AN EVALUATION OF THE EFFECT OF AGE OF HOUSE CONSTRUCTION ON ELECTRICAL ENERGY CONSUMPTION IN MONTGOMERY COUNTY, TEXAS

A Thesis

by

MELINA ALICIA CEDILLO

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Chair of Committee,	Ben F. Bigelow
Committee Members,	Juan Carlos Baltazar
	John A. Bryant
Head of Department,	Patrick Suermann

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ABSTRACT

The United States Energy Information Administration states that homes in the U. S. account for 23% of energy consumed. Although electricity consumption can be reduced through retrofits and other advanced energy consumption products, a homeowner is less likely to implement these changes after construction. This study will address and quantify the actual impact on electric consumption in homes constructed over the last 44 years. Conclusions were drawn after analyzing the electricity consumption of homes built in different time periods in Montgomery County, Texas. When comparing the average yearly consumption for all four periods, it was concluded that year of construction alone did not contribute to a decrease in the amount of electricity consumed. The findings in this study support the argument that building codes do have an impact in reducing electrical consumption.

DEDICATION

To my parents Gerardo and Alicia Cedillo.

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Contributors

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All other work conducted for the thesis was completed by the student independently.

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NOMENCLATURE

IRC	International Residential Code
IECC	International Energy Conservation Code
SSBC	Southern Standard Building Code
CABO	Council of American Building Officials
PV-PCM	Photovoltaic Phase Change Material
PCM	Phase Change Material
ACH	Air Change per Hour
SEER	Seasonal Energy Efficiency Ratio

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CHAPTER I

INTRODUCTION, RESEARCH QUESTIONS, AND SIGNIFICANCE OF STUDY

Introduction

Energy is a vital resource that is used for every day needs. Omer (2008) reports that prior to 1992, there was not much concern about energy consumption levels. However, due to the recent concerns about the scarcity of natural resources, efficient use of energy has gained more attention from academia and project owners. The United States Energy Information Administration reports that homes in the U. S. accounted for 23% of energy consumed in 2015. This includes natural gas and electricity. In addition, the U.S. Housing Census report states that single-family housing units make up 65% of households in the U.S. (USEIA, 2016). Executing energy conservation tactics on this vast portion of energy consumption can create a significant amount of savings.

As the public gains awareness of the scarcity of natural resources, technological advances are improving construction materials in order to confront issues like energy consumption. For example, the Energy Policy Act of 1992 mandated the Building Energy Codes Program (BECP) in order to improve energy efficiency in buildings. The BECP works with the U.S. Department of Energy to periodically develop and implement energy codes and standards. (U.S. Department of Energy [DOE], 2016). Although electricity consumption can be reduced through retrofits and other advanced energy consumption products, a homeowner will not be inclined to implement these changes on their own Suter and Shammin (2013). Because there are constant improvements being made to existing building codes, it is crucial for local governments to continue to adopt and enforce new building codes in order to reduce the amount of electrical consumption directly. Bigelow and Lopez (2015) found that building codes can prove to be a good strategy to reduce electrical consumption.

Although local governments are usually up to date with the most recent code, there are counties in rural areas that do not enforce code compliance. Broadening the scope of electrical consumption and residential construction within code compliance regions to homes built in the county could help influence rural construction to take a step forward in energy conservation. This study is needed to quantify the electrical consumption of home built outside of a municipality that enforces compliance to a building code.

The purpose of this study was to compare electrical consumption in rural homes built in central Texas to both newer and older home construction. This study compared electrical consumption for homes built outside of any municipal code authority that were all in the same county. This study hypothesized that homes that have been built in more recent years, in Montgomery County, TX would have a decreased level of electricity consumption when compared to older homes.

Research Questions

The research questions addressed in this study are: 1) Is there a correlation between year of construction and electricity consumption in homes selected for this study? 2) What is the quantification of the difference in kilowatt hours and thus cost of electrical consumption for homes in Montgomery County, Texas? 3) How is electrical consumption related to building codes, or the absence thereof?

Delimitations

The following delimitations were made in order to increase the accuracy of the study while also eliminating any possible errors:

1. The sample consisted of homes of 2000-2600 square feet.
2. Energy data collected is based on monthly electrical consumption for each house over a one year time period (the year 2016).
3. Remodeled houses were not included in the study.

