

# Restoring Indoor Health, One House at a Time

*The Opportunity Council first does no harm, and then tackles IAQ problems.*

by Dave Finet

Last winter, a couple with four small children called the Opportunity Council (OC), a tri-county, private nonprofit Community Action Agency in Bellingham, Washington, hoping to get some help with their high heating bills. They came in for an appointment with an OC staff member and went through the normal steps to determine their income eligibility and their potential level of energy weatherization assistance. The intake staff member also explained the benefits of the Weatherization Assistance program (WAP) as an effective, long-term solution to lower a household's utility bills. The staff member then asked if the couple would be interested in participating. Yes, they were definitely interested.

Because the OC has implemented a new program, called Weatherization Plus Health, the staff member asked the family some additional questions: How old was the house? Did anyone in the house have asthma or other respiratory problems? It turned out that the house was built in 1959, and two of the children and the father had been diagnosed with asthma. Later that month, those answers became important to the weatherization project coordinator as he prepared to assess the home for cost-effective weatherization opportunities—opportunities that he knew could make the indoor air quality (IAQ) worse if he didn't pay attention to existing pollution sources, ventilation rates, and related health and safety measures. Thanks to a mix of programs and funding sources, the coordinator has developed the skills and knowledge—and has access to the available funding—to work with the family to reduce asthma triggers, and potentially, to improve the children's health and the family's quality of life.



## *Weatherization Plus Health*

The OC's Energy and Home Repair Division provides low-income energy assistance, weatherization, and home repair services in Whatcom, Island, and San Juan counties of Washington State. At first glance the OC looks like many Community Action programs around the country that provide energy and home repair programs using a combination of funding to deliver services. It's not until you look a little deeper, talking to program recipients, Washington State program staff, and other agencies that it becomes obvious that the OC has really incorporated some unique concepts and program components (see "Seven Principles of a Healthy Home"). The culmination of these efforts is a program that we call Weatherization Plus Health.

Over the years, we have come to realize that no two houses are alike, so it seems only reasonable that we would treat each house and each occupant individually. Recognizing that clients with existing respiratory problems can be positively or negatively affected by weatherization services, the OC developed Weatherization Plus Health, an innovative program funded by the HUD's Office of Healthy Homes and Lead Hazard Control. In 2001, the OC received funding for a three-year demonstration project to develop strategies and protocols that identify and reduce indoor environmental hazards for households receiving weatherization services. Targeted indoor hazards include problems caused by high humidity, bulk moisture, dust, rodents, pests, deteriorated lead paint, unsafe combustion appliances, poorly installed ductwork, uncontrolled air movement, clutter, missing handrails,

and broken steps. These hazards can contribute to health conditions that include asthma and respiratory problems, lead poisoning, and CO poisoning.

The Weatherization Plus Health strategies and protocols build on the high-quality work and technical expertise that is already in place and is being delivered throughout the national weatherization network. The OC relied heavily on DOE training and technical assistance funds (T&TA) to develop staff's technical ability in the areas of ventilation, combustion safety testing, and pressure diagnostics—all important components of the WAP's Weatherization Plus initiative, which was implemented in 1998.

Many people see the DOE WAP primarily as an energy efficiency program, but service providers understand that the work delivered through this program can have a significant societal benefit in improving IAQ, thus potentially reducing health care needs for many low-income families. Still, while the weatherization program in many cases can improve indoor environmental conditions with existing resources, the OC has also come to accept that many of the problems we encounter cannot be stabilized or mitigated without additional funding. This realization was instrumental in prompting the OC to develop the Weatherization Plus Health program (see "Funding the Development of the Health Component").

## Beyond Do No Harm

The OC developed the Weatherization Plus Health protocols to address



(top) Project Manager Erin Hamernyk (left) and a client discuss non-toxic cleaning alternatives and dust control. (bottom) These non-toxic cleaning materials come with detailed instruction on how to use them.

indoor environmental hazards. Our goals were to ensure that weatherization providers first Do No Harm, and second, where feasible, Improve Indoor Environment Health Conditions. The OC refers to these two approaches as Level 1 and Level II (see "Addressing Liability," p. 27). We broke down the Weatherization Plus Health protocols into these two levels to provide a standardized method to examine the indoor living environment for all households receiving services, and an enhanced level for

those households that include a member with respiratory illness, such as asthma. The protocols were further broken down into phases and steps. This was done partly to provide agencies with stepping stones to move forward with comprehensive indoor environment upgrades. The implementation of any step, phase, or level will—we hope—lead to implementation of the next. This in turn will enhance the quality of service provided to all participating households.

