A Model to Calculate the Supply of Affordable Housing in Polk County

Jiangping Zhou  
Iowa State University, zjp@iastate.edu

Matthew M. Brooks  
Iowa State University, mmbrooks@iastate.edu

Follow this and additional works at: http://lib.dr.iastate.edu/resilientneighborhoods_reports

Part of the Real Estate Commons, and the Urban, Community and Regional Planning Commons

Recommended Citation
http://lib.dr.iastate.edu/resilientneighborhoods_reports/2

This Article is brought to you for free and open access by the Resilient Neighborhoods Initiative at Iowa State University Digital Repository. It has been accepted for inclusion in Resilient Neighborhoods Technical Reports and White Papers by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
A Model to Calculate the Supply of Affordable Housing in Polk County

Abstract
This report provides an estimate of the existing affordable housing supply in Polk County at this moment in time using the best available secondary data. This paper ultimately used the traditional measurement of housing affordability: households spending no more than 30% of their income on rent and housing-related costs. However, the study did consider using both the Residual Income approach proposed by Michael Stone and the transportation + housing Index development by the Center for Neighborhood Technology.

Disciplines
Real Estate | Urban, Community and Regional Planning
A Model to Calculate the Supply of Affordable Housing in Polk County

Prepared for the Polk County Housing Trust Fund
June 2014

By Jiangping Zhou, PhD
Assistant Professor
Department of Community and Regional Planning

with research assistance from
Matthew Brooks
Department of Community and Regional Planning

ISU Research Team
Jane Rongerude, Biswa Das, Jiangping Zhou, Carlton Basmajian, and Eric Christianson
(Research Assistant)

IOWA STATE UNIVERSITY
Department of Community and Regional Planning
ACKNOWLEDGEMENTS:

This research presented in this paper was part of a two-year study funded by the Polk County Trust Fund to inform how the organization assessed the existing inventory of affordable housing in Polk County, IA.
EXECUTIVE SUMMARY

This report provides an estimate of the existing affordable housing supply in Polk County at this moment in time using the best available secondary data. This paper ultimately used the traditional measurement of housing affordability: households spending no more that 30% of their income on rent and housing-related costs. However, the study did consider using both the Residual Income approach proposed by Michael Stone and the transportation + housing Index development by the Center for Neighborhood Technology.

The question that guided this study is, “How can we best assess the availability of affordable housing in Polk County?” This study uses two features of the housing market to estimate affordable housing supply or affordable housing need at both the Census tract and county levels:

1) The cumulative distribution of households by income bracket and
2) The distribution of housing units by rent bracket.

Like previous studies, our findings show that the absolute quantity of housing supply exceeds that needed by existing households in Polk County when vacant units are included in the analysis. However, households in different census tracts demand affordable housing of different levels of affordability than what might currently be available in that location. In other words, while the existing supply of units exceeds the existing number of households in need of housing when vacant units are included in the analysis, there is a spatial mismatch between the location of the households and the location of the units. When affordability was used as the criteria for evaluating supply, we found that most Census tracts in the region had an undersupply of affordable housing.

The report recommends that future housing policies focus on alleviating the mismatch and addressing the undersupply of affordable housing. Concrete policy tools that could be considered by policymakers include but not limited: rapidly returning vacant units to the market as rental units, location-sensitive economic incentives for home builders or landlords who offer affordable housing in line with the need in that location, and a one-stop on-line “housing market” that better connects private-sector landlords, home builders and renter households to reduce the mismatch between the household demand and housing characteristics.

1 This report relied on data from American Community Survey (ACS) of the US Census and the Location Affordability Portal maintained by the US Department of Housing and Urban Development (HUD). These sources are free and easily accessible, making it possible for the Trust Fund to reproduce this analysis in the future.
INTRODUCTION

This report is an outcome of the “Development of a Special Methodology for Assessing Affordable Housing Inventory in Polk County” project funded by Polk County Housing Trust Fund. The primary impetus for this project is the hypothesis that existing housing needs assessments do not fully capture either the existing affordable housing supply or affordable housing need in Polk County. Therefore the primary research question asks: To what extent does the existing supply of affordable housing in Polk County match with the existing need for affordable housing? This study assesses a range of data sources toward the development of a more comprehensive inventory of the affordable housing market in Polk County, IA. From the assessment we will propose a methodology for cost-effective, periodic inventory, and test the methodology using several neighborhoods within the study area.

