Exploring Potential Health Benefits of Home Weatherization among the Vermont Medicaid Population

June 2025

VERMONT
DEPARTMENT OF HEALTH

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Executive Summary

Home weatherization has the potential to improve health.

Key Findings:

1. Children in the weatherization group experienced a larger decrease in respiratory health care visits than the control group.

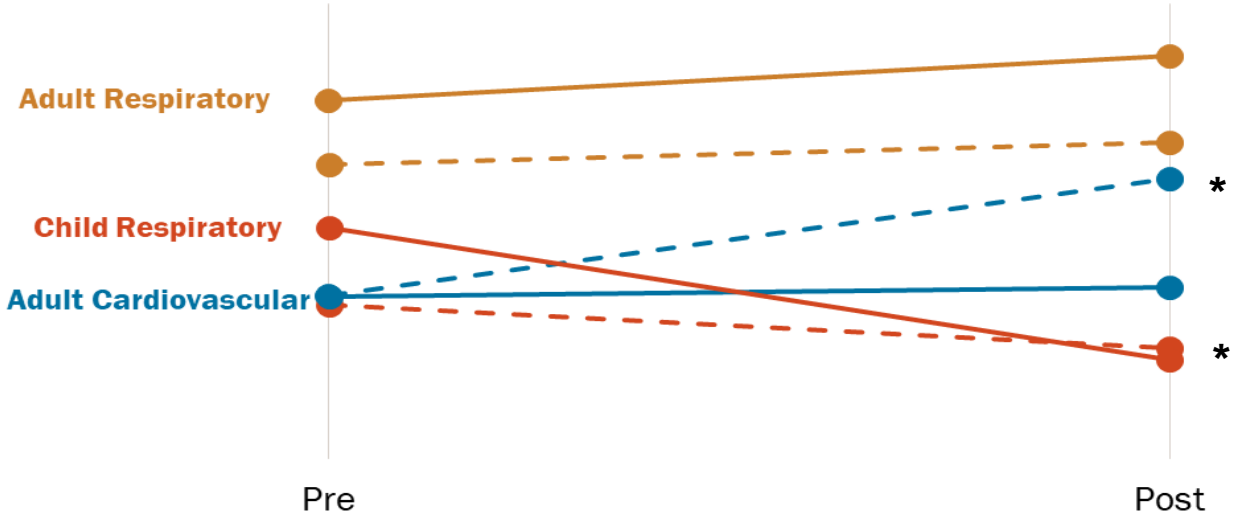
2. Adults in the weatherization group experienced a larger increase in inpatient visits for respiratory causes than the control group.

3. There was no change in rate of visits for cardiovascular causes for adults in the weatherization group. Rates increased for the control group.

4. Medicaid costs were lower for the weatherization group for respiratory care (children) and cardiovascular care (adults) for the 2 years after receiving weatherization services.

Change in rate (per 10,000 average annual enrollments) of emergency department visits pre and post home weatherization intervention.

The weatherization group is shown with solid lines. The control group is shown with dashed lines.



*Statistically significant difference (increase in control group cardiovascular visits, decrease in control group respiratory visits for children).

What does this mean?

This analysis focused on health impacts of basic weatherization in Vermont Medicaid recipients and found the potential for modest benefits among some groups (adult cardiovascular health, children's respiratory health).

Given our small population in Vermont and the imperfect sample used for this analysis, it's not surprising that our findings are mixed. Reasons for seemingly contradictory findings, like the increase in inpatient hospitalizations for adults who received weatherization, are described in more detail on slide 27. These results should be considered as part of a larger body of national evidence exploring the health benefits of home weatherization (slide 28).

More national research is needed, both to more fully understand the potential health benefits of home weatherization, as well as to better understand why for some health outcomes, like asthma, studies do not consistently show a benefit of weatherization.

