Applied Public Policy Research

APPRISE

Institute for Study and Evaluation

The Colorado Evaporative Cooling Demonstration Project

Evaluation Plan

Prepared for the Colorado Department of Human Services / Office of Self-Sufficiency – LEAP

March 2007

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I. Introduction

The purpose of this evaluation is to assess the performance of the Colorado Evaporative Cooling Demonstration Project. The process evaluation will assess the efficiency and effectiveness of program procedures, and identify changes that can be implemented in the second year of the program. The impact evaluation will measure pre and post data for clients on factors including health, independence, cooling behaviors, and energy consumption. This comprehensive evaluation will assist program administrators, State LIHEAP administrators, and federal REACh grant administrators determine the feasibility and desirability of replicating the program throughout Colorado and other areas.

A. Background

Elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status, as well as the increased probability of being socially isolated and economically disadvantaged. The Colorado LIHEAP office, in conjunction with local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the federal Residential Energy Assistance Challenge Program (REACh) for the Colorado Evaporative Cooling Demonstration Project. The Project will be implemented in the counties of Denver, Jefferson, Pueblo, Baca, Bent, Crowley, Kiowa, Otero, and Prowers during fiscal years 2005, 2006, and 2007.

The REACh program, sponsored by the United States Department of Health and Human Services, funds programs that aim to:

- Minimize the health and safety risks that result from high energy burdens
- Increase the efficiency of energy usage by low-income families
- Target energy assistance to individuals who are most in need

The Evaporative Cooling Project will address the vulnerability of the elderly and disabled to prolonged periods of high temperatures by accomplishing the following:

- Installing evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable to program participants.
- Educating program participants about strategies for reducing their exposure to heat during periods when parts of their homes are above a comfortable temperature.
- Establishing a contact system whereby evaporative cooler maintenance requirements are adequately explained and clients are provided with maintenance reminders and assistance when necessary.

The expected outcomes of this project are:

- Client utilization of evaporative coolers in place of less effective cooling strategies when temperatures are unsafe.
- Reduction in clients' risk for heat-related illness symptoms.
- Maintenance of total electricity and water consumption in the home at affordable levels.
- Maintenance of long-term equipment integrity.
- Increased ability for clients to be independent and active in their homes on hot days.

The program evaluation will assess the extent to which these outcomes are realized.

B. Evaluation

APPRISE will conduct a comprehensive evaluation, consisting of both process and impact evaluation activities. Technical support will be furnished by independent contractor Larry Kinney.

The primary goals of this evaluation are:

- To provide feedback to the administrating agencies, Sun Power, Inc., and the Pueblo Department of Housing and Human Services, to assist them in refining the program and managing service delivery.
- To provide information to the Colorado state LIHEAP office so that it can assess whether the program model can and should be replicated in other areas of the state.
- To document program achievement and demonstrate program outcomes to the federal REACh Program so that similar programs can be replicated in other areas.

The evaluation procedures will include on-site inspections of program service delivery, analysis of the program database, surveys with program participants, and retrieval and analysis of electricity and water usage records.

C. Organization of Report

Three sections follow this introduction.

1) *Section II – Program Design:* This section reviews the program design, the program logic model, and the indicator and data model.

2) *Section III – Process Evaluation:* This section identifies the process research questions, outlines the process evaluation activities, and maps the data collection and analysis procedures to the research questions.

3) *Section IV – Impact Evaluation:* This section identifies the impact research questions, outlines the impact evaluation activities, and maps the data collection and analysis procedures to the research questions.

APPRISE prepared this evaluation plan under contract to the Colorado Department of Human Services (HHS). HHS and The Colorado Weatherization Assistance Program facilitated this evaluation plan by providing information and feedback to APPRISE. Any errors or omissions in this evaluation plan are the responsibility of APPRISE.

II. Program Design and Logic Model

The Colorado Evaporative Cooling Demonstration Project is furnishing evaporative coolers to low income elderly and disabled households. The goal of the project is to increase the health and safety of these households by furnishing them with a low cost and effective approach to cooling their homes. In this section of the report, we outline the program design, present the program logic model and identify the indicator and data model.

A. Program Design

In this program, two local weatherization service delivery agencies are responsible for providing services under the Evaporative Cooler Demonstration Project. The program design includes the following elements.

- Program Outreach – The primary sources of referrals are local community-based organizations (CBOs) and provider weatherization lists. The state LEAP office recruited a number of local community groups to furnish referrals to the program. The provider agencies also can recruit clients from their weatherization database.

- Program Intake – There are two components of program intake. The agency must confirm that the household is eligible for services (i.e., meets income and age/disability requirements) and that an evaporative cooler can be installed in the client's home. Preliminary screening is conducted by telephone. Final assessment of program eligibility is conducted at the client's home.

- Service Delivery – Installation of the evaporative cooler in the client's home requires the installation of the unit and the installation of a water line to the unit. In addition, the service technicians orient clients to the operation of the evaporative cooler.

- Maintenance Follow-Up – Required maintenance for evaporative coolers includes covering the cooler and draining the water line in the fall and uncovering the cooler and turning on the water in the spring. The provider agencies are contacting clients to ensure that coolers are maintained and are conducting site visits if they have any questions about the client's ability to maintain the coolers.

In total, the provider agencies have a goal of delivering 750 evaporative coolers to elderly and disabled low-income households.

B. Program Logic Model

The purpose of the logic model is to explicitly identify the assumptions on which the need for the program was based and to demonstrate how the program activities are expected to address the needs of program participants. Table 1 on the next page presents the logic model. On the following pages, we furnish a detailed discussion of the logic model.

Table 1
Colorado Evaporative Cooling Demonstration Project Logic Model

<table>
<tr><th>Assumptions</th><th>Activities</th><th>Immediate Outcomes</th><th>Intermediate Outcomes</th><th>Program Impacts</th></tr>
<tr><td>There are elderly and disabled low-income households that are unable to cool their homes during periods of unsafe heat.</td><td rowspan="5">Network with social service agencies to identify elderly and disabled households in need of cooling equipment.

Conduct intake with clients to ensure that they meet the targeted profile.

Install evaporative coolers in the homes of 750 targeted low-income households.

Educate clients about how to use evaporative coolers most effectively.</td><td rowspan="5">Clients have the capacity to cool their homes during periods of unsafe temperatures.

Clients understand how to use evaporative coolers effectively.</td><td rowspan="5">Clients use evaporative coolers in place of less effective cooling strategies when temperatures are unsafe

Clients experience fewer heat related illnesses.

Clients’ summer electric bills are as affordable as before installation of the coolers.

Clients’ summer water bills are as affordable as before installation of the coolers.</td><td rowspan="8">Clients are able to be more independent and active in their homes.</td></tr>
<tr><td>Targeted clients without cooling equipment use suboptimal strategies for coping with the heat that can lead to health problems.</td></tr>
<tr><td>Evaporative coolers are the least costly way to furnish cooling services to clients.</td></tr>
<tr><td>Evaporative coolers do not result in unaffordable increases in electric bills or water bills.</td></tr>
<tr><td>Clients will use equipment because they perceive that EV coolers are a budget conscious way to cool.</td></tr>
<tr><td>Plan #1
Clients or their caretakers will be able to maintain the EV cooler systems so that they operate efficiently.</td><td>Plan #1
Furnish technical education to client and/or caretaker.</td><td rowspan="3">Clients have the capacity to maintain EV coolers – either by themselves or because they have a maintenance contract with the agency.</td><td rowspan="3">EV coolers are maintained appropriately and remain operational.</td></tr>
<tr><td>Plan #2
Clients are able to maintain the EV cooler with reminders and technical assistance from community agencies.</td><td>Plan #2
Furnish technical education along with follow-up contacts.</td></tr>
<tr><td>Plan #3
Community agencies must furnish EV cooler maintenance to some or all clients.</td><td>Plan #3
Conduct EV cooler maintenance twice a year.</td></tr>
</table>

Assumptions

The program assumptions were developed during the planning phase of the project. The assumptions are based on a variety of information sources that were available to the project design staff.

Assumption #1 – There are low-income elderly and disabled households that are unable to cool their homes during periods of unsafe heat.

In a typical year households in many parts of Colorado experience extreme daytime temperatures that present risks to low-income elderly and disabled households.

- Pueblo – During the summer of 2002, the Pueblo area had 70 days when the temperature exceeded 90 degrees and 27 days when the temperature exceeded 100 degrees.

- Denver – During the summer of 2002, Denver endured 55 days with a high temperature of 90 degrees or higher.

The program assumes that there are low-income elderly and disabled households that do not have the capacity to cool their homes during these periods, and that they are not able to leave their homes to go to a place that is cool. The program assumption was based on a number of information sources. Anecdotal reports from social service providers indicated that there are a significant number of clients living in those circumstances. A pilot program run by the Pueblo County Department of Social Services was oversubscribed each year in which it operated. Statistics from the American Housing Survey showed a very low incidence rate for air conditioning in low-income households in the Denver metropolitan area.

Assumption #2 – Targeted households without cooling equipment use sub-optimal strategies for coping with the heat that can lead to health problems.

In the absence of cooling equipment, there are appropriate strategies for coping with the heat. These include strategies for keeping the housing unit as cool as possible (e.g., closing shades on the sunny side of the house) and strategies for keeping the individual comfortable and safe (e.g., hydration). However, anecdotal evidence suggests that the most common cooling strategy is to turn on fans that are directed at the individual. Particularly in Colorado's dry climate, this strategy can lead to dehydration and can put the individual at risk.

Assumption #3 – Evaporative coolers are the least costly way to furnish cooling services to clients.

For this population and housing stock, a window or through-the-wall evaporative coolers can furnish whole house cooling services. The cost of installation of the evaporative cooler

is lower than the cost of installation of either a central air conditioner or of a number of energy efficient window air conditioning units.

Assumption #4 - Evaporative coolers do not result in unaffordable increases in electric bills or water bills.

Evaporative coolers use electricity only for the fan motor. They use far less electricity than an air conditioner with the same cooling capacity. If a client is currently cooling with a large number of portable fans, the total electricity used for the evaporative cooler can be comparable to the electricity used for the fans.

Older evaporative cooler equipment used a considerable amount of water. Large increases in water bills could potentially offset the operating cost advantage of evaporative coolers when compared to air conditioners. However, new evaporative cooler models are designed to use considerable less water.

Assumption #5 - Clients will use equipment because they perceive that evaporative coolers are a budget conscious way to cool.

Elderly and disabled low-income households are very concerned about their budgets. They will not use cooling equipment if they perceive that they will not be able to pay the bills. As part of the program it was assumed that clients would need to be educated about the cost advantages of evaporative coolers and that they will use the coolers when temperatures reach unsafe levels.

Activities

The program activities are the specific services that the program managers expect to deliver to meet the perceived needs of clients.

Activity #1 – Agencies will network with social service agencies to identify elderly and disabled households in need of cooling equipment.

This program is targeted to a specific segment of the population – elderly and disabled low-income households. The program design uses a referral method to ensure that most applicants for the program are eligible and thereby reduce program intake costs at the agency level.

Activity #2 – Agencies will conduct intake with clients to ensure that they meet the targeted client profile.

To be eligible for program participation, clients have to have an income at or below the LIHEAP guideline, to have an elderly or disabled individual in the household, and to have a housing unit in which an evaporative cooler can be installed. The intake procedure will require telephone verification of demographic eligibility and an on-site visit to the home to confirm technical eligibility. In addition, each client will be priority ranked so that the agency can deliver services to those households in the greatest need.

Activity #3 - Install evaporative coolers in the homes of 750 targeted low-income households.

The service delivery agencies will install the evaporative coolers in the homes of 750 low-income households. The installation procedures will include:

- Model Selection – Determination of the cooler type that will work best for the client.
- Installation – Install the evaporative cooler in the housing unit.
- Water Line – Install a water line as part of the cooler installation.

Activity #4- Educate clients about how to use evaporative coolers most effectively.

The service delivery staff also will inform the client about how to operate the cooler effectively. The operation procedures include:

- Temperature Regulation – The technician will show the client how to set the temperature to keep the home from getting too cold.
- Air Flow – The technician will inform the client that they need to a keep a window open in another part of the house to balance the air pressure and address humidity issues.
- Water Lines – The technician will show the client where the water lines are located and ensure that the client understands that the water must be turned on for the cooler to operate.

Immediate Outcomes

Once the service delivery is complete, it will enable clients to address their cooling needs. In order for the program to be successful, the immediate outcomes of the program must include:

- Cooling – Clients will have the capacity to cool homes during periods of unsafe heat.
- Understanding – Clients will understand how to use the evaporative coolers effectively.

The fundamental change for clients will be that they will have cooling equipment that can keep them cool during periods of unsafe heat.

Intermediate Outcomes

Merely giving customers the capacity to cool their homes will not meet the goals of the program. Rather, clients must feel confident that they can use the coolers to effectively and affordably cool their homes.

Intermediate Outcome #1 – Clients use evaporative coolers in place of less effective cooling strategies when temperatures are unsafe.

To be effective, the program needs to result in clients staying inside and using evaporative coolers when temperatures are unsafe. If clients continue to use fans despite having the cooling equipment, the program will not have achieved its goal.

Intermediate Outcome #2 – Clients experience fewer heat-related illnesses.

By keeping clients cool during periods of unsafe heat they will be less likely to suffer from heat-related illnesses. Some of the symptoms of heat stress include:

- Dizziness
- Low Energy
- Nausea
- Headaches
- Difficulty Breathing
- Loss of Appetite

A reduction in symptoms may be correlated with a reduction in risk of heat-related illnesses.

Intermediate Outcome #3 – Clients' summer electric bills are as affordable as before the installation of the evaporative cooler.

For many low-income households, even a small increase in the electric bills is unaffordable. Technical specifications suggest that the evaporative coolers can be operated for only a few dollars per month. If the household was previously using more than one fan, it is possible that the evaporative cooler will cost the same as, or even less than the fans.

Intermediate Outcome #4 – Clients' summer water bills are as affordable as before the installation of the evaporative cooler.

Technical specifications for the evaporative coolers suggest that water usage should result in only small increases in bills. However, it will be important to test those results in the field.

Program Impacts

The long term goal of the program is to protect low-income elderly and disabled households helping them to stay safe and healthy during periods of unsafe temperatures. This will further enable these households to engage in other daily activities that help them to remain healthy (e.g. cooking and eating a healthy meal).

Cooler Maintenance

There is a special issue associated with maintenance of the evaporative coolers. The evaporative cooler requires a water line. This water line must be drained in the winter so

that it does not rupture. In the spring, the water line must be turned on and the cover of the cooler must be removed. In the autumn, the water line must be turned off and drained, and the evaporative cooler cover must be installed to reduce air infiltration. As part of the pilot, the agencies are going to assess what support clients need to conduct the maintenance and keep the coolers operating properly.

C. Indicator and Data Model for Cooler Effectiveness

It is important to explicitly test each part of the program logic model. In this section of the evaluation plan, we outline the research and data collection activities and map those activities into an Indicator and Data Model.

The Process Evaluation data collection activities include:

- Document Review – Review and analysis of the program materials.
- Administrative Interviews – Telephone and on-site interviews with program managers regarding service delivery.
- On-Site Observations – On-site observations of service delivery.
- In-Depth Interviews – In-depth interviews with a small sample of clients to help develop data collection instruments.
- Database Analysis – Analysis of program data to develop program operations statistics and client demographics.

Impact Evaluation data collection activities include:

- Baseline Interview – Baseline interviews prior to service delivery to measure preprogram client understanding, behaviors, and health status.
- Unsafe Heat Surveys – Interviews with clients during a period when temperatures are unsafe to assess usage of evaporative coolers.
- Follow-Up Surveys – Interviews with clients one year after cooler installation to assess overall program effectiveness.
- Billing Analysis – Analysis of data from the client's electric and water companies to assess changes in water and electricity usage.

These data collection activities will furnish the information needed to document and assess program outcomes.

Assumptions

The first step in the evaluation process will be to assess whether the program assumptions are valid. Table 2A demonstrates the data and indicator model for the program assumptions.

Table 2A
Indicator and Data Model – Assumptions

Assumption	Performance Indicator	Data	Evaluation Activity
There are elderly and disabled low-income households that are unable to cool their homes during periods of unsafe heat.	Program referral rates and program intake rates	Administrative records	Process Evaluation – Administrative interviews and database analysis
Targeted clients without cooling equipment use suboptimal strategies for coping with the heat that can lead to health problems	Rate of use of fans as primary cooling device Rate of awareness of personal safety strategies	Baseline survey	Impact Evaluation – Baseline survey
Evaporative coolers are the least costly way to furnish cooling services to clients	Cooler installation costs compared to costs for energy efficiency air conditioners	Administrative records	Process Evaluation – Administrative interviews
Evaporative coolers do not result in unaffordable increases in electric bills or water bills	Technical research performed prior to program design	Technical research	Process Evaluation – Technical research
Clients will use equipment because they perceive that EV coolers are a budget conscious way to cool	Client perceptions of EV coolers	Baseline survey data on EV coolers compared to air conditioners	Impact Evaluation – Baseline survey

Activities

As part of the evaluation, we will need to assess the effectiveness with which the program activities are complete. Table 2B demonstrates the data and indicator model for the program activities.

Table 2B
Indicator and Data Model – Activities

Activity	Performance Indicator	Data	Evaluation Activity
Network with social service agencies to identify elderly and disabled households in need of cooling equipment	Program referral rates	Administrative records	Process Evaluation – Administrative interviews and database analysis
Conduct intake with clients to ensure that they meet the targeted profile	Program eligibility rate	Administrative records	Process Evaluation – Database analysis

Activity	Performance Indicator	Data	Evaluation Activity
Install evaporative coolers in the homes of 750 targeted low-income households	Evaporative cooler installation rate	Administrative records	Process Evaluation – Database analysis
Educate clients about how to use evaporative coolers most effectively	Information delivered to clients is complete and correct	Administrative records and on-site observations	Process Evaluation – Document review and on-site observations

Immediate Outcomes

We will assess whether the immediate outcomes are achieved. Table 2C demonstrates the data and indicator model for the immediate outcomes.

Table 2C
Indicator and Data Model – Immediate Outcomes

Immediate Outcome	Performance Indicator	Data	Evaluation Activity
Clients have the capacity to cool their homes during periods of unsafe temperatures.	Evaporative cooler installation rate	Administrative records	Process Evaluation – Database analysis
Clients understand how to use evaporative coolers effectively.	Knowledge of appropriate EV cooler practices	Client survey data	Impact Evaluation – Follow-up Survey

Intermediate Outcomes

In the evaluation we will assess whether the intermediate outcomes are achieved. Table 2D demonstrates the data and indicator model for the intermediate outcomes.

Table 2D
Indicator and Data Model – Intermediate Outcomes

Intermediate Outcomes	Performance Indicator	Data	Evaluation Activity
Clients use evaporative coolers in place of less effective cooling strategies when temperatures are unsafe	Evaporative cooler usage rates	Unsafe heat survey	Impact Evaluation – Unsafe heat survey
Clients experience fewer heat related illnesses	Rate of symptoms of heat-related illnesses Attribution of heat-related symptoms to temperature of home	Follow-up survey	Impact Evaluation – Follow-up survey

Intermediate Outcomes	Performance Indicator	Data	Evaluation Activity
Client's summer electric bills are as affordable as before installation	Change in summer electric usage	Electric bill data from utility	Impact Evaluation – Billing Analysis
Client's summer water bills are as affordable as before installation	Change in summer water usage	Water bill data from utility	Impact Evaluation – Billing Analysis

Program Impacts

In the evaluation we will assess whether the program impacts are achieved. Table 2E demonstrates the data and indicator model for the intermediate outcomes.

Table 2E
Indicator and Data Model – Program Impacts

Program Impact	Performance Indicator	Data	Evaluation Activity
Clients are able to be more independent and active in their homes	Rate of heat-related symptoms for clients Percent of clients that are able to undertake daily activities Percent of clients that are able to cook a hot meal	Client survey data	Impact Evaluation – Follow-up Survey

D. Indicator and Data Model for Cooler Maintenance

As part of the pilot, the agencies are going to assess what support clients need to conduct the cooler maintenance and keep the coolers operating properly. There is concern that clients will not be aware of the evaporative cooler maintenance requirements. Further, if clients are made aware of the cooler requirements, there is concern that they will not have the resources to perform the cooler maintenance activities. If the service delivery agencies must take long-term responsibility for cooler maintenance, there is concern that would be an expensive program to operate.

The cooler maintenance issue will be addressed as part of the Process and Impact Evaluation research activities. There will be three steps in the cooler maintenance research process.

- Maintenance Plan Selection – All clients will receive education on cooler maintenance requirements. The client then informs the agency whether they need reminders and/or assistance in cooler maintenance. The agency will record the client status in the database. That information will be used as a preliminary assessment of the long-term need for cooler maintenance.

- Customer Survey – A sample of clients will be interviewed as part of the Client Follow-up Survey. In that survey, clients will be asked for information on the status of their cooler maintenance. That information will be compared to the data furnished by the agencies regarding the selection of a cooler maintenance strategy.

- Inspections – A sample of clients will have their coolers inspected by the agencies and/or OEMC. These inspections will help to assess whether the coolers have been properly maintained. That information will be compared to the data furnished by the agencies and the surveys regarding cooler maintenance.

Together, these three research activities will furnish information on what share of coolers will need some maintenance plan and what types of clients are most in need of the maintenance plan.

Assumptions

Table 3A demonstrates the data and indicator model for the program assumptions for cooler maintenance plans.

Table 3A
Indicator and Data Model – Assumptions

Assumption	Performance Indicator	Data	Evaluation Activity
Clients or their caretakers will be able to maintain the EV cooler systems so that they operate efficiently.	Percent of clients indicating that they do not need assistance.	Administrative records	Process Evaluation – Database analysis
Clients are able to maintain the EV coolers with reminders and technical assistance from community agencies.	Percent of clients indicating that they need to be reminded about maintenance procedures.	Administrative records	Process Evaluation – Database analysis
Community agencies must furnish cooler maintenance to some or all clients.	Percent of clients indicating that they need cooler maintenance.	Administrative records	Process Evaluation – Database analysis

Activities

Table 3B demonstrates the data and indicator model for the program activities.

Table 3B
Indicator and Data Model – Activities

Activity	Performance Indicator	Data	Evaluation Activity
Furnish technical education to client and/or caretaker.	Materials furnished to clients	Administrative records and on-site observation	Process Evaluation – Materials review and on-site observations

Activity	Performance Indicator	Data	Evaluation Activity
Furnish technical education along with follow-up contacts	Materials furnished and follow-up contacts made	Administrative records	Process Evaluation – Database analysis
Conduct EV cooler maintenance	Cooler maintenance performed	Administrative records	Process Evaluation – Database analysis

Immediate Outcomes

Table 3C demonstrates the data and indicator model for the immediate outcomes.

Table 3C
Indicator and Data Model – Immediate Outcomes

Immediate Outcome	Performance Indicator	Data	Evaluation Activity
Clients have the capacity to maintain EV coolers – by themselves or because they have a maintenance contract with the agency.	Self-reported rate of cooler maintenance	Client survey	Impact Evaluation – Follow-up Survey

Intermediate Outcomes

Table 3D demonstrates the data and indicator model for the intermediate outcomes.

Table 3D
Indicator and Data Model – Intermediate Outcomes

Intermediate Outcomes	Performance Indicator	Data	Evaluation Activity
EV coolers are maintained properly and remain operational	Percent of coolers that remain operational	Follow-up inspections	Process Evaluation – Administrative records

III. Process Evaluation

The Evaporative Cooler Demonstration Project was designed to furnish evaporative coolers to 750 low-income elderly and disabled households. The purpose of the Process Evaluation is to determine the effectiveness and the efficiency of the program in delivering those services.

The Process Evaluation questions are:

- Program Referral – Do the program referral procedures identify members of the target population in sufficient numbers to meet program goals?

- Program Intake – Is the program intake system effective in screening for clients for eligibility and in prioritizing clients for service delivery?

- Service Delivery Procedures – Is the program able to deliver evaporative coolers to screened applicants? For what types of housing units and/or households are there service delivery issues?

- Service Delivery Quality – What is the quality of the evaporative cooler installations?

- Costs – How do the costs of referral, intake, and service delivery compare to program budget estimates?

- Satisfaction – Are clients satisfied with the referral, intake, and service delivery procedures?

- Evaporative Cooler Maintenance – Are the evaporative coolers being maintained? Is the maintenance being done by the agencies or the clients?

[Note: The specific Process Evaluation indicators are listed in the previous section in the indicator and data models.]

The Process Evaluation research activities will include:

- *Administrative Interviews:* APPRISE will conduct administrative interviews with the key members of the project team. The purpose of these interviews is to document program operations, to assess whether program procedures are working effectively and to identify any barriers to implementation.

- *Review of Program Statistics:* APPRISE will review production statistics and financial data from the REACh database. The purpose of this review is to understand how production was distributed between the different service territories and between the types of installations since the introduction of the program.

- *Installation Observations and Inspections:* APPRISE will observe evaporative cooler installations, and inspect previously installed coolers. The purpose of these observations and inspections is to document installation procedures, and to identify any systematic problems in the process.

- *In-Depth Client Interviews:* APPRISE will conduct in-depth client interviews to develop a better understand of the need for the program, the way in which the program is affecting clients, and the satisfaction of clients with the program.

- *Baseline and Follow-Up Client Interviews:* APPRISE will conduct baseline and follow-up surveys with clients. The primary purpose of the surveys will be to assess the impact of the program on clients. However, two Process Evaluation questions that will be addressed by the surveys are whether the program is targeting the right clients (i.e., those that have a need for program services) and whether clients are satisfied with program procedures.

- *Evaporative Cooler Maintenance Survey:* APPRISE will conduct interviews with a sample of clients to assess whether the coolers are being properly maintained.

These research activities will give the evaluation team a good understanding of the program operations, help to identify barriers to program implementation, and facilitate the identification of alternatives for program enhancement.

A. Administrative Interviews

Interviews with all of the key members of the project team will be conducted to assess what procedures are being followed, whether the procedures are working effectively, and to identify any barriers to implementation. An administrative interview protocol will be developed, and the interviews will be conducted via telephone.

The key organizations that should be interviewed include:

- Colorado LEAP Office – The LEAP office is the lead agency on the REACH grant and is ultimately responsible for program performance. The LEAP office will be responsible for making final determinations with respect to program policies and will furnish reports to the federal government.

- OEMC – The Governor's Office of Energy Management and Conservation is the program administrator. They have direct contractual relationships with the service delivery agencies and are responsible for financial interactions with agencies. In addition, they will furnish quality control for the program.

- Service Delivery Agencies – The two service delivery agencies, Sun Power and the Pueblo County Department of Housing and Human Services (Pueblo HHS) are responsible for delivery services to clients.

The general topics to be covered through the interviews include:

- Program Goals – What is the organization's understanding of the program goals?
- Program Design – What is the organization's understanding of the program design and what part does the organization play in delivering the program?
- Program Operations – How has the program been implemented in the organization?
- Program Effectiveness – In what ways is the program achieving its expected goals through the original design? In what ways is the program achieving its expected goals through a revised design? In what ways is the program failing to achieve its goals?
- Evaluation Resources – What data and/or statistics are available to the evaluation team that would facilitate analysis of the program? Are there any barriers to obtaining data required for the evaluation?
- Program Costs – How do actual program costs compare to projected costs? What are the sources of the differences?
- Program Recommendations – What recommendations does the organization have for modifying the program to improve operations, reduces costs, or increase effectiveness?

Timeline

Initial administrative interviews will be conducted in person, in June of 2005. Follow-up administrative interviews will be conducted via telephone in the Fall of 2005.

NOTE: Additional administrative interviews will need to be conducted in the Spring of 2007 to assess the final program performance effectiveness. The findings from these interviews will be reported in a Process Evaluation Update Report.

Staff

Jessica Thompson will be responsible for writing the interview questions, conducting the interviews and writing up the interview summaries in 2005. David Carroll will review the interview summaries.

David Carroll will conduct the administrative interviews in 2007 and will write the interview summaries.

B. Review of Program Statistics

The service delivery agencies gather information on the clients that complete the intake process. They record the information on program intake forms and enter key information into the program database. The program database records are uploaded to the OEMC management database for management oversight purposes.

The program statistics review includes:

- Service Delivery Statistics – Analysis of the number and type of evaporative coolers installed in the homes of clients.
- Client Demographics – Analysis of the characteristics of households served by the program.
- Costs – Examination of the costs of service delivery experienced by the local service delivery agencies.

The primary data source for the analysis is the OEMC REACh database. These data will be supplemented with key information from the local service delivery agencies.

Timeline

The initial database analysis will be conducted in the Fall of 2005. This will give REACh program managers an assessment of the program performance during the first program year.

NOTE: Final program statistics will be develop in the Spring of 2007 to assess the final program performance. The findings from this analysis will be reported in a Process Evaluation Update Report.

Staff

Jessica Thompson will be responsible for conducting the initial database analysis.

David Carroll will conduct the database analysis update for 2007.

C. Observations and Inspections

APPRISE staff will directly observe service delivery to clients in each service territory and will inspect installations for a number of different types of dwellings and cooler applications.

The observations and inspections will furnish important information on service delivery, including:

- System Installation Procedures – How did the actual system installation procedures compare to the original design?

- Installation Barriers – What types of barriers did service delivery agencies encounter during the installation of coolers? What are potential solutions to those installation barriers?

- Client Interaction – The observation and inspection visits allowed the evaluation team to make direct contact with program clients and develop a good understanding of the interaction between the service delivery team and the client.

One outcome of the APPRISE observations and inspections is that the OEMC staff will be able to make use to the initial findings in the development of ongoing inspection procedures.

Timeline

The observations and inspections will be conducted in June 2005. (NOTE: OEMC staff will inspect a sample of the jobs on an ongoing basis. An analysis of these inspections will be included in the Process Evaluation Update Report.)

Staff

David Carroll and Jessica Thompson will be responsible for conducting the observations and inspections. David Carroll will conduct the analysis of inspection reports for 2007.

D. In-Depth Client Interviews

APPRISE staff will conduct in-depth interviews by telephone and as part of the on-site observation and inspection process.

