



Lawrence Berkeley National Laboratory



# LBLN Residential Diagnostic Database (ResDB)

**Wanyu Rengie Chan, Jeffery Joh, Max Sherman**  
Indoor Environment Department, EETD

Building America  
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# Project Overview


- Funded by Department of Energy (DOE) and California Energy Commission (CEC)
- Work initiated mid 2010
- Data collection is nearly complete
  - Today's results are preliminary
- Data analysis will continue through the end of 2011
- Reports expected early 2012

# Objectives

- Collect diagnostics data and update LBNL's database
  - US nationwide coverage for DOE's assessment of expected home energy savings from upgrades
  - Spatially resolved, house-characteristic dependent residential air leakage distribution
  - Indoor air quality and exposure modeling

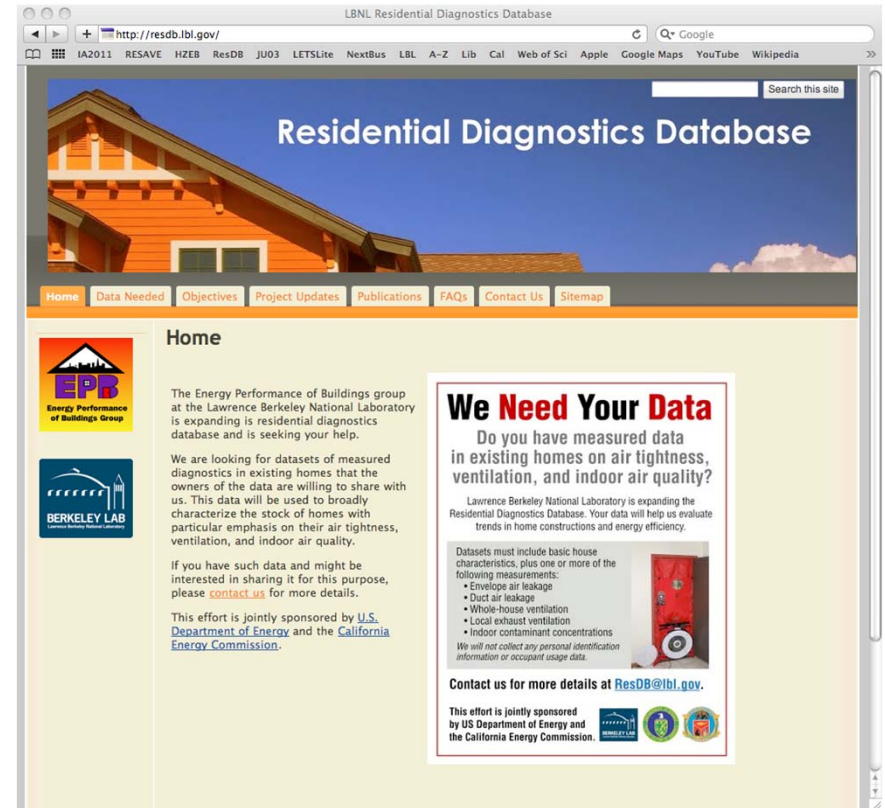
The screenshot shows the Home Energy Saver website interface. At the top, there is a navigation bar with links for Login, Help, About, Privacy, Media Room, and Feedback. The main header features the "HOME ENERGY SAVER" logo and a navigation menu with tabs for START, DESCRIBE, COMPARE, UPGRADE, and LEARN. Below the header, a central banner displays the slogan "Save money, live better, help the earth!" and "Over 6 million visits!". The main content area is dominated by an "ENERGY CALCULATOR" form with input fields for "Enter your zip code, or" and "Enter previous session #", a "GO" button, and a "Look up zip code" link. To the right of the calculator is a large image showing a family and workers in a home, with a bar chart and a house icon. Below the calculator, there are sections for "Case Studies" featuring a quote from Nick Wilder, "Energy NewsWire" with links to articles like "How Do You Use Daylighting While Reducing Excess Heat from Windows?", and a "How do you compare?" section with radio buttons for "Yes" and "No". At the bottom, there are social media icons for RSS, Facebook, and Twitter, and a footer with logos for the U.S. Department of Energy, Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, and other partners.

