

NON-ENERGY BENEFITS (NEBs) FOR LOW INCOME PROGRAMS:

Results, Progress, and Implications / Directions

AESP Webinar, 9/2/10

Speakers:

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AGENDA

- Introduction, drivers, NEBs Skumatz
- Measurement / literature / results Skumatz
- Progress in “hardship metrics” Khawaja
- NEB usage & the Regulatory Test issue Skumatz / Khawaja
- Gaps and conclusions Skumatz

NEBS FOR LOW INCOME PROGRAMS:

Introduction, Measurement, & Results

AESP Webinar

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BACKGROUND AND THEORY

- Project background
- NEBs background
 - Theory
 - NEBs –decisions (and impacts) not solely based on energy savings / energy features – “bundle”
 - Name
- Sources and Uses

NEBS "DRIVERS" ...

<i>Utility/Ratepayer</i>	<i>Societal</i>	<i>Participant (all)</i>
<input type="checkbox"/> Payments/financial <input type="checkbox"/> Debt collection <input type="checkbox"/> Emergencies / insurance <input type="checkbox"/> T&D, power quality, reliability <input type="checkbox"/> Subsidy (LI) <input type="checkbox"/> Other	<input type="checkbox"/> Economic dev'p <input type="checkbox"/> Tax impacts <input type="checkbox"/> Environmental <input type="checkbox"/> Emissions <input type="checkbox"/> Health <input type="checkbox"/> Water & other resources / utilities <input type="checkbox"/> National security <input type="checkbox"/> Wildlife/Other	<input type="checkbox"/> Payments & coll'n <input type="checkbox"/> Education <input type="checkbox"/> Building stock <input type="checkbox"/> Health <input type="checkbox"/> Equipment service (incl. productivity, comfort, maint, etc.) <input type="checkbox"/> Other utilities (water, etc.) <input type="checkbox"/> Other (transactions, enviro, psychic, etc.)

More than 60 categories derive from these drivers
 Include subsets as appropriate to application.

BACKGROUND – WHAT NEBS CAN TELL US

- “Net” NEBs;
 - Why analyzed?
 - Assumption of zero
 - Precision
- Perspectives
 - Agency, societal, participant;
- Esoteric? Many program-related applications

NEBS – NOT SO ESOTERIC TO MANY AUDIENCES...

- Three audiences out there that should care...
 - **Program:** Utilities, agencies, regulators, program planners, cities
 - ➔ Omitted / attributable effects; benefit-cost, program effects, design, barriers, progress, goals; program refinements, econ dev'p
 - **Sales:** Builders, retailers, designers, vendors, mfg
 - ➔ Features that "sell"; marketing; barriers; reaching buyers; understanding / influencing decisions
 - **Users:** Owners, occupants, decision-makers
 - ➔ Decision-making / payback; fuller effects

UTILITY BENEFITS – INDIVIDUAL CATEGORIES

Utility Benefits – changes in...

... valued at utility marginal costs, or similar

- | | |
|---|--|
| <ul style="list-style-type: none"> • Carrying cost on arrearages • Bad debt written off • Shutoffs • Reconnects • Notices • Customer calls / bill or emergency-related • Other bill collection costs | <ul style="list-style-type: none"> • Emergency gas service calls (for gas flex connector and other programs) • Insurance savings • Transmission and distribution savings (usually distribution) • Fewer substations, etc. • Power quality / reliability • Reduced subsidy payments (low income) • Other |
|---|--|

Source: (Skumatz/SERA, ACEEE 2005
And others)

SOCIETAL BENEFITS – INDIVIDUAL CATEGORIES

Societal Benefits – changes in...

... Valued at relevant societal values for the category.

- Economic development benefits – direct and indirect multipliers
- Tax effects
- Emissions / environmental (trading values and/or health / hazard benefits)
- Health and safety equipment
- Water and waste water treatment or supply plants
- Fish / wildlife mitigation
- National security
- Health care
- Other

PARTICIPANT BENEFITS – RESIDENTIAL

Residential Participants – changes in... ...Valued at household marginals.

- | | |
|--|--|
| <ul style="list-style-type: none"> •Water / wastewater bill savings •Operating costs (non-energy) •Equipment maintenance •Equipment performance (push air better, etc.) •Equipment lifetime •Shutoffs / Reconnects •Property value benefits / selling •(Bill-related) calls to utility •Comfort •Aesthetics / appearance •Fires / insurance damage (gas) •Lighting / quality of light •Noise •Safety | <ul style="list-style-type: none"> •Control over bill •Understanding / knowledge •“Care” or “hardship” (low income) •Indoor air quality •Health / lost days at work or school •Fewer moves •Doing good for environment •Savings in other fuels or services (as relevant) •GHG and environmental effects
 •NEGATIVES include: Installation hassles / mess, negative values from items above. |
|--|--|

MEASUREMENT OF NEBS

Practices Updated from the Literature
Review

MEASUREMENT OF NEBS

- Literature Review – 100+ studies, updating 350+ study a few years ago
- Attribution to programs – “NET” NEBs
 - Positive and negative
 - Net beyond standard efficiency – except for some Low Income
 - Net above what would have happened (NTG)
 - Redundancy
 - Overlap
- Mix of measurement approaches
 - Straightforward computations (some)
 - Primary / secondary data
 - Options / bounding
 - Detailed specific modeling (GHG, Econ)
 - Participant NEBs - more challenging

MEASURING UTILITY & SOCIETAL NEBS

MEASUREMENT METHODS – UTILITY PERSPECTIVE

- Arrearage studies for most financial and collections NEBs
 - Not much change in last 10 years
- Gaps / limited progress in:
 - Line loss reductions
 - TOD / capacity / avoided infrastructure
 - Safety & health
 - Future risk / liability

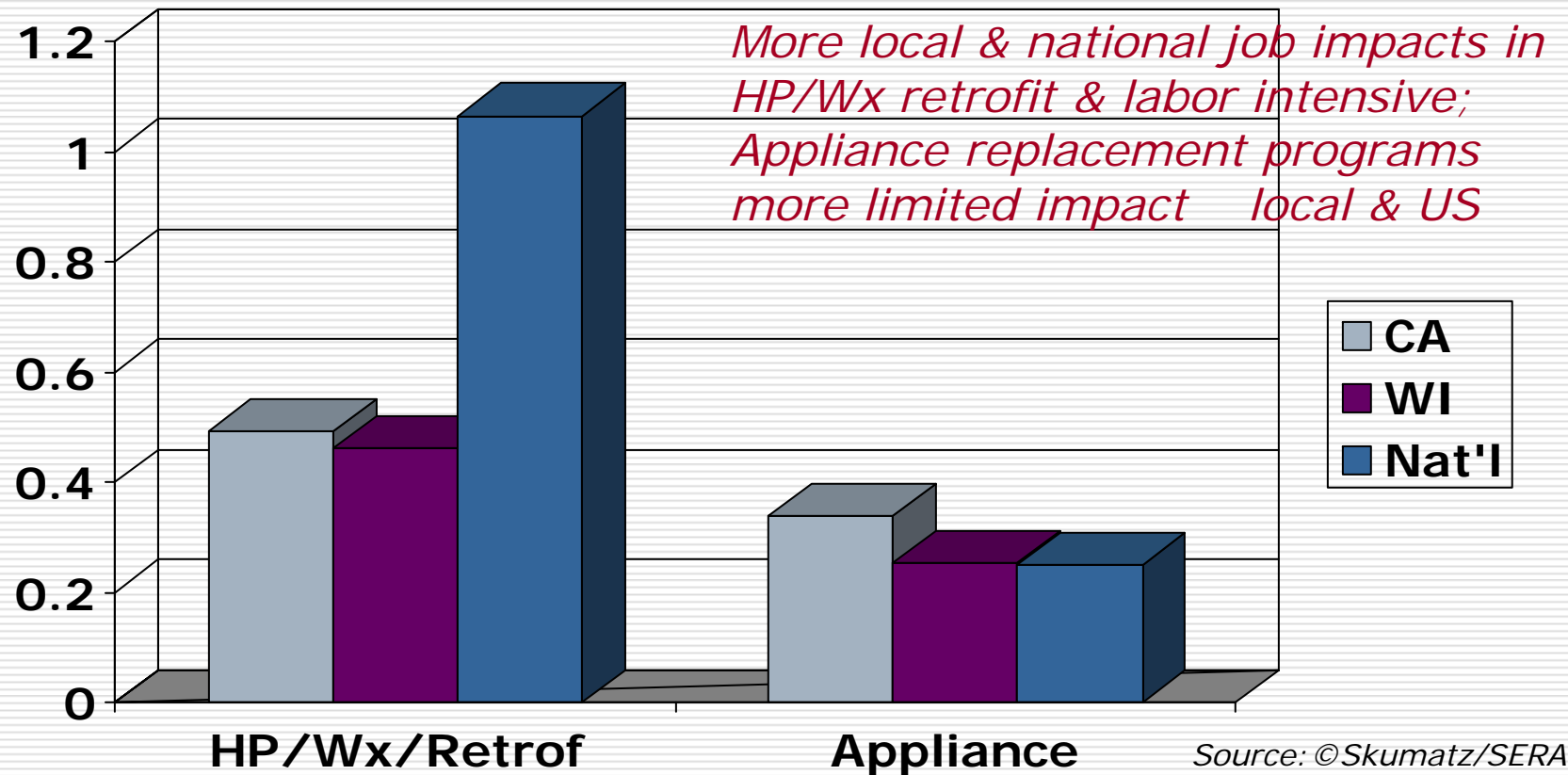
MEASUREMENT METHODS – SOCIETAL PERSPECTIVE

- Climate change / emissions –models & literature – significant activity
 - Simple – system average
 - Mid – peak/off peak, generation mix
 - Hourly dispatch
 - For enhanced use, issues of additionality, program vs. project, uncertainty/risk.
 - Results dependent on region, fuel, TOD, etc.
 - Tradeoffs (simple vs. complex)
 - → Modeling, or periodically updated “deemed” ranges for fuel, vintage, peak by territory (margin)
 - Uses: cap & trade (refined); B/C; marketing, performance tracking.

MEASUREMENT METHODS – SOCIETAL PERSPECTIVE

- Economic Development / jobs – models & literature – significant activity
 - Alternative case issue
 - Range of results – dependent on program / measures, region / industries
 - → Third party models available / reviewable.
 - Uses: auxiliary benefits; B/C; optimizing program selecting measures / programs / portfolios

ECONOMIC MULTIPLIER – PATTERNS



Multiplier for indirect portion of economic output from NET transfer of funds FROM generation TO SIC/NAICS codes relevant to program's design.

