### Regional and national real-world healthcare resource utilization, clinical and cost outcomes of Type 2 diabetes patients treated with SGLT2i

**Background:** From a US third-party payer perspective, it remains unclear whether added clinical benefits of Sodium-Glucose Co-Transporter-2 Inhibitors (SGLT-2i) translate to lower costs, healthcare resource utilization (HCRU), and improve outcomes across regional and payer segments.

**Methods:** This retrospective cohort analysis used Truven MarketScan® database from 4/2013 to 12/2017, along with Aetion Evidence Platform™. Cox proportional hazards model assessed binary outcomes and generalized linear models (GLM) assessed continuous outcomes. Propensity score (1:1) matching was used to control for baseline and clinical confounders. An expanded propensity score was developed and used in the national cohort only, while condensed propensity score was created and used in all cohorts.

**Results:** SGLT2i were found to have reduced HCRU (time to any ED visits, time to any hospitalization) relative to SU reference group (18-20% and 16-29% reduction, respectively). Clinical outcomes were consistent with prior studies, with noted increased risk in Medicare cohorts for genital infections, and consistent reduction in heart failure across all cohorts (40-61% reduction). DKA was not significant across cohorts. Total cost of care was significantly higher in several cohorts, while hospitalization costs were mainly insignificant. Across analyses, point estimates were relatively similar with wider confidence intervals as cohort size decreased.

**Conclusion:** In this large retrospective cohort analysis, SGLT2i were found to have improved HCRU and clinical outcomes relative to SU. Known safety signals were confirmed with potential for future study of Medicare-specific genital infection risk. This study helps assess regional variability when assessing comparative and cost effectiveness of SGLT2i among payer segments.

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### Longitudinal Association Between Chronic Periodontitis and the Risk of Hypertension

**Background:** Globally, hypertension poses a major public health challenge due to its association with heart disease, chronic kidney disease, stroke, and death. The relationship between periodontitis and hypertension is supported by literature relating periodontitis with cardiovascular diseases. Few studies have reported that there may be an association between periodontitis and hypertension.

**Methods:** Participants without hypertension at baseline (n=540) from the San Juan Overweight Adults Longitudinal Study (SOALS), and with complete 3-year follow-up data, were evaluated. Chronic Periodontitis was assessed using the National Health and Nutrition Examination Survey (NHANES) methods. Hypertension was defined as self-reported physician-diagnosed hypertension over the follow-up period. Poisson regression was used, controlling for age, sex, smoking, physical activity, alcohol consumption, diabetes, waist circumference and family history of hypertension.

**Results:** Over the 3-year follow-up period, 65 (12%) of the 540 participants developed hypertension, and 58 (27%) of the 221 with normal blood pressure developed prehypertension/hypertension. There was no statistically significant association between periodontitis and the risk of developing hypertension. Adjusting for age, sex, smoking status, alcohol, BMI, diabetes and number of teeth, people with severe periodontitis had an increased incidence of prehypertension/hypertension (IRR=1.47, 95% CI: 1.01, 2.17) compared to those without periodontitis.

**Conclusion:** In this longitudinal study, there was no association between chronic periodontitis and hypertension. However, severe periodontitis is weakly associated with an increased risk of prehypertension/hypertension.

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### The Impact of Breakfast Skipping on Body Composition and Cardiometabolic Risk Factors: A Systematic Review and Meta-Analysis

**Background:** Obesity affects 40% of US adults increasing their risk for chronic conditions, including heart disease. Prospective studies have demonstrated protective effects of breakfast consumption on weight gain. However, randomized controlled trials (RCTs) have yielded equivocal results.

**Objective:** To evaluate the effect of skipping breakfast on body composition and secondarily assess cardiometabolic risk factors.

**Methods:** A systematic review and meta-analysis was conducted evaluating RCTs of breakfast skipping. Articles in PubMed, Cochrane, CINAHL, and Embase published before October 2018 were considered. Inclusion criteria included age ≥ 18, intervention duration ≥ 4 weeks, ≥ 7 subjects per group, and ≥ 1 body composition measure. A random effects, weighted mean difference (WMD) model was used. Publication quality and bias were assessed with NIH Study Quality Assessment Tool and Egger and Begg testing, respectively.