This report focuses on how to estimate the existing affordable housing supply or affordable housing need in Polk County using the best available secondary data such as American Community Survey (ACS) data of the US Census and Location Affordability Portal by US Department of Housing and Urban Development.

This report is organized as follows. Section 1 describes the overall housing supply in Polk County. Section 2 discusses how to estimate supply of affordable housing. Section 3 details the proposed methodology to estimate demand of affordable housing. This section also contains concrete several concrete examples regarding how to use the methodology and discussions of supply and demand of affordable housing. Section 4 concludes and discusses overall findings and implications of the report.

OVERALL HOUSING SUPPLY

First, we examined all sources of data and classified housing units into three categories and some subcategories. The data we identified as the best for the project are: (1) the 2007-2011 5-year estimates ACS: Selected Housing Characteristics (ID: DP04); (2) Rental home information from the Craigslist for the Des Moines metropolitan area; (3) Location Affordability Portal by US Department of Housing and Urban Development. One thing we should emphasize is that the ACS data are based on samples and that there are margin of errors associated with the data. But the US Census has very strict data quality control measures and thus all that data at most have a margin of error of 2%.

This study uses three categories of units: non-rental units, rental units, and vacant and abandoned units. Each category is described in detail below.
1. Non-Rental Units

Non-rental units include two subcategories of units: owner-occupied units and units that are currently for sale.

Owner-occupied\(^2\)

We assume occupants of these units do not encounter housing affordability issues. In practice, of course, some of them can face unaffordable mortgage issues. In the whole Polk County, there are 118,868 owner-occupied units, which are about 70% of all the housing units. These units house 309,930 residents, which are 74% of all the residents. On average, there are 2.6 residents per owner-occupied unit. The median housing cost for households with a mortgage is $466 while the mean is $484, and the Polk County average housing value is $148,397. When it comes to physical attributes of owner occupied housing units the median number of rooms is 9, and the average unit was built in 1973. At the census tract level, the ratio of owners to the population varies from one tract to another. The lowest ratio is 15%, the highest is 96% and the median is 75%. The mean of the ratio is 70%. The map below shows the distribution of owner-occupied units in Polk County. From the map, one can see that if there are affordable housing issues faced by renter households, they are most likely located in Des Moines.

For sale

Like other housing market, there are housing units for sale in Polk County. The ACS data show that there are 2,344 units for sale in Polk County, which is only 1.4% of all the housing units. In theory, all the for-sale units can be rent out before the new owner moves in. In our studies, we assume only a portion of the for-sale units can be rent out. The portion is census-tract-specific. The portion is the same as the known ratio of rental units in each census tract, for instance, if a census tract’s ratio of rental units is 60%, then the portion of the for-sale units in that tract that can be rent out will be 60% too.

\(^2\) Estimates were obtained from the US Census
Figure 1: Percentage of Owner-Occupied Units in Polk County
2. Rental Units

Rental units in the study are defined as housing units that are occupied by renters or that are vacant but available for rent.

**Renter-occupied**
The ACS data show that there are 48,799 renter-occupied units in Polk County, which is about 29% of all the housing units. These units house 107,147 residents, which is about 26% of all the population. On average, there are 2.2 residents per renter-occupied unit. Compared to the owner-occupied units, renter-occupied units tend to have a smaller household size. The median rent of Polk County is $735 which on average pays for a unit built in 1973, with 5.5 rooms, and occupied by on average 2.2 people. Based on these statistics, one can see that there are more rooms than people for the renter households in Polk County. In other words, some renter households may or are force to over-consume housing. At the census tract level, the ratio of renters to the population varies from one tract to another. The lowest ratio is 4%, the highest is 85% and the median is 25%. The mean of the ratio is 29%. Two maps below show the distribution of all the vacant units for rental and sales and vacant units for sales in Polk County. Interestingly enough, the vacant units also cluster in Des Moines, where the ratio of owner-occupied units is lower than the county’s average.

