

Why Equity Matters: Energy Use and Health Disparities by Neighborhood: Stories (and Data) from Families Living in Chicago's Bungalow Belt

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ABSTRACT

The interconnections between health, housing, and energy efficiency are well documented. Just as housing characteristics are a driver of energy use, housing characteristics are also strongly related to health. For example, respiratory illnesses, as well as energy costs, can be exacerbated by poor ventilation. Further, negative health impacts and high energy burdens are disproportionately felt in lower income communities. Investments in the clean energy economy must be delivered to alleviate these disproportionate health and energy use impacts. Energy and health programs should address equity and geographic disparities.

The historic Chicago bungalow is an example of vernacular architecture; nearly 80,000 of these 1920s-era homes are spread across the city and surrounding suburbs, forming a "bungalow belt" across low-, middle-, and high-income neighborhoods. Though the homes are nearly identical in size and construction, their energy use, air quality and impacts on families' health vary by neighborhood.

Families living in economically distressed neighborhoods have higher gas use, greater energy burdens, experience poorer air quality, and suffer from asthma and other chronic respiratory illnesses at higher rates than families living in higher income neighborhoods.

This paper will present analysis of the energy and health impacts across neighborhoods in Chicago, including energy use, asthma rates, and air quality, as well as a shallow real estate market analysis. The 2018 ACEEE Summer Study presentation will feature case studies via video and interviews, discuss households' participation in energy and health programs, and will tell the energy and health stories of families who live in these homes and their efforts to manage and improve their homes and their health.

Introduction

"The families on this street all know and look out for each other. Our kids play in the front yards; we are proud of and grateful for our homes." – RH, resident, Chatham.

The City of Chicago is a city of neighborhoods, designated by 77 distinct community areas. Approximately one million Chicago households live in a building stock of 461,000 buildings with 1.3 million housing units (Scheu and Garascia 2016.) While single family homes represent approximately 23% of the housing units, they are nearly two thirds of Chicago's building stock- 64.9%. Approximately three hundred thousand families live in single family homes across all community areas in Chicago. Many of these families live in 'Chicago' bungalows.

The city of Chicago was incorporated in 1832 and went through a period of rapid growth until. The Great Chicago Fire of 1871 destroyed one-third of all the residential structures. Afterwards, the city adopted strict building codes that mandated solid masonry construction within city limits. Lower cost wood frame constructed homes were built outside city limits, areas that would later be annexed by the city. The current single family building stock is significantly influenced by the construction boom era that began near the turn of the century and continued through the 1920s, as many of these homes are still occupied by families across the city. Pre-1942 solid masonry and uninsulated wood frame buildings remain the predominant type of single family construction. The masonry bungalows, known as “the Chicago bungalow” are the residential vernacular archetype of Chicago, and nearly 80,000 of these home types are spread across the city and near suburbs. These homes have stood the test of time, are durable and desirable, housing families across generations, eras, building trends, and neighborhood changes. They are remarkably similar in size, construction, and layout. Because of their similarity and large numbers across communities, the bungalows provide an excellent real world ‘test home sample population’ to explore energy use and health disparities across neighborhoods.

This paper makes the case that there are geographic disparities in energy and health outcomes for families living in very similar homes across different neighborhoods in Chicago. The first section describes the data sources and methods. The results sections present: 1) the geospatial analysis of three neighborhood clusters that are comprised of eight community areas, and the income and housing characteristics in each community area; 2) the energy use characteristics of bungalow homes and the single family housing stock in the selected community areas; 3) the health outcomes in those community areas; and 4) a real estate market analysis of bungalows and the single family housing stock in the selected communities. Last, the discussion section presents broad recommendations for cross-sector collaboration of energy, housing and health communities to achieve equity outcomes. It also recommends specific areas of alignment with the City of Chicago’s four year plan to improve health equity.

This analysis is intended to complement other initiatives that identify housing as an important social determinant of health, make the case for energy equity, and to collaboratively address health, housing and energy across sectors.

