



Modeling Radon in Pennsylvania

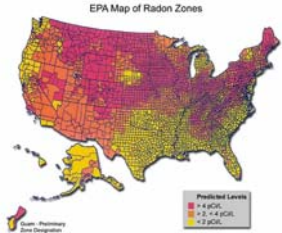
Mike Huber

MAA Session on Quantitative Reasoning and the Environment

MUHLENBERG COLLEGE

Agenda

- Why study Radon?
- How can we get actual data?
- The Project
- Discovering Trends
- Assessment
- References / Questions



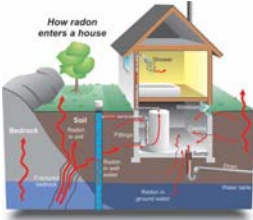
EPA Map of Radon Zones

Source: Pennsylvania State Department of Environmental Protection

MUHLENBERG COLLEGE

Why Study Radon?

Radon is a serious issue in Lehigh County, Pennsylvania. The Environmental Protection Agency has established guidelines and safe levels for residents in the county. Any reading greater than 4 pCi/l (pico Curies per liter) is potentially dangerous. Long-term exposure to radon can lead to lung cancer.



How radon enters a house

MUHLENBERG COLLEGE

The Project

Download the data set for your area (Allentown, Whitehall or Upper Macungie). The data set contains reading of homes tested by the EPA in 2000 in the Allentown area. Each radon reading is given by its location in a latitude/longitude format.

Develop a model to predict radon levels in the Allentown area. Predict each level first as a function of latitude and then as a function of longitude.

Using a linear regression model, develop a linear model to predict the radon level at the center of each area. The centers are located at:

Allentown	Lat 40.61N	Lon -75.49W
Whitehall	Lat 40.36N	Lon -75.99W
Upper Macungie	Lat 40.58N	Lon -75.66W

How confident are you in the models?
Do you notice any trends in the data?
What cautions might you give a resident who is concerned about radon levels?

MUHLENBERG COLLEGE

The EPA Website

www.dep.state.pa.us/RadiationProtection_Apps/Radon



PENNSYLVANIA
Department of Environmental Protection

Radon Test Results Data

What is Radon?

Search for Radon Test Results by Zip Code

Zip Code:

MUHLENBERG COLLEGE

The EPA Website



PENNSYLVANIA
Department of Environmental Protection

Search Results for zip code: '18104'

The Environmental Protection Agency (EPA) recommends that you take action to reduce your home indoor radon levels if your radon test is 4 pCi/L (pico Curies per liter) or higher.

Zip Code	Number of Tests	Minimum Result pCiL	Maximum Result pCiL	Average Result pCiL
18104	4633	0	433.4	7.3

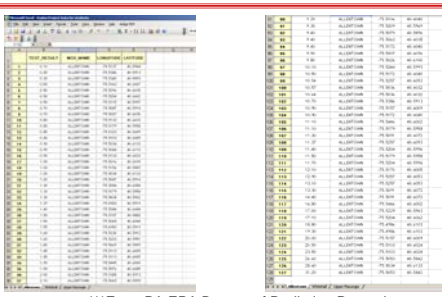
[Search Again](#)

[DEP's Radon Page](#)

[PA Home Site](#) | [Ask DEP](#) | [Plug-Ins](#) | [Home Page](#)

MUHLENBERG COLLEGE

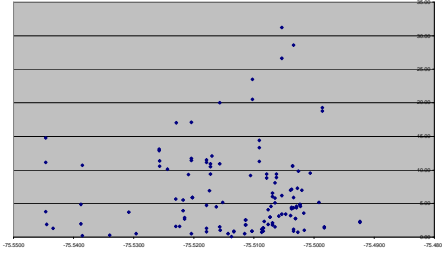
Data for Students



***From PA EPA Bureau of Radiation Protection

MUHLENBERG COLLEGE

Results by Longitude




MUHLENBERG COLLEGE

Finding a Trend

Gather data for the following cities:


Tamaqua	18252
Scranton	18510
East Stroudsburg	18301
Emmaus	18049
Easton	18040
Bethlehem	18018
Nazareth	18064
Reading	18640
Jim Thorpe	18229
Quakertown	18951



***From Google Maps (Terrain)

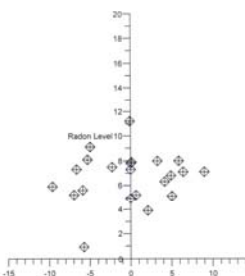
MUHLENBERG COLLEGE

Local Trends (Closer to 'Berg)



MUHLENBERG COLLEGE

Local Trends (Closer to 'Berg)



MUHLENBERG COLLEGE

Assessment

Part I: Developing a Model
 Predicting radon levels (latitude, longitude)
 Using linear regression
 Confidence and trends
 Cautions to resident
 Comments

Part II: Comparing to other zip codes
 Discussing trends
 Creating a better model
 Influential factors
 Comments



Learning Assessment Thread

	Needs Improvement				Satisfactory	Excellent	
Mathematical Reasoning	1	2	3	4	5		
Mathematical Modeling	1	2	3	4	5		
Scientific Computing	1	2	3	4	5		
Communicating Mathematics	1	2	3	4	5		

MUHLENBERG COLLEGE

References / Questions

- http://www.homeprocanada.ca/radon/radon_450x397.jpg
- http://www.dep.state.pa.us/RadiationProtection_Apps/Radon
- <http://www.nationalsafety.biz/radon/images/zonemap2.jpg>
- "The Pennsylvania Radon Story," found online at http://www.dep.state.pa.us/brp/Radon_Division/PA_Radon_Story1.htm
- Conversations with Robert Lewis, Radon Division, Pennsylvania EPA, Bureau of Radiation Protection, 2008.



MUHLENBERG COLLEGE