**Vacant rental units**
The ACS data show that there are 2,914 housing units for rental in Polk County, which is about 1.7% of all the housing units. If we assume that all the vacant for-sale units can be converted into rental units, there could be at most 4,256 units for rental in Polk County. The Polk County median of rent asked is $658 while the mean is $665.
3. Vacant and Deserted Units

Like other housing market, there are also vacant and deserted units in Polk County, these units are neither for rental nor for sale, that is, that are excluded from the local housing market. But compared to cities like Detroit where there are deserted homes block after block, Polk County has a very small number of vacant and deserted units. There are 6,999 such units, which are only 4% of all the units.

THE EXISTING SUPPLY OF AFFORDABLE HOUSING UNITS IN POLK COUNTY

Based on the ACS data, we know that the mean household size for renter family is 2.2 in Polk County. Thus, a typical renter household in the county can be assumed to have two adults and one kid. We then estimate affordable housing supply for such typical renter household in Polk County using three methods where data are available: the 30% of household income method, the combined transportation and housing cost method and the residual income method.

The 30% of household income method is the most popular method used to estimate housing affordability for households (Stone, 2006). It is very straightforward. It assumes that if a household only spends 30% or less on housing, it lives in an affordable unit. This method does not account for the fact that some households have saving in the bank or could receive rent subsidy, which could reduce the actual rent burden for these households. It also does not consider the fact that some households over-consume housing and thus their rent can exceed 30% of their household income.

The combined transportation and housing cost method is a revision of the above method. Its advocates argue that transportation costs are as necessary as housing costs for residents and the two are often highly correlated. Thus, housing affordability should simultaneously consider both (The Center for Neighborhood Technology, 2012). According to the Center for Neighborhood Technology (2012), if a household spends 45% or less on housing and transportation combined it lives in an affordable unit. Otherwise, it does not.

The residual income method can be viewed as a reverse thinking of the above two methods. Its underlying rationale is that in addition to housing and transportation, a household has to spend on items such as food, daycare and healthcare to sustain (Stone, 2006). Thus, if after spending on all the necessary items, a household still has some money left then it has no affordable housing issues. Otherwise, it could have affordable housing issues.
Vacant rental units

The 30% household income method

Using the imputed rent method and ACS data, we estimate that the median rent for all for-rental vacant units in Polk County is $760/month. The inputted rent method takes into consideration property tax, mortgages, marginal and state tax rate, tax deductions, and average charity. That is, of all the aforementioned 4,256 units for rental in Polk County, 50%, that is, 2,128 units ask for a rent of $760/month (or $9,120/year) or less. Following the logic the 30% of household income method, we estimate that a household have to earn $30,400/year or more to afford these units. To estimate how much percentage of the households in Polk County earn $30,400/year or more, we made a continuous distribution of median renter households’ income by census tract in Polk County based on the ACS data (Figure 3).

Figure 3: Median Household Income by Census Tract: Cumulative Distribution

![Cumulative Distribution](image)

Coincidently, about 50% of all the renter households in the above figure earn $30,400 or more per year. At this point, we can conclude that for all the vacant rental units, at least half of them (n=2,128) are affordable for the typical renter household. These units are not rent out in reality for various reasons. Our speculated reasons are that (a) these units’ location and adjacent amenities may not what renter households want; (b) there
is “information asymmetry” between the renters and the vacant rental unit owners or managers; (c) there could be a slightly oversupply of rental units.

