

Legislative History for Connecticut Act

SA 14-14

HB5133

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**CONNECTICUT
GENERAL ASSEMBLY
HOUSE**

**PROCEEDINGS
2014**

**VOL.57
PART 5
1361 – 1680**

pat/gbr
HOUSE OF REPRESENTATIVES

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April 22, 2014

personal privilege. I believe it was one that I felt compelled to make, and I hope many of you believe as I do, that though academic freedom is so very, very important in our state and in academia. Divisiveness, that kind of talk does no one, no one, any good.

Thank you, Mr. Speaker. Appreciate your time.

(Applause.)

DEPUTY SPEAKER GODFREY:

Without objection, thank you, sir. The House will stand at ease.

(Chamber at ease.)

The House will come back to order. We'll return to the Call of the Calendar. Mr. Clerk, please call Calendar 251.

THE CLERK:

On Page 15, Calendar 251, Favorable Report of the Joint Standing Committee on Public Health, House Bill 5133 AN ACT CONCERNING THE LOCATION OF FUNDING SOURCES FOR THE HEALTH HOMES INITIATIVE.

DEPUTY SPEAKER GODFREY:

The distinguished Chair of the Housing Committee, Representative Butler.

REP. BUTLER (72nd):

Thank you, Mr. Speaker. I move for acceptance of

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the Joint Committee's Favorable Report and passage of the bill.

DEPUTY SPEAKER GODFREY:

The question is on acceptance and passage. Will you explain the bill, sir?

REP. BUTLER (72nd):

Yes, thank you, Mr. Speaker. The bill requires the Commissioner of the Public Health in consultation with the Commissioners of the Department of Housing, DEEP and Insurance Commissioner to make a report on, to the standing committees of cognizance about matters addressing the funding sources for the Healthy Homes Initiative.

The report has two provisions. One is to have a detailed report about the availability and location of state funds for the remediation of hazardous conditions to health.

And the second provision is to make recommendations for any legislation that would be required to have a single agency help to have a single source for all the various hazardous conditions that can be addressed through the Healthy Homes Initiative.

I move adoption.

DEPUTY SPEAKER GODFREY:

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Thank you, sir. Will you remark further on this bill? Will you remark further on this bill?

If not, staff and guests please come to the Well of the House. Members take your seats. The machine will be opened.

THE CLERK:

The House of Representatives is voting by Roll.

The House of Representatives is voting by Roll. Will members please report to the Chamber immediately.

DEPUTY SPEAKER GODFREY:

Have all the members voted and is your vote properly recorded?

If so, the machine will be locked. The Clerk will take a tally. And the Clerk will announce the tally.

THE CLERK:

House Bill 5133.

Total number voting	140
Necessary for passage	71
Those voting Yea	140
Those voting Nay	0
Those absent and not voting	10

DEPUTY SPEAKER GODFREY:

The bill is passed. Will the Clerk please call Calendar 105.

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CONNECTICUT
GENERAL ASSEMBLY
SENATE**

**PROCEEDINGS
2014**

**VETO
SESSION**

**VOL. 57
PART 11
3246 – 3508**

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SENATE

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May 7, 2014

SENATOR LOONEY:

Thank you, Mr. President. Moving now to Calendar Page 7, Calendar 345, House Bill 5443, move to place on the Consent Calendar.

THE CHAIR:

So ordered.

SENATOR LOONEY:

Thank you, Mr. President. Moving to Calendar Page 9, Calendar 417, House Bill 5410, move to place on the Consent Calendar.

THE CHAIR:

So ordered.

SENATOR LOONEY:

Thank you, Mr. President. Moving to Calendar Page 10 where there are three items. The first, Calendar 420, House Bill 5258, move to place on the Consent Calendar.

THE CHAIR:

(The President in the Chair.)

So ordered, sir.

THE CHAIR:

Oh, thank you, Madam President. Madam President, Calendar Page 10, Calendar 421, Calendar 5263 move to place on the Consent Calendar.

THE CHAIR:

So ordered, sir.

SENATOR LOONEY:

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SENATE

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May 7, 2014

Calendar 334, House Bill 5339.

Calendar 336, House Bill 5056.

On Page 7, Calendar 345, House Bill 5443.

On Page 9, Calendar 417, House Bill 5410.

On Page 10, Calendar 420, House Bill 5258.

Calendar 421, House Bill 5263.

Calendar 424, House Bill 5439.

On Page 11, Calendar 429, House Bill 5581.

On Page 12, Calendar 445, House Bill 5418.

Calendar 438, House Bill 5336.

On Page 13, Calendar 453, House Bill 5133.

Calendar 446, House Bill 5150.

Calendar 452, House Bill 5531.

On Page 14, Calendar 457, House Bill 5516.

Calendar 455, House Bill 5325.

Calendar 456, House Bill 5440.

Calendar 459, House Bill 5321.

Calendar 461, House Bill 5140.

On Page 15, Calendar 468, House Bill 5450.

Calendar 465, House Bill 5341.

On Page 16, Calendar 474, House Bill 5337.

Calendar 469, 5538.

Calendar 473, House Bill 5328.

On Page 17, Calendar 496, House Bill 5115.

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SENATE

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May 7, 2014

SENATOR LOONEY:

If we might pause for just a moment to verify a couple of additional items.

Madam President, to verify an additional item, I believe it was placed on the Consent Calendar and Calendar Page 30, on Calendar Page 30, Calendar 592, Substitute for House Bill 5476.

THE CHAIR:

It is, sir.

SENATOR LOONEY:

It is on? Okay. Thank you. Thank you, Madam President. If the Clerk would now, finally, Agenda Number 4, Madam President, Agenda Number 4 one additional item ask for suspension to place up on Agenda Number 4 and that is, ask for suspension to place on the Consent Calendar an item from Agenda Number 4.

THE CHAIR:

Seeing no objection, so ordered, sir.

SENATOR LOONEY:

Thank you, Madam President, and that item is Substitute House Bill Number 5566 from Senate Agenda Number 4.

Thank you, Madam President. If the Clerk would now, if we might call for a vote on the Consent Calendar.

THE CHAIR:

Mr. Clerk. Will you please call for a Roll Call Vote on the Consent Calendar. The machine will be opened.

THE CLERK:

An immediate Roll Call has been ordered in the Senate.

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SENATE

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May 7, 2014

An immediate Roll Call on Consent Calendar Number 2 has been ordered in the Senate.

THE CHAIR:

If all members have voted, all members have voted, the machine will be closed. Mr. Clerk will you please call the tally.

THE CLERK:

Consent Calendar Number 2.