Background

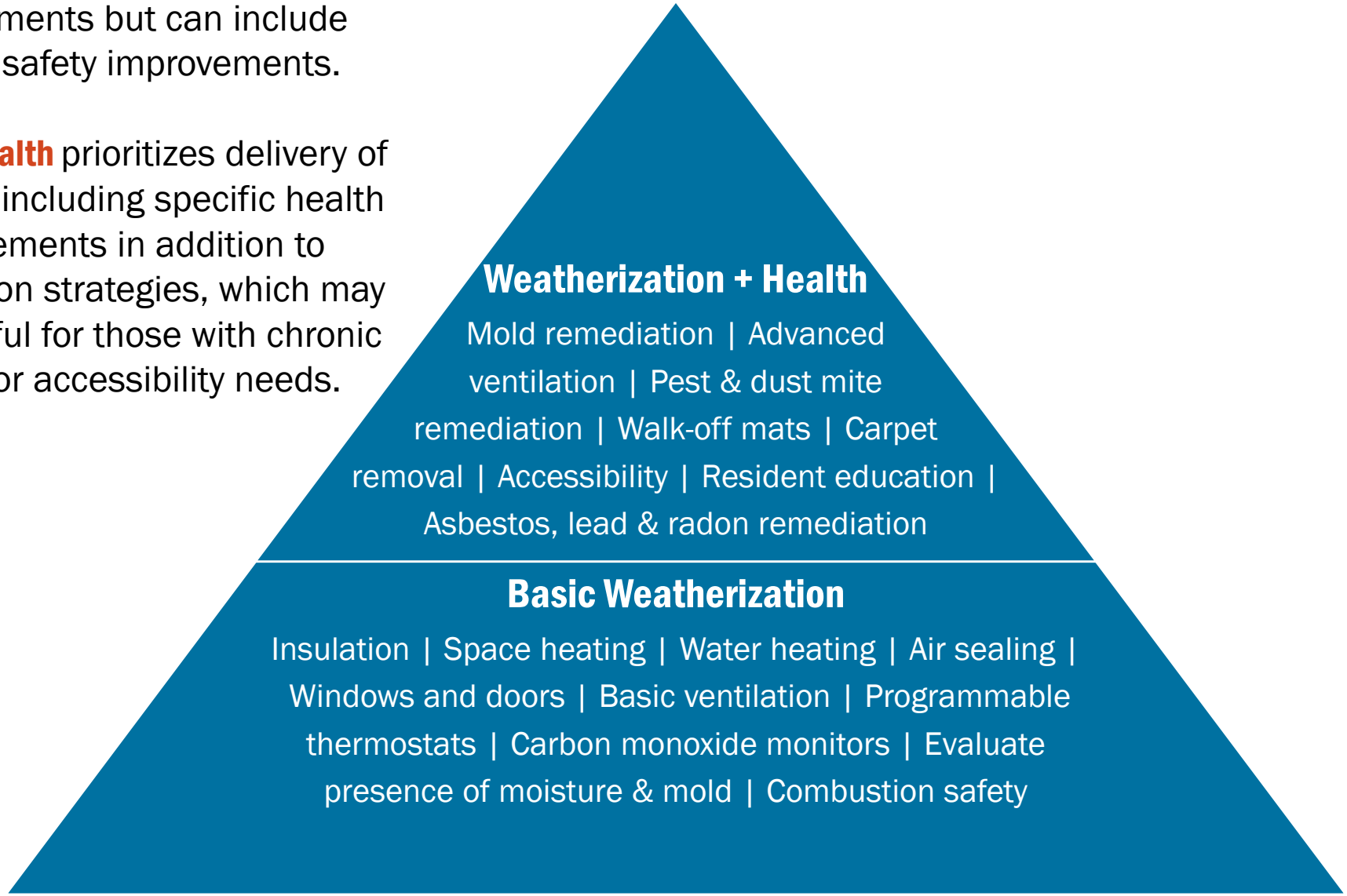
Home weatherization addresses energy, health, and environmental challenges

Benefits Include:

- Reduced energy usage and cost
- Improved housing conditions, which can improve health
- Reduced greenhouse gas emissions
- Increased resilience to climate change impacts

Basic weatherization prioritizes energy efficiency improvements but can include critical health and safety improvements.

Weatherization + Health prioritizes delivery of health benefits by including specific health and safety improvements in addition to basic weatherization strategies, which may be especially helpful for those with chronic health conditions or accessibility needs.



How can home weatherization impact health?

