



A Study Connects Building Efficiency & Occupancy Health

*A REPORT ON WEATHERIZATION'S IMPACT ON ASTHMA CASES IN
CHILDREN.*

Agenda

- Quick overview of Metropolitan Energy Center
- Some details on this report:
 - The Who – who was involved in this project and report content
 - The Data – background on the data used
 - The Findings – what did the data say?

The Who

THE ENTITIES THAT PARTICIPATED IN THIS STUDY

Metropolitan Energy Center

We provide resources, outreach, and training so alternative fuels are no longer “alternative” and energy efficiency becomes commonplace.

Kansas City nonprofit since 1983

- 40 years of energy efficiency

Energy efficiency in the built environment

- Energy Solutions Hub for commercial and residential buildings
- Project Living Proof Demonstration Home
- Launching Vocational Jobs training project Q124

Sustainable Transportation

- Kansas City Regional Clean Cities - 1998
- Central Kansas Clean Cities - 2013

Energy Solutions Hub

Established in 2018 as an extension of the Kansas City Energy Project

- a full-service resource to the community,
- provides information and support for healthy and sustainable buildings
- for all residents and businesses in the region.

Our Hub plays a critical role in the intersection of energy efficiency, health, and equity.

The Authors of the Study

The Impact of a Weatherization Program on the Health Outcomes for Children with Asthma

by

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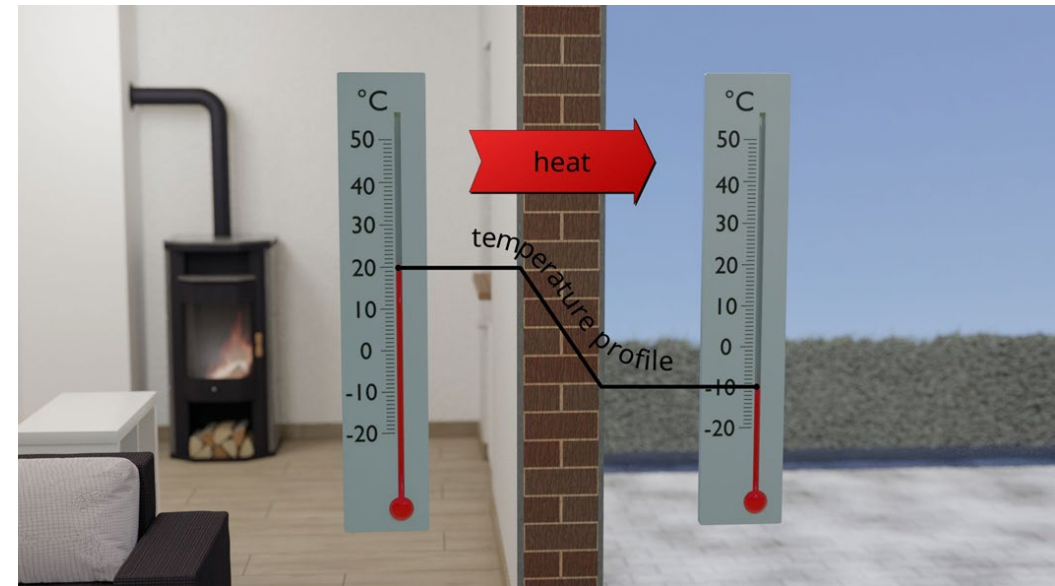
Background

HOW DID WE GET HERE?

MEC and CMH Healthy Homes Had a Hunch.

- Energy Auditors and other Energy Efficiency and Building Performance Specialists can tell you:
 - Most houses suffer from energy deficiency problems.
 - Moisture and extreme temperatures can cause mold in houses, much of it unseen.

CMH's Healthy Homes program was established as a response to chronic issues in children's health in the region to help establish a mitigation process.



MEC Managed an Audit and Weatherization Program 2009-2015

Thousands of addresses with details on energy upgrades completed were in MEC's archives.



