Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____   _____
Elizabeth Marie Boos   Date

Predictors of "no shows" at Omaha Veterans Administration primary care clinics

By

Elizabeth M. Boos

Master of Public Health

Department of Epidemiology

_____

Michael R. Kramer, PhD

Committee Chair

_____

Marvin J. Bittner, MD

Committee Member

Predictors of "no shows" at Omaha Veterans Administration primary care clinics

By

Elizabeth M. Boos

Bachelor of Science

Creighton University

2012

Thesis Committee Chair: Michael R. Kramer, PhD

An abstract of

A thesis submitted to the Faculty of the

Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of

Master of Public Health

in Epidemiology

2015

Abstract

Predictors of "no shows" at Omaha Veterans Administration primary care clinics

By Elizabeth M. Boos

Background: Missed medical appointments ("no shows") affect both staff and other patients who are unable to make timely appointments. No shows can be prevented through interventions that target those most at risk to make appointments. Young age, low socioeconomic status, a history of missed appointments, psychosocial problems, and longer wait times are some predictors that have been previously found to be associated with higher no show rates. **Objective:** This study aimed to determine the potential risk factors for no shows in primary care clinics of the Veterans Affairs Nebraska-Western Iowa Health Care System (VA NWI HCS). **Design:** Age, sex, race, presence of a mental health diagnosis, previous no show rate in past two years, wait time, distance to clinic, and neighborhood deprivation index were obtained for 69,908 primary care visits at the Omaha, Nebraska VA NWI HCS between January 1, 2012 and December 31, 2013. Inclusion criteria were visits for patients whose zip code was within the VA NWI HCS Service Area and non-cancelled appointments at the Omaha primary care clinics. **Results:** In log-binomial models accounting for clustering by zip code, the strongest predictors of no shows were age between 20 and 39 (OR=3.86, 95% CI=3.46, 4.29) or between 40 and 59 (OR=2.22, 95% CI= 2.04, 2.42), black (OR=2.14, 95% CI=1.99, 2.31) or other non-white race (OR=1.35, 95% CI=1.17, 1.56), male sex (OR=1.29, 95% CI=1.15, 1.44), and presence of mental health diagnosis (OR=1.16, 95% CI=1.15, 1.44). **Conclusion:** These results show that individuals who are younger, non-white, male or have been diagnosed with mental health issues are more likely to no show. Interventions to improve compliance could be targeted at these individuals in order to decrease the burden of no shows on healthcare systems, such as the Veterans Health Administration.

Predictors of "no shows" at Omaha Veterans Administration primary care clinics

By

Elizabeth M. Boos

Bachelor of Science

Creighton University

2012

Thesis Committee Chair: Michael R. Kramer, PhD

A thesis submitted to the Faculty of the

Rollins School of Public Health of Emory University

in partial fulfillment of the requirements for the degree of

Master of Public Health or Master of Science in Public Health

in Epidemiology

2015

TABLE OF CONTENTS

CHAPTER 1. BACKGROUND/LITERATURE REVIEW

The Public Health Impact of Outpatient Medical "No Shows"

It has been estimated that 5% to 55% of patients miss primary care appointments[1]. These "no shows" have a great effect on both staff and other patients. No shows yield loss of time, resources, and efficiency for physicians and other staff[2]. The quality of care is compromised, as is the healthcare of other patients who are stuck waiting on no shows when they could have otherwise been seen[3]. If a patient does not show up for an appointment, the space, equipment, and staff reserved for the appointment sit idle while other patients who could have been seen more promptly have to wait. This results in inefficient use of the limited resources for healthcare, a decrease in productivity, and a delay in patient care. The loss of time, efficiency, and resources impacts other patients, staff, and health systems.

Missed appointments have been shown to result in approximately a 16% reduction in revenue; however, this impact was reduced to between to 3.8% and 10.5% with the implementation of appropriate interventions[4]. Various studies have assessed the efficacy of interventions such as automated appointment reminders, staff telephone reminders, mail reminders, text message reminders, open access scheduling, and an orientation clinic in reducing no show rates[5-12]. While these interventions are effective in reducing no show rates, the effect size varies greatly by intervention and context. These interventions can be costly to implement and some, such as mail and telephone reminders, require more staff labor time than SMS reminders. Thus, it is important to determine the predictors of no shows in order to target those at higher risk for not attending appointments.

Veterans Administration (VA) Healthcare

In 1996, Congress relaxed eligibility requirements for VA healthcare, opening access to almost any veteran rather than just low-income veterans with service-related injuries or illnesses[13]. Today, the Veterans Health Administration (VHA) provides healthcare for about 9 million veterans in the United States, approximately 6 million of whom attend VHA medical centers and outpatient clinics annually[14]. The VHA has undertaken intentional quality improvement measures in the past several decades, including the implementation of the VA Quality Enhancement Research Initiative, which focuses on evidence-based clinical practices[13,15]. Additionally, the VHA has proven its commitment to ensuring health equity and reducing health disparities for the veterans who seek VHA healthcare by establishing the Office of Health Equity in 2012[16].

Many Veterans seek primary care at the clinics of the VHA. However, access to primary care appointments is limited. This results in delays for veterans who need primary care. The scheduling goal is to give every veteran an appointment within thirty days of a request[17].

Another recent policy change was to allow veterans eligible for VHA healthcare to seek outside providers for healthcare if they cannot be seen at VHA facilities within wait-time goals or if their place of residence otherwise qualifies them[18]. This would allow veterans, who would have previously had to travel much farther to seek care at a VHA facility, to receive care at a closer non-VHA provider. Those of lower socioeconomic status may find difficulty traveling to a VHA facility that is far from their home and could benefit greatly from this change.

