Grandparents on duty

Final Report
Analytic Methods of Urban Planning: Quantitative - Fall 2020
by Cristina Dávila González

Grandparents on duty

background and criteria

On this year's Back to School season, most of public schools worldwide have decided to go remote. Coming from a current context of diaspora and mass migration of young/adult professionals, where sometimes elders are left in charge of their grandchildren, I decided to take a look at similar **family scenarios in the U.S. where grandparents are a key factor in supporting and making remote-learning feasible for their underage relatives.**

For this exercise I used person-level variables from the **American Community Survey 2018 (ACS 1-year data)** to eventually generate supporting information on the research question, specifically in the state of **Illinois**. As I developed my analysis on the selected variables, I decided to generate two datasets; one with under-age enrolled students and another one considering grandparents of 50 years old and up in charge of their grandchildren.

Regarding the age interval selected for the grandparents dataset, I initially wanted to set the age in 65 and up, however, in the early stages of this project I realized I could consider more individuals than the 813 resulted from this first analysis of variables. This led to the consideration of a lower number, and after investigating more on senior communities in the U.S., I decided to set 50 years as my base age, as according to the **American Association of Retired Persons** **2018 Grandparents Today National Survey**, it is also the average age at first-grandchild in the country. This modification increased my results to **2001 grandparents.**

Research question

income - age - responsibility

For families across the United States, grandparents have stepped up to become caregivers, for a variety of reasons, and with that responsibility often comes difficulties. According to the AARP survey, over 350.000 grandparents in the country are raising their grandchildren, and yet little is known about the characteristics and challenges many of these family structures face.

Although caregivers' lives are, most of the time, enhanced by the experience, providing full-time care to children can decrease their abilities to address their own health and well-being needs. Considering the aforemention, I've come up with the following research question:

How is the **income** of grandparents aged 50 and over affected by **age** and the fact they are **responsible for their grandchildren**?

List of variables

datasets and variables

Age / AGEP **/ continuous**

- **a.** of population under 18 within tract
- **b.** of population of 50 and over within tract

School enrollment / SCH **/ categorical**

Grade Level Attending / SCHG **/ categorical**

Self-care difficulty / FDDRSP **/ categorical**

- **a.** in population under 18 within tract
- **b.** in population of 50 and over within tract

Grandparents responsible for grandchildren / GCR **/ categorical**

Total persons income / PINCP **/ continuous**

in population of 50 and over within tract

Total variables: 6 (2 continuous + 4 categorical)
Total datasets: 2 (under-age students + **50 y/o granparents and over**)

Distribution of continuous variables

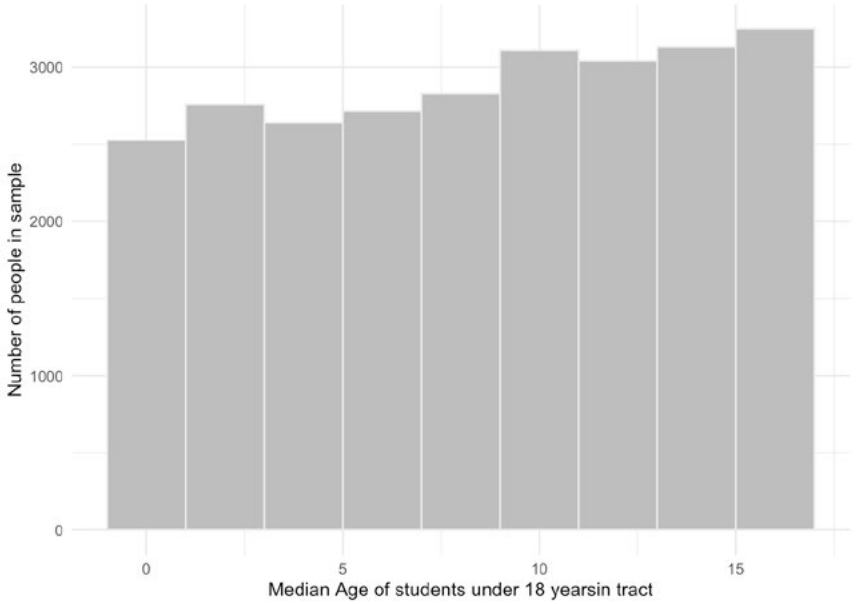
descriptive statistics - census tracts in Illinois