The combined transportation and housing cost method

In Polk County, as mentioned above, a household, on average, spends 18% of its household income on transportation\(^3\). We use this figure to estimate the average transportation costs and its median ($481/month) for median-income households by census tract in the county. The aforementioned median plus the median rent for the vacant housing units for rental will be then treated as the typical combined transportation and housing costs for these units. We estimate that the costs are $1,241/month. At this point, if we follow the logic of the combined transportation and housing cost method, a household has to earn $2,585/month or $31,025/year to find the typical vacant rental units available affordable in Polk County. Referring to the above a continuous distribution of median renter households’ income by census tract in Polk County, we estimate that about 47% of all the renter households earn $31,025/year or more. That is, if we consider combined transportation and housing costs, 47% of all the renter households will be able to afford at least half of the vacant rental units. It can be seen that when both transportation and housing costs are considered, the vacant rental units are a little less affordable for median-income households.

The residual income method

The average residual income has been calculated using Polk County averages for married couples with one child, and both parents are working. According to this chart residual income for these households $3,444, which includes average expenditures for child care, clothing and household expenditures, food, health care, rent and utilities, transportation\(^4\). Actual residual income was calculated by summing up the average transportation cost (18% of income), median gross rent, and other assumed costs. This number is then compared to the projected residual income, where in general the projected residual income is higher than the actual income. Despite the average lower value of residual income, most census tracts still pay more than their income provides. Only 17 census tracts have a higher median income than residual income, 22 have slightly higher residual incomes, and the rest, 60 census tracts, have between a $500 and $2000 negative difference between their median income and residual income. All things considered this means that the majority of people in Polk County are generally short on money, and these calculations do not take into account taxes that would more

\(^3\) The affordable housing portal can be accessed at: http://www.locationaffordability.info/lai.aspx.

\(^4\) More info see: http://www.iowapolicyproject.org/images/COL-images/COL-polk.jpg
than likely increase the difference between income and residual income. These numbers might seem alarming, which they are, but it is wise to remember that these are averages, so in reality a lower income family in a census tract would have lower food and transportation budget than the average, while a richer household would spent more than the average.

**The Craigslist data**

In addition the ACS data, we collected several months’ (March 2013-July 2013) rental home information by private parties at Craigslist for Polk County and adjacent areas too. Craigslist is one the most popular websites that private parties share their rental home informative in a visual market over the Internet. Below is the map we made using the Craigslist data. The map indicates that to a typical renter household in Polk County, that is, a household with household income of $32,134/year (the median renter household income in the county) and with two adults and a kid, if it spends 30% of its income ($803/month) on housing, it will be able find a decent number of housing options in or around the county (Figure 4).

**Figure 4: Average Rent Asked in Polk County Based on Craigslist**
Rental and occupied
The ACS data classify renter households by percentage of the household income spent on rent for each census tract. This enables us to directly estimate how many households in Polk County are rent burdened using the 30% household income method. If we assume the median transportation cost is proportional to the median rent for each census tract and for Polk County, we can use the following to estimate the median transportation cost by census tract:

\[ T_{mi} = R_i/R_p * T_p \]  

(1)

where

- \( T_{mi} \) is the median transportation cost for census tract i;
- \( R_i \) is the median rent for census tract i;
- \( R_p \) is the median rent for Polk County;
- \( T_p \) is the median transportation cost for Polk County.

Having \( T_{mi} \), we can then use the combined transportation and housing cost method to estimate how many households in Polk County are rent burdened and live in an affordable unit when both housing and transportation costs are simultaneously considered.