The in-depth interview topics will include:

- Needs – An assessment of the client's need for the program, including preprogram cooling options and symptoms of heat-related illnesses experienced.

- Cooling Behaviors – Discussion of the client's knowledge and practice of effective home cooling behaviors.

- Health Behaviors – Discussion of the client's knowledge of the symptoms of heat-related illnesses and strategies for staying safe during periods of unsafe heat.

- Program Satisfaction – Satisfaction with intake, service delivery, and outcomes.

The in-depth interviews will furnish guidance to the development of the survey instruments for the impact evaluation.

Timeline

The in-depth interviews will be conducted in June and July 2005. NOTE: No additional in-depth interviews will be conducted for the 2007 Process Evaluation Update Report.

Staff

Jessica Thompson and Arlene Shipley will be responsible for conducting the in-depth interviews. Jessica Thompson will be responsible for writing the interview summaries.

E. Client Surveys

APPRISE staff will conduct three client surveys: a baseline survey prior to cooler installation, an unsafe heat survey during a hot summer day, and a follow-up survey one year after service delivery. The main purpose of the surveys is to measure program impacts. But, the surveys will also serve the following Process Evaluation goals.

- Target Population – The Baseline Survey will assess whether the program is reaching clients with the needs that were targeted by the program.
- Client Satisfaction – The Unsafe Heat Surveys will ask clients to rate their satisfaction with service delivery.

Timeline

The baseline surveys will be conducted during the summer of 2005. The unsafe heat surveys will be conducted during the summer of 2005 and the summer of 2006. The unsafe heat surveys from the summer of 2005 will be used in the Process Evaluation.

Staff

Jessica Thompson will be responsible for managing the client surveys. Jessica Thompson will be responsible extracting Process Evaluation data from those surveys.

F. Evaporative Cooler Maintenance Surveys

APPRISE staff will conduct a supplemental survey to assess whether the evaporative coolers were properly maintained during the winter of 2006 and 2007.

Timeline

The survey will be conducted in March 2007.

Staff

Noelene Jeffers will manage the survey. Arlene Shipley will conduct the surveys.

III. Impact Evaluation

The Evaporative Cooler Demonstration Project was designed to furnish evaporative coolers to 750 low-income elderly and disabled households. The purpose of the Impact Evaluation is to determine the effectiveness of the program in improving the health, safety, and comfort of households without detracting from the affordability of electricity and water services.

The Impact Evaluation questions are:

- Knowledge of Cooler Use – Do clients understand how to use evaporative coolers effectively?

- Cooler Use – Do clients use the coolers in place of less effective cooling strategies during periods when temperatures are unsafe?

- Health Behaviors – Do clients understand how to remain safe and healthy during periods when temperatures are unsafe?

- Health Impacts – Do clients have fewer symptoms of heat-related illnesses? Are clients less likely to attribute symptoms to the temperature of their home?

- Client Independence – Are clients able to undertake more activities of daily living that represent a healthy lifestyle?

- Electric and Water Costs – Do clients' costs for electricity and water remain affordable?

- Cooler Maintenance – Are coolers maintained in such a way that they will continue to deliver program benefits to clients for at least five years?

[Note: The specific Impact Evaluation indicators are listed in the previous section in the indicator and data models.]

The Impact Evaluation research activities will include:

- *Baseline Survey:* APPRISE will conduct a survey with clients prior to the installation of the evaporative cooler. The purpose of these interviews is to capture baseline information on the knowledge, behaviors, experiences, and health status of clients prior to service delivery.

- *Unsafe Heat Survey:* APPRISE will conduct a survey with clients during periods when afternoon temperatures are unsafe. The purpose of these interviews is to assess whether the clients use evaporative coolers during periods of unsafe heat and to measure the health status of individuals during such periods.

- *Follow-Up Survey:* APPRISE will conduct a survey with clients one year after the evaporative cooler was installed. The purpose of the survey is to measure the impact of the program on client knowledge, behaviors, experiences, and health status.

- *Electricity Usage Analysis:* APPRISE will collect electric billing data and conduct an analysis of the change in electric usage associated with the program.

- *Water Usage Analysis:* APPRISE will collect water billing data and conduct an analysis of the change in electric usage associated with the program.

- *Evaporative Cooler Maintenance Analysis:* APPRISE will develop a reporting procedure for assessing the current status of the evaporative coolers. Program staff and OEMC staff will measure the operational status for a sample of coolers and project the long-term viability of the coolers.

These research activities will allow the evaluation team to measure the impacts of the program and to make recommendations regarding the long-term potential for the program to deliver the targeted outcomes.

A. Baseline Survey

The purpose of the baseline survey is to collect information on the status of clients prior to the delivery of program services. The key measurement dimensions include:

- Client Perceptions – Prior to the delivery of program services, do clients perceive that evaporative coolers are a budget conscious way to cool their homes?

- Client Behaviors – Prior to the delivery of program services, do clients use suboptimal strategies for coping with the heat that can lead to health problems?

- Client Health – Prior to the delivery of program services, do clients actually experience the symptoms of heat-related illnesses.

- Client Activities – Prior to the delivery of program services, does the client restrict activities of daily living in response to the heat?

The Baseline Survey instrument is included in Appendix A of this document.

Timeline

It is challenging to administer the baseline survey. The survey must be completed after program intake, but prior to service delivery. In addition, the survey must be completed during the summer months, since it asks about experiences with the heat over the last week. Finally, it will be targeted to those clients with coolers installed during the first year of the program so that a follow-up survey can be conduct. The baseline survey will be conducted during the months of June through September of 2005.

Staff

Jessica Thompson will be responsible for developing the survey instrument. Jessica Thompson will work with Anne Worth to establish a program database. Arlene Shipley will conduct some of the surveys and will supervise temporary staff in conducting additional interviews. Jessica Thomson will be responsible for the data analysis.

B. Unsafe Heat Survey

The primary purpose of the unsafe heat survey is to directly measure the use of the evaporative cooler during a period of unsafe heat, and to assess the client's health status during the period of unsafe heat. The unsafe heat survey also collects information on a period one week prior to the unsafe heat period. Because the unsafe heat survey is being conducted shortly after service delivery for some clients, we also ask client satisfaction questions during the unsafe heat survey.

The key measurement dimensions for the unsafe heat survey include:

- Cooler Use – During a period of unsafe heat, is the cooler in use? [Note: Unsafe heat was identified as a day when the temperature was projected to be over 95 degrees in Pueblo and over 90 degrees in Denver.]

- Point-in-Time Health Status – During a period of unsafe heat, what is the health status of the client?

- Recent Health Status – During the last week, what was the health status of the client?

- Client Satisfaction – Was the client satisfied with the cooler installation? Is the client satisfied with the cooler?

The Unsafe Heat Survey instrument is included in Appendix B of this document.

Timeline

It is challenging to administer the unsafe heat survey. The survey must be completed during the afternoon of a day when the temperature is projected to reach 95 in Pueblo and 90 in Denver. Throughout the summer of 2005 and 2006, project staff will track clients in need of an unsafe heat survey and will monitor the temperature in Colorado. Surveys will be conducted with eligible clients when the temperature meets the targeted guidelines.

Staff

Jessica Thompson will be responsible for developing the survey instrument. Jessica Thompson will work with Anne Worth to establish a program database. Arlene Shipley will conduct some of the surveys and will supervise temporary staff in conducting additional

interviews. Jessica Thomson will be responsible for the data analysis. [Noelene Jeffers replaced Jessica Thompson for the work in 2006.]

C. Follow-Up Survey

The purpose of the follow-up survey is to collect information on the status of clients one year after the delivery of program services. The key measurement dimensions include:

- Client Perceptions – One year after the delivery of program services, do clients perceive that evaporative coolers are a budget conscious way to cool their homes?
- Client Behaviors – One year after the delivery of program services, do clients use suboptimal strategies for coping with the heat that can lead to health problems?
- Client Health – One year after the delivery of program services, do clients actually experience the symptoms of heat-related illnesses?
- Client Activities – One year after the delivery of program services, does the client restrict activities of daily living in response to the heat?
- Client Satisfaction – One year after the delivery of program services, how satisfied is the client with the evaporative cooler and the impact of the evaporative cooler on water and electricity bills?
- Cooler Maintenance – One year after the delivery of program services, is the cooler being maintained and does that place a burden on the client?

The Follow-Up Survey instrument is included in Appendix C of this document.

We plan to attempt a Follow-Up Survey for those clients that received a Baseline Survey. In that way, we can directly measure the change in status of clients served by the program.

It is also important to collect information for the Follow-Up Survey from the individual who completed the Baseline Survey if possible. While the survey respondent can report on anyone in the household, the measurement is likely to be more accurate if the same individual is interviewed.

Timeline

The goal for the Follow-Up Survey is to conduct the survey one year after the Baseline Survey was conducted. For example, if a client was interviewed for the Baseline Survey in July 2005, we will attempt to conduct the Follow-Up Survey in July 2006. In that way, we have the greatest chance of getting a comparable measurement of the status of the vulnerable individual.

Staff

Noelene Jeffers will be responsible for developing the survey instrument. Noelene Jeffers will work with Anne Worth to establish a program database. Arlene Shipley will conduct some of the surveys and will supervise temporary staff in conducting additional interviews. Noelene Jeffers will be responsible for the data analysis.

D. Electric Data Collection and Analysis

The purpose of the electric data collection and analysis is to measure the change in electric usage after the installation of the evaporative cooler. The key measurement dimensions include:

- Annual Electric Usage – What was the change in annual electric usage in the period prior to and after service delivery?
- Summer Electric Usage – What was the change in summer electric usage [June, July, and August] in the period prior to and after service delivery?
- CDD Adjusted Electric Usage – What was the change in annual and summer electric usage after adjusting for differences in cooling degree days.

We will obtain electric usage data directly from each client's electricity supplier. The materials that will be used for that data collection are in Appendix D of this document.

Timeline

For households who received evaporative coolers during the summer of 2005, we will request baseline electric usage data (for the previous 18 months) in October 2005. In October 2006, we will request an additional 12 months of electric usage data.

Staff

Jessica Thompson will be responsible for making the contacts with electric suppliers and sending the data requests. Arlene Shipley will review the data and enter it into the database. Anne Worth will be responsible for developing the usage estimates. [Note: For 2006, Noelene Jeffers will replace Jessica Thompson.]

E. Water Data Collection and Analysis

The purpose of the water data collection and analysis is to measure the change in water usage after the installation of the evaporative cooler. The key measurement dimensions include:

- Annual Water Usage – What was the change in annual water usage in the period prior to and after service delivery?

- Summer Water Usage – What was the change in summer [June, July, and August] water usage in the period prior to and after service delivery?

- CDD and Rainfall Adjusted Water Usage – What was the change in annual and summer water usage after adjusting for differences in cooling degree days and rainfall.

We will obtain water usage data directly from each client's water supplier. The materials that will be used for that data collection are in Appendix E of this document.

Timeline

For households who received evaporative coolers during the summer of 2005, we will request baseline water usage data (for the previous 18 months) in October 2005. In October 2006, we will request an additional 12 months of water usage data.

Staff

Jessica Thompson will be responsible for making the contacts with water suppliers and sending the data requests. Arlene Shipley will review the data and enter it into the database. Anne Worth will be responsible for developing the usage estimates. [Note: For 2006, Noelene Jeffers will replace Jessica Thompson.]

Appendices

Appendix A – Baseline Survey Instrument

Appendix B – Unsafe Heat Survey Instrument

Appendix C – Follow-Up Survey Instrument

Appendix D – Electricity Billing Data Collection Materials

Appendix E – Water Billing Data Collection Materials

Appendix A – Baseline Survey Instrument

Introduction:

Hello. My name is (INTERVIEWER) and I'm calling from APPRISE in Princeton, New Jersey. I'm calling for (NAME) regarding the Evaporative Cooler Program—the program that installs a cooler in your home.

IF (NAME) IS NOT AVAILABLE TO SPEAK, ASK

a) When can I call back to speak with (NAME)? _____
{Interviewer Note: Write date and time for callback.}

IF (NAME) IS NOT ABLE TO SPEAK, ASK b):

b) Is there another person in the home who is familiar with the program and household?
{Interviewer Note: If answer is yes, proceed to interview this person.}

IF (NAME) IS AVAILABLE TO SPEAK, BEGIN SURVEY NOW.

I'm calling to ask about your experience with the Program, as well as your current home cooling practices. Your responses are for research purposes only, and will be used to help improve the program. The entire survey should take around fifteen minutes. Your answers will be kept confidential, and will not affect your participation in the Program.

Satisfaction: Intake Process

S1. How did you find out about the Evaporative Cooler Program?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Informational Mailing
02 Friend or Relative
03 Agency
04 Newspaper
05 Other
06 Do Not Know
07 Refused

S2. How difficult was it to get approved for the Program?

01 Very Difficult
02 Somewhat Difficult
03 Not Too Difficult
04 Not At All Difficult
05 Do Not Know
06 Refused

S3. What parts of getting approved for the Program were most difficult?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Contacting Agency/Getting Appointment with Agency
02 Providing Income Verification
03 Providing Information About Yourself and Your Home
04 Completing the Pre-Assessment
05 None
06 Other
07 Do Not Know
08 Refused

Cognitions:

I would now like to ask you some questions about your current home cooling knowledge.

C1. Which of the following is more expensive to use, an air conditioner or an evaporative cooler?

01 Air Conditioner
02 Evaporative Cooler
03 Equally Expensive
04 Do Not Know the Difference Between the Two
05 Do Not Know
06 Refused

IF ANSWER TO C1 IS DO NOT KNOW THE DIFFERENCE, ASK a):

a) Air conditioning is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

FOR ALL OTHER ANSWERS TO C1, ASK b) and c):

b) Air conditioning is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

c) An evaporative cooler is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

C2. An evaporative cooler is easy to maintain. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with that statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

Now, I will ask you a couple of questions about keeping cool.

C3. When it is hot, what are the things a person *should* do to keep cool?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Use Fans
02 Open Windows/Doors
03 Close Shades
04 Take Cold Showers
05 Drink Water
06 Go Where There is Air Conditioning
07 Use AC/Cooler
08 Stay Indoors/Out of Sun
09 Keep Doors/Windows Closed
10 Wear Proper Clothing
11 Other
12 Do Not Know
13 Refused

C4. If a person is sick because it is too hot, what kinds of symptoms might they experience?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Loss of Appetite
02 Dizziness
03 Low Energy
04 Nausea
05 Headaches
06 Sweating
07 Difficulty Breathing
08 Dehydration
09 Other
10 Do Not Know
11 Refused

Behaviors:

These next questions will ask about your past and present home cooling practices.

B1. In the past, have you ever regularly used air conditioning to cool your home?

01 Yes
02 No
03 Do Not Know
04 Refused

B2. In the past, have you ever regularly used an evaporative cooler to cool your home?

01 Yes
01 No
02 Do Not Know
03 Refused

B3. Do you currently have any cooling equipment in your home?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO B3 IS YES, ASK a) and b):

a) What kind of cooling equipment do you have?

01 Fans
02 Cooler
03 Air Conditioning

b) Do you use this cooling equipment frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

IF ANSWER TO B3 b) IS NEVER, ASK c):

c) Why don't you use it?

RECORD ANSWER:

B4. When your house is too hot, do you do any of the following to keep yourself cool?

a) Use Fans *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

b) Open Windows *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

c) Close Shades *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

d) Take Cold Showers *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

e) Drink More Water *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

f) Go Where There is Air Conditioning *(Optional: When your house is too hot, do you do this?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

Health:

I will now move on to some questions about your health.

H1. Would you say that in general your health is?

01 Excellent
02 Very Good
03 Good
04 Fair
05 Poor
06 Do Not Know
07 Refused

H2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past thirty days was your physical health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past thirty days was your mental health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H4. Do you sleep well through the night frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

H5. Have you or anyone in your household ever had to go to the doctor or hospital because your home was too hot?

01 Yes
02 No
03 Do Not Know
04 Refused

H6. How many days in the last week, did it get so hot in your home that you were uncomfortable?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H7. In the past week, have you or anyone in your household experienced any of the following symptoms?

a) Loss of appetite *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7a IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Dizziness *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7b IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

c) Lower Energy *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7c IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

d) Nausea *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7d IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

e) Headaches *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7e IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

Independence:

These next questions will ask about problems or limitations that you may have in your daily life.

I1. How many times, in the last week, did you leave your home?

01 Number of Times _____
02 None
03 Do Not Know
04 Refused

I2. Is there anything that keeps you from getting out of your home more?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I2 IS <u>YES</u>, ASK a):

a) What is it that keeps you from getting out of your home more?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Physical Impairment
01 Mental Impairment
02 Lack of Transportation
03 Lack of Activities/People to see
04 Heat
05 Other
06 Do Not Know
07 Refused

I3. How many times, in the last week, did you socialize with people who do not live with you?

01 Number of Times _____
02 None
03 Do Not Know
04 Refused

I4. How connected do you feel to other people?

01 Very Connected
02 Somewhat Connected
03 Somewhat Isolated
04 Very Isolated
05 Do Not Know
06 Refused

I5. Do you clean, do dishes and other household chores frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

I6. Do you cook in your home frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

I7. Because of any impairment or health problem, do you need the help of other persons with your *personal care* needs, such as eating, bathing, dressing, or getting around the house?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I7 IS <u>YES</u>, ASK a) and b):

a) Do you get help from a person who is paid?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Do you get help from a person who lives with you?

01 Yes
02 No
03 Do Not Know
04 Refused

I8. Because of any impairment or health problem, do you need the help of other persons in handling your *routine* needs, such as everyday household chores or shopping?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I8 IS YES, ASK a) and b):

a) Do you get help from a person who is paid?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Do you get help from a person who lives with you?

01 Yes
02 No
03 Do Not Know
04 .Refused

Housing:

These last questions are about your household, expenses, and income.

O1. Including you, how many people normally live in this household?

01 Number of people: _____
02 Do Not Know
03 Refused

O2. How many are 60 or older?

01 Number of people: _____
02 Do Not Know
03 Refused

O3. How many are 18 or younger?

01 Number of people: _____
02 Do Not Know
03 Refused

O4. How many are 5 or younger?

01 Number of people: _____
02 Do Not Know
03 Refused

O5. How many are disabled?

01 Number of people: _____
02 Do Not Know
03 Refused

O6. Do you own or rent your home?

01 Own
02 Rent
03 Other
04 Do Not Know
05 Refused

O7. How much is your monthly mortgage/rent payment?

01 Amount _____
02 None
03 Do Not Know
04 Refused

O8. How much are your monthly electricity and gas payments?

01 Included in Rent
02 $0
03 ≤ $50
04 $51 - $100
05 $101 - $150
06 $151 - $200
07 $201 - $250
08 $251 - $300
09 $301 - $350
10 $351 - $400
11 > $401
12 Do Not Know
13 Refused

O9. How much is your monthly water payment?

01 Included in Rent
02 $0
03 ≤ $50
04 $51 - $100
05 $101 - $150
06 $151 - $200
07 $201 - $250
08 $251 - $300
09 $301 - $350
10 $351 - $400
11 > $401
12 Do Not Know
13 Refused

Income:

N1. In the past twelve months, did you or any member of your household receive income from a job?

01 Yes
02 No
03 Do Not Know
04 Refused

N2. In the past twelve months, did you or any member of your household receive Food stamps?

01 Yes
02 No
03 Do Not Know
04 Refused

N3. In the past twelve months, did you or any member of your household receive Medicaid?

01 Yes
02 No
03 Do Not Know
04 Refused

N4. In the past twelve months, did you or any member of your household live in public or subsidized housing?

01 Yes
02 No
03 Do Not Know
04 Refused

N5. In the past twelve months, did you or any member of your household receive LEAP (energy assistance) benefits?

01 Yes
02 No
03 Do Not Know
04 Refused

N6. In the past twelve months, did you or any member of your household receive cash benefits from Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), Old Age Pension, Aid to the Needy Disabled, or Aid to the Blind?

01 Yes
02 No
03 Do Not Know
04 Refused

N7. What is your household's monthly income?

01 ≤ $420
02 $421 - $830
03 $831 - $1,250
04 $1,251 - $1,670
05 $1,671 - $2,080
06 $2,081 - $2,500
07 $2,501 - $2,920
08 $2,921 - $3,330
09 > $3,330
10 Do Not Know
11 Refused

That was my last question. Thank you very much for your time and cooperation. Have a pleasant day/evening.

Appendix B – Unsafe Heat Survey Instrument

Introduction:

Hello. My name is (INTERVIEWER) and I'm calling from APPRISE in Princeton, New Jersey. I'm calling for (NAME) regarding the Evaporative Cooler Program—the program that installed a cooler in your home.

IF (NAME) IS NOT AVAILABLE TO SPEAK, ASK a):

When can I call back to speak with (NAME)? _____
{Interviewer Note: Write date and time for callback.}

IF (NAME) IS NOT ABLE TO SPEAK, ASK b):

b) Is there another person in the home who is familiar with the program and household?
{Interviewer Note: If answer is yes, proceed to interview this person.}

IF (NAME) IS AVAILABLE TO SPEAK, BEGIN SURVEY NOW.

I'm calling to ask about your experience with the Program, as well as your current home cooling practices. Your responses are for research purposes only, and will be used to help improve the program. The entire survey should take around ten minutes. Your answers will be kept confidential, and will not affect your participation in the Program.

Satisfaction:

I am going to begin by asking you a few questions about your experiences with the program.

S1. Did the cooler installation crew arrive at your home on time?

01 Yes
02 No
03 Do Not Know
04 Refused

S2. Was the installation crew friendly and polite?

01 Yes
02 No
03 Do Not Know
04 Refused

S3. Did the installation crew clean up after they were done?

01 Yes
02 No
03 Do Not Know
04 Refused

S4. Did the installation crew explain how to operate your new cooler?

01 Yes
02 No
03 Do Not Know
04 Refused

S5. Did the installation crew explain how to maintain your new cooler?

01 Yes
02 No
03 Do Not Know
04 Refused

S6. Were you given the instruction manual for the cooler?

01 Yes
02 No
03 Do Not Know
04 Refused

Cognitions:

C1. Since you had the cooler installed, have your electricity bills increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Have not yet gotten a bill
05 Do Not Know
06 Refused

C2. Since you had the cooler installed, have your water bills increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Have Not Yet Gotten a Bill
05 Do Not Know
06 Refused

Behaviors:

These next questions will ask about your home cooling practices.

B1. Since the installation of your new cooler have you used it frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never

IF ANSWER TO B1 IS FREQUENTLY, SOMETIMES, OR SELDOM, ASK:

a) When you use your cooler, how often do you open a window in another part of your home? Is it . . .?

01 Frequently
02 Sometimes
03 Seldom
04 Never

B2. Are you using your newly installed cooler today?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO B4 IS NO, ASK a):

a) Why Not?

RECORD ANSWER:

B3. Other than your new evaporative cooler, do you currently have any other cooling equipment in your home?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO B5 IS <u>YES</u>, ASK a) and b) and c):

a) What kind of cooling equipment do you have?

RECORD ANSWER:

b) Since the installation of the evaporative cooler have you used this other cooling equipment frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never

c) Are you using this other cooling equipment today?

01 Yes
02 No
03 Do Not Know
04 Refused

<u>Health:</u>

I will now move on to some questions about your health.

H1. Would you say that in general your health is?

01 Excellent
02 Very Good
03 Good
04 Fair
05 Poor
06 Do Not Know
07 Refused

H2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past thirty days was your physical health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past thirty days was your mental health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H4. Do you sleep well through the night frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

H5. How many days in the last week, did it get so hot in your home that you were uncomfortable?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H6. In the past week, have you or anyone in your household experienced any of the following symptoms?

a) Loss of appetite *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H6a IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Dizziness *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H6b IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

c) Lower Energy *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H6c IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

d) Nausea *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H6d IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

e) Headaches *(Optional: In the past week, have you or anyone in your household experienced this?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H6e IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

H7. Are you or anyone in your household experiencing any of these symptoms today? Which ones? *{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}*

01 None
02 Loss of Appetite
03 Dizziness
04 Lower Energy
05 Nausea
06 Headaches
07 Other
08 Do Not Know
09 Refused

H8. What is the current temperature outside your home?

01 Temperature _____
02 Do Not Know
03 Refused

H9. What is the current temperature inside your home?

01 Temperature _____
02 Do Not Know
03 Refused

That was my last question. Thank you very much for your time and cooperation. Have a pleasant day/evening.

Appendix C – Follow-Up Survey Instrument

Introduction:

Hello. My name is (INTERVIEWER) and I'm calling from APPRISE in Princeton, New Jersey. I'm calling for (NAME) regarding the Evaporative Cooler Program—the program that installed a cooler in your home.

IF (NAME) IS NOT AVAILABLE TO SPEAK, ASK a)

When can I call back to speak with (NAME)? _____
{Interviewer Note: Write date and time for callback.}

IF (NAME) IS NOT ABLE TO SPEAK, ASK b):

b) Is there another person in the home who is familiar with the program and household?
{Interviewer Note: If answer is yes, proceed to interview this person.}

IF (NAME) IS AVAILABLE TO SPEAK, BEGIN SURVEY NOW.

I'm calling to ask about your experience with the Program, as well as your current home cooling practices. Your responses are for research purposes only, and will be used to help improve the program. The entire survey should take around fifteen minutes. Your answers will be kept confidential, and will not affect your participation in the Program.

Unit Details:

U1. What type of cooler do you have? Is it a wall unit, a window unit, or a portable unit?

01 Wall unit
02 Window unit
03 Portable unit
04 Do Not Know
05 Refused

U2. When was your cooler installed? [IF RESPONDENT GIVES A SPECIFIC MONTH, RECORD MONTH AND YEAR UNDER "OTHER"]

01 Spring 2005
02 Summer 2005
03 Spring 2006
04 Summer 2006
05 Other_____
06 Do Not Know
07 Refused

Satisfaction:

S1. Overall, how satisfied are you with the performance of your evaporative cooler?

01 Very Satisfied
02 Somewhat Satisfied
03 Somewhat Dissatisfied
04 Very Dissatisfied
05 Do Not Know
06 Refused

S2. Overall, how satisfied are you with the evaporative cooler program?

01 Very Satisfied
02 Somewhat Satisfied
03 Somewhat Dissatisfied
04 Very Dissatisfied
05 Do Not Know
06 Refused

S3. Do you have any recommendations for improvements to the Program?

RECORD ANSWER:

Perceived Impacts:

We will now ask you a few questions to determine how you feel the evaporative cooler program may have impacted your life.

P1. Since participating in the program, has your *overall health* improved, declined, or stayed the same?

01 Improved
02 Declined
03 Stayed the Same
04 Do Not Know
05 Refused

P2. Since participating in the program, has your *experience* with heat-related illness increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Do Not Know
05 Refused

P3. Since participating in the program, has your *use* of effective ways to stay cool in the heat increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Do Not Know
05 Refused

Cognitions:

I would now like to ask you some questions about your current home cooling knowledge.

C1. Which of the following is more expensive to use, an air conditioner or an evaporative cooler?

01 Air Conditioner
02 Evaporative Cooler
03 Equally Expensive
04 Do Not Know the Difference Between the Two
05 Do Not Know
06 Refused

IF ANSWER TO C1 IS DO NOT KNOW THE DIFFERENCE, ASK a):

a) Air conditioning is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

FOR ALL OTHER ANSWERS TO C1, ASK b) and c):

b) Air conditioning is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

c) An evaporative cooler is affordable to use. Do you Agree, Somewhat Agree, Somewhat Disagree or Disagree with this statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

C2. An evaporative cooler is easy to maintain. Do you Agree, Somewhat Agree, Somewhat Disagree, or Disagree with that statement?

01 Agree
02 Somewhat Agree
03 Somewhat Disagree
04 Disagree
05 Do Not Know
06 Refused

C3. Since you had the cooler installed, have your electricity bills increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Do Not Know
05 Refused

C4. Since you had the cooler installed, have your water bills increased, decreased, or stayed the same?

01 Increased
02 Decreased
03 Stayed the Same
04 Do Not Know
05 Refused

Now, I will ask you a couple of questions about keeping cool.

C5. When it is hot, what are the things a person *should* do to keep cool?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Use Fans
02 Open Windows/Doors
03 Close Shades
04 Take Cold Showers
05 Drink Water
06 Go Where There is Air Conditioning
07 Use AC/Cooler
08 Stay Indoors/Out of Sun
09 Keep Doors/Windows Closed
10 Wear Proper Clothing
11 Other_____
12 Do Not Know
13 Refused

C6. If a person is sick because it is too hot, what kinds of symptoms might they experience?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Loss of Appetite
02 Dizziness
03 Low Energy
04 Nausea
05 Headaches
06 Sweating
07 Difficulty Breathing
08 Dehydration
09 Other_____
10 Do Not Know
11 Refused

Behaviors:

These next questions will ask about your present home cooling practices.

B1. This summer, have you been using air conditioning to cool your home?

01 Yes
02 No
03 Do Not Know
04 Refused

B2. This summer, have you been using your evaporative cooler to cool your home?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO B2 IS YES, ASK B3-B5

B3. On a hot day, when do you usually turn on your cooler?

01 As soon as I get up
02 When the house gets uncomfortably hot
03 It is on when I get up/I keep it on at night/I keep it on constantly
04 Other_____
05 Do Not Know
06 Refused

B4. On a hot day, when do you usually turn off your cooler?

01 At night
02 When the house gets uncomfortably cold
03 Never/I keep it on constantly/I keep it on at night
04 Other_____
05 Do Not Know
06 Refused

B5. When you use your cooler, how often do you open a window in another part of your home? Is it frequently, sometimes, seldom, or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

B6. Not including the cooler the program installed, do you currently have any other cooling equipment in your home?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO B6 IS <u>YES</u>, ASK a) and b):

a) What kind of cooling equipment do you have?

01 Fans
02 EV Cooler
03 Air Conditioner
04 Other_____

b) Since the installation of the evaporative cooler have you used this cooling equipment frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

IF ANSWER TO B6 b) IS <u>FREQUENTLY</u>, SOMETIMES, or SELDOM ASK c):

c) Why do you use this cooling equipment?

