Title
Self-Rated Health and Depressive Symptoms in Farmworker Families in Mendota, California

Author
Sousa, Emily Priscilla

Publication Date
2021

Peer reviewed|Thesis/dissertation

Self-Rated Health and Depressive Symptoms in Farmworker Families in Mendota, California

By

EMILY PRISCILLA SOUSA

DISSERTATION

Submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in

Epidemiology

in the

OFFICE OF GRADUATE STUDIES

of the

UNIVERSITY OF CALIFORNIA

DAVIS

Approved:

_____

Dr. Daniel J. Tancredi, Chair

_____

Dr. Lorena Garcia

_____

Dr. Philip H. Kass

Committee in Charge

2021

Abstract

Foreign-born workers are exposed to increased vulnerability at the intersection of immigration and work, among other social determinants of health. The health impacts of these combined effects are not yet well understood. This is a priority population for public health science and advocacy, in individual locations and comparatively around the globe.

Two samples of foreign-born workers were studied separately in California and Spain, and their self-rated health status was collected in different ways. Statistical methods allow for a comparative analysis to be completed after assessing for health as a latent variable. The data was found to be consistent with health as a latent variable, and with better health among the sample of people born in Latin America who were working in Spain compared to California. The methodology used here is extrapolatable to other comparative analyses when discrepant measures are used.

A longitudinal cohort study of foreign-born farmworker families in Mendota, CA, allowed for more specific exploration of the health effects of precarious employment and undocumented legal status. Self-rated health and depressive symptoms were used to assess health status. A profile of people in the sample with undocumented legal status is presented. Precarious employment was found to be associated with increased

odds of experiencing depressive symptoms. No significant associations were found between legal status and precarious employment, between legal status and self-rated health, or between precarious employment and self-rated health. Interactions between the 'healthy worker effect' and the 'healthy immigrant effect' need to be considered in interpreting these findings.

Future studies are needed to continue to explore social determinants of health compounding the vulnerability of immigrant workers to complete the public health science and allow for optimal health promotion and appropriate structural protections.

Contents

List of Tables

List of Figures

Chapter 1

Introduction

Public health is charged with preventing disease and protecting health in ways that promote social justice (George, Thomson, Chaze, & Guruge, 2015; Silva, Smith, & Upshur, 2013). The first chapter of this dissertation looks at the concept of health and ways it can be quantified for research. The second and third chapters of this dissertation bend towards the social justice lens and look at migration and work as social determinants of health in a cohort of farmworker families in Mendota, California, as part of the Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) Study.

Health is an underlying state that is not objectively quantifiable. The first paper in this dissertation looks at two studies that use different metrics to assess overall health and well-being, and asks three questions: is there a true latent health variable that these metrics are both approximating?; if yes, are the two metrics consistent in the way they estimate this variable?; and if yes, is one study sample healthier than the other?

From a perspective of health equity, migration and work are both important determinants of health. Immigrant workers have been specifically identified as a key population for focus in addressing population health inequities (Ahonen, Fujishiro, Cunningham, & Flynn, 2018; Rosemberg & Tsai, 2018). Legal vulnerability through undocumented status is a known precursor to accepted social determinants of health

(i.e. housing, education, income) in immigrant populations (McConnell, 2015). Precarious employment, defined as a lack of regulations that increase worker vulnerability, is also an understood social determinant of health and part of the sphere of influence work has on health and well-being (Benach et al., 2014). The second and third papers in this dissertation explore the relationship between undocumented legal status, precarious employment, and two measures of health: overall self-rated health and depressive symptoms.

Background

Foreign-Born Californians

More than one quarter of the people living in California in 2017 were born outside of the United States (27%; 11 million people). Of these foreign-born Californians, about half were naturalized citizens (52%), approximately half of the remaining group had some legal authorization to be in the United States (i.e., green card, visa; 25%) and approximately half were living in California without legal authorization (23%). 50% of foreign-born Californians had emigrated from Latin American countries, and 40% had emigrated from Asian countries. Two thirds of foreign-born Californians spoke

proficient English, and differences were small between those who had come to California more than 5 years prior and recent immigrants to California. Education amongst foreign-born Californians was bimodal. Approximately one third of foreign-born Californians did not have a high school diploma, approximately one third had at least a bachelor's degree, and a significant subgroup was noted of recent highly educated immigrants from Asian countries.

An excellent profile of foreign-born population in California was completed by the Public Policy Institute in California (Cha, 2019; Johnson & Sanchez, 2019).

Legal Status

Legal status is an important variable in migration health research. Legal vulnerability through undocumented status has been associated with social determinants of health, including limited housing options, decreased access to health insurance, limited educational opportunities, and limited upward mobility (Abrego, 2006; Chavez, 1996; Cort, 2011; Donato & Armenta, 2011; Goldman, Smith, & Sood, 2005; Gonzales, 2011; Gonzales & Chavez, 2012; Hall, Greenman, & Farkas, 2010; Marcelli, 2004; McConnell, 2015; Yoshikawa, 2011). These associations have been found to persist even among

young people who are fluent in English and consider themselves to be American. An excellent review of legal status literature can be found in McConnel's 2015 study on legal status and home ownership (McConnell, 2015).

Undocumented status has also been shown to have an impact on the family environment, including quality of parent-child relationships and overall child well-being (Von Werthern et al., 2018). Undocumented status has also been shown to amplify the negative effects immigrant detention has on mental health (Von Werthern et al., 2018).

The direct health effects of undocumented status in foreign-born farmworker families have not yet been described in the literature.

Work

Work is an important social determinant of health and a lens for which to better understand and address health inequities (Ahonen et al., 2018). Work offers a physical convergence of several other social determinants of health and serves as a point of articulation between individuals and social and structural institutions. Work is both a

protective factor and a risk factor for health. The complex relationship between work and health has not yet been fully articulated and needs further investigation. Work is intertwined with socio-economic status, and often segregated by race, gender, age, geographic location, educational attainment, and income. Looking at health inequities through a work lens offers a perspective on the roots of inequities, and with that potential ways to address them. (Ahonen et al., 2018)

By example, analyses have shown that a large portion of differences in mortality by race can be explained by less complex work (complex work is health protective). This research identified strategies to reverse job simplification and offer complex work opportunities more uniformly to address injustice. (Fujishiro et al., 2017)

An excellent review of work as a social determinant of health can be found in more detail in the work of Ahonen and colleagues (Ahonen et al., 2018).

Precarious Employment

Precarious employment is defined as, 'a lack of regulations that support the standard employment relationship, making workers more vulnerable' (Benach et al., 2014).

These types of work arrangements have been associated with a variety of health measures, including cardiovascular disease, occupational injuries, musculoskeletal problems, infectious disease, respiratory problems, and changes in mental health (Benach et al., 2014; Canivet et al., 2016; Julià, Vives, Tarafa, & Benach, 2017; Matilla-Santander et al., 2019). Precarious employment has been described as a multidimensional construct, and for the purpose of these analyses is defined by the validated Employment Precariousness Scale (EPRES), built on the dimensions of temporariness, disempowerment, vulnerability, wages, rights, and capacity to exercise rights (Vives et al., 2010). The scale is scored based on instructions from GREDS/Emconet (GREDS, 2004).

Excellent summaries of precarious employment can be found in the literature, with examples by Vives (Vives et al., 2010), Matilla (Matilla-Santander et al., 2019), and Benach (Benach et al., 2014).

Self-Rated Health

Health is defined as, 'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity' in the preamble of the World Health

Organization (WHO) constitution (Jradi, Alharbi, & Mohammad, 2018; World Health Organization, 1948). Self-rated health is a global measure of a person's overall health and well-being that has been accepted as a reliable measure for monitoring population health by both the United States Center for Disease Control and Prevention (CDC) and the WHO (Lommel & Chen, 2016). Self-rated health is captured with one question answered on a 4- or 5-point Likert scale. The question is commonly asked, "In general, would you say your health is excellent, very good, good, fair, or poor?" (Jradi et al., 2018). This metric has been used across languages and cultures as a measure of general health assessment and quality of life, and in clinical studies as a predictor of morbidity and mortality (Idler, E.L.; Benyamini, 1997). Self-rated health has known variability by gender (with males reporting better self-rated health than females) (Idler, E.L.; Benyamini, 1997).

Depressive Symptoms

Mental health is central to health, and includes promotion of mental well-being, prevention and treatment of mental illness, and rehabilitation of people who have been affected by mental illness (George et al., 2015; World Health Organization, 2020). Depressive symptoms have been associated with chronic disease and are a risk factor for stroke (Lerman et al., 2018). Structural violence has been found to be a major

contributor to people's overall well-being, and specifically to depressive symptoms (Mendenhall & Jacobs, 2008). The structural vulnerability with respect to mental health that is introduced by migration has been associated with work-related stress, as well as acculturative stress, limited access to health insurance and health care, and legal vulnerability related to permanent residency/citizenship status (Lerman et al., 2018). In the United States, the Latino community experiences a disproportionate amount of mental health distress compared to the non-Latino white community (Ward et al., 2019). Mexican-American people who are born in the United States have been observed to have higher rates of mental distress than people who have immigrated to the United States from Mexico (Mendenhall & Jacobs, 2008). These patterns remain under investigation.

The Center for Epidemiological Studies Depression Scale-10 (CESD-10) is an accepted tool for the assessment of depressive symptoms and has been validated in Mexican-born farmworkers in California (Grzywacz, Hovey, Seligman, Arcury, & Quandt, 2006; Grzywacz et al., 2010).

Health as a Latent Variable

In statistics, a latent variable is defined as an underlying variable that is present but cannot be observed (measured or quantified) (Salkind, 2010). Variables that can be observed can be used to model this type of unobserved, latent variable. By means of example, we can consider foot size a latent variable, present but undefined as a measurable concept. Sock size and shoe size are two observable associated metrics that can be used as proxies of foot size through modeling. The relationship between two proxy variables, such as sock size and shoe size, can help when deciding if they are both measuring the same foot size, and if so, if sock size of person A and shoe size of person B can be used to compare the relative size of the two people's feet.

Statistical Analysis Software (SAS) allows for such comparisons through methodological innovation to compare two different measures of self-rated health across separate studies.

Conclusion

The research reviewed here sets the stage for three papers that follow: a methodological innovation to accommodate different metrics for self-rated health; analyses of legal

status, precarious employment, and self-rated health in a cohort of farmworker families in Mendota, CA, as part of the Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) Study, and subsequent analyses of analogous relationships between these social determinants of health with depressive symptoms in the same study population.

References

Abrego, L. J. (2006). "I Can't Go to College Because I Don't Have Papers": Incorporation Patterns Of Latino Undocumented Youth. Latino Studies. https://doi.org/10.1057/palgrave.lst.8600200

Ahonen, E. Q., Fujishiro, K., Cunningham, T., & Flynn, M. (2018). Work as an inclusive part of population health inequities research and prevention. American Journal of Public Health, 108(3), 306–311. https://doi.org/10.2105/AJPH.2017.304214

Benach, J., Vives, A., Amable, M., Vanroelen, C., Tarafa, G., & Muntaner, C. (2014). Precarious Employment: Understanding an Emerging Social Determinant of Health. Annual Review of Public Health, 35(1), 229–253. https://doi.org/10.1146/annurev-publhealth-032013-182500

Canivet, C., Bodin, T., Emmelin, M., Toivanen, S., Moghaddassi, M., & Östergren, P. O. (2016). Precarious employment is a risk factor for poor mental health in young individuals in Sweden: A cohort study with multiple follow-ups. BMC Public Health, 16(1). https://doi.org/10.1186/s12889-016-3358-5

Cha, P. (Public P. I. of C. (2019). Immigrants and Health in California. Retrieved from https://www.ppic.org/publication/immigrants-and-health-in-california/

Chavez, L. (1996). Borders and bridges: Undocumented immigrants from Mexico and Central America. In Origins and destinies: Immigration, race, and ethnicity in

America (pp. 250–262).