Housing Conditions	Health Outcome
Indoor air temperature, humidity, mold, air quality, pests	Reduction in frequency of experiencing asthma attacks, symptom severity, and use of asthma medication
Indoor air temperature, humidity, mold, air quality, pests, other allergens	Reduction in upper respiratory symptoms, including hay fever, sinusitis and respiratory allergies
Indoor temperature, air quality	Improvements in cardiovascular health, such as hypertension

Methods

What did we do?

A survey administered by the Department for Children and Families suggested that about 50% of Vermont State Weatherization Assistance Program (WAP) recipients are also Medicaid recipients.

The Agency of Human Services Institutional Review Board approved a data linkage project between a list of WAP recipients and the Vermont Medicaid Claims database.

A de-identified dataset was shared with the Health Department for further analysis.

Primary Questions and Potential Answers from Claims Data

1. **Does occupant health improve after receiving home weatherization services?**

   Health status cannot be determined directly from Medicaid claims data, but reduced claims, reduced costs, or shifts in type of claim from more intensive to less intensive forms of health care may suggest improvements in health status.

2. **Do health care use and costs decrease for occupants after receiving home weatherization services? Do costs to Medicaid decrease?**

   While there are several factors that influence health care use and costs, comparing rate of utilization, average cost of claims, and total costs for weatherization recipients and non-weatherization recipients could be useful in answering the above question.

Results

Symbols and Definitions Used in the Results Section

In non-title text, **bold font** is used to indicate statistically significant findings (p-value < 0.05) in writing. An asterisk (*) is used to denote statistically significant findings in graphs and charts.

Pre-weatherization period: 24 months before weatherization project completion (or anchor date for the control group). The anchor date for the control group was chosen to mimic the weatherization project completion date (it is July 1 of the year in which the corresponding weatherization recipient's project was completed).

Post-weatherization period: 24 months after weatherization project completion (or anchor date for the control group). The anchor date for the control group was chosen to mimic the weatherization project completion date (it is July 1 of the year in which the corresponding weatherization recipient's project was completed).

Rates are calculated per 10,000 average annual enrollments to compare equally across the weatherization and control groups.

Sample Description: Overall

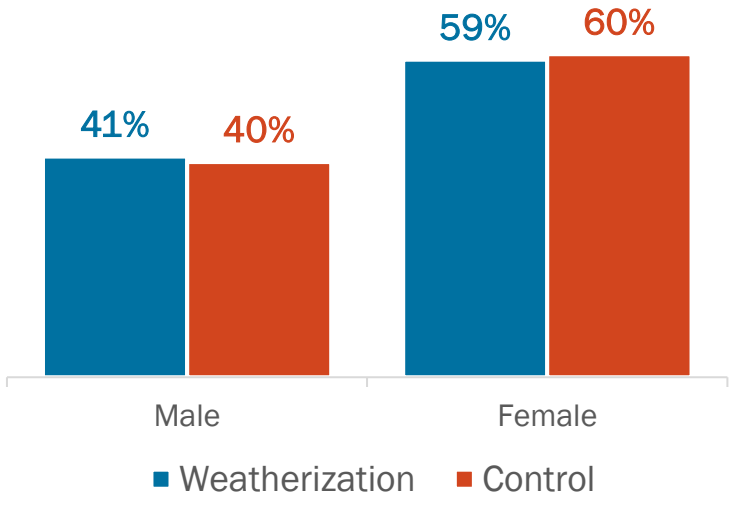
- Started out with 14,544 controls and 1,818 Weatherization recipients (89% and 11% of the sample, respectively).