Total number voting	36
Necessary for adoption	19
Those voting Yea	36
Those voting Nay	0
Those absent and not voting	0

THE CHAIR:

The Consent Calendar passes. Senator Looney.

SENATOR LOONEY:

Thank you, Madam President. Two additional items to take up before the, our final vote on the implementer. If we might stand for just, for just a moment.

The first item to mark Go is, Calendar, to remove from the Consent Calendar, Calendar Page 22, Calendar 536, House Bill 5546. If that item might be marked Go.

And one additional item, Madam President, and that was from Calendar, or rather from Agenda Number 4, ask for suspension to take it up for purposes of marking it Go, that is House Bill, Substitute for House Bill 5417. Thank you, Madam President.

THE CHAIR:

Seeing no objection, so ordered, sir.

SENATOR LOONEY:

**JOINT
STANDING
COMMITTEE
HEARINGS**

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about ten minutes. And I just want to let everyone know, that is, members that are on various committees that they have to go and sit in on to have votes. So, if you see members coming and going, they have to actually go and fulfill their obligations on their other committees that they sit on. So, with that we're going to recess for ten minutes, where we'll reconvene.

REP. BUTLER: Okay. We're going to reconvene the public hearing now that we have our -- our speaker here. The next speaker before us is going to be Michael Gurecka of New Opportunities.

I believe you're testifying on Bill 5133; is that correct?

MICHAEL GURECKA: That is correct.

REP. BUTLER: All right. Well, welcome.

And (inaudible).

MICHAEL GURECKA: And, first, I apologize. You know how that traffic from Waterbury to Hartford is.

So, good afternoon, Representative Butler and members of the Housing Committee. My name is Mike Gurecka, Director of Business Development - Energy Services, with the community action agency New Opportunities in Waterbury, Connecticut.

This afternoon I'm speaking on behalf of New Opportunities, a member of the Community Action -- Association for Community Action, CAFCA.

New Opportunities is a community action agency

and currently a sub-grantee with the Department of Energy's Weatherization Assistance Program, and we are an approved Home Energy Solutions - Income Eligible vendor with CL&P and the United Illuminating.

I'm here today to support the House Bill 5133 and the intent to report on the availability and location of funding to be used by homeowners to remediate conditions in housing that are hazardous to human health and recommendations for any legislation required to locate such funding within a single agency for the purpose of better implementing the Healthy Homes Initiative.

New Opportunities commends the state's legislature and fully supports this bill. On January 18, 2014, New Opportunities was honored to present the findings and recommendation of the Connecticut Weatherization Plus Health - Health Impact Assessment to the joint Housing, Public Health and Human Services legislative committees.

In our presentation, we showed that when conducting weatherization energy audits in homes, especially in our most vulnerable homes, deferrals occur in the field when we uncover health and safety issues, such as mold, moisture, high levels of CO, gas leaks, knob and tube wiring, asbestos, lead and injury prevention.

Currently, all our impediments to Public Act 11-80, in which we're trying to weatherize 80 percent of the -- 80 percent of the homes by 2030, securing funding other than ratepayer funds is a critical factor for improving the quality of life for all the residents of Connecticut.

So, in closing, New Opportunities again applauds the legislature for recognizing the validity and the findings and recommendations of the Health Impact Assessment through the introduction of House Bill 5133. I also have it in my testimony that I'll submit.

There's a recent article that was published in the American Journal of Public Health which cites the effects of weatherization combined with community health workers in home education on asthma control. The article was really -- really shows how by joining both weatherization activities with public health activities and the Healthy Homes Initiatives can really prove -- improve the quality of life and the health of our -- our residents, especially our low-income population.
Thank you.

REP. BUTLER: Thank you.

Are there any questions?

Representative Miller.

REP. MILLER: Thank you, Mr. Chairman. Good afternoon.

According to Owens Corning Ware, the people that make insulation, 40 to 50 percent of all housing in the country is under-insulated. How do you get into the house to correct some of these problems?

MICHAEL GURECKA: By -- by conducting the energy audit, the first thing -- we're all BPI certified, which is Building Performance Institute, to be an approved vendor with the utility ratepayer funds, the Home Energy Solutions or the Home Energy Solutions - Income Eligible. The BPI certification is a

requirement. That's part of conducting a complete home energy assessment.

You want to take -- the easy way of looking at it is looking at A, B and C. You want to look at the attic to make sure that that's air sealed and insulated. You want to look at the basement to make sure that that's air sealed and insulated, and then, you want to look at the conditioned space -- that's all the space that's either heated or cooled -- and make sure that that's air sealed and -- and properly venting.

So we do go up into the attics. We take a look with the utility programs. If it's R-19 or greater, we can't recommend any -- anything else. If it's less than R-19, then we can recommend additional insulation.

REP. MILLER: Another question I had.

MICHAEL GURECKA: Sure.

REP. MILLER: The state is encouraging high efficiency heating systems. And you take some of these houses that don't have insulation, say a ranch with 1,000 square feet, the heat loss may be 100,000 BTUs an hour. If it was properly insulated, the heat loss per hour may go down to 60,000 BTUs.

MICHAEL GURECKA: Correct.

REP. MILLER: And yet, we're putting in equipment to take care of 100,000 BTUs, so we're oversizing the equipment and hoping that it's going to be more efficient, yet, we're wasting a lot of energy. There's a -- this is -- the furnace or the boiler, whatever it may be, is too big for the house when you consider that it should be insulated to a certain factor. So, I -- you

know it's a catch-22, I guess. You're doing -- trying to help on one end and the other side is not getting it, as far as it holding the heat in the house with the insulation. Just a comment.

Thank you.

MICHAEL GURECKA: No, I understand.

REP. BUTLER: Are there any other questions?

I have a couple of questions.

MICHAEL GURECKA: Sure.

REP. BUTLER: Well, I would hope the -- in the scenario that Representative Miller just talked about, when you actually do your energy audit, that, you know, some of the recommendations actually would bring that to their attention and you would actually work with them to get the right mix of insulation and heating solutions for wherever you visit and give your energy audit, but it -- would that be the case?

MICHAEL GURECKA: We -- we would make recommendations because we do -- part -- part of the energy audit is to do what's -- we call "a cast testing" (inaudible) appliance zones, and we are going in and we -- we are taking a look at the efficiency of -- of that heating system. And depending upon which funding source is -- is going to be paying for it, make the recommendations for -- for properly sized and efficient furnaces or boilers.

REP. BUTLER: Okay. And at the informational forum that we had here with the Housing public hearing -- well, the Housing and the Public Health Committee and Human Services --

MICHAEL GURECKA: Uh-huh.