MEASUREMENT METHODS – SOCIETAL PERSPECTIVE

- Other societal NEBs - some work
 - Health & safety –some recent work at National level on IAQ
 - Low income / hardship
 - Impacts on resident illness, job retention, disposal illness, payments
 - Effects from avoided moves
 - Recent survey
- Other societal NEBs – little work
 - Water infrastructure – little work
 - National security, infrastructure, other – little progress

MEASURING PARTICIPANT NEBS

PARTICIPANT NEBS

- Computational approaches (little progress / change)
- Data collection from phone, mail, web, on-site, email, records...
- Survey-based methods – much attention
 - 45+ articles published
 - Controversies from method / confidence, and appropriate uses
 - To date, mostly per-participant

PARTICIPANT NEBS – ANALYSIS APPROACHES

- Computational
 - Primary computation, valuation (A)
 - From secondary sources (B)
 - Regression (C)
- Contingent valuation (D)
 - Open-ended CV, WTP/WTA
 - Discrete CV questions
 - Double-bounded etc.
- Relative scaling (E)
 - Percentage
 - LMS
- Ranking-based (F)
 - Analytic Hierarchy
 - Ranking, ordered
- Other
 - Hedonic decomposition (G)
 - Reported motivations (H)

Advantages / Disadvantages with each...

PARTICIPANT NEB ESTIMATION – PROS & CONS

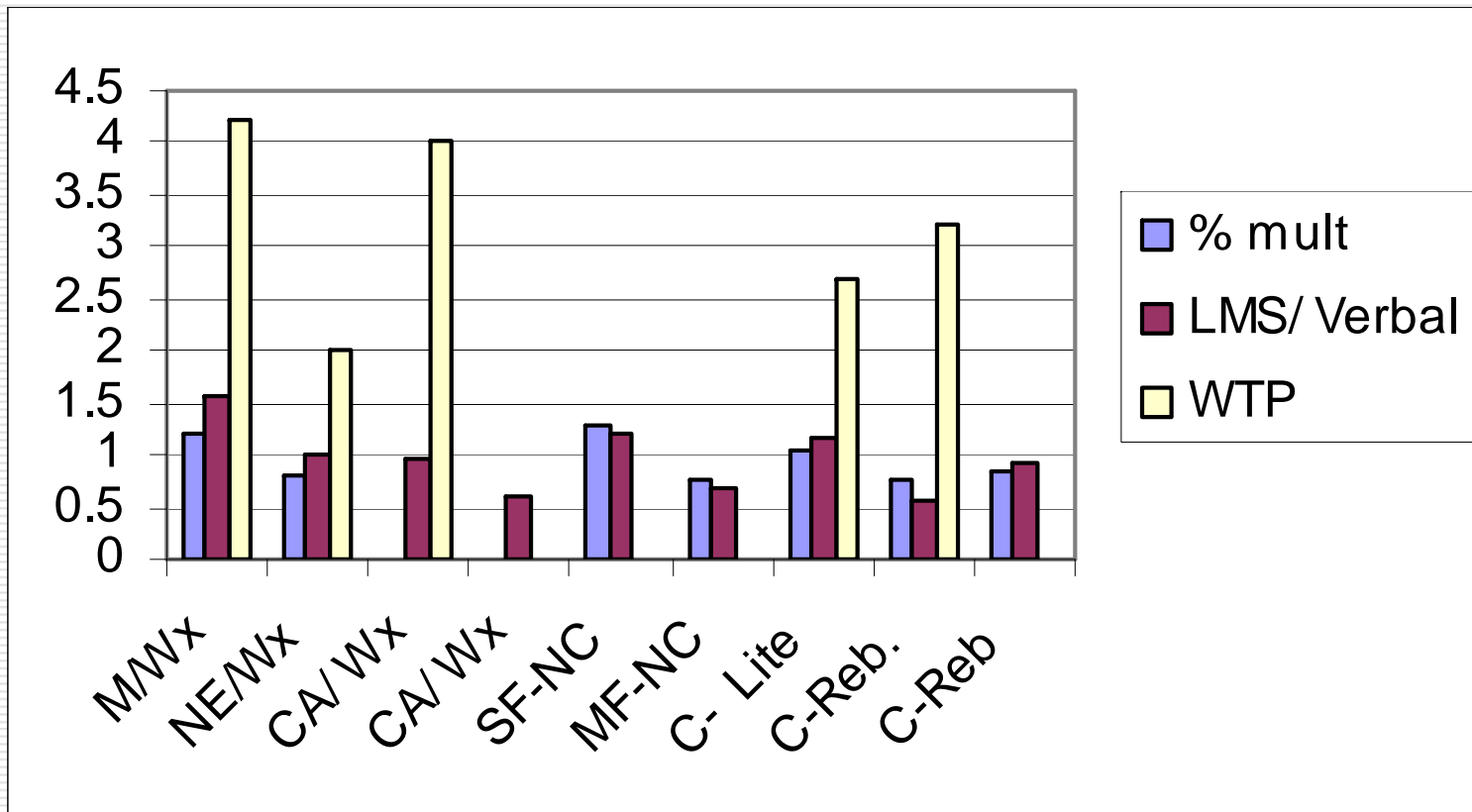
Direct/assisted valu.	Missing obs/bias, \$\$, good
WTP/WTA	Volatile, uncertain resp
Bounded WTP/WTA/CV	Fairly strong, quick
Comparative/numeric	Fast, strong, robust
LMS/verbal relative	Fast, strong, clear
Ordered logit, ranking, conjoint	Strong, slower, complex, robust
Regression	Limited, \$\$, 1 category* (disagg)
Market valuation	Rarely avail, obs
Other	Always testing...!

PARTICIPANT NEB DATA COLLECTION APPROACHES (TRADEOFFS)

In-person interview	Slow/\$\$, robust, low obs
Mail survey	Limited skip / long, understanding, can be low cost
Phone survey (lg)	Low cost, skip, quick, ltd flex, obs
Phone interview	Fast, strong, flex, qual, \$, obs
Phone/fax/email	Fast, strong, clear, low\$
Web survey	Strong, fast, flexible, skip, robust, low \$, growing all segments/paired phone
Real time forms	Limited / no skip, low cost, obs
Secondary/mkt val.	Rarely avail, obs
Other	Always testing...!

Source: Skumatz /SERA

PARTICIPANT MEASUREMENT METHODS COMPARISON



*Other papers compare WTP,
Bounded WTP, LMS (SERA/WEA 2006)*

*(Source: Skumatz/SERA
ACEEE paper 2002)*

NEBs LITERATURE & VALUES / RESULTS

UPDATED LITERATURE

- 100 studies; progress, minimal measure (exceptions)
- Multiple programs / approaches
- Decomposition of results to measures...
 - Example from residential program
- More sophisticated modeling in several key areas:
 - Economics (societal)
 - GHG (societal)
 - Participant information

LEADING NEBS FOR LOW INCOME PROGRAMS - SAMPLE

AREA	Results (percent is for all NEBs in that category, not just leaders)	Total NEB share (Energy sav/ES)
NORTHEAST	Utility: Subsidies, bad debt (61%) Soc: Emissions (18%) Partic: Illness, water sav, prop value (22%)	Total 62% of energy savings (\$81/yr)
NORTHEAST	Utility: Arrearages, Bad debt, T&D (20%) Soc: emissions (18%) Partic: water sav, illnesses, prop value (61%)	Total 28% of energy savings (\$110/yr)
MIDWEST	Utility: not listed; Soc: not listed. Partic: quality of life, comfort, ability to pay for food / medicine / necessities / phone; avoid sharing home or homelessness	Energy savings 833 kWh/yr; 156 therms/yr;
MIDWEST	Utility: Arrearages, shutoffs, coll'n savings (12%) Soc: economic mult, emissions (35%) Partic: prop value, illnesses, safety, water sav(53%)	Total 507% of ES; participant 270% of ES; ES=\$1381/yr
NORTHEAST	Utility: arrearages, shutoffs, coll'n savings (7%) Soc: economics, emissions (30%) Partic: prop value, illnesses, water sav (63%)	Total 200% of ES; Partic 130% of ES; ES=\$5538/yr
WEST	Utility: carrying charge, T&D, notices, coll'n cost (51%) Soc: emissions (econ not included) (13%) Partic: illnesses, moving costs, billing (35%)	Total 150% of ES; Partic 54% ES; ES=\$95/yr

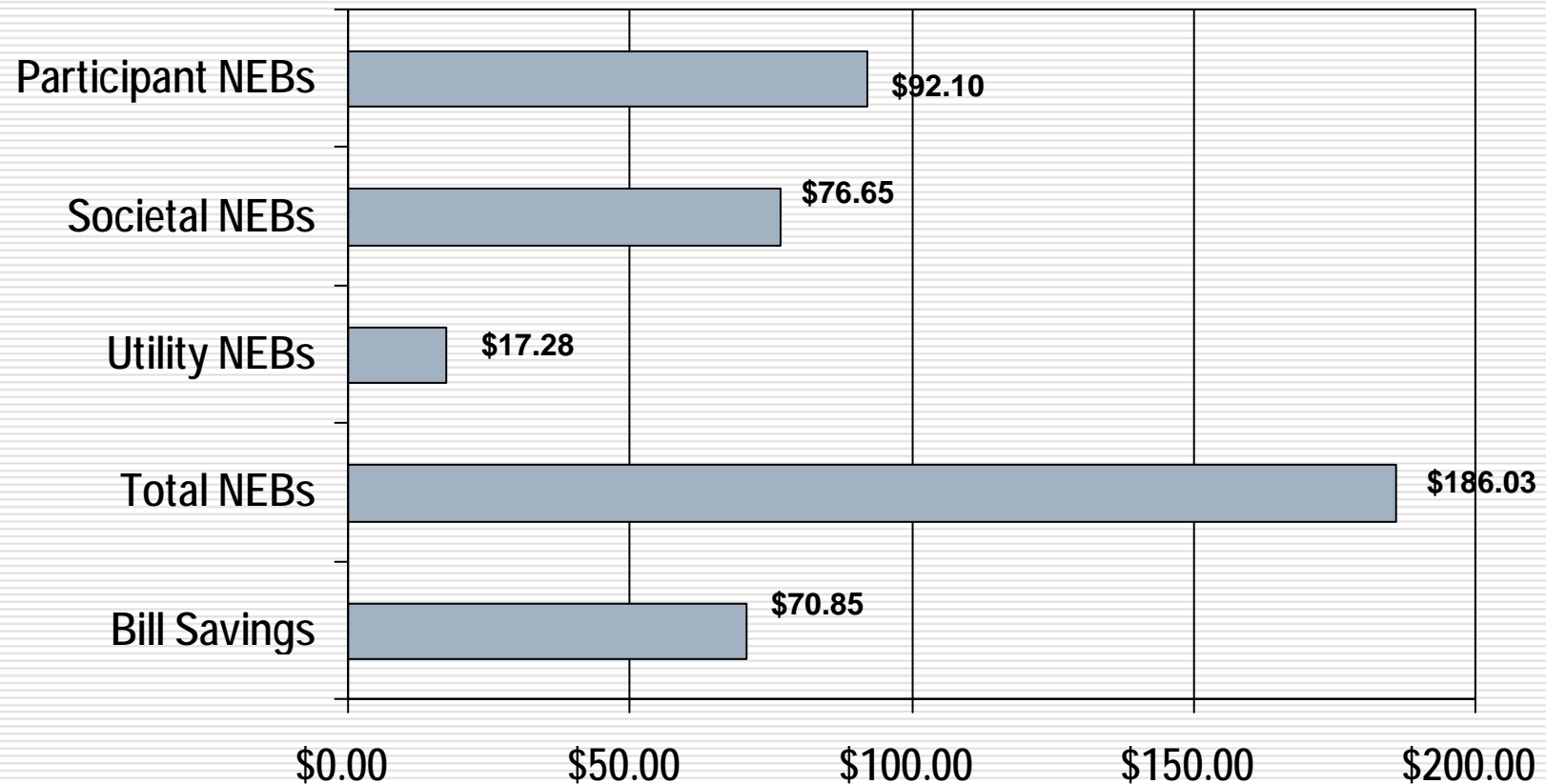
Values and ratios depend on NEBs included by utility: some more conservative than others...

