Housing Insecurity

Monitoring the housing crisis of students at Chico State

Introduction

Over the past decade, universities and colleges across the US have documented a **sharp increase** in **student homelessness** and **housing insecurity**
(Broton and Goldrick-Rab 2016)

Homelessness and housing insecurity has **detrimental effects** on student success, well-being, and academic performance
(Wilking et al. 2019)

Background

Wilking, Roll, & Kornbluh (2019) study investigating student housing insecurity and homelessness at Chico State and impact of Camp Fire

- 1,416 total student respondents
- 43% of students reported experiencing **housing insecurity** in the past 12 months
- 14.7% of students had experienced **homelessness** in the past 12 months
- 13% of students surveyed reported having to move either temporarily due to the fire
- 22.6% reported increased housing costs due to the fire

About Our Data

Our study utilizes the data collected and analyzed by Dr. Wilking and her team.

Data was originally gathered via:

- Self-report survey: contains missing data due to question nonresponse
- Academic Records

Data Contents:

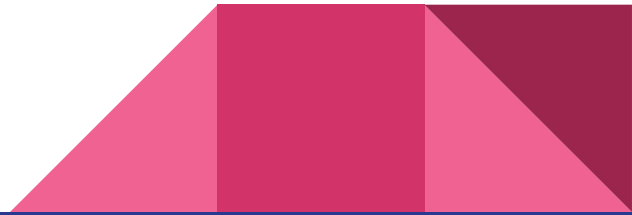
- 1,416 survey responses (48% response rate)
- 136 variables

Original data management and analyses was conducted in Stata (StataCorp. 2017) which we translated into R (R Core Team, 2019) for this study

Goals

1. Using the original survey data, reproduce the findings that resulted from the 2019 study on housing insecurity by Dr. Wilking, Dr. Roll, and Dr. Kornbluh in Wilking et al. (2019).
    a. Translate data management and analysis processes from Stata to R programs
    b. Assess reproducibility of the study based on content of code files and final report

2. Quantify the impact of missing data on the reported results of the study.
    a. Reproduce the study after imputing missing values resulting from participant nonresponse, and compare results of imputed and original analyses



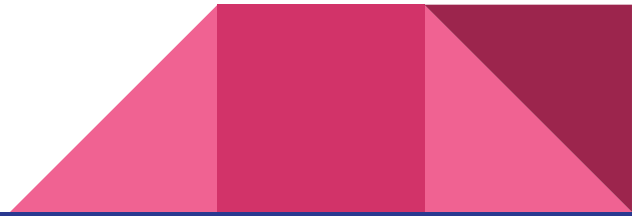
Methods

1. Code Translation
   - Reproduce in R the data management techniques originally performed in Stata
2. Exploration
   - Show that our data sample matches the data sample in the original study
3. Model Building:
   - Reproduce the models that Dr. Wilking used in her study, and compare the results
4. Imputation:
   - Use MICE (van Buuren, Groothuis-Oudshoorn., 2011) multiple imputation techniques in R (R Core Team 2019) to impute missing values
   - Use 10 imputation iterations to ensure convergence of values
5. Quantification of Impact of Missing Data
   - Compare the odds ratios produced by the original model without imputation to those produced by the imputed model

Data Preparation

All data cleaning and preparation was produced by translating original Stata code to R. Examples include:

- Creation of indicator variables based on multiple survey question responses
- Reordering of ordinal variables
- Conversion of question nonresponse cases to NA



Crucial Variables

The following variables were determined based on answers to the questionnaire and were utilized in analyses:

1. Did the student experience 3 or more **incidents of housing insecurity**?
2. How many **weekly hours** does the student work in a paid position?
3. Is the student a **person of color**?
4. Is student is a **sexual minority**?
5. Is the student a **parent**?
6. Does student **rent** their housing?
7. Was the student's housing situation **impacted by the Camp Fire**?
8. Was student **homeless** in the past 30 days or 12 months?
9. What level of **knowledge of student services** does the student have?
10. Is student a **Butte County resident** (and therefore have localized social networks)?
11. What was the **method of contact** for the study (email versus direct contact)?

Exploratory Analysis

Sample Ethnicity & Gender

Dr. Wilking's study reported the same number of students in each classification of both gender and ethnicity.

This was expected due to our use of the same dataset.