Predictors of Appointment Compliance

Individual

There are many individual-level characteristics that impact a patient's ability to attend an appointment. One common predictor of no shows is young age[19-23]. Smith and Yawn[23] found that 69.3% of 20-39 year olds kept appointments, which was significantly less than those 40-59 (80.4%) or 60 and older (89.9%). Another study by Parikh et al.[21] found that the no show rate significantly decreased by 2.4% for every one year increase in age.

Race has also previously been found to be associated with appointment attendance. Smith and Yawn[23] found that Asians (86.4%) or whites (75.8%) kept significantly more appointments than Hispanics (57.6%), African Americans (58.3%), or Native Americans (63.7%). While patient sex has also been associated as a predictor of no shows, the specific direction and strength of the association varies[22,24].

Patient history of missed appointments is commonly correlated to no shows, though the strength of this association is also unclear[5,20]. Comorbidities, such as psychosocial problems, have also been explored in literature, but robust and contemporary information about the significance of associations is thin[5,25]. Health literacy factors have also been associated with greater no shows. No shows have been found to be more likely (10%) than those who keep appointments (4%) to not understand the purpose of their appointment[26]. They also are less likely to understand the scheduling system and the effect their non-attendance has on their provider[20].

While many primary care clinics see patients with these characteristics, some are particularly prevalent in veterans. Substance abuse and psychosocial problems can result from combat-related posttraumatic stress disorder[27]. In addition to increasing the risk of

"no shows," psychosocial problems also put affected veterans at an increased risk of becoming homeless[28]. Veterans are at an increased risk of becoming homeless even after controlling for age, race, and sex; this risk is even greater for veterans living in poverty[29]. This provides an additional barrier to healthcare utilization for homeless veterans who may have difficulty receiving reminders and may have difficulties finding transportation to appointments.

Additionally, it seems reasonable to consider that homelessness, occupation, family structure, and access to transportation can also determine whether or not someone may miss an appointment. For instance, a parent of a child from a family with low socioeconomic status (SES) may have to miss an appointment because they cannot find or afford someone to watch their young child. However, these characteristics and those of health literacy described above were not available for assessment in this study.

Health Systems

In addition to no-shows having consequences for health systems, system wait times could also be a predictor of subsequent no-show. Those who missed appointments experienced wait times that were longer than both the wait times of those who attended appointments and than the median wait time[21]. Specifically, each 30-day increase in wait time for initial patient visits was found to result in a 25% increase in no show rate. Day of week has also been found to be associated with no shows. Appointments on Mondays (80.8%) and Thursdays (77%) were found to have the most appointment attendance while Wednesdays (69.3%), Fridays (68.1%), and Saturdays (67.5%) had the least attendance[23].

Area-Based Correlates of "No Shows"

Area-based SES measures can be linked to census data and used to assess the influence that location, such as neighborhood, can have on health. The effects of location on health have been studied since the late 1980s and have been increasingly popular in research[30]. Typically, census tracts or block groups are used as a proxy for neighborhood, and census characteristics are retrieved to proxy neighborhood features that are relevant to the health outcome of interest. Area-based SES measures can be used to impute missing data about an individual's SES if, for instance, no income is available. It can also be used to characterize something about the individual's location.

There are several dimensions of area-based effects, including material wealth and capital, social capital and social networks, built environment, and proximity to services. An area-based measure of SES that is of use in assessing health care utilization is the Neighborhood Deprivation Index (NDI), which aims to capture information about material wealth and capital. This is a composite measure consisting of a number of socioeconomic factors and potential contextual barriers to care. The NDI has been previously used as a covariate in assessing poor appointment-keeping for primary care appointments in diabetic patients[31]. Parker et al. found that patients in neighborhoods in the most deprived quartile were more likely to have poor appointment-keeping (2.9%) than to have good appointment-keeping (0.2%). However, this study did not explore the difference in poor appointment-keeping between high and low deprivation neighborhoods.

Additionally, studies have assessed the effect of neighborhood deprivation on Emergency Department (ED) attendance[32,33]. Rudge et al.[32] found that those in the highest deprivation quintile had an incidence rate ratio of more than 2 for children and

adults, meaning that those in the highest deprivation quintile attended EDs at more than twice the rate of those in the lowest deprivation quintile. There are many reasons that ED care is associated with low SES. A notable reason is that patients with lower SES may experience barriers in accessing regular care[33]. Willems et al.[33] also found that ED visits increased with increasing levels of deprivation (OR: 2.57, 95% CI: 1.84-3.58). These individuals from more deprived neighborhoods typically have lower education, which is a component of the NDI.

Distance to health care providers has also been explored as a predictor of no shows[23,32]. Rudge et al.[32] found that greater distance from the hospital reduced ED attendance in more deprived neighborhoods, which suggests that distance is a barrier to seeking care[32]. Interestingly, Smith and Yawn[23] found that patients living greater than 3 miles from their provider kept significantly more appointments (78.2%) than those living 3 miles or less from their provider (71.1%)[23]. Clearly, this relationship between distance and no show merits further exploration.

Our aim is to determine the most effective set of predictors from a limited combination of predictors in an under-studied population of interest for no shows in primary care clinics of the Veterans Affairs Nebraska-Western Iowa Health Care System (NWI) in Omaha, Nebraska. We hope to use these findings to inform interventions that target those most at risk to miss appointments. These possible risk factors were chosen from previous literature, which specified age, history of missed appointments, psychosocial problems, wait time, and socioeconomic status as factors impacting no show rates. However, we do not know the specific combination of risk factors that will

best predict no shows. Thus, we will use generalized estimating equations to determine

the best predictive model.