MEC Managed an Audit and Weatherization Program 2009-2015

- MEC data included information about all energy efficiency improvement activities administered between 2009 and 2015 through the Home Performance with Energy Star (HPwES) program.
- Encounter level historic pediatric asthma data was provided by CMH (Housing and Health IRB protocol #11120500).
- Additional geographic and census data were sourced from the CEI data archives.
- **Taken together, the CMH and MEC data were sufficient for the task of describing the impact of EWKC weatherization actions on the health outcomes of pediatric asthma patients.**



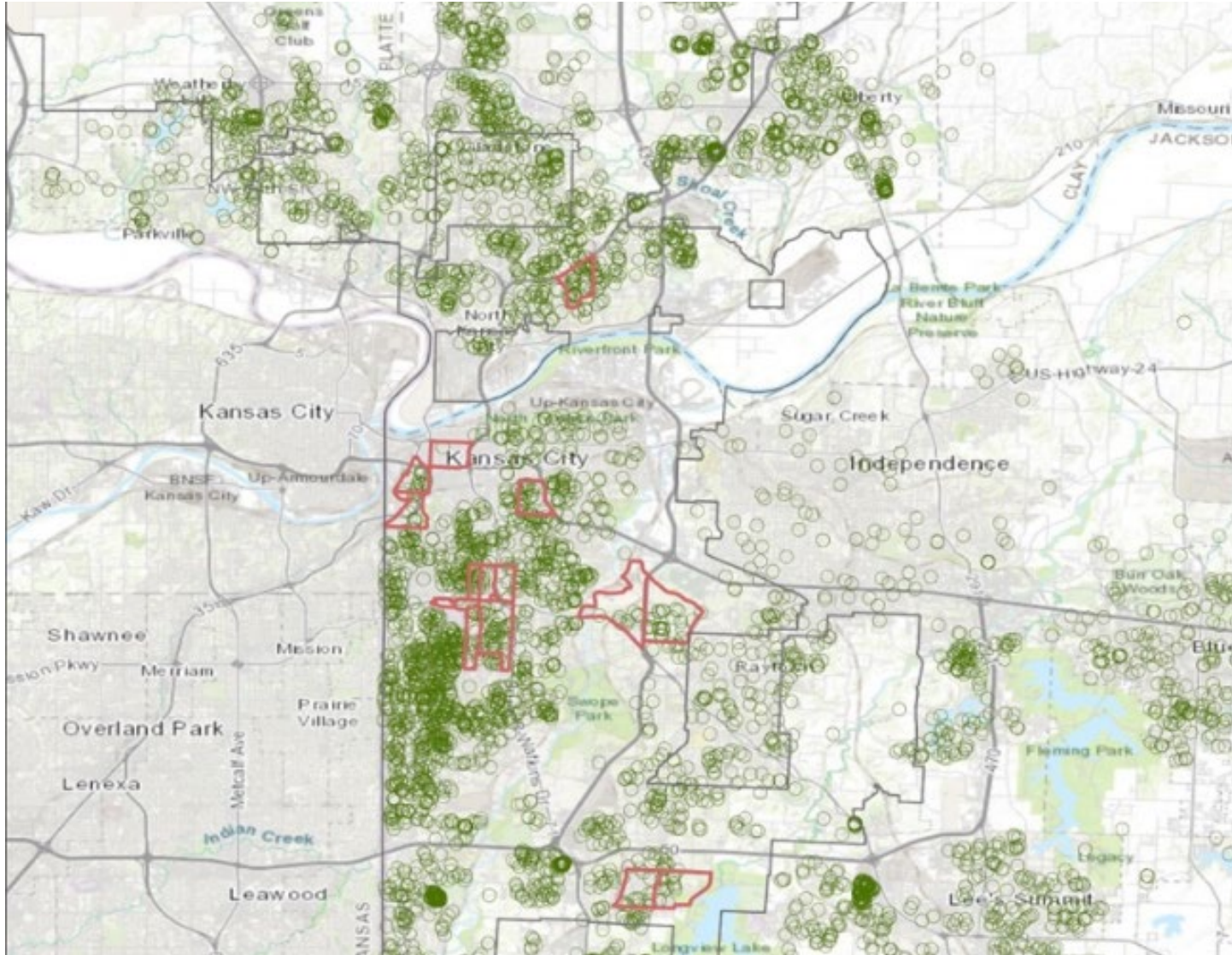
The Data

WHERE DID IT COME FROM?