REP. BUTLER: We talked a little bit about the audit and also about the possibilities of what people would do if, like during the energy audit, they came in and you saw some lead -- or you discovered some lead or some exposed asbestos, could you just walk us through what would happen at that point and how -- what would be the choices of the people who -- that you encounter, what would be their -- their method of remediating either of those hazards?

I -- I know that if you -- if you have the income, you could actually apply to agencies, like CHIF, to -- to get some low-interest or no-interest loans, but could you speak of the people who -- you know, of lower income? Like, could you just walk us through their process, because that's the core of what this legislation is trying to get to.

MICHAEL GURECKA: Correct. When we first arrive at a home, we take an analysis of the building itself. The key part to an energy audit is what's -- what's known as installing and running a blower door. That's depressurizing the house.

There are certain triggers that don't allow you to do a blower door, such as friable asbestos is a big one, mold. You don't want to be spreading mold spores or friable asbestos materials throughout the house. So, those -- those are postponements of services for doing a blower door.

You don't want to really risk doing blind air sealing, sealing up the house, because -- until that's addressed.

New Opportunities is fortunate. Over the last

couple of years, in working with the Department of Public Health and the Healthy Homes Initiative and working with this whole Health Impact Assessment, we've been able to get partners that can -- we can refer to. So, if it's a lead issue, we can refer to LAMP, which does serve five of our towns that we serve, and they can address the lead.

Waterbury has a healthy homes lead program. Some of the other communities do but not all of them. So it depends upon which community you're in as far as being able to refer and have that situation taken care of.

As far as asbestos, LAMP can also address the asbestos piece. There are, through CHIF, new -- new financial products that are available for the low-income population, but they still have FICO scores that you have to reach and -- and other pieces that a lot of our clientele can't address.

So, it is very important to be able to secure some type of other sources of funding outside of, like I said, the utility ratepayer funds, or if we're using the Department of Energy Weatherization Program, we can do minor capsulation with asbestos. You can't remediate the entire piece, depending upon how much is present. I hope that answers --

REP. BUTLER: Yes.

Now, during this process, does the personnel that is conducting the energy audit actually take the information of the client's house that they're in and help walk them through the process? How -- how does that play itself out?

MICHAEL GURECKA: Client -- client education is a very big piece with -- with any of our

programs. We have to document anything that is there, so we take a lot of pictures. We use infrared cameras. We use bore scopes to be able to get into walls to see what the insulation is like, if there is any, testing for live knob and tube. And we explain all these to -- to the clients, so they're aware of what's available.

REP. BUTLER: Okay. And hand in hand with that, once you go through that process, do you, kind of, get them the contact information on where they could go to address this? How -- what's the coordination between if something -- one of these materials is found and the -- actually contacting to -- the source that actually can help them?

MICHAEL GURECKA: I -- I -- I'll take an example. We went to a house in December, and it had some mold and some asbestos issues. So we -- we sat with them. We helped them fill out the application for the LAMP program. We just received that back in on February 7th, and we're going to be submitting that off to them to be put on their priority listing, to be able to go back to address those. Because then, once those measures are addressed, then we can come in and we can complete the energy conservation measures that are necessary for the house.

REP. BUTLER: Very good.

Are there any other questions?

Representative Diminico.

REP. DIMINICO: Thank you, Mr. Chairman.
A couple of questions.

Regarding the heat -- the heating of the home,

the energy source, I'm sure you're focusing more on -- on gas than -- than oil these days, considering the initiative?

MICHAEL GURECKA: There are -- there are a lot of funding available for the gas conversions. We address for fuel blinds, so we address whatever recommendations. Most of the housing stock that we see are oil.

REP. DIMINICO: Okay.

And -- and regarding the finance and -- are most all these homes liened for -- for the bill to -- to -- for -- for any kind of energy improvements, are the -- are the homes usually liened if the owner -- if the owner owns the home -- if the individual owns the home?

MICHAEL GURECKA: Yes. We do both owner-occupied and -- and rental. For any rental properties, the landlord or property owner has to sign off on -- on permission to do any work to the house.

REP. DIMINICO: What is the FICO score?

MICHAEL GURECKA: I'm sorry?

REP. DIMINICO: The FICO score, minimum FICO score, I heard you mention that.

MICHAEL GURECKA: I -- I can get that information to you.

REP. DIMINICO: I'm just curious be -- I'm just curious if it falls in line with the banking side of things or is it much more -- I mean, if you could provide that, I'd be curious.

MICHAEL GURECKA: Sure.

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la/gdm/gbr HOUSING COMMITTEE

February 20, 2014

1:00 P.M.

REP. DIMINICO: Thank you.

REP. BUTLER: Are there any other questions?

All right.

Yes, and I'd be curious about that FICO score too. So, if you could submit that to us, as well as your testimony that you gave today --

MICHAEL GURECKA: Sure.

REP. BUTLER: -- and the article, because I'd like to read that as well.

MICHAEL GURECKA: Okay.

REP. BUTLER: And I'd like to thank you for coming and testifying and thank you for the work that you do.

Every home you get in and make more energy efficient, it saving us all money. So, hopefully, we could achieve that goal -- what is it, 80 percent of housing by 2030?

MICHAEL GURECKA: 80 percent by 2030.

REP. BUTLER: Okay.

MICHAEL GURECKA: And -- and just to -- to remind you, with the -- with the ramp-up funds of the conservation-owned management plan, we're going to be touching a lot more homes statewide with the utility ratepayer funds under the HES and HES IE.

And I would encourage you, if you haven't had a HES energy audit done, then please sign up for one.

REP. BUTLER: All right. Well, thank you. Thank

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February 20, 2014
1:00 P.M.

you for coming today.

MICHAEL GURECKA: Sorry for being late.

REP. BUTLER: All right.

Is there anyone else who would like to speak today?

Going once, going twice. All right. We will officially adjourn our public hearing. Thank you all --

HPACT

Home Performance Alliance of Connecticut

Connecticut State Legislature
Housing Committee
Legislative Office Building, RM 2700
Hartford, CT 06106

RE: HB-5133 "An Act Concerning the Location of Funding Sources for Healthy Homes Initiative"

Dear Representative Butler and Members of the Committee:

I am writing today to ask that you support HB-5133. The Home Performance Alliance of Connecticut, (HPACT) is an industry association comprised of contractors that perform home energy audits, install energy efficiency measures and perform diagnostic tests on homes to measure air loss and air quality. Some of our members also install insulation, replace heating equipment and seal ductwork. It is these services and the strive to meet the goals of PA 11-80 that some or all of these services would be deferred due to Health and Safety findings that could be rectified if Healthy Homes funding can be identified. Many of our members that participate in the HES and HES-IE programs know first-hand how the presence of asbestos, lead, mold or combustion leaks can detour our best efforts to increase the homes energy efficiency.

