Social Determinants of Health:
Attainable Housing Development Model and Development of Healthy Corridors

University of Central Florida
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M.S Urban & Regional Planning
Capstone Class Spring 2020
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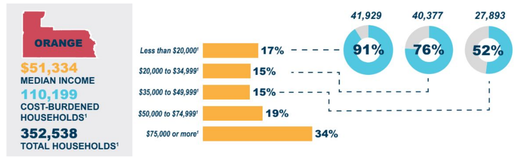
Background

The Joint Center for Housing Studies of Harvard University (2018) reported home rentals and mortgages have increased 20% faster than overall inflation from 1990 - 2016. Disparity between income and housing cost also exists in Orange County due to continuous population growth, prevalence of low-wage industries, and generally high rents due to current supply limitations (Regional Affordable Housing Initiative, 2018). Attainable housing developments with natural elements, sharing and support services, and other helpful features create healthier environments for residents (Sanguinetti, 2014).

Justification

The experience of housing cost burden is associated with poorer health outcomes (Baker, Anh Pham, Daniel & Bentley, 2020). More than ¼ of households within Orange County are considered cost-burdened and spend more than 30% of their income on housing. (Regional Affordable Housing Initiative, 2018)



Source: Regional Affordable Housing Initiative, 2018

Incorporating infill-development of underutilized and vacant properties with mixed-income rent housing supports sustainability and affordability by reducing cost and urban sprawl (Urban Land Institute, 2007).

Case studies support that a healthy corridor approach combined with mixed-income housing creates a holistic, more effective model. This improved model creates conditions in which residents are encouraged to be more physically active. It also increases safety and housing affordability, and focuses on a multimodal transportation system. The resulting development is more sustainable, encourages resident social cohesion, and links residents to the corridor improving connections to jobs and other sectors of the greater community improving overall health of the community (Urban Land Institute, 2016).

Methods

The subject research focused primarily on the application of existing research with the ultimate goal of creating a development model that both public and private developers can use to create healthier more attainable development in Orange County, FL. After an extensive literature review, recurring best practices and proven health improving development principles were summarized and applied to a selected site. Site selection consisted of subjective thematic evaluation of common existing conditions within the region, and choosing a site that aligned with common themes. A site with common existing conditions (large, mostly unused parking lot, located on an urban principal arterial) was selected to maximise applicability of the model.

Spatial analysis of existing pedestrian and bicycle infrastructure was conducted using GIS to identify weaknesses and breaks in the infrastructure network.

Transit analysis of existing infrastructure was conducted and determined using GIS maps provided by Lynx, Central Florida's regional transit agency. This analysis determined the existing level of service, routes and connectivity, and the headways of buses servicing the corridor of the site and identified "gap" improvements.

Data and Analysis

Attainable Housing Development Analysis

When creating a model for attainable housing development, price and affordability are only one dimension of an equitable, effective framework. Many studies have shown that specific improvements to housing design and function can improve health outcomes for residents (Breysse et al, 2011). Based on the literature the following analysis/design elements were considered during the creation of this attainable housing development model:

- **Resident demographic diversity and affordability;**
- **Sustainable building methods and energy conscious design;**

- **Multimodal accessibility;**
- **Quality of the microscale pedestrian environment;**
- **Community garden and other social interaction encouraging design and amenities; and**

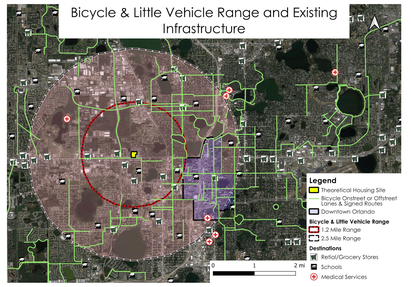
- **Health-oriented construction materials and design.**

Healthy Corridor Analysis

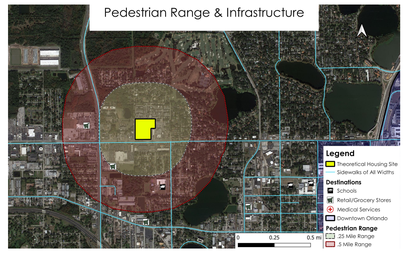
When considering the implications of residential development on future residents and public health, the greater context in which the development is located must be considered. Analysing corridors in terms of public health has been shown to generate improvements that create a more holistically healthy resident experience (Urban Land Institute, 2016). The following healthy corridor pillars were considered during the creation of this public health analysis:

- **Infrastructure integrity, availability and functionality;**
- **Existing design and land use patterns and whether they match community needs;**

- **Community engagement;**
- **Linkages to other parts of the city; and,**
- **Access to services that meet needs of community.**



Data from City of Orlando, FDOT and Orange County Government, FL



Data from City of Orlando, FDOT and Orange County Government, FL

Bicycle and Micromobility Analysis

According to a recent national study on the use and range of micromobility trips the following ranges are viable when analysing connectivity and infrastructure for micromobility users (Krizek & McGuckin, 2017):

75% of trips less than 2.5 miles
50% of trips less than 1.2 miles

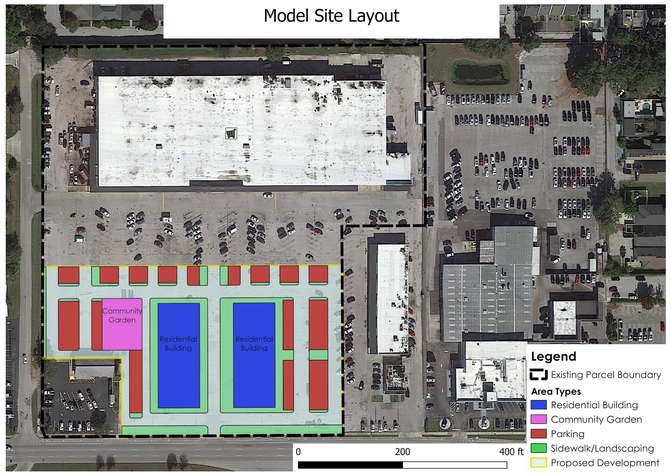
Potential implications: Range overlap, infrastructure improvements could cause direct mode shift from car use to micromobility; ridesharing service mode shift potential; scooters, ebikes and segways mode share simultaneously.

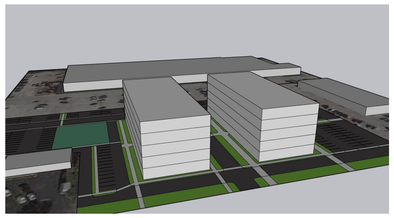
Pedestrian Analysis

Accepted by real estate agents and researchers alike, the walkability model created by Walkscore.com states that the majority of people are willing to walk .25 miles to a destination or transit stop (Walk Score, 2020). It also states that individuals are willing to walk .5 miles to a destination or transit stop however this greater distance is considered the outer limit. With this in mind, an examination of the pedestrian infrastructure and potential destinations within those ranges is necessary to identify potential hazards, or improvements to increase convenience, ease of use and enjoyment. These subjective factors increase the likelihood of walking being the chosen transportation mode, thus decreasing vehicle miles traveled (VMT). Lower VMT is associated with lower levels of air pollution (USDOT, 2015) and increased activity is associated with lower incidence of obesity (Baker, Milner & Campbell, 2015).

Proposal and Development Implications

Preliminary analysis of existing infrastructure, public services, connectivity of pedestrian, micromobility and transit networks, and review of healthy, attainable housing focused literature has generated specific design requirements. These requirements have been incorporated into the following development model.





Source: Alexander Leon-Rivera, 2020

Source: Alexander Leon-Rivera, 2020

Housing Development Model

- Community garden - Fresh food, healthy living and networking.
- Mixed income tenants - Economic desegregation.
- Site selection/design - Revamp underutilized infill sites, decreasing impervious surface and enhance surrounding area.
- Sustainable design - Internal design standards for healthy living and reduction in energy use make development more affordable and environmentally friendly.
- Community partnerships - Open communication channels between housing development and surrounding businesses to facilitate community events, shop local campaigns, and other social capital building networks and opportunities.
- On-site sidewalk - Increase walkability within community.

Healthy Corridor Improvements

- Reduce speed limit - Increase safety and improve pedestrian experience.
- Multi-use path - Remove on-street bike lanes and replace with off-street multi-use path parallel to roadway (colonial), thereby increasing safety as well as user comfort and opening the infrastructure to little vehicles and other micromobility choices.
- Transit - Improve existing transit service by making direct routes to neighborhoods east of I-4. Consider transit centered signal timing and BRT systems.
- Street trees - Increase street trees along corridor providing shade and protection to pedestrians, decreasing heat island effect and improving air quality.
- Urban design requirements - Consider design requirements that bring pedestrian destinations to the street, increasing services within pedestrian range and slowing automobiles.
- Corridor association - Create a corridor resident and business association to engage stakeholders in corridor design, use reform and future improvements.