Assumptions

The following assumptions were made during this study:

1. Houses used for this study were built in the year listed by the Montgomery Country Appraisal District.
2. Electricity consumption collected is accurate.

Significance of Study

This study is significant because it compares electricity consumption for select homes built at different time periods. This data illustrates residential electrical consumption through four different decades. By applying electrical cost rates, this allows for a comparison of user costs based on the ages of the homes. By monetizing electrical consumption, it also allows for a layman comparison of homes built to code and the differences, if any that exist. Showing that new construction is not the only driving factor for homes to be more energy efficient should influence regulators to adopt and enforce updated codes to create reductions in electrical consumption.

CHAPTER II

LITERATURE REVIEW

Literature Review

There have been several studies conducted in the residential sector to examine energy consumption, which help to understand consumption changes that have occurred through time. Some of the studies focus on specific retrofits that can decrease energy consumption or other specific improvements, but there has also been research done on how building codes have an impact on energy consumption.

Cooperman et al. 2011 conducted a study evaluating windows and solar heat gain. Windows play a major role on the amount of energy consumption in homes. In this study, retrofits were created on windows from existing residences in order to create a close to leak-free seal. Improper installation is usually the main cause of air leakage around the windows. Reducing the air change per hour has proven to reduce electrical consumption. It was found that better sealed homes have a 0.1 air change per hour (ach) leakage as opposed to a typical home with a 0.5 ach leakage. Spray insulation was the most effective and convenient retrofit for improving the walls by increasing the amount of heat resistance (R-Value). The goal is to achieve an R-Value of 5, 9, or 10. The roof was retrofitted by installing a photovoltaic-phase change material (PV-PCM) roof. Phase change material melts and solidifies at a certain temperature. It stores and releases energy during these changes. This would reduce the heating and cooling load by absorbing some of the solar gain to the roof. Cooperman et al. 2011 concluded that energy consumption can be reduced by 40% when reducing leakage and improving insulation in walls and roofing. The retrofits that were conducted in this study are similar to improvements made on updated building codes, which shows that a decrease in energy consumption is possible.

Zhai et al. 2014 too, conducted a study that closely monitored the building envelope. They found that 59% of residential energy goes to space or water heating, 12% goes to air conditioning and refrigeration, and 29% goes to other electrical needs. This study paid close attention to thermal energy storage through the use of phase change materials (PCMs). The study looked at three different types of energy storage systems. The most practical and convenient type of system was found to be sensible energy storage. Latent energy storage had the ability to store the most significant amount of energy, due to its phase changing capability, in just a small area making it the most feasible. The last type of energy storage system examined was chemical. Although there was great advantages in this system, there was not a lot research on the type of materials that have the properties needed for chemical energy storage while still being economical. It was concluded that there can be great reductions in energy needs in homes through the use of thermal energy storage technologies.

Sadineni et al. 2011 conducted a study on economic feasibility of energy efficient measures in residential buildings. They calculated the pay-back period after making basic energy upgrades to houses in the Southwest United States. Wall R-Values were upgraded to 17, door R-Value to 7, window U-Value to 0.65, reduced air leakage of windows, used an air conditioner seasonal energy efficiency ratio (SEER) rated 15, and increased the R-Value in the attic to 22. Sadineni et al. 2011 concluded that there would be a payback in less than 10 years when making these basic upgrades. If these techniques were used in more recently built homes in Montgomery County, there could be a similar energy savings. This study created a better understanding of the amount of electricity that is actually being saved after a house has been constructed.

The studies conducted by these previous authors mentioned demonstrate how changes and improvements of materials can save on the amount of energy consumption. The findings in these studies support the idea of the possibility of energy saving through the implementation of more energy efficient materials. The current study focuses on homes constructed over the past forty-four years in Montgomery County.

Other research reports that there are factors other than retrofits that have impact on decreasing energy consumption. McNeil and Bojada (2012) did research on the cost-effectiveness of high energy efficient appliances. These appliances included unit air conditioning, electric cooktops, central air conditioning, electrical water heaters, gas water heaters, and refrigerators. The appliances that were used in the study had a lower energy consumption that what is required by the United States Department of Energy (USDOE). It was concluded that there could be savings of over 5% for the different groups. Even though energy efficient appliances will be generally more costly, the amount of energy savings can be substantial. The only appliances that have code based requirements are heating, ventilation and air conditioning systems. Other appliances that are regularly used do not, this implies that improvements can made in the building code on such appliances.