# Background

- ResDB contains mostly blower door test data and basic house characteristics, also some data on duct leakage
- Focuses on single-family detached homes
- Includes existing homes and new constructions
- Nationwide coverage
- Testing data since 1980's
  - 1998: N = 12,500
  - 2001: N = 70,000
  - 2006: N = 100,000
- Open-source database management system  PostgreSQL

# Data Call

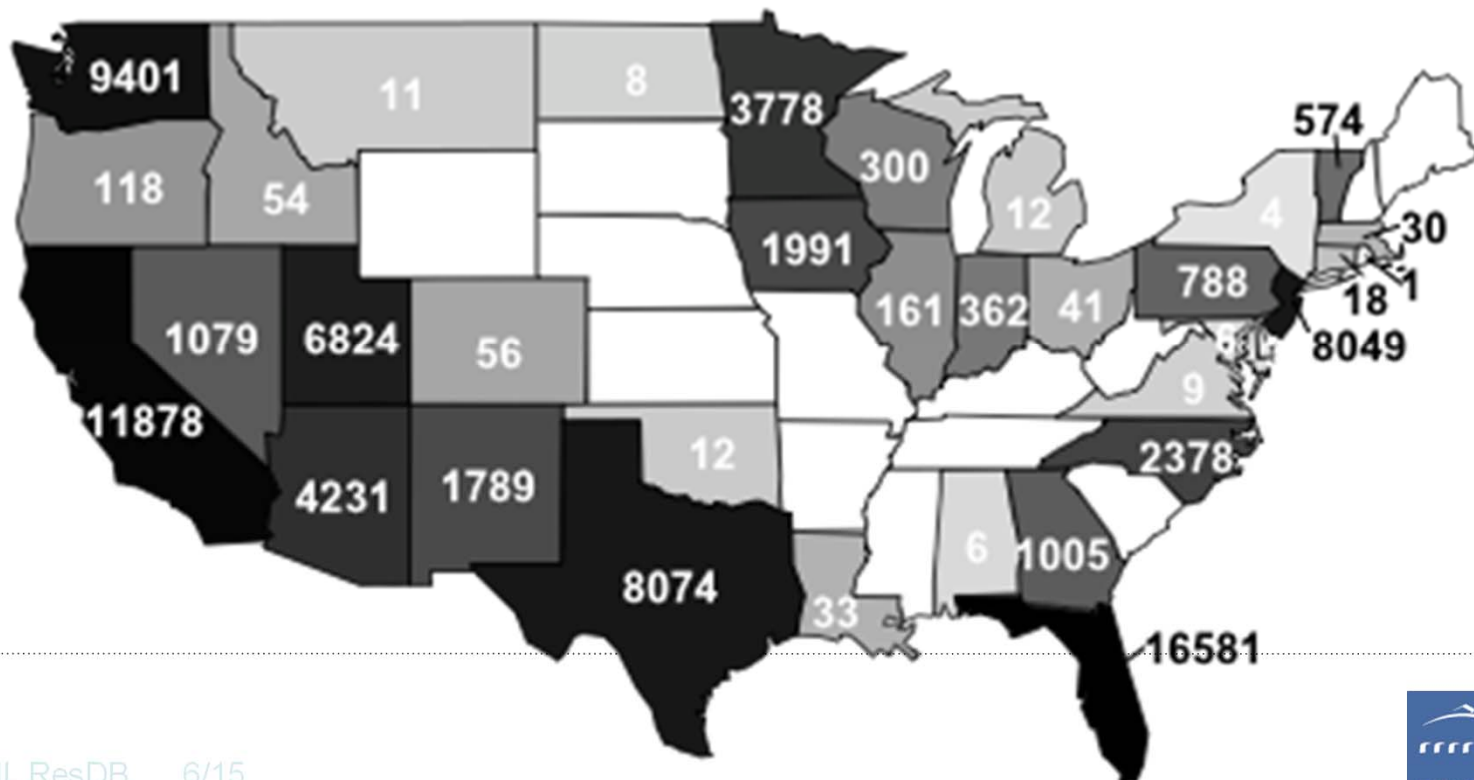
- 35+ contributors
  - Weatherization programs
  - Federal and state energy programs
  - Utility programs
  - Consulting firms
  - Home builders
  - Energy raters
- Large volume of “real-world” data
- Data analysis is challenging