At OC, we start trying to improve a family's indoor environment in the initial intake process performed by staff of the Energy Assistance Program. As I mentioned above, intake staff ask not only the standard income eligibility questions but also questions designed to determine whether the health of the occupants or the condition of the home warrants a Do No Harm approach or an Improve Health Conditions approach. If the intake interview exposes no obvious risks, the weatherization project coordinator will assess the home using Level I protocols; if the intake interview exposes significant risks, the home will be assessed using Level II. The primary differences between Level I and Level II include more advanced ventilation strategies, pollution source mitigation, pollutant sink mitigation, tools to improve cleaning, a personalized education component, and postweatherization follow-up. Our experience to date is that about 80% of the households we survey in the three communities we serve receive Level 1 services and 20% of the households receive Level II services.

## Seven Principles of a Healthy Home

**Dry.** Reducing moisture minimizes mold growth and makes it difficult for pests to thrive.

**Clean.** Dust can cause allergic reactions that trigger asthma attacks. Clutter and debris make it difficult to remove dust and can be breeding grounds for pests.

**Well ventilated.** Ventilation moves air to help reduce excess humidity and airborne contaminants. Spot ventilation exhausts humidity and contaminants from

specific sources (bathroom showers, kitchen cooking), minimizing mold. Dilution ventilation deals with low-level contamination throughout the home.

**Combustion product-free.** Combustion products such as CO are a health hazard.

**Pest-free.** Pests can cause allergic reactions that trigger asthma. Pesticides themselves can also be injurious to a person's health.

**Toxic-chemical-free.** Cleaning compounds, pesticides, oil- or alkyd-based paints, and solvents can release toxics to the indoor air and exacerbate asthma, even when they are stored in containers.

**Comfortable.** A healthy home should be comfortable and not subject to uncontrolled extremes in temperature, air change, or humidity.

Obviously, not all homes or occupant risk levels can be categorized during an intake interview. So it is very important that the project coordinators understand the risk criteria, and that they can make the call in the field when to move from Level I to Level II. John Davies, OC's weatherization and home rehabilitation manager, emphasizes the essential role that project coordinators play in assessing the homes and developing strategies that are effective, inexpensive, and easy for the clients to maintain. "Well-trained, detail-oriented project coordinators are the key in making the critical decisions needed to develop strategies that improve indoor environmental health conditions while controlling costs," says Davies.

All Energy and Home Repair staff have received training in the seven steps to a healthy home, how the agency implements these steps, and each staff member's role in addressing these steps. This training—along with backup aids, such as checklists and strategies—is the foundation of an informal education component that every staff member has a role in delivering. We want to provide our clients, staff, and community partners with a clear and concise definition of what we are trying to achieve with Weatherization Plus Health.

## One House at a Time

On the day of the Weatherization Plus Health assessment of the family with four small children, the project coordinator visited the family in their home. He

asked a number of questions about the house and how it worked, engaging the family in conversation while learning the history, problems, and perceptions of how the house worked from the occupants. Then, using many of the techniques known to weatherization providers, he observed, smelled, measured, and tested various home performance variables to determine building airtightness and identify pollutant sources, pathways, and driving forces. He observed condensation on windows; paint peeling in spots on

and document these types of pollution sources. Level I services only increase the cost of a job by around \$200–\$250 in auditor time. Level II requires an investment of \$3,000–\$10,000, with an average of approximately \$6,000 (see Table 1).

Knowing that members of the household had been diagnosed with asthma, the project coordinator was determined to avoid pulling any of the potential asthma triggers he had identified in the crawlspace, attic, and

**Table 1. Range of Costs**

Education	Labor* and handouts	\$ 600
Ventilation	Assumes some contribution from weatherization	\$1,200
Pollution source cleanup		\$1,100
Supplies	HEPA vacuum, pillow and mattress covers, walk-off mats, etc.	\$ 600
Floor coverings	Eliminate carpets as pollution sinks	\$2,500

\*All labor rates are \$52 per hour.

the ceiling; disconnected gutters; poor site drainage; standing water in the crawlspace under the home; dryer vented into the crawlspace; water dripping off the roofing nails; and visible mold on the underside of the roof sheathing in the attic. The bathroom fan was vented into the attic. The attached garage housed a gas forced-air furnace and water heater, along with a number of solvents, paints, and pesticides. We estimate it takes an additional 30 minutes per home to assess

garage into the living space. To avoid pulling air from these attached zones into the house, he set up the blower door to pressurize, rather than depressurize, the living space—a procedure that only takes an additional 10–15 minutes to set up in most houses. Minimizing exposure to pollutants for people who we feel may be at risk by pressurizing the home is the kind of simple detail that characterizes Weatherization Plus Health. The project

## Funding the Development of the Health Component

The OC has used a combination of funding to develop Weatherization Plus Health. Funding for the program's early development came in 1993 from EPA's Environmental Justice program. This grant helped fund the creation of the Indoor Air Coalition of Whatcom County (IACWC). Our participation in this coalition clarified our understanding of the building-related health needs of the community and the lack of resources that were available to mitigate indoor environ-

mental problems. Key members of the multiagency coalition have been the Whatcom County Health Department and the Northwest Air Pollution Authority's Indoor Air program

Funding from HUD's Healthy Homes program, combined with existing weatherization funds from the DOE's Weatherization Assistance program, Health and Human Services (HHS), and local utility funds, helped support the further development of Weatherization Plus Health.