Source: Skumatz / SERA

SERA

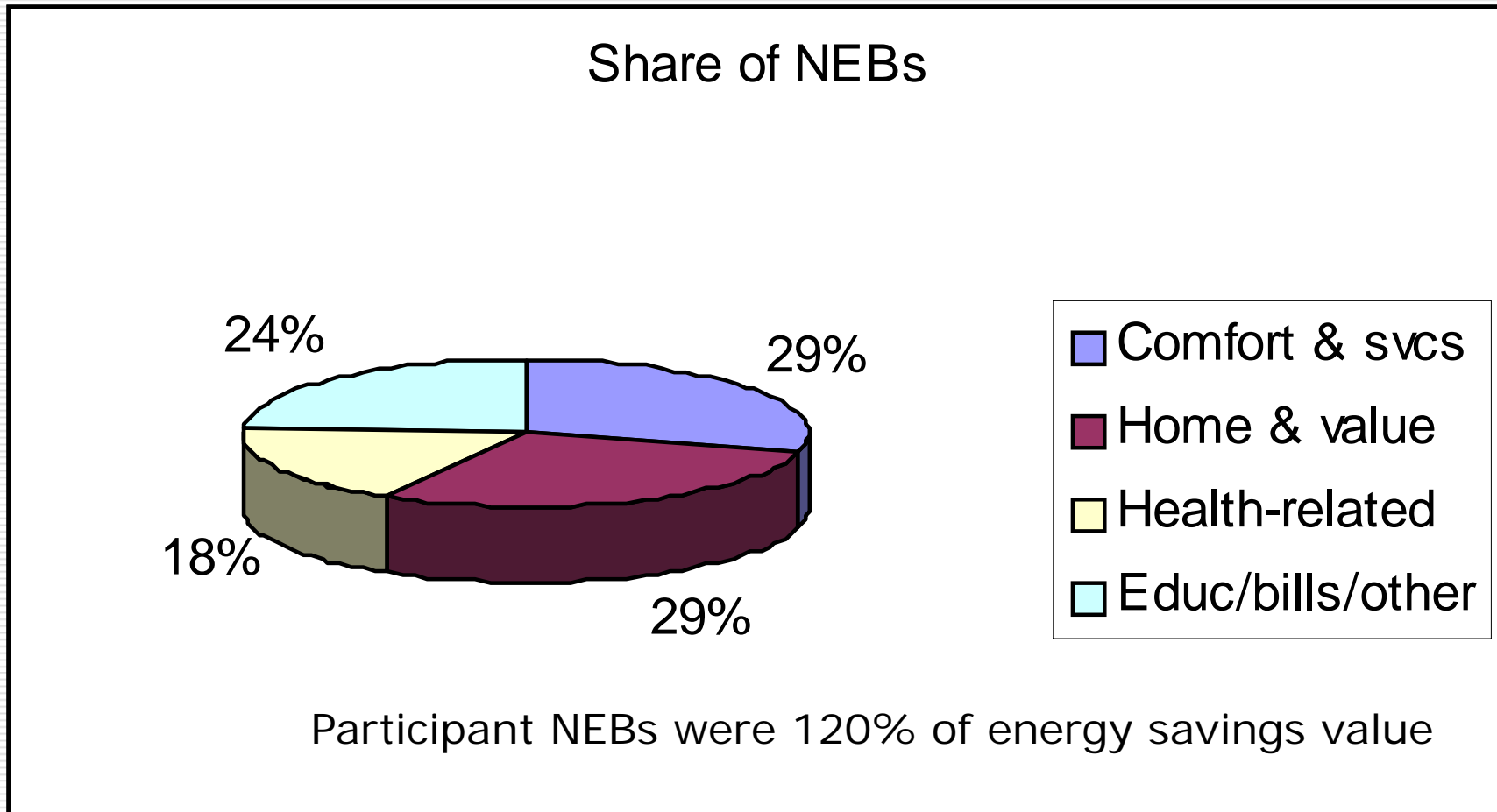
NEB RESULTS FOR LI-Wx:

50% Partic, 41% Soc, 9% Util; Total NEB mult=2.6



(Source:
Skumatz, SERA)

PARTICIPANT NEB VALUES / EXAMPLE



Source: Skumatz Economics (SERA)

LEADING PARTICIPANT NEBS WITHIN GROUPS

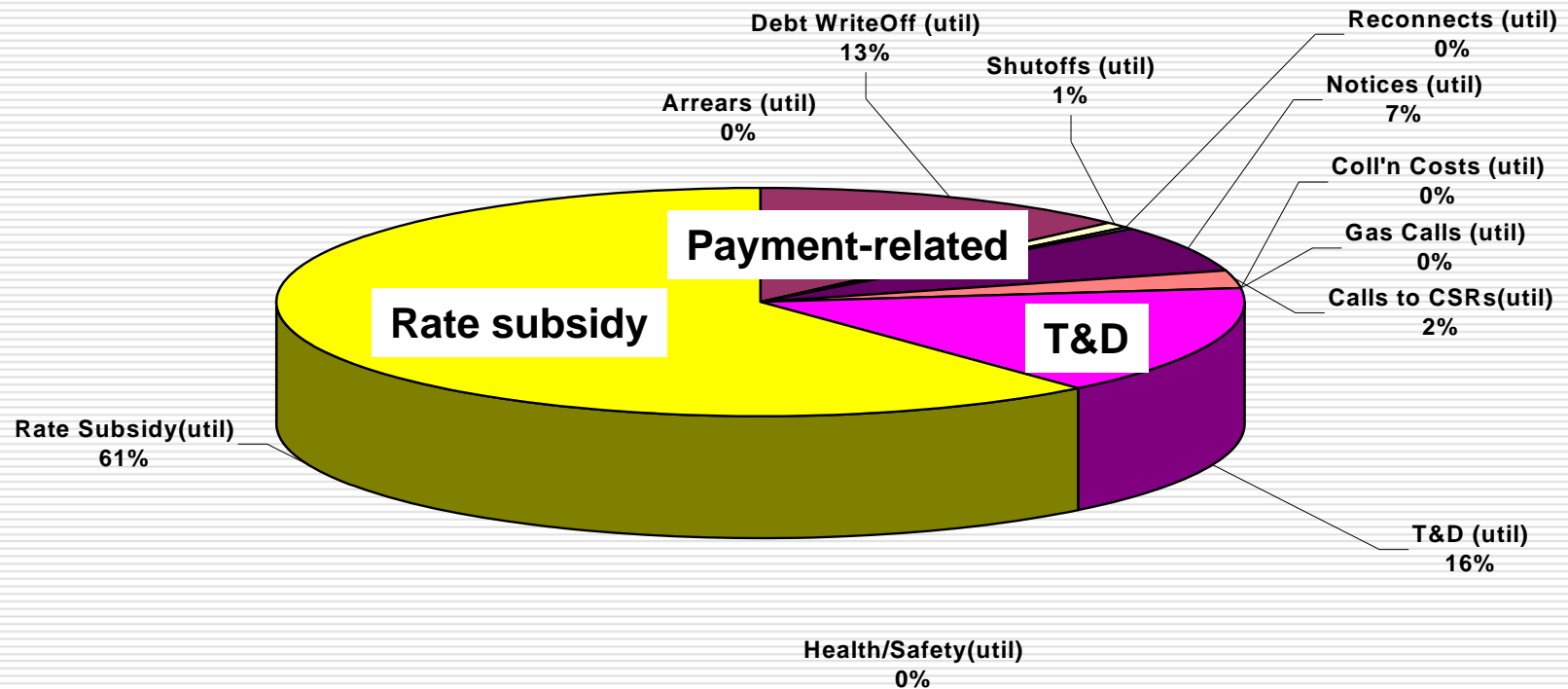
- Comfort:
 - Comfort, lifetime, noise / maintenance / features, construction
- Home / value:
 - Ability to sell, home appearance
- Health:
 - Lost work days, other costs
- Education, etc.
 - Understanding, bill payment concern, enviro

ADJUSTED PAYBACKS – ADDING ONLY PARTICIPANT EFFECTS (RECENT EXAMPLES)

- Gross payback: 5.6 yrs → 2.5
- Net payback excl. FR: 9.0 yrs → 4.0
- B/C incl all partic NEBs: 0.9 → 1.9
- B/C adj for FR: 0.55 → 1.2

UTILITY NEBS FOR LI-Wx

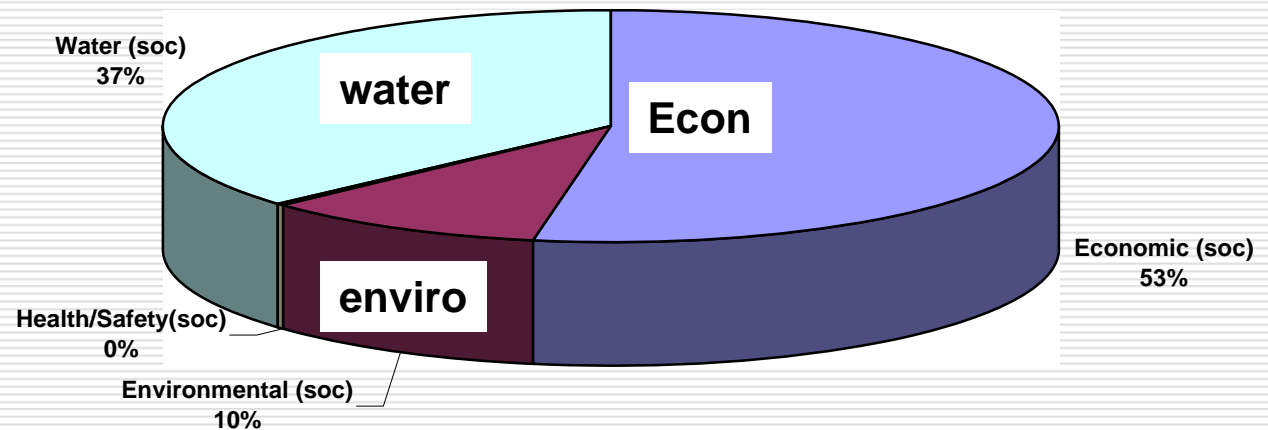
Utility NEBs for Template Program



(Source:
From Skumatz,)