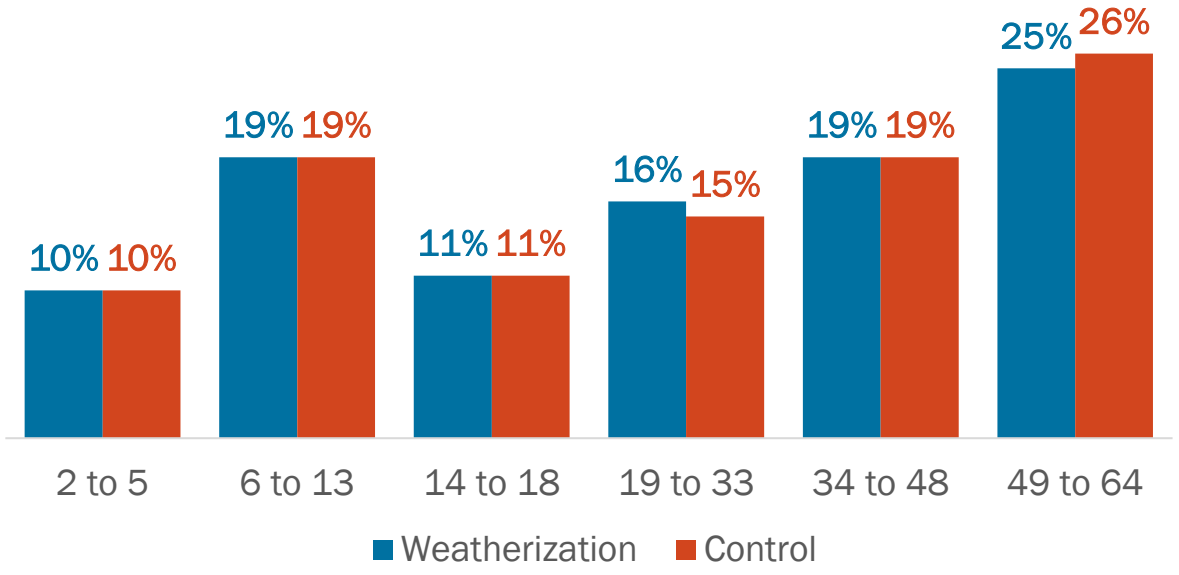
- Weatherization recipients and control group members were frequency matched on: number of months enrolled post anchor date, year of weatherization completion, age group, sex, Medicaid Eligibility Group, and Medicare Disabled under 65 status.

- All had at least 12 months of Medicaid enrollment in the pre and post periods.

- Final analysis was restricted to adults (ages 18-64) and children (ages 2-17) who were solely Medicaid recipients. This was to reduce as much variability in the data that was not related to home weatherization as possible.
  - 11,929 controls
  - 1,473 weatherization recipients

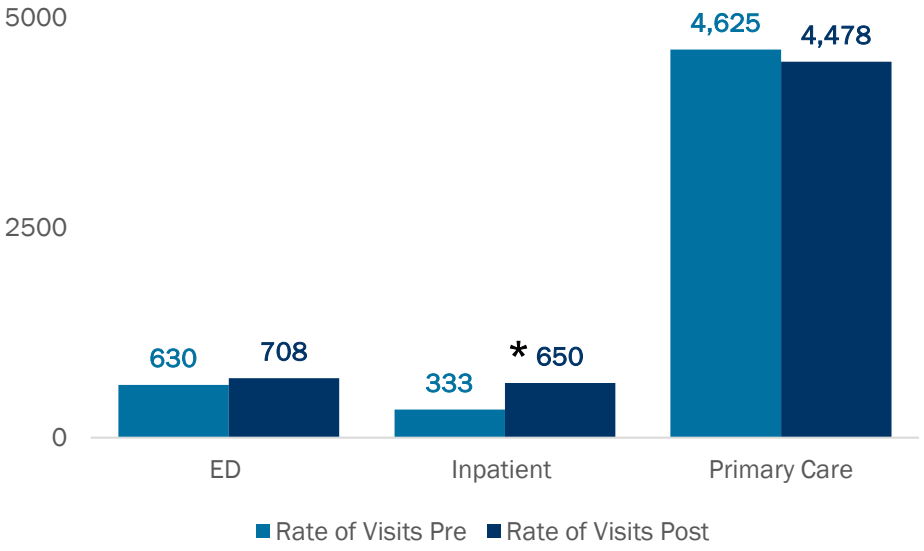
Sample Description: Demographics of the Analytic Sample



