easton, PA (published: Bellamy and Locke, ELR, December 2018) – most of this presentation
 - Amityville PA (doctoral dissertation, Sharon Edelstein-Mammel) – forthcoming
- **Radon Risk Communication:**
 - Study in Allentown, PA (Chrys Cronin) – next !!



C O M M E N T

Legal Tools to Reduce Radon's Risk: An Evaluation of Mandatory Radon-Resistant New Construction in Building Codes

by William C. Bellamy and Paul A. Locke

12-2018

NEWS & ANALYSIS

48 ELR 11063



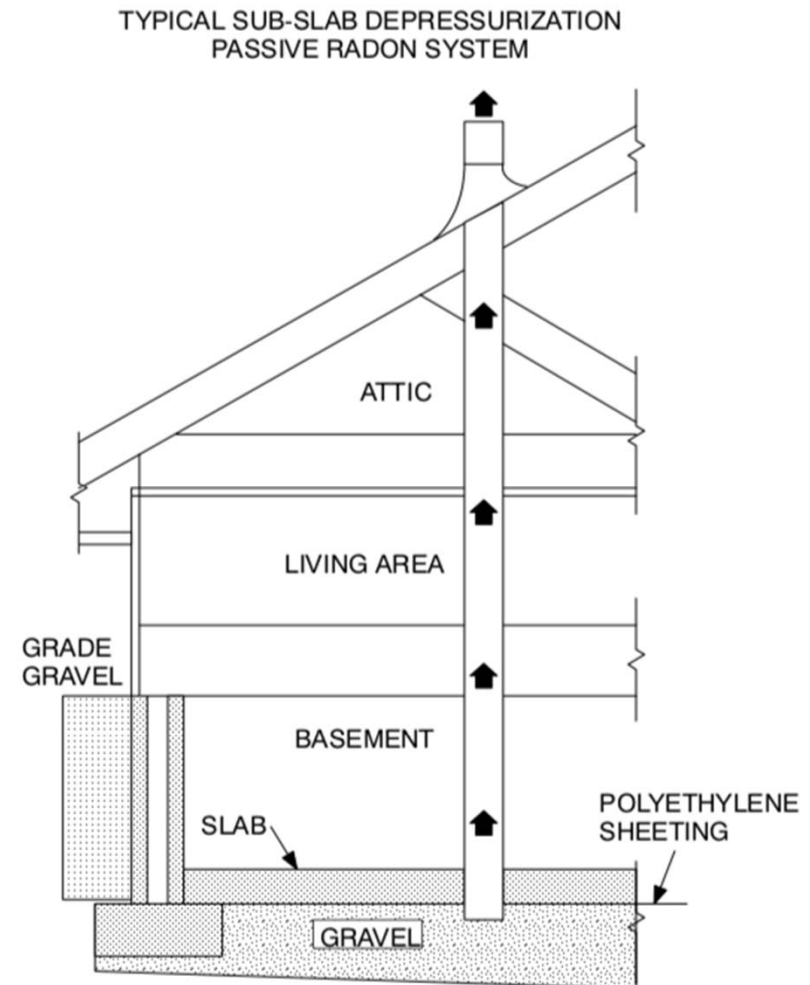
Key points from our research:

- RRNC significantly reduces household radon levels and, by extension, radon-related lung cancer risk
 - ✓ Based on PA DEP data from Easton, PA
 - ✓ Compares before/after enactment of RRNC ordinance
- Geological formation can influence household radon levels on a local level
- PA laws, regulations and policies are very robust
 - ✓ Data collection, certification, anti-fraud
 - ✓ Creation of a cadre of radon professionals to serve public needs
- Additional data (beyond 2013) could make our findings more robust



Appendix F & RRNC Requirements

- Easton adopted Appendix F of the International Residential Code in 2005
- Appendix F requires new homes to be built with radon-resistant techniques
 - Vent pipe
 - Sealants