SOCIETAL NEBS FOR LI-Wx

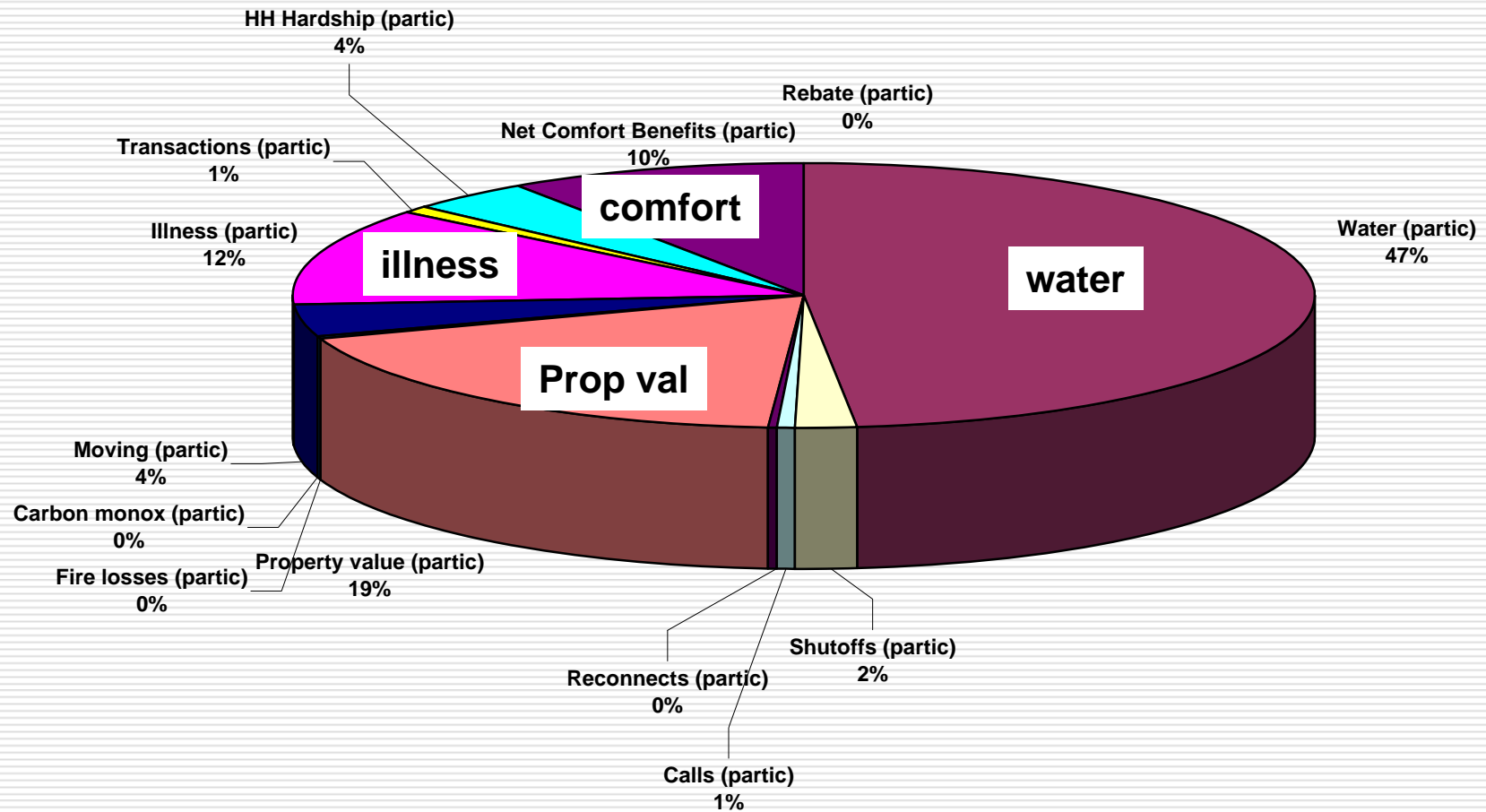
Societal NEBs for Template Program



*(Source:
From Skumatz)*

PARTICIPANT NEBS-LI Wx

Participant NEBs for Template Program



(Source:
From Skumatz)

RELATIVE NEB VALUES FOR LOW INCOME PROGRAMS (LITERATURE REVIEW)

Red = high values.

UTILITY	SOCIETAL	PARTICIPANT	PARTICIPANT
Arrearage	Econ Devp / Jobs	Water/WW	Light
Bad debt	Tax effects (unempl)	Op Costs (non-energy)	Noise (inside / outside)
Shutoffs	Tax effects – tax credits	Maintenance	Safety
Reconnects	Emissions	Performance	Control/ knowledge
Notices	H&S	Lifetime	Hardship / reduced dependence
Calls	Water/WW	Shutoffs	Fewer moves
Emerg. Gas	Health Care	Reconnx	IAQ / Health / sick days
Insurance	Reduced dependency	Calls	Good for enviro
T&D	Other	Property val. / aesthetics	Other and negatives
Rate subsidy	High total	Comfort	High total
Other		Fires/insur.	

PATTERNS IN NEBS RESULTS - UTILITY

- Small share <10% of total NEBs
 - **Program Type:** Larger for low income because of arrearage impacts / collection, and reduced subsidy. Higher if targeted at high arrears customers
 - **Low Income:** as above and “goals” focus
 - **Variation by region:** Potential CZ patterns for arrears; gas utilities may realize higher NEBs (few studied)

PATTERNS IN NEBS RESULTS - SOCIETAL

- Medium to large share of total NEBs (18-45%)
 - **Program Type:** Improvements over last 5 years show significant variations by program & measures
 - **Low Income:** depends on program, measures
 - **Variation by region:** Important patterns in both GHG and jobs based on airshed and fuel mix (GHG) and local industrial mix and sphere of influence (jobs).

PATTERNS IN NEBS RESULTS - PARTICIPANT

- Medium to large share of total NEBs – often equal to value of energy savings, depending on program
 - **Program Type:** Higher for whole building than individual measures (highest if affects comfort)
 - **Low Income:** Important positive and negative NEBs; education / control effects strong for low income; few negatives / barriers
 - **Variation by region:** Strong variations because of influence on comfort (can be 15% of all participant NEBs)

PATTERNS IN NEBS RESULTS - TOTAL

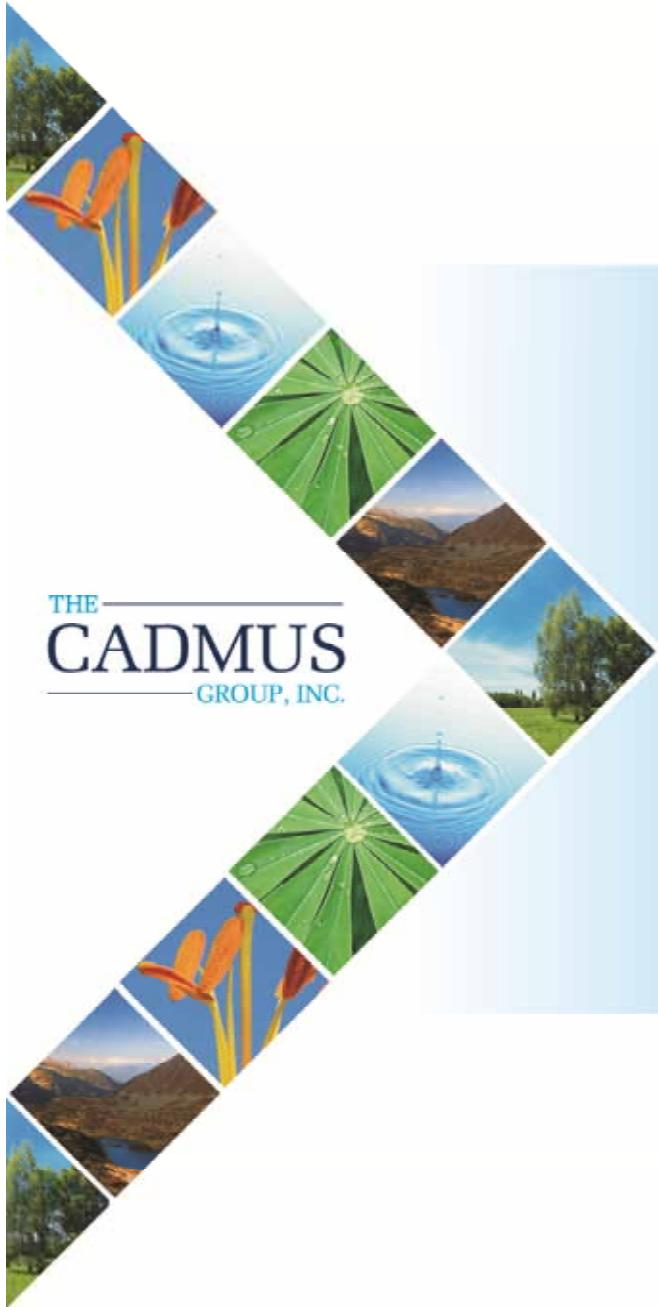
- For low income programs, total NEB values have wide range – 30% - 5x energy savings; most in range of 60-150%
 - Depends primarily on NEBs included; some utilities more conservative than others
 - Program, measure, climate influences

RESULTS FOR LOW INCOME PROGRAMS

- Financial
 - NEBs more than outweighed energy benefits in majority
 - Improved payback
 - Progress toward goals
 - Low income customers strongly valued program – high benefits to them
- Regional and Program-related variations (measures, climate zones)
- Indications of strong health impacts, sensitive subgroups
- Caveats / use
 - Not all NEBs are used for all applications
 - Tailored subsets – especially for B/C work... perspective

NEBS HARDSHIP METRICS

M. Sami Khawaja, Ph.D.
The Cadmus Group



THE
CADMUS
GROUP, INC.