A different approach was taken by Suter and Shammin (2013) who analyzed how much energy was saved when households were given incentives for minimizing consumption and providing them with a programmable thermostat. Three groups were created in order to see which method would be more effective. The first group was only informed about ways to save on energy consumption, the second was not informed about anything completely, and the last group was informed and provided with financial incentives for lowering consumption. The study showed that financial incentives resulted in a greater energy savings in those homes. The first group who was informed about ways to save on energy consumption did save energy, but it was nothing compared to the group provided with incentives. This study continues to support the idea that a few changes can have an impact on energy consumption.

Aside from studies on specific improvements that can be made to decrease energy consumption, the following studies focused on evaluating the effects of building codes. In a study conducted by Raheem et al. 2012 the proposed 2012 International Energy Code (IECC) for residential construction was analyzed in order to see the possible amount of energy savings. Building Information Modeling (BIM) was used in order to compare the 2012 IECC to the Florida Energy Efficiency Building Code (FEEBC). Energy consumption of a model of a home before and after IECC changes was analyzed by running computer simulations on BIM. It was concluded that a home in Miami could save 13.6% on a typical yearly energy bill. This was about $250-$430 savings each year. It is clear after running the computer simulations that there would be a positive effect if the most current building and energy codes were adopted and enforced.

Jacobsen and Kotchen (2013) explored changes in actual energy codes in Florida. The data was collected from the city of Gainesville, Florida. Parameters were then set on the year of construction, floor area, and air conditioning. The primary focus was how these changes affected energy consumption in homes built after the adoption of more stringent energy codes were made. It was found that there was a reduction of electricity consumption by 4% and a 6% reduction in natural gas. This study reveals three significant changes that were made on the 2001 Building Code that would have the greatest impact on energy consumption. First, the existing heating system which consisted of an electric heat resisting system was changed to an electric heat pump. Second, a “leaky” air distribution system replaced the “leak free” one. This permitted homes that are leak free to earn points for improved air duct systems. Lastly, the solar heat gain coefficient changed from .61 to .4. This means that amount of solar heat passing through a window was reduced (Jacobsen & Kotchen, 2013).

In another study conducted by Koirala et al. 2013 the American Community Survey 2007 was used to estimate the effects of IECC 2003 and IECC 2006 on energy consumption. A multi-level analysis was conducted since Koirala et al. 2013, determined that energy use differs between states. Economic behavior of an individual and economic efficiency of market conditions were examined under this study. The American Community Survey produced data showing the total amount of energy consumption, the kind of energy that was being consumed, housing conditions, when the house was build, and economic and demographic data. It was concluded that there could be a savings of 108% in electricity and 1.3% in natural gas. The focus of this study was state wide policies.

Kim et al. 2013, also conducted a study in order to quantify the statewide electricity and demand capacity savings from the implementation of the International Energy Conservation Code (IECC) for single family residences in Texas. Simulations were made using the Energy Systems Laboratory's International Code Compliance Calculator (IC3) from DOE-2 in order to estimate the savings for homes built between 2002 and 2013.This study was focused on homes in Potter, Tarrant, and Harris County. This study concluded that the estimated statewide electricity savings in 2013 were $168 million with reductions of 1,166 MW for summer and 1,175 MW for the winter in electrical consumption. The conclusions drawn from this study indicate that there should be decreases in electrical consumption on the homes analyzed during this study. The interesting part about the current study is that actual electrical consumption was used for the analysis.

Baltazar et al. 2014, conducted a utility bill and ambient conditions analysis in order to quantify the energy savings from implementing the IECC 2000/2001 and IECC 2006 building codes in Texas. The monthly utility bill data was used from the City of College Station, TX. Homes that were built by the same builder were separated into three groups according to construction date. Occupants per household were not considered in this study. This study concluded that there was approximately a 20%

electricity savings from the implementation of the 2001/2001 IECC and a 19% electricity savings from the 2006 IECC.