Statistic	Median age: Underage Students (< 18 years)	Median age: Potential Grandparents (>50)	Total Grandparent's income (>50)
Sample mean	8.9	63.6	33240
Median	9	62	21100
Standard deviation	5.19	8.71	45688
Interquartile range	4 to 13	57 to 69	8800 to 45000
Population mean (95% confidence)	8.84 to 8.97	63.3 to 64	31237 to 35243

histograms - **figure 1**

median age
(under-age students)

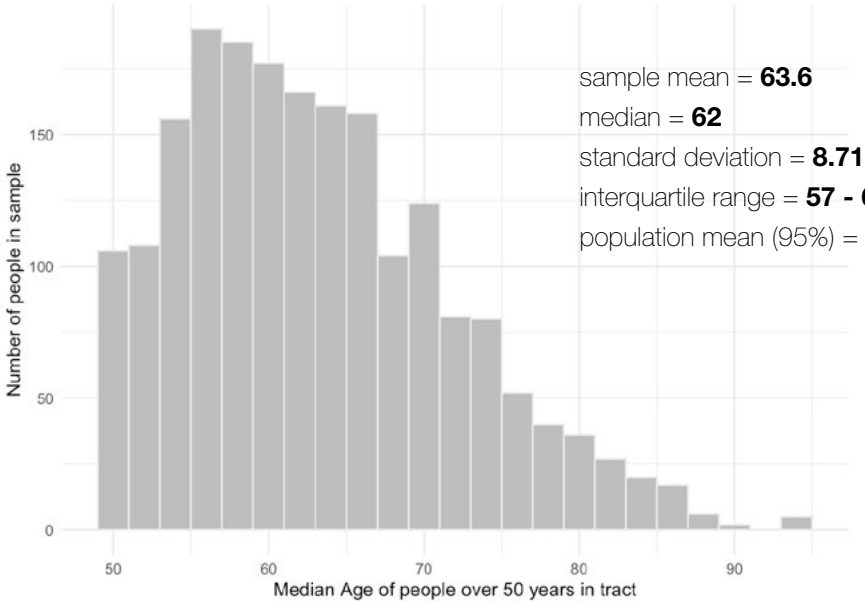
In the under-age student community of Illinois (25,993 ppl.), although there is a strong teenager community as outlier, the average age still remains below ten years old (8.9); a number associated to a population that still needs important attention from adults while at their school duties.



histograms - **figure 2 & 3**

median age
(grandparents of 50 and over)

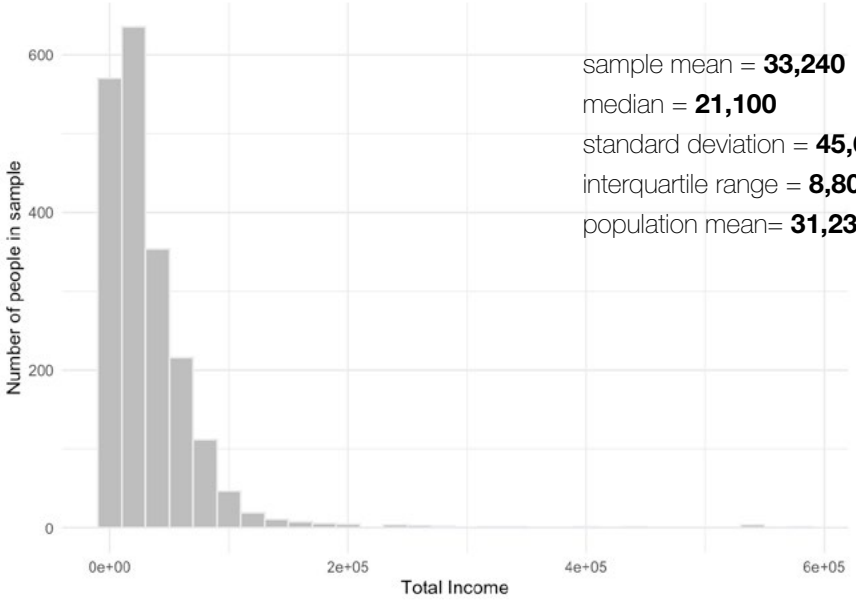
In the grandparents' community of Illinois who are responsible for their grandchildren (2,001 ppl.), the majority of people are aged between 57 and 69 years old, suggesting that it was definitely a good decision to broaden the scope of age study from my initial 65 y/o to 50 y/o as my base age number.