Non-Energy Benefits Hardship Metrics

M. Sami Khawaja, PhD

September 2, 2010

Hardship Measures – Low Income

- This part of the presentation pertains primarily to low income programs
- Some of the measures are hard to quantify and Hard to measure
- They are however real

Types of NEBs

- Those that accrue to utility and ratepayers
 - Reduction in arrears
 - Reduction in collection costs
- Those that accrue to participants and Society
 - Reduction in forced mobility
 - Increase in property values
 - Improved health
 - Hardship indices – Family Development

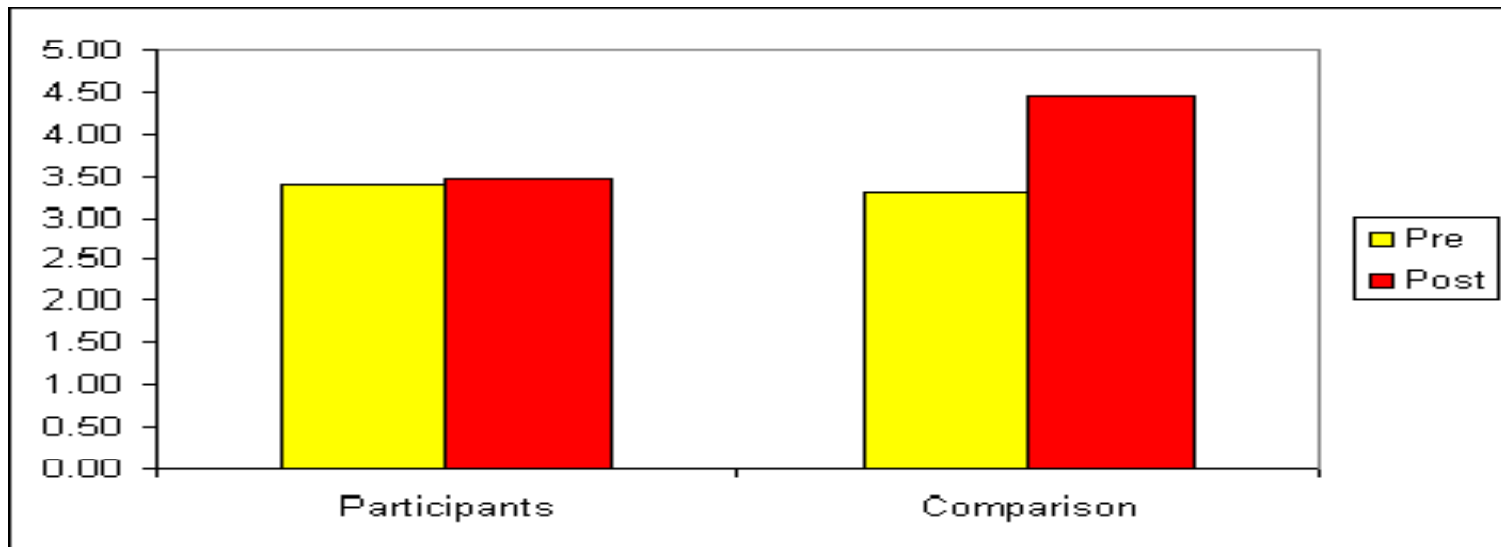
Reduction in Arrears

- As energy use is decreased, ability to pay increases
- Most people would pay when able

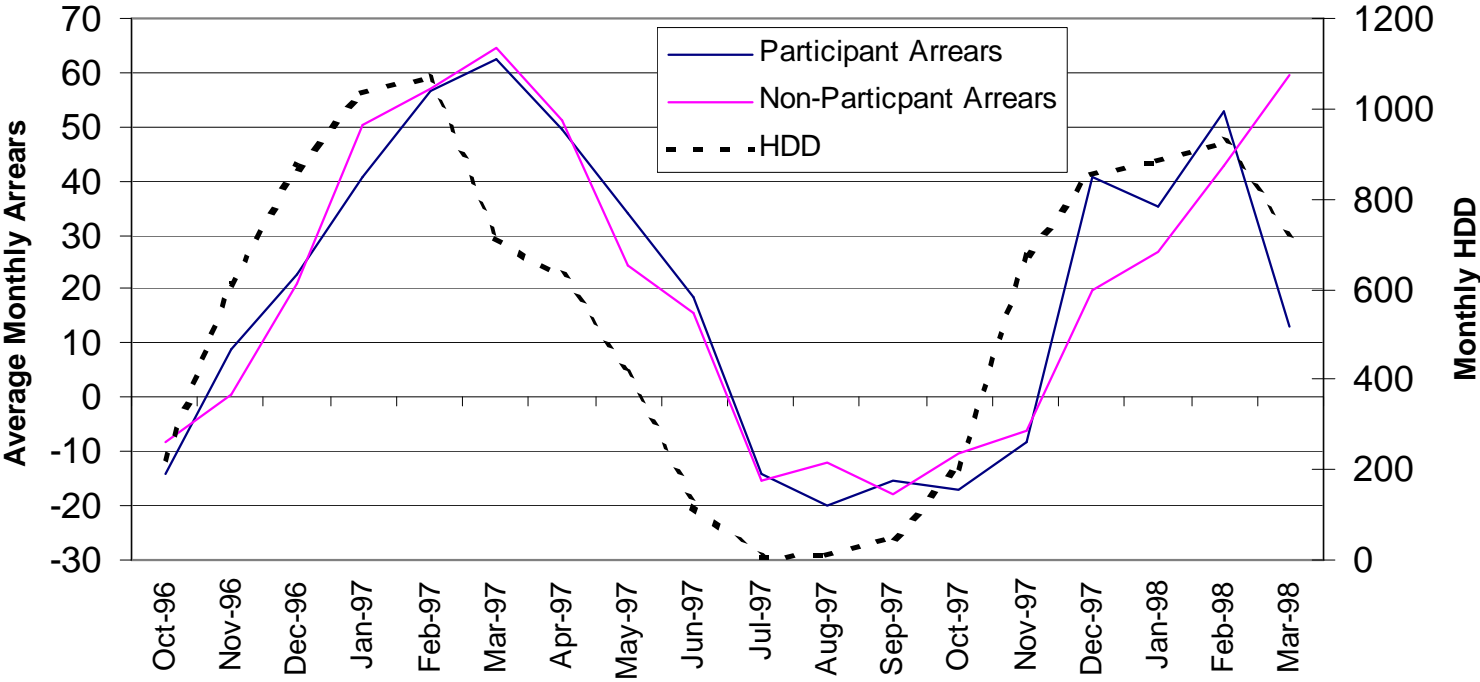
	Participants	Comparison
Pre Invoice	\$498.88	\$567.74
Pre Payment	\$422.70	\$481.63
Pre Arrears	\$76.18	\$78.11
Post Invoice	\$439.86	\$613.10
Post Payment	\$470.36	\$550.40
Post Arrears	\$45.67	\$138.80
Change in Arrears	\$30.51	\$(82.70)
Net Impact	\$93.20	

Reduction in Collection Costs

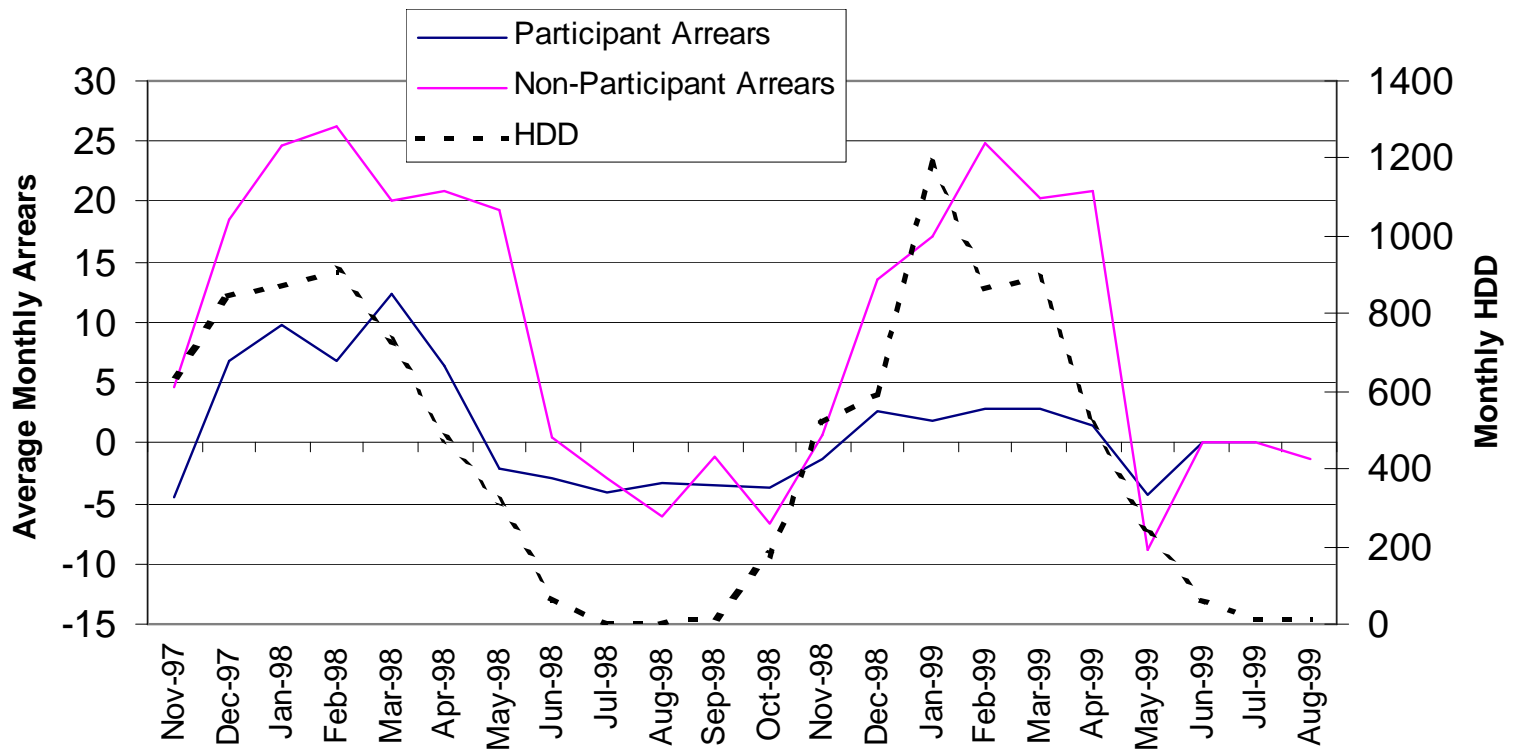
Collection Activities include notices, disconnections, etc



Relationship between Arrears and Weather before



Relationship between Arrears and Weather after



Disconnections and Collections

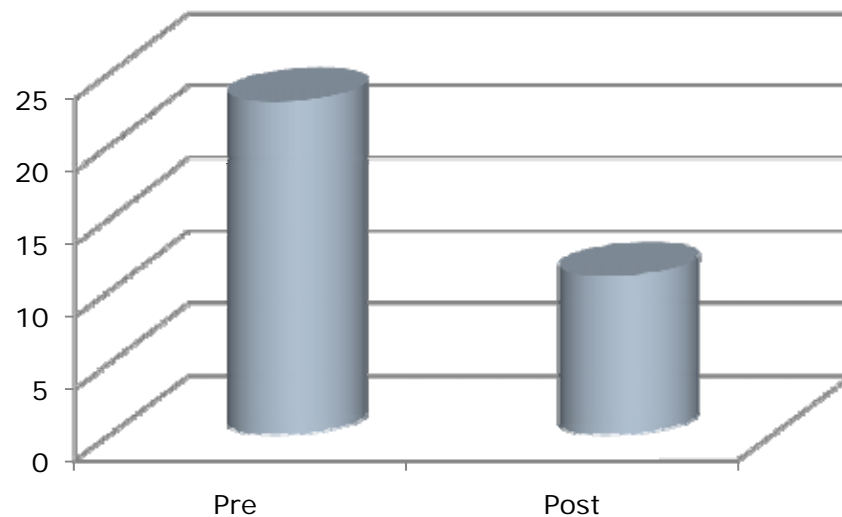
	# Cases	Pre	Post	Reduction	% Reduction
Disconnections (% cases with disconnections)					
Participants	1,111	6.0%	5.0%	1.0%	16.4%
Nonparticipants	1,660	5.2%	6.9%	-1.7%	-33.7%
Net Reduction	2,771				50.1%
Collection Actions (% cases with action) *					
Participants	209	49.6%	65.9%	-16.3%	-32.8%
Nonparticipants	306	17.4%	32.7%	-15.3%	-88.2%
Net Reduction	515				55.4%