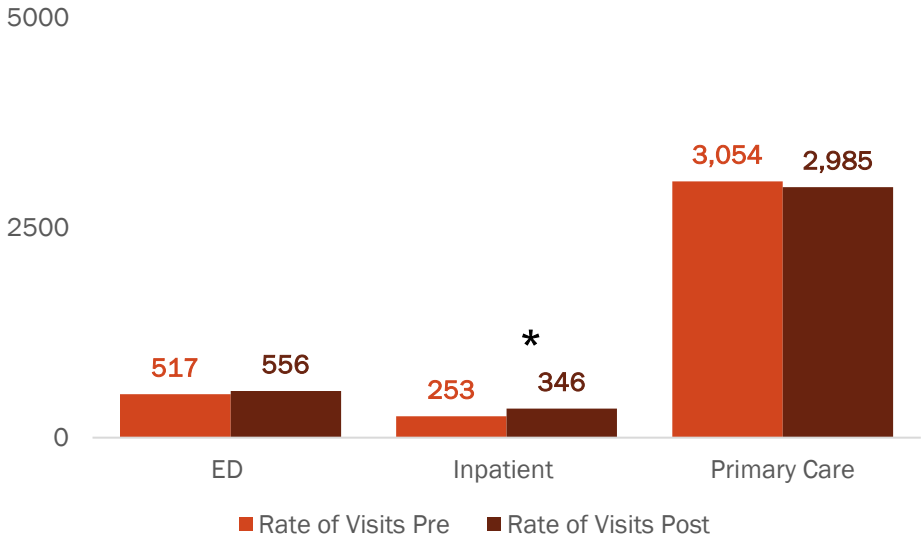


Adults: Respiratory Health

The weatherization group had higher rates of inpatient visits in the post weatherization period. Rates of emergency department and primary care visits stayed about the same in the pre and post weatherization periods.



The control group had no difference in rate of emergency department or primary care visits when comparing the pre and post anchor date periods. **The rate of inpatient visits increased.**



The Weatherization group had higher rates of respiratory primary care visits than the control group. Rates of inpatient visits increased for the weatherization group in the post period more than they did for the control group.

Rates are calculated per 10,000 average annual enrollments. In non-title text, **bold font** is used to indicate statistically significant findings (p-value < 0.05) in writing. An asterisk (*) is used to denote statistically significant findings in graphs and charts. ED: emergency department.

Adults: Respiratory Health Costs

Type of Care	Average Cost of Visit Pre	Average Cost of Visit Post	Summary
Emergency Department Visits	W: $94 C: $98	W: $122 C: $87	No statistically significant differences.
Inpatient Hospitalizations	W: $1,241 C: $971	W: $807 C: $986	No statistically significant differences.
Primary Care	W: $89 C: $91	W: $90 C: $99	**The W group had significantly lower costs than the C group in the post period.**

W: Weatherization group. C: Control group.
*Costs adjusted for inflation to 2023 dollars.

In general, there were no differences in average cost of a visit between the two groups. In the post period, the weatherization group, on average, had lower costs of primary care visits.