References

Baker, E., Anh Pham, N. T., Daniel, L., & Bentley, R., (2020). New evidence on mental health and housing affordability in cities: A quantile regression approach. *The International Journal of Urban Policy and Planning*. 96(2020): 1-7. https://doi.org/10.1016/j.cities.2019.102455
Baker, E. H., Milner, A. N., & Campbell, A. D., (2015). Walking programs to promote weight loss among obese and overweight individuals. *Public Health*. 129(6): 822-824.
Breysse, J., Jacobs, D. E., Weber, W., Dixon, S., Kawecki, C., Aceti, S., & Lopez, J., (2011). Health outcomes and green renovation of affordable housing. *Public Health Reports*. 1(126): 64-75
Joint Center for Housing Studies of Harvard University. (2018). The state of the nation's housing 2018. Cambridge, MA: Author.
Krizek, K. J., & McGuckin, N., (2019). Shedding NHTS light on the use of "Little Vehicles" in urban areas. *Transport Findings*. https://doi.org/10.32866/10777
Regional Affordable Housing Initiative. Executive Summary Report. May 2018. https://www.orangecountyfl.net/NeighborsHousing/RegionalAffordableHousingInitiative.aspx
Pawlukiewicz, M., Prema K.G., & Koelbel C., (2007). Ten Principles for Coastal Development. Urban Land Institute. https://uli.org/wp-content/uploads/ULI-Documents/Ten-Principles-for-Coastal-Development.pdf
Sanguinetti, A. (2014). Transformational practices in cohousing: Enhancing residents' connection to community and nature. *Journal of Environmental Psychology*. 40, 66-96. https://sciencedirect.com/science/article/pii/S0272494414000450
Urban Land Institute (2016). *Building healthy corridors: Transforming urban and suburban arterials into thriving places*. Urban Land Institute.
U.S. Department of Transportation (2015, August 24). *Cleaner air: Relationship to public health*. U.S. Department of Transportation Mission. https://www.transportation.gov/mission/health/cleaner-air
Walk Score (2020). *Walk score methodology*. WalkScore.com. https://www.walkscore.com/methodology.shtml

An Attainable Housing Development Model

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An Attainable Housing Development Model

Background and Justification

In 2018, the Regional Affordable Housing Initiative, a coalition of local governments in Central Florida, released an executive summary report of their efforts to address the growing housing shortage throughout Central Florida. The trends of the housing market, challenges of increasing cost and diminished supply were discussed. Ultimately, several goals and strategies were laid out to address these pressing issues. In particular, the Regional Affordable Housing Initiative (2018) identified the following five goal categories; increase housing supply to meet the needs of all current and future residents; encourage the diversity of housing types; preserve existing affordable housing stock; integrate housing by promoting social and economic integration; and educate by improving financial literacy of future home renters and buyers. In an effort to realize the goals of the Regional Affordable Housing Initiative, the following attainable housing development model was created. Providing context, the following attainable housing development model is presented using a healthy corridors framework.

When creating a development model to increase the supply of attainable housing, it is important to understand what is driving the shortage and increasing prices. According to a report from Fannie Mae (2019), the biggest drivers of regional multifamily construction cost are the price of land and labor. Local labor supply is outside the scope of this research; but the price of land can be hemmed by creative use of space and by increasing value in the development through innovative housing tools (Metcalf, 2018). Also, any housing development model would be remiss if it did not address the topic of housing in a holistic manner, examining housing as a determinant of public health. In this research, a review of current literature has been conducted

to identify applicable, effective interventions and best practices that improve public health through housing. These measures were applied to a real life scenario demonstrating the efficacy and financial viability of the model. Finally, the future implications of the constructed development model and how local governments can change their behavior to increase attainable housing production are discussed. The development model focuses on creating dwellings attainable to lower-middle income households, those making less than 80 percent of the median income, as those have been more impacted by unaffordability (Edmiston, 2016). Attainable housing is housing available at a rent or purchase price that specified income groups are able to purchase using 30 percent or less of their income. The terms *attainable housing* and *affordable housing* for the purposes of this research will be considered interchangeable.

Additional analysis is conducted on the context within which the development model is sited. Health outcomes are related to housing both directly, from the lived experience of residing within the specific development, and indirectly from the aspects imparted on the residential experience by the geospatial location of the housing development within the larger urban context (Urban Land Institute, 2017). The larger urban context will be conceptualized by this research as a healthy corridor framework.

The Joint Center for Housing Studies of Harvard University (2018) reported home rental and mortgage payments have increased 20 percent faster than overall inflation from 1990 - 2016. Increase in out-of-pocket housing expenses generally have disproportionately grown compared to income and the general economy in most metropolitan areas (Edmiston, 2016). This disparity exists in Orange County, Florida, because of the same trends driving the national disparity, plus a few local conditions exacerbating the national trend. The local conditions impacting Orange

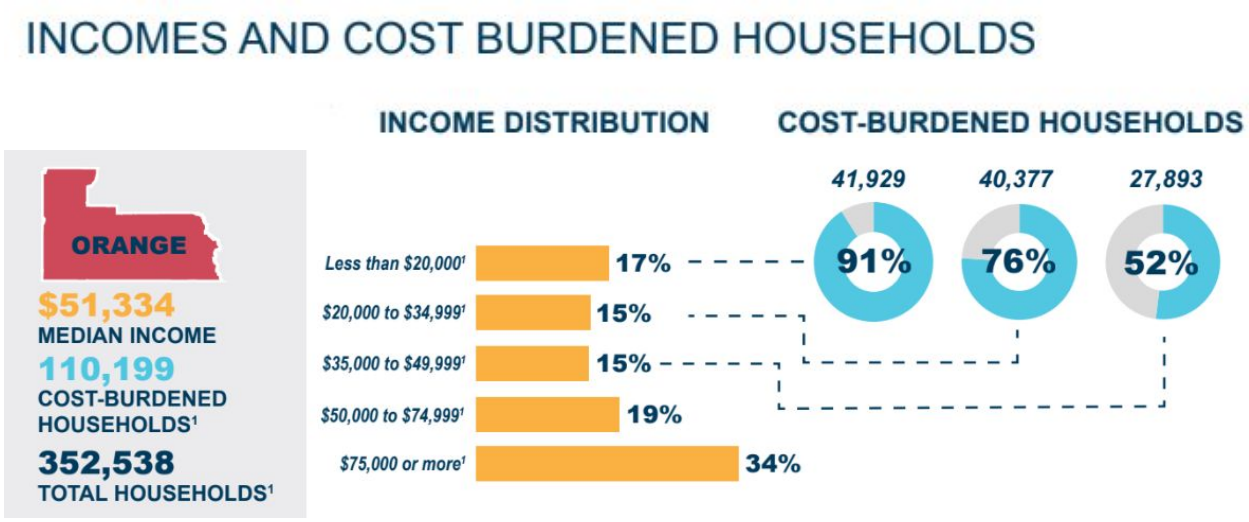
County are population growth, prevalence of low-wage industries in the area, and higher housing cost due to supply limitations (Regional Affordable Housing Initiative, 2018). While the region remains economically attractive, the largest job category, tourism, provides many households median annual earnings of $26,000 to $36,600, which is lower than required in order to afford the area's median housing costs (Regional Affordable Housing Initiative, 2018). Housing is considered affordable when the occupant pays no more than 30 percent of their income towards gross housing costs. The American Community Survey (2016) reports 230,344 households, nearly one-third of the population within Orange County, are cost burdened. A household is considered cost burdened when their gross housing cost exceeds 30 percent of their income.

The experience of housing cost burden is associated with poorer health outcomes (Baker, Anh Pham, Daniel & Bentley, 2020). Nearly one-third of households within Orange County are considered cost burdened and spend more than 30 percent of their income on housing (Regional Affordable Housing Initiative, 2018). Incorporating infill development, especially on underutilized and vacant properties supports sustainability and affordability by reducing cost and urban sprawl, all while utilizing existing infrastructure (Urban Land Institute, 2007).

Not all households are as likely to experience cost burden. In Orange County, lower income households are significantly more likely to experience cost burden than high income households. As seen in Figure 1 below, the poorest households in Orange County are the most likely to experience cost burden.

Figure 1

Orange County Incomes and Cost Burdened Households



Regional Affordable Housing Initiative, 2018

The application of the attainable housing development model in this research will be applied to create housing attainable to households making 75 percent of area median household income or approximately $36,000 per year. While there are many households in this income bracket that are cost burdened, the model should be applied in future research to create development catering to other lower-income economic demographics.

Literature Review

The factors involved in housing and health outcomes are varied and many. Everything from the physical components of the building, to the diversity of the development's residents, to the design of the development have a meaningful impact on the health outcomes of residents. The following review of current literature on housing and health identifies key factors and

interventions that improve the health of residents. These proven interventions are later organized into the attainable housing development model.

One element of sustainable development is social and economic diversity. This aspect of housing has proven to be one of the most difficult to cultivate, as most housing developments are justified by developers who identify a specific demand in the market by a specific demographic. The entire development is thus designed around that financial demographic and while this is effective at increasing occupancy in the short term; in the long term, the homogenous population within the development becomes economically, socially and often racially segregated. The lack of economic diversity could foster a residential population that is wholly subject to the same economic undulations. A more diverse population is more financially resilient as members of different sectors of the local economy are not all subject to the same economic trends. A resilient resident population means the development will have a resilient more sustainable tenant base. Mixed-income housing also potentially creates an atmosphere of inclusion and understanding in which individuals or households of different socioeconomic standing can build communal bonds, thus creating a more connected, understanding society.