The 30% household income method
The ACS data shows that there are 48,799 renter households in Polk County. Of these households, 27,010, that is, 55% of all the renter households pay 30% or less of their household income as gross rent. We assume that these 27,010 households live in an affordable housing unit. The remaining 22,789 rent-burdened households, according to the 30% household income method, may live in an unaffordable housing unit. The spatial distribution of these households is shown in Figure 5.
Figure 5: Rent-Burdened Household Distribution

Number of Rent Burdened Households per Census Tract for Polk County, Iowa

Legend
Number of Households
- Less than 103
- 104 - 196
- 196 - 310
- 311 - 559
- More Than 560

Percentage of Households that are Rent Burdened per Census Tract for Polk County, Iowa

Legend
Number of Households
- Less than 103
- 104 - 195
- 196 - 310
- 311 - 559
- More Than 560

Source: 2012 American Community Survey 5-Year Estimates
The combined transportation and housing cost method
According to the Center for Neighborhood Technology (2012), if a household pay no more than 45% of household income for transportation and housing costs, then it lives in an affordable unit. The ACS data provide us with median household income and median gross rent but not median transportation costs by census tract. We thus used equation (1) to estimate the median transportation costs by census tract. Having the median household income, gross rent and transportation costs by census tract, we were able to estimate, using the above three medians, which census tracts are most likely not to have housing affordability issues in Polk County and how many households living in those tracts. Our assumption here is that if a typical household in census tract X earns the median household income, pays the median gross rent and spent the median amount on transportation costs pay no more than 45% of household income for transportation and housing costs, then other households in X are most likely not to experience housing affordability issues either. Our results show that there are 43 census tracts where a typical household pays no more than 48% of household income for transportation and housing costs. There are 19,578 households in these 43 census tracts.

Having the median transportation costs by census tract allows us to get the estimated median combined transportation and housing costs in Polk County, which is $1,246/month. This indicates that a household in Polk County would have to earn $33,227/year or more to ensure that (a) it can live in a housing unit that costs $1,246/month on transportation and housing; (b) its combined transportation and housing costs are no more than 45% of household income; (c) it finds half of the renter-occupied units in Polk County affordable. In Polk County, according to the ACS data, the median household income is $32,134/year, which is a little less than $33,227/year. This indicates that most households with a household income around the median one in Polk County may find less than half of the renter-occupied units in the County affordable. But they still have options. As shown above, in addition to some renter-occupied units that can potentially be available if a renter moves out, half of the vacant rental units are affordable to 47% of the existing renter households too. Figure 5 shows the affordable units at the census tract level for households making the median income in Polk County. The places where there may not be enough affordable units are concentrated in the southeast of the county.
Figure 6: Housing Affordability for Renter Households Making the Tract AMI

Number of Units affordable to renter households making median tract income by tract, Polk County, Iowa

Legend
- Interstate Highways
- Des Moines

Affordable Units
- Number of Affordable Units
  - 0-100
  - 101-200
  - 201-400
  - 401-600
  - Over 600

Sum: 29790 out of 50378 Total (59.13%)
Mean: 334 affordable units
Range: 0-1213 affordable units

Percentage of Units affordable to renter households making median tract income by tract, Polk County, Iowa

Legend
- Interstate Highways
- Des Moines

Affordable Units
- Percentage of Affordable Units
  - 0-20%
  - 21-40%
  - 41-60%
  - 61-80%
  - 81-100%

Data Source: US Census (American Community Survey 2011
5 year estimates)
DEMAND FOR AFFORDABLE HOUSING IN POLK COUNTY

The ACS data show how many households pay more than 30% of their household income for housing by census tract. If we simply assume that these households are in need of affordable housing, then we can estimate the maximum demand for affordable housing by census tract. Similarly, we can estimate how many household pay more than 45% of their household income for both transportation and housing by census tract. For these households, we can assume that they need affordable housing options too. Last but not least, we can apply the residual income method to estimate how many households do not have money left after paying all necessary costs. These households would expect more supply of affordable housing too. But our data only allow us to apply the 30% household income method to estimating the demand of affordable housing.