Study Design

- Identified tests conducted at addresses in Easton within the larger PADEP dataset (geocoded at JHU)
- Easton chief code administrator provided spreadsheet of addresses of homes built after Appendix F came into effect
- Matched these homes with radon tests in PADEP



11,100 tests conducted in 6,528 homes in Easton, PA, from 1988 to 2013

Adoption of Appendix F by City of Easton in June of 2004, came into effect in July

6074 tests conducted in 4,061 homes in Easton, PA, after passage of Appendix F

4,723 tests conducted in 3,057 homes after June of 2004 with complete data for test location and house type

33 tests conducted in 27 RRNC homes

4,690 tests conducted in 3,030 non-RRNC homes



Statistical Analysis

- Variables examined include:
 - Household radon level (pCi/L)
 - Presence/absence of RRNC
 - House type (two-story, apartment, etc.)
 - Test location (basement, first floor, etc.)
 - Geological formation (Allentown, Epler, etc.)
 - Day/month/year of test
 - Length of testing period

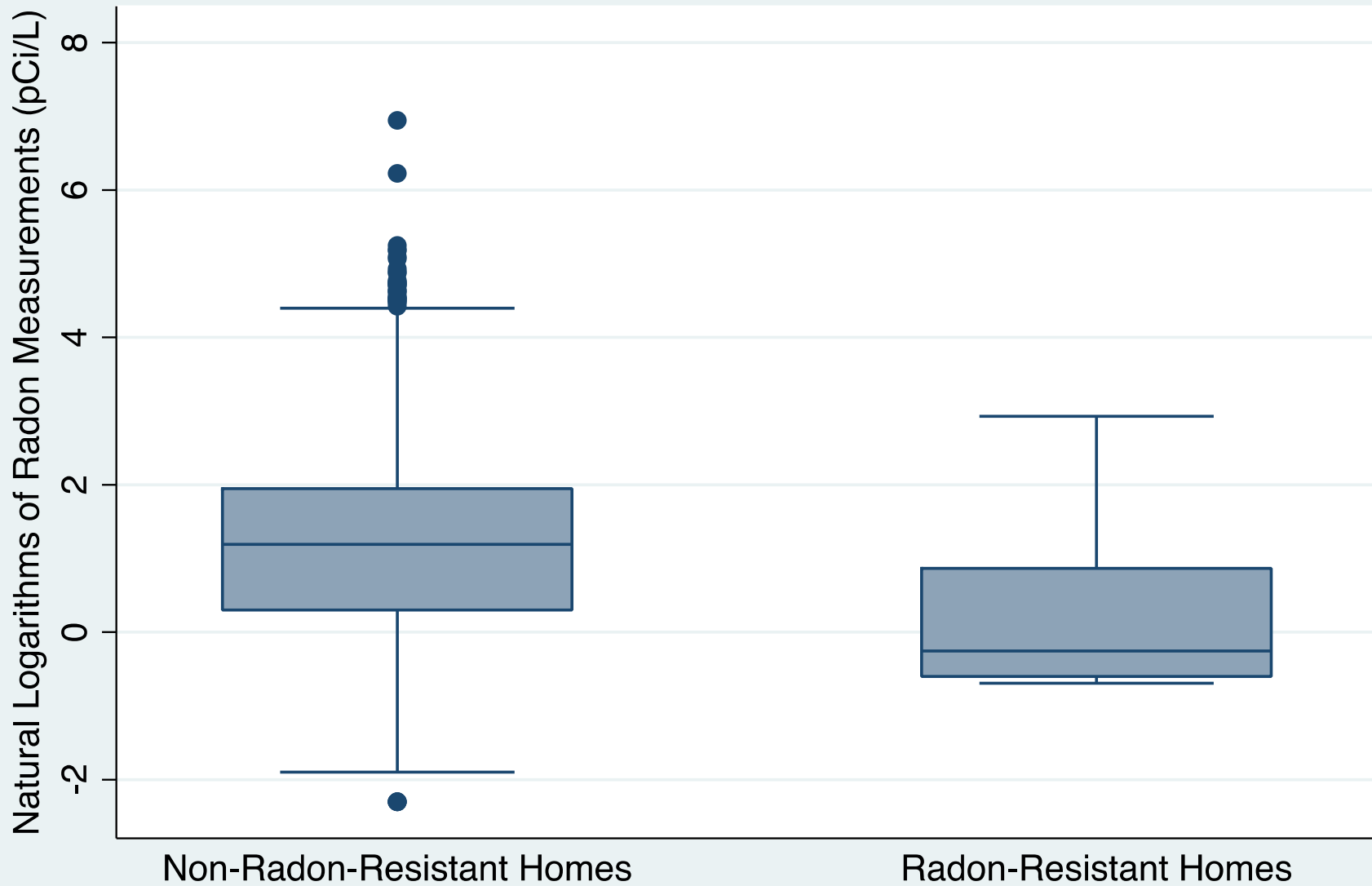


Descriptive Statistics – Radon Levels

- The median radon measurement in homes built with RRNC (0.775 pCi/L) is less than that in homes built without RRNC (3.3 pCi/L)
- Median radon measurement varies by house type, test location, geological formation, and time of year



Box Plots of Radon Measurements After Log Transformation, by RRNC (Post-Appendix F Adoption)



Median Measurement for Non-RRNC Homes: 1.194, $e^{1.194} = 3.3$ pCi/L, Median Measurement for RRNC Homes: -0.255 , $e^{-0.255} = 0.775$ pCi/L



Inferential Statistics – Effect of RRNC

- Logistic regression modeling the odds of exceeding the action level (4 pCi/L), as well as 1 pCi/L
- Adjustment for house type, test location, and season, but not geological formation
- Cluster option used to account for multiple observations in the same home



Results

- The presence of RRNC is associated with:
 - ✓ A -70.75% change in the odds of a test measurement exceeding the action level (95% confidence interval: -93.97%, 42.01%)
 - ✓ A -76.59% change in the odds of a test measurement exceeding 1 pCi/L (95% CI: -91.01%, -39.08%)