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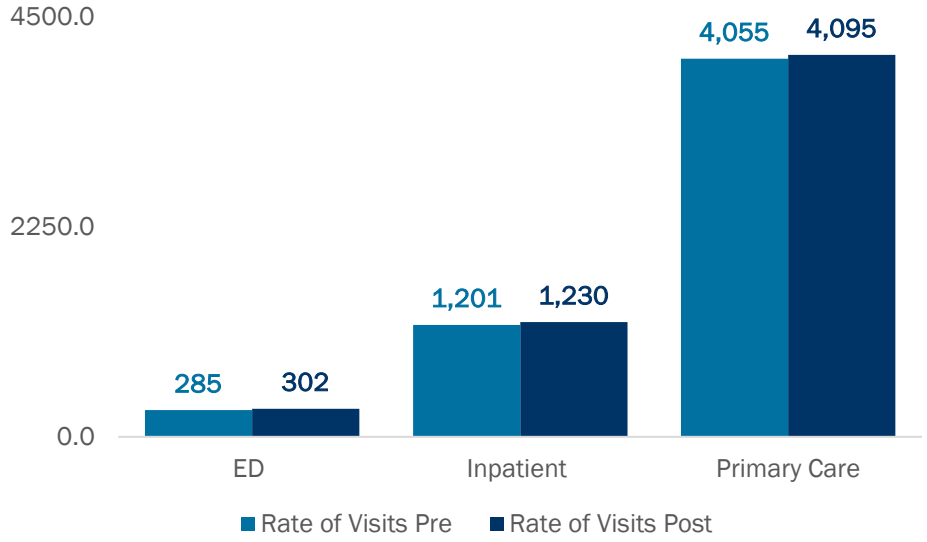
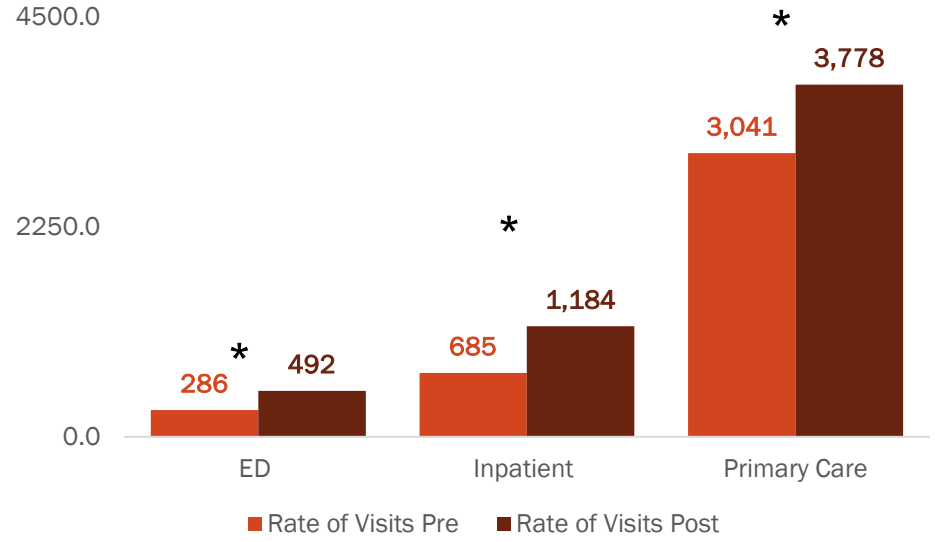
Adults: Cardiovascular Health

There was no significant difference in rates of emergency department, inpatient, or primary care visits for weatherization group when comparing the pre and post weatherization periods.



The control group experienced increases in rates of emergency department, inpatient, and primary care visits when comparing the pre and post anchor date periods.



While rates of cardiovascular visits increased for all three types of care for the control group in the post period, the weatherization group visit rates stayed similar.

Rates are calculated per 10,000 average annual enrollments. In non-title text, **bold font** is used to indicate statistically significant findings (p-value < 0.05) in writing. An asterisk (*) is used to denote statistically significant findings in graphs and charts. ED: emergency department.

Adults: Cardiovascular Health Costs

Type of Care	Average Cost of Visit Pre	Average Cost of Visit Post	Summary
Emergency Department Visits	W: $ 95 C: $ 70	W: $ 62 C: $ 64	No statistically significant differences.
Inpatient Hospitalizations	W: $ 2,249 C: $ 1,142	W: $ 1,078 C: $ 954	**W significantly higher than C in the pre period.** No difference in the post period.
Primary Care	W: $ 101 C: $ 94	W: $ 110 C: $ 97	**W higher than C in both pre and post periods.**

W: Weatherization group. C: Control group.
*Costs adjusted for inflation to 2023 dollars.

The weatherization group had higher average costs per visit than the control group for primary care. In the post period, costs were statistically similar between the groups for emergency department and inpatient visits.