Cort, D. A. (2011). Reexamining the ethnic hierarchy of locational attainment: Evidence from Los Angeles. Social Science Research. https://doi.org/10.1016/j.ssresearch.2011.07.003

Donato, K. M., & Armenta, A. (2011). What We Know About Unauthorized Migration. Annual Review of Sociology, 37(1), 529–543. https://doi.org/10.1146/annurev-soc-081309-150216

Fujishiro, K., Hajat, A., Landsbergis, P. A., Meyer, J. D., Schreiner, P. J., & Kaufman, J. D. (2017). Explaining racial/ethnic differences in all-cause mortality in the Multi-Ethnic Study of Atherosclerosis (MESA): Substantive complexity and hazardous working conditions as mediating factors. SSM - Population Health. https://doi.org/10.1016/j.ssmph.2017.05.010

George, U., Thomson, M. S., Chaze, F., & Guruge, S. (2015). Immigrant mental health, a public health issue: Looking back and moving forward. International Journal of Environmental Research and Public Health, 12(10), 13624–13648. https://doi.org/10.3390/ijerph121013624

Goldman, D. P., Smith, J. P., & Sood, N. (2005). Legal status and health insurance among immigrants: It is one's education, income, and place of employment that matter, not one's place of birth. Health Affairs, 24(6), 1640–1653. https://doi.org/10.1377/hlthaff.24.6.1640

Gonzales, R. G. (2011). Learning to be illegal: Undocumented youth and shifting legal contexts in the transition to adulthood. American Sociological Review, 76(4), 602–619. https://doi.org/10.1177/0003122411411901

Gonzales, R. G., & Chavez, L. R. (2012). "Awakening to a Nightmare." Current Anthropology. https://doi.org/10.1086/665414

GREDS, E. (2004). Employment Precarious Scale - Basic Pack 2004. Universitat Pompeu Fabra.

Grzywacz, J. G., Hovey, J. D., Seligman, L. D., Arcury, T. A., & Quandt, S. A. (2006). Evaluating short-form versions of the CES-D for measuring depressive symptoms among immigrants from Mexico. Hispanic Journal of Behavioral Sciences. https://doi.org/10.1177/0739986306290645

Grzywacz, J. G., Quandt, S. A., Chen, H., Isom, S., Kiang, L., Vallejos, Q., & Arcury, T. A. (2010). Depressive symptoms among latino farmworkers across the agricultural season: Structural and situational influences. Cultural Diversity and Ethnic Minority Psychology. https://doi.org/10.1037/a0019722

Hall, M., Greenman, E., & Farkas, G. (2010). Legal Status and Wage Disparities for Mexican Immigrants. Social Forces. https://doi.org/10.1353/sof.2010.0082

Idler, E.L.; Benyamini, Y. (1997). Self-Rated Health and Mortality : A Review of Twenty-Seven Community Studies Author (s): Ellen L . Idler and Yael Benyamini Source. Journal of Health and Social Behaviour.

Johnson, H. (Public P. I. of C., & Sanchez, S. (Public P. I. of C. (2019). Immigrants in california. Retrieved from https://www.ppic.org/publication/immigrants-in-california/

Jradi, H., Alharbi, Z., & Mohammad, Y. (2018). Self-rated health among Saudi women: Association with morbidity, lifestyle, and psychosocial factors. Journal of Epidemiology and Global Health, 8(3–4), 183–188. https://doi.org/10.2991/j.jegh.2018.04.100

Julià, M., Vives, A., Tarafa, G., & Benach, J. (2017). Changing the way we understand precarious employment and health: Precarisation affects the entire salaried population. Safety Science. https://doi.org/10.1016/j.ssci.2017.01.015

Lerman, S., Jung, M., Arredondo, E. M., Barnhart, J. M., Cai, J., Castañeda, S. F., … Kaplan, R. C. (2018). Religiosity prevalence and its association with depression and anxiety symptoms among Hispanic/Latino adults. PLoS ONE, 13(2), 1–14. https://doi.org/10.1371/journal.pone.0185661

Lommel, L. L., & Chen, J. L. (2016). The Relationship Between Self-Rated Health and Acculturation in Hispanic and Asian Adult Immigrants: A Systematic Review. Journal of Immigrant and Minority Health, 18(2), 468–478. https://doi.org/10.1007/s10903-015-0208-y

Marcelli, E. (2004). The institution of unauthorized residency status, neighborhood context, and Mexican immigrant earnings in Los Angeles County. In The

Institutionalist Tradition in Labor Economics (pp. 206–228).

Matilla-Santander, N., González-Marrón, A., Martín-Sánchez, J. C., Lidón-Moyano, C., Cartanyà-Hueso, À., & Martínez-Sánchez, J. M. (2019). Precarious employment and health-related outcomes in the European Union: a cross-sectional study. Critical Public Health, 1–12. https://doi.org/10.1080/09581596.2019.1587385

McConnell, E. D. (2015). Hurdles or walls? Nativity, citizenship, legal status and Latino homeownership in Los Angeles. Social Science Research, 53, 19–33. https://doi.org/10.1016/j.ssresearch.2015.04.009

Mendenhall, E., & Jacobs, E. (2008). Interpersonal Abuse and Depression among Mexican Immigrant Women with Type 2 Diabetes. Bone, 23(1), 1–7. https://doi.org/10.1038/jid.2014.371

Rosemberg, M.-A., & Tsai, J. H.-C. (2018). Population Health is Immigrant Health is Worker Health. American Journal of Public Health, 108(7), e22.

Salkind, N. (2010). Encyclopedia of Research Design. https://doi.org/10.4135/9781412961288 NV - 0

Silva, D. S., Smith, M. J., & Upshur, R. E. G. (2013). Disadvantaging the disadvantaged: When public health policies and practices negatively affect marginalized populations. Canadian Journal of Public Health. https://doi.org/10.17269/cjph.104.3895

Vives, A., Amable, M., Ferrer, M., Moncada, S., Llorens, C., Muntaner, C., … Benach, J.

(2010). The Employment Precariousness Scale (EPRES): Psychometric properties of a new tool for epidemiological studies among waged and salaried workers. Occupational and Environmental Medicine, 67(8), 548–555. https://doi.org/10.1136/oem.2009.048967

Von Werthern, M., Robjant, K., Chui, Z., Schon, R., Ottisova, L., Mason, C., & Katona, C. (2018). The impact of immigration detention on mental health: A systematic review. BMC Psychiatry, 18(1). https://doi.org/10.1186/s12888-018-1945-y

Ward, J., Vines, A., Haan, M., Fernandez-Rhodes, L., Miller, E., & Aiello, A. (2019). Spanish language use across gnerations and depressive symptoms among US Latinos. Child Psychiatry Hum Dev, 50(1), 61–71. https://doi.org/10.1016/j.physbeh.2017.03.040

World Health Organization. (1948). Constitution of the World Health Organization. Geneva.

World Health Organization. (2020). Mental Health. Retrieved May 17, 2020, from https://www.who.int/mental_health/en/

Yoshikawa, H. (2011). Immigrants raising citizens: Undocumented parents and their young children. In Immigrants Raising Citizens: Undocumented Parents and Their Young Children. https://doi.org/10.1080/13876988.2011.606123

Chapter 2

A Comparative Examination of Self-Rated Health Measures among Latin American-Born Workers in California and Spain

2.1 Abstract

Introduction

Foreign-born workers are an under-studied growing population, embodying a diversity of languages and cultures in host countries around the globe. Self-rated health is a useful health outcome to identify health disparities in this population crossing cultures and communities, and can be determined multiple ways. This research assesses different measures as proxies of the same underlying general health variable.

Methods

Data for this analysis came from the 2008 – 2010 Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) study of farmworker families in Central California (n=619), and from the 2008-2009 Immigration, Work and Health Study (ITSAL) of foreign-born workers in four cities across Spain (n=1208). Cumulative logistic regression assessed relationships between predictors and health - initially as one six-category health outcome variable, and then as a joint model with two response sets (excellent, very good, good, fair, poor; and very good, good, fair, poor, very poor), based on study-specific outcomes. The relationships between predictors and health were compared in both models to determine if a shared theoretical underlying continuous variable was appropriate.

Results

Similar relationships were observed in both the model with fixed common self-rated health cut-points, and the model with unfixed (free) study-specific self-rated health cutpoints, providing evidence of a latent general health variable underlying both versions of self-rated health in these studies.

Conclusions

The two self-rated health questions and response sets in these studies measured the same latent general health variable. This statistical approach to assessing latent variable validity across studies may be useful in future research.

2.2 Introduction

Self-rated health (SRH) is a widely accepted measure of a person's comprehensive health status. Asking a person to rate his/her current state of health in a simple question has been repeatedly associated with other objective health measures in a variety of languages, cultures and communities around the world [1-6]. Two common forms of the question exist: (SRH-US: "Would you say that in general your health is…" excellent, very good, good, fair or poor; SRH-WHO: "How would you rate your health right now?" Very good, good, fair, poor or very poor) (Figure 1). Previous research comparing these measures in retired populations over fifty years of age across countries

in Europe concluded that each measure is assessing the same underlying variable, with its own unique cutpoints [7]. Similar hypotheses remain to be tested in both foreign-born workers and people living outside of Europe. This study aims to test the hypothesis that there is an underlying self-rated health variable common to samples of Latin American-born people working in California and Spain.

Self-rated health, as an ordinal categorical outcome variable can be modeled with cumulative logistic regression when the categories are assumed to approximate an underlying continuous measure (latent variable) [8]. Modeling the theoretical latent variable, rather than its measured approximations, allows for the estimation of single parameters that represent the relationships between each predictor and self-rated health. Cumulative logistic regression modeling of a latent self-rated health variable requires the assumption of proportional odds [8] - that the odds of each outcome category have a similar relationship to a given predictor. If the different measures of self-rated health capture the same latent variable, any differences in the continuous models of these outcomes will be negligible. Differences in the number and placements of the models' intercepts are independent of the associations of interest and would not significantly influence the measurement of relationships between self-rated health and the predictors.

This study compares self-rated health measures in samples of Latin American-born workers in California and Spain. In California (MICASA study), the workers were asked the US version of self-rated health (SRH-US), and in Spain (ITSAL study) the workers were asked the World Health Organization version of self-rated health (SRH-WHO). This study aims to assess the validity of a previously conceptualized underlying health variable, this time in younger individuals - specifically foreign-born workers - and to extend the concept of the latent health variable to people outside of Europe. Statistical modeling implications will also be considered for relationships between self-rated health and its potential predictors.

2.3 Materials and Methods

2.3.1 Study Population and Data Collection

This analysis combines two independently collected cross-sectional data sets.