Data and Methods

For this analysis we combined several sources of geospatial data, existing health analyses, and energy efficiency program learnings from implementation and research to identify neighborhoods for case studies. We utilized geospatial data at the census tract level on local ambient air pollution, respiratory disease prevalence, housing characteristics, and household income. We reviewed existing health disparities analyses completed at the neighborhood and census tract level in Chicago, such as *Healthy Chicago 2.0* and Sinai Urban Health Institute’s *Community Health Counts: Sinai Community Health Survey 2.0*. Last, we drew on the research and experience of energy efficiency program implementers and air quality researchers that work with families in the bungalow communities. The testimonials come from families living in bungalows across the city.

The bungalows are identified and served by The Chicago Bungalow Association (CBA), a membership based non-profit delegate agency of the City of Chicago that has 17,000 members across the City. CBA provides programs and educational resources to homeowners to maintain, preserve, and adapt their Chicago bungalows and vintage homes, thereby strengthening the

neighborhoods they anchor. CBA has created 12 National Register Historic Districts in Chicago. It also provides resources for real estate professionals that buy and sell bungalows.

Since 2008, the CBA has run a robust weatherization program for low-moderate income homeowners. The Energy Savers program, created in partnership with the two utilities, ComEd and Peoples Gas, has retrofitted 3,300 homes, investing \$13 million dollars into the communities. The weatherization services are free to income-eligible households, and services include attic and sidewall insulation, air sealing, health and safety measures, and direct install measures.

For air pollution data, we used annual average concentrations of particulate matter with diameter less than or equal to 2.5 micrometers (PM_{2.5}) and the National Air Toxics Assessment's Respiratory Hazard Index, which are both available at the census tract level from the EPA's EJSCREEN Environmental Justice Screening and Mapping tool. The Respiratory Hazard Index combines concentrations of 140 different pollutants with their health impacts to capture the overall risk to respiratory health from toxic air pollution. The health indicators we used are the prevalence of asthma among adults and the prevalence of chronic obstructive pulmonary disease (COPD), emphysema, or chronic bronchitis. These data are available at the census tract level from the U.C. Centers for Disease Control and Prevention (CDC) 500 Cities data.

Next, we combined air pollution and health data with housing and energy characteristics data from Elevate Energy's single-family housing characterization to identify neighborhoods with large numbers of bungalow-style homes. The housing and energy characterization analysis used property-level data to segment 1.1 million homes based on their age, number of stories, type of construction, energy use, and ability and cost to retrofit. Finally, we layered income data from the American Community Survey.

Using these data we reviewed Chicago community areas and the census tracts within them in terms of their air pollution levels, respiratory health, energy use, housing types, and income. The goal was to identify three cluster areas in the city that have similar homes (bungalows), but show disparities in energy use and health, specifically, air quality.

Finally, for the real estate analysis, we analyzed home sales data from Midwest Real Estate Data, the real estate listing service (MLS) that serves Chicago.

The 2018 ACEEE Summer Study video presentation will present the analysis from this paper and also present video interviews with residents in the cluster communities, some who have received energy retrofits with the Chicago Bungalow Association, and some who have not. The videos will tell the stories of families in the selected neighborhoods and their efforts to manage and improve their health and their homes.

Results –Neighborhood and Housing Characteristics

The analysis focused on **three clusters of community areas** based on prevalence of bungalow style homes, energy use, income, geospatial analysis and existing health disparities analysis. The furthest northwest cluster consists of the community areas of **Irving Park, Portage Park, and Norwood Park**. The north cluster includes **Humboldt Park, Belmont Cragin, and Hermosa**. The third southern cluster includes the **Chatham and Auburn Gresham** community areas. Each of the clusters include at least 4,300 bungalow style homes, include between a minimum of 600-1000 Chicago Bungalow Association members, have homes that have participated in both energy and health programs, and include communities that have been

identified as high priority areas by *Healthy Chicago 2.0* and/or the *Sinai Community Health Survey*.