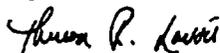
As the remediation work required to fix these types of conditions would not provide any measurable energy savings, it is typical for the homeowner to cover the remediation costs directly. Finding the necessary funding to hire professional environmental remediators is difficult for homeowners, particularly those with low incomes or poor credit history.

We look forward to the report resulting from this Act and applaud the effort to bring together the Commissioners of Public Health, Housing, Energy and Environmental Protection and Insurance to collaborate on this report.

Should you require any further information or have any questions at all, please let me know. HPACT is readily available to assist the Housing Committee with any further questions or clarifications. I can be reached at 860-916-3554 or via email, tlavoie@thereslink.com.

Thank you for your time and consideration.

Regards,



Theresa R. Lavole
Executive Director
Home Performance Alliance of Connecticut
P.O. Box 339
Litchfield, CT 06759
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Testimony Submitted by New Opportunities, Inc.
Public Input Session – Thursday, February 20, 2014

HB – 5133

An Act Concerning the Location of Funding Sources for the Healthy Homes Initiative

Good afternoon Representative Butler and members of the Housing Committee, my name is Mike Gurecka, Director of Business Development – Energy Services with the Community Action Agency New Opportunities, Inc. (NOI), Waterbury, Ct 06702. This afternoon I am speaking on behalf of NOI, a member of the CT Association for Community Action, Inc. (CAFCA). NOI is a Community Action Agency and currently a sub-grantee for the DOE Weatherization Assistance Program and we are an approved Home Energy Solutions – Income Eligible vendor with CL&P and United Illuminating.

I am here today to support the HB 5133 and the intent to report on the availability and location of funding to be used by homeowners to remediate conditions in housing that are hazardous to human health, and recommendations for any legislation required to locate such funding within a single agency for the purpose of better implementing the Healthy Homes Initiative.

NOI commends the state's legislature and fully supports this bill. On January 18, 2014, NOI was honored to present the findings and recommendation of the CT Weatherization Plus Health – Health Impact Assessment to the joint Housing, Public Health and Human Services legislative committees. In our presentation, we showed that when conducting weatherization energy audits in homes, especially our most vulnerable, deferrals occur in the field when we uncover health and safety issues such as Mold, Moisture, High levels of CO, Gas Leaks, Knob and Tube wiring, Asbestos, Lead and injury prevention (trips and falls). Currently all are impediments to the PA 11-80's goal of weatherizing 80% of our homes by 2030. Securing funding other than rate payer funds is critical factor for improving the quality of life for all the residents of CT.

In closing, NOI again applauds the legislature for recognizing the validity of the findings and recommendation of the Health Impact Assessment through the introduction of HB 5133.

Thank You,

Michael A. Gurecka

RESEARCH AND PRACTICE

Study group caregivers did not have substantially greater improvements in cleaning activities than the comparison group (data not shown), suggesting that the observed reduction in asthma triggers was more likely related to weatherization improvements and less to caregivers' education and actions. The weatherization improvements may have also yielded the reductions in dust mite allergen levels and reduced moisture and water damage in study group homes.

We observed only a modest decline in visible evidence of rodents and a small increase in visible evidence of cockroaches. Integrated pest management was not a formal part of the weatherization-plus-health interventions. CHWs did emphasize the behavioral components of integrated pest management, including proper food material storage and disposal. CHWs also performed a one-time cleaning training session in homes with visible cockroach problems. The study findings, including the lack of significant improvements in *Mus m* allergen levels, suggest that education and one-time cleaning alone is insufficient to reduce pest-related asthma triggers.

Strengths and Limitations

Study strengths included a high retention rate, the availability of a comparison group, and inclusion of vulnerable populations. Because the work was done in real-world settings, it is probably generalizable to other weatherization programs.

This study also has limitations. Blinding of the study team was not possible. A randomized controlled design was infeasible because the way homes are processed through the weatherization program precludes randomization. The robust findings of this observational study, however, support the conclusion that a package of weatherization-plus-health interventions and education yield greater improvements in asthma control. As with all intervention studies, the placebo effect may account for some of the findings; however, such placebo effects may be considered a useful intervention, yielding health benefits. The small study size and duration did not permit a formal economic analysis, but the greater decline in urgent health care use in the study group, although not significant, suggests that the intervention has the potential to generate health cost savings.

If structural interventions are durable, longer-term follow-up might reveal greater health improvements. Because of the small sample size, we could not control for multiple comparisons. It would also be beneficial to study the impact of weatherization alone on child health outcomes. In general, weatherization programs are limited in the types of repairs they can make compared with a more holistic approach that has both weatherization and healthy homes funding.

Conclusions

A comprehensive program combining an intensive CHW in-home education program with structural weatherization-plus-health interventions substantially improved asthma control and caregivers' quality of life and significantly reduced the presence of home asthma triggers. These improvements were significantly greater than those observed in households that received asthma education visits alone. Improved coordination among weatherization and public health programs may result in greater improvements in both the home and the health of children with asthma. ■

About the Authors

Jill Breysse, Sherry Dixon, and David E. Jacobs are with the National Center for Healthy Housing, Columbia, MD. Joel Gregory is with the King County Housing Authority, Tukwila, WA. Miriam Philly and James Krueger are with Public Health—Seattle and King County, Seattle, WA.

Correspondence should be sent to Jill Breysse, MHS, CIH, National Center for Healthy Housing, 10320 Little Patuxent Parkway, Suite 500, Columbia, MD 21042 (e-mail: jbreysse@nchhh.org). Reprints can be ordered at <http://www.ajph.org> by clicking the "Reprints" link.

This article was accepted April 12, 2013.

Contributors

J Breysse, a subgrantee project manager, aided in the overall study design and implementation, oversaw evaluation data collection and analysis, and was the primary author of the article. S Dixon, the study biostatistician, was responsible for data management and statistical analysis. J Gregory, the primary grantee project manager, aided in the overall study design and implementation and recruitment of homes, determined the weatherization work to be done and oversaw and documented that work, and collected allergen samples. M Philly, a subgrantee program manager, oversaw the enrollment of residents, managed the community health worker visits, oversaw health and visual assessment data collection, and managed the health and visual assessment data. D E Jacobs, the subgrantee principal investigator, aided in overall study design and contributing to the data interpretation. J Krueger, a subgrantee co-principal investigator, aided in the study design, data

analysis, and interpretation of study findings, and oversaw the provision of comparison group data.