One connection that is not often made is between mental health and affordability. More specifically, the experience of cost burden leads to negative health outcomes (Baker, Anh Pham, Daniel, & Bentley, 2020). In one study, individuals experiencing housing cost burden reported significantly improved psychological well being after the cost burden was alleviated through public subsidy or otherwise (Fenelon, Mayne & Simon, 2017). According to Baker, Anh Pham, Daniel & Bentley (2020), for some individuals, the experience of unaffordability can indeed have a cumulative effect, with the negative effects on their psychological well being magnifying

over time. This relationship, while not informative of housing design, does validate the study and creation of an attainable housing development model that encourages the development of attainable housing.

Cohousing is a form of housing development centered around deliberate, supportive community participation. In the traditional form of cohousing, residents participate in the design and operation of their housing facility, congregate and spend the majority of their time in ample shared spaces, all while maintaining separate living units (Garciano, 2011). The benefits of this housing mode are numerous, including a supportive social network, a greater sense of physical security with "eyes on the street", and the potential for reduced living costs through sharing of resources, skills and work effort. The increased interaction between residents builds trust and subsequently, the strong community bonds necessary for residents to accept assistance from one another. The increased interaction is facilitated not just through shared spaces but through the intentional physical design of the physical development. Hallmark cohousing community design attributes consist of pedestrian orientation, attached units with entrances grouped together, a preference for views of shared spaces and a predominance of communal activity spaces such as community gardens or gathering halls (Garciano, 2011). Generally in cohousing developments cars are relegated to the periphery of lots or developments (Garciano, 2011), increasing the focus on pedestrian life and interaction. All design choices are made to achieve the overarching goal of encouraging social interaction and building community. While classic cohousing is mired in stigma and has generally not been found to reduce gross housing cost or increase diversity, the benefits are undeniable in terms of social resiliency and health outcomes, and those positive outcomes have been found in subsidized cohousing case studies (Garciano, 2011).

In a study by Meltzer (2000), it was found that an individual's experience of community can help bridge the gap between awareness of environmental issues and action. In other words, the experience of intentional community (cohousing) increases an individual's likelihood of taking environmentally-friendly action. If the relationship between community and behavior is extrapolated, the benefits of cohousing or cohousing-like practices could be even more numerous than currently thought. The proposed attainable development housing model could benefit most not from adopting cohousing wholesale, but by incorporating the social capital building strategies that cohousing exhibits. Cohousing strategies could bring benefits beyond reduction of cost to low or moderate-income communities, including improved psychological and physical health through supportive social networks.

When imagining new housing construction, the most common image in Florida is that of single-family residential developments. This type of development generally takes place at the edge of urban areas thereby placing the residents of this development further from employment and other services. The American Planning Association contends in their 2019 Housing Policy Guide that not only are commutes increasing in length nationally over time, but that this increase in time, spent behind the wheel of a car or on a bus or train, "is taking more and more money from the working poor" (p5). With this relationship in mind, the location of housing becomes a more salient issue. The American Planning Association further contends that low and moderate-income households are disproportionately affected by long commute times because there is a lack of attainable housing for those groups in downtowns or other locations close to jobs, thereby forcing these households to look for affordable housing further from employment.

The proposed attainable housing development model should include a preference for locations with attributes conducive to shorter commutes.

Perhaps the most obvious aspect of housing related to health outcomes of residents is the physical construction and utilitarian design of the structure(s). Despite the obvious relationship between quality indoor environments and healthy inhabitants, it is worth noting that research has found that specific criteria should be present to ensure positive health outcomes. In 2011, Breysse et al conducted a study examining the relationship between health outcomes and specific improvements to the dwellings of participants. The improvements, referred to as "Green Building Standards" consisted of improved ventilation, fresh air circulation, and improved building efficiency through insulation and building envelope tightening. The study found statistically significant reported health improvements in participants in as little as one month after renovation. The majority of improvements reported were related to asthma and respiratory ailments, but general health was reportedly improved both in adults and children. Environmental quality measurements such as carbon dioxide levels, radon levels and overall building efficiency all showed marked improvements. While many different green building standards exist, it is certain that an element of green building standard should be included in all future housing construction both for resident health and for affordability, as decreased energy use translates to lower utility bills and less occupant cost over time.

The link between physical activity and health has been heavily reported and confirmed. The link between activity levels and an environment conducive to pedestrian, or physical activity more generally has been studied less so, but the link has been found. In Bauman, Reis, Sallis, Wells, Loos, & Martin's (2012) review of literature on environmental correlates of physical

activity, the strongest correlates between children and activity were walkability, traffic speed and volume, land use mix and proximity to recreation facilities (p262). In the same study, adolescent activity was strongest correlated with land use mix and residential density, while adult correlation was found to be more complex. Bauman et al found that adult activity is most highly correlated with walkability and street connectivity, but also aesthetics. Regardless of the age group, the findings strongly suggest a relationship for all individuals between walkability, connectivity and the pedestrian experience at large.

Everyday activity is important to health both directly and indirectly. As previously discussed, experience of cost burden or of living in unaffordable conditions is generally associated with negative health outcomes (Baker, Anh Pham, Daniel, & Bentley, 2020; Fenelon, Mayne & Simon, 2017). The indirect result of non-walkable conditions, poor land use mix, or significant separation between dwelling and employment is increased commute time and transportation expense. Second to housing, transportation is the biggest expense in a typical American household (American Planning Association, 2019), thus, walkability, pedestrian environment and proximity to employment are important factors when planning for healthy developments. The relationship is both direct, between activity and prevention of disease, and indirect, via the cost of transportation.

An improved model focusing on not just the housing development but the surrounding pedestrian environment could also increase safety and housing affordability. The resulting development is more sustainable, encourages resident social cohesion, and links residents to the corridor improving connections to jobs and other sectors of the greater community, improving

overall health of the community (Urban Land Institute, 2016). Neighborhood based theory of successful mixed use and affordable housing elements include the following:

- Quality of local services
- Socialization by adults
- Peer influences
- Social networks
- Reduced exposure to crime and violence
- Reduced physical distance and social isolation

This theory also states that adults serve as role models for children and youth through demonstrating work skills and the value of education. Choice of peer group is often influenced by where you live. Likewise, social networks that provide emotional support and facilitate word-of-mouth information about jobs and other opportunities may be neighborhood based.

This research does not address food access or availability of healthy food except to acknowledge the relationship between an equitable transportation system and food access. When examining the relationship between pedestrian environment and activity, another indirect effect is revealed: the more walkable the environment, the more accessible surrounding uses become, such as healthy food retail locations. This is important when the relationship between distance to food stores is positively associated with obesity (Ghosh-Dastidar, Cohen, Hunter, Zenk, Huang, Beckman & Dubowitz, 2014). Others have contended that increased investment in pedestrian or micromobility infrastructure through the creation of higher profile, off street urban multi-use paths, could increase the distance that pedestrians or micromobility users are willing to travel (Krizek & McGucken, 2019). When both these ideas are taken together, it seems there could be

a relationship between equitable transportation investment, like that of multi-use path creation and obesity rates related to food access.

In summary, the relationship between housing and health is complex. However, after reviewing the preceding topics, a good sense of what constitutes a healthy housing development does take shape. A healthy housing development must be: affordable, supportive of a diverse population, encourage the building of social networks through deliberate community, be located in close proximity to employment and other land uses, be constructed in a way that provides a healthy internal environment, and, have a positive relationship with a walkable, connected external environment, encouraging of pedestrian or other active transportation modes.

Methodology

The subject research focused primarily on the application of existing research with the ultimate goal of creating a development model that both public and private developers can use to create healthier more attainable development in Orange County, FL. This task was broken into several phases. First, the development model was theoretically outlined and supported by an extensive literature review, identifying recurring housing best practices and proven health improving development principles. Second, the ideas were summarized and applied to a selected site. A brief site selection process was performed based on the development model research. The selection process consisted of subjective thematic evaluation of common existing conditions within the region, and choosing a site that aligned with common themes. A site with common existing conditions (large, mostly unused parking lot, located on an urban principal arterial), in close proximity to employment and other services, was selected to maximize generalizability and efficiency of the model application. Finally, what essentially became a case study of the

development model was more fully defined, designed and financially evaluated for efficacy.

The context of the case study was analyzed using geographic information systems (GIS). Spatial analysis of existing pedestrian and bicycle infrastructure was conducted using GIS to identify weaknesses and breaks in the infrastructure network. Using Florida's Department of Revenue codes, common necessary destinations were identified and cross referenced to acknowledged equitable transit distances using the buffer analysis tool. Transit analysis of existing infrastructure was conducted using GIS maps provided by Lynx, Central Florida's regional transit agency. This analysis determined the existing level of service, routes and connectivity, and the headways of buses servicing the corridor of the site and identified "gap" improvements.

Data Analysis

Preliminary analyses of existing infrastructure and public services within Orange County were conducted. In addition, the connectivity of pedestrian, micromobility and transit networks were examined to select a site near an arterial roadway that offered numerous alternative transportation options. It was also important to incorporate the attainable housing and healthy corridor design elements recommended within the literature review to develop a desirable development model.

Attainable Housing Development Analysis

When creating a model for attainable housing development, price and affordability are only one dimension of an equitable, effective framework. Many studies have shown that specific improvements to housing design and function can improve health outcomes for residents (Breysse et al, 2011). Based on the review of current literature the following development

elements were determined to be significant and form the basis for this attainable housing development model: affordable, diverse population, sustainable building methods, energy efficient design, connected external environment, and social networking factors.