A previous study on the impact of building codes on residential energy consumption in Georgetown, TX was conducted by Bigelow and Lopez (2015). The focus of the study was on the relationship between stringent building codes and energy consumption. It was concluded that electrical consumption can be greatly reduced with the adoption of new building codes. However, it was also reported that changes between codes can be insignificant. The findings suggested that the reduction in electrical consumption resulted from air conditioning systems with higher SEER. From the 1985 SSBC to the 1994 SSBC and Amended 1992 CABO there was a 14% reduction in electrical consumption and from the 1994 SSBC and Amended 1992 CABO to the 2000 IRC there was a 25% reduction in electrical consumption.

The current study did not compare any codes used during construction. A comparison will be made to see if improvements in construction techniques through years without stringent building codes still result in a decrease in electrical consumption. The findings of Bigelow and Lopez (2015) will be compared to the results found in this study.

CHAPTER III

RESEARCH PROCESS

Methodology

The purpose of this study was to compare the amount of electrical consumption in houses built in different time periods in Montgomery County, TX. Monthly electricity consumption from actual homes were used in order to quantify the difference in electrical consumption in homes built from one decade to the next. Houses built under the following different time periods were used in this study:

1. 1970-1980
2. 1981-1991
3. 1992-2002
4. 2003-2013

Mid-South Synergy electrical company provided the electrical consumption data. This data consisted of kWh used per month of each house selected. Mid-South Synergy uses smart meters to collect consumption, so data collected should be highly accurate. Three of the time periods consisted of all of the available date. However, use of all the homes is still a sample because mid-south is not the only electric provider in Montgomery County, Texas. A sample of Montgomery County homes were collected after being filtered by their corresponding floor area and year of construction. Houses similar in area, 2,000-2,600 square feet, was the delimitation on size of the homes in the different time periods. This was critical to the study because this factor could skew the data.

Houses that had undergone any major renovations were not used in this study. Individual homeowner habits can also be a factor that will skew the data, so sample groups of about 100 were used, to mitigate the effect of extremely high or low consumers that would be outliers. The average electrical consumption of group of houses, from each time period, were then compared to each other.

A multi-step process was used in order to determine which homes were to be used in the sample. First, Mid-South Synergy provided the consumption data of homes in Montgomery County, Texas. Next, Montgomery County Appraisal district data were used to find the year each individual house was built. This database was also used to determine if any major renovations after the home was originally built had been done. If major renovations had been done those houses were delimited from the study. The floor area of each home was also confirmed by the appraisal district. Once every home was cross checked, a random sample was collected for each of the four decades. The goal was to have sample groups of at least 100 once these delimitations had been applied. However, once the data was filtered down according to the parameters only time period 3 had more than 100 houses to select from. Table 1 shows the sample sizes used for the analysis. Time periods 1, 2, and 4 are made up of all the available data.

Table 1: Time Period and Sample Size Collected.

Time Period	Year	Sample Size
1	1970-1980	90
2	1981-1991	72
3	1992-2002	100
4	2003-2013	96

The Hypothesis being tested for this study is:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4 \qquad\qquad H_a: \mu_1 \neq at\ least\ one\ other\ \mu$$

Where µ represents the average monthly electricity use of homes that were built under each of the different time periods. The average monthly electricity used derived from electrical consumption used during 2016. A 95% certainty was used when conducting a statistical ANOVA test.

CHAPTER IV

FINDINGS AND CONCLUSIONS

Analysis and Results

The primary interest of this study was to compare average electrical consumption under four different time periods: 1970-1980, 1981-1991, 1992-2002, and 2003-2013. For the remainder of the analysis the 1970-1980 time period is denoted as (1), the 1981-1991 time period is denoted as (2), 1992-2002 as (3), and 2003-2013 as (4). The hypothesis of interest can be expressed as testing $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$ against H_1: at least one mean is different. This hypothesis is tested using a one-way ANOVA model.

ANOVA has two key assumptions that must be tested. The first is that the four groups have nearly equal variance. Both Figures 1 and Table 2 show that this assumption is not met exactly. However, the group variances do not differ greatly. A Levene test for homogeneity of variance confirms this qualitative analysis, with a test statistic value of 0.95 and corresponding p-value of 0.42. The group variances do not differ significantly. The second assumption requires that the ANOVA model residuals are normally distributed. The QQ-Plots shown in Figure 2 confirms this assumption. The residuals, for the most part, appear to follow a normal distribution with some deviation in the tails. This small difference makes no practical impact as ANOVA is already robust to departures from normality. Since these assumptions are met, standard one-way ANOVA is an appropriate tool for testing the hypothesis of interest, and Tukey HSD can be used to compare individual group means.