Gender	Our Study	Wilkings.Study
Female	775 (54.7%)	775 (54.9%)
Male	613 (43.3%)	613 (43.3%)
Transgender/nonbinary	14 (1.0%)	14 (1%)

Ethnicity	Our Study	Wilkings.Study
White/Non-Hipanic	587 (41.5%)	587 (42%)
Hispanic/Latino	522 (36.9%)	522 (37%)
Asian	85 (6.0%)	85 (6%)
Two or more races	74 (5.2%)	74 (5.3%)
Unknown	70 (4.9%)	70 (5%)
African American	42 (3.0%)	42 (3%)
Native American	12 (0.8%)	12 (1%)
Pacific Islander	5 (0.4%)	5 (.4%)

CampFire and Housing Insecurity Impact

- All of the numbers in this study are the same as the numbers reported in Dr. Wilking's study except on the number of students who did not experience incidents of housing insecurity.
    - This is because we are considering missing values as a 0 incidents while Dr. Wilking's team ignored them.
- Identical counts with varied proportions imply a different denominator
    - We used all the responses to calculate our percentage while Dr. Wilking's study ignored missing values

CampFire Impact	Our Study	Dr. Wilking's Study
Temp/Perm Move	185 (13.1%)	185 (13%)
Home Destroyed	14 (1%)	14 (1%)
Increased Housing Fees	321 (22.7%)	321 (22.6%)

# of HI Incidents	Our Study	Dr. Wilking's Study
One or More	43.1%	43%
Three or More	12.3%	12.5%

# of HI Incidents	Our Study	Dr. Wilking's Study
0	806 (56.9%)	783 (56.2%)
1	303 (21.4%)	303 (21.8%)
2	133 (9.4%)	133 (9.6%)
3	89 (6.3%)	89 (6.4%)
4	49 (3.5%)	49 (3.5%)
5	23 (1.6%)	23 (1.7%)
6	9 (0.6%)	9 (0.7%)
7	4 (0.3%)	4 (0.3%)

Homelessness

- Each of our numbers correspond to the numbers in Dr. Wilking's study except the number of not homeless students. We were unable to reproduce this number.

- Again, our proportions do not match with those reported in the original study.
    - Our proportions were calculated using the total number of responses as the denominator
    - Wilking et al. likely removed missing values prior to calculating the percentage (when we attempted this, we still could not reproduce the proportions).

Homelessness	Our Study	Dr. Wilking's Study
Not Homeless	1224 (86.4%)	1113 (85.3%)
Past 30 Days	64 (4.5%)	64 (4.9%)
Past 12 Months	144 (10.2%)	144 (11.3%)
30 Days/12 Months	192 (13.6%)	192 (14.7%

Modeling

Housing Insecurity:
original model reproduction

The first model aimed to use the variables selected by Wilking et al. to **reproduce their results**, which were run on complete cases only.

The results of our model generally reflected those of the original study, although OR values and significance levels varied slightly.

	OR Our Study	OR Wilking et al.
Works Less Than 10 Hours	**1.62** (0.79, 3.16)	**1.55*** (0.86, 2.81)
Works 10-19 Hours	**1.97*** (1.17, 3.29)	**1.94*** (1.2, 3.13)
Works 20-29 Hours	**2.89*** (1.71, 4.88)	**2.75*** (1.64, 4.62)
Works 30+ Hours	**4.02*** (2.24, 7.14)	**3.66*** (1.92, 6.98)
Student Parent	**1.35** (0.54, 3.09)	**1.18** (0.46, 3.04)
Student of Color	**1.80*** (1.24, 2.66)	**1.66*** (1.16, 2.36)
Sexual Minority	**1.50*** (0.93, 2.37)	**1.54*** (0.94, 2.53)
Student is Renting	**1.67*** (1.02, 2.83)	**1.68*** (0.99, 2.84)
Camp Fire Impacted Housing	**3.15*** (2.15, 4.64)	**2.89*** (1.95, 4.30)
Aware of Services	**0.86*** (0.77, 0.96)	**0.88*** (0.80, 0.96)
Butte County Resident	**1.33** (0.88, 1.98)	**1.22*** (0.77, 2.88)
Direct Outreach	**1.78*** (1.18, 2.65)	-

Housing Insecurity: Imputation

Imputation yielded **higher odds** of experiencing housing insecurity if the student was a **parent, a person of color, a sexual minority, impacted by the Camp Fire**, or was **aware of student services**. Their odds of experiencing housing insecurity decreased or remained the same for all other groups.