RECORD ANSWER:

IF ANSWER TO B6 b) IS <u>NEVER</u>, ASK d):

d) Why don't you use this cooling equipment?

RECORD ANSWER:

B7. When your house is too hot, how often do you do the following to keep yourself cool?

a) Use Fans. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you use fans? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

a) Open Windows. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you open windows? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

c) Close Shades. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you close shades? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

d) Take Cold Showers. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you take cold showers? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

e) Drink More Water. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you drink more water? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

f) Go Where there is Air Conditioning. Is it frequently, sometimes, seldom, or never? *(Optional: How often do you go where there is air conditioning? Is it frequently, sometimes, seldom, or never?)*

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

Maintenance:

I will now move on to some questions about the maintenance of the cooler.

M1. Has anyone from the provider agency re-explained how to use and maintain the cooler and thermostat since the cooler was installed?

01 Yes
02 No
03 Don't Know
04 Refused

M2. Has your cooler been properly maintained?

01 Yes
02 No
03 Do Not Know
04 Refused

M3. In the fall, does someone perform the following maintenance activities?:

a) Turn off the water line attached to the cooler? *(Optional: In the fall, does someone turn off the water line attached to the cooler?)*

01 Yes
02 No
03 Don't Know
04 Refused

b) Drain the water line? *(Optional: In the fall, does someone drain the water line attached to the cooler?)*

01 Yes
02 No
03 Don't Know
04 Refused

c) Put the cover on the cooler? *(Optional: In the fall, does someone put the cover on the cooler?)*

01 Yes
02 No
03 Don't Know
04 Refused

M4. Who performs these maintenance activities in the fall?

01 NAME
02 Spouse/Partner
03 Paid Caretaker/Guardian
04 Unpaid Caretaker/Guardian
05 Other_____
06 Don't Know
07 Refused

M5. In the spring, does someone perform the following maintenance activities?:

a) Take the cover off the cooler? *(Optional: In the spring, does someone take the cover off the cooler?)*

01 Yes
02 No
03 Don't Know
04 Refused

b) Turn on the water line for the cooler? *(Optional: In the spring, does someone turn on the water line attached to the cooler?)*

01 Yes
02 No
03 Don't Know
04 Refused

M6. Who performs these maintenance activities in the spring?

01 NAME
02 Spouse/Partner
03 Paid Caretaker/Guardian
04 Unpaid Caretaker/Guardian
05 Other_____
06 Don't Know
07 Refused

[ASK M7-M10 ONLY IF RESPONDENT HAS A PORTABLE COOLER]

M7. Did the installation crew explain how to maintain the portable cooler?

01 Yes
02 No
03 Don't Know
04 Refused

M8. Is your portable cooler hooked up to a water line?

01 Yes
02 No
03 Don't Know
04 Refused

M9. Is the water emptied regularly from the portable cooler?

01 Yes
02 No
03 Don't Know
04 Refused

M10. Who empties the water in the portable cooler?

01 NAME
02 Spouse/Partner
03 Paid Caretaker/Guardian
04 Unpaid Caretaker/Guardian
05 Other_____
06 Don't Know
07 Refused

Health:

I will now move on to some questions about your health.

H1. Would you say that in general your health is?

01 Excellent
02 Very Good
03 Good
04 Fair
05 Poor
06 Do Not Know
07 Refused

H2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past thirty days was your physical health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past thirty days was your mental health not good?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H4. Do you sleep well through the night frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

H5. Have you or anyone in your household ever had to go to the doctor or hospital because your home was too hot?

01 Yes
02 No
03 Do Not Know
04 Refused

H6. How many days in the last week, did it get so hot in your home that you were uncomfortable?

01 Number of Days _____
02 None
03 Do Not Know
04 Refused

H7. In the past week, have you or anyone in your household experienced any of the following symptoms?

a) Loss of appetite *(Optional: In the past week, have you or anyone in your household experienced loss of appetite?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7a IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Dizziness *(Optional: In the past week, have you or anyone in your household experienced dizziness?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7b IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

c) Lower Energy *(Optional: In the past week, have you or anyone in your household experienced lower energy?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7c IS <u>YES</u>, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

d) Nausea *(Optional: In the past week, have you or anyone in your household experienced nausea?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7d IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

e) Headaches *(Optional: In the past week, have you or anyone in your household experienced headaches?)*

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO H7e IS YES, ASK i):

i: Do you think this symptom was caused or made worse by the heat?

01 Yes
02 No
03 Do Not Know
04 Refused

Independence:

These next questions will ask about problems or limitations that you may have in your daily activities and routines.

I1. How many times, in the last week, did you leave your home?

01 Number of Times _____
02 None
03 Do Not Know
04 Refused

I2. Is there anything that keeps you from getting out of your home more?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I2 IS YES, ASK a):

a) What is it that keeps you from getting out of your home more?
{Interviewer Note: DO NOT READ LIST. MARK ALL THAT APPLY.}

01 Physical Impairment
02 Mental Impairment
03 Lack of Transportation
04 Lack of Activities/People to see
05 Heat
06 Other
07 Do Not Know
08 Refused

I3. How many times, in the last week, did you socialize with people who do not live with you?

01 Number of Times _____
02 None
03 Do Not Know
04 Refused

I4. How connected do you feel to other people?

01 Very Connected
02 Somewhat Connected
03 Somewhat Isolated
04 Very Isolated
05 Do Not Know
06 Refused

I5. Do you clean, do dishes and other household chores frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

I6. Do you cook in your home frequently, sometimes, seldom or never?

01 Frequently
02 Sometimes
03 Seldom
04 Never
05 Do Not Know
06 Refused

I7. Because of any impairment or health problem, do you need the help of other persons with your *personal* care needs, such as eating, bathing, dressing, or getting around the house?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I7 IS <u>YES</u>, ASK a) and b):

a) Do you get help from a person who is paid?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Do you get help from a person who lives with you?

01 Yes
02 No
03 Do Not Know
04 Refused

I8. Because of any impairment or health problem, do you need the help of other persons in handling your *routine* needs, such as everyday household chores or shopping?

01 Yes
02 No
03 Do Not Know
04 Refused

IF ANSWER TO I8 IS <u>YES</u>, ASK a) and b):

a) Do you get help from a person who is paid?

01 Yes
02 No
03 Do Not Know
04 Refused

b) Do you get help from a person who lives with you?

01 Yes
02 No
03 Do Not Know
04 Refused

<u>Housing:</u>

These last questions are about your household, expenses and income.

O1. Including you, how many people normally live in this household?

01 Number of people: _____
02 Do Not Know
03 Refused

O2. How many are 60 or older?

01 Number of people: _____
02 Do Not Know
03 Refused

O3. How many are 18 or younger?

01 Number of people: _____
02 Do Not Know
03 Refused

O4. How many are 5 or younger?

01 Number of people: _____
02 Do Not Know
03 Refused

O5. How many are disabled?

01 Number of people: _____
02 Do Not Know
03 Refused

O6. Do you own or rent your home?

01 Own
02 Rent
03 Other
04 Do Not Know
05 Refused

O7. How much is your monthly mortgage/rent payment?

01 Amount _____
02 None
03 Do Not Know
04 Refused

O8. How much are your monthly electricity and gas payments?

01 Included in Rent
02 $0
03 ≤ $50
04 $51 - $100
05 $101 - $150
06 $151 - $200
07 $201 - $250
08 $251 - $300
09 $301 - $350
10 $350 - $400
11 > $400
12 Do Not Know
13 Refused

O9. How much is your monthly water payment?

01 Included in Rent
02 $0
03 ≤ $50
04 $51 - $100
05 $101 - $150
06 $151 - $200
07 $201 - $250
08 $251 - $300
09 $301 - $350
10 $350 - $400
11 > $400
12 Included in Electric Bill
13 Do Not Know
14 Refused

Income:

N1. In the past twelve months, did you or any member of your household receive income from a job?

01 Yes
02 No
03 Do Not Know
04 Refused

N2. In the past twelve months, did you or any member of your household receive Food stamps?

01 Yes
02 No
03 Do Not Know
04 Refused

N3. In the past twelve months, did you or any member of your household receive Medicaid?

01 Yes
02 No
03 Do Not Know
04 Refused

N4. In the past twelve months, did you or any member of your household live in public or subsidized housing?

01 Yes
02 No
03 Do Not Know
04 Refused

N5. In the past twelve months, did you or any member of your household receive LEAP (energy assistance) benefits?

01 Yes
02 No
03 Do Not Know
04 Refused

N6. In the past twelve months, did you or any member of your household receive cash benefits from Temporary Assistance for Needy Families (TANF), Supplemental Security Income (SSI), Old Age Pension, Aid to the Needy Disabled, or Aid to the Blind?

01 Yes
02 No
03 Do Not Know
04 Refused

N7. What is your household's monthly income?

01 ≤ $420
02 $421 - $830
03 $831 - $1,250
04 $1,251 - $1,670
05 $1,671 - $2,080
06 $2,081 - $2,500
07 $2,501 - $2,920
08 $2,921 - $3,330
09 > $3,330
10 Do Not Know
11 Refused

That was my last question. Thank you very much for your time and cooperation. Have a pleasant day/evening.

Appendix D – Electricity Billing Data Collection Materials

To Whom It May Concern:

Please find attached a spreadsheet containing the Evaporative Cooler Program customers for whom we need to obtain the last 15 months of electricity usage and billing data. The spreadsheet contains the names, addresses, and Aquila Electric account numbers for each program participant. Additionally, please find a copy of the program client information sheet, containing the participant's signature authorizing our access to their electricity usage and billing data. Below, please find a reminder of the data we need to receive.

Customer Information Needed

1. Name
2. Address
3. Account #
4. Date service began
5. Date service ended (if applicable)

Usage (Monthly data from June 2005 to September 2006)

6. Date of read
7. Actual or estimated read
8. Number of kilowatt hours used
9. Billing amount

Thank you very much for your assistance in this important component of our program evaluation.

Appendix E – Water Billing Data Collection Materials

To Whom It May Concern:

Please find attached a spreadsheet containing the Evaporative Cooler Program customers for whom we need to obtain the last 15 months of water usage and billing data. The spreadsheet contains the names, addresses, and Pueblo Board of Water Works account numbers for each program participant. Additionally, please find a copy of the program client information sheet, containing the participant's signature authorizing our access to their electricity usage and billing data. Below, please find a reminder of the data we need to receive.

Customer Information Needed

1. Name
2. Address
3. Account #
4. Date service began
5. Date service ended (if applicable)

Usage (Monthly data from June 2005 to September 2006)

6. Date of read
7. Actual or estimated read
8. Number of gallons use
9. Billing amount

Thank you very much for your assistance in this important component of our program evaluation.

Applied Public Policy Research

APPRISE

Institute for Study and Evaluation

The Colorado Evaporative Cooling Demonstration Project

Process Evaluation Final Report

Prepared for the Colorado Department of Human Services / Office of Self-Sufficiency - LEAP

May 2006

Table of Contents

Executive Summary

Introduction

Elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status and of being socially isolated and economically disadvantaged. The Colorado LIHEAP office, in conjunction the Colorado Weatherization Assistance Program and local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the Federal REACh Program for the Colorado Evaporative Cooling Demonstration Project. The Project aims to reduce the vulnerability of the elderly and disabled to heat related illness by installing evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable. The purpose of this report is to provide a general program description, present the process evaluation findings, and suggest program modification alternatives.

APPRISE completed the following evaluation activities during the first program year.

- *Administrative Interviews*
- *Review of Program Statistics*
- *Client In-Depth Interviews*
- *Installation Observations and Inspections*
- *Client Surveys*

Summary of Findings

Program Accomplishments:

Overall, the Evaporative Cooling Project is on track to meet all of its goals for the first program year. Some of the key accomplishments over the first year have been:

- *Program production is on track and on budget*
- *The program is serving the target population*
- *The cooler installations represent high quality work*
- *Provider Agency and client relations are excellent*
- *Overall client satisfaction with the program is very high*

Administrative Interviews

The main findings from the administrative interviews are that:

- ***Relying on Agency Referrals May Be Insufficient:*** Due to unplanned media coverage of the program, both provider agencies experienced a dramatic increase in agency and self-referrals from a previously unreached segment of the population.
- ***Program Outreach Materials Could Be More Effective:*** Both agencies expressed the desire for the development of more effective informational materials for the Evaporative Cooling Project.
- ***Client Notification Could Be Improved:*** Clients need a notification system to make sure that clients and the referral agencies are aware of their status with the program and have a sense of how long their wait might be.
- ***One Two-Man Crew May Be Insufficient:*** Because the weather was so hot and agency staff knew that many people were in need, they were somewhat frustrated with the installation pace with only one crew.
- ***Portable Coolers May Be Used More Frequently Than Desired:*** Because portable units are not permanently installed, less efficient, and require at least weekly upkeep, the LIHEAP office asked that they be used only as a last resort, when all other options had been exhausted. However, portables comprised one fifth of one agency's total installations, and more than one half of the other agency's total installations.
- ***Requests for Landlord Contributions Have Not Been Successful:*** Both agencies reported very low response rates for landlords from whom they sought permission to do work on the home and a 50 percent contribution towards the cost of the cooler and the installation.
- ***Educating Participants on Cooler Use and Maintenance Is Challenging:*** Provider agencies indicate that the elderly and disabled client base has often required agency staff to follow-up with the client via telephone or in person to re-explain how to use and maintain the coolers and thermostats.
- ***A Long-Term Maintenance Plan Needs to Be Developed:*** As the number of program participants increases, the agency time required to perform annual cooler maintenance may become overly burdensome. There is no long-term, sustainable maintenance plan in place at either agency at this point.
- ***Quality Control:*** It appears that there is currently no official inspection system in place for internal quality control.

Program Statistics

Our review of program statistics contained in the REACh database show that both agencies are on track to meet the installation target set for the first program year. Provider agency Sun Power has a first year installation goal of 250 units, and has so far installed 147. Provider agency Pueblo HHS has a first year installation goal of 125 units, and has so far installed 112.

Program statistics also show that the rate of portable cooler installations is unexpectedly high, particularly at Sun Power. Fifty-three percent (78 units) of Sun Power's installations were portable coolers while 47 percent (69 units) were non-portable, and 20 percent (22 units) of Pueblo HHS' installations were portable coolers, while 80 percent (90 units) were non-portable.

In-Depth Client Interviews

The main findings from the in-depth client interviews include the following.

- ***Some Participants Not Running Coolers Effectively or Efficiently:*** Some program participants did not know how to best utilize an evaporative cooler. More data on the most efficient and effective way to use an evaporative cooler would help to determine the extent to which client use may impact cooler effectiveness and efficiency.
- ***Some Participants Report Concerns About Costs of Cooler Use:*** Program Participants were not given enough information about how much using the cooler might cost them.
- ***Program Participants Feel Connected To Others:*** In the more rural areas, large families were common, and clients reported feeling 'connected' to their family. In the more urban locations, participants reported feeling somewhat less connected to family, but still reported strong bonds with neighbors and other community members.
- ***Many Participants Relied On Fans Prior to Receipt of Coolers:*** Almost all of the program participants interviewed reported relying on fans as their primary cooling method prior to receiving the evaporative cooler. Additionally, some participants reported a belief that using the fans was cheaper than using the cooler, and indicated that they would continue to use them in place of the cooler when worried about money.
- ***Some Participants Report Increased Comfort in the Home:*** Program participants who were consistently using the cooler reported experiencing increased comfort in their home as a result. Participants that were not using the cooler, or had been using it sporadically, did not report experiencing increased comfort in their homes.

Installation Observations

Installation observations showed that the installers effectively protected the home on the inside and outside during installation, and that the units appeared stable and well placed. Additionally, installation crew members were trusted and liked by clients. Lastly, although APPRISE observed installers at both agencies explain how to use and maintain the coolers correctly and patiently, it appeared the clients would need follow-up communications to reinforce the information.

Client Surveys

The Baseline Survey captured demographic and housing characteristics of Program participants, as well as baseline data on knowledge and practice of home cooling behaviors, and knowledge of and experience with heat-related illness. We administered surveys to 136 individuals who had been approved for the program.

The Unsafe Heat Survey captured participants' level of satisfaction with the installation of their new coolers, and their experience with heat related illness symptoms and practice of cooling behaviors on a hot day, including their use of the newly installed evaporative coolers. The survey also asked about barriers to using the newly installed coolers. We administered Unsafe Heat surveys to 55 Program participants.

Findings from the Baseline Survey and the first round of the Unsafe Heat Survey included the following.

Baseline Survey:

- ***Program Participant Profile:*** Overwhelmingly, program participants met the target population description: their households have low incomes and at least one elderly or disabled person.
- ***Introduction to Program:*** Most participants found out about the Program through an agency, but others discovered it through word of mouth or a newspaper.
- ***Perceived Affordability of Cooling:*** Most participants were largely uninformed about the affordability of evaporative cooling; although this means that few participants would resist using coolers, it also means that all need information about actual costs.
- ***Knowledge of Home Cooling Behaviors:*** Most participants had little recall of common home cooling behaviors when asked to list them; however, when presented with particular behaviors, they acknowledged performing them.
- ***Knowledge of Heat Related Illness Symptoms:*** Most participants had little recall of common symptoms of heat-related illness when asked to list them; however, when presented with particular symptoms, they acknowledged experiencing them.
- ***Practice of Home Cooling Behaviors:*** Using fans, closing shades, opening windows, and hydrating are the most common cooling behaviors performed by respondents; additionally, at least one third of participants have used or are currently using evaporative coolers or air conditioners.
- ***Overall Health:*** Most participants reported fair or poor overall health; on average, respondents stated that their physical health was poor for half of their days, and that their mental health was poor for close to one third.
- ***Experience with Heat Related Illness:*** Nearly two thirds of respondents indicated that their homes were uncomfortably hot in at least four of the previous seven days. Most participants reported experiencing common symptoms of heat-related illness in the previous week and that these symptoms were caused or made worse by the heat.
- ***Level of Independence:*** Most participants reported feeling connected or somewhat connected to other people; however, they reported leaving their homes fewer than three times per week and socializing with others fewer than four times per week.

Unsafe Heat Survey:

- ***Satisfaction with Installation:*** Nearly all participants reported that the installation crew arrived at their home on time, were friendly and polite, cleaned up after they were done, explained how to operate the cooler, and left the cooler's instruction manual.
- ***Use of the Evaporative Cooler:*** Three in four participants were using their new evaporative cooler on the day of the Unsafe Heat survey. Those not using the cooler listed several reasons: they did not consider it a hot day, they were staying cool in the shade, they had not been home, the portable cooler was too difficult to use, or the cooler made the home too cold.
- ***Use of Other Cooling Equipment:*** One third of participants reported using other cooling equipment frequently or sometimes since the installation of the evaporative cooler.

Summary of Program Modification Alternatives

APPRISE proposed a list of potential program modification alternatives to state and provider agency staff before the program review meeting in December 2006. At that meeting, state and agency staff discussed these alternatives and formulated a consensus plan of action, which is outlined below.

Role of Portable Coolers:

State and agency staff approved a plan to address the high rate of portable cooler installations. The primary decisions were that the portable cooler should not be an option except for in rare circumstances where a wall or window mount was not feasible and the client was at high risk for heat related illness, and that both provider agencies will return to residences where portable units were provided and assess more permanent alternatives.

Client Education-- Cooler Use and Maintenance:

Although the installation crew clearly and patiently explained and demonstrated how to operate and maintain the coolers, some Program participants did not fully comprehend the instructions. The end of year program review meeting concluded that state and evaluation staff would research effective communication strategies for the elderly population, as well as strategies for overcoming cost perceptions regarding the use of evaporative cooling equipment.

Quality Control:

Provider agencies reported no systematic internal installation quality control process, and no official installation inspection protocol. The end of year program review meeting concluded that internal inspection and other quality control activities need to happen more regularly at the provider agency level, and that state staff will incorporate cooler inspections with Weatherization inspections in 2006.

I. Introduction

Research has shown that elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status and of being socially isolated and economically disadvantaged. The Colorado LIHEAP office, in conjunction the Colorado Weatherization Assistance Program and local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the Federal REACh Program for the Colorado Evaporative Cooling Demonstration Project. The purpose of this report is to provide a general program description, present the process evaluation findings, and suggest program modification alternatives.

A. Colorado Evaporative Cooling Demonstration Project

The Colorado Evaporative Cooling Demonstration Project aims to reduce the vulnerability of the elderly and disabled to heat related illness resulting from exposure to prolonged periods of high temperatures. To accomplish this objective, the Project provides and installs evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable to program participants.

Data gathered from the Colorado State University Colorado Climate Center indicates that between June 1 and August 31, 2003 Pueblo, Colorado recorded 63 days of 90 degree or higher temperatures, including 27 days of 100+ degree heat. During that same period, the Denver area endured 47 days of 90 degree or higher temperatures. The provision of affordable and effective cooling is expected to reduce an individual's risk for heat-related illness during periods of such high heat and, over time, to increase an individual's ability to be independent and active in their homes on hot days.

To achieve these goals, two agencies will install a total of 750 evaporative coolers in low-income households over the course of the three-year pilot program. In addition to installing the coolers, the program will ensure that the units are properly operated and maintained, and help program participants better understand and recognize their risks for heat-related illness as well as how they can successfully prevent exposure to heat risks.

B. Process Evaluation

This report presents the findings from the first year of the Process Evaluation of the Colorado Evaporative Cooling Demonstration Project. This report also outlines potential program modification alternatives.

During this time period, the following evaluation activities were undertaken.

- *Administrative Interviews:* APPRISE conducted administrative interviews with the key members of the project team. The purpose of these interviews was to document program operations, to assess whether program procedures were working effectively and to identify any barriers to implementation.

- *Review of Program Statistics:* APPRISE reviewed production statistics and financial data from the REACh database. The purpose of this review was to understand how production was distributed between the different service territories and between the types of installations since the introduction of the program.

- *Client Interviews:* APPRISE conducted initial client interviews that focused on client health, cooling knowledge and behavior, service delivery issues and satisfaction with the program. The purpose of these interviews was to probe program participants in order to get a better sense of the population and its needs.

- *Installation Observations and Inspections:* APPRISE observed evaporative cooler installations, and inspected nine previously installed coolers in June of 2005. The purpose of these observations and inspections was to document installation procedures, and to identify any systematic problems in the process.

- *Client Surveys:* APPRISE conducted the first two of four rounds of client surveys. The purpose of these surveys was to gather baseline data including demographic and housing characteristics, and to assess knowledge and practice of home cooling behaviors, knowledge of and experience with heat-related illness, perception of program impact, and program satisfaction.

These research activities gave the evaluation team a good understanding of the program operations. They helped the team identify barriers to program implementation, and alternatives for program enhancement.

C. Organization of Report

Three sections follow this introduction.

- Section II – Colorado Evaporative Cooling Demonstration Project

- Section III – Evaluation Activities and Findings

- Section IV – Program Accomplishments and Program Modification Alternatives

APPRISE prepared this report under contract to the Colorado Department of Human Services. The Colorado Weatherization Assistance Program facilitated this report by furnishing program data and information to APPRISE. Provider agencies Sun Power, Inc. and Pueblo Department of Housing and Human Services facilitated this report by providing program administration information and program statistics. Any errors or omissions in this

report are the responsibility of APPRISE. Further, the statements, findings, conclusions, and recommendations are solely those of the analysts from APPRISE and do not necessarily reflect the views of The Colorado Department of Human Services.

II. Evaporative Cooling Demonstration Project

Research has shown that elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status and of being socially isolated and economically disadvantaged. In 2003, O'Neil et al. found that the "effects of temperature extremes on mortality fall disproportionately on those persons at relative social disadvantage in the United States."[1] In 2002, sociologist Eric Klinenberg examined the deaths of more than 700 Chicago citizens during an unprecedented heat wave in 1995. Klinenberg determined that social factors including living alone, being in poor health, not having a strong social network, and not having cooling equipment increased risk for heat related illness or death.[2]

Pueblo County Housing and Human Services ran an evaporative cooler replacement pilot program for four years prior to the REACh grant proposal for this demonstration project. In this pilot, Pueblo HHS received funds to replace 30 broken or ineffective cooling units per year. The agency found that the demand for cooling equipment far exceeded the available funds within their service territory. The Colorado LIHEAP office conducted telephone interviews with clients who received cooling equipment under Pueblo HHS' pilot program to assess the value of the services. Every client who was contacted identified important ways the program had impacted their lives, including maintaining health, facilitating daily work in the home, and increasing the comfort inside of the home.

After researching the effects of high heat on vulnerable individuals, and performing a needs assessment within the Denver and Pueblo areas, the Colorado Low-Income Home Energy Assistance Program office, in conjunction with the Colorado Weatherization Assistance Program, and local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the Federal REACh Program for the Colorado Evaporative Cooling Demonstration Project. This Project aims to reduce the vulnerability of the elderly and disabled to heat related illness resulting from exposure to prolonged periods of high temperatures. To accomplish this objective, the Project provides and installs evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable to program participants. The program was implemented throughout ten Colorado Counties. The program's goals, design, and implementation, as well as changes made to the program in its first year, are described below.

A. Program Goals

The overall goal of the Evaporative Cooling Project is to "develop a comprehensive cooling program that will be effective in meeting the cooling needs of Colorado's low-income households." Specifically, the Evaporative Cooling Project will address the vulnerability of

[1] O'Neill, M.S., Zanobetti, A., Schwartz, J. "Modifiers of the Temperature and Mortality Association in Seven U.S. Cities." American Journal of Epidemiology. 2003. 157:12.
[2] Klinenberg, E. Heat Wave: A Social Autopsy of Disaster in Chicago. University of Chicago Press. 2002.

the elderly and disabled to prolonged periods of high temperatures by accomplishing the following:

- Installing evaporative cooling equipment that will reduce the summer in-home temperatures in a way that is affordable to program participants.
- Educating program participants about strategies for reducing their exposure to heat during periods when parts of their homes are above a comfortable temperature.
- Establishing a contact system whereby evaporative cooler maintenance requirements are adequately explained and clients are provided with maintenance reminders and assistance when necessary.
- Leveraging other community resources to furnish additional weatherization services, public assistance, and other social services.

The expected outcomes of this project are:

- Client utilization of evaporative coolers in place of less effective cooling strategies when temperatures are unsafe.
- Reduction in clients' risk for heat-related illness symptoms.
- Maintenance or reduction of total energy and water consumption in the home.
- Maintenance of long-term equipment integrity.
- Increased ability for clients to be independent and active in their homes on hot days.

To achieve these goals, two agencies will install a total of 750 evaporative coolers in low-income households over the course of the three-year pilot program.

B. Program Design and Implementation

1. Program Administration

The REACh Grant that funds the Evaporative Cooling Project is overseen by the Low-Income Home Energy Assistance Program (LIHEAP), within the Colorado Department of Human Services (HHS), and by the Colorado Weatherization Assistance Program (WAP), within the Governor's Office of Energy Management and Conservation (OEMC). Sun Power, Inc. and Pueblo County Department of Housing and Human Services (Pueblo HHS) deliver the program.

a) Oversight Agencies

The LIHEAP Program Manager, along with members of the project team, wrote the REACh grant proposal, and the grant money flows from the federal government through HHS to LIHEAP. The LIHEAP office distributes the funds directly to the evaluation and state staff involved with the project, and allocates the rest to the WAP for distribution to the two provider agencies as they incur program costs. The LIHEAP

office sets program policy, and monitors program progress through review meetings and site visits.

In addition to disbursing program funds to the provider agencies, WAP staff developed, and provides ongoing support for, a REACh grant database that provider agency staff uses to report their work and costs. This database is a supplement to the WAP database that the provider agencies were already using. WAP staff is also responsible for monitoring overall program progress and performing inspections on a sample of the installed evaporative coolers.

b) Provider Agencies

Two providers, Sun Power, Inc. and Pueblo County HHS, are responsible for providing services under the Evaporative Cooling Project. The steps involved in this process include:

1. Program Administration and Finance

- Procuring and storing equipment and materials
- Securing contributions from landlords
- Providing work and cost data via the REACh database
- Submitting invoices to the State

2. Outreach and Intake

- Receiving program referrals from local agencies and potential clients
- Determining program eligibility of referred clients
- Scheduling home assessment visits
- Conducting home assessment visits

3. Service Delivery

- Scheduling cooler installations
- Conducting cooler installations
- Processing paperwork
- Performing follow-up contact with cooler recipients
- Performing unit maintenance

4. Quality Control

- Performing cooler inspections
- Ensuring customer satisfaction

Each agency developed a general project budget that included all costs for equipment and materials, service delivery, and program management. Table II-1 displays the provider budgets that were included in the REACh grant proposal.

Table II-1
Provider Budgets

Budget Item	Sun Power, Inc.	Pueblo HHS
Units	$275,000	$137,500
Materials	$72,500	$36,300
Installer/Technician	$56,500	$28,460
Installer/Specialist	$45,000	$22,670
Inspector	$25,000	$12,600
Coordinator	$44,475	$21,180
Fringe Benefits	$43,200	$21,460
Travel	$9,000	$9,000
Total	$570,675	$289,170

** Total combined provider budget: $859,845

2. Recruitment and Enrollment

The provider agencies receive self-referrals or agency referrals via fax, e-mail or telephone. Once the agency has received the referral, they confirm that the potential client is eligible for the program. Participation in the Evaporative Cooling Project requires that a client be:

- Elderly or adult-disabled
- Low-Income
- Without operational or efficient means of cooling
- Residing in the service territory covered by one of the two provider agencies

The agency checks the State database to see if the potential client has ever received benefits from the Colorado Low-Income Energy Assistance Program (LEAP). If they have received LEAP benefits in the last year, they are automatically income-qualified for the Evaporative Cooling Project. If the potential client has never received LEAP benefits, the agency must collect income verification documents during the initial home assessment visit. Other program requirements, such as age, disability, and a lack of effective cooling equipment are also verified at the initial home assessment visit.

Once the client is determined to be eligible for the program, the agency opens a client file and schedules an installation date. Referred clients are prioritized for installation by the risk-rating they have received by either the referring or provider agency staff. The rating is from 1-5, with 5 being the most at-risk for heat-related illness.