# Spatial Coverage

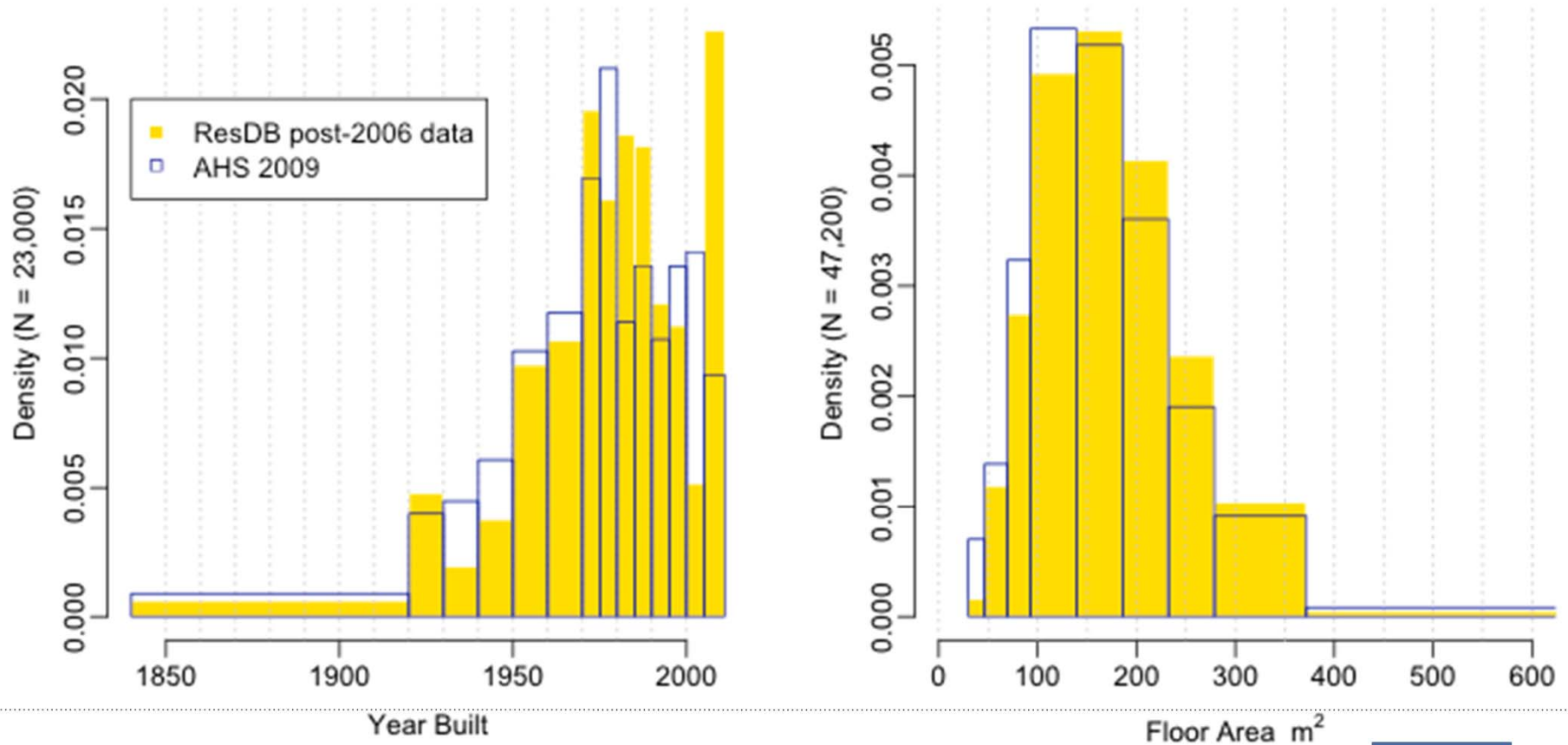
- Most states are represented in ResDB  
(map shows new additions only since 2006 version)