**Results:** Two reviewers screened 7,389 studies. Seven articles with 444 total participants and an average duration of 8.6 weeks were included. Six studies were rated as ‘Good’ quality and one was ‘Fair.’ The only significantly different body composition
measure in breakfast skippers as compared to breakfast consumers was body weight; WMD of –0.54 kg (95% CI -1.05, -0.0; p=0.04). Between study heterogeneity was limited, with an I²=21.4% and nonsignificant Egger and Begg tests. HDL and LDL cholesterol increased in breakfast skippers as compared to breakfast consumers; WMD 0.92 mg/dL (0.24, 1.60; p=0.01) and 9.24 mg/dL (2.18, 16.30; p=0.01), respectively. No significant differences were observed for other cardiometabolic parameters. 

Conclusions: Breakfast skipping may have a modest impact on weight loss and may increase HDL and LDL cholesterol in the short-term.

Egg Consumption and Risk of Stunting Among 6-24 Month Old Children in Nepal

Background: Linear growth faltering and stunting are significant risk factors for child mortality, morbidity, and suboptimal cognitive development in low-and middle-income countries. A recent review of nutrition program implementation in Nepal, where the national stunting rate in 2016 was 35.8%, highlighted the need for innovative programs aimed at overcoming remoteness constraints. Recent studies indicate that egg consumption during the period of complementary feeding may reduce the risk of linear growth faltering.

Methods: We analyzed data from the 2014 Nepal Multiple Indicator Cluster Survey to assess the association of egg consumption with linear growth outcomes and history of diarrhea using multivariate logistic and linear regression. We also examined potential effect modification by location of residence and child age.

Results: Among 1,522 Nepalese children, we found a mean length-for-age z-score of -1.21 (SD: 0.45) and 25% stunting. Multivariate analyses indicated that egg consumption was associated with 0.51 greater length-for-age z-scores (LAZ) and reduced risk of stunting (odds ratio (OR)=0.51; 95% CI: 0.26-0.98; p=0.04). We also found that the association of egg consumption with length-for-age z-score was larger among rural (mean difference LAZ: 0.50; 95% CI: 0.25-0.74; p= less than 0.001) than urban children (mean difference LAZ: -0.12; 95% CI: -0.47-0.24; p=0.51). We found no association of egg consumption and diarrheal disease: OR 1.06. (0.62-1.8), p=0.84.

Conclusion: Egg consumption was associated with improved linear growth and reduced risk of stunting among children 6-24 months of age. Randomized trials and intervention studies of regular egg consumption during the period of complementary feeding appear warranted.

Utility of mGAP score in predicting survival in lung transplant candidates with IPF

Background: IPF is a progressive fibrotic lung disease with a grave prognosis. Ltx is a curative treatment. The mortality rate of IPF patients on the waitlist is highest. We would like to study mGAP score and its predictive capacity to help with organ allocation to reduce waitlist mortality.

Methods: This is a retrospective observational study. The population is IPF patients on waitlist for Ltx from SRTR database from 1985 to 2018. The primary outcome was 1-year mortality after listing. Ltx was considered as competing event in Fine-Gray analyses. Logistic regression was used to build a predicting model for 1-year mortality. Database was divided into derivation and validation cohort. Stepwise approach was used to select variables. Discrimination was measured by ROC analysis. Calibration was measured by Hosmer-Lemeshow goodness of fit test statistic.

Results: Of 9,917 subjects with complete mGAP score, 2,172(21.90%) subjects died within 1 year. The majority of patients were male(66.55%), with mean FVC of 48.48% and mean 6MWD of 789.4 ft. SHR of mGAP is 1.07,p=0.005,95%CI(1.02,1.12),AUC=0.5229. Fine-Gray univariate analysis demonstrated that BMI, FEV1, FVC, history of steroid dependency, 6MWD < 250m, elevated mean pulmonary artery pressure(mPAP) and low cardiac output are predictor of 1-year mortality. 6MWD < 250m, mPAP, history of steroid dependency and physical capacity were included in logistic model which demonstrate good calibration and adequate AUC of 0.61.

Conclusions: mGAP score is not a good predictor for 1-year mortality for IPF patients on waitlist. This may be explained by lacking DLCO affects the capability of the score to predict mortality.
### The Epidemiology of Lassa Fever: Initial Analysis Using Nontraditional Data Sources

**Background:** Lassa virus (LV) is endemic to West Africa. There is a seasonal component to infection, as cases peak during the dry season. The primary route of transmission is zoonotic, with the Mastomys natalensis rodent serving as the reservoir population. There are significant gaps in the understanding of LV epidemiology, which impacts epidemic preparedness and vaccine development.