sample mean = **63.6**
median = **62**
standard deviation = **8.71**
interquartile range = **57 - 69**
population mean (95%) = **63.3 - 64**

total grandparent's income
(grandparents of 50 and over)

Even though this study shows a great amount of grandparents with a total income between 10,000 and 14,000 dollars above the average, their perceived income is strongly compromised when it is also seized to support a child's education, specially in a technology-based modality.



sample mean = **33,240**
median = **21,100**
standard deviation = **45,688**
interquartile range = **8,800 - 45,000**
population mean= **31,237 - 35,243**

Relationships between variables

grandparents of 50 year and over - selected dataset

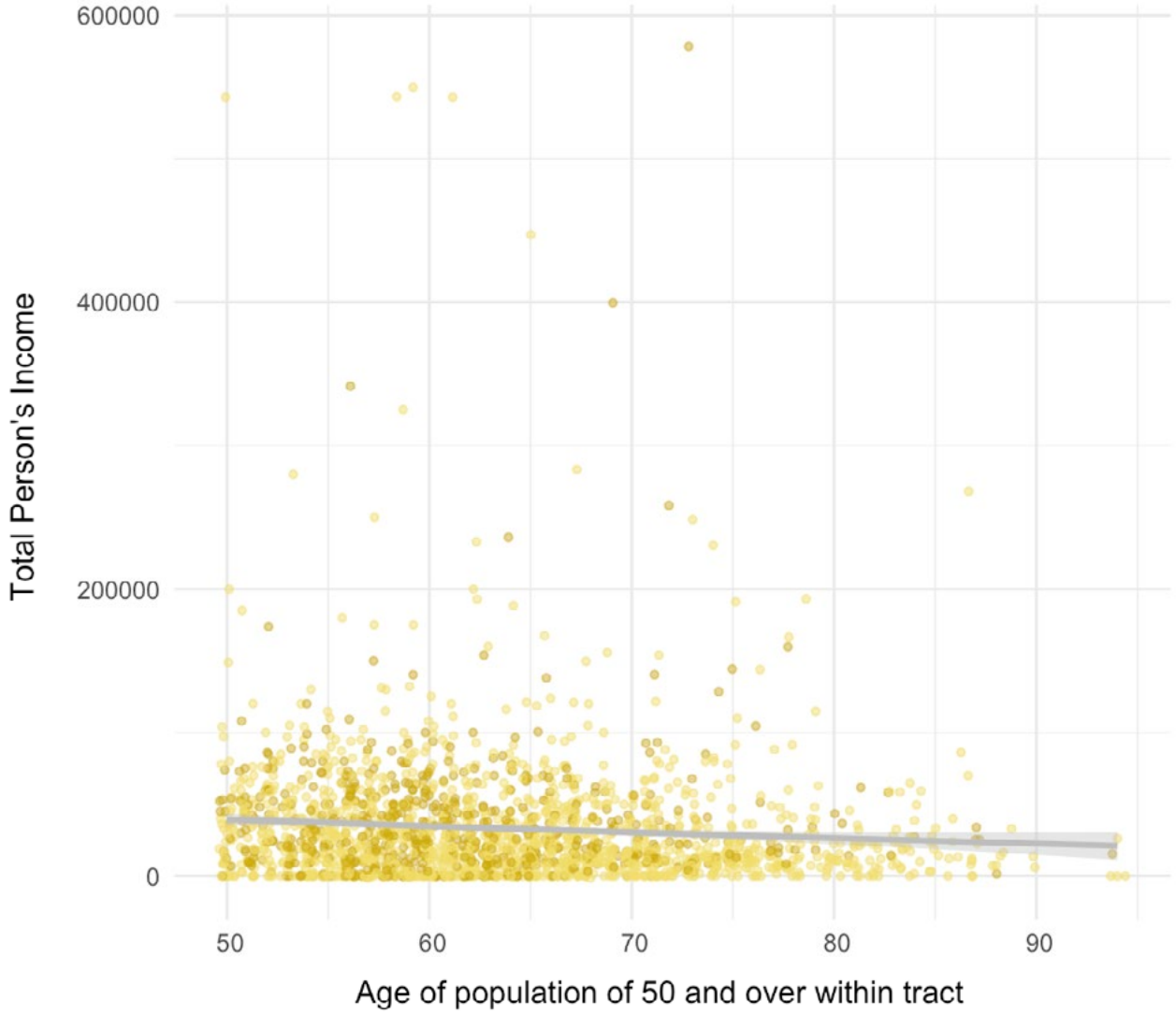
Throughout the course, I had the chance to analyze all possible relationships between the variables I had in both datasets for underage students and grandparents (available here). However, as my research question focuses specifically on **grandparents, their income and their responsibility for their grandchildren**, from this point forward, all models and analysis will be done on the dataset with the variables that includes them. In this section, we will cover the following relationships:

age + income / Pearson's correlation test

age + grandchildren responsibility / Chi square test

Relationships between variables

age + income - Pearson's correlation test - **figure 4**



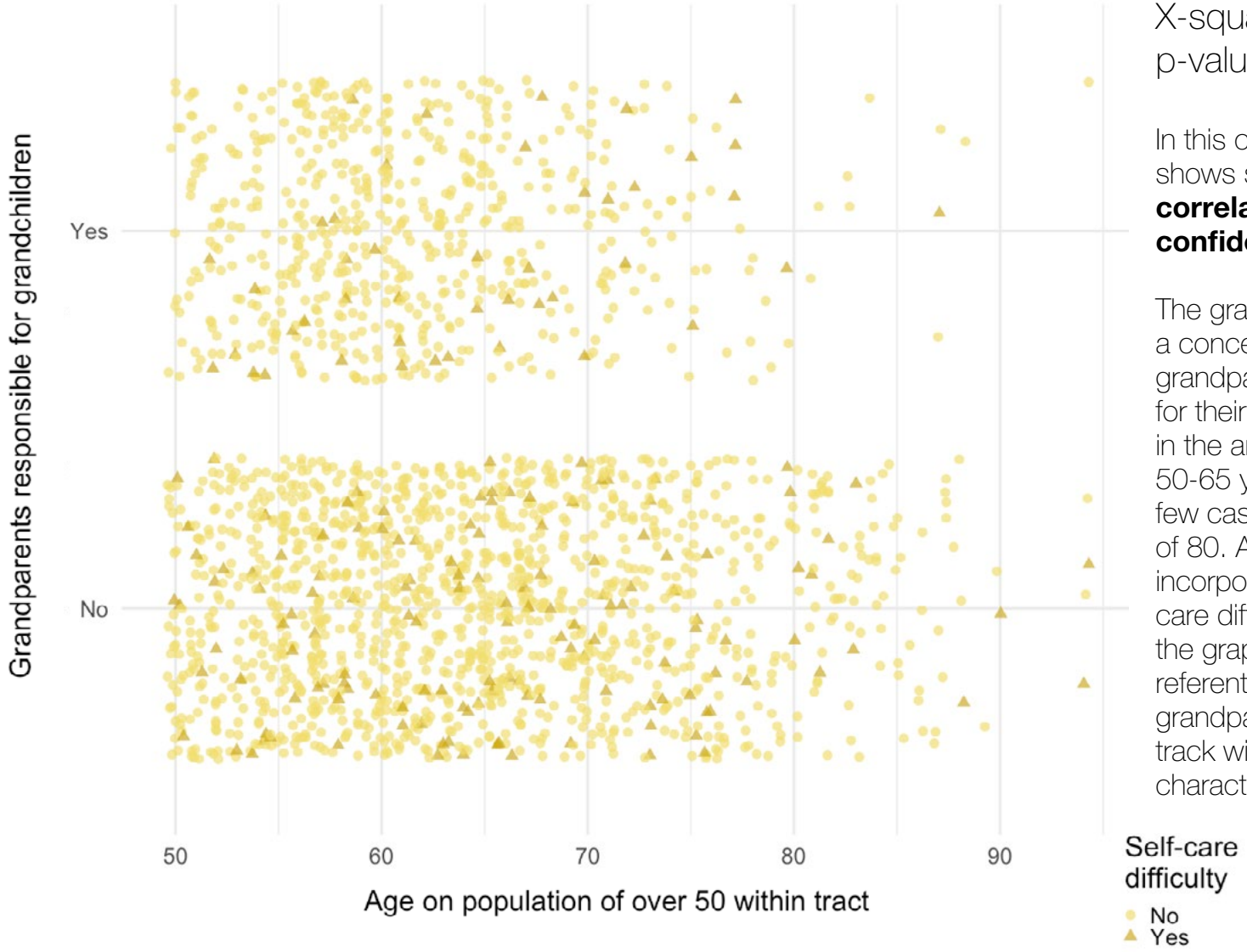
t = **-4.0127**
p-value = **6.224e-05**

The analysis shows a statistically significant, **negative correlation at a 95% confidence level.**

These results also support the general assumption we have on the inversely proportional relationship between age and income, where we usually see people earning less as they get older, especially after their retirement form labor.

Relationships between variables

age + grandchild responsibility - Chi square test - **figure 5**



X-squared = **3.9542**
p-value = **0.04675**

In this case, the results shows statistically significant **correlation at a 95% confidence level.**

The graph also suggests a concentration of grandparents responsible for their underage relatives in the areas between 50-65 years, and very few cases over the age of 80. Additionally, the incorporation of the self-care difficulty variable in the graph also shows a referential distribution of grandparents within the track with the studied characteristics.

Linear regression model

predicting income

As part of a project that involved getting familiarized with the software, variables, possible outcomes and understanding how they contribute to your research question, the latter was **a product of an ongoing process of empiric learning**. The distribution -and division- of my initial variables into two groups defined a set-up for my grandparents dataset that required the **incorporation of an additional variable**, at least for the linear regression model. In this case, I decided to incorporate the -categorical- variable of **gender**.