Acknowledgments

Funding was provided by the US Department of Housing and Urban Development's Office of Lead Hazard Control and Healthy Homes (grant WALHH0186-08). The work that provided the basis for this publication was supported by American Recovery and Reinvestment Act funding.

Project partners for this study included residents, rental property owners, the King County Housing Authority (prime grantee), Public Health Seattle—King County, and the National Center for Healthy Housing.

Note. The authors are solely responsible for the accuracy of the statements and interpretations contained in this publication. Such interpretations do not necessarily reflect the views of the US government.

Human Participant Protection

The University of Washington's human subjects review committee approved this study prior to any data collection.

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- currently lived in Highline School District and intended to remain in the same home for at least 1 year;
- spoke English, Spanish, or Vietnamese;
- had 1 or more children with asthma who were 3 to 17 years old at enrollment;
- had not participated in other asthma programs in the past 3 years;
- had a child whose asthma control level met the National Heart, Lung, and Blood Institute (NHLBI)'s 2007 definition of not-well-controlled or very poorly controlled asthma⁴¹;
- resided in a rental property and the owner was willing to participate; and
- were low income as defined by both HUD and weatherization programs (at or below HUD 80% annual median income and 60% of state median income or 200% of federal poverty level).

The county housing authority aided enrollment, using its weatherization permission form to ask whether any household member had respiratory issues and referring potential participants to the public health department. The housing authority sent weatherization application forms to those who passed the phone screening.

Participants drawn from the previous HH-II study served as this study's historical comparison group. Comparison group enrollment occurred between November 2002 and October 2004, with CHW home visits ending in November 2005. CHWs for both the study and comparison groups received the same training and followed similar home visit protocols. Comparison group eligibility criteria (similar to the study group criteria) were as follows: children aged 3 to 14 years with not-well-controlled or very poorly controlled asthma; income below 200% of the 2001 federal poverty threshold or child enrolled in Medicaid; caretaker's primary language English, Spanish, or Vietnamese; and residence in King County, Washington. The HH-II research team recruited comparison group children primarily through community and public health clinics.

Community Health Worker Home Visit Intervention

For both study and comparison groups, a CHW from the public health department

obtained informed consent and conducted a baseline assessment of the home environment and a health interview, described elsewhere.^{39,42} Over a 1-year period, the CHW made an average of 4 additional home visits to provide education and supplies. For the education component, the CHW worked with each family on a tailored set of actions to reduce asthma triggers, based on standard protocols,^{39,42} including tailored educational messages and demonstrations about medical management of asthma and trigger reduction. During the first education visit, the CHW provided allergen-impermeable bedding encasements for the study child's bed, a low-emission vacuum, vacuum bags, a cleaning kit, a peak flow meter so the caregiver could periodically monitor the asthmatic child's breathing, an inhaler spacer if needed, an asthma medication and action plan storage box, and low-literacy educational materials. At the exit visit, approximately 1 year after the first visit, a CHW repeated the home environment assessment and the health interview.

Weatherization-Plus-Health Structural Interventions

County housing authority personnel conducted a weatherization-plus-health audit that determined the scope of structural interventions. The "weatherization" part included diagnostic home air tightness measurements, combustion safety testing, a heating system assessment, and an assessment of moisture-related problems. The housing authority used the US Department of Energy-approved Targeted Residential Analysis Energy Tool (TREAT) software to determine weatherization work specifications, including energy upgrades, related repairs, and health and safety improvements, with work varying in intensity and cost depending on the type of dwelling (apartments vs duplexes or single-family homes).

The "health" part of the audit included an assessment of asthma triggers that could be treated through additional structural interventions beyond routine weatherization, primarily in the bedroom and main play areas of the child with asthma. Weatherization-plus-health interventions performed in at least 35% of the study group homes are listed in Table 1. The median total cost of weatherization-plus-health interventions was \$4200 for apartments

and \$6300 for duplexes or single-family dwellings.

Environmental Measures

In the study and comparison groups, the CHW completed a home environment checklist and an interview with the primary caregiver, both described elsewhere,^{39,43} to assess home conditions and identify the presence of 6 asthma triggers: pets, smoking inside the home, cockroaches, rodents, mold, and water damage. At baseline and exit visits, we calculated a "trigger score" for each home, with scores ranging from 0 to 6 depending on the number of triggers identified by methods described elsewhere.⁴³

In a subset of study homes, we used a standard HUD method⁴⁴ to assess exposure to asthma-related allergens (dust mite, cockroach, and mouse) through floor dust vacuum sampling in the study child's bedroom, living room, and kitchen at baseline and exit visits. We marked an area of approximately 3 sq ft adjacent to upholstered furniture in the living room and adjacent to and slightly under the bed in the child's bedroom, with each area vacuumed for approximately 2 minutes. On bare floors, we sampled more than one 3 sq ft area if needed to collect sufficient dust for analysis. In the kitchen, we sampled the floor perimeter along the base of walls, appliances, and cabinets. Laboratory analysis was by the Multiplex Array for Indoor Allergen (MARIA) method (Indoor Biotechnologies, Charlottesville, VA) for dust mite allergens Der f1 and Der p1, Mite Group 2 (combination of Der f2 and Der p2), cockroach allergen Bla g2, and mouse allergen Mus m1.

Clinical Outcome Measures

Using interview data, we classified each participating child's asthma as well controlled, not well controlled, or very poorly controlled in accordance with NHLBI guidelines.⁴¹ The interview included the Pediatric Asthma Caregiver's Quality of Life Questionnaire score,⁴⁵ ranging from 1 to 7, with higher scores indicating better quality of life and a change of 0.5 units being clinically significant. Interview data included use of asthma-related urgent clinical care during the previous 12 months (including an overnight stay in hospital, emergency room visit, or unscheduled clinic visit)

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TABLE 3—Children's Asthma Clinical Outcomes: Highline Communities Healthy Homes Project, October 2008–September 2010