**Methods:** Reported case counts of LV infection in Nigeria from 2010-2017 were obtained using a digital disease surveillance system. This system captures infectious disease social media postings and news reports. After cleaning the data, linear interpolation was used to generate a complete cumulative case count. Seasonality was assessed using the interpolated data and compared to recent findings from a hospital in Edo State, Nigeria.

**Results:** Out of 1,000 initial confirmed case reports, only 53 remained after cleaning. Seasonal peaks during the dry season were confirmed using graphical representation of the data, and findings were consistent with published data. As a next step, the Incidence Decay and Exponential Adjustment (IDEA) model will be used to estimate disease parameters.

**Conclusions:** LV is a significant public health threat, and vaccine development and outbreak preparedness are ongoing. Efforts are limited by a lack of knowledge of LV epidemiological transmission properties. Interpolated data generated using novel sources can help characterize outbreak dynamics. Transmission dynamics analysis is a novel tool to use non-traditional data sources to better define outbreaks.

### Association between vitamin D supplementation and cardiovascular risk factors, NHANES 2007-2014

**Background:** Vitamin D deficiency is prevalent in developed countries often secondary to inadequate sunlight exposure. Many studies have shown that vitamin D deficiency is associated with a high risk of cardiovascular diseases. Therefore, many people advocate taking vitamin D supplements to protect our cardiovascular system. However, there is still not enough evidence at the moment to support whether vitamin D supplementation is beneficial in preventing cardiovascular diseases. This study aims to evaluate the association between vitamin D supplementation and cardiovascular risk factors in a representative sample population in the US.

**Methods:** Our study sample included 23088 people from National Health and Nutrition Examination Survey (NHANES) 2007-2014, representing an estimated 2.19 million people nationwide. The exposure of interest is presence of vitamin D supplementation. The primary outcome is systolic and diastolic blood pressure. The secondary outcomes are total serum cholesterol, triglycerides, low-density lipoprotein (LDL), high-density lipoprotein (HDL), Haemoglobin A1c (HbA1c) and plasma fasting glucose. Logistic regression is used to evaluate the association between the exposure and outcome variables. A secondary analysis with the outcome as continuous variables was conducted.

**Results:** Compared to participants who did not take vitamin D, participants taking vitamin D had lower systolic blood pressure (OR=0.84, 95%CI(0.76-0.94)), lower diastolic blood pressure (OR=0.82, 95%CI(0.68-0.99)), lower level of LDL (OR=0.85, 95%CI(0.73-0.98)), higher level of HDL (OR=0.74, 95%CI(0.66-0.83)), fasting glucose (OR=0.67, 95%CI(0.54-0.83)), HbA1c (OR=0.64, 95%CI (0.52-0.78)), adjusted for age, sex, race, BMI and smoking status.

**Conclusions:** We found that vitamin D supplementation is associated with lower risk of cardiovascular risk factors.

### Housing Instability, Smoking, and Intention to Quit in Health Center Patients

**Background:** Smoking is the leading cause of preventable morbidity and mortality in the US, and the prevalence of cigarette smoking is disproportionately high among homeless persons. A better understanding of smoking prevalence and intention to quit among patients of varying housing stability levels may help inform prevention and treatment efforts.

**Methods:** This study analyzes 5,522 adult respondents to the 2014 Health Center Patient Survey, a nationally-representative survey of community health center patients. Logistic regression models assessed the association between housing stability level, smoking, and intention to quit.

**Results:** 2.9% of eligible participants were currently homeless, and 42.5% of participants were classified as unstably housed. 20.6% of stably housed patients, 35.5% of unstably housed patients, and 64.7% of homeless patients were current smokers. Homelessness was associated with increased odds of current smoking (aOR 3.22, 95% CI 2.13-4.86, P < .001); unstable housing was not (aOR 1.24, 95% CI 0.86-1.79, P=.26). Unstably housed smokers were also not significantly different from stably housed smokers with regard to intention to quit smoking (aOR 0.98, 95% CI 0.58-1.65, P=.94). However, intention to quit among homeless smokers was less likely than stably housed smokers (aOR 0.35, 95% CI 0.13-0.96, P=.04).