Figure 1: Boxplots of each average yearly energy consumption by time period.

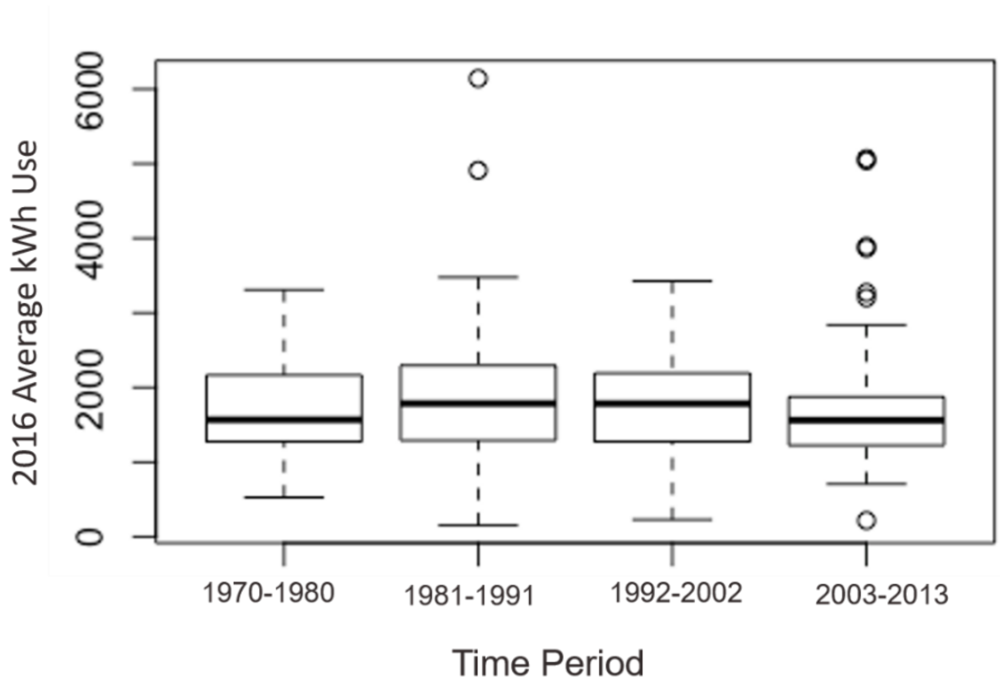
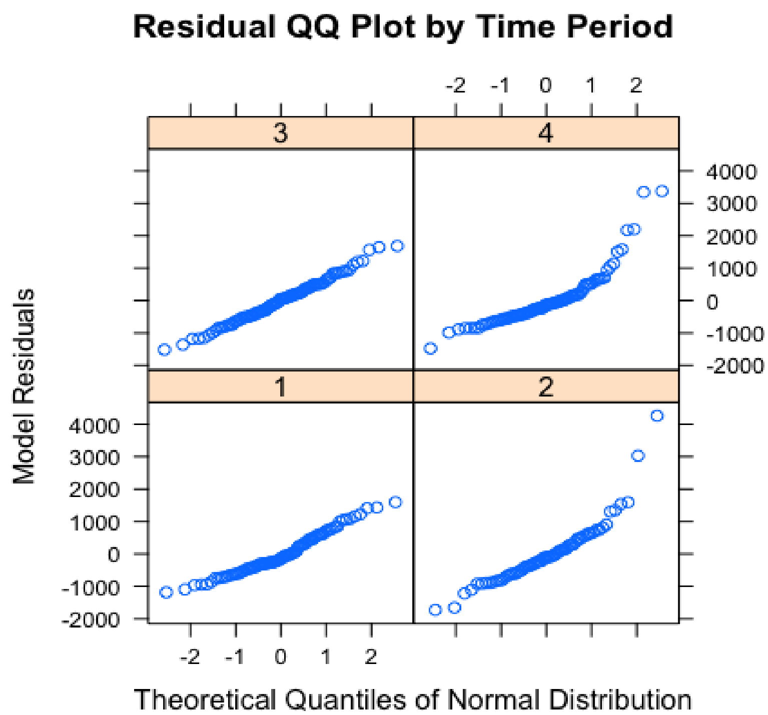


Table 2: Table of 2016 yearly electrical consumption for each time period.