Data Recently Added to ResDB (N = 79,700)



# House Characteristics

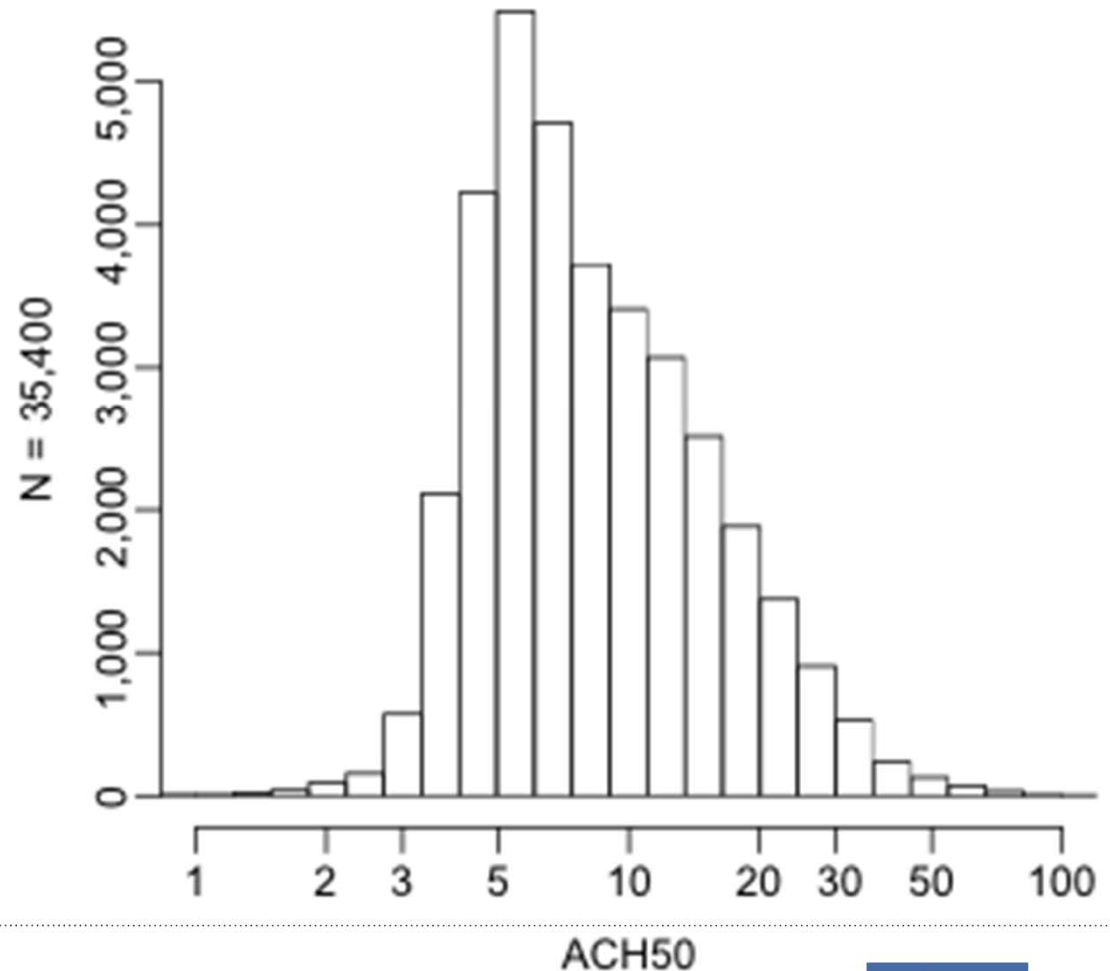
- Comparison with American Housing Survey (2009)