Reduction in Forced Mobility

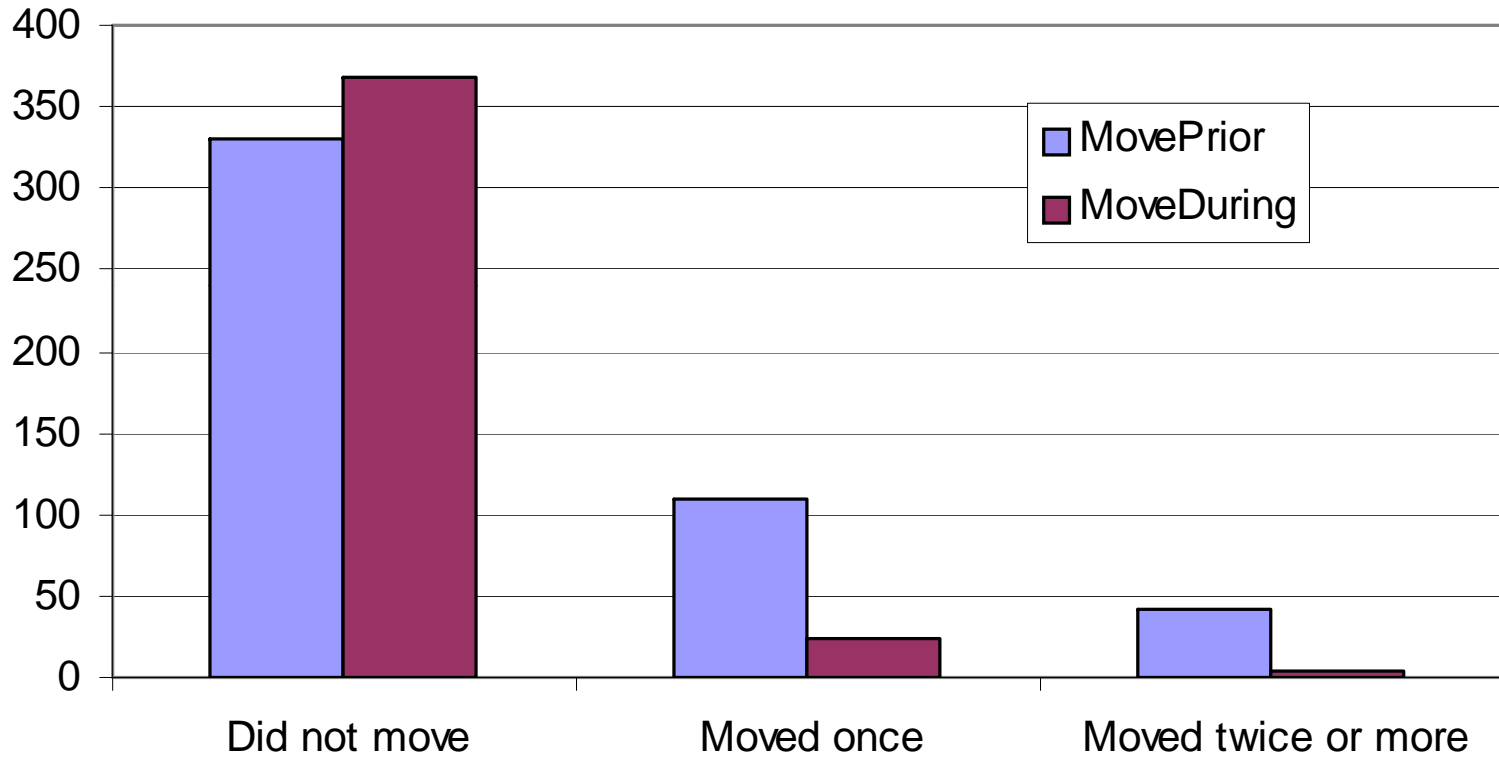
Reduced Homelessness.

Clearly a strong link exists between the inability to pay bills and homelessness. In a study of homelessness in Philadelphia, 7.9% of persons living in emergency shelters indicated that utility termination was the reason for their homelessness. Respondents to a homelessness study in Northern Kentucky indicated that utility shutoff was among the primary causes of homelessness.

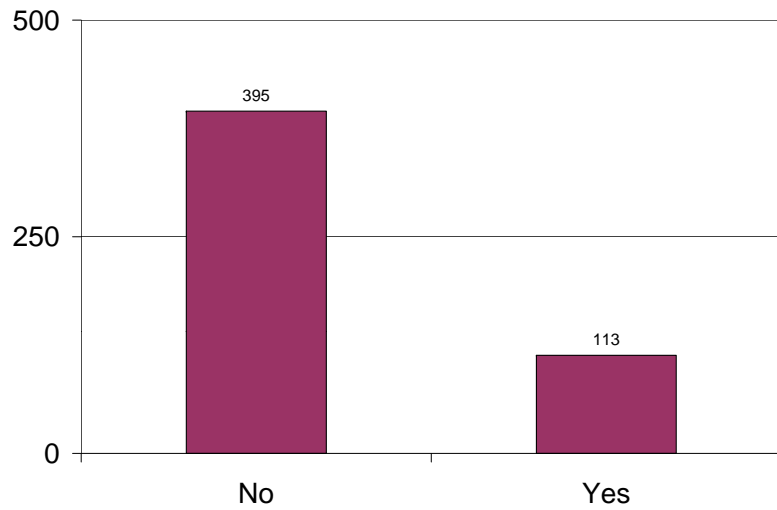
- Change in % Move



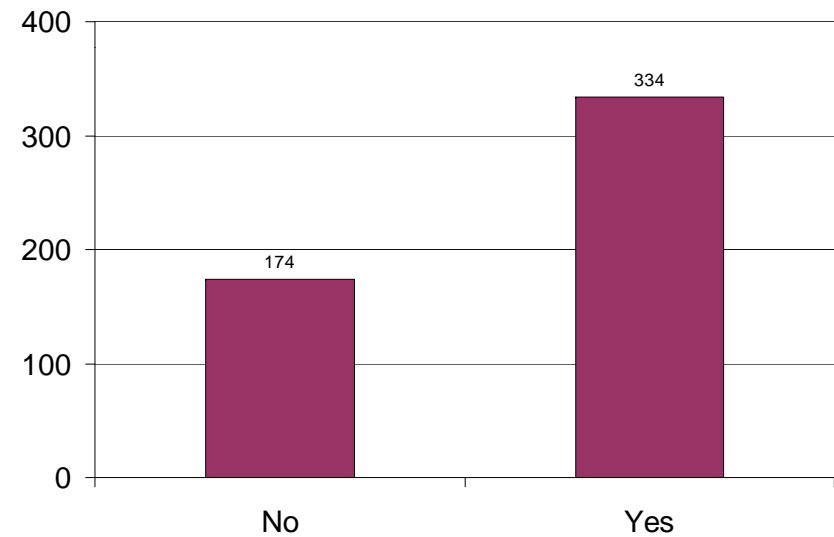
Moves



Other

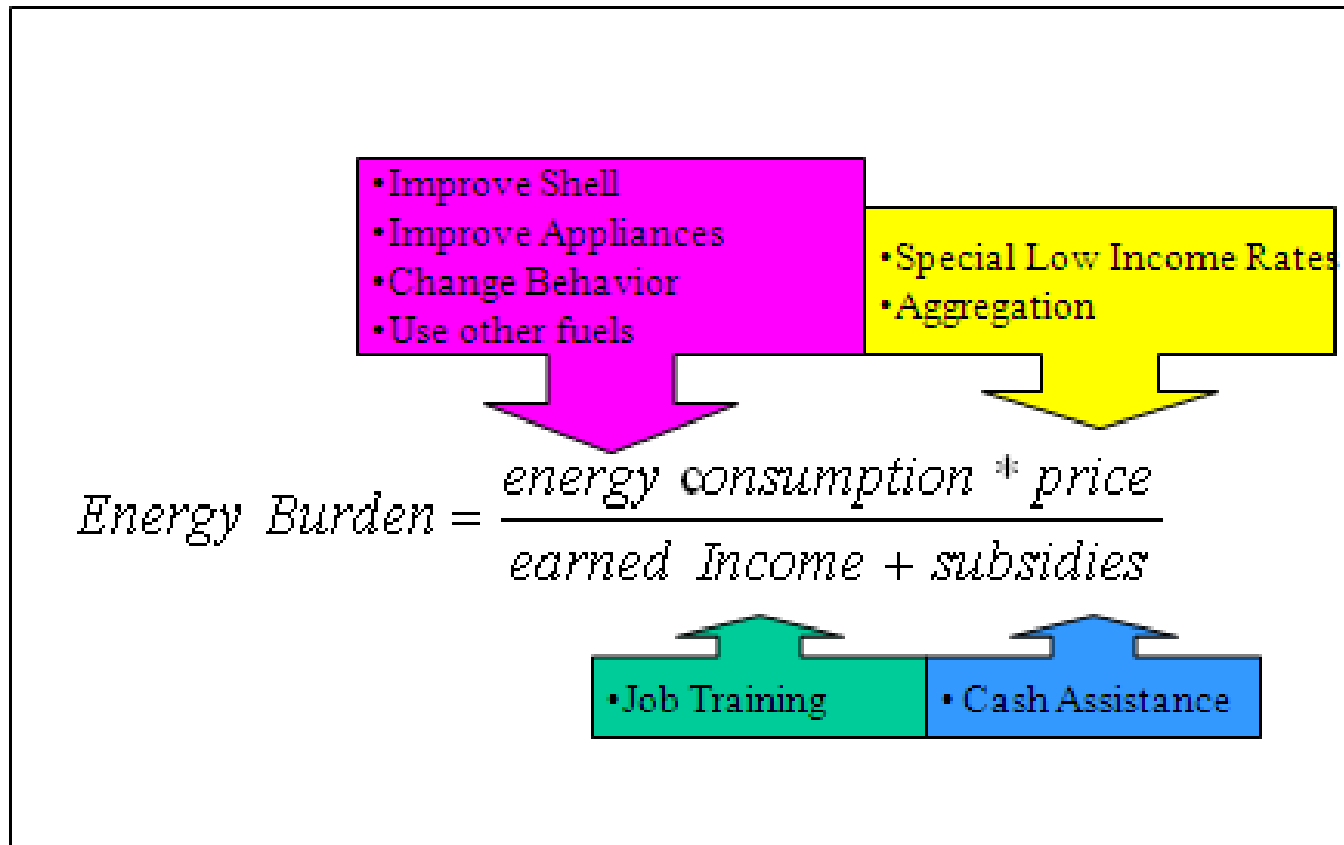


Fewer Illnesses?