3. Service Delivery

Provider agencies consider two installation options when assessing the needs of the client and the home: a wall-mounted unit, and a window-mounted unit.[3] The principal installer accompanies the administrative staff person on the initial home assessment visit to determine which of these units best fit each particular client and home.

a) Slim-Wall Unit

Advanced technology makes the Slim-Wall evaporative cooler the most efficient and most attractive of the three options. This wall-mounted unit requires the crew to cut a 1 x 2 foot hole through the wall of the client's home, in a place where the unit can be hooked up to a water source. The Slim-Wall unit comes with a remote thermostat that is installed in the client's home and can automatically control the unit to achieve the desired set temperature. The job typically takes a two-person crew approximately 2-3 hour to complete[4]. Sometimes a home's structural issues, a lack of appropriate wall space in an effective location, a lack of landlord consent, or a client's discomfort with cutting into his/her home can lead to a choice to not install the Slim-Wall unit.

b) Window Unit

Mounting a window unit requires an appropriately sized window in a place where the unit can be hooked up to a water source. This unit requires the crew to remove the window, insert the unit, and install hooks to keep the unit in place. The remaining window space is filled in with Plexiglas and sealed. The job typically takes a two-person crew approximately 1.5-2 hours to complete. Sometimes, a lack of landlord consent, inappropriately sized windows, or bars on a window can lead to a decision to not install the window unit.

Once one of the two units has been installed, the crew demonstrates how to use and maintain the cooler and, if applicable, the remote thermostat. They leave a user's manual and warranty information before leaving. Following installation, the crew remains on-call to help recipients trouble-shoot whenever they run into difficulties with their coolers. Sometimes this entails advice over the telephone or additional visits to the home.

[3] Because it is less efficient, impermanent, and requires regular maintenance, a portable cooler option was approved for use in rare situations where a wall or window mount was not viable, and the client was at high risk for heat related illness. The portable unit is a stand-alone cooler that plugs in and is not connected to a water source. The client must manually fill the water tank at least once a week when the cooler is in use. Delivering and setting up this unit takes a one-person crew 30 minutes to complete.

[4] All job completion times represent estimates made by installers during administrative interviews. A review of Program statistics revealed significantly higher job completion times for each type of unit. Please see Chart III-7 for more information.

4. Materials and Equipment

The provider agencies published an invitation to bid and negotiated contracts with fixed unit prices for most of the major materials required for the program. These materials include the evaporative coolers, clean machine units, sheet metal and silicone caulk. Each agency orders a different quantity of materials at one time depending on their inventory processes and storage capacity. The materials are shipped directly to the agency, where they are inventoried and stored until needed for installation.

Providers are responsible for directly procuring minor materials that are $75 or less. They must acquire two telequotes before making a purchase. Such materials include lawn hoses to direct the flow of water released from the units, brass water lines and fittings.

5. Landlord Contributions

For those program participants who are renters, landlords are required to make a minimum 50 percent contribution towards the cost of materials and installation for a wall or window unit. The provider agencies send a letter containing a cost assessment and highlighting the landlord's share of the cost. The landlord is given a certain window of time to respond with their intention to make the contribution. For landlords that say no or are non-responsive, the provider agencies consider installing a portable unit, which does not require any changes to the home and would be owned by the tenant and not the landlord[5].

6. Cooler Maintenance

The evaporative cooling units require yearly shut-down and start-up maintenance. Agency installers assign program participants to one of three maintenance options depending on their circumstances. First, they determine whether the participant is able to perform the maintenance based upon the demonstration the installers give and the detailed instructions that are attached directly to the cooler. If the individual indicates that he or she would not be able to do this, the installers inquire about friends or family members that may live with the client or stop by frequently and could perform the maintenance. If such an individual is available, the installers try to arrange a demonstration for that person. Installers are responsible for visiting the home yearly to perform the required maintenance for those clients that are unable to perform the maintenance and do not have a friend or family member to do it for them.

All clients are called near the end and beginning of the cooling season to verify that they or someone else was able to shut down or start up the unit. Regardless of what

[5]The rate of portable installations was higher than expected, in part because landlord refusal or non-response was so high. The LIHEAP office is considering whether the landlord contribution should be removed as a condition for renters, or whether provider agencies will need to walk away from homes where a portable is the only option due to no landlord contribution. This decision will be made before the start of the second program year.

maintenance option they were originally assigned, the installers schedule a maintenance visit for anyone who feels the maintenance will not get done.

7. Quality Control

Both provider agencies provided a budget line item for an inspector; however, there is currently no official inspection system in place for internal quality control. Managerial spot-checks during and after installation have occurred in some cases, and the agencies have developed a satisfaction questionnaire to be administered after the installation. One of the agencies performs occasional product checks by making periodic visits to the distribution warehouses and observing things such as forklift driving, product stacking practices and shrink-wrap policies.

State LIHEAP and WAP staff have observed a number of client homes, both during and after installation. Additionally, WAP staff will be performing inspections of a sample of cooler installations.

C. Program Changes in Fiscal Year 2005

Several changes have already been made in the first year to improve the Evaporative Cooling Project. The targeted client was expanded to include adult-disabled individuals, the Client Information Form was revised, and the portable cooler option was added. Additionally, one agency switched to a rolling inventory and combined the initial visit and the installation visit for long-distance clients. This agency also changed their method of grouping jobs from being location-based to purely risk-rating based.

1. Target Client

The original project proposal defined the target client as low-income elderly. During an early program working-group meeting it was recommended that the program serve an additional group with similar vulnerabilities: low-income, disabled adults. The LIHEAP office approved of this change in client scope and the program has successfully served both low-income elderly and low-income disabled adults in the first program year.

2. Client Information Form

When the provider agencies received the State designed REACh database they found that several of the data fields required information that they were not actually collecting. Consequently, the Client Information Form was revised to include these data fields including client ethnicity and primary language.

3. Portable Cooler

Provider agencies encountered situations where landlords refused services or didn't respond to requests for contributions, where the structural integrity of a home wouldn't support the installation work, or where there was a lack of a viable location for either a Slim Wall or window unit. The agencies did not want to walk away from clients that were in great need of cooling. As a result, they researched cooling options that would not require installation, and would belong to the client, making landlord approval unnecessary. The Adobe Air portable unit was presented at a Program Review meeting at the beginning of program year 1. The units were not as efficient and required regular and active upkeep, but they were effective cooling devices nonetheless. The LIHEAP office approved the purchase and use of these portable coolers for program clients, but only in situations were all other options had been exhausted.[6]

4. Inventory and Home Visits

One provider agency was ordering major materials on an as-needed basis. However, upon discovering the number of installations located in distant corners of their multiple-county service territory, they realized that making two round trips for the assessment and the installation visit was inefficient. The agency decided to increase efficiency by combining the assessment and installation visits, and switching to a rolling inventory system, where they would come to the home with each type of unit on the service truck, ready to be installed.

5. Job Prioritization

The provider with the larger, multi-county service territory designed the program such that referred clients were grouped by county, and within that county, prioritized by risk-rating. When enough clients were ready to be assessed in one county, the agency would go out and serve those clients. However, the agency found that while they were receiving many referrals from a couple of counties, they were receiving only a small number from others. This meant that some referred clients with high risk-ratings were not being served in a timely manner because there were few referrals from their county. The agency decided that this was not ideal, and revised the program such that all referrals were prioritized only by risk-rating, and were served according to that priority regardless of location.

[6] Because provider agencies utilized the portable unit in far more homes than the LIHEAP office had intended, it was decided at an end of the year review meeting to no longer use portables, and to reassess all homes that had received portables to determine whether they could converted to more permanent installations. For more information about this decision, please see the Program Modification Alternatives section of this report.

III. Evaluation Activities and Findings

During the first year of the program, APPRISE conducted interviews with provider agency staff, reviewed program production statistics, conducted in-depth interviews with program clients, observed and inspected evaporative cooler installations, and conducted two client surveys. This section of the report describes the evaluation activities conducted during the Evaporative Cooling Project Process Evaluation, and the findings from these evaluation activities

A. Administrative Interviews

APPRISE conducted administrative interviews with administrative and technical staff at Sun Power, Inc. and Pueblo HHS. These interviews focused on program implementation and program operations.

1. Goals of the Evaluation Activity

The purpose of these interviews was to document program operations, to assess whether program procedures were working effectively, and to identify any barriers to implementation.

2. Design/Rationale

Interviews were conducted with provider agency staff to obtain updates on program operations and program changes.

3. Evaluation Findings

Both provider agencies reported satisfaction with progress and overall success of the program. The administrative interviews also provided information on current or potential struggles with program processes, including outreach, communication, client education, and cooler maintenance.

a) Relying on Agency Referrals May Be Insufficient

The main source of program participants have been referrals received from agencies such as Meals on Wheels and Volunteers of America, which have daily contact with elderly and disabled individuals. This referral system was set in place prior to the program's commencement when the LIHEAP office convened referral agency representatives for an informational meeting and requested their assistance in recruiting program participants. Both provider agencies reported that the referrals received from these agencies were the most on target in terms of participants meeting program requirements. However, while one provider agency experienced a robust stream of referrals, the other had difficulty getting enough. In fact, only one of the eight counties in their service territory came through with a steady stream of referrals.

Due to a very hot Colorado summer, and the heat-related death of an elderly woman in Pueblo, CO, the local media in both of the program service regions ran stories on the issues associated with heat-related illness, and the Evaporative Cooling Project as a potential solution for vulnerable individuals. Following this media coverage, both provider agencies experienced a dramatic increase in agency and self-referrals. Although some of the referrals generated from the media coverage were not an ideal match for the program, both agencies agreed that the coverage resulted in the program reaching an entirely new group of individuals in need. Though not a part of the original outreach plan, this media coverage became instrumental in reaching new individuals in need of program services.

b) Program Outreach Materials Could Be More Effective

The LIHEAP office and Xcel Energy collaborated on a program flier that was printed on 8.5 x 11 sheets of paper. Provider agencies reported distributing these fliers, but did not seem to feel that they had a large impact for the program. Additionally, the WAP and LIHEAP offices collaborated with technical consultant Larry Kinney on a program brochure that provider agencies could use to explain and market the program. The provider agencies indicated that this brochure fell somewhat short of the desired impact. Both agencies expressed the desire for the development of more effective informational materials for the Evaporative Cooling Project.

c) Client Notification Could Be Improved

Provider agencies reported that the only consistent complaint received throughout the first year of the program was client frustration with waiting for the cooler installation. After receiving numerous inquiries from clients and referring agencies regarding the date by which a client could expect to receive the cooler, both agencies made attempts to keep clients and agencies up to date by sending them notifications that included information about when they might expect to receive the cooler. However, no official update or notification system seems to have been put in place to make sure that, on a regular basis, clients and the referral agencies are aware of their status with the program and have a sense of how long their wait might be.

d) One Two-Man Crew May Be Insufficient

Although both provider agencies are on target to meet their first year installation goals, the demand for the program surprised them. Both agencies have sizeable waiting lists for the coming year. Both agencies indicated that had they been aware of the demand they may have planned for more man-hours, or even an additional crew to get to more clients more quickly. Because the weather was so hot and they knew so many people were in need, the agencies were somewhat frustrated with the slower pace of only one crew.

e) Portable Coolers May Be Used More Frequently Than Desired

Portable coolers were added as an option during the first program year because some clients were in great need of cooling, yet their homes could not support wall or window installation, or their landlords would not allow the work to be done. However, because these units are not permanently installed, less efficient, and require at least weekly upkeep, the LIHEAP office asked that they be used only as a last resort, when all other options had been exhausted. This system seemed to work adequately for one provider agency, where portable coolers constituted 20 percent of their installed units, and were not even presented to clients or landlords as an option until every other avenue had been exhausted. However, the other provider agency encountered far more rental units and large multi-family structures in their more urban service territory. This led to more situations in which they deemed the portable cooler as the only viable option. Consequently, portable coolers comprised 53 percent of their cooler installations in the first program year.[7]

f) Requests for Landlord Contributions Have Not Been Successful

Both agencies reported very low response rates for landlords from whom they sought permission to do work on the home and a 50 percent contribution towards the cost of the cooler and the installation. Both agencies reported that only two landlords had agreed to make their required contribution during the first program year. The rest of the requests resulted in either non-responses or answer of 'no'. The only options for renters whose landlords refuse to contribute are to receive no cooling unit at all, or to receive the less efficient portable unit, which requires the recipient to perform regular upkeep and maintenance activities.

g) Educating Participants on Cooler Use and Maintenance Is Challenging

Provider agencies report moderate levels of success in describing the program and explaining the use and maintenance of the evaporative coolers to clients. They indicate that the elderly and disabled client base makes this process challenging, and has often required agency staff to follow-up with the client via telephone or in person to re-explain how to use and maintain the coolers and thermostats.

h) A Long-Term Maintenance Plan Needs to Be Developed

Both provider agencies reported that upon making follow-up calls, more program participants were in need of help with the first year's shut-off maintenance than they had anticipated. Both agencies also reported that the first round of maintenance visits went pretty smoothly, and that the installers were able to do the maintenance fairly efficiently. However, as the number of program participants increases with time, the

[7] The rate of portable cooler installation at both agencies was higher than anticipated. As a result, it was decided at an end of the year review meeting to no longer use portables, and to reassess all homes that had received portables to determine whether they could converted to more permanent installations. For more information about this decision, please see the Program Modification Alternatives section of this report.

agency time required by this task may become overly burdensome. There is no long-term, sustainable maintenance plan in place at either agency at this point.

i) Quality Control

Both provider agencies provided a budget line item for an inspector; however, there is currently no official inspection system in place for internal quality control. Managerial spot-checks during and after installation have occurred in some cases, and the agencies have developed a satisfaction questionnaire to be administered after the installation. One of the agencies performs occasional product checks by making periodic visits to the distribution warehouses and observing things such as forklift driving, product stacking practices and shrink-wrap policies.

B. Review of Program Statistics

The REACh database contains detailed information on each job completed, including the date completed, the provider agency, the service location, the type of unit installed, and the labor hours and materials cost associated with each job. The database also contains demographic information on each household, including age, ethnicity, language ability, disability status of household members, and information for each house including number of stories and number of rooms. A review of these data provides important information about program accomplishments and the characteristics of the jobs that have been completed as well as characteristics of the clients that have been served.

1. Goals of the Evaluation Activity

The purpose of this review was to understand how production was distributed between the different service territories and between the types of installations since the introduction of the program.

2. Design/Rationale

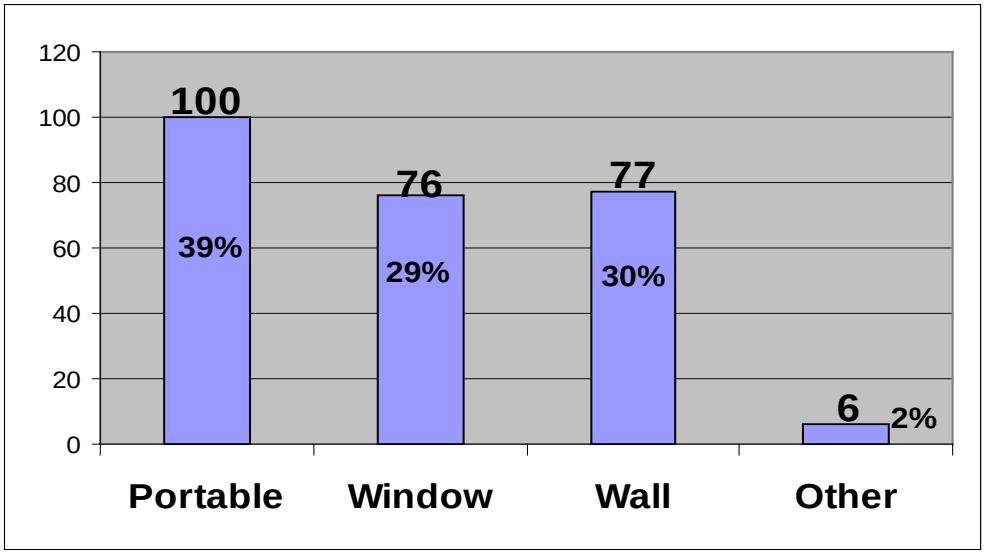
The WAP Office provided APPRISE with a copy of the REACh database, which contained all job and cost statistics for both provider agencies.

3. Evaluation Findings

a) Total Production

Chart III-1 displays the total production by type of unit installed for both agencies as of November 1, 2005. The total production goal for the first year of the Evaporative Cooling Project is 375 installed units. Through more than half of the first program year, provider agencies have installed 259 units. They are on track to install the remaining 116 units by June 30, 2005, the end of the first program year.

Chart III-1
Total Installations by Type of Unit: May-November 2005

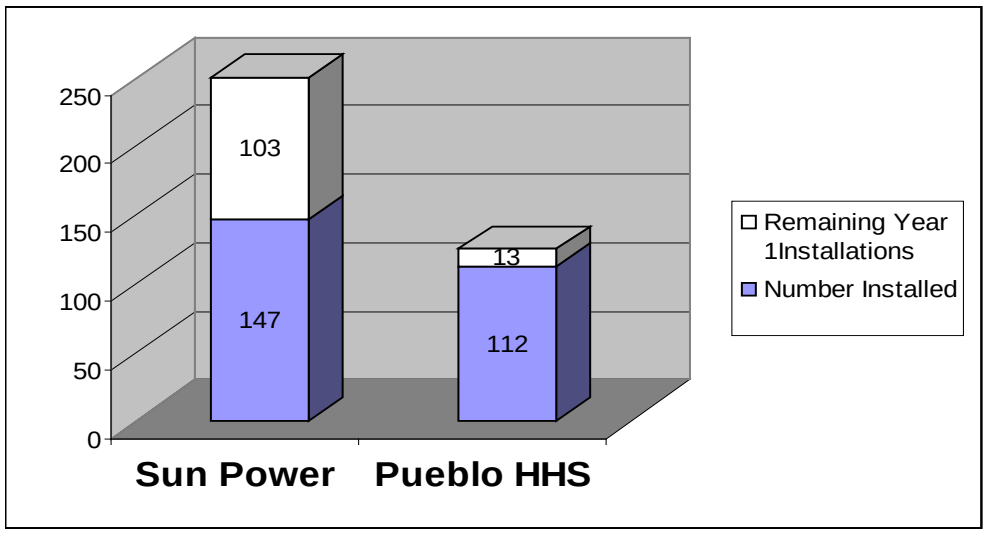


** Total Units Installed = 259

b) Production by Agency

Provider agency Sun Power has a first year installation goal of 250 units. Provider agency Pueblo Count Department of Housing and Human Service (Pueblo HHS) has a first year installation goal of 125 units. Chart III-2 displays production by agency as of November 1, 2005. This chart shows that, while both agencies are on track to complete their targeted jobs, Pueblo HHS is ahead of schedule.

Chart III-2
Installations by Agency



c) Production by Agency and Type of Unit

Chart III-3 displays the total number of units installed by agency and type of unit. Because the portable cooler was added to the program as a last resort option we expected to find low rates of portable cooler installation. However, 53 percent (78 units) of Sun Power's installations were portable coolers, and 20 percent (22 units) of Pueblo HHS' installations were portable coolers.

Chart III-3
Installations by Agency, Type of Unit

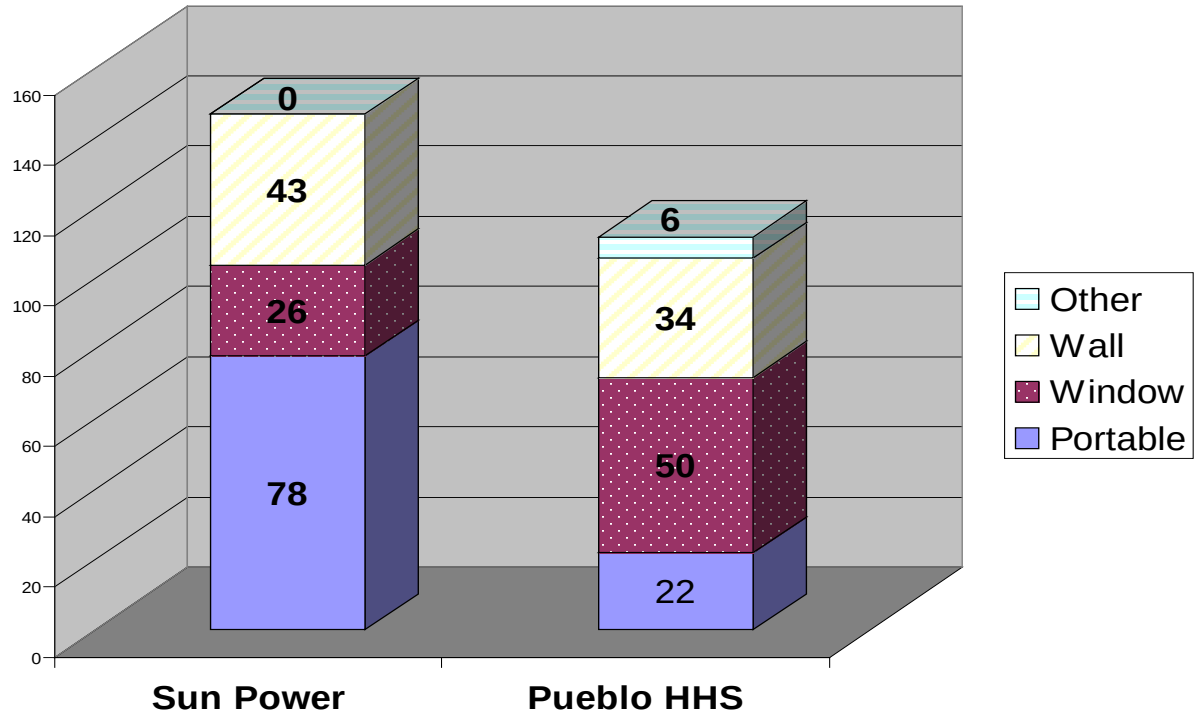


Table III-1 displays the totals and percentages for portable and non-portable installations by agency and the client's status as a homeowner or renter. This table shows that while the majority of portable installations occurred in rental homes where it was difficult to get permission and a monetary contribution from a landlord. We expected that where participants owned their own homes, we would see very low rates of portable cooler installations. However, 19 percent of Sun Power's total installations (38 percent of the agency's portable installations) occurred in homes that were owned by the program participant. This was much less of an issue for Pueblo HHS, as only 4 percent of the agency's total installations (22 percent of the agency's portable installations) occurred in homes that were owned by the program participant.[8]

[8] One of the homeowners that received a portable cooler from Pueblo HHS lived in a multi-family structure, which could not support the necessary installation work. Two additional homeowners in multi-family structures received non-portable units. The remaining multi-family structure dwellers in both service territories were renters, and are

Table III-1
Ownership Status: by Agency, and Portable vs. Non-Portable

	Sun Power: Portable	Sun Power: Non-Portable	Pueblo HHS: Portable	Pueblo HHS: Non-Portable
Owner[9]	28 (19%)	63 (43%)	5 (4%)	86 (77%)
Renter[10]	50 (34%)	6* (4%)	17 (15%)	4* (4%)

** The 10 total landlord contributions that enabled non-portable installations in renter-occupied homes came from only four landlords.*

d) Production by Agency and County

The Evaporative Cooling Project serves ten Colorado counties. Sun Power serves two metropolitan counties: Denver and Jefferson. Pueblo HHS serves eight suburban and rural counties: Pueblo, Las Animas, Otero, Bent, Custer, Huerfano, Baca and Prowers. Table III-2 displays the total population for each county in the two service territories.

Table III-2
County Populations and Installations by County

	Sun Power Service Territory		Pueblo HHS Service Territory							
	Denver	**Jefferson**	**Pueblo**	**Otero**	**Las Animas**	**Prowers**	**Huerfano**	**Bent**	**Baca**	**Custer**
2004 Total Population	556,835	526,351	150,171	19,605	15,353	14,062	7,755	5,610	4,121	3,841
Percent 65+ Years	11.3%	9.6%	15.2%	16.5%	18%	12.6%	17%	15.9%	22.4%	14.8%
Installations Per County	133	14	57	15	21	1	3	7	2	6

Charts III-4 and III-5 display the percentage of installations by county for Sun Power and Pueblo HHS. These charts show that both agencies installed the majority of units within the most populous counties. Chart III-5 shows that Pueblo HHS installed 49 percent of the agency's units outside of Pueblo, its most populous and closest county. Chart III-4 shows that Sun Power's penetration of Jefferson County was limited.

covered as such in the table above. There is a possibility that Sun Power may consider the portable units that were installed in owner-occupied homes to be temporary units, until the crew can make a permanent installation. However, these units are currently counted by Sun Power as completed installations.

[9] Owners comprise 62% of Sun Powers program participants and 81% of Pueblo HHS' program participants.

[10] Renters comprise 38% of Sun Power's program participants and 19% of Pueblo HHS' program participants.

Chart III-4
Percentage of Installations by County: Sun Power

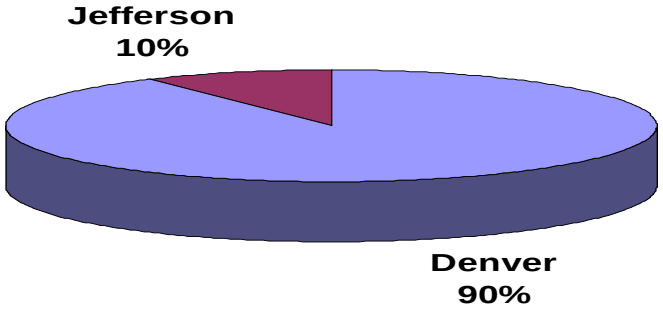
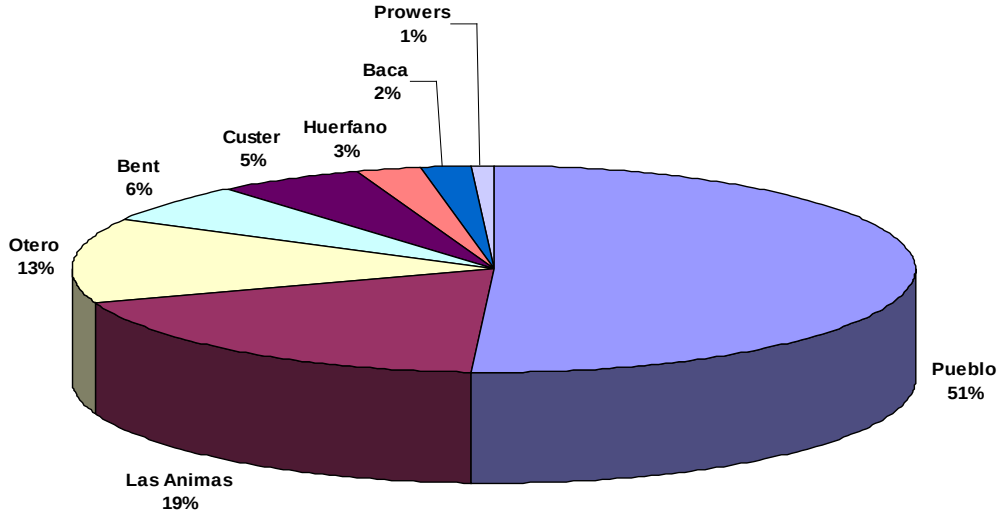


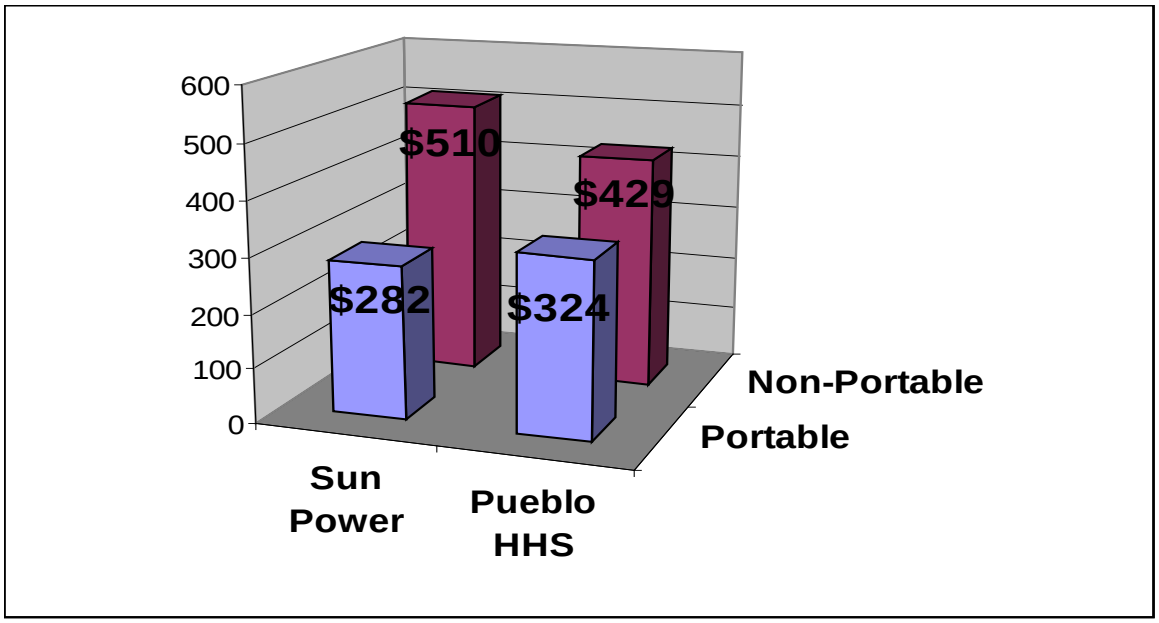
Chart III-5
Percentage of Installations by County: Pueblo HHS



e) Average Materials Cost Per Job by Agency

Chart III-6 displays the average materials cost per job by agency and portable vs. non-portable units. This chart shows that the average cost for materials, including the cooler itself, varies significantly between portable and non-portable units. Portable coolers materials costs are 25-45 percent less than materials costs for non-portable units.