“The bungalow association brings together the community and provides a sense of belonging with fellow bungalow owners.” -Auburn Gresham resident

Table 1: Photos and locations of the bungalow homes and neighborhood clusters



Table 2: Household income and housing characteristics in selected neighborhoods

	Median household income \$	Number of households	Average household size	Percent of households earning $\leq 80\%$ AMI	Number of single family homes	Percent single family homes %
Chatham	\$32,222	13,560	2.3	67%	5366	33

Auburn Gresham	\$30,469	17,158	2.7	72%	8416	49
Humboldt Park	\$32,073	16,519	3.3	70%	4158	21
Belmont Cragin	\$43,534	21,726	3.6	64%	8771	36
Hermosa	\$39,157	7099	3.6	66%	2246	29
Irving Park	\$51,997	20,300	2.8	48%	5643	25
Norwood Park	\$71,282	14,311	2.5	37%	11,193	71
Portage Park	\$57,031	22,589	2.9	47%	10,422	42

The utility income-eligible energy efficiency programs serve households at or below 80% of area median income (AMI). For reference, the 80% of area median income limit for a four person household living in Chicago is \$67,700, according to 2018 HUD AMI income limits.

Results –Energy Use

Bungalows tend to be generally more energy intensive than other single family homes Chicago and Cook County, due to their age, size, and construction type- 160 kBtu/sf/year compared to 141 kBtu/sf/year and 126 kBtu/sf/year, (Bailey-Burns and Scheu 2014 and Scheu, Rachel, Robinson, and Evens 2014.) Despite their homogeneity, there is substantial variation in energy use, especially gas usage, among bungalows in different neighborhoods. Specifically, median annual gas usage is distinctly higher among bungalows in Chatham and Auburn Gresham compared to the other neighborhoods (1704 and 1822 therms, respectively), so these families face a substantial burden related to their heating costs. In other words, bungalow owners in some higher-income neighborhoods are able to reduce their gas use to below the city-wide bungalow median of 1606 therms, while bungalow owners in some moderate and lower-income neighborhoods have higher than average gas use and costs. For comparison, the annual median therm use in single family homes in Cook County is 1338 therms.

The variation in electricity usage in bungalows by neighborhood is not as stark as the variation in gas usage. For electricity usage in the neighborhoods of Irving Park and Norwood Park the median annual electricity usage (8154 and 8207 kWh, respectively) is slightly lower than the city-wide bungalow median of 8331. In contrast, among the other neighborhoods only Chatham has lower median electricity usage at 8063 kWh, while Auburn Gresham, Humboldt Park, and Belmont Cragin all have median usage higher than the city-wide bungalow median.

These patterns illustrate the disparity in energy use and costs, which is partially associated with housing quality and maintenance. Even with the same type of home, higher-income families and families living in higher resourced neighborhoods are able to invest in home maintenance and upgrades to increase their energy efficiency and home value, such as new appliances, attic and wall insulation, and other measures. These home improvements are often unaffordable for economically disadvantaged families.

Table 3. Gas and electricity use patterns in bungalow homes in selected

neighborhoods (n=13,545)

	Median annual kWh use	Median annual therm use	EUI kBtu/sf/year
Chatham (n=1567)	8063	1714	
Auburn Gresham (n=2830)	8891	1822	
Hermosa (n=756)	8382	1519	
Humboldt Park (n=949)	8420	1565	
Belmont-Cragin (n=361)	8732	1573	
Irving Park (n=557)	8154	1461	
Norwood Park (n=765)	8207	1508	
Portage Park (n=3060)	8191	1512	
City of Chicago (n=47,899)	8331	1606	160

Similar to the bungalows, the energy use patterns illustrating the disparity in energy use, particularly gas, exist across all single family residences in the selected neighborhoods. Norwood Park and Portage Park have higher household incomes and lower gas use. Auburn Gresham and Chatham have lower household incomes and higher gas use.

Table 4: Gas and electricity use characteristics of all single family homes in selected neighborhoods (n=56,215), Chicago, and Cook County (includes Chicago)

	Median annual kWh use	Median annual therm use	EUI kBtu/sf/year
Chatham (n=5366)	7988	1504	
Auburn Gresham (n=8416)	8646	1600	
Hermosa (n=2246)	8382	1519	
Humboldt Park (n=4158)	7990	1446	
Belmont-Cragin (n=8771)	8424	1472	
Irving Park (n=5643)	8654	1411	
Norwood Park (n=11,193)	8207	1226	
Portage Park (n=10,422)	8248	1399	
City of Chicago (n=299,373)	8390	1611	141
Cook County (n=919,103)	8761	1338	126

Results – Health Outcomes: Respiratory health

Although Chicago has poor ambient air quality overall relative to much of the rest of the U.S., we identified census tracts in three clusters of neighborhoods that exhibit high, moderate to high, and low or moderate levels of air pollution and respiratory disease prevalence. Those clusters include the neighborhoods of Chatham and Auburn Gresham (high), Humboldt Park, Belmont Cragin, and Hermosa (moderate to high) and Irving Park, Portage Park, and Norwood Park (low or moderate). Humboldt Park also has high prevalence of asthma and COPD. In

Humboldt Park, 23% of adults had asthma, compared to 11% in nearby Hermosa. In Humboldt, Park one in three adults had COPD, compared to 17% in Norwood Park and 15% in Hermosa.