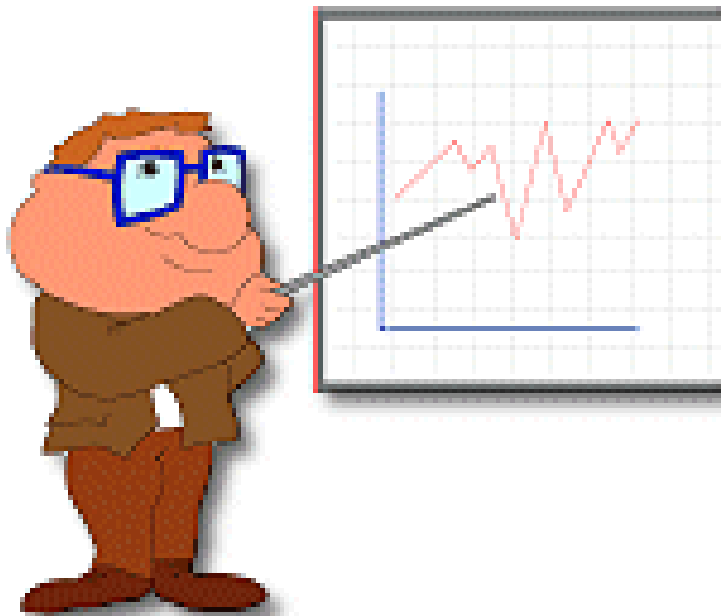


Fewer Absences?

Energy Burden



Indiana Reach

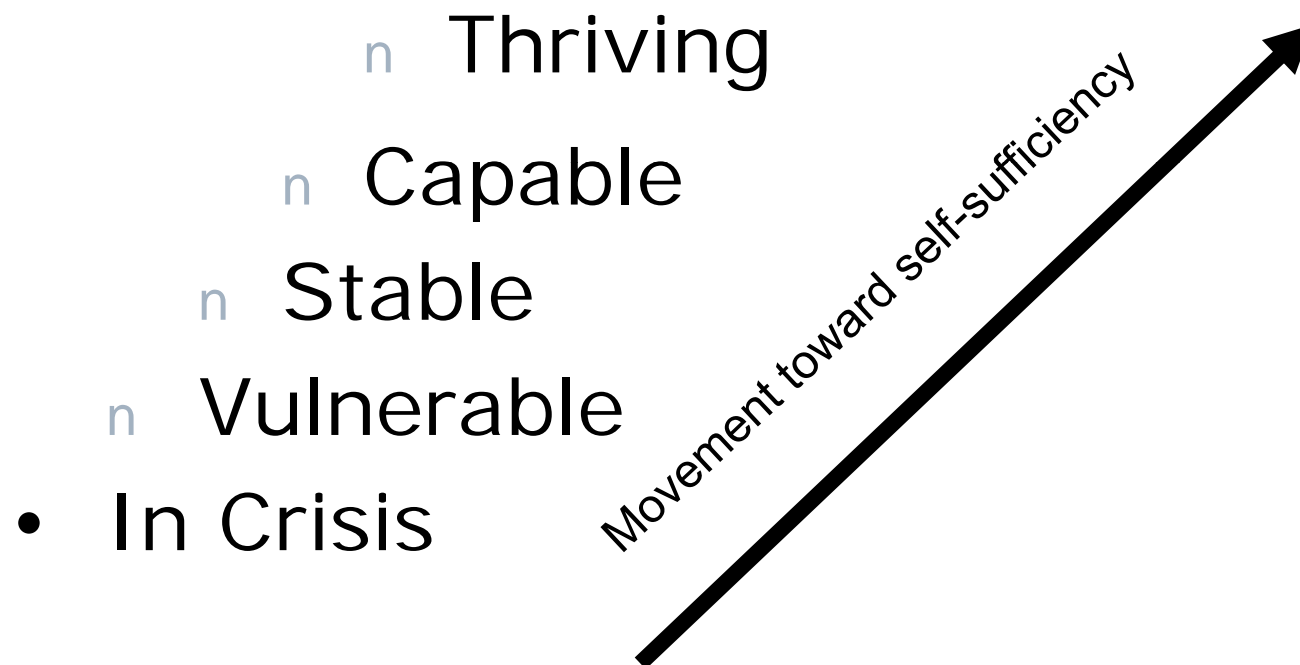


- β With energy cost being reduced from where it would have been had the program not existed by 12.5% and total income increasing by 23.7%, energy burden was estimated to have been reduced by 29%.

Energy Insecurity – Family Development Scales

- Home Energy Insecurity Scale
 - Developed for HHS, Division of Energy Assistance by Roger Colton of Fisher, Sheehan and Colton.
 - Family caseworkers assess participant families and their energy needs on a scale ranging from in-crisis to thriving.
 - The tool allows program administrators to determine incremental changes to the condition of families in their programs.
 - Uses the same five thresholds as the Results Oriented Management and Accountability (ROMA) process
 - ROMA is a well-accepted method for measuring family progress and program outcomes for social service organizations

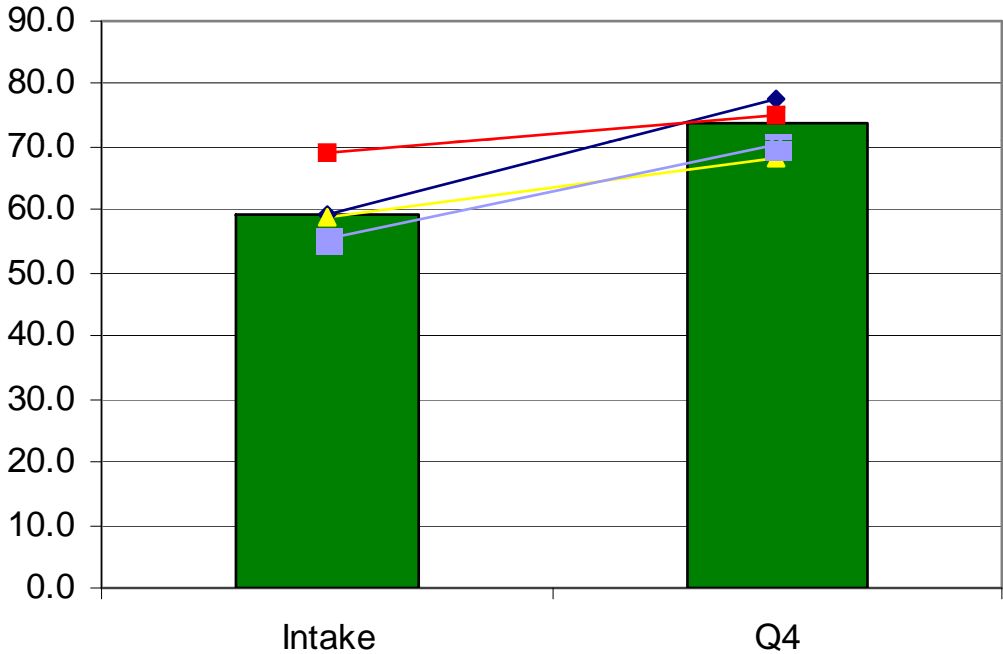
Home Energy Insecurity Scale: Internal Structure: Thresholds



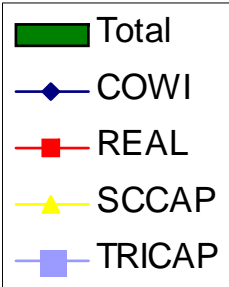
Home Energy Insecurity Scale Indicators

- The scale uses five basic categories through which to determine the placement of the household on the scale:
 - Receipt of outside assistance
 - Constraints on energy usage
 - Constraints on household necessities
 - Nonpayment of energy bills
 - Financial strain

Indiana REACH Results



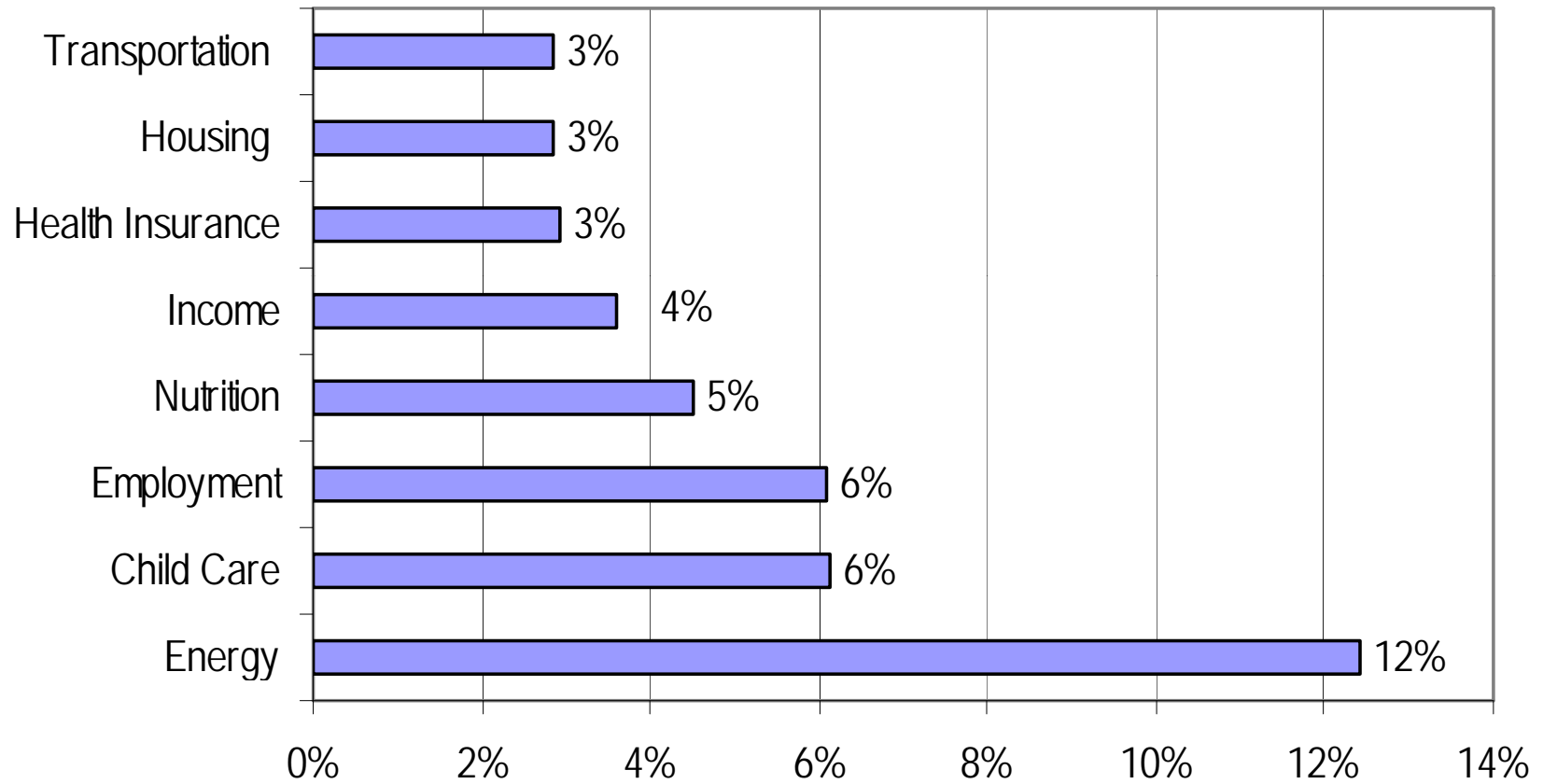
Points	Status
120 - 97	Thriving
96 - 73	Self sufficient
72 - 49	Stable
48 - 25	Vulnerable
24 - 0	In crisis