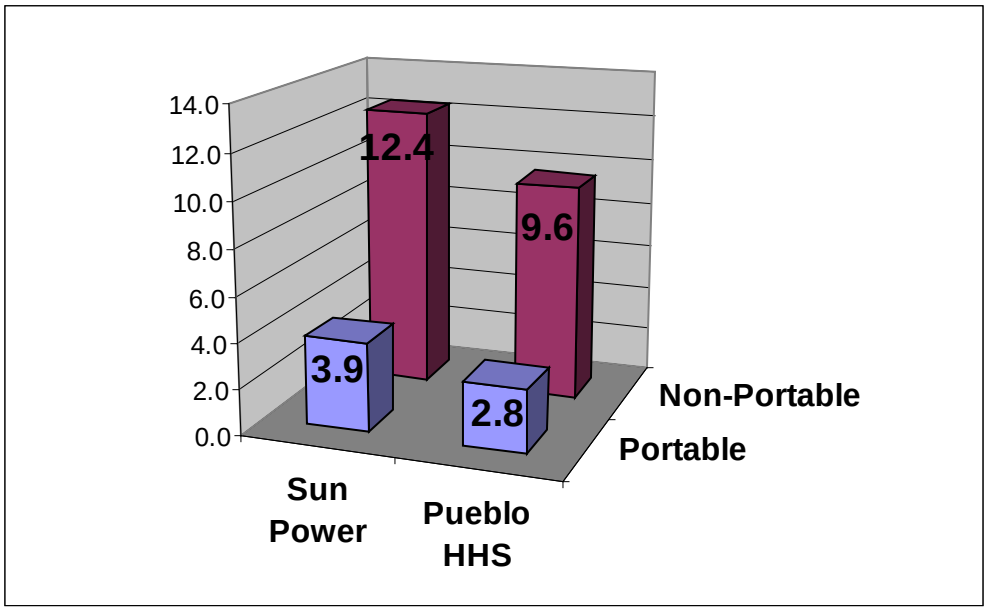
Chart III-6
Average Materials Cost Per Job by Agency and Portable vs. Non-Portable



f) Average Labor Hours Per Job by Agency

Chart III-7 displays the average labor hours per job by agency and portable vs. non-portable units. This chart shows that the average labor hours per job, including the initial home assessment and the cooler installation, varies significantly between portable and non-portable units. Portable coolers take about 70 percent fewer hours to install than non-portable units.

Chart III-7
Average Labor Hours Per Job by Agency and Portables vs. Non-Portables



C. *In-depth Client Interviews*

APPRISE conducted in-depth, open ended client interviews in June 2005. Program participants were interviewed about knowledge and practice of home cooling behaviors, knowledge of and experience with heat-related illness and other health problems, and program satisfaction. These interviews also served as cognitive pre-tests of the client surveys, assisting in the survey revision and refinement process.

1. Goals of the Evaluation Activity

The purpose of these interviews was to probe program participants in order to get a better understanding of the population and its needs.

2. Design/Rationale

APPRISE conducted 9 in-depth client interviews in person from June 27-June 30th, 2005 in Pueblo, Trinidad, and Denver, Colorado. APPRISE also conducted 18 in-depth client interviews via telephone during the month of June 2005.

3. Evaluation Findings

a) Some Participants Not Running Coolers Effectively or Efficiently

In-depth interviews revealed that some program participants had little general understanding of how to best utilize an evaporative cooler. Many of them reported waiting until they got uncomfortably hot in their homes before turning their coolers

on. Upon becoming hot in their homes, participants reported turning the coolers on high for very short periods of time until they felt sufficiently cool and then turning the coolers off until the home became too hot again. This pattern of use seems to contradict our understanding of the most efficient method of use for these evaporative coolers, which includes turning them on low before the home gets a chance to become uncomfortably warm, and leaving the cooler on unless the home gets uncomfortably cool. Additionally, there was some concern about whether small bursts of cooler use would impact the operations of the Clean Machine water pump installed inside of the cooler. More data on the most efficient and effective way to use an evaporative cooler would help to determine the extent to which client use may impact cooler effectiveness and efficiency.

b) Some Participants Report Concerns About Costs of Cooler Use

Some program participants reported concerns about how much running the cooler would cost them. These participants reported a belief that if they ran the cooler only when absolutely necessary and only for short periods of time, the cost would be manageable. Program Participants did not possess any information about how much using the cooler might cost them.

c) Program Participants Feel Connected To Others

Most program participants interviewed indicated moderate or strong connections to others. In the more rural areas, large families were common. In the more urban locations, participants reported feeling somewhat less connected to family, but still reported strong bonds with neighbors, caseworkers and social agency workers, health workers, or church members. Some of the more disabled participants, including those who were bed or house ridden, reported feeling somewhat isolated from others. Although they did have people who checked up on them and assisted them with their needs, they did not necessarily feel connected to those people.

d) Many Participants Relied On Fans Prior to Receipt of Coolers

Almost all of the program participants interviewed reported relying on fans as their primary cooling method prior to receiving the evaporative cooler. They reported running up to as many as ten fans at a time, and would often sit in front of them to maximize their relief. Many participants reported getting rid of or not using their fans since receiving the cooler. However, some participants reported a belief that using the fans was cheaper than using the cooler, and indicated that they would continue to use them in place of the cooler when worried about money.

e) Participant Satisfaction with Installation Crew

Program participants that had received the coolers overwhelmingly reported high levels of satisfaction with the installation process and crew. They reported that the crewmembers were polite, friendly and professional. They had no complaints about

any of the work that was done. One participant likened the crew to a 'group of brothers' coming over to help her out. Participants also indicated satisfaction with the level of accessibility to the crewmembers after the installation as they encountered questions or problems with their coolers.

f) Some Participants Report Increased Comfort in the Home

Program participants who were consistently using the cooler reported experiencing increased comfort in their home as a result. Participants that were not using the cooler, or had been using it sporadically, did not report experiencing increased comfort in their homes. They were appreciative of the cooler and reported anticipation of increased comfort in the home, but had not received much benefit due to non-use or ineffective use of the cooler.

g) Participants Report Experience with Heat-Related Illness

Most of the participants interviewed rated themselves as being in poor or moderate health, and many of those interviewed drew a strong link between the heat and symptoms of heat-related illness that they may have experienced. Some participants reported having a difficult time distinguishing symptoms that they may experience due to long-term health problems and symptoms they may experience due to excessive heat. Adult disabled or elderly severely disabled participants reported higher levels of discomfort due to heat and a greater impact of heat on their health.

D. Installation Observations and Inspections

APPRISE observed cooler installations by two different crews in June 2005. These observations covered preparation of the client and home, actual installation, testing of the equipment, educating the client about use and maintenance, and clean up. APPRISE also inspected 9 previously installed coolers.

1. Goals of the Evaluation Activity

The purpose of these observations and inspections was to document installation procedures, and to identify any systematic problems in the process.

2. Design/Rationale

APPRISE observed a Slim Wall installation in Pueblo, CO on June 27, 2005 and a Slim Wall installation in Denver, CO on June 30, 2005. APPRISE inspected 6 previously installed coolers in and around Pueblo, CO on June 27-28 (three window mount and three Slim Wall installations), and 3 previously installed coolers in Denver, CO on June 29-30 (one window mount, one Slim Wall, and one portable installation).

3. Evaluation Findings

a) Protecting the Home

During the installation, both crews prepared the inside of the home by covering all furniture appliances with sheets or plastic sheeting to protect the belongings from dust and debris. They also used plastic sheeting to create an enclosure, within which the installer working from the inside could contain most of the dust and debris. Afterwards the installers removed the coverings and vacuumed up all of the dust. To the observers, this process appeared to be quite effective in keeping the inside of the home protected during the installation.

On the outside of the home, installers made sure to place protective screens in front of windows or other openings that were underneath the point of installation, so that dust and debris did not gather at those points or make its way inside the home.

For both the observed installations and the additional inspected units, the holes were cut cleanly and the seals looked neat and effective. All of the units appeared stable and well placed. Added touches, such as one agency's design of special hooked nails that held cords into place against the home added to the overall attractive appearance of the installed unit.[11]

b) Interaction with Program Participants

Based on observations and conversations with program participants, installation crews from both agencies were very well received and liked by clients during the installation process. The crewmembers were observed to be very friendly; introducing themselves, explaining their installation process, and creating a generally comfortable atmosphere for the time that they were there. Participants appeared to feel free to go about their business or observe and ask questions as they pleased. Participants also reported feeling confident about their access to the installers in the future should they have any trouble with the unit.

c) Explaining the Cooler and Maintenance

Although APPRISE observed installers at both agencies explain how to use and maintain the coolers correctly and patiently, their messages did not appear to be completely understood by clients. Program participants did not seem to comprehend fully how to use the cooler after one explanation and demonstration.

Additionally, at one observed installation, the installers did not go over the automated cooler drainage process with the client, nor did they go over the cooler maintenance while we were present. The client indicated that he had a daughter that lived with him

[11] Please note that APPRISE observers do not have technical expertise in evaporative cooler installation techniques and best practices. Future inspections by Colorado WAP staff and technical consultant Larry Kinney will be more technically informative.

most of the time; however, we did not observe the installers schedule a time to go over the cooler maintenance with her so that the agency would not have to do it.

E. Client Surveys

APPRISE conducted the first round of client surveys in summer 2005. The second round of surveys will be completed in summer 2006. In each round of the survey, program participants were asked about their health, understanding of and experience with heat-related illness, practice of home cooling behaviors, and program satisfaction.

1. Goals of the Evaluation Activity

The purpose of these surveys was to gather baseline data including demographic and housing characteristics, and to assess knowledge and practice of home cooling behaviors, knowledge of and experience with heat-related illness, perception of program impact, and program satisfaction.

2. Design/Rationale

Three surveys, one of which has two rounds, were planned. Two of these surveys have been conducted to date.

- Survey 1 – Summer 2005: The Baseline Survey was administered to 136 program participants who had been assessed and approved for the program, but had not yet received a cooler from the months of July through August of 2005.

- Survey 2 – Summer 2005: The Unsafe Heat Survey was administered to 55 program participants who had received the cooler between the months of June through August of 2005, and were experiencing temperatures of over 95 degrees in Pueblo, CO and surrounding countries and over 90 degrees in Denver and surrounding counties at the time of the survey.

The third survey and an additional round of the Unsafe Heat Survey are planned for next year.

- Survey 2, Round 2 – Summer 2006: The Unsafe Heat Survey will be administered to the same sample of program participants who received the Baseline survey, and are experiencing temperatures of over 95 degrees in Pueblo, CO and surrounding counties, and over 90 degrees in Denver and surrounding counties at the time of the survey.

- Survey 3 – Summer 2006: The Follow-Up Survey will be administered one year after the installation of their evaporative cooler, to the same sample of program participants who received the Baseline survey.

3. Evaluation Findings – Survey 1: Baseline Survey

The Baseline Survey was designed to capture demographic and housing characteristics of program participants, as well as baseline data on knowledge and practice of home cooling behaviors, and knowledge of and experience with heat-related illness. The Baseline Survey was administered to program participants who had been assessed and approved for the program, but had not yet received a cooler from the months of July through August of 2005. One hundred and thirty-six program participants were surveyed: 60 from Sun Power's service territory and 76 from Pueblo HHS' service territory.

a) Program Participant Profile

Overwhelmingly, participants that received coolers through the Evaporative Cooling Project reported that their household contained at least one elderly (60 years of age or older) and/or disabled person, which is the program's target population. Very few households reported receiving income from employment. However, most households reported receiving in-kind and cash assistance. The mean household income was just over the federal poverty level, with the average one person household reporting an income of $9,903 (compared to the 2005 federal poverty level of $9,579), and the average two person household reporting an income of $13,675 (compared to the 2005 federal poverty level of $12,830).[12]

- *Household Composition:* Table III-3 shows that 86 percent of program participants had at least one elderly person in the household and 70 percent had one or more disabled persons in the home. Only 15 percent of clients had one or more children 18 or younger in the home. Also, nearly half of program participants live alone.

Table III-3
Household Composition

# Household Members	Total	60 or Older	18 or Younger	Disabled
0	--	13%	84%	29%
1	49%	68%	7%	56%
2	33%	18%	5%	14%
3	9%	0%	1%	0%

[12] The Baseline Survey requested that respondents report which income bracket they fell into based on a 9-point scale. However, APPRISE acquired more accurate, interval level participant income data from the REACh Program database. Average incomes reported above are derived from this data. Standard deviation of annual income in one person households was $3,000. Standard deviation of annual income in two person households was $4,800.

# Household Members	Total	60 or Older	18 or Younger	Disabled
4	4%	0%	1%	0%
5-8	5%	0%	1%	0%

- *Income and Assistance:* Table III-4 shows that 13 percent of program participants reported receiving employment income, 40 percent reported public assistance, 35 percent reported receiving Food Stamps, 65 percent reported receiving Medicaid, 11 percent reported receiving housing assistance, and 74 percent reported receiving LEAP benefits. The survey did not ask about the receipt of social security or retirement benefits. The average income per household was $11,232.

Table III-4
Types of Income and Benefits Received[13]

Employment Income	13%
Public Assistance: Cash Benefits	40%
Food Stamps	35%
Medicaid	65%
Public or Subsidized Housing	11%
LEAP	74%

- *Housing:* 78 percent of program participants reported owning their homes, while 18 percent reported renting. 4 percent of participants reported living in another family member's home. The average monthly rent or mortgage payment was $268; the maximum reported was $1600.

b) Introduction to Program

Program participants were asked about how they found out about the program and how difficult it was to enroll in the program. Table III-5 shows that most participants found out about the program through an agency, which is unsurprising because local agency referrals were designed to be the program's primary recruitment tool. Word of mouth accounted for 18 percent of program clients. 10 percent of program participants reported finding out about the program through a newspaper. It is important to note that newspaper articles about the program did not appear until well into the first year of implementation. This indicates that the percentage of participants who find out about the program through newspapers may increase as the program continues.

[13] Note that percentages do not sum to 100% because a respondent could receive multiples types of income and benefits.

Table III-5
How Participants Found Out About the Program[14]

Agency	63%
Friend or Relative	18%
Newspaper	10%
Informational Mailing	5%
Other	5%

Table III-6 shows that most program participants reported that getting into the program was not at all difficult. No participants reported that the program was very difficult to get into, and only 1 percent reported that it was somewhat difficult to get into.

Table III-6
Difficulty of Enrolling in the Program

Not At All Difficult	77%
Not Too Difficult	8%
Somewhat Difficult	1%
Very Difficult	0%
Do Not Know	14%

c) Perceived Affordability of Cooling

In order to determine participant's level of knowledge about the affordability of cooling equipment, they were asked whether they agreed, somewhat agreed, somewhat disagreed or disagreed with the statement that an air conditioner was affordable to use and the statement that an evaporative cooler was affordable to use.

Table III-7 shows that more program participants perceive evaporative coolers as affordable than they do air conditioners. The table also shows that 21 percent of program participants perceive air conditioners as unaffordable, while only 2 percent perceive evaporative coolers as unaffordable. This is encouraging because it indicates that many participants might be receptive to using evaporative coolers because they perceive them to be affordable to use. However, a significant percentage of the population, around 25 percent, reported not knowing whether an air conditioner was affordable. A similar percentage reported not knowing whether evaporative coolers were affordable.

[14] Note that participants could choose more than one answer, so percentages may not sum to 100.

Importantly, 12 percent of respondents reported not knowing the difference between these two types of cooling equipment; as a result, the percentages reported in the table below do not sum to 100.

Table III-7[15]
Perceived Affordability of Cooling

	Agree	Somewhat Agree	Somewhat Disagree	Disagree	Do Not Know
Air Conditioner	27%	8%	7%	21%	24%
Evaporative Cooler	49%	8%	2%	2%	27%

d) Knowledge of Home Cooling Behaviors and Heat Related Illness

Participants were asked, 'when it is hot, what are the things a person should do to keep cool?' The six common cooling behaviors that we focused on were the following:

- Use fans
- Open windows/doors
- Close shades
- Take cold showers/baths
- Drink water
- Go to an air conditioned location

We focused on these six based on cooling behaviors that were recommended by the Center for Disease Control and Prevention (CDC), and behaviors that were most commonly reported by participants that took part in extensive cognitive testing of the survey instruments. Table III-8 shows that, when unprompted with any answers to the question above, most participants were unable to identify more than one of the six common cooling behaviors listed above. Participants were then specifically asked whether they performed each of the six common cooling behaviors frequently, sometimes, seldom or never when it was hot. Table III-8 also shows that, when prompted, participants, on average, reported performing over two of the six common cooling behaviors frequently when it was hot. The table displays the mean, median, mode and standard deviation for the number of behaviors recalled and the number of behaviors performed frequently by participants. Later tables will show the frequency at which, when prompted, participants reported performing each of the six behaviors when it was hot.

[15] Percentages may not sum to 100 due to rounding and due to 12 percent of respondents that did not know the difference between the two types of cooling.

Table III-8
Home Cooling Behaviors Recalled and Exhibited

	Mean	Median	Mode	Standard Deviation
Number of Behaviors Recalled	1.18	1	1	.97
Number of Behaviors Performed Frequently	2.4	2	2	1.66

Participants were asked, 'If a person is sick because it is too hot, what kinds of symptoms might they experience?' The five common symptoms of heat related illness that we focused on were the following:

- Loss of appetite
- Dizziness
- Low Energy
- Nausea
- Headaches

Again, we focused on these five based on the CDC's list of symptoms for heat related illness, and the symptoms that were most commonly reported by participants that took part in extensive cognitive testing of the survey instruments. Table III-9 shows that, when unprompted with any answers to the question above, most participants unable to identify more than one common symptom of heat related illness. Participants were then asked whether they had experienced each of the five symptoms within the last week, which was hot. Table III-9 also shows that, when prompted, participants, on average, reported experiencing over three of the five common cooling behaviors in the past week, which was hot. The table displays the mean, median, mode and standard deviation for the number of symptoms recalled and the number of symptoms experienced by participants in the past week. Later tables will show the frequency at which, when prompted, participants reported experiencing each of the five common symptoms when it was hot.

Table III-9
Heat Related Illness Symptoms Recalled and Experienced

	Mean	Median	Mode	Standard Deviation
Number of Symptoms Recalled	1.01	1	1	.81
Number of Symptoms Experienced	3.35	3	3	1.13

Ultimately, these data indicate that program participants have a difficult time recalling home cooling behaviors and the symptoms of heat related illness. However, when prompted, they report performing home cooling behaviors when they are hot, and when they are or have recently experienced a symptom they are able to attribute it to

the heat. It is a concern that their difficulty in recalling behaviors and symptoms may be linked to a decreased ability to be proactive before the exposure to high heat.

e) Practice of Home Cooling Behaviors

Participants were asked about their past and current use of home cooling equipment and about the frequency with which they perform common cooling behaviors. Table III-10 shows that about one third of program participants have used an air conditioner and about one third of program participants have used an evaporative cooler at some time in their lives. 13 percent reported currently possessing and using air conditioners, and 13 percent reported currently possessing and using evaporative coolers. Note that this is prior to receiving the new evaporative cooler though the Evaporative Cooling Project[16].

Table III-10[17]
Past and Current Use of Home Cooling Equipment

	Used A/C Previously	Using A/C Now	Used EV Cooler Previously	Using EV Cooler Now
Yes	28%	13%	32%	13%
No	71%	87%	66%	87%

Participants were asked, 'When your house is hot, do you [insert common cooling behavior] frequently, sometimes, seldom or never to keep yourself cool?' This question was asked for the following six behaviors.

- *Use fans:* a behavior that helps to circulate air in a hot house, but can also accelerate dehydration.
- *Open windows/doors:* a behavior that helps to circulate air in a hot house, as well as let cool air into the house, particularly in the early morning or evening hours.
- *Close shades:* a behavior that can help keep a house cool by keeping the direct sunlight out.
- *Take cold showers/baths:* a behavior that can help an overheated individual cool down quickly, but can also increase the heart rate quickly.
- *Drink water:* a behavior that not only cools down an overheated individual, but also counteracts the dangerous dehydrating effects of extreme heat.
- *Go to an air conditioned location:* a behavior that gets an individual out of a hot house and into a cooler location. Access or transportation to such a location may be an issue for some individuals, particularly those who are disabled, elderly, or in a remote location.

[16] The Evaporative Cooling Project does not have 'cooler replacement' as a primary aim, however, eligible individuals with ineffective or non-working cooling equipment are served through the Program.
[17] Percentages may not sum to 100 due to occasional 'don't know' or 'refused' answers.

Table III-11 shows that using fans, closing shades and hydrating are the most common cooling behaviors, with 87-95 percent of participants practicing them frequently or sometimes. 79 percent of participants open windows frequently or sometimes on hot days or nights, and 55 percent frequently or sometimes take cold or cool showers when it is hot. 42 percent of participants report leaving their homes frequently or sometimes when it is hot. Overall, program participants practice common cooling behaviors at a high rate. However, the high rate of fan use can be a concern for the elderly and disabled population because fans accelerate dehydration, which can have a serious, negative impact on health.

Table III-11[18]
Home Cooling Behaviors: Frequency of Practice

	Frequently	Sometimes	Seldom	Never
Use Fans	79%	10%	3%	8%
Open Windows	55%	24%	9%	12%
Close Shades	73%	14%	4%	9%
Cold Showers	31%	24%	4%	40%
Hydrate	85%	10%	3%	3%
Leave Home	13%	29%	21%	37%

f) Overall Health

Participants were asked to rate their overall health on a 5 point scale. Table III-12 shows that 60 percent of participants reported their health as fair or poor, while only 11 percent reported their health as being excellent or very good.

Table III-12
Participant Health Self-Rating

	Excellent	Very Good	Good	Fair	Poor	Don't Know
Percentage Reporting Level of Health	4%	7%	27%	35%	25%	2%

On average, participants reported that out of the past 30 days 15 of them were days when the participant's physical health was not good. On average, participants reported that out of the past 30 days, 7 of them were days when the participant's mental health was not good. 68 percent of participants reported sleeping well through the night frequently or sometimes.

[18] Percentages may not always sum to 100 due to rounding.

g) Experience with Heat Related Illness

In order to assess the level of discomfort experienced by participants due to the heat, they were asked the following questions:

- Have you or anyone in your household ever had to go to the doctor or hospital because your home was too hot?
- How many days in the last week did it get so hot in your home that you were uncomfortable?
- In the past week, have you or anyone in your household experienced [heat related illness symptom]?
  - Loss of appetite
  - Dizziness
  - Low Energy
  - Nausea
  - Headaches
- If yes, Do you think this symptom was caused or made worse by the heat?

Only 6 percent (8) of participants reported ever having to go to the doctor or hospital because their home was too hot. 40 percent of participants reported that their home had gotten uncomfortably hot in all 7 of the past 7 days. Twenty-three percent of participants reported that their home had gotten uncomfortably hot in 4-6 of the past 7 days. That such a small number had ever had to seek medical treatment due to the temperature in their home is positive. However, the fact that over 60 percent of participants reported that their home had gotten uncomfortably hot in 4-7 of the 7 days preceding the survey indicates a strong need for effective home cooling.

Table III-13 shows that loss of appetite and low energy were the most common symptoms experienced by participants. For all participants who experienced loss of appetite, dizziness, low energy and nausea, over 80 percent reported that the symptom had been caused or made worse by the heat. Sixty-nine percent of those participants experiencing headaches reported that the symptom was caused or made worse by the heat. A substantial portion of participants reported experiencing the common symptoms of heat related illness, and a surprisingly high number of them attributed those symptoms to the heat.

Table III-13
Experience with Heat Related Illness Symptoms in Past Week

	Loss of Appetite	Dizziness	Low Energy	Nausea	Headaches
% Reporting Symptom	54%	40%	74%	29%	45%
% of the Above Reporting Symptom Caused or Made Worse by the Heat	82%	87%	89%	87%	69%

h) Level of Independence

Participants were asked how many times they left their homes in the past 7 days and how many times they socialized with people other than those who lived with them in the past 7 days. On average, participants reported the following:

Average reported number of times participants left home over past 7 days: ***2.8***[19]
Maximum reported number of times a participant left home over past 7 days: ***15***

Average reported number of times participants socialized over past 7 days: ***3.5***[20]
Maximum reported number of times socialized over past 7 days: ***15***

Participants were asked whether there was anything in particular that kept them from leaving their home more often. Participants could choose multiple responses. Twenty-nine percent reported that nothing keeps them from getting out of the house more often. Thirty-five percent reported that a physical impairment kept them from leaving the home more often, 13 percent reported that a lack of transportation kept them from leaving the home more often, and 15 percent reported that excessive heat kept them from leaving the home more often. Nineteen percent of participants reported that a mental impairment, lack of activities or something else kept them from leaving the home more.

On average, participants reported feeling very connected (41 percent) or somewhat connected (38 percent) to other people. Thirteen percent of participants reported feeling somewhat isolated from others and 4 percent reported feeling very isolated from others. Three percent of participants responded that they did not know how connected they felt to others. The data above demonstrates that program participants are not generally isolated. However, for the minority of program participants that are somewhat or very isolated, more regular follow-up contacts, and more frequent reinforcement of cooler use and maintenance instructions may be very helpful.

Additionally, 68 percent of participants reported that they frequently or sometimes perform household chores and cook in their home.

Participants were asked if they received help from other persons with their personal care needs and with their routine needs. Those who answered yes were asked whether they got help from a person who was paid and whether they got help from a person that lived with them. Table III-14 shows that more people receive help with their routine needs than with their personal needs. However, those that need help with their personal needs are more likely to receive help from a person who is paid or lives with them.

[19] Standard deviation for number of times participants left home was 2.4.
[20] Standard deviation for number of times participants socialized was 3.

Table III-14
Receipt of Assistance with Personal or Routine Needs[21]

	Personal Needs	Routine Needs
% Receiving Assistance	36%	56%
% of the Above Receiving Paid Assistance	63%	47%
% of the Above Receiving Live-in Assistance	53%	30%

i) Summary of Baseline Survey Findings

Key findings from the Baseline Survey are highlighted below.

- *Participant Profile:* Overwhelmingly, participants in the Evaporative Cooling Program were likely to have at least one vulnerable member in their household. This includes an individual who is disabled, or over the age of 60. Very few households reported receiving employment income, and most households reported receiving in-kind and cash assistance. The mean household income was just over the federal poverty level, and the majority of participants, 78 percent, owned their homes.

- *Introduction to Program:* Most participants, 63 percent, found out about the Evaporative Cooling Program through an agency. A number of participants also found out about the program through word of mouth and local newspapers. Over three-fourths of participants reported that getting into the program was not at all difficult.

- *Perceived Affordability of Cooling:* More participants perceive evaporative coolers as affordable than they do air conditioners. However, a significant percentage of the respondents, around 25 percent, reported not knowing whether an air conditioner or an evaporative cooler was affordable to use.

- *Knowledge of Home Cooling Behaviors and Heat Related Illness:* Participants had a difficult time recalling common home cooling behaviors and symptoms of heat related illness. Participants only recalled, on average, one common cooling behavior and one common symptom of heat related illness. However, when prompted, participants reported performing an average of 2 cooling behaviors frequently, and experiencing an average of over 3 symptoms in the past week.

- *Practice of Home Cooling Behaviors:* About one third of participants reported having used an air conditioner at some point in their lives, and about one third reported having used an evaporative cooler. Thirteen percent of participants

[21] Participants were instructed that personal needs included eating, bathing, dressing and getting around the house, and that routine needs included everyday household chores and shopping.

reported currently possessing and using air conditioners, and 13 percent reported possessing and using evaporative coolers. Using fans, closing shade and hydrating are the most common cooling behaviors, with 87-95 percent of participants practicing them frequently or sometimes when it is hot. Seventy-nine percent of participant open windows frequently or sometimes on hot days or nights, and 55 percent frequently or sometimes take cold or cool showers. Additionally, 42 percent report leaving their homes frequently or sometimes when it is hot.

- *Overall Health:* Sixty percent of participants reported their health as fair or poor, on a five point scale ranging from poor to excellent. On average, participants reported that of the past 30 days, 15 of them were days when the participant's physical health was not good, and 7 of them were days when the participant's mental health was not good.

- *Experience with Heat Related Illness:* Forty percent of participants reported that their home had gotten uncomfortably hot in all seven of the past 7 days, and 23 percent reported that their home had gotten uncomfortably hot in 4-6 of the past 7 days. Loss of appetite and low energy were the most common heat related illness symptoms experienced by participants. For all participants who experienced loss of appetite, dizziness, low energy and nausea, over 80 percent reported that the symptom had been caused or made worse by the heat.

- *Level of Independence:* Participants reported leaving their homes, on average, about 3 times per week and reported socializing, on average, about 3.5 times per week. Thirty-five percent of participants reported that a physical impairment kept them from getting out of the house more often, 15 percent said that excessive heat kept them from getting out, and 13 percent said that a lack of transportation kept them from getting out. Seventy-nine percent of participants feel somewhat or very connected to other people. Sixty-eight percent of participants reported that they frequently or sometimes perform household chores and cook in their home. About one third of participants receive help with their personal needs, and over one half receive help with their routine needs on a regular basis.

4. Evaluation Findings – Survey 2: Unsafe Heat Survey

The Unsafe Heat Survey was designed to capture participants' satisfaction with the installation of their new cooler, and experience with heat related illness symptoms and practice of cooling behaviors on a hot day, including their use of the newly installed evaporative cooler. The survey was also designed to uncover barriers to use of the newly installed cooler.

The Unsafe Heat Survey was administered to program participants who had received the cooler between the months of June through August of 2005, and were experiencing temperatures of over 95 degrees in Pueblo, CO and surrounding countries, and over 90 degrees in Denver and surrounding counties at the time of the survey. Fifty-five program participants were surveyed in this preliminary implementation of the Unsafe Heat

Survey: 25 from Sun Power's service territory and 30 from Pueblo HHS' service territory.

a) Satisfaction with Installation

96 to 100 percent of participants reported that they strongly agreed with the following statements:

- Installation crew arrived at their home on time
- Installation crew was friendly and polite
- Installation crew cleaned up after they were done
- Installation crew explained how to operate the cooler
- Installation crew left the cooler's instruction manual

7 participants (13 percent) reported that the installation crew did not explain how to maintain their new cooler. This may have been because the installation crew had determined that the agency would perform the maintenance for the participant because they were unable.