Based on the ACS data, we found that as many as 21,789 renter households in Polk County spend more than 30% of their household income on rent. They are 45% of all the renter households in the county. If we call these renter households “rent-burdened households”, the ACS data allow us to know where they are and how many there are at the census tract level. At the census tract level, the ratio of rent-burdened households varies from one tract to another. The lowest ratio is 9% (Tract # 30.1), the highest is 83% (Tract #52) and the median is 46%. The mean of the ratio is 43%. In reality, households in need of affordable housing are part of these rent-burdened households. But not all rent-burdened households would need an affordable home, as the ACS data do not tell us important information such as (a) whether the rent-burdened households over-consume housing (e.g., a two-person household lives in an apartment with four bed rooms); (b) in addition to annual income, whether the rent-burdened households have extra saving in the bank, which would enable them to afford a home that asks for a rent which is more than 30% of their annual income; (c) whether the rent-burdened households receive rent subsidy.

Demand Considering Only Occupied Units

One way to more accurately estimate households in need of affordable housing is to compare the cumulative distribution of household income and gross rent. With the distribution function, we could estimate how much percentage of households and how many households are in need of an affordable housing unit. Let’s illustrate this using the ACS data, which tell us the median income and median rent by census tract. Using this information, we can make a graph showing the cumulative distributions of the 30% median household income by month for renter households and median gross rent for renter-occupied units in Polk County (Figure 7). If we assume that the cumulative
distributions of household income and gross rent of the renter households of all income level is the same as the above distribution, we can then estimate how much percentage of households and how many households are in need of an affordable housing unit by different income brackets. Based on Figure 6, we can see that there are more households than homes when the gross rent is around or less than $700, that is, the household income is $2,333/month or $28,000/year or less, assuming only 30% of the household income is spent on rent. We can estimate how many affordable housing units are needed below different rent and income levels. For instance, when the rent is $535/month or less or the household income is $21,400/year or less, 7,770 units are needed. The calculation is as follows:

**Figure 7: The Demand for Affordable Housing by Rent Level**

![Graph showing demand for affordable housing by rent level](image)

On the supply side: at the rent of $535/month or less, there are only 0.6% of all the rental homes (n=48,799), which are 292 units. On the demand side: there are as much as 16.5% of all the renter households (n=48,799) that make $21,400/year or less, which are 8,061 households. The difference between the above would be the demand for affordable housing, which are 7,770 (rounded).

**Demand Considering Both Occupied and Vacant Units**

The calculations in 3.1 do not take into account of vacant homes. As mentioned above, there are 2,914 vacant homes for rental and at most 4,256 vacant homes on sale that can be potentially rent out in the county. If we assume that these vacant homes’ availability is proportional to the rent level, then, there would be 2,369 (=535/658*2914) rental homes in the housing market or 3,460 (=535/658*4256) homes at most ask for
rent that is at $535/month or less. At this point, we estimate that the demand for affordable homes that ask for a rent of $535/month or less range from 4,310 to 5,400 units.

Figure 6 shows a method that we can use to estimate the demand for affordable housing at the county level. The method can also be applied at other geographical levels, for instance, census tract or census block. Applications of the method at the census tract or census block levels would allow us know better the desired quantity and distribution of affordable housing units at smaller geographical areas.

To illustrate, we will examine two extreme census tracts in Polk County where there are the highest percentage and the lowest (non-zero) percentage of rent-burden households, that is, households paying 30% or more of their household income on rent. Based on the ACS data, we identified that the census tracts that has the highest percentage and the lowest percentage of rent-burden households are tract #52 and tract #30.01, respectively. Descriptive statistics of housing and household income are shown in Table 1.

Table 1: Selected Census Tracts in Polk County: Housing Characteristics

<table>
<thead>
<tr>
<th>Tract</th>
<th>Overall housing supply</th>
<th>Total occupied units</th>
<th>Non-rental units</th>
<th>Rental units</th>
<th>Other vacant units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Owner-occupied</td>
<td>Renter-occupied</td>
<td>Vacant for sale</td>
</tr>
<tr>
<td>#52</td>
<td>1,395</td>
<td>1,223</td>
<td>633</td>
<td>590</td>
<td>7</td>
</tr>
<tr>
<td>#30.01</td>
<td>947</td>
<td>894</td>
<td>749</td>
<td>145</td>
<td>2</td>
</tr>
<tr>
<td>#108.2</td>
<td>3,345</td>
<td>3,202</td>
<td>3,031</td>
<td>212</td>
<td>91</td>
</tr>
<tr>
<td>#102.8</td>
<td>1,619</td>
<td>1,558</td>
<td>1,078</td>
<td>480</td>
<td>0</td>
</tr>
</tbody>
</table>