Outcome	Study Group			Comparison Group			Study vs Comparison P ^a				
	No. of Children	Baseline, % or Mean	Exit, % or Mean	Percentage-Point Change (95% CI)	P ^b	No. of Children		Baseline, % or Mean	Exit, % or Mean	Percentage-Point Change (95% CI)	P ^b
Asthma not well controlled or very poorly controlled, %	33	100	28.8	-71.2 (-87.1, -55.2)	<.001	68	100	51.6	-48.4 (-60.7, -36.2)	<.001	.04
Urgent clinical care in previous 12 mo, %	34	93.5	61.8	-31.7 (-47.8, -15.5)	.01	61	89.9	66.2	-23.6 (-36.5, -10.7)	.003	.553
Symptom-free days in previous 2 wk, mean	34	8.4	11.9	3.5 (2.0, 5.0)	<.001	68	8.8	11.8	3.1 (1.7, 4.5)	<.001	.673
Asthma attacks in previous 3 mo, mean	34	1.7	0.9	-0.8 (-1.5, -0.1)	.027	66	3.5	1.2	-2.3 (-4.0, -0.7)	.006	.092
Caretaker's quality of life, mean	34	5.1	6.7	1.6 (1.3, 2.0)	<.001	68	5.3	6.2	0.9 (0.6, 1.2)	<.001	.002
Days activity limited in previous 2 wk, mean	34	3.2	0.5	-2.7 (-3.8, -1.6)	<.001	68	2.5	0.9	-1.6 (-2.6, -0.6)	.002	.139
Days rescue medicine used in previous 2 wk, mean	34	5.7	1.7	-4.0 (-4.1, -2.0)	<.001	68	5.0	2.2	-2.8 (-4.2, -1.4)	<.001	.338
W (days with symptoms in previous 2 wk, mean	34	2.8	0.4	-2.4 (-3.5, -1.3)	<.001	68	2.9	1.2	-1.7 (-2.8, -0.5)	.005	.376

Note. CI = confidence interval.

^aBased on paired t test comparing within-group change from baseline to exit visit.

^bBased on 2-sample t test comparing within-group change across groups or logistic regression comparing exit visit values adjusted for baseline values across groups.

levels at baseline and exit visits less than its DL of 0 196 µg/g. Although Bla g2 was generally less frequently detected at the exit visit (6%, 6%, and 0% ≥ DL in child's bedroom, kitchen, and living room, respectively) than the baseline visit (6%, 19%, and 12% ≥ DL, respectively), these decreases were not significant. Dust mite allergen, particularly Der p1 (the predominant dust mite species in the Seattle area⁴⁵) and Mite Group 2, was detected more frequently than Bla g2. The percentage of Der p1 results equal to or greater than the DL significantly decreased from baseline (75%) to exit visit (44%) in the living room ($P = .059$ [marginally significant]), but there was no significant change in the child's bedroom (75% to 69%). The percentage of Mite Group 2 sample results equal to or greater than the DL significantly decreased between baseline and exit visits in both the child's bedroom (94% to 75%, $P = .083$ [marginally significant]) and the living room (75% to 44%, $P = .025$). Mus m1 showed a significant increase in the percentage of results equal to or greater than the DL in both the kitchen (25% to 62%, $P = .014$) and living room (37% to 81%, $P = .008$), however, the majority of Mus m1 results were very low, with medians at or just above the DL of 0.002 in all locations. A summary of baseline and exit visit allergen concentrations is available as a supplement to the online version of this article at <http://www.aph.org>

DISCUSSION

This study suggests that adding weatherization-plus-health structural interventions to an existing CHW educational asthma home visit program results in greater benefits in asthma control and asthma-related quality of life. There were also improvements in mold, water damage, and child exposure to asthma triggers over and above those found in households receiving CHW education visits alone.

This study complements the Breathe Easy Home (BEH) study, which examined the impact of CHW education and newly constructed asthma-friendly homes and used the same historical comparison group. Similar to our study, the BEH Study found significant improvements in children's asthma control, asthma-symptom-free days, frequency of urgent clinical care visits, and caretakers' quality of life.⁴³

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TABLE 2—Baseline Household Characteristics: Highline Communities Healthy Homes Project, October 2009–September 2010

Characteristic	Study Group (n = 34), %	Comparison Group (n = 68), %	P ^a
Child's age, y			.327
3–6	41	51	
7–17	59	49	
Dwelling type			.049
Single-family	68	47	
Apartment (≥ 3 units)	32	53	
Caretaker's education			.79
< high school	44	41	
High school graduate or GED	21	21	
Some college	35	35	
College graduate		3	
Child's race/ethnicity			.74
African American	18	16	
Hispanic	47	48	
Other Asian/Pacific Islander	6	10	
Other or unknown	3	7	
Vietnamese	21	12	
White	6	9	
Child's asthma control			.779
Not well controlled	50	53	
Very poorly controlled	50	47	
Child's gender			.253
Male	68	56	
Female	32	44	
Primary language in home			.953
English	50	49	
Spanish	32	35	
Vietnamese	18	16	
Season of data collection			.241
Not winter	71	81	
Winter ^b	29	19	

^aBased on χ^2 test to determine whether study group baseline characteristics were different from those of the comparison group.

^bDecember 21 to March 20

Fifty percent of households reported English as the primary language, 32% reported Spanish, and 18% reported Vietnamese. The average time between the baseline and exit data collection visits for the study group was 12 months (range = 11–15 months), compared with 14 months (range = 8–24 months) for the comparison group.

Clinical Outcomes

Between baseline and exit visits, the percentage of study group children whose asthma

was either not well controlled or very poorly controlled significantly improved, from 100% to 28.6% ($P < .001$; Table 3). The comparison group also had a significant improvement, from 100% to 51.6% ($P < .001$); however, the study group's absolute percentage reduction was significantly greater than that of the comparison group ($P = .04$). Moreover, the study group's improvement in caregivers' quality of life exceeded that observed for comparison group caregivers ($P = .002$) by 0.7 units, a clinically important difference

For the following measures, the study group showed greater improvement than the comparison group, but the across-group difference in improvement did not reach statistical significance:

1. percentage of children with urgent clinical care visits in the previous 12 months;
2. mean symptom-free days in previous 2 weeks;
3. mean days of limited activity in previous 2 weeks;
4. mean days of rescue medicine use in previous 2 weeks; and
5. mean nights with symptoms in previous 2 weeks.

The improvement in the mean number of asthma attacks in the previous 3 months for the comparison group marginally exceeded that of the study group ($P = .092$).

Asthma Triggers

The percentage of study group homes with visible evidence of mold, and of those with water damage, condensation, leaks, or drips, significantly decreased from baseline to exit (Table 4; $P < .001$ and $P = .01$, respectively). The percentage of study group homes with visible evidence of rodents marginally decreased ($P = .087$). Although the decline in the percentage of homes with indoor smoking was not significant ($P = .128$), a low percentage of caregivers reported indoor smoking at baseline (6.9%), and by the end of the study, no caregivers reported indoor smoking. Although visible signs of cockroach exposure appeared to increase from baseline to exit (14.3% to 25.3%), this increase was not significant ($P = .17$).