Healthy Corridor Analysis

A healthy corridor analysis was conducted focusing mainly on transportation. After selection of a site to apply the attainable development model, the following analyses were conducted on the section of East Colonial Dr starting from approximately two miles west of the subject site, running east, to approximately two miles east of the intersection of East Colonial Drive and Interstate 4. Pedestrian analysis and, bicycle and micromobility zoning analysis was completed to diagnose the health of the networks in the zones directly emanating from the subject site, while transit analysis was conducted along the corridor to determine connectivity to other neighborhoods.

The result of these analyses are a series of improvements recommended to enhance the site and the surrounding areas to develop a healthy corridor. Analyzing corridors in terms of public health have been shown to generate improvements that create a more holistic resident experience (Urban Land Institute, 2016). Infrastructure integrity, availability and functionality are considered healthy corridor pillars that were examined during the creation of this public health analysis. Existing design, linkages to other parts of the city, and access to services were considered to meet the needs of the community.

Bicycle and Micromobility Analysis

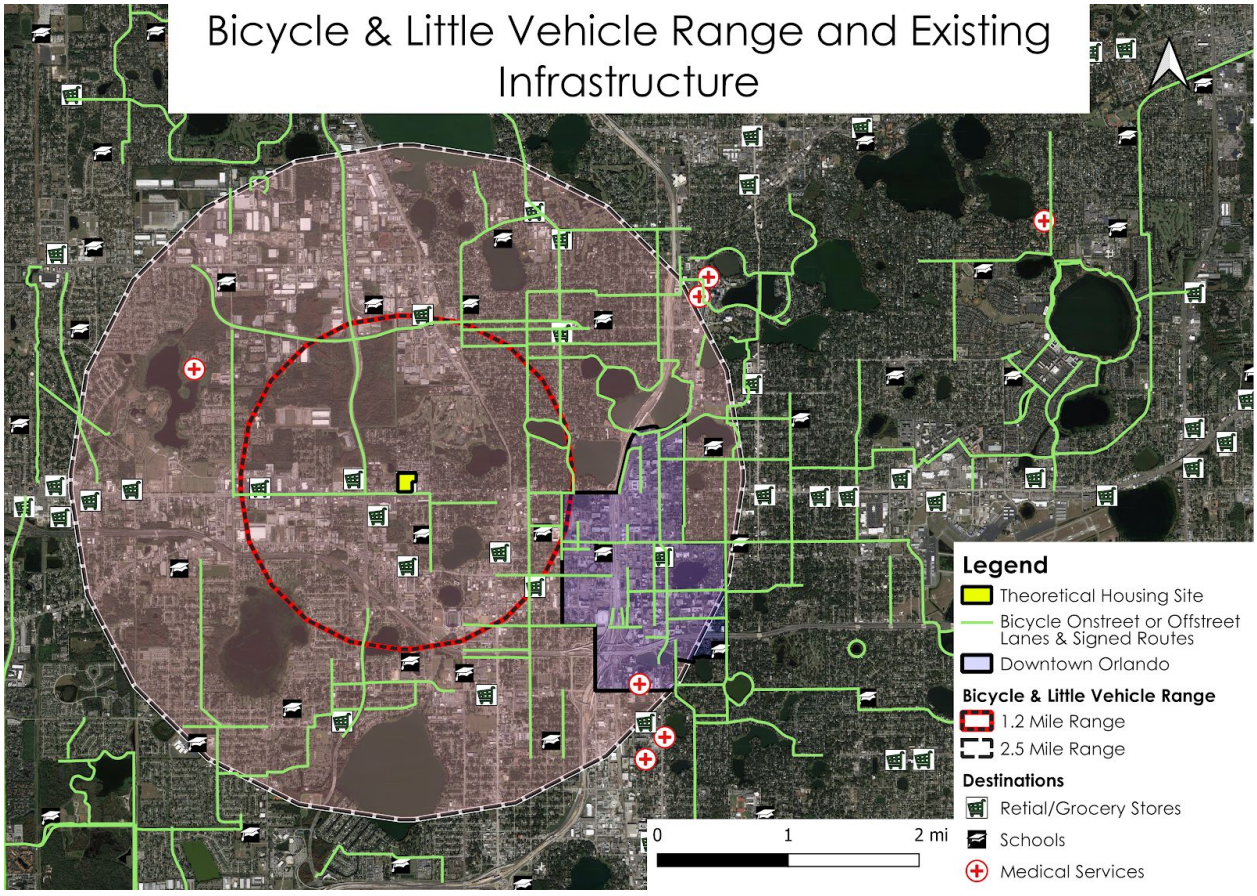
According to a recent national study on the use and range of micromobility trips, 75 percent of trips are less than 2.5 miles and 50 percent of trips are less than 1.2 miles. These

figures are viable when analysing connectivity and infrastructure for micromobility users (Krizek & McGuckin, 2017). Some potential improvements that would have a direct effect on mode shift from car to micromobility include making improvements to the sidewalks and road infrastructure and dedicated lanes in a safe manner for bike travel. Specifically, the visual analysis comparing the location of existing infrastructure to known activity zones revealed an important missing link in the network. The subject site and the surrounding neighborhood within the 1.2 mile range is not connected to the employment center located in the neighborhood into the northeastern corner of the intersection of Interstate 4 and Tollway 408, otherwise known as Downtown Orlando.

Another stark trend that becomes visible when analysing the bicycle and micromobility transportation network in this way is the stark difference in total amount of present infrastructure between the subject properties immediate radius and Downtown Orlando, highlighted in blue in Map 1. Immediate recommendations for improvement are clear when analyzing these conditions.

Map 1

Bicycle and Little Vehicle Range and Existing Infrastructure



Paul Ashworth, 2020

Pedestrian Analysis

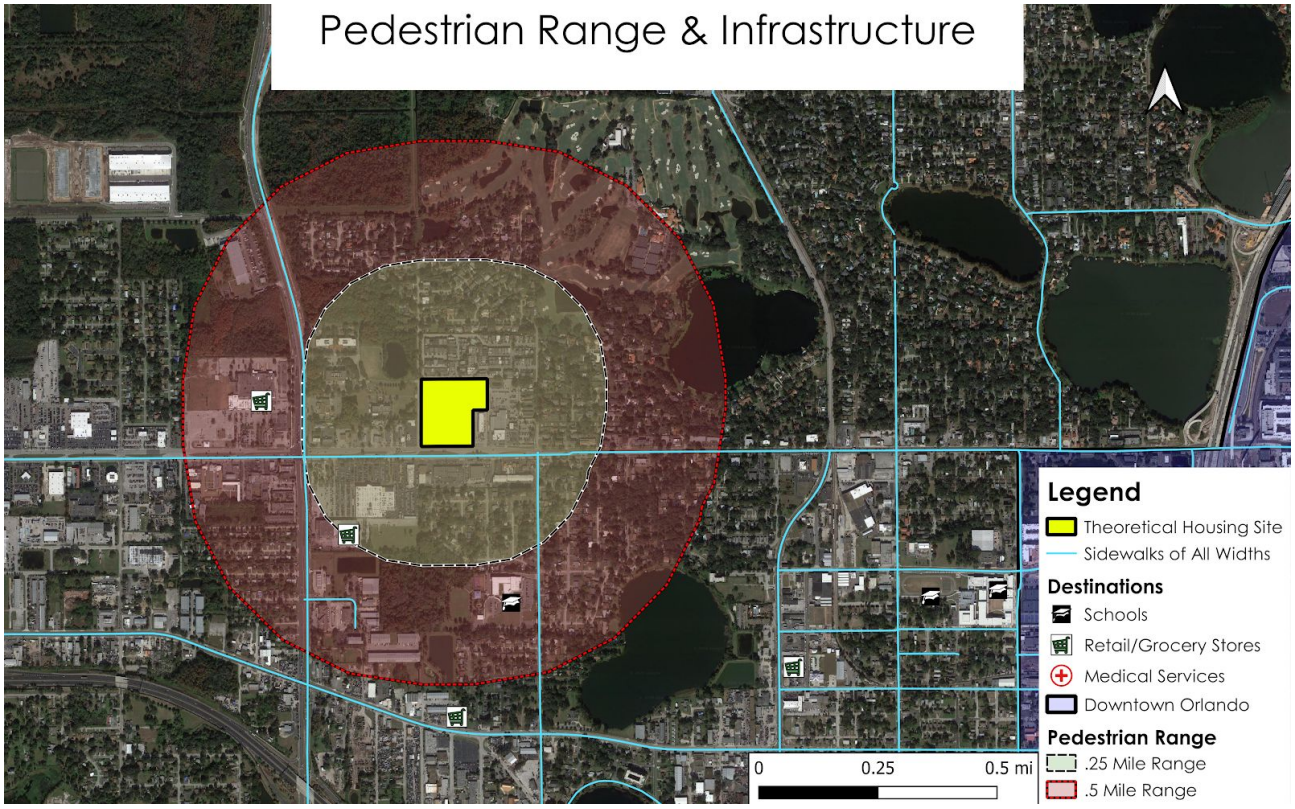
The current network has a walk safety score of 58 out of a 100; a bike score of 46 out of 100, and a transit score is 43 out of 100 (Walk Score, 2020). Accepted by real estate agents and researchers alike, the walkability index available from Walkscore.com asserts that the majority of people are willing to walk .25 miles to a destination or transit stop (Walk Score, 2020). It also states that individuals are willing to walk a half-mile to a destination or transit stop; however,

this greater distance is considered the outer limit of what pedestrians consider a reasonable walking distance. These radii are represented in Map 2 below as concentric yellow and red zones. With this in mind, an examination of the pedestrian infrastructure and potential destinations within those ranges were conducted in order to identify potential hazards, or improvements to increase convenience, ease of use, and enjoyment. These subjective factors increase the likelihood of walking being the chosen transportation mode, thus decreasing vehicle miles traveled (VMT). Lower VMT is associated with lower levels of air pollution (USDOT, 2015) and increased activity is associated with lower incidence of obesity (Baker, Milner & Campbell, 2015). Walking is also the least expensive form of transportation and is therefore, the most equitable and sustainable mode.