Overall, what we can see from the Table 1 is that:

(a) If we ignore the house characteristics, there is an oversupply of housing as compared to the number of households, even in tract #52, where there is the highest percentage (87%) of households who pay 30% or more of their household income on rent. In this particular tract, there are 7 housing units vacant for sale and 165 vacant units, neither for rental nor for sale. In theory, all these vacant units can be converted into a unit for rental.

(b) As expected, a higher percentage of owner-occupied units tends to be associated with a lesser severe degree of housing affordability issues for renter households.
To further validate the above, we further studied two census tracts (#108.2 and #102.8) that have the percentage of renter households paying 30% or more of their household income on rent that is neither the highest nor the lowest, that is, the regular census tracts. These two tracts do have a higher percentage of owner-occupied units than tract #52. They also have an oversupply of housing units as compared to the number of households. Most notably, there are 41 vacant units for rent and 91 vacant units for sale in tract #108.2. If we assume that the housing market is at work, rental households and landlords should be able to find an equilibrium price (rent) that will consume the vacant units, as shown in Figure 8 below.

**Figure 8: Equilibrium Price in a Housing Market at Work**

Based on the above, we can conclude that in Polk County, there is not an overall housing supply shortage per se, if we assume that those vacant units can enter the housing market for renters. If there were housing affordability issues among renter households, it is more about the mismatch between the housing characteristics such as price range, maintenance status, availability in the market, for sale/rental and room number of the available housing units and the desired housing attributes (including location) among the renter households. From the data we can have access to such as the ACS data, we could, for instance, see that of all occupied units in Polk County, the average number of bedrooms is 2.9 while the estimated average household size is 2.5. In other words, even we assume that each resident occupies one bedroom in a housing unit, many units still have one bed room vacant in Polk County. There is also possibly “information asymmetry” between renter households and landlords, that is, the housing demand of renters and the supply of housing by landlord
do not match up. This could contribute to the above fact that there are more bedrooms per housing unit (supply) than residents per household (demand). Last but not least, there could be over-consumption of housing among renter households. According to the ACS data, for instance, the average renter household size is 2.2 while the average number of rooms of the renter-occupied units is 5.5 in Polk County. On average, each member in a household consumes 2.5 rooms. In theory, a household with 3 members (a couple and a child) can get by having two bedrooms, one storage room, one bathroom and one living room, that is, each member on average has 1.7 room. Putting the above together, we can see that renter households in Polk County may have over-consumed (or are forced to over-consume due to the above-mentioned mismatch between housing supply and demand) housing by 50%.

To show occupied rental housing units in which price (rent) ranges are oversupplied or undersupplied as compared to the number of renter households by income bracket in the four tracts, we made Figures 7 to 10 below, which are similar to Figure 6, using the ACS data of households by rent bracket and by income bracket. Figures 7 to 10 indicate that in all four Census tracts housing affordability is always associated with households in the brackets with lower household income in the tract. There are more affordable rental units than renter households once the rent exceeds certain threshold, which shows where there could be the mismatch between affordable housing supply and demand. This threshold differs across the tracts, meaning that in different tracts we have to deal with households of different income levels when alleviating housing affordability issues. In Census Tract 52, for instance, households can at most pay $500 on rent each month, that is, earning less than $20,000 annually if we assume $500 is 30% of their monthly household income, face housing affordability issue. In Census Tract 108.2, it is households can at most pay $1,000 on rent each month, that is, earning less than $40,000 annually if we assume $1,000 is 30% of their monthly household income encounter housing affordability issues.
Figure 9: Census Tract 52: Demand and Supply of Affordable Housing

Census Tract 52 (Both housing units and households n=556)