Study group improvements in mold and water damage issues significantly exceeded those of the comparison group ($P = .078$ [marginally significant] and 0.029, respectively). The decline in overall exposure of study group children to asthma triggers (baseline and exit trigger scores = 1.8 and 0.8, respectively) was marginally significantly greater than that of comparison group children (baseline and exit trigger scores = 1.2 and 0.7, respectively; $P = .080$).

Allergens

Overall, H1a g2 was infrequently detected in study group homes ($n = 16$), with median

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TABLE 1—Most Frequently Performed Weatherization-Plus-Health Structural Interventions: Highline Communities Healthy Homes Project, October 2009–September 2010

Task	Dwellings With Task, %	
	Apartments (n = 11)	Duplexes and Single-Family Dwellings (n = 23)
Install bathroom fan liner(s)	82	87
Replace bathroom fan(s)	64	74
Insulate water pipes	27	78
Replace carpet ^a	91	48
Install CO detector	18	74
Repair or replace ductwork ^b	27	61
Insulate home ^c	18	61
Reduce air infiltration	18	57
Install smoke detector(s)	18	48
Weather-strip door(s)	18	48
Insulate or seal ductwork ^d	0	52
Replace light fixture(s)	18	43
Install CFLs	18	35
Install crawl space vapor barrier	9	35
Repair electrical issue(s)	18	30
Repair plumbing	9	35
Install door sweep	0	35
Replace door(s)	0	35
Replace kitchen range hood	18	26
Replace dryer hood	9	26

Note. CO = carbon monoxide; CFL = compact fluorescent lamp. The table presents interventions performed in at least 35% of study group dwellings. A full list of weatherization-plus-health interventions is available as a supplement to the online version of this article at <http://www.ajph.org>.

^aIn various homes, carpets were replaced with low-volatile-organic-compound (low-VOC) carpets, laminate flooring, vinyl, refinished hardwood, or a combination of carpet and laminate.

^bIncludes replacing bathroom fan duct, installing passive roof vent, venting kitchen exhaust fan, cleaning dryer duct, installing heat vent, repairing baseboard heater, repairing dryer vent, repairing duct and heating, ventilation, and air conditioning (HVAC), replacing crawlspace duct, replacing duct, venting bathroom fan, and replacing dryer duct, to improve ducts and vents.

^cIncludes insulating attic, walls, ceiling, or crawlspace, or a combination of these locations, all done to prevent air leakage into or out of the home.

^dIncludes insulating HVAC ducts, sealing ducts, and insulating furnace walls, all done to prevent energy leakage from various heating and air conditioning systems.

and self-reported asthma attacks in the previous 3 months.

Statistical Analysis

We used the χ^2 test to determine whether there was a difference in baseline demographic and other characteristics between the study and comparison groups (Table 2). Type of residence was the only significant difference between the 2 groups, with 32% of study group children living in apartments compared with 53% of comparison group children ($P = .049$). Because type of home could influence the type of weatherization-plus-health

interventions conducted in a given dwelling, we adjusted for these differences using propensity score weighting, controlling for the differences between the 2 groups; this resulted in an unbiased estimation of the treatment effect. To create the propensity score, we used a logistic regression model to predict the log-odds of being in the study group vs the comparison group. The regression model was based on child's age (3–6 vs ≥ 7 years), apartment versus house, winter (December 21–March 20) data collection period (yes vs no), and year of construction (1940–1959, 1960–1979, or 1980–2009)

We used propensity score weighting for all analyses except for descriptive statistics about the structural interventions (Table 1) and baseline household demographics (Table 2). Although propensity score weighting was unnecessary for within-group comparison of baseline versus exit visit data, we used it for consistency.

For yes-or-no interview questions, we used the McNemar test to test the hypothesis that the percentage of people within each group who answered yes to a question was different at baseline versus exit visit. When all people had the same responses at both times, we could not calculate the P value. We used a logistic model to test whether or not the log-odds of yes answers was different for the study vs comparison groups, controlling for the baseline response for each variable.

For categorical variables with answers representing some order of intensity (e.g., very sure, somewhat sure, not sure at all), we used the Cochran-Mantel-Haenszel row mean score to test whether responses were the same at the baseline and exit visits. For questions involving the number of days, quality-of-life scores, number of visits, and number of triggers, we used the paired t test to test whether there was a significant change in the means from baseline to exit visit. For these same variables, we used the 2-sample t test to determine whether the mean change from baseline to exit visit was significantly different between the study and comparison groups. For all tests, we defined statistical significance as $P < .05$.

We used McNemar's test to determine whether the percentage of allergen samples with concentrations at or above the detection limit (DL) was the same at baseline and exit visits.

RESULTS

The study team enrolled 45 households, of which 34 were retained through the 1-year follow-up visits (76% retention rate). The 34 study households had low annual incomes, and the education of most caregivers was either less than high school or a high school diploma or GED (Table 2). Almost half (47%) of enrolled children were Hispanic, 21% were Vietnamese, and 18% were African American.

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TABLE 4—Asthma Triggers Found in Homes: Highline Communities Healthy Homes Project, October 2009–September 2010

Outcome	Study Group				Comparison Group				Study vs Comparison P ^b		
	No. of Homes	Baseline, % or Mean	Exit, % or Mean	Change (95% CI)	P ^a	No. of Homes	Baseline, % or Mean	Exit, % or Mean		Change (95% CI)	P ^a
Any pet, %	34	27.1	24.0	-3.2 (-19.2, 12.9)	.729	55	17.2	29.9	12.7 (-1.4, 26.8)	.098	.326
Mold, %	34	53.5	7.0	-46.5 (-63.9, -29.2)	<.001	68	48.7	21.0	-27.7 (-42.1, -13.3)	.001	.078
Cockroaches, %	34	14.3	25.3	11.0 (-4.4, 26.5)	.17	63	13.1	12.0	-1.2 (-13.2, 10.9)	.856	.11
Rodents, %	34	15.6	2.2	-13.4 (-25.3, -1.6)	.087	61	6.7	3.5	-3.2 (-9.7, 3.3)	.371	.424
Smoking inside home, %	34	6.9	0.0	-6.9 (-15.7, 1.9)	.128	66	1.8	3.2	1.4 (-1.5, 4.3)	.419	.988
Water damage, condensation, leaks, or drips, %	34	60.6	24.1	-36.4 (-54.9, -18.0)	.01	68	34.4	4.9	-29.5 (-2.5, -16.6)	<.001	.029
Trigger score, ^c mean	34	1.8	0.8	-1.0 (-1.4, -0.5)	<.001	68	1.2	0.7	-0.5 (-0.8, -0.2)	.001	.089

95% CI = confidence interval.