*“I love everything about my bungalow home: the big foyer, the traditional wood details, skylights upstairs and the space to expand downstairs. But I’m concerned about the air quality in our home. My middle child has asthma, and he was asymptomatic on vacation. But on the first night back, he slept on the couch downstairs because his room was so stuffy. We have a HEPA filter and we are diligent about cleaning and replacing area rugs. I wish I knew what else we can do to improve our home’s air quality. –
homeowner of a certified historic bungalow in Belmont Cragin*

Results – Health Outcomes: Other health outcomes

Sinai Urban Health Institute (SUHI) conducted the *Sinai Community Health Survey 2.0* to provide critical data on the health outcomes and related health factors in nine Chicago neighborhoods. Hermosa, Humboldt Park, and Norwood Park, three of the communities chosen for this analysis, were three of the nine neighborhoods surveyed by SUHI. The purpose of the community health survey is to: 1. Document the health status of selected Chicago community areas; 2. Understand the social factors associated with health-related behaviors, service utilization, and outcomes; and 3. Use findings to develop public health interventions to address health inequities.

The following summarizes the salient non-respiratory health outcomes identified in the survey related Hermosa, Humboldt Park and Norwood Park (Sinai Urban Health Institute, 2017.) General health: Among males, the average number of mentally unhealthy days in the past month ranged from a high of 3.9 days for males in Humboldt Park to a low of 0.6 days for males in Norwood Park. Obesity: In Humboldt Park, over half of female residents were obese compared to a low of 8% for females in Norwood Park. Depression and Anxiety: In Humboldt Park, one in six adults had current depression symptoms, and the prevalence of current depression symptoms ranged from a high of 18% in Humboldt Park. Additionally, about one in five adults in Humboldt Park had current anxiety symptoms. In the nine communities surveyed, the prevalence of current anxiety symptoms ranged from a high of 21% in Humboldt Park to a low of 8% in Norwood Park. Social cohesion: Among the nine communities surveyed, Norwood Park had the highest average social cohesion. In Humboldt Park, at least one in ten adults had been diagnosed with PTSD, and at least one in four females in Humboldt Park had current PTSD symptoms. Among females, the prevalence of current PTSD symptoms ranged from a high of 29% for females in Humboldt Park to a low of 15% for females in Hermosa. Among males, the prevalence of current PTSD symptoms ranged from a high of 24% for males in Humboldt Park. Smoking: Among the nine communities surveyed the percentages of females who currently smoke ranged from 47% to a low of 6% for females in Norwood Park. Domestic violence: In Humboldt Park, about one in three females reported ever experiencing intimate partner violence. Health insurance: Over half of adults aged 18-64 years were covered by public insurance in Humboldt Park. The percentage of adults aged 18-64 years with private health insurance ranged from a high of 80% in Norwood Park. Access to health care: The percentage of adults who did not get needed mental health care in the past year due to cost ranged from a high of 13% in Humboldt Park, and about one in eight adults in Humboldt Park did not get needed mental health

care in the past year due to cost. The percentage of males with a routine check-up in the past year ranged from a high of 80% for males in Norwood Park. Norwood Park had the lowest percentage 5% of adults who did not get needed dental care in the past year due to cost. Food insecurity: the prevalence of household food insecurity in the past year ranged from a high of 46% in Humboldt Park to a low of 7% in Norwood Park. Criminal justice experiences: In Humboldt Park, about one in three males had ever been convicted of a crime or placed under criminal justice supervision such as jail, prison, or probation.

The disparities that exist between neighborhoods offer opportunities for targeted home based solutions that could accelerate the pace by which we close gaps in health outcomes.