When retail centers, grocery centers and other food distribution locations, the subject site and the existing pedestrian infrastructure network are all represented as seen in Map 2, visual analysis of gaps and potential improvements become clear. Additional satellite imagery analysis reveals lack of street trees or buffer between existing sidewalks and traffic.

Map 2

Pedestrian Range and Infrastructure



Paul Ashworth, 2020

Proposal

Housing Development Model

The analysis of the current body of literature regarding housing and health has yielded the following best practices. The attainable housing development model is in essence these principles. The expression of these principles through the case study previously described and the development proposal are an example of the power and viability of this theoretical model. The attainable housing development model required that development meet the following criteria:

- Be located in close proximity to employment and other land uses;
- Practice deliberate, intentional community through design and function;
- Be constructed in a way that provides a healthy internal environment;
- Reduce cost over time through sustainable, green building standards;
- Integrate into a healthy, well planned and connected corridor complete with transit and a mix of land uses in accessible proximity;
- Be part of larger community context, empowering residents of surrounding community to create business and resident sub-organizations that advocate for their own health;
- Have a positive relationship with a walkable, connected external environment, encouraging of pedestrian or other active transportation modes.

The ability to revamp vacant areas or build on infill sites serves as a win-win to the developer and the community. The underutilized infrastructure has been replaced with two twin buildings, five stories in height, that house 162 apartment units. The planned development decreases existing impervious surface area, provides an active service for the community and improves the surrounding area. This housing model is equipped with Energy-Star appliances, LED lighting, solar panels and other Leadership in Energy and Environmental Design (LEED) recommendations to ensure energy efficiency. By using smart and sustainable design elements, the hope is to create an affordable, environmentally-friendly development focused on healthy living.

Intentional community is cultivated by incorporating a community garden which enhances the design of the complex, increases social interaction, provides fresh food, and continues to encourage healthy living. The community can host monthly meetings to teach

residents how to plant and grow a variety of foods, basic maintenance, and other life lessons. Incorporating community partnerships with surrounding businesses can facilitate local events, "shop local" campaigns by increasing the social capital of residents and resiliency of those communities.

The development was evaluated based on an assumption that a portion of the housing units provided are available at a reduced rate, affordable to households making less than 75 percent of area median income. Based on financial evaluation, 30 percent of units, or approximately 50 of the 162 units created will be affordable to this income group. This economic desegregation model can be seen throughout the United States as a hands-up approach, with the intention of creating more resilient, diverse communities.

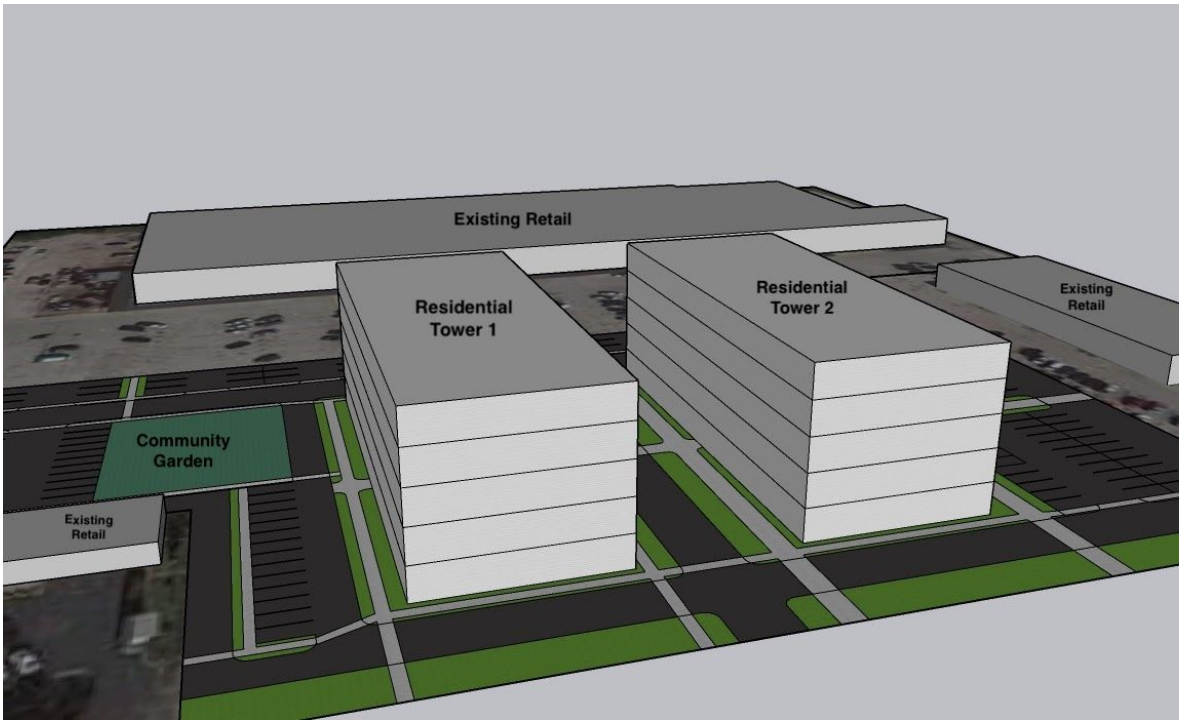
The proposed site, at an approximate 3.80 acres, would cover the southern portion of the parcel closest to the main arterial the parcel faces. The development would infill an expansive and largely underutilized surface parking lot retrofitting a single-use retail center on a site currently zoned and intended for multiple uses by the City. Implementing the multiple criteria within the development model, the configuration of the proposal allows for a connected environment to the corridor and onsite retail, a community garden within the site, and pedestrian safety has been incorporated in the parking layout.

Streets and sidewalks within the proposed site are arranged to clearly delineate pedestrian and vehicular access safely providing a path between the main arterial to the retail center. Sidewalks of varying widths are intended to provide pedestrian safety and access. Wider sidewalk paths line the street perpendicular to the arterial leading up to the retail establishment with the two apartment structures on both sides. A second wider sidewalk path bisects the two

structures creating a mid-block crossing leading to a second retail center on the eastern end of the parcel and the community garden on the western end. Figure 2 is a massing sketch and provides a visual representation of the layout of the property.

Figure 2

Aerial southwest perspective with surrounding building on site for scale.



Alexander Leon-Rivera, 2020

Zoning of Selected Site

The site for the housing proposal is currently zoned as AC-2 Urban Activity Center District. Under Chapter 58, Section 58.341 of the Code of the City of Orlando (2020), the AC-2 district is intended to provide for concentrated areas of multiple uses to serve major subregions of the Orlando urban area. This designation is made for these sites to have greater intensities and encourage a mixture of land uses than what would be in surrounding neighborhoods. This is

intended for locations where main arterials, corridors, or mass transit service is available, providing access between metropolitan subregions.

The intended use for this site by the City aligns with the reasoning behind site selection and corridor analyses performed. Locating this proposal on a site intended for multiple uses along a main arterial or corridor facilitates the access to transit routes, giving residents the ability for movement to other subregions within the metropolitan area.

Density

As an AC-2 urban activity center district with a mixture of uses encouraged, the code allows for a maximum of 100 dwelling units per acre. Density and intensity bonuses are available for this zoning district. Maximum bonuses, however, may not be available or appropriate in all situations based on neighborhood compatibility, current infrastructure capacity, or extent of additional infrastructure needed. Bonuses are dictated under Section 58.1101 and may receive council approval with reasonable conditions or bonus alterations. Table 1 provides the maximum allowable bonus in units under this city code of AC-2.

Table 1

Maximum Available Bonus

	Density (units per acre)		
District	**Max. allowed by zoning district**	**Max. Bonus**	**Max. with bonus**
AC-2	100	100	200

City of Orlando, 2020

According to the Orange County Property Appraiser (n.d), the parcel where the site is located is calculated at 11.1 acres. The specific site within the parcel for the housing proposal is

calculated at 3.80 acres. The acreages allows for a maximum allowable density of 380 dwelling units per acre. With the proposal containing approximately 162 units, this falls well below the maximum at approximately 40 dwelling units per acre.