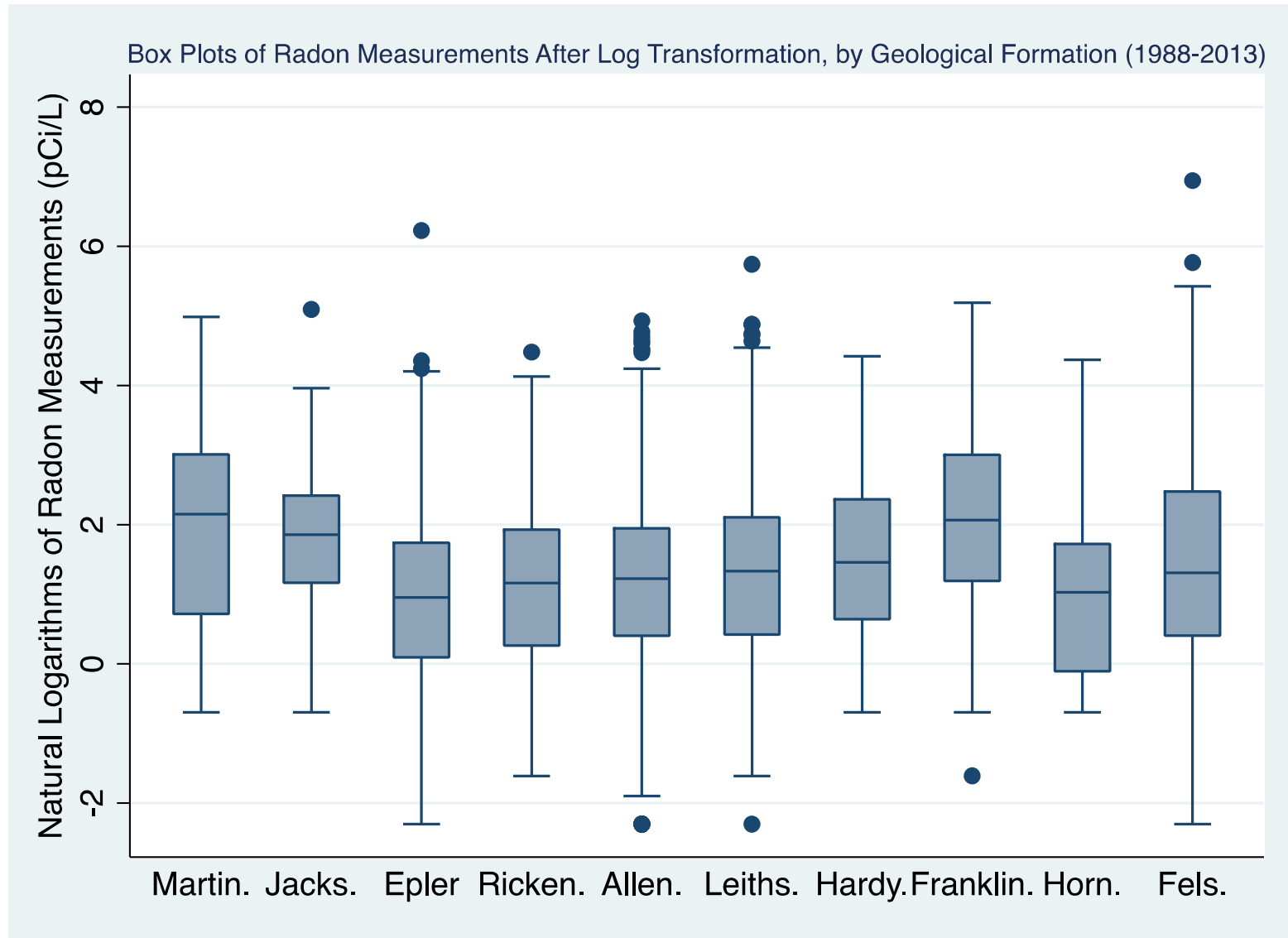


Discussion

- Our findings suggest that RRNC is effective at reducing household radon levels, and by extension, lung cancer risk associated with radon:
 - below the 4 pCi/L action level; and
 - also effective at bringing levels below 1 pCi/L
- Findings would likely be strengthened if additional data (2013-present) were analyzed



Geological Formation



10,159 observations



Questions About Geological Formation

- To what extent do household radon levels vary by geological formation?
- How does the effect of RRNC differ from “high radon” to “low radon” formations?
- Is it time to revamp radon potential maps based on more precise geological formation data?



Citations

1. International Code Council. Appendix F Radon Control Methods. 2015. Available at: <https://codes.iccsafe.org/content/IRC2018/appendix-f-radon-control-methods>
2. Bellamy & Locke, Legal Tools to Reduce Radon's Risk: An Evaluation of Mandatory Radon-Resistant New Construction in Building Codes. 48 Env't L. Rept. 11063 (December 2018). Available at: <https://elr.info/news-analysis/48/11063/legal-tools-reduce-radons-risk-evaluation-mandatory-radon-resistant-new-construction-building-codes>



**Promoting Radon Testing, Disclosure, and Remediation:
Protecting Public Health Through the Home Mortgage
Market**

November 1990

Citation: 20 ELR 10475

Issue: 11

Author: Paul A. Locke

**Columbia Journal of
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Vol. 25, No. 1

2000

**Caveat Broker: What Can Real Estate Licensees Do About Their
Potentially Expanding Liability for Failure to Disclose Radon
Risks in Home Purchase and Sale Transactions?**

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Progress ??





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Thanks!!

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