Results – Real Estate Analysis

Location. Location. Location. The real estate adage accurately describes the Chicago bungalow market. Although bungalows across the city are remarkably similar in size and floor plans, their purchase price, market time, home value, and recovery from the 2005-2007 housing bubble varies by neighborhood. The three neighborhood clusters illustrate these real estate market differences. Comparatively, the further northwest cluster of Irving Park, Portage Park, and Norwood Park are strong markets with consistent year over year growth, and experienced smaller bubble era peaks, and had lower but steady appreciation year over year. The northwest cluster of Humboldt Park, Belmont Cragin and Hermosa experienced larger changes in price appreciation and increased demand. The third, south cluster of Auburn Gresham and Chatham had higher market time, lower median sales price, lower appreciation since 2000, and a larger market recovery climb from the 2008 market crash.

The Institute for Housing Studies at DePaul University produces an annual submarket price index that is based on Public Use Microdata Areas (PUMAs) from the 2010 US Census. The index highlights four key metrics for analyzing house price trends and describes their patterns and their implications for communities.

Table 5: Summary of price indices of all single family homes in Chicago submarkets from the Institute for Housing Studies at DePaul University

Submarket	Change since 2000	Change from Bubble Era Peak (2005-2007) to Current	Recovery from Bottom (2008-17)	Year-over-year change (2016-2017)
Chicago-- Irving Park /Albany Park	89.3%	-3.9%	47.9%	3.6%
Chicago-- Portage Park /Jefferson Park	70.8%	-15.7%	52.6%	1.8%
Chicago--Austin/ Belmont Cragin	60.4%	-30.2%	65.0%	5.7%
Chicago-- Humboldt Park /Garfield Park	74.1%	-40.7%	107.4%	7.4%
Chicago-- Auburn Gresham/Chatham	13.2%	-43.3%	33.2%	4.3%
City of Chicago	63.6%	-23.3%	40.7%	2.8%
Suburban Cook County	37.8%	-21.9%	31.0%	2.7%

Source: Derived from Institute for Housing Studies Cook County Submarket Indices (4th Quarter 2017)

From April 1, 2017 to April 30, 2018, 22,752 detached, single-family homes were listed in Chicago on the Multiple Listing Service. 916 of these homes were located in Portage Park, 792 in Norwood Park, 736 in Auburn Gresham, 660 in Irving Park, 624 in Belmont Cragin, 349 in Chatham, and 294 in Humboldt Park. The highest number of sales occurred in Portage Park, 389, and homes in this neighborhood sold for a median price of \$319,000. Comparatively, the median sales price for a home in Irving Park was \$490,000. Chatham was much lower, \$149,900, and the median price was similar in Humboldt Park, \$150,050. On average, Chatham homes spent the longest time on the market, at 118 days. Irving Park homes sold in 108 days, and Humboldt Park homes closed at an average of 93.

During this period of time, 4,026 bungalows were listed in the city and 1,684 were sold. 385 of these bungalows were listed in Portage Park, 292 in Auburn Gresham, 289 in Belmont Cragin, 102 in Chatham, 68 in Irving Park, and 27 in Humboldt Park. Between 37% and 49% of bungalows closed during this one-year time frame, in all neighborhoods. The highest numbers of bungalow sold were 180 and 126, in Portage Park and Belmont Cragin, respectively. Chatham bungalows that were sold stayed on the market for the highest number of days, 133 on average. Auburn Gresham bungalows sold for the lowest price, at \$137,500. Hermosa bungalows, like all Hermosa homes, sat on the market for the least number of days, 72, and sold at a median price of \$255,500. Irving Park bungalows sold for the highest median price, \$401,000, and stayed on the market for an average of 91 days before closing.

For the city as a whole, there was not a large difference between average bungalow market times (104 days) compared to market times of all single family homes (109 days), or median bungalow sale prices (\$229,000) compared to sale prices of all single family homes (\$235,900). 18% of listed homes in Chicago were bungalows, and similarly, 19% of closed homes were bungalows. However, variation is notable among the markets of the six community areas and neighborhood clusters. Irving Park, Norwood Park and Portage Park homes, the furthest northwest cluster, sold for prices substantially above the city median, but stayed on the market for an average amount of time.