The Inmigración, Trabajo y Salud (ITSAL) Study:

From 2008-2009 a cross-sectional survey was conducted in Spain. A quota sample of foreign-born workers was constructed of the four largest foreign-born collectives (Ecuadorian, Colombian, Moroccan, Romanian) in the four Spanish cities with the largest foreign-born populations (Barcelona, Huelva, Valencia, and Madrid). Inclusion criteria were: residence in Spain for at least one year, employment in Spain for at least

three months, and adequate Spanish language abilities to participate in interviews. Exclusion criteria were Spanish citizenship and work as a professional athlete, artist, graduate student, or business executive. Participants were provided an informative letter explaining their rights and guaranteeing their confidentiality. Participation was voluntary and consent was implied by completion of the survey. Interviews were face-to-face and took place in the community (n=2,434). This analysis utilizes the interview data from Latin American born workers (n=1,208). This study was reviewed and approved by the University of California, Davis, Institutional Review Board (UCD IRB approval #244644). More detailed descriptions of the ITSAL study have been previously published [9, 10].

Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) Study: From 2008-2010 a cross-sectional survey was conducted in Mendota, California, as the second cycle of a three-part longitudinal cohort study of farmworker families. The sample was constructed in 2006 by representative random sampling of households from census blocks selected with stratified area probability sampling. Inclusion criteria were: age 18-55 years, residence in Mendota at baseline (2006-2007), residence in a household with at least one person who worked in agriculture (a minimum of 45 days in the last year), self-identification as Mexican or Central American, and written informed consent. Second cycle interviews were conducted with a 70% household response rate (n=640).

Interviews were conducted face-to-face in the community. This study was reviewed and approved by the University of California, Davis, Institutional Review Board (UCD IRB approval #244644). A comprehensive description of sampling and study methods for the MICASA study exists in the literature [11].

2.3.2 Variable Definitions

Self-Rated Health:

Individuals in each study were asked to rate their health. In the MICASA study, this was assessed with the US self-rated health definition and scale (SRH-US), and in the ITSAL study, this was measured by the WHO self-rated health definition and scale (SRH-WHO). Figure 2.1 illustrates the two categorizations of self-rated health laid over the hypothesized latent health variable.

Demographic and Health Covariates, and Exposures:

The following variables of interest were assessed in both studies: sex (male, female), age (10-year intervals), education (at most primary, more than primary), income (below poverty line, peri-poverty line, above poverty line), and country of birth (MICASA: Mexico, Central America, United States; ITSAL: Ecuador, Colombia). Additional exposures of interest specific to the MICASA study included comfort with taking a break at work (very comfortable, somewhat comfortable, not comfortable), current

smoking status (yes, no), and pesticide exposure at work in the previous year (yes, no). Additional exposures of interest specific to the ITSAL study included type of employment contract (none, temporary, permanent), and type of work permit (none, temporary, permanent).

2.3.3 Analyses

Descriptive statistics were conducted for demographic, socio-economic and exposure variables in each study sample as a whole, and by self-rated health status.

The relationships between the variables of interest and self-rated health were estimated with cumulative logistic regression models. Crude odds ratios and 95% confidence intervals (95% CI) were calculated for all available variables of interest in each study (MICASA: sex, age, country of birth, education, income, pesticide work in the past year; ITSAL: sex, age, country of birth, education, income, type of work permit, type of job contract). An adjusted model was then constructed for each study. Covariates were included in each model in two stages. First, an a priori set of variables were added based on expert opinion and literature review. A second set of variables were then screened in due to statistically significant associations with the outcome ($P < 0.05$). The MICASA model adjusted for sex, age, country of birth, education, income, and work

with pesticides in the last year. The ITSAL model adjusted for sex, age, country of birth, education, income, and type of job contract.

After individual analyses, the two data sets were concatenated. An indicator variable was added to identify each participant's study, and a six-category outcome was created that combined potential self-rated health responses (Figure 1). There was no overlap between samples in the extreme response categories available to participants to rate their health: 'excellent' health was only an option in the MICASA study (SRH-US), and 'very poor' health was only an option in the ITSAL study (SRH-WHO).

Cumulative logistic regression modeling was used to analyze relationships between self-rated health and predictors in the joint data set. The health ratings across the samples were compared via the study indicator variable. The models adjusted for sex, age, income, education, and the study indicator. Two models were constructed: one with the combined six-category self-rated health outcome (excellent, very good, good, fair, poor, very poor), and one without a fixed mutual outcome, with each study's participants self-rated health analyzed along their original scale. Numerical optimization was completed to allow for maximum likelihood estimation of the odds ratio relationships in the models with both shared and study-specific cutpoints in self-rated health. The NL MIXED procedure was used in SAS because logistic regression

would not allow for study-specific thresholds to dichotomize self-rated health (code available upon request.) After constructing both models, the adjusted odds ratios were compared to explore the effects of measuring self-rated health along one continuous underlying variable.

2.4 Results

Variable distributions

The SRH-WHO responses in the ITSAL study's data were more skewed than the SRH-US responses in the MICASA study's data (Table 2.1). ITSAL study participants reported better SRH-WHO health than MICASA study participants SRH-US health. In the ITSAL study, 24% of participants ranked their health as high as possible (very good health), and 21% of participants ranked their health in the lowest categories (fair, poor or very poor health). In the MICASA study, 17% of participants ranked their health in the highest categories (excellent or very good health), and 45% of participants ranked their health in the lowest categories (fair or poor health).

Female participants in the ITSAL study reported poorer SRH-WHO than male ITSAL study participants, while male and female participants in the MICASA sample reported similar SRH-US levels. ITSAL participants reported higher levels of education than

MICASA participants, although the relationship between education and self-rated health did not emerge as significant in either sample.

Associations between self-rated health measures and covariates, separately by study

In the MICASA sample, crude analyses indicated that female sex, older age, less education, and no work with pesticides in the past year were associated with greater odds of poorer SRH-US. After adjustment, females (OR 1.72, 95% CI 1.32 – 2.22), older individuals (OR 1.06, 95% CI 1.04 – 1.08), and Central American-born individuals (OR 1.41, 95% CI 1.01 – 1.98) were observed to have increased odds of poorer self-rated health compared to their male, younger, and Mexican-born counterparts, respectively (Table 2.2).

Female sex, older age, and lower income were associated with greater odds of poorer SRH-WHO (Table 2.2). After adjustment, age was the only significant predictor of SRH-WHO, with older individuals reporting poorer health than their younger counterparts.

Associations between self-rated health and covariates, jointly in both samples

Two models were generated: first, with a six-category outcome that was forced with the same SRH cutpoints, and second, with free SRH cutpoints for each study's responses (Table 2.3).

The measured relationships between covariate and self-rated health outcomes varied very little between models, with the only statistically significant change in the effect of the study identifying indicator-variable.

2.5 Discussion

The distribution of health self-ratings in this analysis was weighted more toward good health in the ITSAL study with SRH-WHO than it was in the MICASA study with SRH-US. While the lack of overlap in measures between the studies prevents direct conclusions about the relative health of the two study populations, it can be noted that previous research has found SRH-US to be biased towards better health ratings than SRH-WHO [7]. This finding from the European SHARE study, together with the observation in this paper that participants reported worse health by the SRH-US measure than by the SRH-WHO measure, suggests that the MICASA study population may be experiencing poorer health than the ITSAL study population.

Previous research has shown that self-rated health measures are associated with objective health measures [1, 3, 4, 6]. In single populations, different self-rated health measures have been compared for concordance, as well as respective relationships with demographic and health covariates [7]. Individual measures of self-rated health have also been compared across cultures and communities to help add to the understanding

of these self-reports as reasonable predictors of health [1]. These studies cover a broad range of geographic, cultural, and demographic study settings. This study builds on existing literature comparing of multiple self-rated health measures in retired populations across Europe [7] and begins to explore different self-rated health measures in foreign-born workers between California and Spain.

Existing literature has consistently found that female sex is associated with poorer self-rated health. In contrast, significant variation was not observed in SRH-US reports between male and female participants in the MICASA study. Gender patterns in SRH-WHO reports among ITSAL study participants did agree with the general self-rated health trends established in the literature, with poorer SRH-WHO reported by female participants than their male counterparts.

When the two samples were jointly analyzed, statistically significant associations emerged consistently between self-rated health and sex, age, and income, both with forced literal concordance between SRH cut-points, and with SRH cutpoints that varied freely by study. This agrees with findings from earlier research showing that both SRH measures (SRH-US and SRH-WHO) assess the same underlying health variable.

Limitations of this analysis include differences between the two studies. Each study population was asked only one version of self-rated health, and the study design, sampling methods, and question order varied between the studies. This limits the ability to draw clear conclusions about concordance between the two measures within individuals, and to draw valid comparisons about the relative health levels of the two samples.

Strengths of this study include a first look at comparing these two global health measures in workers, foreign-born individuals, and people less than fifty years of age, as well as a novel approach to assessing the commonality of a latent variable across response sets and samples by constructing maximum likelihood estimates in regression models with numerical optimization.

The results of this analysis agree with those of earlier studies, indicating that the latent-health-variable concept for self-rated health versions holds in these samples of foreign-born workers. Analyses with fixed or free cut-points of this underlying variable yield similar findings in this study and are taken to be comparable. Further, there is evidence here that general health may be poorer in foreign-born farmworker families in California than in foreign-born workers across Spain. Additional investigation is warranted to explore this hypothesis further.

References

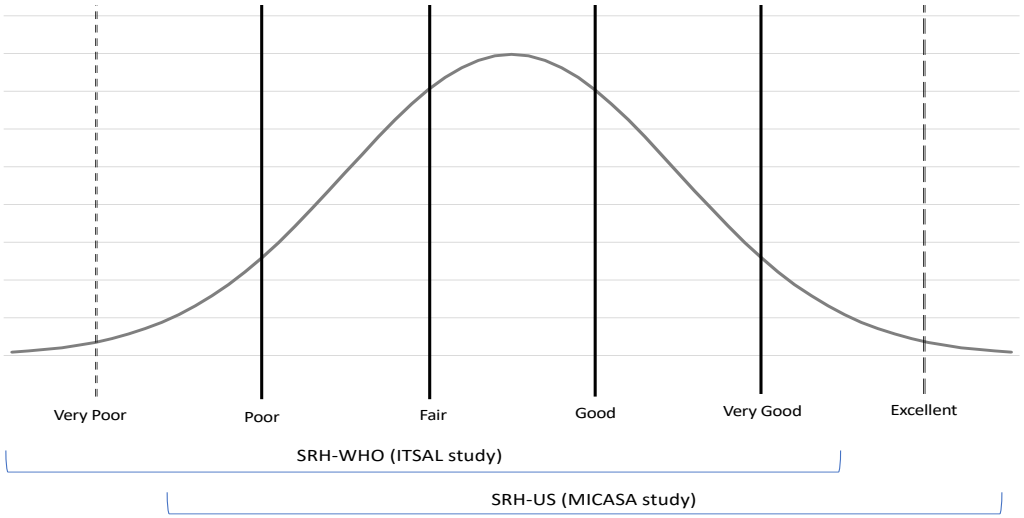
1. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. J Health Soc Behav. 1997;38(1):21-37.
2. Newbold KB. Self-rated health within the Canadian immigrant population: risk and the healthy immigrant effect. Soc Sci Med. 2005;60(6):1359-70.
3. Mejia G, Armfield J, Jamieson L. Self-rated oral health and oral health-related factors: the role of social inequality. Australian dental journal. 2014;59(2):226-33.
4. Hasegawa T. Average and healthy life expectancies and self-rated health in the European country. Nihon Ronen Igakkai Zasshi. 2014;51(2):144-50.
5. Lee S, Schwarz N, Goldstein LS. Culture-Sensitive Question Order Effects of Self-Rated Health Between Older Hispanic and Non-Hispanic Adults in the United States. Journal of aging and health. 2014.
6. Meng Q, Xie Z, Zhang T. A single-item self-rated health measure correlates with objective health status in the elderly: a survey in suburban Beijing. Front Public Health. 2014;2:27.
7. Jurges H, Avendano M, Mackenbach JP. Are different measures of self-rated health comparable? An assessment in five European countries. Eur J Epidemiol. 2008;23(12):773-81.
8. Agretsi A. An Introduction to Categorical Data Analysis. 2nd Edition ed. John Wiley & Sons I, editor. Hoboken, NJ: John Wiley & Sons, Inc; 2007.

9. Agudelo-Suarez AA, Ronda-Perez E, Gil-Gonzalez D, Vives-Cases C, Garcia AM, Garcia-Benavides F, et al. [The migratory process, working conditions and health in immigrant workers in Spain (the ITSAL project)]. Gac Sanit. 2009;23 Suppl 1:115-21.

10. Delclos CE, Benavides FG, Garcia AM, Lopez-Jacob MJ, Ronda E. From questionnaire to database: field work experience in the 'Immigration, work and health survey' (ITSAL Project). Gac Sanit. 2011;25(5):419-22.

11. Stoecklin-Marois MT, Hennessy-Burt TE, Schenker MB. Engaging a hard-to-reach population in research: sampling and recruitment of hired farm workers in the MICASA study. J Agric Saf Health. 2011;17(4):291-302.

Figure 2.1. Health Status as a Latent Variable Categorized in Two Ways



= Response specific to SRH-WHO

= Response shared by SRH-WHO and SRH-US

= Response specific to SRH-US

Table 2.1. Descriptive Profile of Self-Rated Health in MICASA 2008 and ITSAL 2008 Samples.

	MICASA 2008						ITSAL 2008					
	Total	Excellent	Very Good	Good	Fair	Poor	Total	Very good	Good	Fair	Poor	Very Poor
Overall	**619**	8.4%	8.9%	37.6%	41.0%	4.0%	**1208**	24.1%	54.9%	17.8%	2.6%	0.7%
Demographics												
Sex												
Male	277	11.2	12.3	36.1	36.5	4	584	27.6	57.2	13.4	1.5	0.3
Female	342	6.1	6.1	38.9	44.7	4.1	624	20.8	52.7	22	3.5	1
Age (mean±SE)	40.8 ±1.1											
Country of birth												
Mexico	424	8.5	9.2	40.3	38.2	3.8	--	--	--	--	--	--
Central America	172	8.1	7.6	33.7	47.7	2.9	--	--	--	--	--	--
US	20	10	15	20	50	5	--	--	--	--	--	--
Ecuador	--	--	--	--	--	--	611	19.3	56.3	20.6	2.6	1.1
Colombia	--	--	--	--	--	--	597	29	53.4	14.9	2.5	0.2
SES												
Education												
<= primary	402	7.2	8.2	37.1	43.3	4.2	262	24.4	50.8	21.8	2.7	0.4
> primary	215	10.7	9.8	39.1	36.7	3.7	943	23.9	56.1	16.8	2.5	0.7
Income												
Exposures												
Taking Breaks												
Very comfortable	430	9.5	8.4	37.7	40	4.4	--	--	--	--	--	--
Somewhat comfortable	132	6.1	11.4	33.3	46.2	3	--	--	--	--	--	--
Uncomfortable*	29	3.4	6.9	34.5	48.3	6.9	--	--	--	--	--	--
Current Smoker												
Yes	45	6.7	13.3	33.3	42.2	4.4	--	--	--	--	--	--
No	574	8.5	8.5	38	40.9	4	--	--	--	--	--	--
Pesticide work in last year												
Yes	34	20.6	14.7	35.3	29.4	0	--	--	--	--	--	--
No	552	7.8	8.7	36.8	42.6	4.2	--	--	--	--	--	--
Work permit												
None	--	--	--	--	--	--	178	23	57.3	15.7	2.8	1.1
Temporary	--	--	--	--	--	--	697	23.5	54.4	19.1	2.4	0.6
Permanent	--	--	--	--	--	--	333	25.8	54.7	16.2	2.7	0.6
Job contract												
None	--	--	--	--	--	--	277	26.4	50.9	19.5	2.5	0.7
Temporary	--	--	--	--	--	--	501	24	55.7	17.8	2	0.6
Permanent	--	--	--	--	--	--	430	22.8	56.5	16.7	3.3	0.7

-- denotes variables and/or values that were not available in the respective study because they were not collected.
* Uncomfortable is a built from responses: neither comfortable nor uncomfortable, a little uncomfortable, or very uncomfortable.

Table 2.2. Factors associated with poorer self-rated health: MICASA 2008 and ITSAL 2008 samples.

	MICASA 2008				ITSAL 2008			
	Crude		Adjusted		Crude		Adjusted	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Demographics								
Sex								
female	1.0		1.0		1.0		1.0	
male	0.64	(0.51, 0.81)	0.58	(0.45, 0.76)	0.77	(0.62, 0.96)	0.84	(0.66, 1.06)
Age	1.05	(1.04, 1.07)	1.06	(1.04, 1.08)	1.02	(1.01, 1.03)	1.02	(1.01, 1.04)
Country of birth								
Mexico	1.0		1.0		--		--	
Cen America	1.36	(0.99, 1.89)	1.41	(1.01, 1.98)	--		--	
US	1.30	(0.58, 2.89)	2.02	(0.92, 4.42)	--		--	
Ecuador	--		--		1.0		1.0	
Colombia	--		--		0.99	(0.80, 1.23)	0.95	(0.75, 1.19)
SES								
Education								
> primary	1.0		1.0		1.0		1.0	
primary or less	1.35	(1.09, 1.67)	0.95	(0.72, 1.26)	1.27	(0.98, 1.65)	1.15	(0.88, 1.51)
Income^	1.0	(1.00, 1.00)	1.0	(1.00, 1.00)	0.97	(0.94, 0.99)	0.97	(0.94, 1.01)
Exposures								
Pesticide work								
yes	1.0		1.0		--		--	
no	2.52	(1.15, 5.57)	2.13	(0.85, 5.33)	--		--	
work permit								
none	--		--		1.0		not in adjusted model	
temporary	--		--		0.92	(0.64, 1.30)		
permanent	--		--		1.06	(0.82, 1.36)		
job contract								
none	--		--		1.0		1.0	
temporary	--		--		1.18	(0.90, 1.56)	0.97	(0.75, 1.25)
permanent	--		--		0.95	(0.74, 1.22)	1.15	(0.88, 1.51)

-- denotes variables and/or values that were not available in the respective study because they were not collected.

^ dollars/year in the US, euros/month in Spain

Table 2.3. Factors associated with poorer self-rated health in MICASA 2008 and ITSAL 2008 samples, jointly.

		Free assignment of response		Fixed – 6 category outcome	
		Adjusted		Adjusted	
		OR	95% CI	OR	95% CI
Demographics					
Sex					
	Female	1.0		1.0	
	Male	0.63	(0.53, 0.76)	0.64	(0.54, 0.77)
Age		0.96	(0.95, 0.97)	0.96	(0.96, 0.97)
SES					
Education					
	> primary	1.0		1.0	
	<= primary	1.02	(0.83, 1.26)	1.03	(0.84, 1.27)
Income		1.25	(1.08, 1.45)	1.25	(1.09, 1.45)
Exposures					
Study					
	MICASA	0.42	(0.3, 0.58)	1.76	(1.42, 2.18)
	ITSAL	1.0		1.0	

Chapter 3

Precarious Employment, Undocumented Legal Status, and Self-Rated Health in a Cohort of California Farmworkers: the MICASA Study

3.1 Abstract

Introduction: Immigrant workers comprise a large population, particularly in selected industries such as agriculture. Factors affecting their health thus represent an important public health concern. This study explores the relationship between undocumented status, precarious employment, and self-rated health in Mexican and Central American-born farm workers in California's Central Valley.

Methods: Data were used from the 2008 – 2010 Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) Study in a farmworker community in Mendota, California (n=504). Logistic regression was used to explore the relationships between undocumented status and precarious employment, and how these relate to self-rated health (individually and jointly). Undocumented status was assessed indirectly through a four-item scale developed by the Robert Wood Johnson Foundation. Precarious employment was measured via a modified version of a 26-item Spanish Employment Precariousness Scale (EPRES).

Results: Better self-rated health was associated with more education, younger age, and fewer years worked in agriculture. Undocumented individuals were more likely to be female, have more years of education, and be born in Mexico than their authorized

counterparts. The undocumented individuals in this study had also lived in the United States for less time and were less likely to have worked in agriculture for more than 10 years, than were their authorized counterparts. Poor health was not significantly associated with undocumented status or high precariousness of employment, and a significant association between precariousness of employment and undocumented status also was not found.

Conclusions: This profile of undocumented workers in a community context adds to the growing research working to understand the effects of undocumented status for Latin American-born people living in the United States. Expected relationships between undocumented status, high precariousness of employment, and self-rated health were not observed in this study.

3.2 Introduction

Immigrant workers are an important subpopulation to consider when working toward population health equity, at the intersection of two accepted social determinants of health: migration and work (Ahonen, Fujishiro, Cunningham, & Flynn, 2018; Rosemberg & Tsai, 2018). This paper offers a look at how immigrant workers rate their health and the potential relationships between this self-rated health status, the legal

authorization to be in the United States, and the precariousness of employment. The participants studied here were part of a cohort of farm-working families in an agricultural community in California's Central Valley, as part of the larger Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) study (Stoecklin-Marois, Hennessy-Burt, & Schenker, 2011).

3.3 Background

Foreign-Born Californians

More than one quarter of the people living in California in 2017 were born outside of the United States (27%; 11 million people). Of these foreign-born Californians, about half were naturalized citizens (52%), approximately half of the remaining group had some legal authorization to be in the United States (i.e., green card, visa; 25%), and approximately half were living in California without legal authorization (23%). Fifty percent of foreign-born Californians had emigrated from Latin American countries, and 40% had emigrated from Asian countries. Two thirds of foreign-born Californians spoke proficient English, and differences were small between those who had come to California more than 5 years prior and more recent immigrants to California.

Education amongst foreign-born Californians was bimodal. Approximately one third of foreign-born Californians did not have a high school diploma, approximately one third had at least a bachelor's degree, and a significant subgroup was noted of recent highly educated immigrants from Asian countries.

An excellent profile of foreign-born population in California was completed by the Public Policy Institute in California (Cha, 2019; Johnson & Sanchez, 2019).

Legal Status

Legal status is an important variable in migration health research. Legal vulnerability through undocumented status has been associated with social determinants of health, including limited housing options, decreased access to health insurance, limited educational opportunities, and limited upward mobility (Abrego, 2006; Chavez, 1996; Cort, 2011; Donato & Armenta, 2011; Goldman, Smith, & Sood, 2005; Gonzales, 2011; Gonzales & Chavez, 2012; Hall, Greenman, & Farkas, 2010; Marcelli, 2004; McConnell, 2015b; Yoshikawa, 2011). These associations have been found to persist even among young people who are fluent in English and consider themselves to be American. An

excellent review of legal status literature can be found in McConnell's 2015 study on legal status and home ownership (McConnell, 2015a).

Undocumented status has also been shown to have an impact on the family environment, including quality of parent-child relationships and overall child well-being (Von Werthern et al., 2018). Undocumented status has also been shown to amplify the negative effects immigrant detention has on mental health (Von Werthern et al., 2018).

The direct associations between health and undocumented status in foreign-born farmworker families has not yet been found in the literature.

Work

Work has been accepted in the literature as an important social determinant of health and a lens for which to better understand and address health inequities (Ahonen et al., 2018). Work offers a physical convergence of several other social determinants of health and serves as a point of articulation between individuals and social and structural institutions. The relationship between work and health is complex, has not yet been

fully examined, and needs further investigation. Work is intertwined with socio-economic status, and often segregated by race, gender, age, geographic location, educational attainment, and income. Looking at health inequities through a work lens offers a perspective on the roots of inequities, and with that potential ways to address them. (Ahonen et al., 2018)

By example, analyses have shown that a large portion of the variation in mortality by race can be explained by less complex work (complex work is health protective). This research identified strategies to reverse job simplification and offer complex work opportunities more uniformly to address injustice. (Fujishiro et al., 2017)

An excellent review of work as a social determinant of health can be found in more detail in the work of Emily Ahonen, et al (Ahonen et al., 2018).

Precarious Employment

Precarious employment is defined as, 'a lack of regulations that support the standard employment relationship, making workers more vulnerable.' (Benach et al., 2014) These types of work arrangements have been associated with a variety of health

measures, including cardiovascular disease, occupational injuries, musculoskeletal problems, infectious disease, respiratory problems, and changes in mental health (Benach et al., 2014; Canivet et al., 2016; Julià, Vives, Tarafa, & Benach, 2017; Matilla-Santander et al., 2019). Precarious employment has been described as a multidimensional construct, and for the purpose of these analyses is defined by the validated Employment Precariousness Scale (EPRES), built on the dimensions of temporariness, disempowerment, vulnerability, wages, rights, and capacity to exercise rights (Vives et al., 2010). The scale is scored based on instructions from GREDS/Emconet (GREDS, 2004).

Excellent summaries of precarious employment can be found in the literature, with examples by Vives (Vives et al., 2010), Matilla (Matilla-Santander et al., 2019), and Benach (Benach et al., 2014).

Self-Rated Health

Health is defined as, 'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity' in the preamble of the World Health Organization (WHO) constitution (Jradi, Alharbi, & Mohammad, 2018; World Health

Organization, 1948). Self-rated health is a global measure of a person's overall health and well-being that has been accepted as a reliable measure for monitoring population health by both the United States Center for Disease Control (CDC) and the WHO (Lommel & Chen, 2016). Self-rated health is captured with one question answered on a 4- or 5-point Likert scale. The question is commonly asked, "In general, would you say your health is excellent, very good, good, fair, or poor?" (Jradi et al., 2018). This metric has been used across languages and cultures as a measure of general health assessment and quality of life, and in clinical studies as a predictor of morbidity and mortality (Idler & Benyamini, 1997). Self-rated health has known variability by gender (with males reporting better self-rated health than females) (Idler & Benyamini, 1997).

3.4 Methods

Data Collection & Study Population

A comprehensive description of sampling and study methods for the MICASA study exists in the literature (Stoecklin-Marois et al., 2011). In brief, from 2010-2011, a cross-sectional survey was conducted in Mendota, California, as the final wave of a three-part longitudinal cohort study of farmworker families. The sampling was performed in 2006 by representative random selection of households from census blocks chosen with

stratified area probability sampling (Mines, Ward, & Schenker, 2014). Eligibility criteria for participants included: age 18-55, residence in Mendota at baseline (2006-2007), living in a household with at least one person who worked in agriculture (a minimum of 45 days in the last year), self-identification as Mexican or Central American, and written informed consent. Second wave interviews were conducted with a 79% household response proportion (n = 504). Interviews were conducted face-to-face in the Mendota community.

Variables

Self-Rated Health

Participants were asked to rate their current health status ("Would you say that in general your health is…") on a five-point Likert scale (excellent, very good, good, fair, poor). Responses were dichotomized into good (excellent, very good, or good) and poor (fair or poor) health, in accordance with established methods from the literature.

Exposures of Interest

Documentation status was assessed using a four-item scale previously implemented by

multiple researchers and generally accepted as an indirect proxy measure for legal status (McConnell, 2015a; Rodríguez, Vargas Bustamante, & Ang, 2009). Each participant responded to the following questions: What year did you enter the United States?; Are you a citizen of the United States?; Are you a legal permanent resident of the United States?; Do you have a picture identification document issued by any U.S. government office?. If responses to the last three questions were all negative, the individual was classified as undocumented for the purposes of this analysis. The response proportion for these items was 99%.

Precarious employment was measured with a 26-item scale built on six dimensions attempting to quantify power dynamics in an individual's employment situation. The six dimensions include: temporariness, disempowerment, vulnerability, wages, rights, and the capacity to exercise rights. This scale was developed in Spain (Vives et al., 2010), has been used and validated, and has been modified for our purposes in this sample via expert consultation and participant feedback (Appendix 1). Subscale scores are calculated for each of the six dimensions, and these are transformed onto a 0 to 4 scale. These subscale scores are combined using an established scoring algorithm into a global EPRES score, which is then transformed onto a 0 to 4 scale, with 4 representing the most precarious employment (GREDS, 2004; Vives et al., 2010).

Demographic and Health Covariates

The following potential covariates were measured and considered for adjustment in our analyses: sex (male, female), current age (10-year intervals), age at migration (under 18, 18 and older), education (at most primary, more than primary), income (below poverty line, peri-poverty line, above poverty line), years worked in agriculture (up to 10 years, more than 10 years), and country of birth (Mexico, Central America, United States).

Analyses

Descriptive analyses were first conducted for all variables in the whole study population, and then separately for those categorized as documented and undocumented. Frequency distributions were examined, and chi-square tests of homogeneity were used to assess the association of categorical variables with good self-rated health and with documentation status, controlling the per-comparison type-1 error rate at five percent. Age was analyzed as a continuous variable, with Student t-tests used for assessing bivariate differences by good self-rated health and by documentation status. All other ordinal variables were dichotomized and analyzed accordingly as two-level variables.

Logistic regression models were constructed with SAS 9.3 software (Cary, NC). To assess mediation, we fit separate models corresponding to the classical Baron-Kenny steps (Kenny, 2016). Among these were models that specified: (1) self-rated health as an outcome with documentation status as an exposure, (2) self-rated health as an outcome with precarious employment as an exposure, (3) precarious employment as an outcome with documentation status as an exposure, and (4) self-rated health as an outcome with both documentation status and precarious employment as exposures. All models were fit without and with adjustment for sex and age. Self-rated health, precarious employment and documentation status were each analyzed as binary variables. Generalized estimating equation models were considered for further examination of mediation effects. These models were not needed because no significant associations emerged from initial analyses.

3.5 Results

Better self-rated health was associated with more education (Table 3.1). Age appeared to follow expected trends from the existing literature (better self-rated health was associated with younger age), as did years worked in agriculture (better self-rated health associated with fewer years worked in agriculture), although neither association

was statistically significant. Notably, an association was not observed between self-rated health and sex, as seen in several previous studies. Self-rated health was not significantly associated with any other covariates.

Females, those with more education, those born in Mexico, those who had worked in agriculture for less than 10 years, and those with less time in the United States were significantly more likely to be undocumented in this sample (Table 3.2). Although the associations were not statistically significant, older individuals, individuals who immigrated after age 18, and individuals with high precariousness of employment were also more likely to be undocumented.

Odds ratios were calculated using logistic regression to further explore these relationships (Table 3.3). In testing the modified Baron-Kenny procedure: (1) the odds of self-reported poor health was not significantly different by documentation status, (2) the odds of self-reported poor health was not significantly different by level of precariousness of employment, (3) the odds of precarious employment was not significantly different by documentation status, (4) the complete model with both precarious employment and documentation status as exposures of interest for the self-rated health outcome found almost no change in the above described relationships.

3.6 Discussion

The hypothesized relationships between documentation status, precarious employment, and self-rated health were not observed in the data analyzed in this study. This may be due to the potential for measurement error in the indirect assessment of documentation status, the extrapolation of a European sociologic scale for precarious employment to an sample in California, the breadth and subjectivity of self-rated health as an outcome measure, the potential for incorrectly hypothesized relationships, a lack of adequate sample size or insufficient variation in key predictors in this sample to ensure sufficiently narrow confidence intervals for the odds ratios of interest, or any combination of the above (Colegrave & Ruxton, 2003). The strength of the qualitative evidence, theoretical constructs, and previous quantitative analyses of similar variables in other samples support a theory of inaccurate measurement of documentation status, precarious employment, and/or health status, rather than lending strength to an argument against relationships between these variables.

This profile of a representative sample of farm worker families in Mendota, a community in California's Central Valley adds to the growing understanding of the effects of undocumented status and employment relations in foreign-born workers. The individuals selected methodically from a community of farmworker families and

studied for this analysis were more likely to be identified as undocumented if they were female, had comparatively more education, had been in the U.S. for a comparatively short tenure, and had been born in Mexico (as opposed to Central America).

Limitations of this study include a general, subjective outcome (self-rated health), insufficient precision in estimating effects of key predictors (as evidenced by wide confidence intervals) , as well as analysis of relatively new variables that are difficult to measure, without existing gold-standard reliable methods (e.g., documentation status and precarious employment). Strengths include a community-based approach, and a cohort with a long-standing relationship with study investigators prior to collecting data on sensitive variables, such as documentation status. The use of a detailed, specific precarious employment scale that was designed and studied in other samples of foreign-born workers also adds to the quality of this analysis.

This profile of foreign-born farmworker families by documentation status and precarious employment provides a first look at these hard-to-research and hardly researched variables. The description of this sample may suggest factors associated with undocumented status in communities of foreign-born farmworker families and does not provide significant evidence of relationships between precarious employment, documentation status, and self-rated health. Future research should continue to explore

effective methods to ascertain documentation status and employment relations, and the health implications of these factors in foreign-born farmworker families, thereby continuing this line of inquisition to build a healthier society for all people.

References

Abrego, L. J. (2006). "I Can't Go to College Because I Don't Have Papers": Incorporation Patterns Of Latino Undocumented Youth. *Latino Studies*. https://doi.org/10.1057/palgrave.lst.8600200

Ahonen, E. Q., Fujishiro, K., Cunningham, T., & Flynn, M. (2018). Work as an inclusive part of population health inequities research and prevention. *American Journal of Public Health*, *108*(3), 306–311. https://doi.org/10.2105/AJPH.2017.304214

Benach, J., Vives, A., Amable, M., Vanroelen, C., Tarafa, G., & Muntaner, C. (2014). Precarious Employment: Understanding an Emerging Social Determinant of Health. *Annual Review of Public Health*, *35*(1), 229–253. https://doi.org/10.1146/annurev-publhealth-032013-182500

Canivet, C., Bodin, T., Emmelin, M., Toivanen, S., Moghaddassi, M., & Östergren, P. O. (2016). Precarious employment is a risk factor for poor mental health in young individuals in Sweden: A cohort study with multiple follow-ups. *BMC Public Health*, *16*(1). https://doi.org/10.1186/s12889-016-3358-5

Cha, P. (Public P. I. of C. (2019). *Immigrants and Health in California*. Retrieved from https://www.ppic.org/publication/immigrants-and-health-in-california/

Chavez, L. (1996). Borders and bridges: Undocumented immigrants from Mexico and Central America. In *Origins and destinies: Immigration, race, and ethnicity in America* (pp. 250–262).