CHAPTER 2. MANUSCRIPT

Predictors of "no shows" at Omaha Veterans Administration primary care clinics

Elizabeth Boos, Marvin Bittner, MD, Michael R. Kramer, PhD

ABSTRACT

OBJECTIVE. This study aimed to determine the potential risk factors for no shows in primary care clinics of the Veterans Affairs Nebraska-Western Iowa Health Care System (VA NWI HCS).

DESIGN. Age, sex, race, presence of a mental health diagnosis, previous no show rate in past two years, wait time, distance to clinic, and neighborhood deprivation index were obtained for 69,908 primary care visits at the Omaha, Nebraska VA NWI HCS between January 1, 2012 and December 31, 2013. Inclusion criteria were visits for patients whose zip code was within the VA NWI HCS Service Area and non-cancelled appointments at the Omaha primary care clinics.

RESULTS. In log-binomial models accounting for clustering by zip code, the strongest predictors of no shows were age between 20 and 39 (OR=3.86, 95% CI=3.46, 4.29) or between 40 and 59 (OR=2.22, 95% CI= 2.04, 2.42), black (OR=2.14, 95% CI=1.99, 2.31) or other non-white race (OR=1.35, 95% CI=1.17, 1.56), male sex (OR=1.29, 95% CI=1.15, 1.44), and presence of mental health diagnosis (OR=1.16, 95% CI=1.15, 1.44).

CONCLUSION. These results show that individuals who are younger, non-white, male or have been diagnosed with mental health issues are more likely to no show. Interventions to improve compliance could be targeted at these individuals in order to

decrease the burden of no shows on healthcare systems, such as the Veterans Health
Administration.

INTRODUCTION

Missed medical appointments ("no shows") affect both staff and other patients.
No show rates in primary care settings are estimated to be between 5% and 55%[1]. No
shows yield loss of time, resources, and efficiency for physicians and other staff[2].
Scheduled patients who eventually no-show cause a reduction in the quality of care for
patients who meet challenges scheduling timely appointments[3]. There are also significant
economic losses to healthcare systems. One study determined that no shows reduce
revenue by approximately 16%[4].

Within the broader realm of healthcare systems, the Veterans Health
Administration (VHA) represents a unique model. The VHA has a benchmark for
"missed opportunities," which include no shows and doctor cancellations, of no more
than 10%. Beginning in the spring of 2014, reports in the media drew attention to wait
time issues and some possible manipulation of patient waiting lists. An investigation
determined that the Phoenix, Arizona VA facilities maintained paper waiting lists in
order to conceal veterans' actual times to appointment[34]. These issues make the current
study particularly timely. The study of no shows can be a part of the solution in terms of
improving the flow of healthcare systems and reducing barriers to receiving care.

No shows can be prevented through well-designed interventions. One study found
economic benefit of interventions, but there was no assessment of whether economic gain
was made without loss of quality of care. Nonetheless, appropriate interventions resulted
in a reduction of revenue loss from 16% to between to 3.8% and 10.5% [4]. In order to

create interventions that target those most at risk to miss appointments, it is necessary to understand the factors that predict no shows. These predictors fall under three domains: individual, health system, and social. We will explore these predictors in more depth in this study.

METHODS

Study Population

Medical records were retrieved for patients with visits between January 1, 2012 and December 31, 2013 at the VA Nebraska-Western Iowa Health Care System (NWI HCS) primary care clinics in Omaha, Nebraska. Inclusion criteria were non-deceased patients for these primary care clinics whose zip code was within the VA NWI HCS Service Area (Figure 1). Appointments cancelled by either patients or clinic appointments were excluded.

Ethical Review

Research service at the VA NWI HCS and the Emory University Institutional Review Board reviewed the research protocol, characterizing the work as quality improvement and not classified as research.

Variables

Individual Level

Individual level variables of age, race, sex, mental health diagnosis (yes or no), and rate of previous primary care no shows were obtained from medical records. Age was categorized from 18-39, 40-59, and 60 or older. Race was determined through patient self-identification of either White, black/African American, Asian, American Indian/Alaska Native, Native Hawaiian/Other, unknown, or declined to answer. Mental

health diagnosis was determined as ever having a diagnosis with an ICD code of 290 to

799.59. The rate of previous primary care no shows was calculated by dividing the

number of no shows for primary care appointments in the two-year time frame by the

number of primary care appointments during that time for each appointment. This was

used to assess history of missed appointments.

Health Systems Level

Health systems variables of wait time and day of week of appointment were also

obtained from medical records. Wait time was determined by calculating the time

between the date the appointment was made and the date of the appointment itself. The

resulting variable was then categorized into 0-14 days, 15-30 days, 30-90 days, and

greater than 90 days.

Contextual Level

Patient residential zip codes were linked to socioeconomic data available from the

census for calculation of the Neighborhood Deprivation Index (NDI) and distance from

each zip code to the clinic. Distance was calculated inputting both patient and NWI zip

codes into Google Maps. These distances were subsequently categorized into 0-5 miles, 5

to 10 miles, 10 to 30 miles, and greater than 30 miles.