- Less than $200
- $200 to $299
- $300 to $499
- $500 to $749
- $750 to $999
- $1,000 to $1,499
- $1,500 or more

Affordable Units By Bracket
- Renter Households

Figure 10: Census Tract 30.01: Demand and Supply of Affordable Housing

Census Tract 30.01(Both housing units and households n=145)

- Less than $200
- $200 to $299
- $300 to $499
- $500 to $749
- $750 to $999
- $1,000 to $1,499
- $1,500 or more

Affordable Units By Bracket
- Renter Households
A Model to Calculate the Supply of Affordable Housing in Polk County

Figure 11: Census Tract 102.8: Demand and Supply of Affordable Housing

Census Tract 102.8 (Both housing units and households n=480)

Figure 12: Census Tract 108.2: Demand and Supply of Affordable Housing

Census Tract 108.02 (Both housing units and households n=171)
Since we argue that there could be an oversupply issues in the housing market in Polk County, one may wonder how we can deal with housing affordability issues in this situation. Let’s illustrate using Census Tract 108.2 as an example. For this tract, we assume that certain percentage of “other vacant units” (n=143) can enter the rental housing market. We calculate the percentage like this:

\[
P_{V_i} = \frac{R_{U_i}}{T_{OU_i}}
\]

(2),

where \(P_{V_i}\) is the percentage of “other vacant units” can be converted into a rental unit due to reasons such as maintenance/repairing subsidy or rent subsidy in census tract \(i\); \(R_{U_i}\) is the existing occupied rental units in census tract \(i\); \(T_{OU_i}\) is the total occupied units in census tract \(i\).

Using Eq. (2) and the ACS data for Census Tract 108.2, we know that there can be 50 of “other vacant units” that can be converted into a rental unit. For these 50 units, we assume that they all charge a rent less than $1,000/month, where the cumulative distribution function curves of affordable units and renter households intersect in Figure 10. In addition, these 50 units’ rent distribution simply follows that of the existing renter households’ 30% household income. At this point, we can have a revised cumulative distribution function curve of the renter units in the tract, which is shown in the dash line in Figure 11. This curve now moves closer to the red curve (the cumulative distribution function curve of rental households by income level) when the rent is less than $1,000. This means that housing affordability issues have been alleviated for households can at most affordable to pay $1,000 per month on rent. Assuming that we follow the 30% of the household income method then we can estimate that households’ annual household income is $40,000 or less would benefit the most when we convert 50 more vacant units into a rental unit following the logic mentioned above. Of course, we can also directly give renter households or landlord rent subsidy, this would move the red curve closer to the blue curve, which is the cumulative distribution function curve of affordable housing unit by rent.
CONCLUSIONS AND DISCUSSIONS

This study shows that we can use the cumulative distribution functions of households by income bracket and housing units by rent bracket to estimate affordable housing supply or affordable housing need in Polk County. Applying this method, we find that the absolute quantity of housing supply exceeds the need of existing households in Polk County when vacant units are included in the analysis. However, households in different census tracts demand affordable housing of different levels of affordability than what might currently be available in that location. In other words, while the existing supply of units exceeds the existing number of households in need of housing when vacant units are included in the analysis, there is a spatial mismatch between the location of the households and the location of the units. When affordability was used as the criteria for evaluating supply, we found that most Census tracts in the region had an undersupply of affordable housing.

The report recommends that future housing policies focus on alleviating the mismatch and addressing the undersupply of affordable housing. Concrete policy tools that could be considered by policymakers include but not limited: rapidly returning vacant units to the market as rental units, location-sensitive economic incentives for home builders or landlords who offer affordable housing in line with the need in that location, and a one-
stop on-line “housing market” that better connects private-sector landlords, home builders and renter households to reduce the mismatch between the household demand and housing characteristics. While this study focused on housing supply, it did not look at the barriers that individual households face in their search for affordable housing. Such information may be useful in understanding some of the causes for the existing spatial mismatch in Polk County.
REFERENCES