Bonus for Low Income Housing

Due to the proposal including low-Income housing, under City of Orlando zoning code in 6D-Bonuses for Low Income Housing, the possibility for an intensity bonus has been identified. Section 58.1133 Intensity Bonus for Low-Income and Very-Low Income Housing states the current zoning at AC-2 allows for a maximum intensity, or F.A.R., of 1 and maximum bonus of .15 with a total available intensity with bonus at 1.15, as shown in Table 2.

Table 2

Intensity Bonuses

District	**Intensity**		**Maximum Bonus**		**Available Intensity with Bonus**
AC-2	1.0	+	.15	=	1.15

City of Orlando, 2020

The current housing proposal, with approximately 162 dwelling units averaging 800 square feet per unit, provides a total leasable area of 130,000 square feet. However, combined leasable and non leasable square footage comes to 160,000 square feet. With the site at 3.8 acres, this calculates to an intensity of 0.97 falling within the allowable intensity of 1.0, thus not requiring the proposal to request an intensity bonus.

Number of Parking Spaces

Under City of Orlando zoning code 3C-Number of Parking Spaces, Section 61.320 states additional parking is required when the site will undergo either one, or in combination of, one of the following: a new use, an expansion or improvement, a change to another use, or an increase in intensity (City of Orlando, 2020). The proposal will cause this site to undergo additional uses and an increase in intensity. With the additional intensities and uses proposed for this site, Section 61.321 Counting Rules states the required number of parking spaces shall be the sum of the separate requirements for each individual use on this site. A shared parking study or other adjustments may then be used to reduce the total number of required parking spaces. Demolitions do not credit additional reductions, and with this proposal not undergoing any demolition, the process will ensue as normal.

Requirements for parking, based on site uses are provided under Section 61.322. This proposal will occur outside the City of Orlando Downtown Parking Area and will adhere to the following standards in Table 3.

Table 3

Residential Parking Requirements

Use	**Per Dwelling Unit**
Multi-Family and multi-plex dwellings:	
Efficiency Apartment	0.75
Studio	1
1-bedroom	1.5
2 bedrooms	1.75

3 or more bedrooms	2

City of Orlando, 2020

The site will also keep current uses and will not displace current business. Table 4 provides the parking requirements for the current uses on the selected site.

Table 4

Nonresidential Parking Requirements

Land Use	**Minimum Requirement**	**Maximum Permitted**
Retailing - light, intensive & shopping centers:		
<4,000 sf GFA	2.5:1,000 sf GFA	5:1,000 sf GFA
4,000 - 400,000 sf GFA	2.5:1000 sf GFA	4:1000 sf GFA
400,001 - 600,000 sf GFA	3:1000 sf GFA	4.5:1000 sf GFA
>600,000 sf GFA	3.5:1000 sf GFA	5:1000 sf GFA

City of Orlando, 2020

The site is currently categorized under a DOR code of 1600, listed as Retail Community Center. The retail center building is calculated at 117,500 square feet of leasable space. With a minimum of 2.5 parking spaces for every 1,000 square feet, approximately 294 parking spaces are required in order to satisfy parking minimums for current uses. For the residential portion of the proposal with 162 units, assuming a mixture of smaller efficiencies, studios, and one bedroom units, would follow this metric for estimation:

Number of parking spaces = (54 x 0.75) + (54 x 1) + (54 x 1.5) = 175.5

A total of 176 parking spaces would be the minimum requirement by the City for this residential development proposal. With both uses on this site, the development will need to accommodate 470 parking spaces.

Due to this being an infill type of development, space would potentially limit the number of parking spaces. Several adjustments are available in obtaining parking reductions under Section 61.323 Adjustments to Parking Requirements, with approval of staff or the Municipal Planning Board (City of Orlando, 2020). Minimum Requirement Reductions are available with the construction of a new building, expansions of existing buildings, or changes in use to higher density or intensity uses. Requests for reductions can be made at the time of or prior to application for Master Plan, Conditional Use Permit, Zoning Change, or Future Land Use Change, if applicable. These requests will be evaluated based on the site's location and uses. A request with a reduction of 10 percent or less will be eligible for staff approval via a Zoning and Transportation Official Determination. A reduction of spaces between 11 percent to 40 percent will require Municipal planning Board approval, while reductions of 40 percent or greater shall not be granted.

Reductions granted under Section 61.323 also bring restrictions in the number of spaces that can be assigned or reserved for individual residents or employees. Cross-access easements and joint pedestrian circulation plans and design are required with reduction approvals, as shown in Table 5.

Table 5

Parking Reduction Requirements

	Maximum Reduction
Proximity to Premium Transit:	Up to 10%
Proximity to Public Parking Facilities:	Up to 5%
Complementary Land Uses in the Same Building or Site:	Up to 5%
Provision of Onsite Car Share:	Up to 5%
Inclusion of Affordable Housing Element:	Up to 5%
Separation from Residential Neighborhoods with On-Street Parking	Up to 5%
Provision of Enhanced Bike & Pedestrian Facilities:	Up to 5%

City of Orlando, 2020

The proposal contains 161 parking spaces for residential and an estimated 234 parking spaces for the existing retail totaling 395 spaces. With the 470 minimum parking requirement, the 395 figure puts this development at 84 percent of required parking, or a 16 percent reduction. With this development including the affordable housing component, complementary land uses, and a provision of enhanced bike and pedestrian facilities, that would cover 15 of the 16 percent reduction for a request for approval. Since this request is above 11 percent, a Municipal Planning Board approval will be required.

Bicycle Parking

With the proposal for the selected site anticipating pedestrian and bicycle infrastructure enhancements it is worth noting City codes under 3D-Bicycle Parking. Alignment with the intent of Bicycle Parking Requirements under Section 61.330 is achieved through the proposal's focus on healthy residents. That section of codes states that by encouraging the use of bicycles,

the public health, safety and welfare will be furthered through improved air quality, reduced energy consumption and more efficient use of vehicular parking facilities (City of Orlando, 2020). Since this site will undergo substantial improvements, bicycle parking will be required under Section 61.331. General requirements for bicycle parking are stated under Section 61.332. This parking may consist of short-term bicycle parking, long-term bicycle parking, or in any combination in various forms.

Section 61.333 states the number of spaces required for bicycle parking. With the residential proposal and current uses on the site, this will be taken into consideration for the number of parking spaces required. Table 6 shows the number of required bicycle spaces as per the uses of the current site. On-site bicycle parking has specific location criteria under Section 61.334. Short-term spaces shall be located within 50 feet of the main entrance to the building as measured along the most direct pedestrian access route. Long-term bicycle parking must be located on the same building site as the use being served. All long-term bicycle parking spaces must be located within 200 feet of the principal entrance to the building.

Table 6

Minimum Number of Bicycle Parking Spaces Required

Land Use	**Long-Term**	**Short-Term**
Retailing, Eating & Drinking	1:25,000 sf GFA	4 spaces plus 1:7,500 sf GFA
Office 1	1:25,000 SF GFA	4 spaces plus 1:15,000 sf GFA
Multi-family Dwellings (3 Stories or Less)	1:10 units	1:5 units
Multi-family Dwellings (4 Stories of More)	1:10 units	1:10 units

City of Orlando, 2020

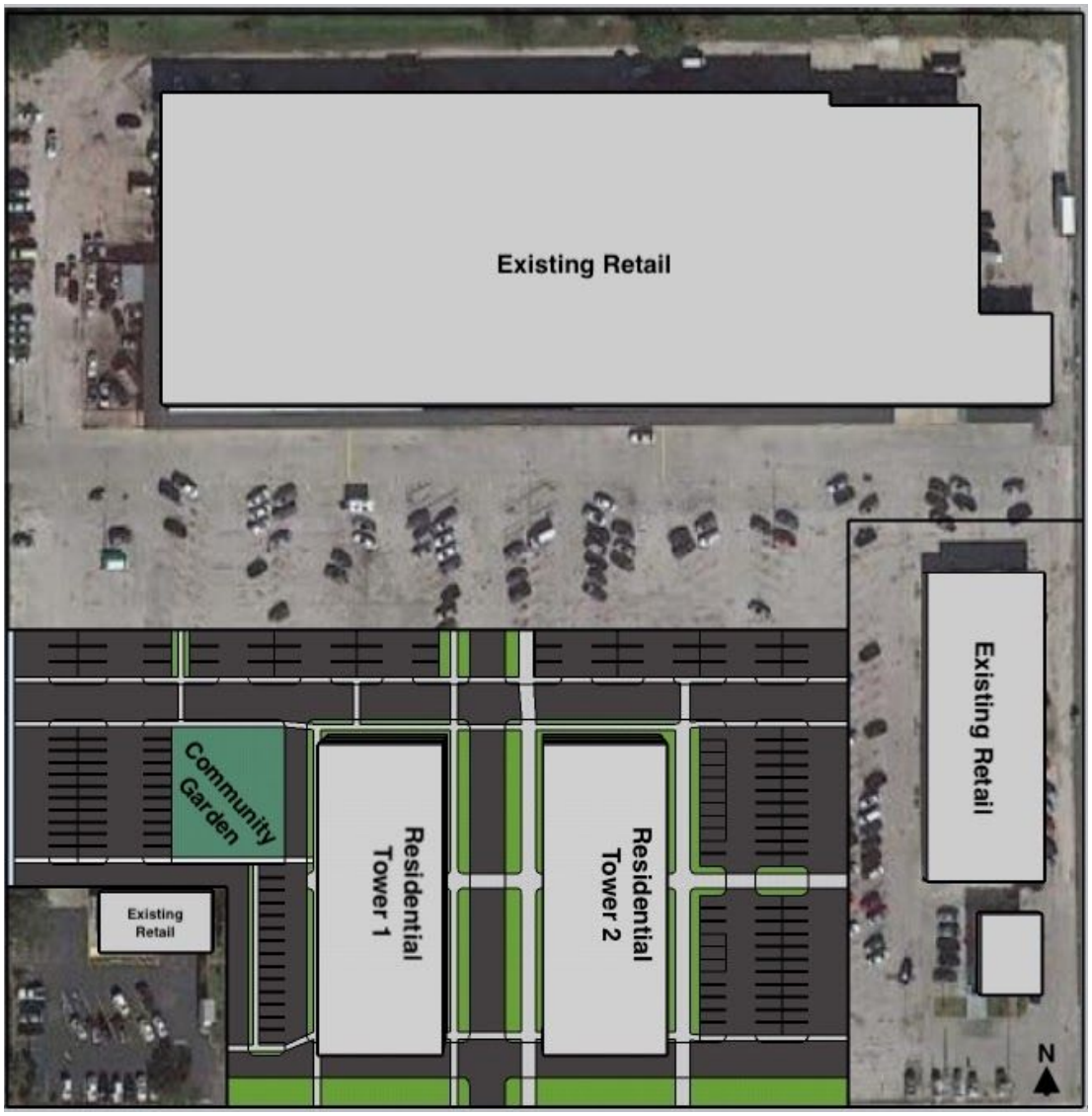
In tying in social determinants of health, access improvements, and enhancing bicycle facilities, exceeding minimum bicycle parking requirements is important. With existing retail at 117,500 square feet of space, five long-term bicycle spots are required, along with 20 short-term spots. For the residential proposal component containing two, five-story structures, and an office space for leasing, a minimum of 18 long-term bicycle parking spots and 22 short-term spots are required. All parking requirements are met by the proposed design, either internally to the structure or in traditional form on the street.