The NDI was developed to identify contextual factors associated with health

disparities[35]. This measure is constructed for geographic units, including ZIP Code

Tabulation Areas (ZCTA), using data from the 2008-2012 American Community Survey

(ACS). The composite index is created from eight census variables (percent of males in

management and professional occupations, percent of crowded housing, percent of

households in poverty, percent of female headed households with dependents, percent of

households on public assistance, percent of households earning less than $30,000 per year estimating poverty, percent earning less than a high school education, and percent unemployed) which approximate the following domains of material wealth and deprivation: poverty/income, education, employment, occupation, housing/crowding, and residential stability.

The area-based data (Table 1) was retrieved from the 2008-2012 ACS using the U.S. Census Bureau's American FactFinder[36]. Five-digit ZCTA were chosen as the geographical area of interest in order to merge ACS data with the patient zip codes. ACS datasets were edited to only include the ZCTAs and estimate variables of interest. Percentages were calculated by dividing the estimate by the total population surveyed for each ZCTA. NDI was then calculated as a weighted average using weights recommended by Messer et al. and standardized to a mean of 0 and standard deviation of 1[35]. Standardized NDI was categorized into quintiles by ZCTA.

Appointments for patients with residential addresses and zip codes within the catchment area were retained. ACS data and NDI weights from Table 1 were linked to the remaining zip codes. NDI and distance to clinic were merged with patient-level information by ZCTA in Microsoft Excel. Actual zip codes were stripped and replaced with anonymized values in order to carry out the analysis on de-identified data.

Statistical Analysis

Collinearity among predictor variables was assessed using a macro based on work by Zack, M. and adapted by Singleton, J., Wall, K., and Delaney, K.[37] Log-binomial generalized estimating equation models were fit to estimate bivariate associations between each predictor variable (age, race, sex, previous no show rate, psychiatric

diagnosis, wait time, day of week of appointment, distance, and NDI) and the outcome of

"no show" while accounting for possible correlation of individuals from the same ZCTA.

An assessment of all possible subsets of predictors was performed separately by predictor

domain beginning with individual level predictors. The significant individual predictors

of age, race, sex, and mental health diagnosis were then used as the foundation for

modeling all possible subsets of health systems and contextual predictors. Interaction

between standardized NDI and three individual level variables of age, race, and mental

health were each assessed in bivariate analyses and in the final model, using an alpha of

0.05. The final best model was determined after combining significant combinations of

factors for each domain. All analyses were performed using SAS Statistical Software

(SAS Institute, Cary, NC).

RESULTS

The initial dataset included 95,835 visits by non-deceased patients. 1,741 visits were

dropped because they accounted for patients outside the catchment area. 11,781 and 12,405 visits

were excluded because they were cancelled by the patient and clinic prior to the visit,

respectively. Following these exclusions, 69,908 visits remained for analysis.

Table 2 shows the demographics of the study population and the frequency of no show

for each category of each predictor. The frequency of missed appointments decrease as age

increases, as 17.2% of those age 20-39 years old missed appointments, whereas 12% of those age

40-59 and 5.3% of those age 60 and older missed appointments. Although the majority of the

visits (81.2%) were by white patients, 15.1% of blacks missed appointments compared to 7.2%

whites and 9.6% of other races. Visits with wait times of 0-14 or 30-90 days appeared to have

greater no shows than when the wait times were 15-30 days or greater than 90 days. While 3.1%

of patients living in the most deprived neighborhoods missed appointments, compared to a range of 0.9% to 2.0% in less deprived neighborhoods, 38% of the study population live in these most deprived neighborhoods.

Unadjusted bivariate analyses (Model 0, Table 3) show that patients age 20-39 were more than 3 times more likely to miss appointments than patients age 60 and older (OR: 3.74, 95% CI: 3.36, 4.15) (Table 3). Even patients 40-59 were more than twice as likely as those over 60 to miss appointments (OR: 2.45, 95% CI: 2.25, 2.67). Blacks were twice as likely as whites to miss appointments (OR: 2.29, 95% CI: 2.13, 2.46). However, males, who accounted for 91.6% of the visits, were less likely than women to miss appointments (OR: 0.80, 95% CI: 0.72, 0.89). Additionally, individuals diagnosed with mental health issues were more likely than those without mental health issues to miss appointments (OR: 1.39, 95% CI: 1.30, 1.49). Health systems predictors, contextual predictors, and interaction terms were all non-significant.

After assessing all possible subsets of individual predictors, we identified a subset of individual predictors for the adjusted individual model (Model 1, Table 3). The model including health systems predictors of day of week of the appointment and wait time had the best fit when added to Model 1 (Model 2, Table 3). However, neither health systems predictor was significantly associated with the outcome of no show, and both were subsequently dropped from the model. Finally, the area-based predictors were examined using all possible subsets added to the model with age, race, sex, and mental health diagnosis (Model 1). Model 3 (Table 3) shows the best model including area-based predictors, which includes age, race, sex, mental health diagnosis, and continuous distance to the clinic. None of the area-based predictors were significant when added to Model 1, thus Model 1 remained as the final best model.

DISCUSSION

This study aimed to determine factors that are associated with non-attendance to VA primary care appointments. Individual factors of age, race, sex, and mental health diagnosis were found to be the primary factors associated with missed appointments while measured health system and contextual factors were relatively non-contributory.

The findings of this study reinforce previous findings that suggest a strong association between individual factors and missed appointments. The 20-39 year old age group was also found to be associated with greater missed appointments in previous literature[23]. Similarly, Parikh et al.[21] found that younger patients had greater no show rates. Older patients tend to have more health issues that require regular attendance. Lacy et al.[20] described a lack of understanding of the health care scheduling system, which could be more prevalent in younger patients and aid in explaining this difference in missed appointments by age.