The remaining findings from round one of the Unsafe Heat Survey are reported in the Preliminary Impact Evaluation Findings.

b) Use of the Cooling Equipment

Ideally, we would like to see all program participants using their coolers on a hot day. Seventy-six percent of participants were using their new evaporative cooler on the day of the Unsafe Heat survey. Those that were not using the cooler (13 participants, 24 percent) gave the following reasons:

Table III-15
Reasons for Not Using Coolers on Hot Day

Reason	#
Not hot today	3
Shade or breeze adequate to cool today	2
Portable unit too difficult to use	2
Not home	1
Too Busy	1
Cooler makes home too cold	1
Only use cooler at night	1
Sick	1
No reason	1

Table III-16 shows the frequency of use for the evaporative cooler and other cooling equipment since the installation. Ninety-six percent reported using their evaporative coolers frequently or sometimes since it had been installed, and no participants reported never using their new cooler. However, 34 percent of participants also reported using other cooling equipment frequently or sometimes since the installation of the evaporative cooler.

Table III-16
Frequency of Use Since Installation: Evaporative Cooler and Other Cooling Equipment

	Frequently	Sometimes	Seldom	Never
Evaporative Cooler	80%	16%	4%	0%
Other Cooling Equipment	18%	16%	5%	58%

IV. Program Accomplishments and Program Modification Alternatives

This section highlights program accomplishments from the first year of the program, as well as major areas where evaluation findings indicated the potential need to consider changes to the program. Possible modification alternatives are presented for discussion in each issue area, as well as related decisions that were made at a mid-year review meeting in December 2006.

A. Program Accomplishments

There have been significant accomplishments in the design and implementation of the Evaporative Cooling Project in the first year of operation. Some of the key accomplishments over the first year have been:

- *Program production is on track and on budget:* Both provider agencies are on track to meet their first year installation targets[22]. Though both agencies reported some unexpected and higher than expected expenses, they report being generally on budget.

- *The Program is serving the target population:* The agencies are successfully serving the program's target population. Eighty-six percent of program participants had at least one elderly person in the household and 70 percent had one or more disabled persons in the home. Nearly 50 percent of program participants reported living alone. Eighty-seven percent of program participants have no cooling equipment other than fans. Additionally, most participants report that their homes get uncomfortably hot during periods of high temperatures, and report experiencing at least 3 common symptoms of heat related illness in the hot week prior to the Survey.

- *The cooler installations represent high quality work:* APPRISE observed what appeared to be clean and high quality installation work. However, future inspections by Colorado WAP staff and technical consultant Larry Kinney will be more technically informative.

- *Provider Agency and client relations are excellent:* APPRISE observations and interviews revealed a respectful and comfortable relationship between agency staff and program participants. Participants enthusiastically reported appreciation for and a high level of comfort with the agencies and staff.

- *Overall client satisfaction is very high:* Program participants overwhelmingly reported no difficulty in enrolling in the program. Additionally, 96 to 100 percent of participants reported that the installation crew arrived at their home on time, were friendly and polite, cleaned up after they were done, explained how to operate the cooler, and left the cooler's instruction manual.

[22] If Sun Power is unable to revisit and convert a substantial number of the portable units that they installed, they may not be on track or on budget as the current data suggests.

B. Program Modification Alternatives

The principal alternatives for continued improvements to the program relate to the role of portable coolers in the program, client cooler use and maintenance education, and quality control.

1. Role of Portable Coolers

When portable coolers were added to the program as a last resort option, it was expected that they would comprise a small number of total cooler installations. However, portable coolers comprised 53 percent of Sun Power's total installations and 20 percent of Pueblo HHS' total installations. Additionally, it was expected that portable coolers would be used exclusively in rental-occupied homes where a landlord contribution could not be obtained, or in owner-occupied homes where structural challenges made a window or wall mount impossible. However, 19 percent of Sun Power's total installations were portable coolers installed in owner-occupied homes, compared to 4 percent for Pueblo HHS. This is an unexpected number of owner-occupied homes that may have had structural challenges that made a window or wall mount impossible.

There are four potential concerns relating to the large role that portable coolers have played in the first year of the Evaporative Cooling Project.

- The portable coolers are less efficient than wall or window mount units at cooling the entire home due to poorer quality media and the fact that they recycle indoor air of increasing humidity.

- The portable coolers raise the level of humidity in the home, which may have an adverse impact on the health of elderly and disabled individuals.

- The portable coolers require regular upkeep because they are not directly hooked into a water source. This upkeep requires that a program participant refill the water in the portable cooler manually on a regular basis. This process may take several trips to and from a water source, or may require the individual to wheel the large cooler to a water source. These actions may be difficult for many elderly and/or disabled people to perform. Additionally, it may be difficult for them to remember that they have to refill the cooler as well as recognize when they have to refill the cooler.

- The portable coolers cost 25-45 percent less, and take 70 percent fewer hours to install than non-portable coolers. As agencies install additional portable units, they will reach their program installation goals much more quickly and at a lower cost than was expected.

Currently, no data related to the impact of portable units on cooler use and participant health are available. However, because the rate of portable installations has dramatically

exceeded expectations, it may be worthwhile to discuss the various program options outlined below.

a) Make No Changes

This option entails making no changes to program operations regarding portable coolers. Provider agency staff would continue to install portable units as they judge them appropriate, and the number of portable units installed would have no impact on each agency's annual installation goals. This decision could change should future outcomes data show a significant maintenance burden or health impact due to the portable coolers.

b) Increase Annual Installation Goals

This option also allows agency staff to continue to install portable units as they judge them appropriate. However, due to the lower cost of materials and fewer hours of labor required by a portable installation, agency installation goals would be raised in proportion to the number of portable units they install (e.g. three portable installations are equal to the installation of 2 non-portable installations).

c) Institute a Cap on Portables

This option entails the imposition of a cap on portable cooler installations, as an absolute number or as a percentage of total installations. Once an agency reaches this cap, they would have to walk away from homes where a wall or window mount were not viable options.

d) Increase the Landlord Contribution Effort

This option entails an increased and more aggressive effort by provider agencies to procure landlord contributions so that the rental population might be served with non-portable units more frequently.

e) Discontinue Use of Portable Coolers

This option would entail removing portable coolers as a program option. Under this option, provider agencies would have to walk away from all clients for whom wall or window mounts were determined to be non-viable options for any reason.

f) Replace Portable Cooler With New Alternative

This option would entail performing research to determine whether there exists an alternative portable or semi-portable cooler that meets the needs of clients and does not have the drawbacks that the current portable cooler model has.

The issue of portable coolers was discussed at a mid-year review on December 6, 2005. At that meeting, the state staff and provider agencies agreed that the following actions would be taken to address the issue:

- In owner-occupied homes where the client refuses a window or wall mounted installation (and one or both are feasible), agencies are now to inform the client that no other services are available and close the file.

- Both Pueblo HHS and Sun Power, Inc. will return to all residences where portable units were provided and assess more permanent alternatives. Alternatives include a wall or window mount, a roof mount, or the conversion of the portable to a more permanent unit by affixing to the floor and attaching a permanent water supply.

- State staff authorized Sun Power, Inc. to proceed with 12 roof-mounted installations, and for Pueblo to proceed with six. This more expensive installation option is only to be used where no other options are available.

- No additional portable units are to be provided to clients unless they are serving as a temporary measure while a client at high risk for heat related illness waits for a window or wall installation.

- Sun Power is to submit rebate documentation to Xcel for any portables that are converted to more permanent units.

- The project team must create a plan for the ultimate disposal or use of the potential inventory of portable units that will exist after the program is completed.

2. Client Education: Cooler Use and Maintenance

Client education in the Evaporative Cooling Project consists of explaining and demonstrating how to effectively use and maintain the evaporative cooler. Currently, the installation crew educates the program participant, or friends or family members that may be assisting the participant, on cooler use and maintenance just after installation is completed. For those participants determined by the crew to be unable to perform the maintenance, and not have someone available to assist them, the agency is assigned to perform the maintenance, and the demonstration is skipped. Prior to seasonal cooler shut-down and start-up times each year, the agency places a follow-up call to each program participant to verify that they have or plan to complete the required maintenance. For each client that indicates difficulty in doing this, the agency schedules a visit to the home to complete the maintenance for them.

Observations and administrative interviews revealed that, although the installation crew clearly and patiently explained and demonstrated how to operate and maintain the coolers, program participants tended to not fully comprehend or to soon forget the instructions. This was evidenced by participants who were observed inefficiently and/or

ineffectively using the coolers, and by agency reports of many and repeated requests for continues help with cooler operation and maintenance.

In Summer 2006, APPRISE will ask program participants questions about how they are using the coolers, and whether they have been able to successfully maintain the units on their own or with the help of a friend or family member. This information will help to determine the degree to which participants are struggling with the cooler use and maintenance education that they currently receive. However, because there are preliminary indications that this might be an issue that impacts the use of the cooler and integrity of the equipment, as well as consuming significant agency staff time, it may be worthwhile to discuss the potential program modifications outlined below.

a) Develop Cooler Use Education Materials to Leave With Clients

It may be worthwhile consider designing, producing, and distributing cooler use education materials. Simple maintenance instructions are currently being attached to the coolers, and it may be helpful to design a brochure, flier, or magnet that outlines simple use instructions. Such materials may include things like simple tips for effective and efficient cooler use, frequently asked questions, and a troubleshooting guide. Technical research planned by Larry Kinney should lead to the development of evaporative cooler usage best practices, and the use costs associated with them. This information will be important in developing any cooler use education materials.

b) Send Cooler Use and Maintenance Reminder Mailings

It may be worthwhile to consider designing, producing and mailing postcards with simple reminders about using and maintaining the evaporative coolers. Multiple postcards could be sent, each with a different set of simple reminders to help instill proper use and maintenance behaviors in program participants.

c) Make Unsafe Heat Visits

It may be worthwhile to consider making in-person visits to program participants in their homes on very hot days to observe how the participant is using the cooler and how he or she is coping with the heat. Random visits to program participants would enable program staff to gather information about what the most challenging issues are for participants in general. Additionally, unsafe heat visits to the minority of participants that are somewhat or very isolated would enable the agency to reinforce client-specific messages in-person for the most vulnerable individuals.

The issue of client education was discussed at a mid-year review on December 6, 2005. At that meeting, the state staff and provider agencies agreed that the following actions would be taken to address the issue:

- State and evaluation staff would pursue assistance from experts in the area of low-income and elderly populations. Successful models demonstrating how to

improve the likelihood that an individual in this population will receive, retain, and act upon a message will be particularly helpful.

- State and evaluation staff will also look into strategies for overcoming cost perceptions regarding the use of evaporative cooling equipment.

3. Quality Control

Quality control in the Evaporative Cooling Project is designed to consist of internal evaporative cooler installation inspections and second-level inspection by the State WAP staff.

Administrative interviews revealed that although there is significant quality control relating to administrative and financial processes, and while one agency Manager does conduct spot-checks on some installed units, there appears to be no systematic internal installation quality control process, and no official installation inspection protocol.

As stated, State WAP staff will be performing inspections on a sample of installed coolers. However, an internal installation quality control process can be very important in ensuring consistency and quality over time and across installers. Consequently, it might be worthwhile to discuss developing an evaporative cooler inspection protocol, and each provider agency appointing a staff member to inspect a certain percentage of installation in progress and coolers after installation.

The issue of quality control was discussed at a mid-year review on December 6, 2005. At that meeting, the state staff and provider agencies agreed that the following actions would be taken to address the issue:

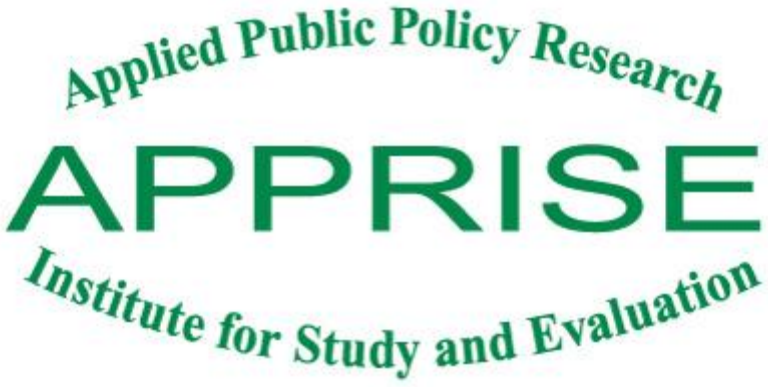
- Internal inspection and other quality control activities need to happen more regularly at the provider agency level.

- State staff will begin field inspections in conjunction with Weatherization inspections in early 2006.

  - State and provider agency staff should jointly inspect the first series of units visited and discuss inspection processes and protocols.

Appendices

Appendix A: Client Information Sheet
Appendix B: Client Rating Scale
Appendix C: Baseline Survey
Appendix D: Unsafe Heat Survey
Appendix E: Follow-Up Survey



The Colorado Evaporative Cooling Demonstration Project

Impact Evaluation Report

June 2007

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Executive Summary

The purpose of the Colorado Evaporative Cooling Demonstration Project was to develop a model for reducing the vulnerability of elderly and disabled households to periods of unsafe heat by furnishing home cooling equipment to those households and educating clients about how to stay safe during periods of unsafe heat. The purpose of this impact evaluation is to assess the performance of the Colorado Evaporative Cooling Demonstration Project. The process evaluation assessed the efficiency and effectiveness of program procedures, and developed recommendations for changes to be implemented in the second year of the program. This impact evaluation measured pre and post data for clients on factors including health, independence, cooling behaviors, and consumption of water and electricity. This evaluation will assist program administrators, State LIHEAP administrators, and federal REACh grant administrators to determine the feasibility and desirability of replicating the program throughout Colorado and other areas.

Introduction

Elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status, as well as the increased probability of being socially isolated and economically disadvantaged. The Colorado LIHEAP office, in conjunction with local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the federal Residential Energy Assistance Challenge Program (REACh) for the Colorado Evaporative Cooling Demonstration Project. The Project was implemented in the counties of Denver, Jefferson, Pueblo, Baca, Bent, Crowley, Kiowa, Otero, and Prowers during fiscal years 2005, 2006, and 2007.

The REACh program, sponsored by the United States Department of Health and Human Services, funds programs that aim to:

- Minimize the health and safety risks that result from high energy burdens
- Increase the efficiency of energy usage by low-income families
- Target energy assistance to individuals who are most in need

The Evaporative Cooling Project addressed the vulnerability of the elderly and disabled to prolonged periods of high temperatures by accomplishing the following:

- Installing evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable to program participants.
- Educating program participants about strategies for reducing their exposure to heat during periods when parts of their homes are above a comfortable temperature.

- Establishing a contact system whereby evaporative cooler maintenance requirements are adequately explained and clients are provided with maintenance reminders and assistance when necessary.

The expected outcomes of this project are:

- Client utilization of evaporative coolers in place of less effective cooling strategies when temperatures are unsafe.
- Reduction in clients' risk for heat-related illness symptoms.
- Maintenance of total electricity and water consumption in the home at affordable levels.
- Maintenance of long-term equipment integrity.
- Increased ability for clients to be independent and active in their homes on hot days.

The program evaluation assessed the extent to which these outcomes are realized.

Research Methodology

The Evaporative Cooler Demonstration Project was designed to furnish evaporative coolers to low-income elderly and disabled households. The purpose of the Impact Evaluation is to determine the effectiveness of the program in improving the health, safety, and comfort of households without detracting from the affordability of electricity and water services.

The Impact Evaluation questions are:

- Knowledge of Cooler Use – Do clients understand how to use evaporative coolers effectively?
- Cooler Use – Do clients use the coolers in place of less effective cooling strategies during periods when temperatures are unsafe?
- Health Behaviors – Do clients understand how to remain safe and healthy during periods when temperatures are unsafe?
- Health Impacts – Do clients have fewer symptoms of heat-related illnesses? Are clients less likely to attribute symptoms to the temperature of their home?
- Client Independence – Are clients able to undertake more activities of daily living that represent a healthy lifestyle?
- Electric and Water Costs – Do clients' costs for electricity and water remain affordable?
- Cooler Maintenance – Are coolers maintained in such a way that they will continue to deliver program benefits to clients for at least five years?

The Impact Evaluation research activities included:

- *Baseline Survey:* We conducted a survey with clients prior to the installation of the evaporative cooler. The purpose of these interviews was to capture baseline information on the knowledge, behaviors, experiences, and health status of clients prior to service delivery.

- *Follow-Up Survey:* We conducted a survey with clients one year after the evaporative cooler was installed. The purpose of the survey was to measure the impact of the program on client knowledge, behaviors, experiences, and health status.

- *Electricity Usage Analysis:* We collected electric billing data and conducted an analysis of the change in electric usage associated with the program.

- *Water Usage Analysis:* We collected water billing data and conducted an analysis of the change in electric usage associated with the program.

- *Evaporative Cooler Maintenance Analysis:* We conducted a survey of the maintenance of the evaporative coolers to assess whether the coolers were being maintained and what options were available to ensure the long-term performance of the systems.

These research activities allowed the evaluation team to measure the impacts of the program and to make recommendations regarding the long-term potential for the program to deliver the targeted outcomes.

Need for the Program – Baseline Survey

The Baseline Survey was designed to capture information on the status of clients prior to the installation of the evaporative cooler. The survey collected information on client knowledge, behaviors, experiences, and health status. The key findings from the Baseline Survey are the following:

- Use of Cooling Equipment – Most clients (about 75%) perceive that air conditioning is affordable to use and would use it if they had it. Some clients (about 17%) perceive that an evaporative cooler would be affordable to use, but an air conditioner would not. About 8% of clients perceive that both air conditioning and evaporative coolers are not affordable.

- Cooler Maintenance – Most clients (over 90%) perceive that evaporative coolers are not easy to maintain and that they would need some assistance in maintaining a cooler if it were installed in their homes.

- Strategies for Keeping Homes Cool and Staying Safe – Few clients can articulate an effective strategy for keeping their homes cool or for keeping themselves safe when it gets hot.

- Symptoms of Heat-Related Illness – Few clients have a good understanding of the symptoms that they might experience if they had a heat-related illness.

- Home Cooling Behaviors – Most clients (74%) cooled with fans prior to program enrollment. While most of those clients used fans safely by drinking more water, about 10% of clients used fans frequently or sometimes and did not drink more water to stay hydrated.

- Incidence of Symptoms of Heat-Related Illnesses – Three-fourths of clients were "uncomfortably hot" in three or more of the previous seven days. Most clients reports some symptoms of heat-related illness, with 54% reporting loss of appetite, 29% reporting nausea, and 45% reporting headaches. For most symptoms, more than 80% of clients with those symptoms reported that they were "caused or made worse by the heat."

- Independence – Most clients (70%) had barriers that prevented them from getting out of the house. While clients feel "connected" to others, many (67%) see a person from outside their home three times or fewer during a typical week. Less than half of the clients are able to cook and do household chores frequently.

In general, the clients served by the pilot program are in need of cooling equipment that can help them make their homes more comfortable and that can help to address some of their potential for heat-related illnesses.

Impact of the Program – Follow-Up Survey and Analysis

The Follow-Up Survey was designed to capture information on how the status of clients changed after to the installation of the evaporative cooler. The survey collected information on client knowledge, behaviors, experiences, and health status. The key findings from the Follow-Up Survey are the following:

- Use of Cooling Equipment – Most clients (92%) perceive that an evaporative cooler is affordable to use and almost all (99%) reported that they used their evaporative cooler.

- Cooler Maintenance – Most clients (82%) perceive that evaporative coolers are easy to maintain. However, while most clients (95%) report that their cooler has been properly maintained, only about 60% report that they took the actions necessary for cooler maintenance. Moreover, in about half of the cases where the cooler was maintained, the work was done by the REACH program agency.

- Strategies for Keeping Homes Cool and Staying Safe – The follow-up survey showed that the program did not make improvements in client knowledge of effective cooling strategies; few clients can articulate an effective strategy for keeping their homes cool or for keeping themselves safe when it gets hot. However, with the installation of the evaporative cooler, clients were less likely to need to use those strategies.

- Symptoms of Heat-Related Illness – The follow-up survey showed that the program did not make improvements in client knowledge of the symptoms of heat-related illness; few clients have a good understanding of the symptoms that they might experience if they had a heat-related illness.

- Incidence of Symptoms of Heat-Related Illnesses – The follow-up survey showed that clients had a much lower incidence of the symptoms of heat-related illnesses during the postprogram period. In the postprogram period, 80% of clients reported that they were not "uncomfortably hot" at any time in the previous seven days. In addition, there was a reduction in the reported incidence of the symptoms of heat-related illness, including:

    - The incidence of clients reporting loss of appetite fell from 54% to 20%.

    - The incidence of clients reporting nausea fell from 29% to 17%.

    - The incidence of clients reporting headaches fell from 45% to 30%.

- Self Reports on the Cause of Heat-Related Illnesses – During the preprogram period, for most symptoms, more than 80% of clients with those symptoms reported that they were "caused or made worse by the heat." During the postprogram period, for most symptoms, only one-third o one-half of the clients reported that those symptoms were "caused or made worse by the heat."

- Independence – In the preprogram period, less than half of the clients were able to cook and do household chores frequently. In the post-program period, almost two-thirds of the clients reported that they were able to cook and do household chores frequently.

The baseline survey showed that the clients served by the pilot program were in need of cooling equipment to help to make their homes more comfortable and to help to address some of their potential for heat-related illnesses. The follow-up survey showed that the program had successfully delivered cooling equipment, clients used the cooling equipment, clients reported fewer symptoms of heat-related illness, and clients reported that they were more likely to be able to cook for themselves and do household chores.

The analysis found that installation of the evaporative coolers did not increase client usage of electricity, but that it did increase client usage of water. On average, the water bills for a small sample of clients increased by about $30 per month.

Recommendations

The purpose of the Colorado Evaporative Cooling Demonstration Project was to develop a model for reducing the vulnerability of elderly and disabled households to periods of unsafe heat by furnishing home cooling equipment to those households and educating clients about how to stay safe during periods of unsafe heat.

Program Impacts

The pilot program installed cooling equipment in the homes of elderly and disabled clients. In a baseline survey, most of those clients reported being "uncomfortably hot" in their homes during one or more of the last seven days. The clients also reported a high incidence of symptoms of heat-related illnesses and many of the clients perceived that the symptoms were "caused or made worse by the heat." And, less than half of the clients reported that they "frequently" cooked for themselves or were able to do household chores.

In a follow-up survey conducted at the same time of the year as the client's baseline survey, most clients reported that they were never "uncomfortably hot" in the previous seven days. Moreover, clients reported a substantially lower incidence of the symptoms of heat-related illness. And, almost two-thirds of clients reported that they were able to cook for themselves and do household chores. These findings suggest that the installation of the cooling equipment can have a positive impact on the health and safety of these elderly and disabled clients.

The study findings would have been more robust if a control group had been included in the study design. In addition, longer term study would be needed to assess whether the reduction in the symptoms of heat-related illness lead to better health outcomes.

Client Education

As part of the pilot program, clients were presented with some information on ways to stay safe and healthy during periods of unsafe heat. The program attempted to educate clients about ways to keep their home cool without using their home cooling equipment. The program also attempted to educate clients about how to protect themselves from heat-related illnesses and how to recognize when they might be suffering from a heat-related illness. Comparing the baseline survey to the follow-up survey, we did not find that the program was successful in increasing the ability of clients to articulate a proactive strategy for staying health and safe during periods of unsafe heat.

Use of Evaporative Coolers

The pilot program installed evaporative coolers in the homes of low-income elderly and disabled clients because it was perceived that they would use less energy and therefore be more affordable for those clients. It was expected that clients would be more likely to use their evaporative coolers than air conditioning because they would perceive that it is affordable. Several important research questions remained unanswered by the study.

- Client Perceptions – In the baseline survey, most clients reported that they perceived that air conditioning was an affordable way to cool their homes. If air conditioners had been installed, it is possible that the clients would have received the same benefits.

- Equipment Costs – The evaporative coolers that were installed were less expensive to install than central air conditioning, but were more expensive than a room air conditioner. It is possible that a room air conditioner could have delivered similar benefits for a lower installation cost.

- Cooling Needs – With the climate in Colorado, it appears that the clients served by this program need cooling equipment that can keep their home cool during the hottest part of the day. In addition, since many of these clients use only one or two rooms at that time, it is possible that a room air conditioner could meet the client's cooling needs.

- Water Usage and Maintenance – From the small sample of clients for whom we were able to obtain water usage data, it appears that the use of coolers will increase water usage and water bills for clients using evaporative coolers. And, it is unclear how well maintained the coolers are and whether a failure to maintain the coolers will reduce their effectiveness in the long run.

While the pilot program was successful in installing cooling equipment in the homes of clients who had no other source of cooling, it is important to consider whether other equipment choices might have been more effective in the long run for these clients.

Recommendations

The pilot program furnishes evidence that installation of cooling equipment in the homes of low-income elderly and disabled households can improve their health status. However, before expanding the program, it would be appropriate for policymakers to study other options for delivering the same services.

- Need for Cooling – It is clear that the low-income elderly and disabled households in Colorado need cooling equipment to help them stay healthy and safe in their homes. Policymakers should consider ways to deliver those services to clients in a way that is affordable and sustainable.

- Need for Education – The low-income elderly and disabled clients in this study did not have a good understanding of how to keep their homes cool without air conditioning, did not have a good understanding of how to stay safe when their home was uncomfortably hot, and were not aware of the symptoms of heat-related illness. Policymakers should consider development of public education programs and direct client education programs that focus on those issues.

- Cooling Equipment Alternatives – Evaporative coolers appear to be one good option for furnishing cooling services to clients. However, before expanding the program to a larger population, policymakers should resolve issues related to water use and cooler maintenance. In addition, policymakers should examine and possibly test other options for delivering cooling services to clients; including, but not limited to energy-efficient room air conditioners.

The Colorado Evaporative Cooling Demonstration Project met its primary goal of finding a safe and affordable way to deliver cooling services to low-income elderly and disabled clients. However, additional study is needed to develop a strategy that can serve the needs of all vulnerable low-income elderly and disabled clients.

I. Introduction

The purpose of the Colorado Evaporative Cooling Demonstration Project was to develop a model for reducing the vulnerability of elderly and disabled households to periods of unsafe heat by furnishing home cooling equipment to those households and educating clients about how to stay safe during periods of unsafe heat. The purpose of this impact evaluation is to assess the performance of the Colorado Evaporative Cooling Demonstration Project. The process evaluation assessed the efficiency and effectiveness of program procedures, and developed recommendations for changes to be implemented in the second year of the program. This impact evaluation measured pre and post data for clients on factors including health, independence, cooling behaviors, and consumption of water and electricity. This evaluation will assist program administrators, State LIHEAP administrators, and federal REACh grant administrators to determine the feasibility and desirability of replicating the program throughout Colorado and other areas.

A. Colorado Evaporative Cooling Demonstration Project

Elderly and disabled individuals are at higher risk for heat-related illnesses and deaths due to their greater likelihood of having a vulnerable health status, as well as the increased probability of being socially isolated and economically disadvantaged. The Colorado LIHEAP office, in conjunction with local agency partners Sun Power, Inc., and the Pueblo Department of Housing and Human Services, procured funding from the federal Residential Energy Assistance Challenge Program (REACh) for the Colorado Evaporative Cooling Demonstration Project. The Project was implemented in the counties of Denver, Jefferson, Pueblo, Baca, Bent, Crowley, Kiowa, Otero, and Prowers during fiscal years 2005, 2006, and 2007.

The REACh program, sponsored by the United States Department of Health and Human Services, funds programs that aim to:

- Minimize the health and safety risks that result from high energy burdens.
- Increase the efficiency of energy usage by low-income families.
- Target energy assistance to individuals who are most in need.

The Evaporative Cooling Project will address the vulnerability of the elderly and disabled to prolonged periods of high temperatures by accomplishing the following:

- Installing evaporative cooling equipment that will reduce summer in-home temperatures in a way that is affordable to program participants.
- Educating program participants about strategies for reducing their exposure to heat during periods when parts of their homes are above a comfortable temperature.

- Establishing a contact system whereby evaporative cooler maintenance requirements are adequately explained and clients are provided with maintenance reminders and assistance when necessary.

The expected outcomes of this project are:

- Client utilization of evaporative coolers in place of less effective cooling strategies when temperatures are unsafe.
- Reduction in clients' risk for heat-related illness symptoms.
- Maintenance of total electricity and water consumption in the home at affordable levels.
- Maintenance of long-term equipment integrity.
- Increased ability for clients to be independent and active in their homes on hot days.

The program evaluation will assess the extent to which these outcomes are realized.

B. Impact Evaluation

The Evaporative Cooler Demonstration Project was designed to furnish evaporative coolers to low-income elderly and disabled households. The purpose of the Impact Evaluation is to determine the effectiveness of the program in improving the health, safety, and comfort of households without detracting from the affordability of electricity and water services.

The Impact Evaluation questions are:

- Knowledge of Cooler Use – Do clients understand how to use evaporative coolers effectively?
- Cooler Use – Do clients use the coolers in place of less effective cooling strategies during periods when temperatures are unsafe?
- Health Behaviors – Do clients understand how to remain safe and healthy during periods when temperatures are unsafe?
- Health Impacts – Do clients have fewer symptoms of heat-related illnesses? Are clients less likely to attribute symptoms to the temperature of their home?
- Client Independence – Are clients able to undertake more activities of daily living that represent a healthy lifestyle?
- Electric and Water Costs – Do clients' costs for electricity and water remain affordable?

- Cooler Maintenance – Are coolers maintained in such a way that they will continue to deliver program benefits to clients for at least five years?

The Impact Evaluation research activities included:

- *Baseline Survey:* We conducted a survey with clients prior to the installation of the evaporative cooler to capture baseline information on the knowledge, behaviors, experiences, and health status of clients.

- *Follow-Up Survey:* We conducted a survey with clients one year after the evaporative cooler was installed to measure the impact of the program on client knowledge, behaviors, experiences, and health status.