# ACH50 Distribution

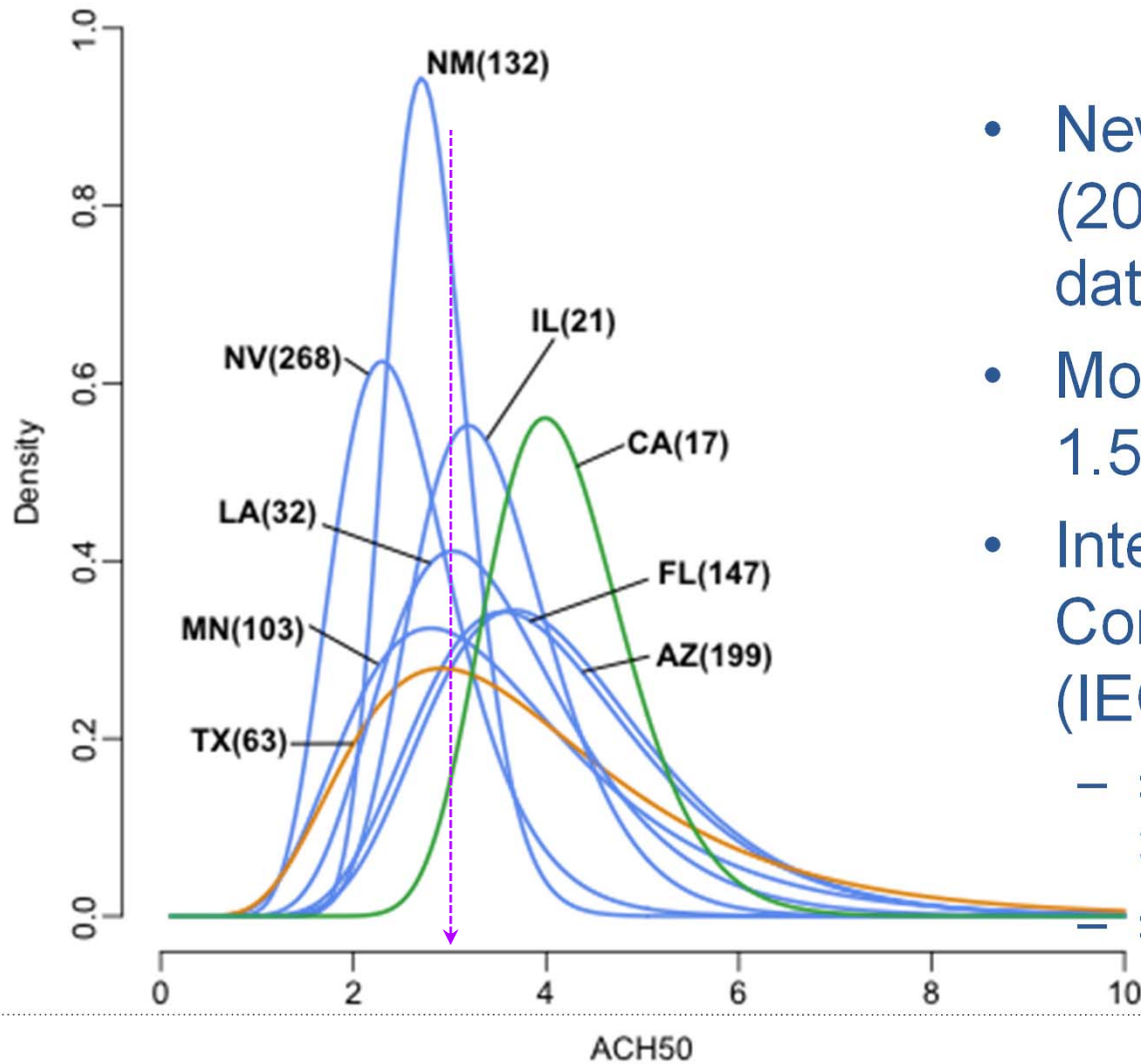
**Preliminary and unadjusted summary**

- Estimated from CFM50 and house volume or square footage
- Includes both existing homes and new constructions