Smith and Yawn[23] also found that white patients had lower no show rates than Hispanics or African Americans. They found that the highest no show rates were in Hispanics, followed by African Americans, with the lowest being for Asians. We could not replicate this finding due to the small sample sizes of Asians, American Indian/Alaska Natives, and Native Hawaiian/Pacific Islanders. The center examined by Smith and Yawn included a clinic for Southeast Asian children, which could influence their finding. As primary care clinics, the VA NWI HCS clinics assessed in the current study were open to veterans of all races.

The direction of the association between sex and no show was varied in previous literature[22,24]. Our finding that male gender was significantly associated with more no

shows is similar to that reported by Sharp and Hamilton[22]. This could be due to the gendered difference of the veteran population or differences in family responsibilities.

The association between mental health diagnosis was not explored deeply in recent literature of primary care clinics. It might be expected, as we found, that certain mental health issues would be barriers to keeping appointments. This finding is particularly important in this population. Table 1 shows that approximately 60% of the study population has a mental health diagnosis, compared to a 46% prevalence among the general U.S. population[38]. It is also plausible that mental health issues represent a much larger set of barrier to care that should be attended in order to provide high quality care.

We primarily found associations between no shows and the individual level factors described above. This contradicted the findings of recent literature, which found higher no show rates with longer wait times and appointments on specific days of the week[21,22]. Previous studies also found an association between high neighborhood deprivation and poor appointment-keeping [31]. It is possible that neighborhood deprivation would have a stronger association for other study populations.

Strengths and Limitations

This study had several strengths. We performed a complete analysis of all non-cancelled primary care visits in a specified catchment area. Our study assessed predictors of no shows for primary care clinics that had not been previously explored to our knowledge. Our finding that having a mental health diagnosis is associated with increased risk of no show fills a gap in contemporary literature and is worthy of further study. However, we were unable to discriminate among types of mental health diagnoses. Finally, our exploration of neighborhood effects is an important contribution to the

literature. Even though we did not find significant effects of neighborhood deprivation on no shows for the VA NWI HCS primary care clinics in Omaha, it is possible that the effect could be different for other VA locations, other types of clinics, or other geographic scales.

There were several limitations of this study. For confidentiality reasons, we were unable to link visits by patient ID, which made it impossible to account for clustering by patient. If several patients accounted for a large number of visits, this could alter the estimation of precision and variance. Additionally, not having patient IDs resulted in use of visit as the unit of analysis rather than patient. However, the variable of previous primary care no show rates was calculated by the VA electronic health system for unique patients and is therefore still valid.

We were also unable to use patient addresses to determine census tracts for area-based measures. However we did capture zip code of residence, and this allowed at least partial control for clustered events. ZCTA are derived from zip codes, which are created by the United States Postal Service (USPS). Although they are more useful than USPS zip codes, they are still areal representations of these zip codes and have inherent limitations. They may not represent the contextual environment or distances that are actual barriers and facilitators for access to care.

Due to the nature of this study as a medical record review, we only had demographic variables collected during routine doctor visits to assess as barriers to care. We did not have information about perceived barriers to care, which could have a greater impact on patient attendance. We created the "wait time" variable from the date the patient scheduled their appointment and the date of the appointment. It also may have

been useful to assess the time between the patient's desired appointment date and the date for which they were scheduled.

REFERENCES

1. George A, Rubin G. Non-attendance in general practice: a systematic review and its implications for access to primary health care. *Family practice.* 2003;20(2):178-184.
2. Capko J. The price you pay for missed appointments. *The Journal of medical practice management : MPM.* 2007;22(6):368.
3. Hussain-Gambles M, Neal RD, Dempsey O, Lawlor DA, Hodgson J. Missed appointments in primary care: questionnaire and focus group study of health professionals. *British Journal of General Practice.* 2004;54:108-113.
4. Berg BP, Murr M, Chermak D, et al. Estimating the cost of no-shows and evaluating the effects of mitigation strategies. *Medical decision making : an international journal of the Society for Medical Decision Making.* 2013;33(8):976-985.
5. Griffin SJ. Lost to Follow-up: the Problem of Defaulters from Diabetes Clinics. *Diabetic Medicine.* 1998;15(Supplement 3):S14-S24.
6. Guy R, Hocking J, Wand H, Stott S, Ali H, Kaldor J. How effective are short message service reminders at increasing clinic attendance? A meta-analysis and systematic review. *Health services research.* 2012;47(2):614-632.
7. Hashim MJ, Franks P, Fiscella K. Effectiveness of Telephone Reminders in Improving Rate of Appointments Kept at an Outpatient Clinic: A Randomized Controlled Trial. *J Am Board Fam Pract.* 2001;14(3):193-196.
8. Haynes JM, Sweeney EL. The Effect of Telephone Appointment-Reminder Calls on Outpatient Absenteeism in a Pulmonary Function Laboratory. *Respiratory Care.* 2006;51(1):36-39.
9. Jain S, Chou CL. Use of an Orientation Clinic to Reduce Failed New Patient Appointments in Primary Care. *Journal of general internal medicine.* 2000;15:878-880.
10. Prasad S, Anand R. Use of mobile telephone short message service as a reminder: the effect on patient attendance. *International dental journal.* 2012;62(1):21-26.
11. Rose KD, Ross JS, Horwitz LI. Advanced access scheduling outcomes: a systematic review. *Archives of internal medicine.* 2011;171(13):1150-1159.
12. Stubbs ND, Geraci SA, Stephenson PL, Jones DB, Sanders S. Methods to Reduce Outpatient Non-attendance. *American Journal of the Medical Sciences.* 2012;344(3):211-219.
13. Fong T. An army of patients. *Modern Healthcare.* 2003;33(20):48-52.
14. Chokshi DA. Improving Health Care for Veterans - A Watershed Moment for the VA. *The New England journal of medicine.* 2014;371(4):297-299.
15. Atkins D, Kilbourne A, Lipson L. Health equity research in the Veterans Health Administration: we've come far but aren't there yet. *American journal of public health.* 2014;104 Suppl 4:S525-526.
16. Uchendu US. Institutional Journey in Pursuit of Health Equity: Veterans Health Administration's Office of Health Equity. *American journal of public health.* 2014;104(54):S511-S513.
17. Affairs DoV. Wait-Time Goals of the Department for the Veterans Choice Program. *Federal Register.* 2014;79(201):62519-62520.