Time Period	Year	Yearly kWh Average
1	1970-1980	1713
2	1981-1991	1883
3	1992-2002	1745
4	2003-2013	1694

Figure 2: Normal QQ plot of residuals of ANOVA model separated by time period. The points lie close to a straight line



The results of the comparison between the means at each of the four time period over the course of a year (2016) is given in Table 3. There is no evidence of a difference in average energy consumption between any of the time periods since our p-value is 0.399. The mean square error of the residuals is nearly equal to the mean square error of the time periods, which indicates time period alone is not sufficient to explain the variation present in energy consumption. Table 4 shows the results of Tukey HSD comparing the difference in mean energy consumption between each of the four groups. As expected with a non-significant ANOVA test, average energy consumption does not seem to change at each time period.

Table 3: ANOVA Table: Average Energy Consumption Across Time Periods

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Time	3	1677726.000	559241.800	0.988	0.399
Residuals	352	199250969.000	566053.900		

Table 4: Comparison of Average Yearly Energy Expenditure for all Time Periods

Time Period	Difference	Lower	Upper	P-adjusted
2-1	200.843	-233.837	635.522	0.632
3-1	-98.771	-496.850	299.308	0.919
4-1	-334.601	-736.567	67.364	0.140
3-2	-299.614	-723.552	124.324	0.264
4-2	-535.444	-963.033	-107.854	0.007
4-3	-235.800	-626.155	154.495	0.403

Comparing average electricity expenditure across each of the months is also of interest. Table 5 shows summary statistics for each month in the dataset separated by time period. Table 6 shows a comparison of the different time periods using Tukey Adjusted p-values and confidence intervals. The largest and only significant difference in February average energy expenditures comes from comparing time period 4 to time period 2. There was an estimated 535.444 kWh difference in energy expenditure between those two time periods. Table 7 shows an ANOVA analysis for each month which tests whether there was a difference in monthly energy expenditure across the four time periods. Only February appears to have been impacted by the change in time periods.

Table 5: Monthly summary statistics of energy expenditure summary

	Time Period 1		Time Period 2		Time Period 3		Time Period 4	
Month	Mean	SD	Mean	SD	Mean	SD	Mean	SD
January	1678	815	1785	931	1602	796	1502	859
February	1971	937	2172	1157	1872	1043	1637	1102
March	1407	604	1554	872	1358	671	1286	780
April	1155	472	1327	770	1195	575	1197	714
May	1186	550	1379	782	1281	598	1342	776
June	1475	684	1637	915	1563	663	1566	826
July	2146	910	2263	1145	2186	976	2159	1035
August	2538	984	2762	1326	2604	1011	2526	1166
September	2266	943	2475	1224	2374	882	2333	1026
October	1997	823	2167	1086	2074	776	2018	910
November	1464	665	1672	954	1563	625	1564	765
December	1276	630	1409	879	1274	568	1209	621

Table 6: Comparison of average energy expenditure in February for all time periods.

Time Period	Difference	Lower	Upper	P-adjusted
2-1	200.843	-233.837	635.522	0.632
3-1	-98.771	-496.850	299.308	0.919
4-1	-334.601	-736.567	67.364	0.140
3-2	-299.614	-723.552	124.324	0.264
4-2	-535.444	-963.033	-107.854	0.007
4-3	-235.800	-626.155	154.495	0.403

Table 7: ANOVA comparing mean energy expenditure for every month.