- States 500+ data: CA, WA, NV, UT, TX, IA, MN, VT, NJ, NC





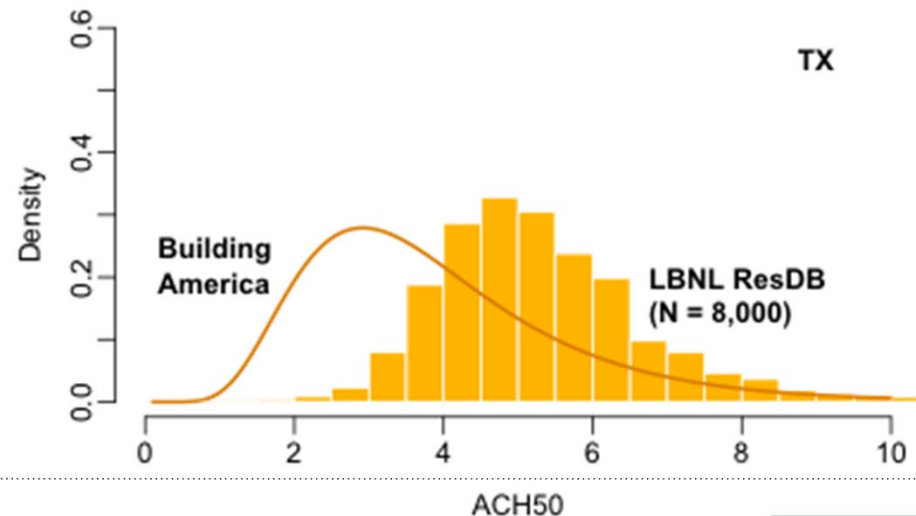
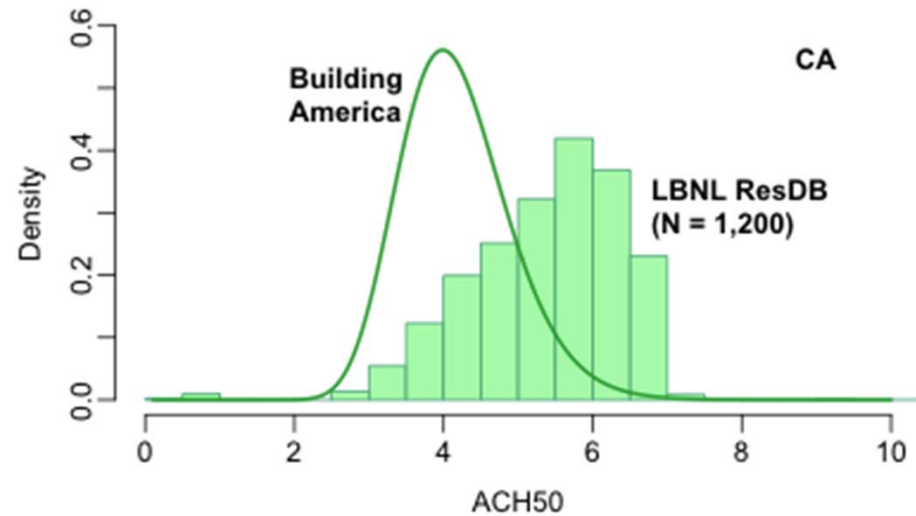
# Building America Blower Door Data