18.   Affairs DoV. Expanded Access to Non-VA Care Through the Veterans Choice Program. *Federal Register.* 2014;79(214):65571-65587.

19.   Barron WM. Failed appointments. Who misses them, why they are missed, and what can be done. *Primary care.* 1980;7(4):563-574.

20.   Lacy NL, Paulman A, Reuter MD, Lovejoy B. Why we don't come: patient perceptions on no-shows. *Annals of family medicine.* 2004;2(6):541-545.

21.   Parikh A, Gupta K, Wilson AC, Fields K, Cosgrove NM, Kostis JB. The effectiveness of outpatient appointment reminder systems in reducing no-show rates. *The American journal of medicine.* 2010;123(6):542-548.

22.   Sharp DJ, Hamilton W. Non-attendance at general practices and outpatient clinics. *Bmj.* 2001;323(7321):1081-1082.

23.   Smith CM, Yawn BP. Factors associated with appointment keeping in a family practice residency clinic. *The Journal of family practice.* 1994;38(1):25-29.

24.   Giunta D, Briatore A, Baum A, Luna D, Waisman G, de Quiros FG. Factors associated with nonattendance at clinical medicine scheduled outpatient appointments in a university general hospital. *Patient preference and adherence.* 2013;7:1163-1170.

25.   Cosgrove MP. Defaulters in general practice: reasons for default and patterns of attendance. *The British journal of general practice : the journal of the Royal College of General Practitioners.* 1990;40(331):50-52.

26.   Frankel S, Farrow A, West R. Non-attendance or non-invitation? A case-control study of failed outpatient appointments. *Bmj.* 1989;298(6684):1343-1345.

27.   Donovan S, Shinseki EK. Homelessness is a public health issue. *American journal of public health.* 2013;103 Suppl 2:S180.

28.   Sayer NA, Rettmann NA, Carlson KF, et al. Veterans with history of mild traumatic brain injury and posttraumatic stress disorder: Challenges from provider perspective. *The Journal of Rehabilitation Research and Development.* 2009;46(6):703.

29.   Fargo J, Metraux S, Byrne T, Munley E, Montgomery AE, Jones H. Prevalence and Risk of Homelessness Among US Veterans. *Preventing Chronic Disease.* 2012.

30.   Diez Roux AV, Mair C. Neighborhoods and health. *Annals of the New York Academy of Sciences.* 2010;1186:125-145.

31.   Parker MM, Moffet HH, Schillinger D, et al. Ethnic differences in appointment-keeping and implications for the patient-centered medical home--findings from the Diabetes Study of Northern California (DISTANCE). *Health services research.* 2012;47(2):572-593.

32.   Rudge GM, Mohammed MA, Fillingham SC, Girling A, Sidhu K, Stevens AJ. The combined influence of distance and neighbourhood deprivation on Emergency Department attendance in a large English population: a retrospective database study. *PloS one.* 2013;8(7):e67943.

33.   Willems S, Peersman W, De Maeyer P, Buylaert W, De Maeseneer J, De Paepe P. The impact of neighborhood deprivation on patients' unscheduled out-of-hours healthcare seeking behavior: a cross-sectional study. *BMC family practice.* 2013;14:136.

34. McCarthy M. US investigation confirms Veterans Affairs staff kept multiple waiting lists. *Bmj.* 2014;348:g3649.

35. Messer LC, Laraia BA, Kaufman JS, et al. The development of a standardized neighborhood deprivation index. *Journal of urban health : bulletin of the New York Academy of Medicine.* 2006;83(6):1041-1062.

36. Bureau USC. American FactFinder. 2014.

37. Davis CE, Hyde JE, Bangdiwala SI, Nelson JJ. An example of dependencies among variables in a conditional logistic regression. In: Moolgavkar SH, L. PR, eds. *Modern statistical methods in chronic disease epidemiology*. New York: John Wiley & Sons, Inc.; 1986:140-147.

38. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry.* 2005;62(6):593-602.

39. DuMontier C, RIndfleisch K, Pruszynski J, Frey JJ. A Multi-Method Intervention to Reduce No-Shows in an Urban Residency Clinic. *Family Medicine.* 2013;45(9):634-641.

40. Go HT, Becker A. Reducing Broken Appointments in Primary Care Clinic. *Journal of Ambulatory Care Management.* 1979:23-30.

41. Affairs DoV. Removal of Penalty for Breaking Appointments. *Federal Register.* 2014;79(5):1332-1333.

42. Bell CF, Bryant C. Determinants of nutrition appointment attendance among male veterans attending Veterans Health Administration clinics. *Journal of nutrition education and behavior.* 2013;45(6):739-744.

TABLES

TABLE 1. Components of the Neighborhood Deprivation Index (NDI) from the U.S.

Census Bureau's 2008-2012 American Community Survey (ACS) by 5-digit ZCTA

ACS Table	Domain	Variable	NDI Weight
B11005	Housing/Crowding	Percent of female headed households with dependents	0.357
B15002	Education	Percent earning less than a high school education	0.369
B17001	Poverty/Income	Percent of households in poverty	0.397
B19057	Poverty/Income	Percent of households on public assistance	0.382
B19101	Poverty/Income	Percent of households earning <$30,000/year, estimating poverty	0.386
B23001	Employment	Percent unemployed (of civilians employed)	0.366
B25014	Housing/Crowding	Percent of crowded housing	0.261
C24010	Occupation	Percent of males in management and professional occupations	-0.285

TABLE 2. Descriptive Statistics by Visits

	Total		No Show	
	N or Mean	% or SE	N or Mean	% or SE
Outcome				
No show	5888 / 69908 appointments	8.4%		
Individual Predictors				
Age				
20-39	7,372	10.6%	1,270	17.2%
40-59	19,574	28.0%	2,350	12.0%
60 and over	42,960	61.5%	2,268	5.3%
Race (missing = 153)				
White	56,643	81.2%	4,089	7.2%
Black	9,437	13.5%	1,429	15.1%
Other[a]	3,675	5.3%	352	9.6%
Sex				
Male	64,046	91.6%	5,290	8.3%
Female	5,862	8.4%	598	10.2%
Mental health diagnosis				
Yes	42,389	60.6%	3,984	9.4%
No	27,519	39.4%	1,904	6.9%
Primary care no show rate in past two years	6.50	13.5	32.12	24.6
Health System Predictors				
Day of week of appointment (missing = 72)				
Monday	13,681	19.6%	1,276	1.8%
Tuesday	15,453	22.1%	1,305	1.9%
Wednesday	14,547	20.8%	1,188	1.7%
Thursday	12,554	18.0%	971	1.4%
Friday	13,395	19.2%	1,120	1.6%
Saturday	278	0.4%	28	0.0%
Wait time (days) (continuous)	28.38	29.2	28.17	29.0
Wait time (days)				
0-14	31,969	45.8%	2,734	3.9%
15-30	12,279	17.6%	1,003	1.4%
30-90	22,224	31.8%	1,844	2.6%
>90	3,364	4.8%	300	0.4%

Contextual Predictors

Unique zip codes	394		271	
Standardized Neighborhood Deprivation Index (continuous) (missing = 6)	0.16	1.3	0.12	1.3
Standardized Neighborhood Deprivation Index (quintiles) (missing = 6)				
1 - Least deprived	16,485	23.6%	1,412	2.0%
2	8,998	12.9%	751	1.1%
3	10,269	14.7%	924	1.3%
4	7,589	10.9%	646	0.9%
5 - Most deprived	26,561	38.0%	2,155	3.1%
Distance to clinic (miles) (continuous)	20.32	29.0	20.91	28.3
Distance to clinic (miles)				
0-5	15,410	22.0%	1,256	1.8%
>5-10	19,054	27.3%	1,597	2.3%
>10-30	21,650	31.0%	1,758	2.5%
>30	13,794	19.7%	1,277	1.8%
LN(Distance to clinic) (ln(miles))	2.38	1.1	2.41	1.1

Abbreviation: SE: Standard Error

[a] Other: Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, Unknown

TABLE 3. Model Selection

	Model 0 Unadjusted Bivariate Models[a]			Model 1 Individual Predictors Best Model			Model 2 Health Systems Predictors Best Model			Model 3 Area-Based Predictors Best Model		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
Individual Predictors												
Age												
20-39	3.74	3.36	4.15	3.86	3.46	4.29	3.86	3.47	4.30	3.86	3.47	4.30
40-59	2.45	2.25	2.67	2.22	2.04	2.42	2.23	2.05	2.42	2.23	2.04	2.42
60 and over (referent)	1.00			1.00			1.00			1.00		
Race												
White (referent)	1.00			1.00			1.00			1.00		
Black	2.29	2.13	2.46	2.14	1.99	2.31	2.14	1.98	2.31	2.14	1.99	2.31
Other[b]	1.36	1.16	1.60	1.35	1.17	1.56	1.35	1.17	1.56	1.35	1.17	1.56
Sex												
Male	0.80	0.72	0.89	1.29	1.15	1.44	1.30	1.16	1.45	1.29	1.15	1.44
Female (referent)	1.00			1.00			1.00			1.00		
Mental health diagnosis												
Yes	1.39	1.30	1.49	1.16	1.09	1.24	1.16	1.09	1.24	1.16	1.09	1.24
No (referent)	1.00			1.00			1.00			1.00		
Primary care no show rate in past two years	1.07	1.07	1.07									
Health System Predictors												
Day of week of appointment												
Monday	0.93	0.59	1.45				0.90	0.58	1.39			
Tuesday	0.83	0.54	1.30				0.83	0.54	1.27			
Wednesday	0.80	0.52	1.25				0.77	0.50	1.18			

Thursday	0.76	0.49	1.16		0.73	0.48	1.11		
Friday	0.82	0.52	1.31		0.76	0.48	1.20		
Saturday (referent)	1.00				1.00				
Wait time (days) (continuous)	0.99	0.97	1.01		1.00	1.00	1.00		
Wait time (days)									
0-14 (referent)	1.00								
15-30	0.95	0.87	1.04						
30-90	0.97	0.91	1.03						
>90	1.05	0.94	1.17						
Contextual Predictors									
Standardized Neighborhood Deprivation Index (continuous)	0.97	0.94	1.00						
Standardized Neighborhood Deprivation Index (quintiles)									
1 - Least deprived (referent)	1.00								
2	0.97	0.85	1.11						
3	1.04	0.91	1.19						
4	0.97	0.86	1.10						
5 - Most deprived	0.93	0.83	1.04						
Distance to clinic (miles) (continuous)	1.00	1.00	1.00					1.00	1.00	1.00
Distance to clinic (miles)									
0-5 (referent)	1.00								
>5-10	1.00	0.99	1.01						
>10-30	1.00	0.99	1.01						
>30	1.01	1.00	1.02						

LN(Distance to clinic) (ln(miles))	1.04	1.00	1.07			
QIC				38311.4	38257.4	38311.2

Abbreviations: OR: Odds Ratio, CI: Confidence Interval, QIC: Quasilikelihood under the Independence model Criterion

[a] Unadjusted bivariate analyses of predictors with the outcome of no shows

[b] Other: Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, Unknown
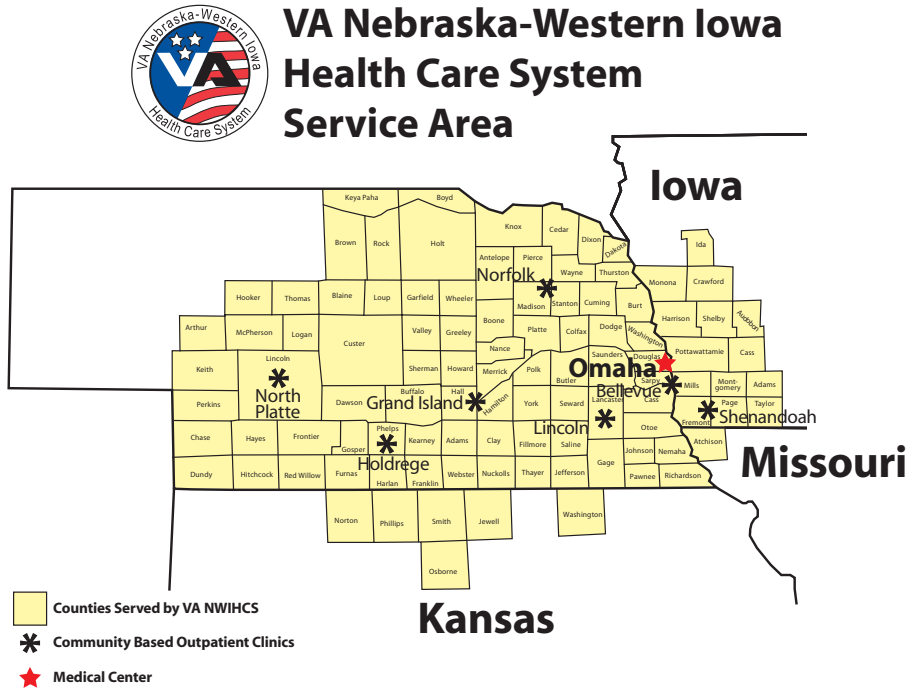
FIGURES

FIGURE 1. VA Nebraska-Western Iowa Health Care System Service Area
Source: Figure provided by Dr. Marvin J. Bittner, VA NWI HCS

CHAPTER 3. CONCLUSION

In this study, we aimed to determine the most effective set of predictors of no shows in primary care clinics of the VA NWI HCS. Of the variables available for this study the individual factors of age, race, sex, and mental health status were most predictive of visit no show. Patients who were younger than 60 years of age, or of non-white race, or male sex, or had a mental health diagnosis were of greater risk for no shows than patients who were 60 years old or older, or white race, or female, or did not have a mental health diagnosis. These findings can allow for the VA NWI HCS primary care clinics to target interventions at these high-risk groups in order to reduce the number of no shows.

There are a number of potential interventions that can be implemented to reduce no shows from mail, telephone, or SMS reminders to open access scheduling[4-12,39,40]. The San Francisco VA Medical Center implemented an orientation clinic for new patients, which significantly reduced no shows for first appointments[9]. They found a no show rate of 45% in the pre-intervention group and 18% in the orientation clinic group for initial primary care visits. Another effective intervention has been use of advanced, or open, access scheduling. Rose, Ross, and Horowitz[11] describe several studies that found significantly lower no show rates upon implementation of advanced access scheduling.

Future Directions

An immense amount of change has occurred for the VA following the previously described wait time issues that were uncovered during the spring of 2014. One of these changes was to remove the penalty for veterans who miss two medical appointments

without "24 hours' notice and a reasonable excuse"[41]. This study focused on the time

period January 1, 2012 to December 31, 2013. Future research should assess how these

changes, particularly the removal of the penalty related to no shows, affects the no show

rate.

Further research is needed to more completely understand the barriers to keeping

appointments. Exploring patients' perceived barriers to care as in Bell and Bryant[42] and

Lacy et al.[20] could influence even more effective interventions than targeting high-risk

patients. The addition of other potential risk factors, such as the difference between the

patient's desired appointment date and the actual appointment date, more detailed mental

health diagnoses, and presence of non-VA healthcare would also help with defining those

at highest risk of missing appointments. We did not find that neighborhood deprivation

index had a significant effect on no show rate for primary care visits at the VA NWI

HCS, it is possible that there could be a stronger effect for specialty clinics at the VA

NWI HCS, at another VA, or for another healthcare system altogether. Additionally,

using a more meaningful area measure, such as census tract, or a different

sociocontextual determinant of health, such as area-based poverty or segregation indices

could have a more significant effect on no shows.