An initial, exploratory consideration of **age** as the variable to predict, led to interesting insight in the predictions of relationships responsibility for grandchildren with age, and possible variations between grandmothers and grandfathers (figure 8). Nevetheless, as my final research question specifically focused on the variable of **income**, the linear regression models included in this report are analyzed on a potential prediction of income based on the variables of age, gender, responsibility for grandchildren and self-care difficulty.

Predicting income

non-logarithmic regression - **figure 6**

```
Call:
lm(formula = PINCP ~ SEX_label + AGEP + GCR_label + FDDRSP_label,
    data = o50peopleg_data)

Residuals:
   Min     1Q Median     3Q    Max
-53654 -21860  -9990   9262 534773

Coefficients:
                          Estimate Std. Error t value Pr(>|t|)
(Intercept)                63613.2     9121.0   6.974 4.33e-12 ***
SEX_labelMale              18654.2     2225.9   8.380  < 2e-16 ***
AGEP                        -595.9      126.8  -4.699 2.82e-06 ***
GCR_labelResponsible        -614.0     2374.1  -0.259    0.796
FDDRSP_labelNo care needed  5373.2     3712.3   1.447    0.148
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 45760 on 1757 degrees of freedom
Multiple R-squared:  0.0507, Adjusted R-squared:  0.04854
F-statistic: 23.46 on 4 and 1757 DF,  p-value: < 2.2e-16
```

Predicting income: Results

rsquared value 0.48 = prediction of around 5% of income variation

gender
(male)

estimate std. = **18654.2**
pr (>| t |) = **< 2e-16**

Not only we can say there is a statistically significant relationship with a p-value below 0.05, but this model also shows there is still a considerable income difference within gender, with **a grandfather earning almost 19,000 dollars more than a grandmother**, even in this stage in life.

age

estimate std. = **-595.9**
pr (>| t |) = **2.82e-06**

Here we also find a statistically significant relationship, but negative correlation between income and age. These results are consistent with our previous analysis of relationships (figure 4), yet more precise, as they indicate **a decrease of almost 600 dollars in a grandparent's income** for each added year.

grandchild responsibility
(responsible) **&**

estimate std. = **-614.0**
pr (>| t |) = **0.796**

self-care difficulty
(responsible)

estimate std. = **5373.2**
pr (>| t |) = **0.148**

Even though the estimated variations might suggest subtantial changes on a grandparent's income, both variables have p-values considerably above 0.05. This indicates **a lack of significant relationships, and therefore, no clear impact of these variables on income.**

other possible models

MODEL 1 / Initial regression model **/ Rsquared: 0.48**

MODEL 2 / Age log transformation **/ Rsquared: 0.50**

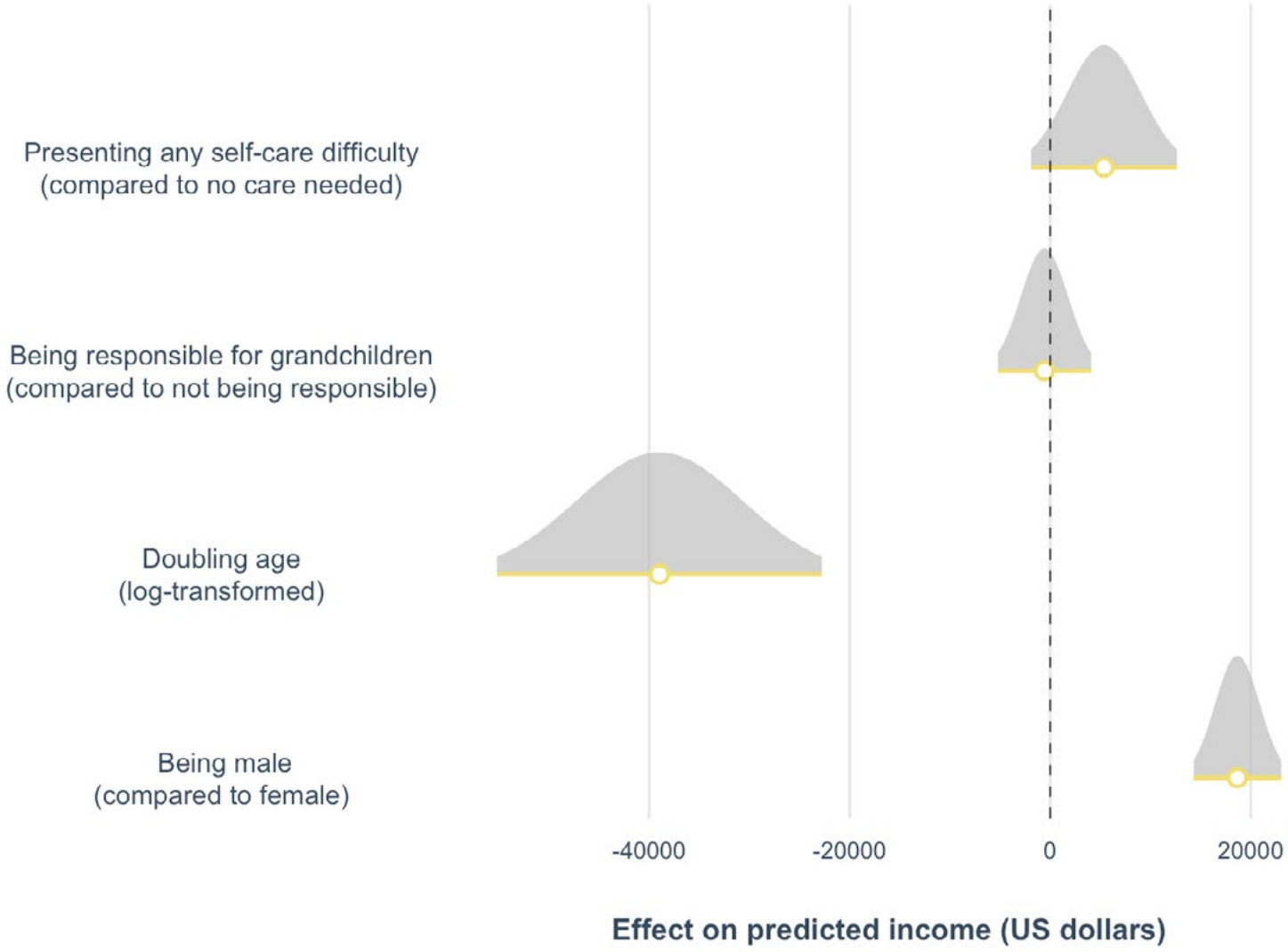
MODEL 3 / Convert Age in categorical **/ Rsquared: 0.45**