Homeownership has historically been a key strategy to asset building and wealth creation. The Portage Park submarket exhibited a 70.8% increase in home value since 2000, greater than the city average of 63.6%, and as example, homeowner KH, was able capitalize on Portage Park's stable and consistent growth.

Portage Park homeowner, KH, purchased her bungalow in 2001 for \$178,000. She made minor, mostly cosmetic investments in the home, such as painting and removing carpeting, and lived there for approximately a year before getting married and moving into her husband's home. She considered selling the house but decided to rent it out instead because the rent covered her expenses. Several years later, she was able to leverage the equity in the Portage Park bungalow to purchase another rental property, a 2 flat, for investment.

Discussion and Recommendations

The previous sections presented data and analysis that make the case that energy and health disparities are present in Chicago's bungalow belt, and the outcomes vary by

neighborhood. This section discusses these disparities and poses recommendations to align health and housing strategies and policies with energy to achieve broader equity outcomes that include lower energy insecurity, safe and affordable housing, and improved health, across communities.

Energy- The bungalow home and energy use analysis illustrated the disparities in energy use across the selected neighborhoods and clusters. The analysis demonstrated that bungalow households in the farthest northwest cluster of Irving Park, Portage Park and Norwood Park households have lower gas use and higher incomes. Households in the southern cluster of Auburn Gresham and Chatham have higher gas use and lower incomes.

Additionally, customer nonpayment to Chicago's gas utility Peoples Gas, soared last year. According to the national public radio affiliate in Chicago, WBEZ, the amount Peoples reported as uncollectible in filings with the Illinois Commerce Commission in 2017 was \$58.2 million, more than twice the amount it recorded in 2016. (Daniels 2018.) Elevate Energy analysis of the filings estimates that approximately 4000 and 4600 of these disconnections were located in the zip codes that predominate the Chatham and Auburn Gresham community areas, compared to just 185 disconnections in the zip code that predominates Norwood Park.

These findings demonstrate that there are disparities in energy burdens, the ratio of energy use/costs over income, across these neighborhood clusters despite living in nearly identical homes. Energy burden is a simple metric, and lends itself to simple solutions of increasing household income or reducing energy use. Both are valuable and proven strategies. However the geospatial disparities in energy use and health, despite similar home type, point to the need for a multidimensional approach to achieve equity outcomes.

Professor Dianna Hernández, in her 2016 journal article "*Understanding energy insecurity and why it matters to health*" states that energy is a critical social and public health matter. She compares energy insecurity to food insecurity where affordability and access to quality is critical, argues that energy insecurity is also determined by access to decent, efficient and affordable housing. She posits that "energy insecurity acts as a mediator in the poor housing to poor health continuum," and she offers a valuable multiple dimensional framework to address energy insecurity. She posits that the primary dimensions of energy insecurity are **physical, economic and behavioral**. The **physical** dimensions of energy insecurity are related to the "deficiencies in the physical infrastructure of the home that impact thermal comfort, induce harmful indoor exposures, and increase energy costs." The **behavioral** dimensions are "strategies used to cope, improvise and counteract the impacts of economic and structural energy insecurity." The **economic** dimension of insecurity is "financial hardship associated with the cost of energy relative to income and other expenses."

Two examples of physical dimensions are poor housing quality, such as presence of mold or lead, and faulty building infrastructure, such as inadequate insulation or HVAC systems. Energy-specific financial hardship examples can include reconnection and late fees or the cost spikes based on seasonal variations. But the economic dimension of insecurity can be broader, and could include poverty, and the material hardship of not earning enough income to cover living expenses, or the financial impacts of little or negative credit history. 'Heat or eat' and 'cool or school' are examples of the behavioral dimensions of energy insecurity, where households make tradeoffs between paying utilities and other household needs. Other examples include lump sum and partial bill payments, energy conservation, adjusting thermal comfort and utilizing fuel

assistance programs. All of these strategies are sources of household stress and demonstrated negative health outcomes.