- New constructions only (2000-2009, partial dataset)
- Most ACH50 between 1.5 and 6.5
- International Energy Conservation Code (IECC 2012)
  - $\leq 3$  ACH50 for climate zones 3 to 8
  - $\leq 5$  ACH50 for zones 1 & 2

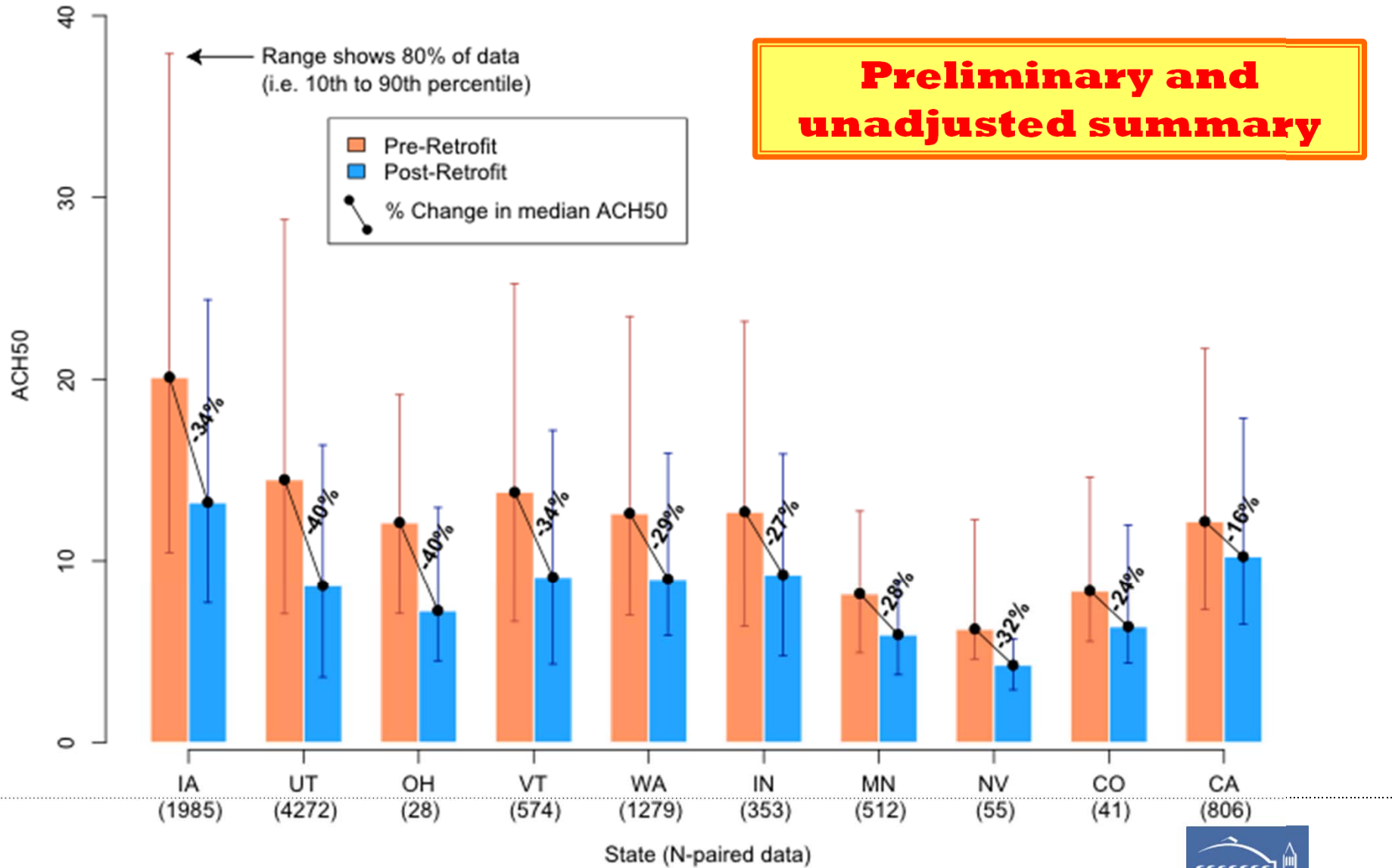
# New Construction Data

- Building America projects (data mostly from 2000-2009) have lower ACH50
- New constructions in ResDB (post-2005) show distribution spread similar to Building America project data in respective state