Housing Insecurity: With Missing (n = 1,230)

		95% CI		
	OR	LCL	UCL	p
Works Less Than 10 Hours	1.62	0.79	3.16	0.2
Works 10-19 Hours	1.97	1.17	3.29	0.0
Works 20-29 Hours	2.89	1.71	4.88	<0.001
Works 30 or More Hours	4.02	2.24	7.14	<0.001
Student Parent	1.35	0.54	3.09	0.5
Nonwhite	1.80	1.24	2.66	0.0
Sexual Minority	1.50	0.93	2.37	0.1
Student Rent	1.67	1.02	2.83	0.0
Housing Impacted Camp Fire	3.15	2.15	4.64	<0.001
Services Index	0.86	0.77	0.96	0.0
Butte County Resident	1.33	0.88	1.98	0.2
Direct Survey Outreach	1.78	1.18	2.65	0.0

Housing Insecurity: Imputed (n = 1,416)

		95% CI		
	OR	LCL	UCL	p
Works Less Than 10 Hours	1.54	0.77	2.90	0.2
Works 10-19 Hours	1.97	1.23	3.13	0.0
Works 20-29 Hours	2.88	1.77	4.68	<0.001
Works 30 or More Hours	3.86	2.27	6.53	<0.001
Student Parent	1.68	0.74	3.51	0.2
Nonwhite	1.87	1.32	2.68	<0.001
Sexual Minority	1.71	1.11	2.59	0.0
Student Rent	1.53	0.98	2.48	0.1
Housing Impacted Camp Fire	3.72	2.61	5.34	<0.001
Services Index	0.93	0.84	1.02	0.1
Butte County Resident	1.15	0.78	1.66	0.5
Direct Survey Outreach	1.59	1.08	2.31	0.0

Working 10+ hours, being a student of color or sexual minority, and being impacted by the fire remained significant predictors. Knowing about services was no longer a significant predictor under imputation.

Homelessness:
original model reproduction

We also ran **two models** on predictors of homelessness on the data.

Once again, the first model aimed to **reproduce the results of Jen Wilkins' study**, which was produced with complete cases only.

Again, the results of our model generally reflected those of the original study, but with some variation in predictor ORs and significance.

	OR Our Study	OR Wilking et al.
Works Less Than 10 Hours	**1.84*** (1.00, 3.27)	**1.46** (0.82, 2.61)
Works 10-19 Hours	**1.10** (0.65, 1.83)	**0.85** (0.49, 1.47)
Works 20-29 Hours	**2.66*** (1.71, 4.26)	**2.18*** (1.31, 3.63)
Works 30+ Hours	**2.05*** (2.24, 3.57)	**1.93*** (1.12, 3.33)
Student Parent	**1.77** (0.54, 3.75)	**1.43** (0.61, 3.36)
Student of Color	**1.09** (1.24, 1.55)	**1.21** (0.84, 1.73)
Sexual Minority	**1.64** (0.93, 2.52)	**1.45** (0.93, 2.27)
Camp Fire Impacted Housing	**2.74*** (2.15, 3.91)	**2.97*** (2.12, 4.15)
Aware of Services	**1.00** (0.77, 1.10)	**0.97** (0.89, 1.07)
Butte County Resident	**1.42** (0.88, 2.07)	**1.61*** (1.13, 2.32)

Homelessness: imputation

Imputation of the missing data using MICE (van Buuren, Groothuis-Oudshoorn., 2011) yielded **higher odds** of experiencing homelessness for students working **10-19 hours or 30+ hours, students that are people of color, students whose housing was impacted by the Camp Fire, and Butte County Residents**. Odds of experiencing homelessness decreased or remained the same for all other groups.

Homelessness: Complete Cases (n = 1241)

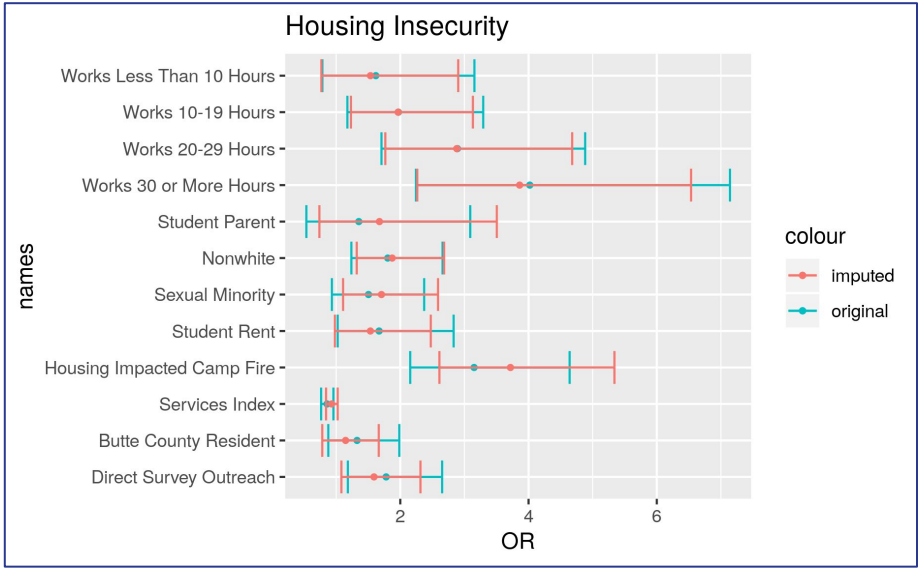
		95% CI		
	OR	LCL	UCL	p
Works Less Than 10 Hours	1.84	1.00	3.27	0.0
Works 10-19 Hours	1.10	0.65	1.83	0.7
Works 20-29 Hours	2.66	1.65	4.26	<0.001
Works 30 or More Hours	2.05	1.15	3.57	0.0
Student Parent	1.77	0.76	3.75	0.2
Nonwhite	1.09	0.77	1.55	0.6
Sexual Minority	1.64	1.04	2.52	0.0
Housing Impacted Camp Fire	2.74	1.92	3.91	<0.001
Services Index	1.00	0.90	1.10	0.9
Butte County Resident	1.42	0.96	2.07	0.1