Healthy Corridor Improvements

All development surrounding the subject site was preserved purposefully when designing and evaluating the proposed development to retain existing social and economic networks, as displayed in Figure 3. The authenticity of this area can easily be noticed by walking through the market on the backside of the property, which consists of several local businesses selling their goods to local residents. The impact of the local community was taken into consideration, as eliminating the existing social and economic support system would force residents to travel farther for their needs. The development offers mixed-income living in harmony with the existing development, providing a safe and secure housing option to many of the local business owners and residents who wish to remain in the area as home and rental prices continue to rise.

Figure 3

Aerial map view for rendering of housing proposal



Alexander Leon-Rivera, 2020

In an effort to increase safety, street trees, lower speed limits, and street parking are proposed to slow traffic and encourage more "walkability" surrounding the complex. A new path removes on-street bike lanes and provides an off-street multi-use path that runs parallel to the roadway. This increases safety, as well as user comfort, and opens the infrastructure to little

vehicles and other micromobility choices. Human scale elements, such as street lighting and street signs, provide better visibility throughout the complex. Life occurs 24/7 and residents should feel safe in their living environment.

With the growing concern of climate change and a proven connection between activity and health, the development model and this case study, recommend reducing parking and encouraging alternative methods of transportation. Although there are four bus stops within a half-mile of the subject site, efforts should be made to improve existing transit service by making direct routes to neighborhoods east of Interstate 4. All existing bus routes stop at Lynx central before traveling further east. While a central bus hub provides a lot of options for transfers, it does increase the travel time considerably for anyone attempting to go more than a few blocks east of the subject site on the bus. Employers and employees within the local area should be granted preference for apartment rentals as this decreases auto dependency and lowers VMT resulting in decreased emissions.

Another method to improve air quality throughout Orange County, and to improve the pedestrian environment is the addition of trees. The benefits of trees are enormous - they not only provide shade and protection, they improve air quality, and decrease the heat island effect of city streets. They also increase the value of properties and neighborhoods. The development has planted trees every fifty to sixty feet to maximize the energy efficiency of trees' natural cooling effects, along with their other benefits.

Urban design enhancements such as trees, wide sidewalks, and additional security features are factors that residents seek while searching for their new home. Curving sidewalks with interesting crosswalks make evening walks much more desirable. Complete street designs

with humanscale factors, street parking, and gathering places encourage people to congregate resulting in a natural street calming element. When things occur naturally, rather than being forced, it tends to have a calming effect, not only on the situation but the people involved as well. The development brings natural elements into play internally and externally, to promote a satisfying experience to all.

The corridor association is perhaps the most important element. The development will only thrive and improve with caring residents and business associates who are willing to engage stakeholders, maintain the infrastructure, and implement improvements, as needed, to generate interest and encourage community participation. These individuals ensure residents and business throughout the corridor drive maximum value from their investments.

Specific recommendations from the pedestrian and bicycle infrastructure analysis include eliminating bicycle and micromobility infrastructure gaps between the subject property's surrounding area and Downtown Orlando. At a minimum the following improvements should be made: the signed bicycle route along Arlington St, terminating at Springdale Road should be continued south along Springdale Road and east along West Concord and Amelia Street to connect with the existing bike lanes at the intersection of Westmoreland and Amelia Street; the existing bike lane on Westmoreland that currently terminates at Orange Blossom Trail should be continued west until it connects with the existing bike lane at North Tampa Avenue. The infrastructure improvement most efficacious at increasing mode share of bicycle, pedestrian and micromobility modes is to remove on street bike lanes on East Colonial and create an off street multi-use path running the length of the East Colonial Drive corridor. This improvement would connect the subject site and surrounding neighborhoods to Downtown Orlando and to

neighborhoods east of Downtown Orlando, expanding opportunity, increasing the impact of all development constructed using this model on the corridor, and increasing the likelihood of positive health outcomes in the corridor..

More generally, spatial analysis of bicycle and pedestrian infrastructure reveals a disparity of investment. In the future, infrastructure monies dedicated to pedestrian and bicycle infrastructure should be equitably distributed to neighborhoods west of Interstate 4.

Analysis also revealed many design components that hinder the pedestrian experience in the area and along the corridor. Along East Colonial and found generally in the area, the strip of land in between the sidewalk and automobile lanes of the right-of-way, sometimes called the *devil's strip* is either too small or non-existent. The devil's strip should be expanded to a minimum of four feet and planted with trees to provide a sense of security to pedestrians. Street trees are known to provide shade for pedestrians, improve air quality, lessen the heat island effect and provide a traffic calming effect on automobiles.

Vehicle speed is linked to not only pedestrian safety, but has an obvious effect on the pedestrian experience (Urban Land Institute, 2016). Vehicle speed is linked to safety in several ways. The faster vehicles are moving, the higher the chance of fatality if a pedestrian is struck. In one study, the chance of fatality if a pedestrian was struck by a vehicle was 5 percent at 20 miles per hour, compared to a 40 percent chance and 80 percent chance respectively for 30 and 40 miles per hour (National Highway Safety Administration, 1999). The speed limit on the road abutting the subject site to the south, West Colonial Drive, is 45 miles per hour. In the interest of public safety, the speed should be reduced to 30 miles per hour.

Financial Evaluation

A development model, and indeed a case study, cannot be considered viable without a financial evaluation. The development model itself is not analytical outside of application, therefore, the financial evaluation of the previously described application of the development must stand for both. The following estimation of cost and revenue are primarily derived from Fannie Mae's 2019 "Multi-family Construction Report" and a convenience sample of area rents from Apartments.com (see Table 7). The building square footage, estimated costs, revenues and projected rents represented in dollars per square foot per month are described in Table 7.

Table 7

Convenience sample of rents

Apartment Name	Examples	Square Footage	Rent per Month	Rent Per SF
Novel Lucerne	1	594	$1,336	2.25
	2	685	$1,515	2.21
	3	693	$1,433	2.07
	AVG	657	$1,428	2.17
City View Orlando	1	604	$1,153	1.91
	2	777	$1,275	1.64
	3	1,181	$1,695	1.44
	AVG	854	$1,374	1.61
The Yard @ Ivanhoe	1	754	$1,456	1.93
	2	680	$1,558	2.07
	3	754	$1,782	2.36
	AVG	729	$1,599	2.19
Post Parkside	1	770	$1,140	1.48
	2	1,000	$1,195	1.20
	3	1,032	$1,250	1.21
	AVG	934	$1,195	1.28
Nora	1	691	$1,390	2.01
	2	731	$1,442	1.97
	3	768	$1,462	1.90
	AVG	730	$1,431	1.96

Rent Stats	Per Square Foot per Month		
Range	1.28 - 2.19 = 0.91		
Average	$1.84		

Apartments.com

Hard costs were calculated using an average multi-family (four to seven stories) construction cost per square foot derived from Fannie Mae, the national single family and multi-family mortgage company. Fannie Mae (2019) reported the estimated multi-family construction cost per square foot for many large metropolitan areas around the United States. They also reported that the leading driver of discrepancy in cost between cities was the cost of labor, related to the cost of living. The cost of construction per square foot in Orange County was not reported by Fannie Mae, but was inferred by comparing the Orlando urban area to its closest reported urban area, Atlanta, Georgia. The construction cost reported for Atlanta was then adjusted based on median household income (American Community Survey, 2018) to Orange County, Florida. This calculation is shown in Table 8 below.