EnergyWorks KC and Home Performance with Energy Star

- EWKC was funded by the American Recovery and Reinvestment Act of 2009. The project spent \$20,446,039 on energy efficiency improvements between January 2011 and the January 2014, including city and commercial buildings.
- Weatherization activities were based on HPwES, which provided home weatherization rebates facilitated by utility companies from 2009-2015.
- Rebates were up to \$2,000, subsidies up to \$500 to cover the cost of energy audits, and eligibility for zero interest loans up to \$15,000 (each figure is per single family home).
- MEC provided address level information for **6,029** home weatherizations that took place between January 2009 and January 2015.
- These addresses included information about all energy efficiency improvement activities.





Map: Kansas City MO Metropolitan Region

Addresses Receiving Energy Efficiency Improvements 2009-2014, Detail.
(count 6,029)

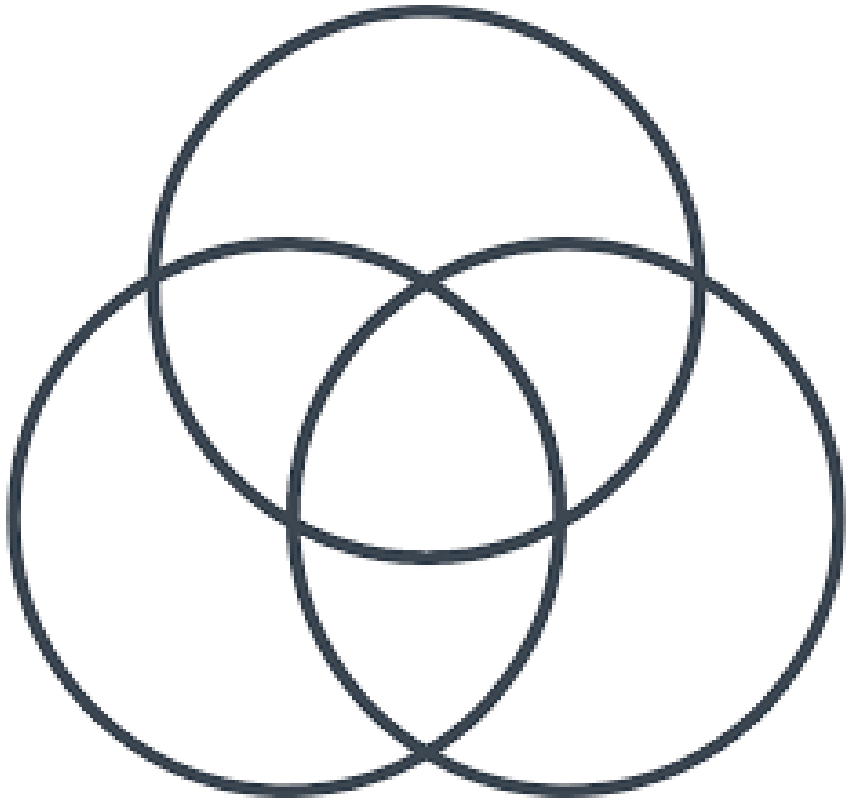
*Important: this data contained homes from all construction eras (home ages) and designs.

Weatherization Improvements by Dataset

Improvements	MEC Address	Asthma Encounters at MEC Address
AIR SEALING; INSULATION	2,270	101
AIR SEALING (only)	1,315	77
INSULATION (only)	1,179	37
AIR SEALING; INSULATION; WINDOW(s)	185	13
WINDOW(s) (only)	477	8
AIR SEALING; WINDOW(s)	92	7
AIR SEALING; INSULATION; DUCT SEALING	58	3
DUCT SEALING (only)	91	3
INSULATION; WINDOW(s)	56	3
AIR SEALING; DUCT SEALING	43	1
AIR SEALING; INSULATION; DOOR(s)	19	1
NA	24	1
AIR SEALING; DOOR(s)	20	0
AIR SEALING; INSULATION; WINDOW(s); DOOR(s)	18	0
AIR SEALING; WINDOW(s); DOOR(s)	12	0
DOOR(s) (only)	45	0
HEAT PUMP (only)	1	0
INSULATION; DOOR(s)	5	0
INSULATION; DUCT SEALING	5	0
INSULATION; WINDOW(s); DOOR(s)	11	0
WINDOW(s); DOOR(s)	103	0

Additional Public Data:

Geographic information systems (GIS) were used to match asthma encounters with the addresses of homes receiving energy efficiency improvements. Geographic and census data were collected as part of an initiative supported in part through grants from HUD's Office of Lead Hazard Control and Healthy Homes, and the Health Forward Foundation of Greater Kansas City.



