

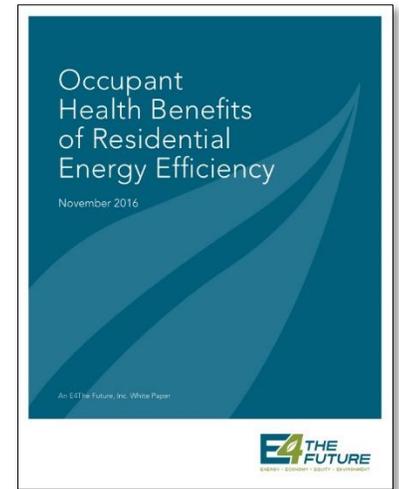
Energy efficiency (EE) creates value beyond simple energy cost reduction. EE:

- builds energy security
- supports economic development by creating jobs
- reduces excess burdens on low-income customers
- improves public health by cutting air pollution

Home occupant health benefits can also result due to improved indoor air quality, safety, and comfort.

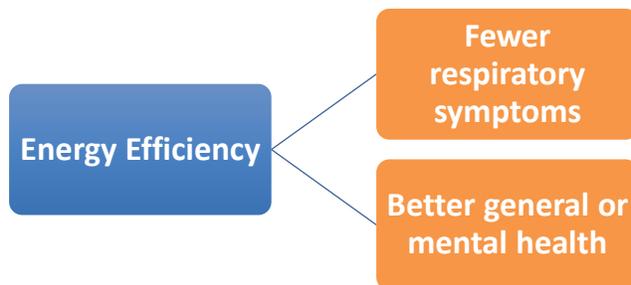
E4TheFuture’s paper reviews existing research on residential EE upgrades and associated health impacts, discusses how programs monetize occupant health co-benefits, highlights innovative programs, and identifies research gaps and strategies.

The report builds on broader research by U.S. Department of Energy. See *Home Rx: The Health Benefits of Home Performance: A Review of Current Evidence* (December 2016).



Excerpts from E4TheFuture’s paper:

Occupant Health Improvements



12% fewer asthma ED visits and a 48% decline in poor health among adults in households receiving DOE funded weatherization
Tonn et al. 2014

What the EE Studies Tell Us: Key Findings

- Occupants can experience fewer asthma symptoms and respiratory related Emergency Dept. (ED) visits after EE.
- Occupants report better physical and mental health after EE.
- Programs delivering EE with added home repairs and client education can produce more significant improvements in asthma symptoms and indoor environmental conditions.
- Improvements in occupant health are strongest among vulnerable groups: lower income households and residents with pre-existing health conditions linked to housing risks.

23% reduction in poorly controlled asthma for children in homes receiving EE, some home repairs & education compared to those receiving only education
Breysse et al. 2014

- Whole house ventilation strategies using heat or energy recovery ventilators (HRVs or ERVs) can reduce asthma and respiratory symptoms in children with pre-existing risks. Such strategies are increasingly being considered in EE programs.
- Homes receiving EE can experience increases in radon or formaldehyde; ventilation systems may offer the potential to reduce radon in such homes.

The majority of studies were conducted in single family, lower-income homes located in northern heating climates.

Innovative Energy and Health Programs Are Testing New Models

EE programs are testing innovative approaches and developing new partnerships to improve occupant health. Building Performance Institute (BPI) [Healthy Homes Evaluator Credential](#), launched in 2016, provides health training to the EE workforce. This certification can help to support these new programs.

Potential Occupant Health Impacts From Residential EE

Residential EE programs typically improve the building envelope and heating systems, creating warmer and more comfortable homes. Pathways by which home energy upgrades can also help to improve indoor conditions and occupant health:

