

Diabetes and Public Housing

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A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Public Health

University of Washington

2020

Committee:

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Program Authorized to Offer Degree:

Health Services

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Abstract

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Health Services

“Here is my abstract”

Table of Contents

	Page
LIST OF FIGURES	ii
LIST OF TABLES	iii
CHAPTER 1: BACKGROUND AND SIGNIFICANCE	I
1.1 Public Housing	I
1.2 Diabetes	I
1.3 Problem Definition	3
CHAPTER 2: METHODS	4
2.1 Study Setting and Study Design	4
2.2 Data Sources	5
2.3 Study Population	5
2.4 Analyses	7
CHAPTER 3: RESULTS	9
CONCLUSION	12
APPENDIX A: APPENDIX	13
COLOPHON	14
REFERENCES	18

List of Figures

Figure Number

Page

List of Tables

Table Number		Page
3.1	Population Demographics	10
3.2	Association between PHA Status and Diabetes	11
3.3	Association between the Public Housing Authorities and Diabetes	11

Background and Significance

1.1 PUBLIC HOUSING

1.2 DIABETES

Diabetes is a chronic disease that is characterized by an inability of the body to maintain a healthy blood glucose level, this can cause a variety of symptoms that affect multiple systems in the body and can lead to potentially life-threatening complications. The key regulator hormone of glucose is insulin and it is produced in the pancreas. The absence or malfunction of insulin leads to elevated blood glucose levels called hyperglycemia. When insulin hormone is missing or ineffective the disease is called Diabetes Mellitus,

this condition has multiple types.

1.2.1 DIABETES VARIANTS

The most common diabetes variants include type I diabetes mellitus, type II diabetes mellitus, and gestational diabetes. Type I diabetes is usually caused by genetic factors triggering an autoimmune reaction that results in the destruction of insulin producing cells in the pancreas. Also known as Juvenile Diabetes, the type I classification is typically diagnosed relatively early in life during childhood or early adulthood. Whereas, Type II diabetes develops when the body can still produce insulin however the amount is insufficient or when the body becomes resistant to the effects of insulin. Type II diabetes is largely attributed to lifestyle factors including obesity and physical activity levels. Gestational diabetes is the least common type and occurs during pregnancy.

Diabetes is a serious chronic disease condition without a medical cure. Medical treatment of Diabetes is centered around exogenous insulin replacement or use of medications that stimulate the pancreas to produce endogenous insulin. In the absence of adequate control, diabetes can lead to increased risk of vision loss, heart disease, stroke, kidney failure, nerve damage, amputation of toes, feet, or legs and even premature death; all of which have financial implications.

Many families have been left devastated by some of these complications and are financially indebted because of hospital bills, cost of medications, and time off work. For Type II Diabetics, a big part of their management is lifestyle modification which includes diet control and increased physical activity. This goal of this later method is to promote weight loss and reduce excess fat which in turn reduces insulin resistance and enhances disease control. (Ludwig et al., 2011)

For this reason, One avenue that public health researchers are beginning to explore is the relationship between

several studies have examined the

Few studies have examined the association between

Finding an association between public housing and diabetes status.

1.3 PROBLEM DEFINITION

2

Methods

2.1 STUDY SETTING AND STUDY DESIGN

The current study investigates whether public housing is associated with risk of diabetes status among King County, WA residents who were enrolled in Medicare and Medicaid. This study uses a descriptive cross-sectional design. The cross-sectional design is appropriate because it allows for an estimate of a dichotomous disease outcome at a particular point in time (???).

The analysis of this study was conducted on a dataset compiled from the King County *Data Across Sectors for Housing and Health (DASHH)* partnership. The findings from the original initial study have previously been reported (Public Health - Seattle & King County, 2018).

2.2 DATA SOURCES

In an effort to reduce fragmented data siloes across different sectors, the DASHH partnership was formed in 2016 between Public Health - Seattle and King County (PHSKC), and two public housing authorities, King County Housing Authority (KCHA) and Seattle Housing Authority (SHA). The primary objectives for DASHH were to join health and housing administrative data together to inform and measure future interventions, relating to policy, outreach, and program evaluation that would improve the health of King County residents, as well as to disseminate actionable data with key health and housing stakeholders.

The housing data provided by both KCHA and SHA originated from the US Department of Housing and Urban Development (HUD). This data source contained elements that included demographic information and period of enrollment for families and individuals. Claims and enrollment for Medicaid and Medicare data were from Washington Health Care Authority (HCA) which was provided to PHSKC. Enrollment data contained information on who was receiving Medicaid and Medicare benefits. Claims data provided elements such as diagnosis codes that were used to identify acute events and chronic conditions. All these data sources were linked together by a unique identifier ID.

2.3 STUDY POPULATION

The study population were participants that were enrolled in either Medicare or Medicaid programs. Further eligibility for study participation included King County, Washington residency and at least 11 months of Medicare or Medicaid coverage in 2017. The overall number of participants derived from the DASHH dataset totaled 585,372.

2.3.1 EXPOSURE VARIABLE

The exposure variable for this study was public housing assistance status. This was extracted from the HUD-50058 form which was provided by the PHAs. The HUD-50058 form provides information on

families that participate in public housing or Section 8 rental subsidy programs [Source]. Housing assistance is separated into 3 main types:

- Housing Choice Vouchers - vouchers provided to recipients to rent units on the private housing market
- Public housing properties and units - subsidized housing managed by PHAs
- Project-based vouchers - subsidized housing units not managed by PHAs

Responses on the HUD-50058 form were combined into a composite public housing binary variable. Study participants that were not enrolled in any of the listed housing assistance programs were coded as 0 for PHA status. Whereas, those responses that contained any of the 3 types of housing assistance were given a 1 for PHA status.

2.3.2 OUTCOME VARIABLE

The outcome variable for this study was diabetes status. This was defined using the Centers for Medicare and Medicaid Services (CMS) Chronic Conditions Warehouse (CCW) algorithm [Source]. According to the CCW, a participant meets the criteria if they have at least 1 inpatient, skilled nursing facility, home health agency visit or 2 hospital outpatient or carrier claims with diabetes diagnosis codes as outlined by the chronic conditions reference list within the last 2 years [Source]. This definition does not specify diabetes variant but instead accounts for any type of diabetes diagnosis. The diabetes status outcome variable was dichotomous, given a 0 or 1. Those that did not meet the CCW algorithm were coded as 0 and those that met the criteria were coded as 1 for diabetes status.

2.3.3 POTENTIAL CONFOUNDERS

Potential confounders were identified based on literature review. This study considers age, race and ethnicity and gender as potential confounding variables. Each of these variables was selected due to the increased baseline risk for participants to be either in public housing or have diabetes. It is known that

diabetes is an age-related disease, with a higher risk for older populations (Selvin & Parrinello, 2013). Age was presented as a discrete variable for the participants age in 2017. Similarly, according to CDC data, racial minority groups may be differentially at risk for both type 1 and type 2 diabetes compared to their white counterparts (Divers et al., 2020 & CDC (2020)). Race and ethnicity variable was defined categorically and included: American Indians/Alaska Natives, Asian, Asian Pacific Islander, Black/African American, Latino, Multiple, Native Hawaiian and Pacific Islander, Other, Unknown, and White. Gender was selected because both psychosocial and biological factors are responsible for sex and gender diabetes risk differences (Kautzky-Willer, Harreiter, & Pacini, 2016). Gender was grouped categorically and included: Female, Male, and Multiple.

2.4 ANALYSES

As is common in epidemiological and health services research, demographic characteristics were presented to describe the population distribution (???). Descriptive analyses were first used to list the percentages for each of the demographic categorical variables. (See table 1). The demographics table is arranged by PHA status, this included: KCHA, SHA, combined PHA and non-PHA. Although the discrete variable for age was used in the statistical analyses, age was reported categorically in the descriptive analyses for a simpler layout. Mean and median age were also shown for each category.

For the statistical analyses, logistic regression models were fitted to assess the risk of diabetes status in relation to public housing assistance status. This analysis is appropriate for this study because logistic reregression analyses allows for measuring the association of an effect towards a binomial response variable by combining multiple variables to avoid confounding (???). Two models were used to determine the odds ratios (OR) and corresponding 95% confidence intervals for the association between public housing assistance and diabetes status. The models used were the unadjusted model, without any other variables included in the analysis and the adjusted model including age, race and ethnicity and gender variables. In addition, models were fit to determine the odds of diabetes for each of the public housing authority. Similarly, the unadjusted model and the adjusted model that included age, race and ethnicity and gender variables were used to determine the association for the second analysis. Findings were statistical signif-

icant if the estimates did not cross the the confidence intervals and p-values were below <0.05 cutoff.

Analyses were conducted using R version 3.6.0.

3

Results

Among the study participants, the proportion of people that were in the PHA category was 10.4% and of that, 5.9% were with KCHA and 4.6% with SHA. The majority, 89.5% did not have any public housing assistance in 2017. Descriptive analysis revealed that PHA population had a greater proportion of people meeting the definition of diabetes at 12.7% compared to the non-PHA group with 9.6%. Overall, 9.9% were considered to meet the definition of diabetes and the rest, 90.1% were not considered to have diabetes. Additionally, the population age distribution were different between PHA status, the non-PHA category had an older population with a median of age of 62 and a mean age of 50 compared to the PHA population with a median and mean age of 34 and 35.7 respectively. For the primary analysis, the association between diabetes status and public housing assistance, the crude model showed that the odds ratio

Table 3.1: Population Demographics

Characteristics	KCHA	SHA	Combined PHA	Non-PHA
	N=34,514 (5.9%)	N=27,044 (4.6%)	N=60,919 (10.4%)	N=523,814 (89.5%)
Age				
<5	6.6%	6.1%	6.4%	5.5%
5-9	12.0%	10.2%	11.2%	7.0%
10-17	19.5%	14.9%	17.5%	9.8%
18-29	12.5%	9.9%	11.3%	8.3%
30-49	21.0%	19.3%	20.3%	11.2%
50-64	15.3%	19.9%	17.4%	9.4%
65-74	6.8%	11.5%	8.9%	28.0%
75+	6.1%	7.9%	7.0%	20.6%
Median	39.1 years	29.0 years	34.0 years	62.0 years
Mean	33.3 years	38.7 years	35.7 years	50.0 years
Race and Ethnicity				
American Indian or Alaska Native	0.8%	1.4%	1.0%	0.8%
Asian	5.5%	11.7%	8.3%	6.9%
Asian Pacific Islander	0.1%	0.2%	0.2%	3.5%
Black/African American	36.9%	44.9%	40.2%	7.9%
Latino	3.8%	2.8%	3.4%	6.5%
Multiple	15.5%	10.2%	13.2%	8.0%
Native Hawaiian or Pacific Islander	2.3%	1.9%	2.1%	2.4%
Other	0.0%	0.0%	0.0%	0.8%
White	30.1%	22.3%	26.8%	56.1%
Unknown	5.0%	4.5%	4.8%	6.9%
Gender				
Female	58.6%	53.5%	56.3%	52.4%
Male	40.6%	45.7%	42.9%	47.2%
Multiple	0.8%	0.8%	0.8%	0.4%

Note:

Percentages may not add up to 100 because of missing data

of having diabetes was 1.34 fold greater for those with public housing assistance (table 2). In the adjusted model, PHA residents were 94% more likely to meet the definition of diabetes compared to those that were non-PHA residents.

Table 3.2: Association between PHA Status and Diabetes

Housing Status	Model 1	Model 2
Non-PHA	Referent	Referent
PHA	1.34 (CI: 1.31-1.38)	1.94 (CI: 1.88-1.99)

In the second analysis, the association between diabetes status and the specific public housing authorities, the crude model showed that the odds of meeting the definition of diabetes were 1.28 times greater among KCHA residents and 1.42 times greater among SHA residents. The adjusted model revealed that among KCHA residents the odds of meeting the definition of diabetes were 2.16 times higher and 1.70 for SHA residents compared to non-PHA residents.

Table 3.3: Association between the Public Housing Authorities and Diabetes

Status	Model 1	Model 2
Non-PHA	Referent	Referent
KCHA	1.28 (CI: 1.24-1.33)	2.16 (CI: 2.09-2.25)
SHA	1.42 (CI: 1.38-1.48)	1.70 (CI: 1.64-1.77)

Conclusion

If we don't want Conclusion to have a chapter number next to it, we can add the `{-}` attribute.

More info

And here's some other random info: the first paragraph after a chapter title or section head *shouldn't be* indented, because indents are to tell the reader that you're starting a new paragraph. Since that's obvious after a chapter or section title, proper typesetting doesn't add an indent there.

A

Appendix

Colophon

This document is set in **EB Garamond**, **Source Code Pro** and **Lato**. The body text is set at 11pt with *EBGaramond(3)*.

It was written in R Markdown and \LaTeX , and rendered into PDF using **huskydown** and **bookdown**.

This document was typeset using the XeTeX typesetting system, and the **University of Washington Thesis class** class created by Jim Fox. Under the hood, the **University of Washington Thesis LaTeX template** is used to ensure that documents conform precisely to submission standards. Other elements of the document formatting source code have been taken from the **Latex, Knitr, and RMarkdown templates for UC Berkeley's graduate thesis**, and **Dissertate: a LaTeX dissertation template to support the production and typesetting of a PhD dissertation at Harvard, Princeton, and NYU**

The source files for this thesis, along with all the data files, have been organised into an R package, `xxx`, which is available at <https://github.com/xxx/xxx>. A hard copy of the thesis can be found in the University of Washington library.

This version of the thesis was generated on 2020-05-23 21:11:11. The repository is currently at this commit:

The computational environment that was used to generate this version is as follows:

```
- Session info -----
setting  value
version  R version 3.6.1 (2019-07-05)
```

```

os      Windows 10 x64
system  x86_64, mingw32
ui       RTerm
language (EN)
collate English_United States.1252
ctype   English_United States.1252
tz       America/Los_Angeles
date     2020-05-23

```

- Packages -----

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assertthat	0.2.1	2019-03-21	[1]	CRAN (R 3.6.1)
backports	1.1.4	2019-04-10	[1]	CRAN (R 3.6.0)
bookdown	0.18.1	2020-05-01	[1]	Github (rstudio/bookdown@cd97d40)
callr	3.3.1	2019-07-18	[1]	CRAN (R 3.6.1)
cli	1.1.0	2019-03-19	[1]	CRAN (R 3.6.1)
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[1] C:/Users/Marc/Documents/R/win-library/3.6

[2] C:/Program Files/R/R-3.6.1/library

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