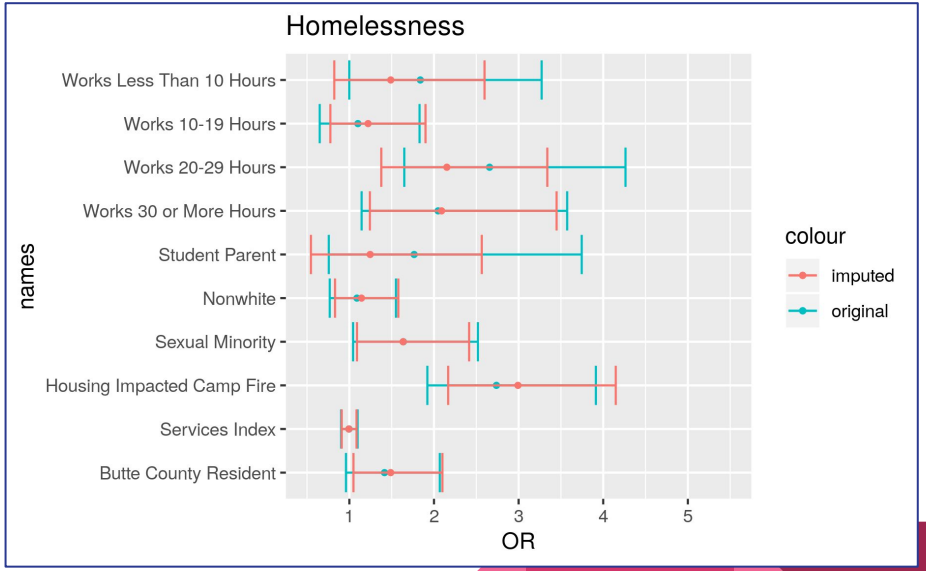
Homelessness: Imputed

		95% CI		
	OR	LCL	UCL	p
Works Less Than 10 Hours	1.49	0.82	2.60	0.2
Works 10-19 Hours	1.22	0.78	1.90	0.4
Works 20-29 Hours	2.15	1.38	3.34	<0.001
Works 30 or More Hours	2.09	1.24	3.45	0.0
Student Parent	1.25	0.55	2.56	0.6
Nonwhite	1.14	0.83	1.58	0.4
Sexual Minority	1.64	1.09	2.42	0.0
Housing Impacted Camp Fire	2.99	2.17	4.15	<0.001
Services Index	0.99	0.91	1.08	0.9
Butte County Resident	1.49	1.05	2.10	0.0

Working 20-29 or 30+ hours, being a sexual minority, and having housing impacted by the fire remained significant predictors. Being a Butte County Resident was a significant predictor in the imputed model, but not in the original model on complete cases.

Effects of Missing Data on Regression Results:
Multiple Imputation vs. Complete Case





Shifts in odds of experiencing homelessness or housing insecurity were observed for some predictors following imputation of missing data.

Conclusions

Conclusions: Reproducibility of Report

Our study shows that:

- **43.1% of students** experienced **at least 1 incident** of housing insecurity
  - Wilking et al. reported 43.8%
- **12.3% of students** experienced **3 or more incidents** of housing insecurity
  - Wilking et al. reported 12.5%
- **10.2% of students** experienced **homelessness** in the past year
  - Wilking et al. reported 11.3%

While our complete-case models **reflected similar trends**, we did not always identify the same significant predictors or proportions in each case.

We theorize that this may be due to lack of disclosure of control variables (e.g. direct outreach), missing data omission decisions, and proportion denominators.

Conclusions: Impact of Missing Data

Imputation of missing data yielded **notable shifts** in the odds of a student experiencing housing insecurity and homelessness according to some predictors.

For example:

- Odds of a student working 20-29 hours experiencing homelessness decreased by 24% after imputation
- Odds of experiencing housing insecurity if housing was impacted by the Camp Fire increased by 18% after imputation.

References

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