

Ohio's HWAP is one of the highest performing low-income weatherization programs in the nation. Not only has it reduced energy consumption and corresponding bills, but it has also had an effect on payment behavior, health and safety issues, environmental impacts, and the Ohio economy.

OHIO'S HOME WEATHERIZATION ASSISTANCE PROGRAM

An Independent Evaluation...

This report is based on studies conducted by independent contractors selected to evaluate and assess the Home Weatherization Assistance Program.

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For more than 20 years, the Home Weatherization Assistance Program (HWAP) has installed energy efficiency measures in the homes of Ohio's low-income residents.

Key Findings

This method of insulation, called "tubing," allows for a dense packing of insulation within the walls.



Key findings include the following:

Ohio's HWAP saves more energy per household served than has been documented for any other state's low-income weatherization program. Ohio's technically innovative approach to weatherization is responsible for this result. Households that heat with gas — the great majority of HWAP participants — reduced gas used for space heating, on average, by 29 percent. Households with electric heat — the second most common type of space heating — reduced electricity used for space heating, on average, by 15 percent.

The energy savings produced by the HWAP program save Ohio ratepayers \$14 million over the life of the measures by reducing the cost of the Percentage of Income Payment Plan (PIPP). Under PIPP, eligible low-income households pay utilities 10 percent of their income for gas heat and 5 percent towards their electric bill, or 15 percent for electric heat. The difference between the amount paid by the household and the actual bill is collected from all utility ratepayers. HWAP reduces the PIPP deficit that ratepayers must "pick up."

Ohio's HWAP program is so effective that many households don't need to go on PIPP to retain utility service. PIPP participation is reduced by about 25 percent after HWAP.

Key Findings continued...

HWAP's energy savings also result in energy bill savings of more than \$13 million for non-PIPP households that participated in HWAP. These bill savings are realized over the life of the measures that were installed in the year studied. These bill savings flow to non-PIPP households that pay their full utility bills and to households that heat with propane or oil.

HWAP's direct economic benefits exceed the costs of the program from 7 to 26 percent.

Depending upon the value counted for environmental benefits, the present value of savings over the lifetime of measures installed in homes is between \$2.2 million and \$8.0 million greater than the total costs of the program. These economic benefits consist mainly of reduced fuel bills over the lifetime of measures installed through HWAP. Some savings also flow from health and safety related improvements, such as replacement of unsafe heating equipment, that are made in a portion of homes served by HWAP.

The evaluation team quantified reductions in air pollutants due to HWAP. The total annual reduction of CO₂ emissions attributable to the program's weatherization activities is equivalent to the annual emissions from more than 4,600 average U.S. passenger automobiles.

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The number of jobs and the level of personal income in the state are increased by HWAP. The study team evaluated the aggregate economic impacts of HWAP, finding that the program has a net positive impact on the state's overall economy. After accounting for all economic effects of HWAP — including federal tax payments from Ohioans to finance federal HWAP grants to the state — both the number of jobs in the state and the level of personal income are higher than they would be without the program.

The great majority of HWAP participants are satisfied with program delivery. PIPP participants are motivated by the prospect of comfort improvement, and non-PIPP participants by the prospect of bill savings plus comfort improvement. Both types of participants learn about the program mostly through personal contacts. These findings provide information the Office of Energy Efficiency can use in its continued marketing of HWAP. Hundreds of thousands of eligible households are not yet served by HWAP.

Ohio's HWAP was designed to reduce the energy consumption of Ohio's low-income households, making energy services more affordable.