MODEL 4 / Add Sex as interaction term **/ Rsquared: 0.47**

In the quest of the model with a better prediction, **the one with a logarithmic transformation of the age variable was the preferred**. However, all models' values round up to 0.5, as they all have numbers of between 0.45 and 0.50.

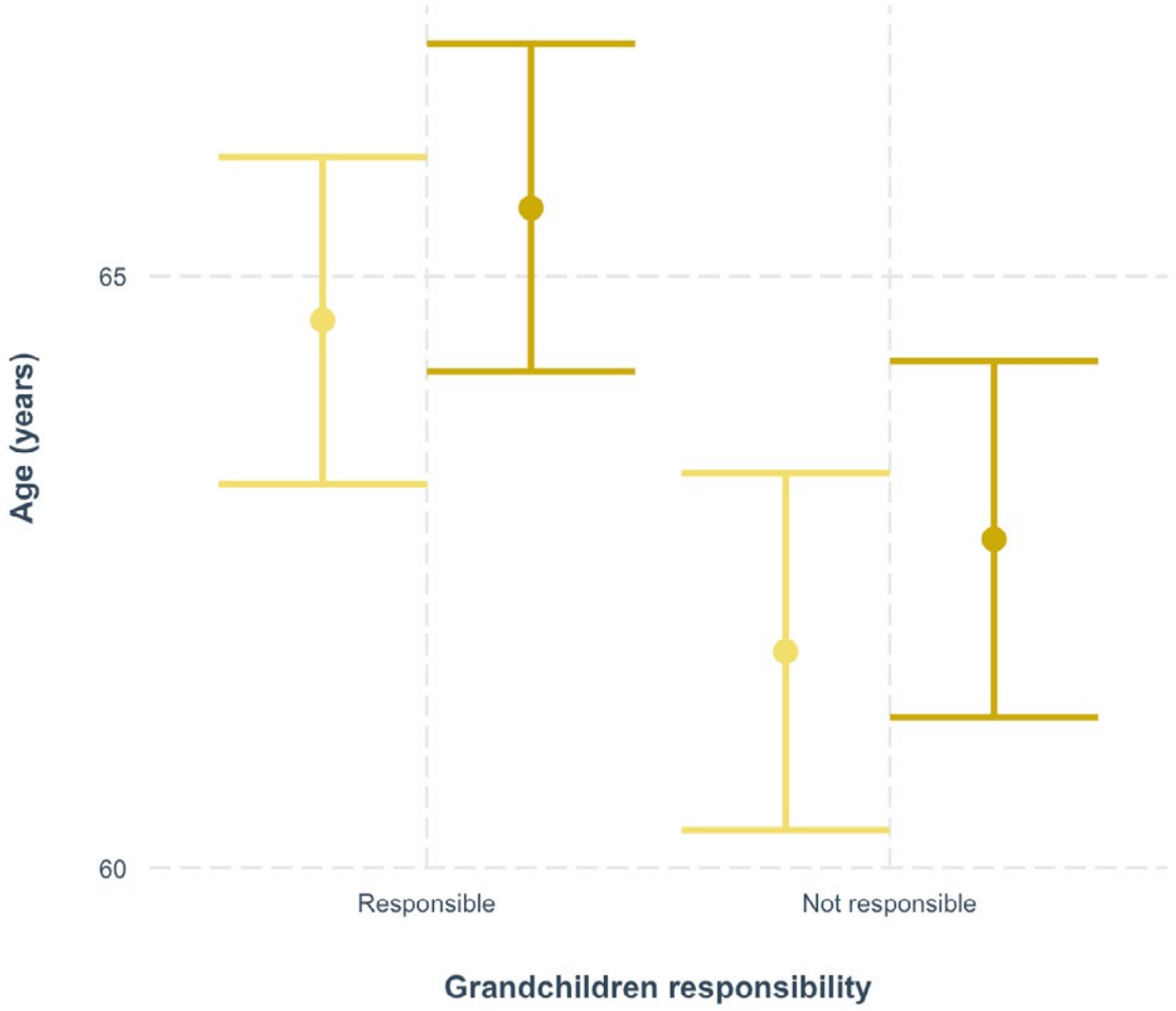
Preferred model

graphic visualization - **figure 7**



Predicted relationships

grandchildren responsibility and age, for both men and women - **figure 8**



bonus insight
from an inital model predicting age

adjusted R-squared: **0.05244**

In this model, the grandchildren responsibility variable had a statistically significant relationship with age. Apart from this, the graphic representation of this interaction includes more information on the age intervals of both grandmothers and grandparents responsible -and/or not- for their children, ellaborating more on the previous analysis and remarks from figure 5.

Conclusions

limitations and further inquiries

Based on the previous analysis of the relationships between total income and the aforementioned variables, we can conclude that **grandparents' self-care difficulty and responsibility for their grandchildren do not condition their income, but their age and gender do have a considerable impact on their economic capacities**.

These findings, apart from addressing the project's main research question, also generate further questions for future research. From potential differences between total and perceived income and additional information on school enrollment and the average grade level for under-age student currently supported by their grandparents, addressing these inquiries might also provide complementary insight that could place existing conclusions on a more specific context. Considering this, some of the limitations of this project are the fact that I am still yet to **generate potential correlations between my two initial datasets**, and also develop a deeper analysis on the self-care difficulty variable.