- *Electricity Usage Analysis:* We collected electric billing data and conducted an analysis of the change in electric usage associated with the program.

- *Water Usage Analysis:* We collected water billing data and conducted an analysis of the change in electric usage associated with the program.

- *Evaporative Cooler Maintenance Analysis:* We conducted a survey of the maintenance of the evaporative coolers.

These research activities allowed the evaluation team to measure the impacts of the program and to make recommendations regarding the long-term potential for the program to deliver the targeted outcomes.

C. Organization of the Report

Four sections follow this introduction.

1) *Section II – Research Methodology:* This section identifies the impact research questions and outlines the impact evaluation activities.

2) *Section III – Baseline Profile of Program Participants:* This section furnishes baseline information for program participants prior evaporative cooler installation.

3) *Section IV – Follow-Up Status of Program Participants:* This section furnishes information for program participants one year after evaporative cooler installation.

4) *Section V – Recommendations:* This section discusses the findings and recommendations from the project.

APPRISE prepared this evaluation plan under contract to the Colorado Department of Human Services (HHS). HHS and The Colorado Weatherization Assistance Program facilitated this evaluation plan by providing information and feedback to APPRISE. Any errors or omissions in this report are the responsibility of APPRISE.

II. Research Methodology

The Colorado Evaporative Cooling Demonstration Project furnished evaporative coolers to low income elderly and disabled households. The goal of the project is to increase the health and safety of these households by furnishing them with a low cost and effective approach to cooling their homes. In this section of the report, we outline the program design, present the program logic model, and review the research procedures that were used to assess the program impact.

A. Program Design

In this program, two local weatherization service delivery agencies were responsible for providing services under the Evaporative Cooler Demonstration Project. The program design included the following elements.

- Program Outreach – The primary sources of referrals were local community-based organizations (CBOs) and provider weatherization lists. The state LEAP office recruited a number of local community groups to furnish referrals to the program. The provider agencies could also recruit clients from their weatherization database.

- Program Intake – There were two components of program intake. The agency must confirm that the household is eligible for services (i.e., meets income and age/disability requirements) and that an evaporative cooler can be installed in the client's home. Preliminary screening was conducted by telephone. Final assessment of program eligibility was conducted at the client's home.

- Service Delivery – Installation of the evaporative cooler in the client's home required the installation of the unit and the installation of a water line to the unit. In addition, the service technicians oriented clients to the operation of the evaporative cooler.

- Maintenance Follow-Up – Required maintenance for evaporative coolers included covering the cooler and draining the water line in the fall and uncovering the cooler and turning on the water in the spring. The provider agencies were contacting clients to ensure that coolers are maintained and are conducting site visits if they have any questions about the client's ability to maintain the coolers.

In total, the provider agencies had a goal of delivering 750 evaporative coolers to elderly and disabled low-income households.

A. Program Logic Model

The purpose of the logic model is to explicitly identify the assumptions on which the need for the program was based and to demonstrate how the program activities are expected to address the needs of program participants. Table 1 on the next page presents the logic model. On the following pages, we furnish a detailed discussion of the logic model.

Table 1
Colorado Evaporative Cooling Demonstration Project Logic Model

<table>
<tr><th>Assumptions</th><th>Activities</th><th>Immediate Outcomes</th><th>Intermediate Outcomes</th><th>Program Impacts</th></tr>
<tr><td>There are elderly and disabled low-income households that are unable to cool their homes during periods of unsafe heat.</td><td rowspan="5">Network with social service agencies to identify elderly and disabled households in need of cooling equipment.

Conduct intake with clients to ensure that they meet the targeted profile.

Install evaporative coolers in the homes of 750 targeted low-income households.

Educate clients about how to use evaporative coolers most effectively.</td><td rowspan="5">Clients have the capacity to cool their homes during periods of unsafe temperatures.

Clients understand how to use evaporative coolers effectively.</td><td rowspan="5">Clients use evaporative coolers in place of less effective cooling strategies when temperatures are unsafe

Clients experience fewer heat related illnesses.

Clients’ summer electric bills are as affordable as those before installation of the coolers.

Clients’ summer water bills are as affordable as those before installation of the coolers.</td><td rowspan="8">Clients are able to be more independent and active in their homes.</td></tr>
<tr><td>Targeted clients without cooling equipment use suboptimal strategies for coping with the heat that can lead to health problems.</td></tr>
<tr><td>Evaporative coolers are the least costly way to furnish cooling services to clients.</td></tr>
<tr><td>Evaporative coolers do not result in unaffordable increases in electric bills or water bills.</td></tr>
<tr><td>Clients will use equipment because they perceive that EV coolers are a budget conscious way to cool.</td></tr>
<tr><td>Plan #1
Clients or their caretakers will be able to maintain the EV cooler systems so that they operate efficiently.</td><td>Plan #1
Furnish technical education to client and/or caretaker.</td><td rowspan="3">Clients have the capacity to maintain EV coolers – either by themselves or because they have a maintenance contract with the agency.</td><td rowspan="3">EV coolers are maintained appropriately and remain operational.</td></tr>
<tr><td>Plan #2
Clients are able to maintain the EV cooler with reminders and technical assistance from community agencies.</td><td>Plan #2
Furnish technical education along with follow-up contacts.</td></tr>
<tr><td>Plan #3
Community agencies must furnish EV cooler maintenance to some or all clients.</td><td>Plan #3
Conduct EV cooler maintenance twice a year.</td></tr>
</table>

B. Research Methodology

The Evaporative Cooler Demonstration Project was designed to furnish evaporative coolers to 750 low-income elderly and disabled households. The purpose of the Impact Evaluation is to determine the effectiveness of the program in improving the health, safety, and comfort of households without detracting from the affordability of electricity and water services.

The Impact Evaluation questions are:

- Knowledge of Cooler Use – Do clients understand how to use evaporative coolers effectively?
- Cooler Use – Do clients use the coolers in place of less effective cooling strategies during periods when temperatures are unsafe?
- Health Behaviors – Do clients understand how to remain safe and healthy during periods when temperatures are unsafe?
- Health Impacts – Do clients have fewer symptoms of heat-related illnesses? Are clients less likely to attribute symptoms to the temperature of their home?
- Client Independence – Are clients able to undertake more activities of daily living that represent a healthy lifestyle?
- Electric and Water Costs – Do clients' costs for electricity and water remain affordable?
- Cooler Maintenance – Are coolers maintained in such a way that they will continue to deliver program benefits to clients for at least five years?

The Impact Evaluation research activities included:

- *Baseline Survey:* We conducted a survey with clients prior to the installation of the evaporative cooler. The purpose of these interviews was to capture baseline information on the knowledge, behaviors, experiences, and health status of clients prior to service delivery.
- *Unsafe Heat Survey:* We conducted a survey with clients during periods when afternoon temperatures are unsafe. The purpose of these interviews was to assess whether the clients use evaporative coolers during periods of unsafe heat and to measure the health status of individuals during such periods.
- *Follow-Up Survey:* We conducted a survey with clients one year after the evaporative cooler was installed. The purpose of the survey was to measure the impact of the program on client knowledge, behaviors, experiences, and health status.

- *Electricity Usage Analysis:* We collected electric billing data and conducted an analysis of the change in electric usage associated with the program.

- *Water Usage Analysis:* We collected water billing data and conducted an analysis of the change in electric usage associated with the program.

- *Evaporative Cooler Maintenance Analysis:* We conducted a survey of the maintenance of the evaporative coolers to assess whether the coolers were being maintained and what options were available to ensure the long-term performance of the systems.

These research activities allowed the evaluation team to measure the impacts of the program and to make recommendations regarding the long-term potential for the program to deliver the targeted outcomes.

1. Baseline Survey

The purpose of the baseline survey was to collect information on the status of clients prior to the delivery of program services. The key measurement dimensions included:

- Client Perceptions – Prior to the delivery of program services, did clients perceive that evaporative coolers are a budget conscious way to cool their homes?

- Client Behaviors – Prior to the delivery of program services, did clients use suboptimal strategies for coping with the heat that can lead to health problems?

- Client Health – Prior to the delivery of program services, did clients actually experience the symptoms of heat-related illnesses?

- Client Activities – Prior to the delivery of program services, did the client restrict activities of daily living in response to the heat?

The Baseline Survey instrument can be found in Appendix A of the Final Evaluation Plan.

Issues

It was challenging to administer the baseline survey. It had to be completed after program intake, but prior to service delivery. In addition, the survey had to be completed during the summer months, since it asks about experiences with the heat over the last week. Finally, it was targeted to those clients with coolers installed during the first year of the program so that a follow-up survey could be conducted. The baseline survey was conducted during the months of June through September of 2005.

2. Follow-Up Survey

The purpose of the follow-up survey was to collect information on the status of clients one year after the delivery of program services. The key measurement dimensions included:

- Client Perceptions – One year after the delivery of program services, did clients perceive that evaporative coolers were a budget conscious way to cool their homes?
- Client Behaviors – One year after the delivery of program services, did clients use suboptimal strategies for coping with the heat that could lead to health problems?
- Client Health – One year after the delivery of program services, did clients actually experience the symptoms of heat-related illnesses?
- Client Activities – One year after the delivery of program services, did the client restrict activities of daily living in response to the heat?
- Client Satisfaction – One year after the delivery of program services, how satisfied was the client with the evaporative cooler and the impact of the evaporative cooler on water and electricity bills?
- Cooler Maintenance – One year after the delivery of program services, was the cooler being maintained and did that place a burden on the client?

The Follow-Up Survey instrument can be found in Appendix C of the Final Evaluation Plan.

Issues

We attempted to conduct a Follow-Up Survey for those clients that received a Baseline Survey. In that way, we could directly measure the change in status of clients served by the program.

It also was important to collect information for the Follow-Up Survey from the individual who completed the Baseline Survey if possible. While the survey respondent can report on anyone in the household, the measurement is likely to be more accurate if the same individual is interviewed.

The goal for the Follow-Up Survey was to conduct the survey one year after the Baseline Survey was conducted. For example, if a client was interviewed for the Baseline Survey in July 2005, we attempted to conduct the Follow-Up Survey in July 2006. In that way, we have the greatest chance of getting a comparable measurement of the status of the vulnerable individual.

3. Electric Data Collection and Analysis

The purpose of the electric data collection and analysis was to measure the change in electric usage after the installation of the evaporative cooler. The key measurement dimensions include:

- Annual Electric Usage – What was the change in annual electric usage in the period prior to and after service delivery?

- Summer Electric Usage – What was the change in summer electric usage [June, July, and August] in the period prior to and after service delivery?

We obtained electric usage data directly from each client's electricity supplier. The materials that were used for that data collection can be found in Appendix D of the Final Evaluation Plan.

Issues

For households who received evaporative coolers during the summer of 2005, we requested baseline electric usage data (for the previous 18 months) in October 2005. In October 2006, we requested an additional 12 months of electric usage data.

4. Water Data Collection and Analysis

The purpose of the water data collection and analysis was to measure the change in water usage after the installation of the evaporative cooler. The key measurement dimensions include:

- Annual Water Usage – What was the change in annual water usage in the period prior to and after service delivery?

- Summer Water Usage – What was the change in summer [June, July, and August] water usage in the period prior to and after service delivery?

We obtained water usage data directly from each client's water supplier. The materials that were used for that data collection can be found in Appendix E of the Final Evaluation Plan.

Issues

For households who received evaporative coolers during the summer of 2005, we requested baseline water usage data (for the previous 18 months) in October 2005. In October 2006, we requested an additional 12 months of water usage data.

III. Baseline Profile of Program Participants

The purpose of the Baseline Survey was to capture information on the status of clients prior to the installation of the evaporative cooler. The survey collected information on client knowledge, behaviors, experiences, and health status. The results of the Baseline Survey are compared to the results from the Follow-Up Survey to assess the program impact. In this section of the report, we present information on the findings from the Baseline Survey.

A. Evaporative Cooler Knowledge

One of the key program assumptions was that clients would perceive that evaporative coolers are a "budget conscious way to cool their homes." For that reason, it was expected that clients would be more likely to make use of evaporative coolers than air conditioners.

Our analysis finds that this assumption was true for some clients. Table 3-1 shows that 38% of clients perceived that an air conditioner was more expensive to operate. However, 7% said that an evaporative cooler was more expensive and 1% said that they cost the same. Most of concern was that more than half of the clients did not know whether an evaporative cooler was more or less expensive to use than an air conditioner.

Table 3-1
Perceived Affordability of Air Conditioner and Evaporative Cooler

Which of the following is more expensive to use: an air conditioner or an evaporative cooler?	
AC More Expensive	38%
EV Cooler More Expensive	7%
Equally Expensive	1%
Do Not Know the Difference	11%
Do Not Know	43%

However, our concern that clients would not use the evaporative cooler because of the expense was somewhat mitigated by their response to a question about the affordability of air conditioning. Table 3-2 shows that 92% of clients who did not know whether an air conditioner was more expensive than an evaporative cooler felt that air conditioner was affordable to use.

Table 3-2
Perceived Affordability
(Clients that did not know the difference between an AC and EV Cooler)

Air conditioning is affordable to use. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement?	
Agree	67%

Somewhat Agree	25%
Somewhat Disagree	0%
Disagree	8%

Among those households that did know the difference between an air conditioner and an evaporative cooler, Table 3-3 shows that 93% thought that an evaporative cooler was affordable to use, while only 56% thought an air conditioner was affordable to use. Taking the responses to Tables 3-2 and 3-3 together, we find that about 80% of clients perceive that air conditioning is affordable to use. Of the remaining households, most feel that, while an air conditioner is not affordable, an evaporative cooler is affordable. These statistics suggest that an air conditioner installation program is likely to be successful with about 80% of clients, while the evaporative cooler program is likely to be successful with 92% of clients.

Table 3-3
Perceived Affordability
(Clients that knew the difference between an AC and EV Cooler)

Air conditioning is affordable to use. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement? **An evaporative cooler is affordable to use. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement?**		
	Air Conditioning is Affordable to Use	**An Evaporative Cooler is Affordable to Use**
Agree	43%	80%
Somewhat Agree	13%	13%
Somewhat Disagree	12%	4%
Disagree	33%	4%

One of the key concerns with the evaporative cooler was that people would be unable to maintain them. The Baseline Survey found that clients were concerned about cooler maintenance. Table 3-4 shows that only 6% of clients agree with the statement that "an evaporative cooler is easy to maintain."

Table 3-4
Evaporative Cooler Maintenance

An evaporative cooler is easy to maintain. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement?	
Yes	6%
No	91%

B. Client Health Knowledge and Behaviors

One important program assumption was that "clients without cooling equipment would use suboptimal strategies for coping with the heat that could lead to health problems." The concern has several dimensions.

- Keeping Homes Cool – There is concern that the client will not know how to keep their home as cool without cooling equipment. The best strategies are to close shades and to keep doors and windows closed when it is cooler inside than outside.

- Staying Safe – There is concern that the client will not know how to keep themselves safe when their home does get hot. The best strategies are to drink water, stay indoors out of the sun, wear light clothing, and limit physical activity. In most cases, opening windows actually raises the temperature in the home and using fans can dehydrate an elderly person if they do not drink enough water.

- Awareness of Symptoms – It also is important for clients to know the signs that they may be experiencing heat-related illness. If they are aware of possible symptoms of heat-related illness, they may be able to more effectively manage their situation during periods when the temperatures are unsafe.

- Presence of Symptoms – The presence of symptoms of heat-related illness is a potential indication of the need for the cooling equipment supplied by this program.

The Baseline Survey furnished information on all of these dimensions and give us a good understanding of the knowledge and awareness of clients. Table 3-5 shows the strategies that clients reported using to keep their homes cool. About one-third of clients knew that closing shades would help keep their home cool and about one-fifth knew that keeping their doors and windows closed during the day is appropriate. Only 17% of the clients suggested using air conditioning because most did not have access to AC. Almost four in ten households reported using fans and opening windows to keep their homes cool. In Colorado, using fans can lead to dehydration and opening windows can let hot air into the home.

Table 3-5
Strategies for Keeping Homes Cool

When it is hot, what are the things a person should do to keep cool?	
Effective	
Close Shades	31%
Keep Doors/Windows Closed	21%
Use AC	17%
Ineffective	
Use Fans	38%

Open Windows	18%

Table 3-6 shows the strategies that clients reported using to keep themselves safe when it is hot outside. Some clients were aware that taking cold showers, staying indoors, hydrating, and wearing light clothing would be effective. However, on average, the most clients could only report one strategy for staying safe.

Table – 3-6
Strategies for Staying Safe

When it is hot, what are the things a person should do to keep cool?	
Take Cold Showers	32%
Stay Indoors/Out of Sun	26%
Hydrate	19%
Wear Proper Clothing	12%
Go Where There is Air Conditioning	2%

It is also important for a client to know when they might be getting sick from being too hot. Table 3-7 shows the health symptoms that clients recalled that might be consistent with heat-related illness. Table 3-8 shows that, on average, while clients could only name one symptom, the survey showed that, on average, clients reported that they had experienced 2.4 of the symptoms in the last week. Prior to installation of the Evaporative Coolers, clients were experiencing the symptoms of heat-related illness, but were not aware that those symptoms were related to being too hot.

Table – 3-7
Symptoms Recalled

If a person is sick because it is too hot, what kinds of symptoms might they experience?	
Dizziness	38%
Low Energy	29%
Nausea	18%
Headaches	14%
Loss of Appetite	1%

Table – 3-8
Heat-Related Illness Symptoms Recalled and Experienced

	Mean	Median	Mode
Number of Symptoms Recalled	1.01	1	1
Number of Symptoms Experienced	2.42	2	2

Source – Baseline Survey (136 clients)

C. Home Cooling Behaviors

It is important to understand how clients cooled their homes prior to the installation of the evaporative coolers. In the Baseline Survey, we asked clients about previous experience with air conditioners and their current cooling practices. Table 3-9 shows that the majority of clients have never used either air conditioning or evaporative coolers in their homes. Table 3-10 shows that 65% of clients say that they have home cooling equipment, but that most of those (67%) consider fans to be home cooling equipment. Table 3-11 shows that only 7% of the program clients have AC, while 74% cool with fans, and 19% use some other strategy for cooling.

Table 3-9
Past Use of Home Cooling Equipment

In the past, have you ever regularly used air conditioning to cool your home? In the past, have you ever regularly used an evaporative cooler to cool your home?		
	Used A/C Previously	**Used EV Cooler Previously**
Yes	28%	32%
No	71%	66%

Table 3-10
Home Cooling Equipment

Do you currently have cooling equipment in your home? What kind of cooling equipment do you have?	
% with Home Cooling Equipment	65%
Fans	67%
EV Cooler	20%
Air Conditioner	20%

Table 3-11
Personal Cooling Strategy

Use AC	7%
Use Fans	74%
Other	19%

Program managers are concerned about fan use because, in Colorado's dry climate, use of fans can lead to dehydration. Table 3-12 shows that 79% of clients use fans frequently and that 10% use fans sometimes. In order to assess whether fans were being used safely, we checked fan use against reports that the client drank extra water when it is hot. We found

that most clients use fans safely (i.e., drink extra water when it is hot and they are using fans). However, 12% of clients were at risk for dehydration due to their failure to drink extra water when they were using a fan on a hot day. Table 3-13 shows that most clients do take positive actions to keep themselves cool when their house is too hot. When prompted, most clients report that they take appropriate actions to keep their home cool and keep themselves safe. Table 3-14 shows that almost nine in ten clients close their shades and that almost all clients reported that they "always or sometimes" drink more water. However, the concern is clients do not have a consistent strategy for staying safe when the temperature gets above 90 degrees.

Table 3-12
Fan Use

When your house is too hot, how often do you use fans? Is it frequently, sometimes, seldom, or never?				
	Frequently	**Sometimes**	**Seldom**	**Never**
Use Fans	79%	10%	3%	8%

Table 3-13
Safe/Unsafe Fan Use

Safe Fan Use	88%
Unsafe Fan Use	12%

Table 3-14
Cooling Behaviors

When your house is too hot, do you do any of the following to keep yourself cool?				
	Frequently	**Sometimes**	**Seldom**	**Never**
Close Shades	74%	14%	4%	9%
Take Cold Showers	31%	24%	4%	40%
Drink More Water	85%	10%	3%	3%
Go Where There is AC	13%	29%	21%	38%

D. Health Status and Knowledge

The Baseline Survey gives us information on the client's perceptions of their health status prior to installation of the evaporative cooler, the incidence of symptoms of heat-related illness, and their perceptions of the impact of the heat on their symptoms.

Table 3-14 shows us that the average client for this program perceives that their health is only fair, with one-fourth indicating that it is poor and only 11 percent saying that it is

excellent or very good. Table 3-15 shows that clients had an average of 15 days of poor physical health and 7 days of poor mental health in the last 30 days. Table 3-16 shows that only about one-third of the clients report that he/she frequently sleeps through the night, while almost one-third report that he/she seldom or never sleeps through the night.

Table 3-14
Participant Health Self-Rating

Would you say that in general your health is?	
Excellent	4%
Very Good	7%
Good	27%
Fair	35%
Poor	25%

Table 3-15
Physical and Mental Health

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past thirty days was your physical health not good? Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past thirty days was your mental health not good?		
	Mean	**Standard Deviation**
Physical Health	15	12.6
Mental Health	7	9.7

Table 3-16
Sleeping Well

Do you sleep well through the night frequently, sometimes, seldom or never?	
Frequently	32%
Sometimes	36%
Seldom	22%
Never	8%

The Baseline Survey also asked the client to discuss their comfort in the home, as well as the presence of symptoms of heat-related illness in the last week. Table 3-17 shows that 40% of clients were uncomfortably hot every day in the last week, while only 11% were comfortable all seven days. [Note: Since clients were interviewed at different times, they

will not have had the same experiences.] Table 3-18 shows that many of the clients reported symptoms of heat-related illness and that most of those reporting the symptoms said that they "were caused or made worse by the heat." While most clients report these symptoms, only 6% reported that they had to call a doctor or go to the hospital because of the heat.

Table 3-17
Days of Uncomfortably Hot Home

How many days in the last week, did it get so hot in your home that you were uncomfortable?	
0	12%
1-3	25%
4-6	23%
7	40%

Table 3-18
Experience with Heat-Related Illness Symptoms in Past Week

In the past week, have you or anyone in your household experienced any of the following symptoms? Do you think this symptom was caused or made worse by the heat?					
	Loss of Appetite	**Dizziness**	**Low Energy**	**Nausea**	**Headaches**
% Reporting Symptom	54%	40%	74%	29%	45%
% of the Above Reporting Symptom Caused or Made Worse by the Heat	82%	87%	89%	87%	69%

Table 3-19
Doctor/Hospital Visit Because of Hot Home

Have you or anyone in your household ever had to go to the doctor or hospital because your home was too hot?	
Yes	6%
No	91%

E. Independence

One of the long term goals of the program is to increase the rate at which "clients are able to be more independent and active in their homes." The Baseline Survey collected information on this topic.

Table 3-20 shows that about three-fourths of clients left their home three or fewer times in the last week. About half of the clients reported that they were prevented from leaving their home due to a physical barrier while for about one-fifth transportation was a problem.

These findings suggest that going to a place with air conditioning is not a good option for most of the clients.

Table 3-20
Number of Times Left Home

How many times, in the last week, did you leave your home?	
0	15%
1-3	58%
4-6	15%
7+	13%

Table 3-21
Presence of Barriers to Leaving Home

Is there anything that keeps you from getting out of your home more?	
Yes	70%
No	30%

Table 3-22
Barriers to Leaving Home

What is it that keeps you from getting out of your home more?	
Physical Impairment	51%
Mental Impairment	3%
Lack of Transportation	18%
Lack of Activities/People to See	6%
Heat	21%
Other	18%

Table 3-23 shows that almost two-thirds of clients indicated that they socialized with someone outside the home three times or fewer in the last week. However, Table 3-24 shows that most clients feel that they are very or somewhat "connected to other people." For those clients that do not see someone else every day, it is important that they have some way of dealing with the heat independently on days when temperatures reach unsafe levels.

Table 3-23
Number of Times Socialized

How many times, in the last week, did you socialize with people who did not live with you?	
0	14%

1-3	49%
4-6	19%
7+	21%

Table 3-24
Perception of Connectedness to Other People

How connected do you feel to other people?	
Very Connected	41%
Somewhat Connected	38%
Somewhat Isolated	13%
Very Isolated	4%

The Baseline Survey also collected information on the ability of clients to function independently in the home. The survey shows that less than half of clients frequently do household chores or cook (Table 3-25). Most clients get at least some help from others. Table 3-26 shows that 56% of clients get help with routine household chores and that 36% of clients need more intense help with personal needs.

Table 3-25
Frequency of Household Chores/Cooking

Do you clean, do dishes and other household chores frequently, sometimes, seldom or never? Do you cook in your home frequently, sometimes, seldom or never?				
	Frequently	**Sometimes**	**Seldom**	**Never**
Household Chores	44%	24%	13%	19%
Cook	44%	25%	12%	20%

Table 3-26
Needs Help from Others for Personal and Routine Needs

Because of any impairment or health problem, do you need the help of other persons with your *personal care* needs, such as eating, bathing, dressing, or getting around the house? **Because of any impairment or health problem, do you need the help of other persons in handling your *routine* needs, such as everyday household chores or shopping?** **Do you get help from a person who is paid?** **Do you get help from a person who lives with you?**		
	Personal Care Needs	**Routine Care Needs**

Yes	36%	56%
No	64%	43%
Help From Paid Person	23%	27%
Help From Person that Lives with Them	19%	39%

F. Summary of Findings

The Baseline Survey was designed to capture information on the status of clients prior to the installation of the evaporative cooler. The survey collected information on client knowledge, behaviors, experiences, and health status. The key findings from the Baseline Survey are the following:

- Use of Cooling Equipment – Most clients (about 75%) perceive that air conditioning is affordable to use and would use it if they had it. Some clients (about 17%) perceive that an evaporative cooler would be affordable to use, but an air conditioner would not. About 8% of clients perceive that both air conditioning and evaporative coolers are not affordable.

- Cooler Maintenance – Most clients (over 90%) perceive that evaporative coolers are not easy to maintain and that they would need some assistance in maintaining a cooler if it were installed in their homes.

- Strategies for Keeping Homes Cool and Staying Safe – Few clients can articulate an effective strategy for keeping their homes cool or for keeping themselves safe when it gets hot.

- Symptoms of Heat-Related Illness – Few clients have a good understanding of the symptoms that they might experience if they had a heat-related illness.

- Home Cooling Behaviors – Most clients (74%) cooled with fans prior to program enrollment. While most of those clients used fans safely by drinking more water, about 10% of clients used fans frequently or sometimes and did not drink more water to stay hydrated.

- Incidence of Symptoms of Heat-Related Illnesses – Three-fourths of clients were "uncomfortably hot" in three or more of the previous seven days. Most clients reports some symptoms of heat-related illness, with 54% reporting loss of appetite, 29% reporting nausea, and 45% reporting headaches. For most symptoms, more than 80% of clients with those symptoms reported that they were "caused or made worse by the heat."

- Independence – Most clients (70%) had barriers that prevented them from getting out of the house. While clients feel "connected" to others, many (67%) see a person from

outside their home three times or fewer during a typical week. Less than half of the clients are able to cook and do household chores frequently.

In general, the clients served by the pilot program are in need of cooling equipment that can help to make their homes more comfortable and that can help to address some of their potential for heat-related illnesses.

IV. Follow-Up Status for Program Participants

The purpose of the follow-up survey was to collect information on the status of clients one year after the delivery of program services. The key measurement dimensions included:

- Client Perceptions – One year after the delivery of program services, did clients perceive that evaporative coolers are a budget conscious way to cool their homes?
- Client Behaviors – One year after the delivery of program services, did clients use suboptimal strategies for coping with the heat that could lead to health problems?
- Client Health – One year after the delivery of program services, did clients actually experience the symptoms of heat-related illnesses?
- Client Activities – One year after the delivery of program services, did the client restrict activities of daily living in response to the heat?
- Client Satisfaction – One year after the delivery of program services, how satisfied was the client with the evaporative cooler and the impact of the evaporative cooler on water and electricity bills?
- Cooler Maintenance – One year after the delivery of program services, was the cooler being maintained and did that place a burden on the client?

In addition to the follow-up survey, the evaluation team obtained electric billing records and water billing records to measure the impact of evaporative cooler installation on electric usage and water usage.

This section of the report presents the findings from the follow-up survey and compares the baseline survey results to the follow-up survey results to assess the impact of the Evaporative Cooler Pilot Program.

A. Satisfaction

The follow-up survey collected information on client satisfaction with their evaporative cooler and with the evaporative cooler program. Tables 4-1 and 4-2 show that almost all clients (89%) said that they were very satisfied with their evaporative cooler and with the evaporative cooler program (91%). When asked for suggestions for improving the program, 70% of the clients had no suggestions. About 30% of the clients made suggestions; many of those suggestions related to improvement in service delivery, including furnishing cooler maintenance services, improving the installation of the cooler, or giving better instructions on the use and/or maintenance of the cooler.

Table 4-1
Overall Satisfaction with Cooler

Overall, how satisfied are you with the performance of your evaporative cooler?	
Very Satisfied	89%
Somewhat Satisfied	7%
Somewhat Dissatisfied	4%
Somewhat Dissatisfied	0%

Table 4-2
Overall Satisfaction with Evaporative Cooler Program

Overall, how satisfied are you with the evaporative cooler program?	
Very Satisfied	91%
Somewhat Satisfied	5%
Somewhat Dissatisfied	1%
Somewhat Dissatisfied	0%
Do Not Know	3%

Table 4-3
Recommendations for Improvements to the Program

Do you have any recommendations for improvements to the Program?	
Provide Maintenance or Follow-up	6%
Increase Program Outreach	6%
Provide Cooler Accessories	4%
Place Coolers in Better Places in the Home	4%
Speed Up Service Delivery	2%
Don't Give Portable Coolers	2%
Provide Smaller Coolers	2%
Give Better Instructions on Cooler Maintenance	2%
Insulate Window Area where Cooler is Installed	2%
No Suggestions	70%
Other	2%
Don't Know	4%

A. Perceived Impacts

Clients also were asked to furnish information on how they perceived that the program had affected their health and their cooling behaviors. Table 4-4 shows that about one-half of the program participants perceived that their health had improved since the installation of the evaporative cooler, while only 2% perceived that their health had gotten worse. Table 4-5 shows that almost two-thirds of program participants reported that their use of effective cooling procedures had increased.