Energy efficiency programs and policies can address the multiple components of energy insecurity: physical, economic and behavioral, in order to address equity and neighborhood disparities. For example, the State of Connecticut Department of Energy and Environmental Protection (DEEP) is launching the EnergizeCT Health & Safety Revolving Loan Fund that will provide "gap funding" loans and limited grants for owners of multifamily housing, serving primarily low income residents, to remediate health and safety issues in apartments. Credit qualification is based on historical on time payment of utility bills, not solely on credit scores. In Chicago, the electric utility ComEd piloted a successful program with nine hospitals called HEAL (Hospital-based Energy Assistance and Long-term health) that intervenes at a time of stress, such as a hospitalization, that may undermine their ability to pay household expenses and lead to utility disruption. The program utilized social workers to identify patients that due to burden of hospitalization or medical expenses, are eligible for special financial assistance to avoid disconnection. (Evens, Garascia, and Issacson. 2017.)

Health and Safety- Home energy upgrade and retrofit programs, particularly ones that serve an older housing stock and/or economically disadvantaged communities must address home repairs, maintenance, and health and safety. Programs must include flexible funding to address a multitude of health and safety improvements. Nationally, about one in five income-qualified households' homes cannot be weatherized without first addressing significant structural, health or safety issues, such as knob-and-tube wiring, asbestos insulation, mold and roof leaks. (Hoffman, 2017.)

The Green and Healthy Homes Initiative (GHHI) also noted the prevalence of health and safety hazards at 25% of the homes undergoing weatherization in collaboration with DOE Weatherization Assistance Program (WAP) weatherization providers in 12 GHHI designated sites. These hazards included significant ventilation issues, mold and moisture, mildew hazards, and pests. Structural defects were found in 30% of the audits with the most common type being leaky roofs. The prevalence of roofing issues is a concern of the high cost and extended time associated with addressing those hazards. Further, the report documented fire and safety hazards present in over half of homes. (GHHI, 2010.)

In Chicago, the walkaway rate was even higher. From 2014-2017, one of every two applicants to the Chicago Bungalow Association Energy Savers program from income-qualified households' homes were rejected and could not be weatherized because of significant health and safety issues. CBA staff worked with staff from Peoples Gas and ComEd to address health and safety issues and to include funds to address these problems. The revised weatherization program created under Illinois's 2016 Future Energy Jobs Act (FEJA) for single family income-qualified households' homes includes funds to remediate some health and safety issues including repairing small roof leaks, replacing broken glass in windows, replacing rotted basement doors, and furnace cleaning and tuning. The FEJA-created CBA Energy Savers (weatherization) program offering is now available to 85% of all applicants, as opposed to 50% previously. The FEJA-created Energy Savers offering is prescriptive for the individual applicant's home, and an average of \$7706 per home. It includes attic insulation, sidewall insulation, air sealing, furnace clean and tune, weather stripping of doors and installation of an ASHRAE fan, in addition to the health and safety measures listed above, as needed. Some homes' total investment can be as high

as \$11,000. Prior to FEJA, CBA's Energy Savers program was administered by the Illinois Department of Commerce and Economic Opportunity and included only attic insulation and some air sealing and was a flat \$3,600 per home.

Next steps for local collaboration – The energy, health and housing neighborhood disparities analysis will be shared with stakeholders of Healthy Chicago 2.0. The Healthy Chicago 2.0 plan for partnering to improve health equity 2016-2020, focuses on four key areas: the built environment, economic development, housing, and education. The housing strategies outlined are the most relevant to include energy and neighborhood disparities data and analysis. The authors highlight many of the health disparities found in the eight community areas our analysis selected. For example, Auburn Gresham, Belmont Cragin, Hermosa and Humboldt Park were identified as 'high economic hardship' communities (City of Chicago. 2016.) Auburn Gresham, Hermosa and Humboldt Park were also identified as community areas that had between 4.1% -10.1% of children under 3 years with elevated blood lead levels (.6mcg/dl.)

Conclusion

This analysis makes the case for Why Equity Matters: Energy Use and Health Disparities in Chicago neighborhoods. The analysis presented the energy and health impacts across three clusters of neighborhoods in Chicago, and included energy use, health and air quality, as well as a shallow real estate market analysis. The analysis focused on households living in a single vernacular housing type, the ubiquitous Chicago bungalow. The 2018 ACEEE Summer Study presentation will feature the voices of the families that live in these communities. The authors advocate for cross-sector collaboration of energy, housing and health communities to achieve equity outcomes. They also recommend aligning strategies with the City of Chicago's four year plan to improve health equity in Chicago's neighborhoods.

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