Colegrave, N., & Ruxton, G. D. (2003, May). Confidence intervals are a more useful

complement to nonsignificant tests than are power calculations. *Behavioral Ecology*, Vol. 14, pp. 446–447. https://doi.org/10.1093/beheco/14.3.446

Cort, D. A. (2011). Reexamining the ethnic hierarchy of locational attainment: Evidence from Los Angeles. *Social Science Research*. https://doi.org/10.1016/j.ssresearch.2011.07.003

Donato, K. M., & Armenta, A. (2011). What We Know About Unauthorized Migration. *Annual Review of Sociology*, *37*(1), 529–543. https://doi.org/10.1146/annurev-soc-081309-150216

Fujishiro, K., Hajat, A., Landsbergis, P. A., Meyer, J. D., Schreiner, P. J., & Kaufman, J. D. (2017). Explaining racial/ethnic differences in all-cause mortality in the Multi-Ethnic Study of Atherosclerosis (MESA): Substantive complexity and hazardous working conditions as mediating factors. *SSM - Population Health*. https://doi.org/10.1016/j.ssmph.2017.05.010

Goldman, D. P., Smith, J. P., & Sood, N. (2005). Legal status and health insurance among immigrants: It is one's education, income, and place of employment that matter, not one's place of birth. *Health Affairs*, *24*(6), 1640–1653. https://doi.org/10.1377/hlthaff.24.6.1640

Gonzales, R. G. (2011). Learning to be illegal: Undocumented youth and shifting legal contexts in the transition to adulthood. *American Sociological Review*, *76*(4), 602–619. https://doi.org/10.1177/0003122411411901

Gonzales, R. G., & Chavez, L. R. (2012). "Awakening to a Nightmare." *Current Anthropology*. https://doi.org/10.1086/665414

GREDS, E. (2004). *Employment Precarious Scale - Basic Pack 2004*. Universitat Pompeu Fabra.

Hall, M., Greenman, E., & Farkas, G. (2010). Legal Status and Wage Disparities for Mexican Immigrants. *Social Forces*. https://doi.org/10.1353/sof.2010.0082

Idler, E. L., & Benyamini, Y. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior*. https://doi.org/10.2307/2955359

Johnson, H. (Public P. I. of C., & Sanchez, S. (Public P. I. of C. (2019). *Immigrants in california*. Retrieved from https://www.ppic.org/publication/immigrants-in-california/

Jradi, H., Alharbi, Z., & Mohammad, Y. (2018). Self-rated health among Saudi women: Association with morbidity, lifestyle, and psychosocial factors. *Journal of Epidemiology and Global Health*, *8*(3–4), 183–188. https://doi.org/10.2991/j.jegh.2018.04.100

Julià, M., Vives, A., Tarafa, G., & Benach, J. (2017). Changing the way we understand precarious employment and health: Precarisation affects the entire salaried population. *Safety Science*. https://doi.org/10.1016/j.ssci.2017.01.015

Kenny, D. (2016). Mediation. Retrieved January 17, 2017, from http://davidakenny.net/cm/mediate.htm

Lommel, L. L., & Chen, J. L. (2016). The Relationship Between Self-Rated Health and Acculturation in Hispanic and Asian Adult Immigrants: A Systematic Review. *Journal of Immigrant and Minority Health*, *18*(2), 468–478.

https://doi.org/10.1007/s10903-015-0208-y

Marcelli, E. (2004). The institution of unauthorized residency status, neighborhood context, and Mexican immigrant earnings in Los Angeles County. In *The Institutionalist Tradition in Labor Economics* (pp. 206–228).

Matilla-Santander, N., González-Marrón, A., Martín-Sánchez, J. C., Lidón-Moyano, C., Cartanyà-Hueso, À., & Martínez-Sánchez, J. M. (2019). Precarious employment and health-related outcomes in the European Union: a cross-sectional study. *Critical Public Health*, 1–12. https://doi.org/10.1080/09581596.2019.1587385

McConnell, E. D. (2015a). Hurdles or walls? Nativity, citizenship, legal status and Latino homeownership in Los Angeles. *Social Science Research*, *53*, 19–33. https://doi.org/10.1016/j.ssresearch.2015.04.009

McConnell, E. D. (2015b). Restricted movement: Nativity, citizenship, legal status, and the residential crowding of Latinos in Los Angeles. *Social Problems*, *62*(1), 141–162. https://doi.org/10.1093/socpro/spu007

Mines, R., Ward, C., & Schenker, M. (2014). Prior Enumeration: A Methods for Enhanced Sampling with Migrant Surveys. In *Migration and Health: A Research Methods Handbook* (pp. 192–205). University of California Press.

Rodríguez, M. A., Vargas Bustamante, A., & Ang, A. (2009). Perceived quality of care, receipt of preventive care, and usual source of health care among undocumented and other Latinos. *Journal of General Internal Medicine*, *24*(3 SUPPL.). https://doi.org/10.1007/s11606-009-1098-2

Rosemberg, M.-A., & Tsai, J. H.-C. (2018). Population Health is Immigrant Health is

Worker Health. *American Journal of Public Health*, *108*(7), e22.

Stoecklin-Marois, M. T., Hennessy-Burt, T. E., & Schenker, M. B. (2011). Engaging a hard-to-reach population in research: Sampling and recruitment of hired farm workers in the MICASA study. *Journal of Agricultural Safety and Health*.

Vives, A., Amable, M., Ferrer, M., Moncada, S., Llorens, C., Muntaner, C., … Benach, J. (2010). The Employment Precariousness Scale (EPRES): Psychometric properties of a new tool for epidemiological studies among waged and salaried workers. *Occupational and Environmental Medicine*, *67*(8), 548–555. https://doi.org/10.1136/oem.2009.048967

Von Werthern, M., Robjant, K., Chui, Z., Schon, R., Ottisova, L., Mason, C., & Katona, C. (2018). The impact of immigration detention on mental health: A systematic review. *BMC Psychiatry*, *18*(1). https://doi.org/10.1186/s12888-018-1945-y

World Health Organization. (1948). *Constitution of the World Health Organization*. Geneva.

Yoshikawa, H. (2011). Immigrants raising citizens: Undocumented parents and their young children. In *Immigrants Raising Citizens: Undocumented Parents and Their Young Children*. https://doi.org/10.1080/13876988.2011.606123

Table 3.1. Descriptive profile of self-rated health in 504 members of farmworker families in Mendota, CA, in 2010 (MICASA study, final survey data).

	Total+	Excellent/Very Good/Good		Fair/Poor	
	N	n	%	N	%
Total	504	281	*55.8*	221	*43.8*
Sex					
Male	222	124	*55.9*	97	*43.7*
Female	282	157	*55.7*	124	*44.0*
Age (SD)	43.7 +/- 10.4	42.2 +/- 10.2		45.4 +/- 10.4	
Marital status					
Married, or living as^	459	258	*56.2*	199	*43.4*
Single, or living as^^	44	22	*50.0*	22	*50.0*
Education*					
primary or less	309	152	*49.2*	155	*50.2*
> primary	182	122	*67.0*	60	*33.0*
Age at migration					
under 18	84	53	*63.1*	30	*35.7*
18 and over	389	210	*54.0*	178	*45.8*
Documentation Status					
documented	384	207	*53.9*	175	*45.6*
undocumented	116	72	*62.1*	44	*37.9*
Precariousness of Employment					
low/moderate	307	166	*54.1*	141	*45.9*
High	161	92	*57.1*	67	*41.6*
Country of Birth					
US	16	12	*75.0*	4	*25.0*
Mexico	339	194	*57.2*	144	*42.5*
Central America^^^	134	69	*51.5*	64	*47.8*
Years in Agriculture					
<=10	144	88	*61.1*	55	*38.2*
> 10	358	192	*53.6*	165	*46.1*
Years in the US					
<=10	51	28	*54.9*	22	*43.1*
11 to 20	210	117	*55.7*	93	*44.3*
21+	241	135	*56.0*	105	*43.6*

+ n=504, but some participants did not respond to all questions. Subtotals vary.
*Significant association between education and self-rated health ($p < 0.001$)
^ Married, or living as, includes individuals who are married, living with a partner, or temporarily separated
^^ Single, or living as, includes individuals who are single, divorced, permanently separated or widowed.
^^^ Central America includes individuals born in El Salvador, Honduras, Nicaragua, and Guatemala

Table 3.2. Descriptive profile of documentation status in 504 members of farmworker families in Mendota, CA, in 2010 (MICASA study, final survey data). P-values refer to tests of association between documentation status and demographic variables.

	Total[+]	**Undocumented**		**Documented**	
	N	n	%	N	%
Total	504	116	*23.0*	384	*76.2*
Sex	p=0.0003				
Male	222	34	*15.3*	185	*83.3*
Female	282	82	*29.1*	199	*70.6*
Age (SD)	43.7 +/- 10.4	45.8 +/- 10.3		36.6 +/- 7.2	
Marital status	p=0.646				
Married, or living as ^	459	107	*23.3*	348	*75.8*
Single, or living as ^^	44	9	*20.5*	35	*79.5*
Education	p=0.0159				
primary or less	309	61	*19.7*	246	*79.6*
> primary	182	52	*28.6*	129	*70.9*
Age at migration	p=0.222				
under 18	84	15	*17.9*	69	*82.1*
18 and over	389	93	*23.9*	294	*75.6*
Self-Rated Health	p=0.134				
Excellent/Very Good/Good	281	72	*25.6*	207	*73.7*
Fair/Poor	221	44	*19.9*	175	*79.2*
Precarious	p=0.709				
low/moderate	307	59	*19.2*	247	*80.5*
High	161	42	*26.1*	116	*72.0*
Country of Birth	p<0.0001				
US	16	0	*0.0*	15	*93.8*
Mexico	339	96	*28.3*	241	*71.1*
Central America ^^^	134	12	*9.0*	122	*91.0*
Years in Agriculture	p<0.0001				
<=10	144	61	*42.4*	83	*57.6*
> 10	358	55	*15.4*	299	*83.5*
Years in the US	p<0.0001				
<=10	51	29	*56.9*	22	*43.1*
11 to 20	210	68	*32.4*	140	*66.7*
21+	241	18	*7.5*	222	*92.1*

[+] n=504, but some participants did not respond to all questions. Subtotals vary.

^ Married, or living as, includes individuals who are married, living with a partner, or temporarily separated

^^ Single, or living as, includes individuals who are single, divorced, permanently separated or widowed.

^^^ Central America includes individuals born in El Salvador, Honduras, Nicaragua, and Guatemala

Table 3.3. Associations between documentation status, precarious employment and self-rated health in the MICASA 2010 sample. OR = odds ratio; CI = confidence interval. [Reference values: documented status, non-precarious employment, poor health.]

Outcome	Variable of Interest	Crude OR	95% CI	Adjusted OR*	95% CI
Self-Rated Health	Undocumented Status	0.72	(0.47, 1.11)	0.92	(0.58, 1.47)
Self-Rated Health	Precarious employment	0.86	(0.58, 1.26)	0.87	(0.58, 1.29)
Precarious Employment	Undocumented Status	1.52	(0.96, 2.38)	1.47	(0.89, 2.42)
Self-Rated Health	Undocumented Status	0.74	(0.47, 1.16)	0.91	(0.56, 1.50)
	Precarious Employment	0.89	(0.60, 1.32)	0.87	(0.58,1.30)

* The adjusted OR adjusts for sex and age.