^aBased on McNemar's test to test the hypothesis that the percentage of people within each group who answered yes to a question was different at the baseline vs the exit visit.

^bBased on a logistic model to test that the log-odds of yes answers in the study group were different from those in the comparison group, controlling for the baseline response for each variable.

^cThe trigger score was 0 to 6, depending on the number of triggers identified.

however, the improvements observed for the BEH group, although greater than those for the historical-education-only group, were not significantly greater. The improvements observed in our current study were generally greater than those observed in the BEH study. For example, the asthma control improvement of the study group versus comparison group was approximately 20% in the current study and 5% in the BEH study. Caregivers' quality of life improved by 0.7 units in the study group over that of the comparison group in the current study, compared with 0.2 units in the BEH study. Improvements in asthma trigger scores, however, were greater in the BEH study than in the current study (score reduction of 0.69 vs 0.5). More research is needed to determine why asthma outcome improvements observed for weatherizing existing homes were greater than those observed for constructing new, asthma-friendly homes.

The types of structural interventions and costs varied considerably depending on the type of dwelling in which the study child resided. Roughly one third of enrolled homes (32%) were apartments in multifamily buildings; the remaining 68% were duplex or single-family dwellings. Additional interventions that supplemented the more routine weatherization repairs, such as carpet replacement and bathroom fan installation, were generally performed both in apartments and in duplexes and single-family dwellings. However, the housing authority could perform only limited weatherization interventions in single apartments of multifamily buildings because they were not treating the whole building. In a routine weatherization program, the housing authority would treat an entire multifamily building if 50% or more of the residents were eligible in terms of income. However, because this study began with enrollment of asthmatic children instead of enrollment of homes needing weatherization, the housing authority could treat only the study child's apartment. The median weatherization cost for duplexes and single-family dwellings (\$4181) was nearly twice as high as that for apartments (\$2243), whereas median costs for the additional interventions were similar (apartment = \$3005; duplex or single-family dwelling = \$3103). The small sample size prevented evaluation of the impact of variable intervention intensity on asthma outcomes.

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Effect of Weatherization Combined With Community Health Worker In-Home Education on Asthma Control

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Asthma is a major public health and environmental justice issue associated with multiple interacting environmental and other factors. Asthma prevalence and morbidity among all US children have increased dramatically in the past 2 decades and remain high.¹ Asthma disproportionately affects disadvantaged populations, who have a higher prevalence of the disease²⁻⁴ and experience more severe impacts.⁵⁻¹² Being poor or a person of color is associated with increased rates of sensitization to several asthma-associated allergens.¹³⁻²⁰ Sensitization to airborne allergens is one of the main risk factors for developing asthma and its complications.²¹⁻²³

Disparities in asthma morbidity and allergic sensitization may be due, in part, to disproportionate exposure to indoor environmental asthma triggers associated with substandard housing.^{12,24,25} Moisture and dampness, poor ventilation, crowding, residence in multiunit dwellings, deteriorated carpeting, and structural defects can contribute to high levels of indoor asthma triggers.

In its Guide to Community Preventive Services,²⁶ the US Centers for Disease Control and Prevention (CDC) summarized studies²⁷⁻³⁵ showing that home visits, in particular those performed by community health workers (CHWs) and addressing multiple asthma triggers, improve self-management behaviors, reduce exposure to triggers, decrease symptoms and urgent health care use, and increase quality of life. The US Department of Housing and Urban Development (HUD),³⁶ US Environmental Protection Agency,³⁷ and CDC²⁶ recommend home visits, and the National Asthma Education and Prevention Program³⁸ recommends that home visits be considered, but notes that this area needs more research.

The historical Seattle-King County Healthy Homes II (HH-II) project studied the effectiveness of CHW home visits for controlling asthma.³⁹ CHWs provided in-home education and helped participants implement action plans

Objectives We assessed the benefits of adding weatherization-plus-health interventions to an in-home, community health worker (CHW) education program on asthma control.

Methods We used a quasi-experimental design to compare study group homes (n = 34) receiving CHW education and weatherization-plus-health structural interventions with historical comparison group homes (n = 68) receiving only education. Data were collected in King County, Washington, from October 2009 to September 2010.

Results Over the 1-year study period, the percentage of study group children with not-well-controlled or very poorly controlled asthma decreased more than the comparison group percentage (100% to 28.8% vs 100% to 51.6%; $P = .04$). Study group caregiver quality-of-life improvements exceeded comparison group improvements ($P = .002$) by 0.7 units, a clinically important difference. The decrease in study home asthma triggers (evidence of mold, water damage, pests, smoking) was marginally greater than the comparison group decrease ($P = .089$). Except for mouse allergen, the percentage of study group allergen floor dust samples at or above the detection limit decreased, although most reductions were not statistically significant.

Conclusions Combining weatherization and healthy home interventions (e.g., improved ventilation, moisture and mold reduction, carpet replacement, and plumbing repairs) with CHW asthma education significantly improves childhood asthma control (*Am J Public Health* 2013;104:e57-e64. doi:10.2105/AJPH.2013.301402).

that addressed multiple triggers. The study found that the CHW home education program was relatively inexpensive, significantly reduced asthma morbidity and trigger exposure, and improved caregivers' quality of life. The HH-II study also found that adding CHW home visits to clinic-based asthma education yielded a clinically important increase in asthma-symptom-free days and modestly improved caretakers' quality of life.³⁹ However, the homes of many low-income asthmatic children needed structural interventions beyond the scope of the home visit program.

In this Highline Communities Healthy Homes Project, we used a quasi-experimental design to determine whether adding weatherization-plus-health structural interventions to an existing home CHW home visit program resulted in greater reductions in asthma morbidity and exposure to home asthma triggers than reductions achieved for the historical

HH-II comparison group receiving CHW home education visits alone. Over 100 000 homes are weatherized each year,⁴⁰ yet we found no studies that examined the impact of weatherization work on resident asthma outcomes.

METHODS

We collected study data in homes of low-income children in the Highline communities in southwest King County, Washington. Enrollment of children and homes occurred between October 2009 and September 2010. Interested families having 1 or more children who used asthma medication during the school day and who had a medical verification of asthma diagnosis were referred by school district nurses to the public health department for phone eligibility screening. Families were eligible if they met the following study and weatherization program requirements

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