During the development of this final report, I went back to previous exercises and my preliminary selection of variables across scales, and it would be interesting to conduct an additional **study not only across states to generate potential comparisons, but also considering household-level variables** like, but not limited to, the following variables:

presence of persons under 18 - access to internet connection
grandparent-headed household with no parent present - limited English-speaking household.

Relevance
why is this important?

grandparents as assets for child development
in a mutually beneficial bond

Across the world, grandparents are associated to figures of support for grandchildren, and viceversa. In both favorable and adverse circumstances, the quality of relationships between the two generations has measurable consequences on the mental well-being of both, supporting their performance in their respective stages in life.

source: Here's what people call their grandparents around the world. Insider, 2020.

access to opportunities for all
through integrated assistance

Recognizing that grandparents would benefit from improved coordination of resources to assist them as they care for their grandchildren, (as well as information about those resources) would not only represent a general improvement on their quality of life, but also one of the multiple ways local authorities and stakeholders can guarantee access to opportunities of growth for all.

planning for unconventional, yet possible scenarios
for both the urgent and the important

Both a pandemic, and a not-so-common caregiving scenario are some of the forms in which the unconventional and urgent manifest in our ever-changing realities. However, these circumstances are directly -and indirectly- fueled by our daily actions, which inevitably opens of a greater reflection on how planners and professionals in the built environment foresee and include all possible outcomes in our common vision for a resilient, equitable urban system.

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