Chapter 4

Precarious Employment, Documentation Status, and Depressive Symptoms in a Cohort of Foreign-Born Farm Worker Families in California

4.1 Abstract

This observational study explores the relationship between undocumented legal status, precariousness of employment, and presence of depressive symptoms in Mexican, El Salvadorian, and Guatemalan-born farm workers in California's Central Valley. Data were used from the 2008-2010 Mexican Immigration to California: Agricultural Safety and Acculturation Study (MICASA) in a Central Californian farmworker community (n=504). Documentation status was assessed indirectly using a four-item scale developed by the Robert Wood Johnson Foundation. Precarious employment was measured via a modified version of a 26-item Spanish Employment Precariousness Scale. Depressive symptoms were assessed with the Center for Epidemiologic Studies Short Depression Scale (CES-D 10). The presence of depressive symptoms was found to be significantly associated with high precariousness of employment. This association remained significant among undocumented workers. Depressive symptoms were more common among females and participants who were living alone. Depressive symptoms were not significantly associated with age, education, age at migration, documentation status, country of birth, years worked in agriculture, or years lived in the United States. The relationship between precarious employment and depressive symptoms in this sample is an important public health consideration for farmworker families. The lack of significant association between depressive symptoms and documentation status deserves further investigation.

4.2 Introduction

In 2014, there were 2.4 million farmworkers in the United States, one-third of whom lived in California. Ninety-two percent of farmworkers in California are Latino, 86% of whom are foreign-born [1]. Seventy-seven percent of farmworkers in California are not U.S. citizens and 67% are reportedly undocumented [2]. Seventy-eight percent of farmworkers in California do not have a high school diploma or GED, and 73% of farmworkers in California earn less than 200% of the poverty line [1].

Farmworkers are often in disadvantageous social positions and have jobs that have been identified by researchers as "dirty, dangerous, and demanding" [3]. Farmworkers are also at risk for poor mental health, especially depressive symptoms, with a study in North Carolina finding depressive symptoms in 28% of the farmworker participants. Risk factors for depressive symptoms and mental distress amongst farmworkers have been categorized as: legality and logistics, social isolation, work conditions, family, and substance abuse by others. Stressful work conditions was the risk factor most strongly association with depression [4]. Specific examples of experiences Mexican-born farmworkers gave that caused depression included separation from loved ones, discrimination and harassment, long hours and multiple jobs, unemployment or insufficient pay, social isolation, and a change in substance use [5,6].

Precarious employment encompasses many of these risk factors for depression, and has detrimental effects on workers' lives, especially with respect to mental health and depression [4,7–11]. Precarious employment also disproportionally affects those in vulnerable social positions, such as workers who are older and/or disabled [12]. The impact of undocumented legal status has been explored in previous research, but questions about the impact of legal vulnerability on health remain open, largely because of a lack of epidemiological evidence [13]. Job options, socioeconomic status, and other stressors place undocumented workers in vulnerable social positions. Citizenship documentation could potentially protect these workers from depressive symptoms by improving their social position, either directly by decreasing the precariousness of employment, or indirectly by buffering other risk factors for depressive symptoms and the negative mental health implications of work stress [13].

In the Mexican Immigration to California: Agricultural Safety and Acculturation (MICASA) Study, a cohort of farmworker families in Mendota, California, was followed over three waves of survey data collection. Documentation status was measured indirectly with a scale previously used by the Robert Wood Johnson Foundation. Four questions are used as a marker for documentation status, as described in earlier in the literature [14]. This indirect measure was selected with consideration of the sensitivity, legal and ethical aspects of directly asking someone their documentation status, as well

as the need to fill gaps in the evidence-based understanding of this potential social determinant of health [13]. Precarious employment, defined as a lack of regulations that support the standard employment relationship that makes workers more vulnerable [15], is considered a social determinant of health, moderating health through various pathways through stress, material deprivation, and hazardous work environments. The Employment Precariousness Scale (EPRES) was constructed and validated in Spain and has been found to be associated with differential health outcomes [4,8,16,17]. Depressive symptoms were assessed with the Center for Epidemiologic Studies Short Depression Scale (CESD-10), which has been validated in Mexican-born farmworkers in California [5,6] and used in other studies as an accepted metric of depressive symptoms [18,19].

This study aims to explore the relationship between precarious employment and depressive symptoms in participants in the final wave of the MICASA study, and to examine undocumented status as a potential risk factor in this relationship.

4.3 Materials and Methods

A comprehensive description of study sampling methods for the MICASA study exists in the literature [20]. A cross-sectional survey was conducted in Mendota, California, from 2010-2011 as the final wave of a three-part longitudinal cohort study of farmworker

families. The sample was constructed in 2006 through representative random sampling of households from census blocks selected with stratified area probability sampling. Eligibility criteria included: age 18-55 years, residence in Mendota at baseline (2006-2007), residence in a household with at least one person who worked in agriculture a minimum of 45 days in the previous year, self-identification as Mexican or Central American, and written informed consent. These final wave interviews were conducted with a 79% household response rate (n=504). Interviews were conducted face to face in the community.

Variables in this study include the outcome (depressive symptoms), exposures of interest (documentation status and precarious employment), and demographic covariates. Depressive symptoms were measured with the Center for Epidemiologic Studies Short Depression Scale (CESD-10), an accepted tool in research to screen for depression that assesses the frequency of depressive symptoms in the last week. Each question is answered on a Likert scale, and responses are coded to build a continuous total score which is cut dichotomously at 10 to indicate the presence of absence of depressive symptoms [6,21].

Exposures of interest were measured with scales established in existing literature. Documentation status was assessed with a four-question measure: what year did you

enter the United States?; are you a citizen of the United States?; are you a legal permanent resident of the United States?; do you have a picture identification document issued by and U.S. government office? If responses to the last three questions are negative, the participant was classified as undocumented for the purposes of this analysis, in alignment with existing literature using this metric [14]. The response rate for these items was 99%. Precarious employment was measured with a 26-item scale build on six dimensions to quantify power dynamics in an individual's employment situation. The six dimensions include: temporariness, disempowerment, vulnerability, wages, rights, and the capacity to exercise rights. Scores were calculated for each dimension and an overall precariousness score was computed and classified as high or moderate-to-low. This use aligns with previous analyses published by authors who developed the EPRES scale, which was modified for use in this study through expert consultation and participant feedback.

Demographic covariates that were assessed and considered for adjustment in regression analyses in this study include sex (male, female), age (ten-year intervals), marital status (married/living together/temporarily separated, single/divorced/separated permanently/widowed/temporarily separated), education (at most primary, more than primary), age at migration (younger than 18 years old, 18 year old or older), country of birth (Mexico, Central America, United States), years worked in agriculture (up to 10

years, 10 years or more), and years lived in the United States (up to 10 years, 11-20 years, 21 years or more).

Crude descriptive analyses were first conducted for all variables in the sample, and then stratified by presence of depressive symptoms. Univariate and bivariate analyses were conducted with an alpha of five percent.

A series of logistic regression models were built with a modified Baron-Kenny procedure to assess whether the potential effects of documentation status on depressive symptoms could be mediated by precarious employment. Models were constructed with (1) depressive symptoms as an outcome and documentation status as an exposure; (2) depressive symptoms as an outcome and precarious employment as an exposure; (3) precarious employment as an outcome and documentation status as an exposure; (4) depressive symptoms as an outcome with documentation status and precarious employment as exposures. All models were built crudely and also with adjustment for sex and age. All models were constructed with SAS 9.3 (Gary, IN). Alpha of 0.05 was used to define statistical significance.

4.4 Results

Female participants, single participants (or those living alone as divorced, permanently or temporarily separated, or widowed), and precariously employed participants were significantly more likely to experience depressive symptoms than their male, married, or non-precariously employed counterparts (Table 4.1).

Age, education, age at migration, legal status country of birth, years worked in agriculture, and years lived in the United States were not significantly associated with the presence or depressive symptoms. Participants were more likely to experience depressive symptoms if they were documented, older, less-educated, older at the time of migration, Mexican-born, less experienced in agriculture, and longer-standing residence in the United States, although these associations did not emerge as significant.

Crude logistic regression models revealed no statistically significant increase in odds of precarious employment among participants without legal authorization to live in the United States [OR 1.47, 95%CI 0.89 – 2.42] (Table 4.2). Significant association emerged between precarious employment and depressive symptoms, both crudely [OR 1.84, 95%CI 1.09 – 3.13] and while adjusting for documentation status [OR 1.87, 95%CI 1.10 – 3.17]. Undocumented participants did not have significantly higher odds of experiencing depressive symptoms, either crudely or while controlling for precarious employment.

There was a non-significant inverse relationship between undocumented status and depressive symptoms, opposing the hypothesized association between these variables. Interactions between documentation status and precarious employment with respect to depressive symptoms were not tested due to sample size restrictions (undocumented participants with depressive symptoms, n=13).

4.5 Discussion

The analyses shown here reflect a positive association between high precariousness of employment and the presence of depressive symptoms, as has been previously shown in the literature [22–27]. The relationship between undocumented legal status and these variables, however, is less clear. Although not statistically significant, undocumented stats in this sample was positively associated with high precariousness of employment, and negatively associated with depressive symptoms. The difference in the directions of these relationship may be indicative of instability in the estimation of these relationship, with only 13 undocumented individuals reporting depressive symptoms. The opposing directions of the relationships may also indicate a protective effect of undocumented status for depressive symptoms in the setting of low precarious employment. It is also possible that the effects of self-reporting are inconsistent across these variables.

Limitations of this study include sample size limitations, prohibiting more detailed assessment of potential interactions between precarious employment and documentation status; uncertainty of the validity of undocumented status information collected; and the subjective nature of the self-report information being analyzed.

Strengths of this study include a first-time look at precarious employment and depressive symptoms in a population-based study of a farmworker community in Central California. The context of long-standing relationships between participants and the research team supports valid self-reported data, especially given the sensitive nature of documentation status and mental health issues [14,28–30]. This attempt to ascertain and understand the impacts of documentation status adds to the body of literature and development of effective methodology with the aim of developing a more complete understanding of documentation status and its health implications.

This study confirms the relationship between precarious employment and depressive symptoms in farmworker families in Mendota, California, and raises questions about documentation status as a potential modifier of the relationship between precarious employment and depressive symptoms. Undocumented individuals did not report an increase of experiencing depressive symptoms, which raises questions about the validity of documentation status measurement and the complexity of the effects of documentation

status on farmworker families' lives and health. Future research would be well guided to continue exploring documentation status in foreign-born farmworkers, including a potential interaction between precarious employment and documentation status with respect to depressive symptoms; improving methodology for larger-scale studies; and continuing to build an understanding of this vulnerable population.

4.6 Conclusions

This cross-sectional observational study in a randomized population-based sample of farmworker families in Mendota, California, confirms that highly precarious employment is associated with increased likelihood of depressive symptoms. No significant associations were found between undocumented legal status and precarious employment or depressive symptoms. This may be due in part to sample size limitations and/or interactions between the effects of undocumented legal status and precarious employment on depressive symptoms. More research is needed to clarify the effects on undocumented status on depressive symptoms, including analyses stratified by precarious employment.

References

1. Rogers, P.; Buttice, M.K. Farmworkers in California: A Brief Introduction. **2013**, 1–2.
2. Martin, P. *California Ag Employment: 2014*; 2014;
3. Benach, J.; Muntaner, C.; Chung, H.; Benavides, F.G. Immigration, employment relations, and health: Developing a research agenda. *Am. J. Ind. Med.* **2010**, doi:10.1002/ajim.20717.
4. Virtanen, M.; Kivimäki, M.; Joensuu, M.; Virtanen, P.; Elovainio, M.; Vahtera, J. Temporary employment and health: A review. *Int. J. Epidemiol.* 2005.
5. Grzywacz, J.G.; Quandt, S.A.; Chen, H.; Isom, S.; Kiang, L.; Vallejos, Q.; Arcury, T.A. Depressive symptoms among latino farmworkers across the agricultural season: Structural and situational influences. *Cult. Divers. Ethn. Minor. Psychol.* **2010**, doi:10.1037/a0019722.
6. Grzywacz, J.G.; Hovey, J.D.; Seligman, L.D.; Arcury, T.A.; Quandt, S.A. Evaluating short-form versions of the CES-D for measuring depressive symptoms among immigrants from Mexico. *Hisp. J. Behav. Sci.* 2006.
7. de Leon Siantz, M.L. The Mexican-American migrant farmworker family. Mental health issues. *Nurs. Clin. North Am.* 1994.
8. Tompa, E.; Scott-Marshall, H.; Dolinschi, R.; Trevithick, S.; Bhattacharyya, S. Precarious employment experiences and their health consequences: Towards a

theoretical framework. *Work* **2007**.