History of HWAP

Origin

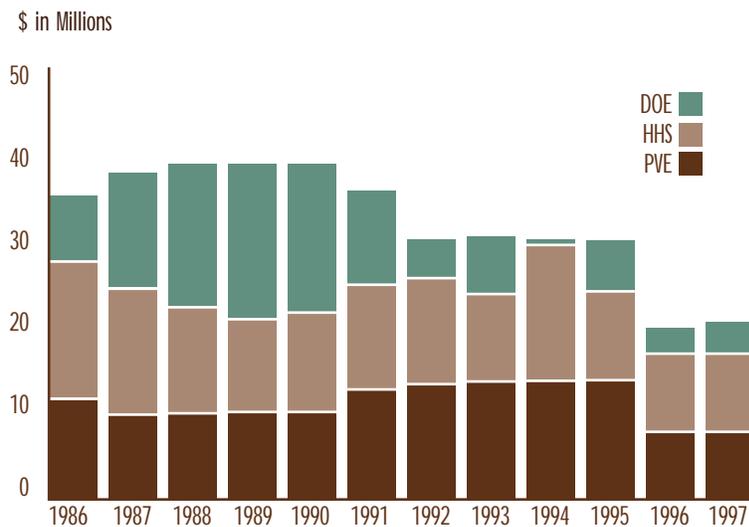
Ohio's HWAP was designed to reduce the energy consumption of Ohio's low-income households, making energy services more affordable. It does this by installing energy conservation measures in eligible homes, at no cost to the residents. The program also identifies and repairs health, safety, and comfort-related problems which are common in older homes often occupied by low-income families. The program began in 1977 and is operated by the Ohio Department of Development's Office of Energy Efficiency.

Weatherization treatments are administered and carried out by local organizations. These include community action agencies, local governments, and community-based non-profit organizations.

The HWAP program served 250,000 low-income households in its first 20 years of operation.

Program funding peaked at \$39 million in 1988 and fell to less than \$20 million for 1997. HWAP funds are provided by the U.S. Departments of Energy and Health and Human Services (DOE and HHS) and from "oil overcharge" money (Petroleum Violation Escrow, or PVE). The graph to the left shows the year-by-year breakdown of program funding from 1986 through 1997.

HWAP Funding



History of HWAP continued...

Program Treatments

Low-income weatherization efforts have changed considerably over the past 20 years. From installing simple measures such as weather-stripping and storm windows, low-income weatherization has evolved into a technically sophisticated approach that is based on site-specific diagnostic testing and targeted treatments. Ohio's HWAP has been at the forefront in incorporating many new approaches and in assessing their effectiveness.

The main measures provided by the program include:

- in-home energy education**
- wall insulation**
- attic insulation**
- blower-door guided air sealing**
- heating system safety tests, repairs, and tune-ups (and replacements for safety reasons)**
- duct insulation and sealing**
- floor insulation**
- hot water savings measures (insulation blankets and low-flow showerheads)**
- energy-related home repairs**

The local HWAP agency performs an initial energy audit at each house to determine which measures are needed. This on-site audit also identifies health and safety related problems that need correction. The local agency, or the private contractor it hires, performs the work recommended by the audit; in some cases a heating system sub-contractor is also hired. After all the work is completed on a home, the local agency performs a final inspection to verify the quality of the work.



▲ The gauges on the blower door are used to measure air leakage from the building.

Based on HWAP program records, the average costs for installed measures per treated home were as follows:	
Single family	
Site built	\$2,030
Mobile home	\$1,320
Multi-family	
Building	\$2,760
Suite	\$910

HWAP primarily serves households whose incomes are at or below 125 percent of the federal poverty level. For a household of three, this is about \$15,000 per year.

Program Context

Demographics and Income

Ohio is an urbanized state with a high level of homeownership. Its poverty rates are only slightly less than national averages. Countywide poverty rates are highest in the Appalachian foothills in the southern part of the state.