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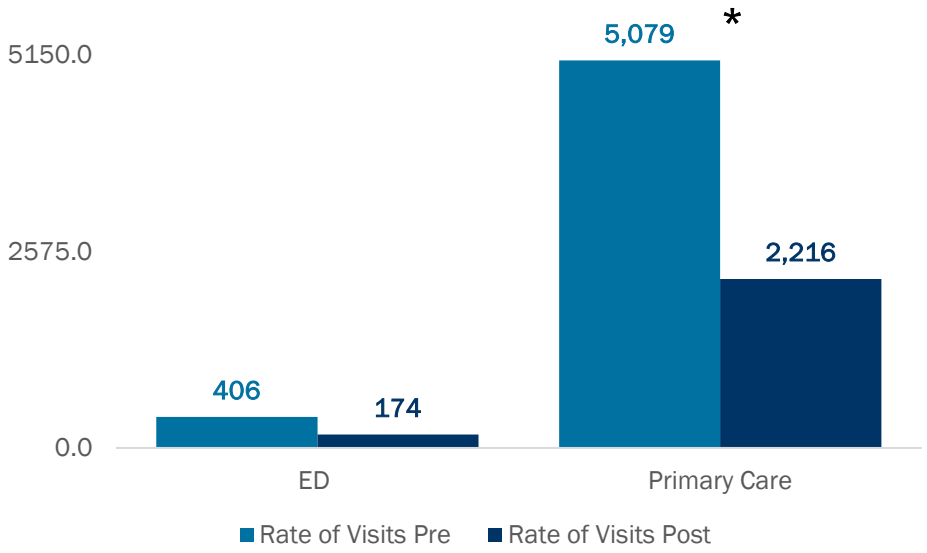
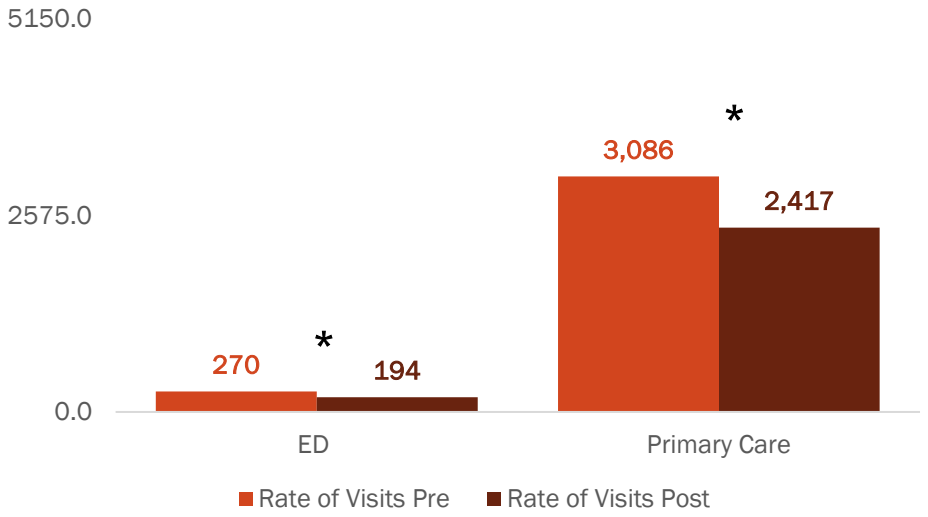
Children: Respiratory Health

The weatherization group had lower rates of primary care visits in the post weatherization period.



The control group had lower rates of emergency department and primary care visits in the post anchor date period.



The weatherization group had higher rates of respiratory visits in the pre period than the control group. In the post period, the weatherization group had lower rates of visits than the control group (significantly lower for primary care visits).

Rates are calculated per 10,000 average annual enrollments. In non-title text, **bold font** is used to indicate statistically significant findings (p-value < 0.05) in writing. An asterisk (*) is used to denote statistically significant findings in graphs and charts. ED: emergency department.

Children: Respiratory Health Costs

Type of Care	Average Cost of Visit Pre	Average Cost of Visit Post	Summary
Emergency Department Visits	W: $ 149 C: $ 120	W: $ 129 C: $ 127	No statistically significant differences.
Primary Care	W: $ 133 C: $ 127	W: $ 145 C: $ 133	**Costs increased for both groups in the post period. W higher than C in both pre and post period.**

W: Weatherization group. C: Control group.
*Costs adjusted for inflation to 2023 dollars.

The weatherization group had higher average costs of primary care visits than the control group in both the pre and post periods.

Rates are calculated per 10,000 average annual enrollments. In non-title text, **bold font** is used to indicate statistically significant findings (p-value < 0.05) in writing. An asterisk (*) is used to denote statistically significant findings in graphs and charts. ED: emergency department.

Putting it All Together: Medicaid Cost Savings

Using the data from the previous slides, we can calculate how much money Medicaid saved (in total, per individual, and per household) during the 2 years after enrollees received home weatherization services, as compared to Medicaid enrollees who did not receive weatherization services. For more detail on how these were calculated, please see the technical summary that accompanies this document.