Table 8

Hard Cost Calculation

Hard Cost Calculation	
Atlanta Metro Reported Hard Cost per Square Foot	$180
Atlanta Metro 2018 Median HH Income:	$70,342
Orlando Metro 2018 Median HH Income:	$59,949
Orlando/Atlanta HH Income Ratio	0.852
Estimated Orlando Metro Hard Cost per Square Foot	$153.41

American Community Survey, 2018

After incorporating hard costs, soft costs, loan interest over a twenty-five year term loan at six percent interest and incorporating minimum operating and marketing expenses, the

development proposal is projected to cost approximately $55.2 million dollars (as seen in Table 9) over the life of the construction loan. The project is projected to generate, including a reduced rate per square foot for 30 percent of rentable space, approximately $65 million dollars. This places the project in a profitable position, returning 14.8 percent of revenue as profit at the end of the life of the loan.

Table 9

Financial evaluation

Type of Space		Non-Rentable SF	Rentable SF	Avg. Rent/sf	Revenue(per yr)	Loan Term	Per SF
Apartment (Market)			90,000	$ 22	$ 1,990,307	$ 49,757,675	$ 22
Apartment (Reduced)			40,000	$ 15	$ 600,000	$ 15,000,000	$ 15
Office/Amenities		6,000					
Halls/Elevators (15%)		24,000					
Total SF		30,000	**130,000**		**$ 2,590,307**	**$ 64,757,675**	**$ 20**
Expenditures							
Land Cost (	3.8	acres @	$ 206,910.0	per acre)		**$ 780,051**	$ 6
Development Costs							
Construction Costs (buildings only)					$ 24,544,812		
Land and Infrastructure Improvements					$ 94,250		
Soft Costs (20% of all, excluding land)					$ 4,927,812		
Financing costs (			2.0%	of max loan)	$ 443,503		
Marketing (			6.0%	of revenue)	$ 3,885,461		
Administration & contingency (			6.0%	of revenue)	$ 3,885,461		
Total Development Costs						$ 37,781,299	$ 291

Subtotal						**$ 38,561,350**	$ 297
Interest Calculation							
Equity				25.0%	$ 7,391,719		
Debt				75.0%	$ 22,175,156		
Average balance (estimate)				50%	$ 11,087,578		
Duration (years)				25			
Rate				6.0%		$ 16,631,367	
Total Expenditures						$ 55,192,717	*$ 425*
Profit							
						$ 9,564,958	$ 74
						24.8%	*of total costs*
						14.8%	*of total revenue*

Sources

Discussion

Local governments have long grappled with how best to provide attainable housing to citizens in the face of increasing cost and market demands. Now more than ever, this issue has become salient. Based on the research provided herein, an attainable development model is now available for local governments to evaluate and plan future developments. The proposed development case study has shown at least preliminarily to be financially viable and based on the latest research will produce positive health outcomes for residents. The recommended contextual improvements should be thought of not only in this development proposal, but in all future housing developments. Housing developments should not be evaluated in isolation from the greater urban context; corridor analysis should be conducted commensurate with this idea.

The proposed model could be used in the traditional method, as an evaluative tool when reviewing private proposals, however, the model could be used to design and then create development proposals to private developers. The proposal would be designed around public

health using the model and include agreements locking a certain percentage of rentable square feet at a reduced rate in perpetuity. The proposal could be accompanied by public incentives such as grants or low interest loans further increasing desirability. The City of Orlando has an existing tax abatement incentive for attainable development that could be used. It is important to point out, however, that incentives are less important than the inherent financial solvency of the project. A financially proven project without subsidy, is a sustainable project that is more likely to attract private development funds and management.

Moving forward, the discussion of public project and corridor design should lead to development process reform. One way for local government to play a more active role in attainable housing development is to depart from its traditional place as regulation maker and enforcer, and take up a more cooperative role as an active development partner. Using the development model described here, local governments can design their own projects and take agency of their housing future. As long as this process is accompanied by intuitive, real-time financial analysis, risk is shifted away from private developers, thereby making the designed development concepts more desirable. Attainable, mixed income, healthy housing must be proven to be viable and financially desirable in order for private sector buy-in. Local government assistance at the feasibility and project design stage, through public design and analysis, can prove these financial conditions. Local government should be a leader in viable development design and market analysis and stop simply responding to developer requests.

References

American Planning Association, (2019). *Housing policy guide*. https://www.planning.org/publications/document/9178529/

Bach, A., Prema K. G., Richard, H., George, K., Michael P.,& Michael P,. (2007) Ten Principles for Developing Affordable Housing. Washington, D.C.: The Urban Land Institute.

Baker, E. H., Milner, A. N., & Campbell, A. D., (2015). Walking programs to promote weight loss among obese and overweight individuals. *Public Health*. 129(6): 822-824

Baker, E., Anh Pham, N. T., Daniel, L., & Bentley, R., (2020). New evidence on mental health and housing affordability in cities: A quantile regression approach. *The International -Journal of Urban Policy and Planning*. 96(2020): 1-7 https://doi.org/10.1016/j.cities.2019.102455

Bauman, A. E., Reis, R. S., Sallis, J. F., Wells, J. C., Loos, R. J., & Martin, B. W., (2012). Correlates of physical activity: Why are some people physically active and others are not? *Lancet*. 380(9838): 258–271.

Breysse, J., Jacobs, D. E., Weber, W., Dixon, S., Kawecki, C., Aceti, S., & Lopez, J., (2011). Health outcomes and green renovation of affordable housing. *Public Health Reports*. 1(126): 64-75

City of Orlando. (2020). Code of the City of Orlando. https://library.municode.com/fl/orlando/codes/code_of_ordinances?nodeId=TITIICICO_CH61RODEACMA_PT3PALO_3DBIPA_S61.333NUSPRE

Edmiston, K.D., (2016). Residential rent affordability across U.S. Metropolitan Areas. *Economic Review*. (4): 5-27

Fannie Mae Multifamily Market Commentary. Sept 2019.

Fenelon, A., Mayne, P. & Simon, A. E., (2017). Housing assistance programs and adult health in the United States. *American Journal of Public Health*. 107(4): 571-578

Garciano, J. L., (2011). Affordable cohousing: Challenges and opportunities for supportive relational networks in mixed-income housing. *Journal of Housing & Community Development Law*. 20(2), 169-192

Ghosh-Dastidar, B., Cohen, D., Hunter, G., Zenk, S. N., Huang, C., Beckman R., & Dubowitz, T., (2014). Distance to store, food prices, and obesity in urban food deserts. *American Journal of Preventive Medicine*. 47(5): 587-595. doi:10.1016/j.amepre.2014.07.005

Joint Center for Housing Studies of Harvard University. (2018). The state of the nation's housing 2018. Cambridge, MA: Author.

Krizek, K. J., & McGuckin, N., (2019). Shedding NHTS light on the use of "Little Vehicles" in urban areas. *Transport Findings*. https://doi.org/10.32866/10777

Meltzer, G. (2000). Cohousing: Verifying the importance of community in the application of environmentalism. *Journal of Architectural and Planning Research, 17*(2), 110-132. Retrieved from https://www.jstor.org/stable/43030531

Metcalf, G. (2018). Sand Castles Before the Tide? Affordable Housing in Expensive Cities. *Journal of Economic Perspectives*, 32(1), 59–80. https://doi.org/10.1257/jep.32.1.59

National Highway Safety Administration. (1999). Literature Review on Vehicle Travel Speeds and Pedestrian Injuries. *U.S. Department of Transportation*.

Orange County Property Appraiser. (n.d). *Property Record - 22-22-29-5333-01-000.* Retrieved from: https://prc.ocpafl.org/Searches/vabparcel.aspx/PDF/false/PID/292222533301000

Pawlukiewicz, M., Prema K.G., & Koelbel C., (2007). Ten Principles for Coastal Development. Urban Land Institute. https://uli.org/wp-content/uploads/ULI-Documents/Ten-Principles-for-Coastal-Development.pdf

Regional Affordable Housing Initiative (2018). Executive Summary Report. https://www.orangecountyfl.net/NeighborsHousing/RegionalAffordableHousingInitiative.aspx#.Xcr-lldKguU

Sanguinetti, A. (2014). Transformational practices in cohousing: Enhancing residents' connection to community and nature. *Journal of Environmental Psychology*. 40, 66-96. https://sciencedirect.com/science/article/pii/S0272494414000450

Stegman, M. A. (2017). The Housing Market Cannot Fully Recover without a Robust Rental Policy. Boston College Environmental Affairs Law Review, 44(2), 395–405. https://search.ebscohost.com/login.aspx?direct=true&db=8gh&AN=123483355&site=eds-live&scope=site

Urban Land Institute. (2016). Building healthy corridors: Transforming urban and suburban arterials into thriving places. Urban Land Institute.

Urban Land Institute (2007, 2017). https://americas.uli.org/

U.S. Department of Transportation (2015, August 24). *Cleaner air: Relationship to public health.* U.S. Department of Transportation Mission. Retrieved from https://www.transportation.gov/mission/health/cleaner-air

Walk Score (2020). *Walk score methodology*. WalkScore.com. Retrieved from https://www.walkscore.com/methodology.shtml