Indiana REACH Results

	Actual Pre	Actual Post	Change	Good/Bad Change
Average No. School Absences	1.8	1.5	-18%	Good
Percent of Families that Moved	23%	11%	-52%	Good
Federal/State Benefits/Month	\$485	\$532	9%	Good
Average Family Debt	\$1,351	\$1,789	32%	Varies
Electric Debt	\$82	\$70	-15%	Good
Gas Debt	\$55	\$36	-36%	Good
Total Income	\$1,198	\$1,458	22%	Good
Monthly Employment Income	\$240	\$308	28%	Good
Annual Energy Consumption	---	---	-12.5%	Good
Energy Burden	---	---	-28%	Good

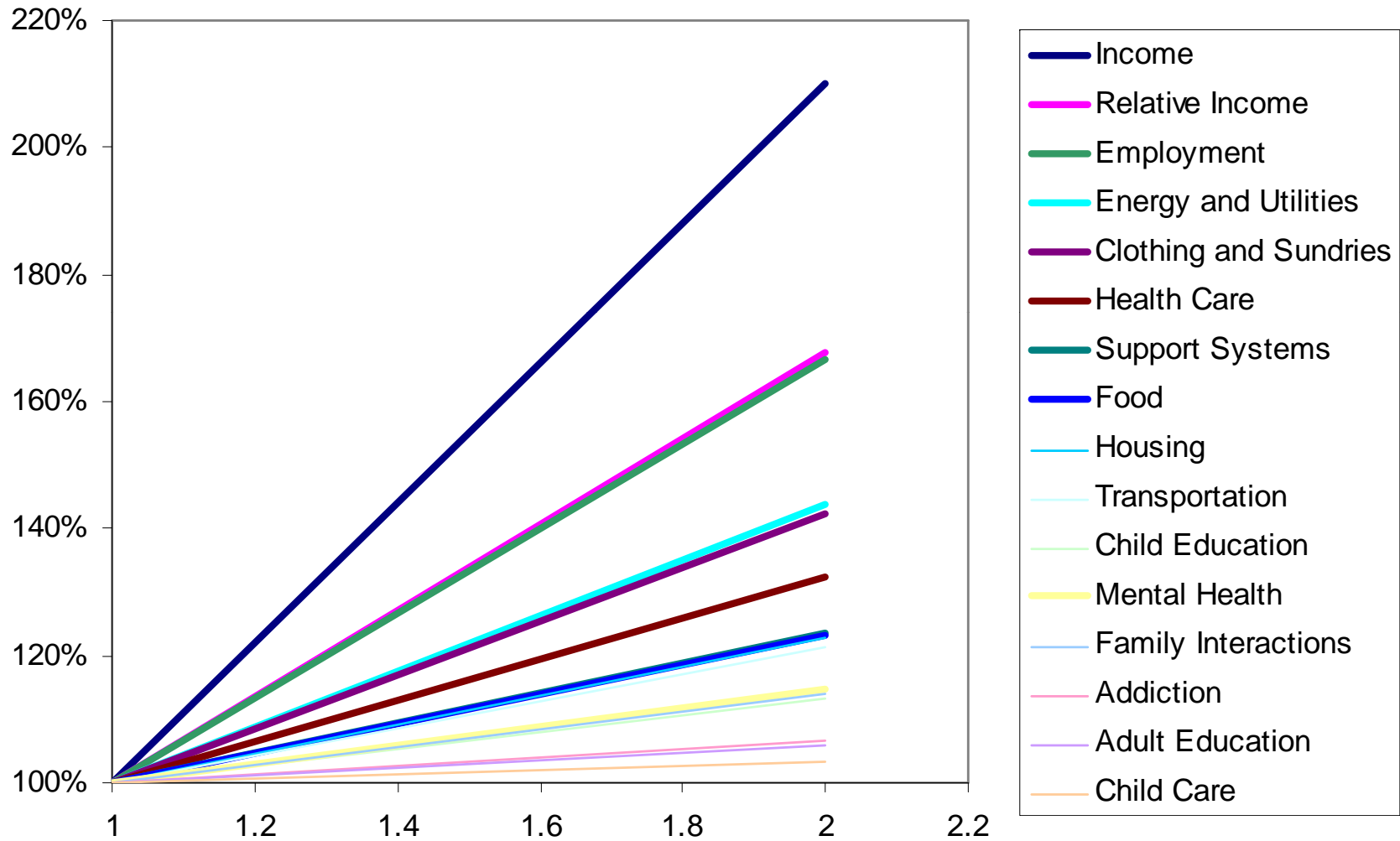
Oregon REACH Change in Scores



Energy Smart Results

- 9.4% decrease in energy usage
- Increase in amount and number of bill payments
- 25% decrease in energy burden
- Participants experienced an increase in income – from an average score of 1 “in-crisis” to an average score of 2.1 “vulnerable”

Energy Smart Results



NEB USAGE & THE REGULATORY TEST ISSUE

UPDATE

- No utilities with broad, formal use of NEBs in regulatory process
 - Informal use in marketing, targeting, potential for others (many examples)
 - Missing key elements – especially for low income programs
 - Many exploring other uses
 - Use in regulatory processes
 - Scenarios
 - “Readily measurable”
 - Screens

USES OF NEBS

	Utility NEBs	Societal	Participant
Marketing & targeting		Suitable	Yes
Program refinement	Yes	Yes	Yes
B/C internal customer		Suitable	Yes
Portfolio dev'p	Yes	Yes	Yes
B/C tests	Yes	Potential (high)	Potential

USING PARTICIPANT NEBS IN PROCESS/PROGRAM RESEARCH

- ❑ Process / program research & equipment selection applications
- ❑ Program logic / researchable questions
- ❑ “Disconnects” within chain of measure delivery
- ❑ Negative NEBs – “barriers”
- ❑ Paybacks & Participation analysis – internal is NOT based solely on energy savings (Tide™ example)

ALTERNATIVE NEBS TREATMENTS

- Adder (CO, NH, other)
- Readily measured
 - BC Hydro (maintenance, GHG, lifetime, product loss, productivity, floor space)
 - Energy Trust of OR (carbon value on societal test, PV deferred plant extension, water / sewer savings; laundry soap)
 - Others ("reliable and with economic value; maintenance & equipment replacement)
- All measured NEBs
- Hybrid

NEBS TREATMENT

- Benefits and risks
 - Important uses \leftrightarrow trusted metrics
 - Some NEBs can ONLY be measured from user perceptions; some most practically measured from surveys; modeling work progressed as well...
- Subsets / tests
 - TRC, Total market effects (TMET), other

CONTEXT AND CURRENT USAGE OF NEBS IN TESTS

(Source: SERA)

Inclusion	Discussion	State
GHG, Prop value, tax, health, jobs in formal B/C for low income req'd for legislature; only Low income; Maint / eqpt replacement	Also used for marketing / outreach – adapted from LIPPT; updates	VT
Variety of NEBs for all 3 perspectives; scenarios including percentages of NEB values examined / presented for regulators	Also marketing / outreach	NY
B/C model used includes NEBs reflecting utility cost savings & some participant NEBs (reliable & with “real economic value”)	Current TRC model includes some NEBs / unclear source	MA
10% environmental “adders” included if allowed by regulators	Limited arrearage analyses, some other NEBs allowed if low income programs don't meet threshold	CA, ID, OR, UT, WA (in past) WY, other
CO: 20% electricity adder; 5% gas adder for all programs; NH had 15% adder	CO: Re-examining; orig.derivation not well documented	CO, NH
TRC calcs include GHG; also Trust allows “readily measured” (incl. comm'l)	Measure-specific so some low income measures	PNW, BPA, Trust, NEEA
Not officially incorporated or not required and thus not measured		Others

NEBS AND REGULATORY TESTS

- ❑ Low income program goals
- ❑ Direct and improved economic and GHG NEBs in screening & B/C
 - TRC – case to include resource-related (GHG, labor, Water/wastewater)
 - Societal – case to include utility, societal, participant
- ❑ Readily measured NEBs into screening and B/C
- ❑ Developing acceptable multipliers for “other” HTM for proxies / conversation
- ❑ Use metrics for NEB values for screening, B/C, protocols

RECOMMENDATIONS AND NEXT STEPS

WHAT HAS BEEN LEARNED? STATE OF MEASUREMENT

- Arrearage based
- Readily measured
- Model based societal
- Survey based participant
 - Some values ONLY from perceptions
 - Some most readily from surveys
 - Surveys fastest for multiple NEBs
- Explore financial computations
- Weak / unexplored NEBs
- Weak on across-program comparisons (methods & values)
- Missing:
 - Measure-based
 - kW based

NEBS ADDRESSED WELL

Utility Perspective	Social perspective	Participant perspective
Collection activities Transmission & distribution Utility rate subsidy	Economic dev'p Emissions Possibly social / hardship indicator	Water / sewer savings Shutoffs / reconnections Calls and notices Property value Sick days Moves "Soft" NEBs in total, not associated with measures

NEBS NOT ADDRESSED WELL

UTILITY	SOCIETY	PARTICIPANT
Health	Tax impacts	Performance / operations
Safety	Water / wastewater	of measures
Insurance / self- insurance	infrastructure	Maintenance / lifetime
Substation / infrastructure	Fish/wildlife	Fires / safety
Power quality	National security	Chronic health / indoor air quality
	Health	
	Full treatment of social hardship indicators	

NEB VALUES RESEARCH PRIORITIES

Very High	High	Medium	Low
Relevant to Low Income; little work			Not relevant to Low Income, or well-known
<ul style="list-style-type: none"> •Health, IAQ (S, P) •Social / hardship (S, P) 	<ul style="list-style-type: none"> •Health / days lost (P) •Stability / moves (P) •Prop value / neigh. (S, P) •H&S, fires, insurance (P, S) •Emergency calls (U) •Insurance (U) •Infrastructure 	<ul style="list-style-type: none"> •Knowledge/control (P) •Subsidies (U) •Jobs (S) •Water (P) •Other bills (P) •GHG (elsewhere) •Participant effects (comfort, etc.) (PI) •Negative effects 	<ul style="list-style-type: none"> •Arrears-related •Fish / wildlife (S) •National security

U=Utility perspective; S=Societal; P=Participant

GAPS / NEXT STEPS

- ❑ Surveys with embedded tests, modules, comparisons
- ❑ Additional analysis in health & safety (multiple perspectives) Which measures, impact, value of effect;
 - Potentially will take engineering, inspections, health research, etc.
- ❑ Peak / off-peak enhancements for some NEBs (T&D, infrastructure)
- ❑ Utilities define “hardship” and develop metrics and survey – Important – initial progress made
 - Independently estimated vs. survey
 - Goals-related
- ❑ Revisit appropriate B/C tests, computational integration

WRAP-UP - NEBS

- ❑ Effects are large
- ❑ Progress made – focus of literature
- ❑ Measurement progress
- ❑ Developments in hardship – goals of low income
- ❑ Movement on uses by different utilities / regulators
- ❑ Some gaps / remaining research

QUESTIONS? CONTACT INFORMATION

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