Type of Care	Cost Difference for Weatherization Recipients^
Respiratory (Adults)	$19,477 more expensive
Cardiovascular (Adults)	$1,783,220 less expensive
Respiratory (Kids)	$314,060 less expensive

Group	Cost Savings^^
Adults (Respiratory + Cardiovascular)	$176
Kids (Respiratory)	$31

^Total cost difference calculated by multiplying rate of utilization (per 10,000 average annual enrollments) by the average cost of a visit for that type of care.
^^Per 12 months of Medicaid enrollment.

Putting it All Together: Medicaid Cost Savings

We can use the information from the previous slide to calculate savings for different types of households.

Household Description	Cost Savings per Year*	Cost Savings over Post Weatherization Period^
1 adult and 1 child	$208	$416
2 adults	$353	$706
2 adults and 1 child	$384	$768
2 adults and 2 children	$415	$831

*Cost savings for respiratory and cardiovascular health care specifically. There were likely other health care costs or savings related to home weatherization that are not being accounted for in this estimation. Costs adjusted for inflation to 2023 dollars.

^ While this analysis was limited to 2 years post weatherization, we would anticipate savings to continue beyond 2 years.

These estimations assume that the entire difference in cost of care between the groups was attributable to home weatherization. Please see the limitations slide for other factors that may have contributed to the cost differences between the groups.

Discussion and Limitations

Key Findings

1. In this analysis, inpatient respiratory visits increased more for adults in the weatherization group than for adults in the control group.

2. Visits for cardiovascular conditions stayed the same for the weatherization group while they increased for the control group.

3. Among children, the weatherization group experienced larger decreases in respiratory visits than the control group.

4. Medicaid costs were lower for the weatherization group for respiratory care (children) and cardiovascular care (adults) for the 2 years after receiving weatherization services.

Limitations

Insurance claims are collected for administrative purposes, not public health surveillance work.

The weatherization group is a non-random sample, which increases the risk of sampling bias. For example, the weatherization group had a baseline health care utilization that was higher than the control group. This could be because those who are more likely to enroll in the Weatherization Assistance Program are also more likely to use other systems, like health care. It could also be because the weatherization group had worse health at baseline.

The weatherization group likely has a higher rate of homeownership than the Medicaid population overall. While the Weatherization Assistance Program is available to renters, challenges in working with landlords and/or weatherizing multi-family housing mean that in practice, the majority of Weatherization Assistance Program recipients are homeowners.

Our populations are dynamic. People with a certain type of claim in the pre period are not necessarily the same people with similar types of claim in the post period. In addition, we don't know how long people stayed in their weatherized home after their weatherization project was complete.

Interpretation in Context

Interpretation of this Analysis	Comparison to Published Evidence
Weatherization does not appear to have a beneficial impact on rate of adult respiratory visits. Among children, weatherization may have contributed to a larger decrease in respiratory visits.	Studies have not consistently found that weatherization positively impacts some respiratory conditions, such as asthma. Studies looking specifically at weatherization + health interventions found consistent improvement in asthma symptom severity. Studies looking at upper respiratory symptoms found a positive association between weatherization and reduction of symptoms for hay fever, allergies, and sinusitis. These improvements were more common when the intervention specifically targeted those with chronic respiratory issues.
Weatherization may have had a beneficial impact on rates of visits for cardiovascular conditions.	A few studies have shown improvements in measures of cardiovascular health, including blood pressure and angina.
Weatherization may have resulted in modest cost savings to Medicaid at the household level over two years.	Some studies have indicated a decrease in health care utilization and costs following weatherization, while others have found inconclusive results.

What does this mean?

This analysis focused on health impacts of basic weatherization in Vermont Medicaid recipients and found the potential for modest benefits among some groups (adult cardiovascular health, children's respiratory health).

According to national analyses published elsewhere, there is the potential to achieve further health benefits when integrating basic weatherization interventions with additional healthy homes services.

Given our small population in Vermont and the imperfect sample used for this analysis, it's not surprising that our findings are mixed. These results should be considered as part of a larger body of national evidence exploring the health benefits of home weatherization.

More national research is needed, both to more fully understand the potential health benefits of home weatherization, as well as to better understand why for some health outcomes, like asthma, studies do not consistently show a benefit of weatherization.

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For more information, read the Health Benefits of Home Weatherization technical and two-page summaries.

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