Children's Mercy Hospital:



- Encounter-Level asthma data from CMH was used (including routine and acute care visits). The retrospective Asthma data comprised of 67,698 asthma observations including routine and acute care visits corresponding to 20,135 patients.
- The match process with MEC address data found 881 encounters of 317 asthma patients.
- Statisticians were able to further subdivide this data into 549 encounters of 207 asthma patients at an MEC provided address before the weatherization took place.
- And 318 encounters of 152 asthma patients at an MEC provided address after the weatherization took place.

Table 16: Severity Level because of Diagnosis Code

Diagnosis Code	Diagnosis Name
Severity Level 1	
493	EXTRINSIC ASTHMA, NOS
493.1	INTRINSIC ASTHMA, NOS
493.2	CHRONIC OBSTRUCTIVE ASTHMA, NOS
493.82	COUGH VARIANT ASTHMA
493.9	ASTHMA, UNSPECIFIED
Severity Level 2	
493.02	EXTRINSIC ASTHMA, W (ACUTE) EXACERBATION
493.12	INTRINSIC ASTHMA, W (ACUTE) EXACERBATION
493.22	CHRONIC OBSTRUCTIVE ASTHMA, W (ACUTE) EXACERBATION
493.81	EXERCISE INDUCED BRONCHOSPASM
493.92	ASTHMA, UNSPECIFIED, W (ACUTE) EXACERBATION
493.01	EXT ASTHMA W STATUS ASTH
493.11	INT ASTHMA W STATUS ASTH
493.21	ASTHMA, CHRONIC OBSTRUCTIVE W ASTHMATICUS
493.91	ASTHMA W STATUS ASTHMAT

Type of occurrence:

Each asthma encounter is assigned a severity level based on ICD9 code and another severity level based on patient class.

Type of Home	Asthma Encounters at MEC Address¹	MEC Address¹
Multi Family	5.10%	10.10%
Single Family	94.60%	89.80%
NA	0.40%	0.10%

¹ Percent normalized to prevent double counting of patients

Table 4: Distribution of Total Spending by Dataset (\$)

	Observations	Mean (sd)	Median	Min	Max
MEC Address	6,020	2,454 (2,945)	1,623	250	60,777
Asthma Encounters at MEC Address	256	2,207 (2,224)	1,525	250	20,994

The Findings

THE REPORT'S HIGHLIGHTS



Short Story Conclusion:

The energy efficiency enhancements were estimated to reduce the incidence of acute care asthma visits **by 34%**.



Deeper Dive

- A Poisson regression model was used. These models are typically used to express the probability of events occurring over time.
- The team estimated the change in the frequency of such encounters that follows the child's home receiving energy efficiency upgrades. The outcome variable focused on was the count of the most severe asthma encounters associated with an individual child over their time at risk.
- The team calculated time at risk for the control population from the patient's first asthma encounter until the end of the study period or their home received weatherization.
- For the treatment population they calculated time at risk from weatherization until the end of the study period.
- The technical statistical term for this estimate is an Incidence Rate Ratio (IRR).

More Key Take-away's:

The Asthma Encounters at the MEC Addresses *after* weatherization have a lower percentage of the most serious asthma encounters compared with the before weatherization encounters.

There were 34% fewer acute care visits for a child in a weatherized home (other things held constant) per year than those who lived in un-weatherized homes.

Critically for this report, the addition of the Post-1980 Home and Payment Type variables had minimal effect on the IRR estimated for weatherization.

A Note on Asthma

- Every asthma attack is a frightening experience, a person struggling for a breath. Ten Americans die every day from asthma.
- Black Americans are 2-3 times more likely than any other racial or ethnic group to die from asthma because they were exposed to something (pollution, particulate, allergens, airborne chemicals, extreme weather and other triggers) that led to a flare-up or attack causing airways to constrict and preventing exhalation

It is important keep in mind the scale on which Americans experience asthma, its costs in human terms, and its unequal distribution among the population.

What's Next?

- The study will be submitted for scientific peer review and publication.
- This will lead to more studies and better understanding of the health impacts of energy efficient living spaces.
- Help us spread the word!



Thank You

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