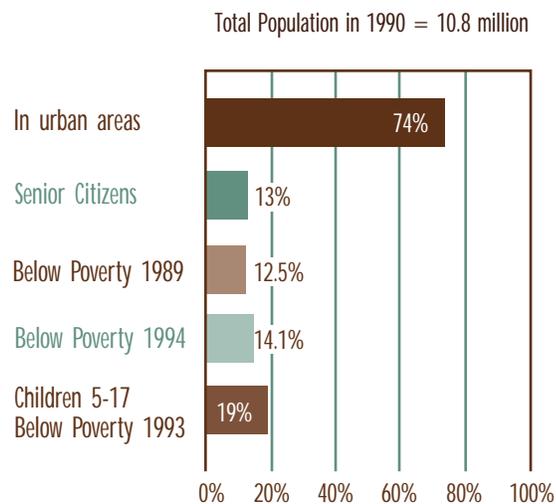
HWAP primarily serves households whose incomes are at or below 125 percent of the federal poverty level, about \$15,000 a year for a household of three. In 1989, 650,000 households fell into this category; by 1994, the size of this category grew to about 745,000.

Households with incomes between 125 percent and 150 percent of poverty can also receive weatherization through HWAP if they participated in the Home Energy Assistance Program (*see below*).

Other Low-Income Energy Programs

In addition to HWAP, low-income households in Ohio can participate in a number of fuel assistance and weatherization related programs. The largest programs are fuel assistance from the Home Energy Assistance Program (HEAP) and the Percentage of Income Payment Plan (PIPP). In addition, households with senior or handicapped members can participate in the Ohio Energy Credits fuel assistance program. The major gas utilities and some electric utilities provide weatherization services. Local agencies and governments also provide a variety of housing programs for low- and moderate-income households.

Population Demographics



**Other Low-Income
Energy Programs continued....**

The Home Energy Assistance Program

The Home Energy Assistance Program (HEAP) distributes fuel assistance funds provided through the U.S. Department of Health and Human Services. In 1995, HEAP provided approximately \$46 million to nearly 330,000 households with incomes below 150 percent of the federal poverty level. Also included in HEAP is an Emergency Program that is available to households that are threatened with a utility shut-off or have run out of bulk fuel such as oil or propane.

The Percentage of Income Payment Plan

The Percentage of Income Payment Plan (PIPP) is an extended payment arrangement program available to low-income customers of gas and electric utilities regulated by the Public Utilities Commission of Ohio (PUCO). Customers with incomes below 150 percent of poverty can enter a PIPP agreement with their local utilities. They agree to pay 10 percent of their income to maintain utility service for their primary heating source, and/or 5 percent of their income to maintain service for their secondary heating-related energy source. PIPP participation in December 1995 included approximately 105,000 gas-heating customers, 15,000 electric heating customers, and 120,000 electric non-heating customers.



“There are lots of families and elderly people that could use the same kind of help I got, so I’ve been telling everyone I can to call and see if they’re eligible.”

The HWAP program is periodically evaluated. Evaluations provide information regarding program performance to the Office of Energy Efficiency and other parties interested in HWAP. The Office of Energy Efficiency uses evaluation findings in managing and improving HWAP.

Evaluation Overview

Previous Evaluations

Ohio's HWAP has been evaluated several times. Previous evaluations examined overall energy savings, savings from client education, durability of savings, technical field performance, and the effectiveness of administrative and other systems. The most recent evaluation¹ was completed in 1992 and studied the performance of the program in 1988. That study found average net savings of 18.9 percent of gas usage (296 ccf/yr.) for single family site-built houses.

¹ see Gregory, Judith M. and L. Nelson, "Fuel Savings Study 1988 Program Year: Final Report," prepared for State of Ohio Department of Development Office of Energy Efficiency by Cleveland State University and Applied Energy Research Group, June 1992.

Current Evaluation

From 1996-8, the Ohio Department of Development's Office of Energy Efficiency sponsored five interrelated studies of HWAP for the year 1994-5. Services in this year were provided to more than 30,000 people living in a total of 11,997 housing units.

Included in the studies are:

An impact evaluation, determining HWAP's effects on energy use, and its direct costs and benefits.

An environmental impact assessment, quantifying the reductions in air pollutants and in carbon dioxide emissions as a result of the program.

An economic impact report, quantifying the changes in overall state employment and personal income due to HWAP.

A process evaluation, examining the effectiveness of program delivery, and the reasons why eligible households find and participate in HWAP.