9. Breslau, J.; Borges, G.; Hagar, Y.; Tancredi, D.; Gilman, S. Immigration to the USA and risk for mood and anxiety disorders: Variation by origin and age at immigration. *Psychol. Med.* **2009**, doi:10.1017/S0033291708004698.
10. Kessler, R.C.; Aguilar-Gaxiola, S.; Alonso, J.; Chatterji, S.; Lee, S.; Ormel, J.; Üstün, T.B.; Wang, P.S. The global burden of mental disorders: An update from the WHO World Mental Health (WMH) surveys. *Epidemiol. Psichiatr. Soc.* **2009**, doi:10.1017/S1121189X00001421.
11. Borges, G.; Breslau, J.; Orozco, R.; Tancredi, D.J.; Anderson, H.; Aguilar-Gaxiola, S.; Medina Mora, M.E. A cross-national study on Mexico-US migration, substance use and substance use disorders. *Drug Alcohol Depend.* **2011**, doi:10.1016/j.drugalcdep.2010.12.022.
12. Law Commission of Ontario Identifying Vulnerable Workers and Precarious Work.
13. Hilfinger Messias, D.A.K.; McEwen, M.M.; Clark, L. The impact and implications of undocumented immigration on individual and collective health intheUnited States. *Nurs. Outlook* **2015**, doi:10.1016/j.outlook.2014.11.004.
14. Rodríguez, M.A.; Vargas Bustamante, A.; Ang, A. Perceived quality of care, receipt of preventive care, and usual source of health care among undocumented and other Latinos. *J. Gen. Intern. Med.* **2009**, *24*, doi:10.1007/s11606-009-1098-2.

15. Benach, J.; Vives, A.; Amable, M.; Vanroelen, C.; Tarafa, G.; Muntaner, C. Precarious Employment: Understanding an Emerging Social Determinant of Health. *Annu. Rev. Public Health* **2014**, *35*, 229–253, doi:10.1146/annurev-publhealth-032013-182500.

16. Benach, J.; Muntaner, C. Precarious employment and health: Developing a research agenda. *J. Epidemiol. Community Health* **2007**, *61*, 276–277, doi:10.1136/jech.2005.045237.

17. Vives, A.; Amable, M.; Ferrer, M.; Moncada, S.; Llorens, C.; Muntaner, C.; Benavides, F.G.; Benach, J. The Employment Precariousness Scale (EPRES): Psychometric properties of a new tool for epidemiological studies among waged and salaried workers. *Occup. Environ. Med.* **2010**, *67*, 548–555, doi:10.1136/oem.2009.048967.

18. Mendenhall, E.; Jacobs, E.A. Interpersonal Abuse and Depression Among Mexican Immigrant Women with Type 2 Diabetes. *Cult. Med. Psychiatry* **2012**, doi:10.1007/s11013-011-9240-0.

19. Ward, J.B.; Haan, M.N.; Garcia, M.E.; Lee, A.; To, T.M.; Aiello, A.E. Intergenerational education mobility and depressive symptoms in a population of Mexican origin. *Ann. Epidemiol.* **2016**, doi:10.1016/j.annepidem.2016.05.005.

20. Stoecklin-Marois, M.T.; Hennessy-Burt, T.E.; Schenker, M.B. Engaging a hard-to-reach population in research: Sampling and recruitment of hired farm workers in

the MICASA study. *J. Agric. Saf. Health* **2011**.

21. Burnam, M.A.; Wells, K.B.; Leake, B.; Landsverk, J. Development of a brief screening instrument for detecting depressive disorders. *Med. Care* **1988**, doi:10.1097/00005650-198808000-00004.

22. Ferrante, G.; Fasanelli, F.; Gigantesco, A.; Ferracin, E.; Contoli, B.; Costa, G.; Gargiulo, L.; Marra, M.; Masocco, M.; Minardi, V.; et al. Is the association between precarious employment and mental health mediated by economic difficulties in males? Results from two Italian studies. *BMC Public Health* **2019**, *19*, doi:10.1186/s12889-019-7243-x.

23. Moscone, F.; Tosetti, E.; Vittadini, G. The impact of precarious employment on mental health: The case of Italy. *Soc. Sci. Med.* **2016**, doi:10.1016/j.socscimed.2016.03.008.

24. Kachi, Y.; Otsuka, T.; Kawada, T. Precarious employment and the risk of serious psychological distress: A population-based cohort study in Japan. *Scand. J. Work. Environ. Heal.* **2014**, doi:10.5271/sjweh.3442.

25. Han, K.M.; Chang, J.; Won, E.; Lee, M.S.; Ham, B.J. Precarious employment associated with depressive symptoms and suicidal ideation in adult wage workers. *J. Affect. Disord.* **2017**, doi:10.1016/j.jad.2017.04.049.

26. Rönnblad, T.; Grönholm, E.; Jonsson, J.; Koranyi, I.; Orellana, C.; Kreshpaj, B.; Chen, L.; Stockfelt, L.; Bodin, T. Precarious employment and mental health: A

systematic review and meta-analysis of longitudinal studies. *Scand. J. Work. Environ. Heal.* **2019**, *45*, 429–443, doi:10.5271/sjweh.3797.

27. Matilla-Santander, N.; González-Marrón, A.; Martín-Sánchez, J.C.; Lidón-Moyano, C.; Cartanyà-Hueso, À.; Martínez-Sánchez, J.M. Precarious employment and health-related outcomes in the European Union: a cross-sectional study. *Crit. Public Health* **2019**, 1–12, doi:10.1080/09581596.2019.1587385.

28. Bollini, P.; Pampallona, S.; Wanner, P.; Kupelnick, B. Pregnancy outcome of migrant women and integration policy: A systematic review of the international literature. *Soc. Sci. Med.* **2009**, doi:10.1016/j.socscimed.2008.10.018.

29. Zimmerman, C.; Kiss, L.; Hossain, M. Migration and Health: A Framework for 21st Century Policy-Making. *PLoS Med.* **2011**, doi:10.1371/journal.pmed.1001034.

30. Kraler, A.; Reichel, D. Measuring Irregular Migration and Population Flows - What Available Data Can Tell. *Int. Migr.* **2011**, doi:10.1111/j.1468-2435.2011.00699.x.

Table 4.1. Descriptive profile of depressive symptoms in 504 members of farmworker families in Mendota, CA, in 2010 (MICASA study, final survey data), tests for significant differences in depressive symptoms by covariates.

Covariates	Total+	Depressive Symptoms		No Depressive Symptoms	
	N	n	%	n	%
Sex					
Male	222	17	*7.7*	204	*91.9*
Female	282	62	*22.0*	220	*78.0*
Age	43.7 + - 10.4	47.2 + - 11.0		43.0 + - 10.2	
Marital status*					
Married^	459	66	*14.4*	392	*85.4*
Single^^	44	13	*29.5*	31	*70.5*
Education					
Primary or less	309	57	*18.4*	252	*81.6*
> primary	182	21	*11.4*	160	*87.9*
Age at migration					
Under 18	84	12	*14.3*	72	*85.7*
18 and over	389	64	*16.5*	324	*83.3*
Documentation status					
Documented	384	66	*17.2*	317	*82.6*
Undocumented	116	13	*11.2*	103	*88.8*
Precarious employment*					
Low/moderate	307	38	*12.4*	268	*87.3*
High	161	36	*22.4*	125	*77.6*
Country of birth					
US	16	3	*18.8*	13	*81.3*
Mexico	339	59	*17.4*	279	*82.3*
Central America^^^	134	17	*12.7*	117	*87.3*
Years in Agriculture					
<= 10	144	26	*18.1*	118	*81.9*
>10	358	53	*14.8*	304	*84.9*
Years in the US					
<=10	51	6	*11.8*	45	*88.2*
11 to 20	210	35	*16.7*	175	*83.3*
21+	241	38	*15.8*	202	*83.8*
Total	504	79	*15.8*	424	*84.1*

+ n=504, but some participants did not respond to all questions. Subtotals vary.
^ Includes individuals who are married, living with a partner, or temporarily separated;
^^ Includes individuals who are single, divorced, permanently separated, or widowed;
^^^ Includes individuals born in El Salvador, Honduras, Nicaragua, and Guatemala;
* p-value was significant with alpha of 0.05

Table 4.2. Associations between depressive symptoms, high precariousness of employment, and undocumented status in 504 members of farmworker families in Mendota, CA, in 2010 (MICASA final survey). OR = odds ratio, CI = confidence interval, PE = precarious employment.

Outcome	Variables of Interest	Crude OR	95% CI	Adjusted OR*	95% CI
Depressive symptoms	Documented	1.00		1.00	
	Undocumented	0.61	(0.32, 1.14)	0.75	(0.37, 1.50)
Depressive symptoms	Low PE	1.00		1.00	
	High PE	2.03	(1.22, 3.36)	1.84	(1.09, 3.13)
High PE	Documented	1.00			
	Undocumented	1.52	(0.96, 2.38)	1.47	(0.89, 2.42)
Depressive Symptoms	Undocumented	0.67	(0.35, 1.29)	0.85	(0.41, 1.76)
	High PE	2.14	(1.29, 3.54)	1.87	(1.10, 3.17)

* Adjusted for sex and age

Chapter 5

Conclusion

Health and social justice are at the heart of public health. This dissertation in epidemiology applies statistical methods to better understand health, and logistic regression models to understand social determinants of health among farmworker families in Mendota, California.

This first paper in this dissertation looks at the concept of health and takes a statistical approach to understanding health as a latent variable. We found that both metrics for self-rated health were consistent with an underlying concept of health, and that the sample of Latin American-born workers in Spain was healthier than the sample of Latin American-born workers in California.

The second paper in this dissertation looks at work and migration as social determinants of overall self-rated health, specifically through the relationships between undocumented legal status, precarious employment, and self-rated health. The third paper looks similarly at the relationships between undocumented legal status, precarious employment, and depressive symptoms. While significant relationships did not emerge, these negative results add to the literature around immigrant worker health and offer additional questions about potential protective effects of immigration on health, and potential interaction with bias from the 'healthy worker effect.' Undocumented legal status is associated with lower income and structural barriers to

housing and educational opportunities in existing literature, which are understood to be social determinants of poorer health. Why then is undocumented status not associated with poorer health in these analyses of this study population? While the burden of mental distress in the United States disproportionally falls on the Latino population, Mexican-born individuals have been found to report lower levels of distress than US-born Mexican Americans. Is there a protective effect of immigration on mental health in the context of work?

In understanding health and social justice from a population perspective through quantitative analyses, these three papers help to understand health as a continuous latent variable, underlying two different measures of self-rated health, and in the background of individual and population health research. These papers also help to look at a void in the literature around immigrant workers, an important population for health equity research and target for equitable interventions. While these analyses did not yield solutions, they lay important groundwork for future studies to continue toward a more equitable, healthy world.