Table 4-4
Perceived Change in Health Status

Since participating in the program, has your overall health improved, declined, or stayed the same?	
Improved	52%
Declined	2%
Stayed the Same	44%
Don't Know	2%

Table 4-5
Perception of Use of Effective Ways to Stay Cool

Since participating in the program, has your use of effective ways to stay cool in the heat increased, decreased, or stayed the same?	
Increased	66%
Decreased	2%
Stayed the Same	26%
Don't Know	6%

B. Evaporative Cooler Knowledge

During the installation of the evaporative cooler, clients were informed that the evaporative cooler was less expensive to operate than an air conditioner and were encouraged to use the evaporative cooler because it would help the client to stay healthy and safe.

In the baseline survey, only about 38% of the clients perceived that an evaporative cooler was less expensive to operate than an air conditioner. Table 4-6 shows that, in the follow-up survey, 70% of the clients reported that they perceived that an evaporative cooler was less expensive to operate than an air conditioner. However, the baseline survey also showed that most clients perceived that both air conditioning and evaporative coolers were affordable to use; from that perspective, the evaporative cooler education may not have had a big impact on the client's willingness to use evaporative coolers. Table 4-7 shows that 92% of clients reported that they perceive evaporative coolers to be an affordable way to cool their homes.

Table 4-6
Perceived Affordability of Air Conditioner and Evaporative Cooler

Which of the following is more expensive to use, an air conditioner or an evaporative cooler?	
AC More Expensive	70%
EV Cooler More Expensive	2%
Equally Expensive	0%
Do Not Know the Difference	6%
Do Not Know	22%

Table 4-7
Perceived Affordability
(Clients that know the difference between an AC and EV Cooler)

Air conditioning is affordable to use. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement? An evaporative cooler is affordable to use. Do you agree, somewhat agree, somewhat disagree, or disagree with this statement?		
	Air Conditioning is Affordable	**Evaporative Cooler is Affordable**
Agree	12%	88%
Somewhat Agree	2%	4%
Somewhat Disagree	4%	0%
Disagree	64%	0%
Don't Know	18%	8%

However, it also is important that clients continue to make use of their evaporative coolers. The follow-up survey asked clients about cooler maintenance, and the cost of electricity and water associated with the use of the evaporative cooler. Table 4-8 shows that most clients perceive that their evaporative cooler is easy to maintain. However, Table 4-9 shows that almost one-half of clients perceive that their electric bill has increased and Table 4-10 shows that over one-third of clients perceive that their water bill has increased.

Table 4-8
Evaporative Cooler is Easy to Maintain

An evaporative cooler is easy to maintain. Do you agree, somewhat agree, somewhat disagree, or disagree with that statement?	
Agree	82%
Somewhat Agree	8%
Do Not Know	10%

Table 4-9
Electricity Bill since Participating in the Program

Since you had the cooler installed, have your electricity bills increased, decreased, or stayed the same?	
Increased	46%
Decreased	8%
Stayed the Same	40%
Don't Know	6%

Table 4-10
Water Bill since Participating in the Program

Since you had the cooler installed, have your water bills increased, decreased, or stayed the same?	
Increased	36%
Decreased	2%
Stayed the Same	48%
Don't Know	14%

B. Client Health Knowledge and Behaviors

One important program assumption was that "clients without cooling equipment would use suboptimal strategies for coping with the heat that could lead to health problems." The concern has several dimensions.

- Keeping Homes Cool – There is concern that the clients will not know how to keep their home as cool without cooling equipment. The best strategies are to close shades and to keep doors and windows closed when it is cooler inside than outside.

- Staying Safe – There is concern that the clients will not know how to keep themselves safe when their home does get hot. The best strategies are to drink water, stay indoors out of the sun, wear light clothing, and limit physical activity. In most cases, opening windows actually raises the temperature in the home and using fans can dehydrate an elderly person if she/he does not drink enough water.

- Awareness of Symptoms – It also is important for clients to know the signs that they may be experiencing heat-related illness. If they are aware of possible symptoms of heat-related illness, they may be able to more effectively manage their situation during periods when the temperatures are unsafe.

- Presence of Symptoms – The presence of symptoms of heat-related illness is a potential indication of the need for the cooling equipment supplied by this program.

The Baseline Survey furnished information on all of these dimensions and give us a good understanding of the knowledge and awareness of clients. As part of the cooler installation, clients were to be educated on these issues. The Follow-Up Survey helps us to assess whether clients had a better understanding of how to keep themselves safe after the program was implemented.

Table 4-11 shows that the changes in client awareness between the baseline survey and the follow-up survey were inconsistent. The most important difference is that the follow-up survey showed that almost two-thirds of the clients in the follow-up survey suggested that an air conditioner or evaporative cooler should be used, compared to only 17% in the baseline survey.

Table 4-11
Strategies for Keeping Homes Cool

When it is hot, what are the things a person should do to keep cool?		
Effective	**Baseline Survey**	**Follow-Up Survey**
Close Shades	31%	18%
Keep Doors/Windows Closed	21%	32%
Use Air Conditioning	17%	64%
Ineffective		
Use Fans	38%	18%
Open Windows	18%	22%

Table 4-12 shows the strategies that clients reported using to keep themselves safe when it is hot outside in the baseline survey and the follow-up survey. The table shows that clients were more likely to report that someone should stay indoors and hydrate. Those strategies were the focus of the project education. However, many fewer clients reported that one should take cold showers, perhaps because they reported instead that one should turn on the air conditioning.

Table – 4-12
Strategies for Staying Safe

When it is hot, what are the things a person should do to keep cool?		
	Baseline Survey	**Follow-Up Survey**
Take Cold Showers	32%	8%
Stay Indoors/Out of Sun	26%	34%
Hydrate	19%	30%
Wear Proper Clothing	12%	14%

Go Where There is Air Conditioning	2%	0%

Table 4-13 shows the symptoms of heat related illness that the clients recalled in the baseline and follow-up surveys. The table shows that there was very little difference between the knowledge of clients prior to participation in the program compared to after participation in the program.

Table – 4-13
Symptoms Recalled

If a person is sick because it is too hot, what kinds of symptoms might they experience?		
	Baseline Survey	**Follow-Up Survey**
Dizziness	38%	40%
Low Energy	29%	34%
Nausea	18%	26%
Headaches	14%	20%
Loss of Appetite	1%	0%

In general, it does not appear that the education component of the Evaporative Cooler Pilot program was particularly effective. After participating in the program, clients did not have a better understanding of safe cooling practices and were not significantly more aware of the signs of heat-related illnesses.

C. Home Cooling Behaviors

The baseline survey showed that only 7% of the program participants had air conditioning prior to the installation of the evaporative cooler, while 74% of the clients used fans to cool themselves and 19% of the clients did not even have fans available. Table 4-14 shows that 99% of the follow-up survey respondents indicated that they were using their evaporative cooler. However, Table 4-15 indicates that only about half of the clients were using the cooler properly. Clients were encouraged to turn on their evaporative cooler in the morning to ensure that the home stayed cool. However, 20% of clients reported that they don't turn on their cooler until the afternoon and 31% of clients reported that they don't turn on their cooler until the house gets "uncomfortably hot."

Table 4-14
Recent Use of Home Cooling Equipment

This summer, have you been using air conditioning to cool your home? This summer, have you been using your evaporative cooler to cool your home?		
	Used A/C This Summer	**Used EV This Summer**
Yes	3%	99%
No	97%	1%

Table 4-15
Cooler Turn On Practices

On a hot day, when do you usually turn on your cooler?	
When they Get Up	8%
When the house gets uncomfortably hot	31%
Morning	29%
Afternoon	20%
Thermostat-Controlled	5%
It is on at night/I keep it on constantly	3%
At Night	3%
Other	1%

It is also important that the client use the evaporative cooler properly. Because the cooler draws air into the home, proper cooler operation requires that a window in another part of the house be opened to allow the warm air to exhaust and so as not to pressurize the home. Table 4-16 shows that about three-fourths of the clients reported that they "frequently" opened a window when operating their cooler. Additional education is needed on this issue to ensure that the cooler operates properly.

Table 4-16
Frequency of Opening a Window while Using Cooler

When you use your cooler, how often do you open a window in another part of your home? Is it frequently, sometimes, seldom, or never?	
Frequently	71%
Sometimes	16%
Seldom	8%
Never	5%

It also is important that the clients stop using their fans when the evaporative cooler is needed. Table 4-17 shows that 76% of clients have other home cooling equipment and that 95% of those report that they have fans. Table 4-18 shows that about one-fourth (28%) use their fans frequently and that about one-fourth (24%) use their fans sometimes. However, 93% report that they hydrate when they use fans (Table 4-19). Table 4-20 shows that only 20% of the clients use their fans to "cool down," while most use the fans to help circulate air or when they don't need to use the cooler. Table 4-21 shows that clients who report that they don't use their fans find that the evaporative cooler makes them unnecessary.

Table 4-17
Home Cooling Equipment

Not including the cooler the program installed, do your currently have any other cooling equipment in your home? What kind of cooling equipment do you have?	
% With Other Home Cooling Equipment	76%
Fans	95%
Air Conditioner	5%

Table 4-18
Fan Use

When your house is too hot, how often do you use fans? Is it frequently, sometimes, seldom, or never?				
	Frequently	**Sometimes**	**Seldom**	**Never**
Use Fans	28%	24%	10%	38%

Table 4-19
Safe/Unsafe Fan Use

Safe Fan Use	93%
Unsafe Fan Use	7%

Table 4-20
Reasons for Using Equipment

Why do you use this cooling equipment?		
	Fans	**EV Cooler**
To Cool Down	20%	100%
Circulate Air	43%	0%
Use in Evenings	2%	0%
Cooler Makes it Too Cool	5%	0%
Use When Not Using Cooler	11%	0%
Not Hot Enough to Use Cooler	2%	0%
Other	16%	0%

Table 4-21
Reasons for Not Using Equipment

Why don't you use this cooling equipment?		
	Fans	**EV Cooler**
No Need to Use With Cooler	91%	0%
Creates Too Much Breeze	9%	0%
Not Working	0%	100%

D. Evaporative Cooler Maintenance

To ensure the long-run integrity of the evaporative cooler, it is important that the cooler be properly maintained. The maintenance tasks in the fall included:

- Turn off the water line so it doesn't freeze.
- Drain the water line so that freezing temperatures don't crack the water lines.
- Put the cover on the cooler to protect it from the elements.

In the spring, the water line needs to be turned on and the cover needs to be removed.

Because of concerns about cooler maintenance, agencies were asked to conduct follow-up calls with the clients to make sure that coolers were being properly maintained. Table 4-22 shows that only 37% of clients remembered receiving such a contact.

Table 4-22
Agency Follow-Up

Has anyone from the provider agency re-explained to you how to use and maintain the cooler and thermostat since the cooler was installed?	
Yes	37%
No	58%
Don't Know	5%

Clients indicate that they believe that their cooler has been properly maintained (Table 4-23). However, only about two-thirds of the clients reported that the appropriate actions were taken in the fall and the spring (Tables 4-24 and 4-26). Moreover, about 40% of the time, the agency was taking responsibility for cooler maintenance (Tables 4-25 and 4-27), while the client was taking responsibility only about 10% of the time. These findings suggest that

proper maintenance of the cooler is an important barrier to the long-run success of any expanded evaporative cooler program for low-income elderly and disabled clients.

Table 4-23
Proper Maintenance of Cooler

Has your cooler been properly maintained?	
Yes	95%
No	4%

Table 4-24
Fall Maintenance Activities

In the fall, does someone perform the following maintenance activities?	
Turn off the Water Line in the Fall	65%
Drain the Water Line in the Fall	63%
Put the Cover on the Cooler	59%

Table 4-25
Fall Maintenance Providers

Who performs these maintenance activities in the fall?	
Agency Representative	37%
Child/Grandchild/Nephew	25%
Respondent	11%
Spouse/Partner	5%
Sibling	3%
Unpaid Caretaker/Guardian	1%
Don't Know	17%

Table 4-26
Spring Maintenance Activities

In the spring, does someone perform the following maintenance activities?	
Take the Cover off the Cooler	61%
Turn on the Water Line in the Fall	66%

Table 4-27
Spring Maintenance Providers

Who performs these maintenance activities in the spring?	
Agency Representative	41%
Child/Grandchild/Nephew	24%
Respondent	11%
Sibling	3%
Spouse/Partner	1%
Neighbor	1%
Don't Know	18%

Some clients received portable coolers because their homes could not have a window or wall cooler installed. Such coolers need to be emptied regularly. Table 4-28 shows that all clients report that the water is emptied regularly. But, Table 4-29 shows that only about 50% of the clients are able to do that task themselves.

Table 4-28
Portable Cooler Maintenance Activities

Did the installation crew explain how to maintain the portable cooler? Is your portable cooler hooked up to a water line? Is the water emptied regularly from the portable cooler?	
Explanation of how to maintain portable cooler by installation crew	60%
Portable Cooler Hooked Up to Water Line	10%
Water Emptied Regularly	100%

Table 4-29
Portable Cooler Maintenance Providers

Who empties the water in the portable cooler?	
Respondent	50%
Child/Grandchild/Nephew	30%
Spouse/Partner	10%
Refused	10%

E. Health Status and Knowledge

The baseline survey showed that clients were generally in poor health, that many clients experienced the symptoms of heat-related illness, and that many clients perceived that their symptoms were caused or made worse by the heat. In the follow-up survey, both the questions on the general health status and symptoms of heat-related illness were addressed.

Tables 4-30 and 4-31 show that there were few changes in health status for the clients between the baseline and the follow-up survey. About the same percentages of clients reported that their general health status as only fair or poor, and clients reported about the same number of days of poor physical and mental health in the last 30 days.

Table 4-30
Participant Health Self-Rating

Would you say that in general your health is?		
	Baseline Survey	**Follow-Up Survey**
Excellent	4%	2%
Very Good	7%	10%
Good	27%	34%
Fair	35%	30%
Poor	25%	24%

Table 4-31
Poor Physical and Mental Health

Now thinking about your physical health, which includes physical illness and injury, for how many days during the past thirty days was your physical health not good? Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past thirty days was your mental health not good?		
	Baseline Survey	**Follow-Up Survey**
Physical Health	15	13
Mental Health	7	9

Tables 4-32 and 4-33 also show that the installation and use of the evaporative coolers had little or no effect on certain indicators of well-being. For example, slightly fewer clients reported "frequently" sleeping well through the night in the follow-up survey. And, there was only a slight decline in the incidence of clients reporting that someone had to go to the doctor or hospital because their home was too hot.

Table 4-32
Sleeping Well Through the Night

Do you sleep well through the night frequently, sometimes, seldom, or never?		
	Baseline Survey	**Follow-Up Survey**
Frequently	32%	26%
Sometimes	36%	48%
Seldom	22%	20%
Never	8%	6%

Table 4-33
Doctor/Hospital Visit Because of Hot Home

Have you or anyone in your household ever had to go to the doctor or hospital because your home was too hot?		
	Baseline Survey	**Follow-Up Survey**
Yes	6%	4%
No	91%	95%
Don't know	3%	1%

The most important change for clients was in their ability to stay cool in their homes. The baseline survey was conducted during the summer of 2006. The follow-up survey was conducted at about the same time during the summer of 2007. The weather was similar for those two years. Table 4-34 shows that, because of the installation of the evaporative coolers, 80% of the clients reported that their home was never uncomfortably hot in the last seven days. By comparison, in the baseline survey, 40% of the clients reported that their home was uncomfortably hot every day in the last week.

Table 4-34
Days of Uncomfortably Hot Home

How many days in the last week, did it get so hot in your home that you were uncomfortable?		
	Baseline Survey	**Follow-Up Survey**
0	12%	80%
1-3	25%	15%
4-6	23%	0%
7	40%	5%

Comparing Tables 4-35a (for the baseline period) and 4-35b (for the follow-up period) shows the health impact of this change. In the baseline period, many clients reported experiencing symptoms that were consistent with heat-related illness. Moreover, in most cases, the clients indicated that those symptoms were caused or made worse by the heat. The estimated incidence of symptoms that clients perceived were caused or made worse by the heat ranged from 26% for nausea to 66% for low energy. By comparison, Table 4-35b shows that the percent of clients reporting symptoms declined substantially in the follow-up survey (e.g., the percent of clients experiencing loss of appetite declined from 54% in the baseline period to 20% in the follow-up period). In addition, the percent of clients that perceived that the symptoms were caused or made worse by the heat also declined substantially. For example, the estimated incidence of loss of appetite that was caused or made worse by the heat declined from 42% in the baseline survey to 10% in the follow-up survey.

Table 4-35a
Experience with Heat Related Illness Symptoms in Past Week – Baseline Survey

In the past week, have you or anyone in your household experienced any of the following symptoms?					
Baseline Survey	**Loss of Appetite**	**Dizziness**	**Low Energy**	**Nausea**	**Headaches**
% Reporting Symptom	54%	40%	74%	29%	45%
% of the Above Reporting Symptom Caused or Made Worse by the Heat	82%	87%	89%	87%	69%
Estimated Incidence of Symptoms Caused by Heat	42%	35%	66%	26%	30%

Table 4-35b
Experience with Heat Related Illness Symptoms in Past Week – Follow-Up Survey

In the past week, have you or anyone in your household experienced any of the following symptoms?					
Follow-Up Survey	**Loss of Appetite**	**Dizziness**	**Low Energy**	**Nausea**	**Headaches**
% Reporting Symptom	20%	20%	45%	17%	30%
% of the Above Reporting Symptom Caused or Made Worse by the Heat	47%	53%	50%	38%	26%
Estimated Incidence of Symptoms Caused by Heat	10%	10%	22%	7%	8%

There is no direct evidence that the overall health of clients improved with the installation of evaporative coolers. However, there is direct evidence that the clients were more comfortable and were less likely to experience the symptoms of heat-related illness. In the long run, it is likely that the reduced stress on the elderly and disabled clients who received the evaporative coolers should have a positive impact on their health and well-being.

F. Independence

One of the long term goals of the program is to increase the rate at which "clients are able to be more independent and active in their homes." The follow-up survey measured whether the Evaporative Cooler program changed any measures of client independence.

The baseline survey showed that many clients left their homes only a few times each week and that, for most of those clients, physical barriers prevented them from leaving their homes. Tables 4-36 through 4-38 show that the results were similar for respondents in the follow-up survey, but that a smaller number of clients reported that they never left their home and a correspondingly larger number said that they left their homes all seven days in the last week.

Table 4-36
Days Left Home

How many times, in the last week, did you leave your home?		
	Baseline Survey	**Follow-Up Survey**
0	15%	4%
1-3	58%	54%
4-6	15%	16%
7	13%	26%

Table 4-37
Presence of Other things that Prevent Leaving Home More

Is there anything that keeps you from getting out of your home more?		
	Baseline Survey	**Follow-Up Survey**
Yes	70%	46%
No	30%	54%

Table 4-38
Things that Prevent Leaving Home More

What is it that keeps you from getting out of your home more?		
	Baseline Survey	**Follow-Up Survey**
Physical Impairment	51%	39%
Lack of Transportation	18%	30%
Lack of Activities/People to See	6%	4%
Heat	21%	22%
Other	18%	22%

Table 4-39 and 4-40 also shows that clients reported similar levels of socializing with someone outside the home and of being "connected to other people."

Table 4-39
Days Socialized with Non-Household Members

How many times, in the last week, did you socialize with people who do not live with you?		
	Baseline Survey	**Follow-Up Survey**
0	14%	14%
1-3	45%	42%
4-6	19%	22%
7	21%	22%

Table 4-40
Perception of Connectedness with Others

How connected do you feel to other people?		
	Baseline Survey	**Follow-Up Survey**
Very Connected	41%	54%
Somewhat Connected	38%	36%
Somewhat Isolated	13%	8%
Very Isolated	4%	2%

One of the most significant changes for clients was in their ability to do household chores and to cook for themselves. In the baseline survey, 69% of clients reported that they cooked for themselves frequently or sometimes. In the follow-up survey, 88% of clients reported cooking for themselves frequently or sometimes.

Table 4-41
Household Activities Performed

Do you clean, do dishes and other household chores frequently, sometimes, seldom or never? Do you cook in your home frequently, sometimes, seldom or never?					
Activity	**Survey**	**Frequently**	**Sometimes**	**Seldom**	**Never**
Household Chores	Baseline	44%	24%	13%	19%
	Follow-Up	68%	16%	14%	2%
Cooking	Baseline	44%	25%	12%	20%
	Follow-Up	62%	26%	10%	2%

C. Electric Usage

The primary focus of the Evaporative Cooler Pilot program was to improve the health and safety of low-income elderly and disabled households by making it possible for them to affordably cool their homes. One reason for installing Evaporative Coolers was that it was determined that the coolers would require less electricity than air conditioners and that clients would be more likely to use their cooling equipment. Table 4-14 shows that almost all clients made use of their coolers. However, the evaluation also collected electricity consumption and expenditure data to assess whether client cooler use was affordable.

The evaluations successfully collected preprogram and postprogram electric billing data for 95 clients. Analysis of the data found:

- Electric Usage – Average annual electric usage increased by 5 kWh, about 0.1% of total usage.

- Electric Costs – The average electric billed increased by about $42, about 8.0% of total costs.

These findings are consistent with previous analysis. The baseline survey showed that clients were using fans to keep cool during the summer; it is expected that fans and evaporative coolers will use about the same amount of electricity. In the follow-up survey, clients perceived that their electric bills had increased. However, the analysis finds that the increase was due to a change in electric rates, rather than a change in electric usage.

D. Water Usage

One concern with installing Evaporative Coolers was that the coolers make use of water and could possible increase the average water usage and water bills for clients. The evaluations successfully collected preprogram and postprogram water billing data for 45 clients. Analysis of the data found:

- Water Usage – Average annual water usage increased by over 13,000 gallons, an increase of over 16%.

- Water Costs – The average water billed increased by about $30, an increase of about 15% of total costs.

These findings are somewhat of concern. While the water cost increases are modest in terms of the total amount per year in usage, they do somewhat offset the advantage of installing evaporative coolers instead of air conditioners in the targeted homes.

E. Summary of Findings

The Follow-Up Survey was designed to capture information on how the status of clients changed after the installation of the evaporative cooler. The survey collected information on client knowledge, behaviors, experiences, and health status. The key findings from the Follow-Up Survey are the following:

- Use of Cooling Equipment – Most clients (92%) perceive that an evaporative cooler is affordable to use and almost all (99%) reported that they used their evaporative cooler.

- Cooler Maintenance – Most clients (82%) perceive that evaporative coolers are easy to maintain. However, while most clients (95%) report that their cooler has been properly maintained, only about 60% report that they took the actions necessary for cooler maintenance. Moreover, in about half of the cases where the cooler was maintained, the work was done by the REACH program agency.

- Strategies for Keeping Homes Cool and Staying Safe – The follow-up survey showed that the program did not make improvements in client knowledge of effective cooling strategies; few clients can articulate an effective strategy for keeping their homes cool or for keeping themselves safe when it gets hot. However, with the installation of the evaporative cooler, clients were less likely to need to use those strategies.

- Symptoms of Heat-Related Illness – The follow-up survey showed that the program did not make improvements in client knowledge of the symptoms of heat-related illness; few clients have a good understanding of the symptoms that they might experience if they had a heat-related illness.

- Incidence of Symptoms of Heat-Related Illnesses – The follow-up survey showed that clients had a much lower incidence of the symptoms of heat-related illnesses during the

postprogram period. In the postprogram period, 80% of clients reported that they were not "uncomfortably hot" at any time in the previous seven days. In addition, there was a reduction in the reported incidence of the symptoms of heat-related illness, including:

- The incidence of clients reporting loss of appetite fell from 54% to 20%.
- The incidence of clients reporting nausea fell from 29% to 17%.
- The incidence of clients reporting headaches fell from 45% to 30%.

- Self Reports on the Cause of Heat-Related Illnesses – During the preprogram period, for most symptoms, more than 80% of clients with those symptoms reported that they were "caused or made worse by the heat." During the postprogram period, for most symptoms, only one-third to one-half of the clients reported that those symptoms were "caused or made worse by the heat."

- Independence – In the preprogram period, less than half of the clients were able to cook and do household chores frequently. In the post-program period, almost two-thirds of the clients reported that they were able to cook and do household chores frequently.

The baseline survey showed that the clients served by the pilot program were in need of cooling equipment to help to make their homes more comfortable and to help to address some of their potential for heat-related illnesses. The follow-up survey showed that the program had successfully delivered cooling equipment, clients used the cooling equipment, clients reported fewer symptoms of heat-related illness, and clients reported that they were more likely to be able to cook for themselves and do household chores.

The analysis found that installation of the evaporative coolers did not increase client usage of electricity, but that it did increase client usage of water. On average, the water bills for a small sample of clients increased by about $30 per month.

V. Recommendations

The purpose of the Colorado Evaporative Cooling Demonstration Project was to develop a model for reducing the vulnerability of elderly and disabled households to periods of unsafe heat by furnishing home cooling equipment to those households and educating clients about how to stay safe during periods of unsafe heat. This section of the report presents the recommendations based on the findings from the Impact Evaluation.

A. Home Cooling Equipment Impacts

The pilot program installed cooling equipment in the homes of elderly and disabled clients. In a baseline survey, most of those clients reported being "uncomfortably hot" in their homes during one or more of the last seven days. The clients also reported a high incidence of symptoms of heat-related illnesses and many of the clients perceived that the symptoms were "caused or made worse by the heat." And, less than half of the clients reported that they "frequently" cooked for themselves or were able to do household chores.

In a follow-up survey conducted at the same time of the year as the client's baseline survey, most clients reported that they were never "uncomfortably hot" in the previous seven days. Moreover, clients reported a substantially lower incidence of the symptoms of heat-related illness. And, almost two-thirds of clients reported that they were able to cook for themselves and do household chores. These findings suggest that the installation of the cooling equipment can have a positive impact on the health and safety of these elderly and disabled clients.

This study shows that there is a direct relationship between the installation of cooling equipment and improved status of the clients. However, there are two limitations to the study.

1. Control Group – There was no control group for this study. As such, we cannot say with certainty that these clients would not have demonstrated the same changes without the installation of cooling equipment.

2. Health Impacts – In the study we were able to measure the client-reported incidence of the symptoms of heat-related illness, not the actual presence of heat-related illness. So, we have no direct measure of the long-term impact of installing cooling equipment on the health of these elderly and disabled clients.

Despite these limitations, the study furnishes valuable information on the potential for improving the health and safety of elderly and disabled clients in Colorado by installing cooling equipment.

B. Client Education

As part of the pilot program, clients were presented with some information on ways to stay safe and healthy during periods of unsafe heat. The program attempted to educate clients about ways to keep their home cool without using their home cooling equipment. The program also attempted to educate clients about how to protect themselves from heat-related illnesses and how to recognize when they might be suffering from a heat-related illness. Comparing the baseline survey to the follow-up survey, we did not find that the program was successful in increasing the ability of clients to articulate a proactive strategy for staying healthy and safe during periods of unsafe heat.

C. Evaporative Coolers

The pilot program installed evaporative coolers in the homes of low-income elderly and disabled clients because it was perceived that they would use less energy and therefore be more affordable for those clients. It was expected that clients would be more likely to use their evaporative coolers than air conditioning because they would perceive that it is affordable. Several important research questions remained unanswered by the study.

- Client Perceptions – In the baseline survey, most clients reported that they perceived that air conditioning was an affordable way to cool their homes. If air conditioners had been installed, it is possible that the clients would have received the same benefits.

- Equipment Costs – The evaporative coolers that were installed were less expensive to install than central air conditioning, but were more expensive than a room air conditioner. It is possible that a room air conditioner could have delivered similar benefits for a lower installation cost.

- Cooling Needs – With the climate in Colorado, it appears that the clients served by this program need cooling equipment that can keep their home cool during the hottest part of the day. In addition, since many of these clients use only one or two rooms at that time, it is possible that a room air conditioner could meet the client's cooling needs.

- Water Usage and Maintenance – From the small sample of clients for whom we were able to obtain water usage data, it appears that the use of coolers will increase water usage and water bills for clients using evaporative coolers. And, it is unclear how well maintained the coolers are and whether a failure to maintain the coolers will reduce their effectiveness in the long run.

While the pilot program was successful in installing cooling equipment in the homes of clients who had no other source of cooling, it is important to consider whether other equipment choices might have been more effective in the long run for these clients.

D. Recommendations

The pilot program furnishes evidence that installation of cooling equipment in the homes of low-income elderly and disabled households can improve their health status. However, before expanding the program, it would be appropriate for policymakers to study other options for delivering the same services.

- Need for Cooling – It is clear the low-income elderly and disabled households in Colorado need cooling equipment to help them stay healthy and safe in their homes. Policymakers should consider ways to deliver those services to clients in a way that is affordable and sustainable.

- Need for Education – The low-income elderly and disabled clients in this study did not have a good understanding of how to keep their homes cool without air conditioning, did not have a good understanding of how to stay safe when their home was uncomfortably hot, and were not aware of the symptoms of heat-related illness. Policymakers should consider development of public education programs and direct client education programs that focus on those issues.

- Cooling Equipment Alternatives – Evaporative coolers appear to be one good option for furnishing cooling services to clients. However, before expanding the program to a larger population, policymakers should resolve issues related to water use and cooler maintenance. In addition, policymakers should examine and possibly test other options for delivering cooling services to clients; including, but not limited to energy-efficient room air conditioners.

The Colorado Evaporative Cooling Demonstration Project met its primary goal of finding a safe and affordable way to deliver cooling services to low-income elderly and disabled clients. However, additional study is needed to develop a strategy that can serve the needs of all vulnerable low-income elderly and disabled clients.