# ACH50 Pre- and Post-Retrofit

**Preliminary and unadjusted summary**



# Data Processing and Regression

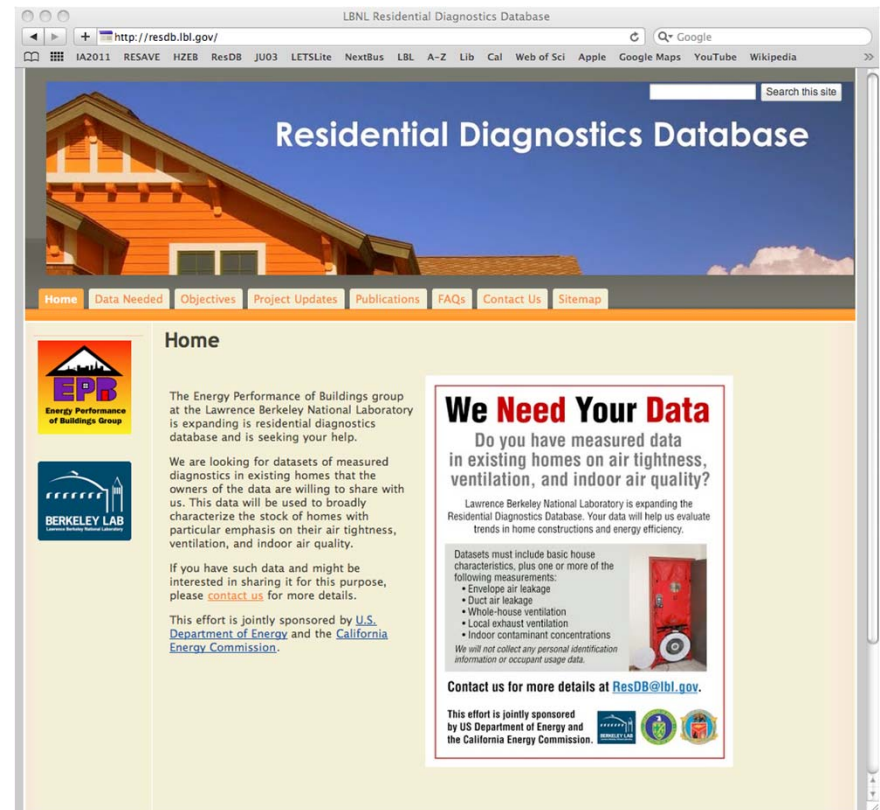
- Evaluate data quality and coverage
- Adjust data representation
- Explanatory variables in regression analysis
  - Year built and age
  - Energy-efficient new construction
  - Income-qualified weatherization program
  - 1- and 2-stories
  - Foundation types (e.g. basement, slab)
  - Ductwork (e.g. forced air units)

# Analysis Plan

- Differences by regions, states, and/or programs
- Characterize envelope air leakages of new constructions
- Comparison of pre- and post-retrofit test data
- Duct leakage measurements as a fraction of supply airflow
- Rough summary statistics for multi-family homes
- Other diagnostics data: heating/cooling equipments, combustion equipments, indoor air quality measurements
- Implications to indoor air quality and energy use

# Comments and Questions?

- Do you have blower door, duct blaster, and other diagnostic measurements?
- Suggestions for online data summary table and estimation tool
- Analyses for Building America and other related research and projects



<http://resdb.lbl.gov/>



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**Wanyu Rengie Chan**

[wrchan@lbl.gov](mailto:wrchan@lbl.gov)

**Max Sherman**

[mhsherman@lbl.gov](mailto:mhsherman@lbl.gov)

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