A field site investigation, reviewing the quality and persistence of weatherization work done by HWAP delivery agencies in a small sample of homes.

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Impacts

HWAP Impact Summary

	IMPACT BY FUEL			TOTAL
	GAS	ELECTRICITY	OTHER	VALUE
ENERGY BENEFITS				
Ratepayer Savings in PIPP	\$11.0 m	\$3.4 m	—	\$14.4 m
Client Energy Cost Savings	\$7.8 m	\$2.0 m	\$3.9 m	\$13.8 m
TOTAL ENERGY BENEFITS	\$18.8 m	\$5.4 m	\$3.9 m	\$28.2 m
NON-ENERGY BENEFITS				
Disconnections Avoided per year	585	58	—	\$0.5 m
Health and Safety Improvements	\$3.0 m	\$0.1 m	\$0.7 m	\$3.8 m
Environmental Benefits				\$0.3 – \$6.1 m
TOTAL NON-ENERGY BENEFITS (see note)				\$4.6 – \$10.4 m
PROGRAM COSTS				
HWAP Total	\$21.7 m	\$2.2 m	\$4.7 m	\$28.6 m
Utility	\$2.0 m	—	—	\$2.0 m
TOTAL PROGRAM COSTS	\$23.7 m	\$2.2 m	\$4.7 m	\$30.6 m
NET PROGRAM BENEFIT (Benefits minus Costs)				\$2.2 – \$8.0 m

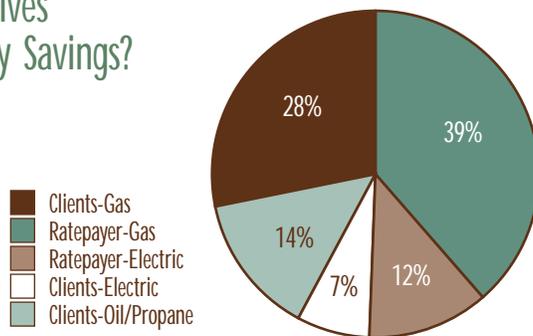
Note: The value of benefits is based on savings produced over the lifetime of measures installed during Program Year 1994. All costs and savings are expressed in 1994 dollars.

Impacts continued...

Gas and Electricity Consumption

The Impact Evaluation quantified the gas and electricity savings that resulted from HWAP for single-family houses and multifamily units. These savings were then valued economically, based on retail gas and electric rates in Ohio. They are reported in the table on page 9, as are the cost savings in households heating with oil or propane.

Who Receives the Energy Savings?



Payment Behavior

HWAP participants that are PIPP customers are paying a percentage of their income for heating energy. Consequently, their own portions of the bills do not change from weatherization; rather, the reduced cost of heating means that the PIPP program pays less for these households. The savings go to reducing PIPP program costs; however, HWAP reduces energy use enough that some participants can leave PIPP entirely.

For HWAP participants that are not PIPP customers, savings are reducing the difference between customer payments and full retail bills and have therefore reduced utility disconnections by approximately one-third.

Environmental Impacts

The energy savings from HWAP lead to considerable carbon dioxide emission reductions, as well as reductions in emissions of sulfur oxides, nitrogen oxides, carbon monoxide, methane, and particulate matter. The emissions reductions result from reduced burning of gas and oil in home furnaces and from reduced burning of coal, oil, and gas by electric utilities, which lessens the need for costly environmental controls.

Health and Safety

Many low-income houses have old and poorly maintained space heating and water heating equipment, which can lead to health and safety problems such as indoor air pollution, carbon monoxide poisoning, and fires and explosions from safety malfunctions or gas leaks.

HWAP has provided health and safety benefits by addressing numerous equipment and wiring problems in low-income homes. Significant resources have been devoted to identifying and repairing many health and safety problems. For example, \$2.7 million was spent on health and safety measures in 1994, including the replacement of 850 heating systems.