The State of Washington Department of Community Trade and Economic Development (DCTED) has also supported the development of the program's IAQ component. The OC has further benefited from DOE and DCTED support and the funding they provide to gradually integrate a program component that addresses one of the mission's primary objectives: ensuring health and safety for program participants.

## Addressing Liability

It is important to remember that we are diagnosing the home and making repairs to improve the indoor environment. We are not diagnosing the family. Our perspective is that we want to know if someone in the home already has a compromised health condition, because the last thing we want to do is to exacerbate it. We understand that reducing asthma triggers, pollution sources, and indoor hazards may or may

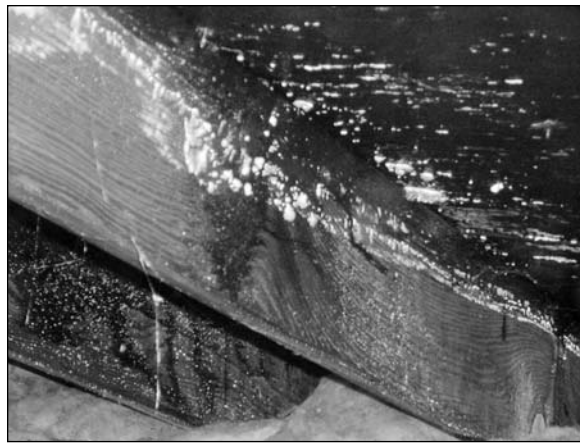
not improve client health, but we also know that if these hazards are not addressed, we expose ourselves to increased risk. We feel that Weatherization Plus Health protocols reduce agency risk by addressing potential problems up front, by giving us a better understanding of the IAQ conditions that program participants live with, and by creating an established system to address these issues. The level of liability for work per-

formed is no different from that for any other weatherization or home rehabilitation project, since the work that is performed is similar—it's just the methodology that's different. The OC carries pollution occurrence insurance with a mold exclusion. We currently contract out mold mitigation, but we plan to perform these services in-house in the future with the appropriate insurance.

coordinator then performed combustion safety testing on all combustion appliances. He also measured exhaust fan flows and duct leakage and recorded humidity levels inside and out. Finally, he conducted a lead paint hazard risk assessment.

With all the information gathered, it was time to develop a Weatherization Plus Health plan for the family. The plan included air sealing and duct sealing in the attic and crawlspace, with additional duct insulation in the attic. The dryer was vented to the outside; the gutters and downspouts were repaired. The existing bathroom fans were replaced with quiet, efficient fans controlled by one-hour spring timers for spot ventilation; these fans were vented to the outside. Mechanical exhaust was placed in the crawlspace and set to run continuously. This system creates a slight negative pressure in the crawlspace with reference to the house, reversing the natural flow of air from the crawlspace up into the house and instead drawing air from the house into the crawlspace and outdoors. A 100 CFM multiport ventilation system with a high-efficiency pleated filter was installed in the home and was set to run continuously to provide fresher and drier air directly to each of the three bedrooms and the children's playroom.

We coupled these measures with a very focused education program that provided maintenance information and a maintenance schedule, as well as strategies and materials for dust and



Moisture from the crawlspace has migrated into this attic, causing mold and deterioration of the roof deck.

moisture control, recommendations and samples of nontoxic cleaners, and information about lead paint hazards and how to control them. Erin Hamernyik, project coordinator for the OC's Healthy Homes Project, developed the pre- and posteducation curriculum. "Working with families to reduce clutter and implement asthma trigger reduction strategies is a challenge, but we find many families are receptive and participate actively once they understand how much the indoor environment may be impacting the health of a family member," says Hamernyik.

We completed work on this house during the summer of 2003. We know we improved the indoor health conditions in this home dramatically through Weatherization Plus Health. We will get a more precise assessment of how the work and the education this family received affected their health—and that

of the other 16 households we have worked with—during the upcoming evaluation stage of the program. So far, the feedback we have received from clients is very positive. Clients describe generally feeling better and experiencing fewer asthma attacks.

To help evaluate the project, Dave Blake, of the Northwest Air Pollution Authority, and Hamernyik collected pre- and postweatherization air sampling data and tape lift dust samples from all the 16 homes that we have worked on. The purpose of the generalized dust sampling was to determine what types of dust—the most

prevalent asthma trigger—were present before the weatherization work was done, and at what levels, and to compare the results to those found in the homes postweatherization. The project also incorporated a quality of life survey and documented the frequency of medical visits pre- and postweatherization. The results will be forthcoming this spring.



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