Source	Df	SS	MS	F	*p*
January					
Between groups	3	3567010	1189003	1.6606	0.175
Within Groups	352	252037540	716015.7		
February					
Between groups	3	12426129	4142043	3.698619	0.012
Within Groups	352	394200922	1119889		
March					
Between groups	3	3077957	1025985.7	1.924566	0.125
Within Groups	352	187651139	533099.8		
April					
Time	3	1278005	426001.6	1.05389	0.369
Residuals	352	142284811	404218.2		
May					
Time	3	1786610	595536.6	1.293719	0.276
Residuals	352	162035823	460329		
June					
Time	3	1067592	355863.9	0.6017272	0.614
Residuals	352	208174227	591404.1		
July					
Time	3	632743.3	210914.4	0.2058465	0.892
Residuals	352	360666285.4	1024620.1		
August					
Time	3	2726034	908678.1	0.7291127	0.535
Residuals	352	438690322	1246279.3		
September					
Time	3	1802183	600727.5	0.587042	0.624
Residuals	352	360206070	1023312.7		
October					
Time	3	1363837	454612.4	0.5706589	0.635
Residuals	352	280418949	796644.7		
November					
Time	3	1701648	567216.1	1.013557	0.387
Residuals	352	196989528	559629.3		
December					
Time	3	1663520	554506.6	1.239196	0.295
Residuals	352	157510410	447472.8		

The study conducted by Bigelow and Lopez (2015) analyzed average electric consumption across homes built with the presence of building codes. In order to further understand the difference on electric consumption of homes built in rural areas with the absence of codes, the following cost comparison between the two studies was done. When comparing the kilowatt consumption of the most recent time period (2003-2013) to the results found by Bigelow and Lopez (2015) for homes built under the 2000 IRC, there was a significant increase. However, there are some differences to take into consideration. The size of homes in the study conducted in Georgetown ranged from 1,600-2,000 ft^2 while the ones in this study were 2000-2600 ft^2. Nonetheless, assuming that square footage has a direct correlation with the amount of consumption, electrical consumption for homes in Montgomery County are still higher. There is a 62% annual decrease for the homes built under the 2000 IRC when compared to the homes used in this study as shown in Table 8. According to weather reports Georgetown, TX experienced an average high of 89 °F and average low of 26 °F. Montgomery County had a high and low of 90 °F/34 °F. This could have impacted the decrease in electrical consumption since Georgetown experienced colder weather.

Table 8: Electrical consumption in Georgetown, TX (2014) vs. Montgomery County, TX (2016)

Month	Montgomery County	2000 IRC Georgetown	Percent Decrease	Montgomery County kWh/ft² (2,300 ft²)	2000 IRC Georgetown kWh/ft² (1,800 ft²)
Jan	1502	486	68%	0.65	0.27
Feb	1637	629	62%	0.71	0.35
Mar	1286	793	38%	0.56	0.44
Apr	1197	1094	9%	0.52	0.61
May	1342	982	27%	0.58	0.55
Jun	1566	822	48%	0.68	0.46
Jul	2159	602	72%	0.94	0.33
Aug	2526	472	81%	1.10	0.26
Sep	2333	416	82%	1.01	0.23
Oct	2018	414	79%	0.88	0.23
Nov	1564	462	70%	0.68	0.26
Dec	1209	456	62%	0.53	0.25
Total	20338	7628	62%	8.84	4.24

Conclusion

The results of this study show that there was no significant difference in electrical consumption in homes that were built during different decades for the past 44 years in Montgomery County, Texas. When comparing the electrical consumption of code compliant homes to the homes used for this study, homes built under a code showed a 62% decrease in electrical consumption.

Homes built in an unincorporated county area are not required to follow the guidelines placed by the International Residential Code, or any building code, which are enforced by a municipality. Because the homes in the county don't have to follow these building code requirements, along with their energy conservation measures, These findings suggest that the lack of building codes in the county are why there has been no significant decrease in consumption over the past four decades. These findings support the argument that, building codes play an important role in reducing energy consumption. The author recognizes that occupant behavior and climate change in different regions could impact this study, so the results should be interpreted with caution.

This study took a step forward in revealing the impact on electrical consumption when homes are built without the requirement to be built to a building code such as the 2000 IRC. There are still several topics that could help understand the fluctuations of electrical consumption of homes in Texas. They include: An analysis comparing electrical consumption of homes built under different building codes or the absence of from other climate zones and what are the difficulties with building/energy codes adoption/enforcement in non-incorporated counties in Texas? An understanding of why building codes are not enforced in the county. In August, 2015, Montgomery County adopted the 2015 IRC to be in effect January 2016. It would be interesting to conduct this same study on homes that have been built in 2017 in Montgomery County and compare electric consumption with the homes used in this study. This would help evaluate how well the code is being enforced, or promote the importance of why it should be.

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