Impact on Economy

HWAP produces a number of impacts on the Ohio economy. The program reduces imports of fuel into the state. An economic impact analysis was used to trace the effects of HWAP on employment in Ohio. The analysis accounted for both employment increases due to clients and ratepayers having more disposable income after energy savings begin, and employment decreases due to tax payments to fund HWAP and to reduced energy sales. The net effect from 1994's costs and savings is a modest increase in employment equating to approximately 13 jobs lasting 20 years.

The economic impact analysis also found that HWAP, over the life of the measures installed, increases the aggregate level of economic activity in the state by more than \$5 million due to the 1994 program (discounted 1995 dollars).

Other Program Impacts

Low-income weatherization programs provide additional benefits to participants, utilities, ratepayers, and society at large. These benefits include improved participant comfort, reduced gas service emergency calls, and increased durability of the low-income housing stock.

The Process Evaluation report reviewed how program services were delivered during 1994 and 1995. The review found high overall levels of client satisfaction, and a system that efficiently delivers professional quality services.

Process Findings

The Process Evaluation report reviewed how program services were delivered during 1994 and 1995. The review found high overall levels of client satisfaction, and a system that efficiently delivers professional quality services.

The Process Evaluation yielded the following conclusions:

Personal contacts are the major channel through which information about HWAP reaches the community.

Saving money on utility bills and improving comfort levels are the two most important motivating factors for participants.

These factors also were found to be potentially important for non-participants.

Clients expressed consistently high degrees of satisfaction with program delivery mechanisms and personnel. Two-thirds of participants surveyed gave HWAP the highest satisfaction ranking used in the survey.

Many of the non-participants contacted are aware of the program, but face other barriers to participation, such as confusion about the eligibility requirements and application process for rental units.

The evaluation included:

conducting telephone surveys with program participants and non-participants

reviewing printed program materials

interviewing program administrative staff, service providers, and national experts in the design of energy service programs for low-income populations

Targeting clients based on the usage level and screening for previous weatherization treatment would help ensure higher savings program wide.

Field Site Findings

The Field Site Investigation evaluated the installation quality of weatherization and health/safety measures and noted any missed opportunities for energy savings. A number of the findings from the investigation have already led to changes that have been incorporated in HWAP program operating standards. The investigation found that homes treated by HWAP vary significantly in the amount of savings realized. While some of the savings discrepancies are due to the occupants, the majority are due to the selection of homes and the services



provided by the agencies.

The Site Investigation found that:

Houses that saved larger amounts of energy following weatherization did so due to high initial consumption and more effective treatment.

Houses that saved lower amounts of energy after weatherization had lower levels of energy use to begin with, which provided fewer opportunities for installation of HWAP program measures.

Targeting clients based on the usage level and screening for previous weatherization treatment would help ensure higher savings program wide.

Good documentation was maintained by the agencies. Pre-existing conditions within the home could be better documented.

Potentially serious combustion safety problems were identified and have since been targeted by new program standards.

“This is a wonderful program that’s led by people who really care about other people.”

Acknowledgements

This report is based on studies conducted by independent contractors selected to evaluate and assess the Home Weatherization Assistance Program. The competitively selected contractors were **Proctor Engineering Group** and **Tellus Institute**. The principal individuals on the evaluation team were **Michael Blasnik and Tom Downey of Proctor; David Hill, Shawn Intorcio, and David Nichols of Tellus; and Don Michael Jones of Residential Building Analysis.**

This report summarizes the findings and conclusions of the evaluation team, and does not necessarily represent the views of the Ohio Department of Development (ODOD). The detailed findings of the evaluation team are available, in separate reports, from ODOD's Office of Energy Efficiency (OEE).

The evaluation team received the cooperation of numerous individuals, including OEE staff, program contractors, HWAP delivery agencies, the major gas and electric utilities of Ohio, the Public Utilities Commission, the Office of Community Services, and last, but not least, hundreds of residents in low-income households who participated in surveys of HWAP participants and non-participants.

The results and conclusions summarized in the report are the sole responsibility of the evaluation team.