**Conclusions:** While patients experiencing current homelessness were more likely to be smokers and less likely to have intentions to quit smoking in the near term, patients with housing instability had smoking rates and quitting intentions similar to stably housed counterparts. Promoting tobacco cessation in clinical settings may benefit from targeted interventions that consider gradations of housing stability level.
Validation of a Tool to Predict Violence and Aggression by Behavioral Health Patients for Use in the Emergency Department

**Background:** The Dynamic Appraisal of Situational Aggression is an assessment tool that has been validated for use to predict violent or aggressive behavior in psychiatric inpatient settings. Its validity has not been established for use in the emergency department.

**Methods:** The Dynamic Appraisal of Situational Aggression was implemented as an assessment tool within the electronic health record of an academic medical center with inpatient psychiatric services. A retrospective analysis was conducted using Spearman rank-correlation coefficients to compare a final risk score with the incidence of violence or aggression, defined as the use of hard physical restraints or the administration of intramuscular sedative medication. A receiver operating characteristic curve was used to summarize the predictive accuracy of the Dynamic Appraisal of Situational Aggression.

**Results:** 3433 scores were analyzed, representing 1550 patients. The Dynamic Appraisal of Situational Aggression was found to have predictive validity with increasing scores (p-value less than 0.001) using Spearman correlation coefficients comparing all tested cut-off scores against incidence of violence and aggression. The receiver operating characteristic comparing DASA scores of 0 vs greater than 0 resulted in an area under the curve of 0.791. The median time to subsequent aggression was determined to be 110 minutes.

**Conclusions:** The Dynamic Appraisal for Situational Aggression is an assessment tool that has predictive validity for use evaluating behavioral health patients in the emergency department setting. The tool is capable of predicting violence or aggression within a time frame conducive to the implementation of non-invasive measures.

The Association Between Hospital Quality and Costs of Inpatient Colorectal Cancer Surgery in a Universal Healthcare System

**Background:** The cost of cancer care in Canada is increasing; reducing healthcare spending is a public health priority. The association between better quality of care and healthcare costs in Canada remains poorly documented. The objective of this study was to compare the rates of post-operative complications and 30-day mortality to the cost of hospitalization for colorectal cancer surgery in Manitoba.

**Methods:** This was a retrospective cohort study of patients undergoing surgery for stage I to IV CRC in Manitoba between 2004 and 2014. The primary exposure was post-operative complications and 30-day mortality. The primary outcome was cost of hospitalization for colorectal cancer surgery. Risk- and reliability-adjustment was used to adjust the primary exposure and outcome for variations in sample size and case mix across hospitals.

**Results:** A total of 4,884 patients from 16 different hospitals were included. The average hospital adjusted postoperative complication rate ranged from 9.8% to 23.9% and the average hospital adjusted 30-day mortality rate ranged from 3.6% to 5.1%. The average hospital adjusted cost ranged between $15,000 to $25,000. There was a moderate positive correlation between a hospital’s adjusted rate of postoperative complications and adjusted costs (rho=0.66 p < 0.01) and a strong positive correlation between a hospital’s adjusted 30-day mortality rate and adjusted costs (rho=0.87, p < 0.01).

**Conclusions:** Hospitals with higher average adjusted rates of post-operative complications and 30-day mortality had higher adjusted average costs of hospitalization. This suggests variations in the quality of CRC surgery may exist across hospitals and quality improvement initiatives might help reduce these costs.

Racial differences in admission rates for substance use disorders in a Wisconsin community hospital

**Background:** The critical access hospital (CAH) in this study serves a diverse population with over 9,000 American Indians (AI) living in its service area. In the United States, the AI population has high rates of substance use disorders compared to whites, 21.8% versus 8.7%. Between 2006-2013, emergency departments in the United States saw a 37% increase substance use disorder (SUD) diagnosis.

**Methods:** In this retrospective study, 1860 ER visits during the period of 2015-2018 at a Wisconsin CAH had an associated SUD diagnosis. Multivariable logistic regression was used only on the first event for an individual with the outcome of admission versus discharge. An interaction term was introduced into the model to look for effect modification between race and specific SUDs.

**Results:** After controlling for gender, age, county residence, insurance type and type of SUD there was no racial difference for admission for SUD to this Wisconsin community hospital during this time period with an odds ratio of .91, CI (.77, 1.4) and p-value of .60. In the adjusted model, using subgroups, stimulant use disorder was associated with hospitalization among American Indians with an odds ratio of 3.37, CI (1.5, 7.55) with a p value of 0.003. In contrast, the odds ratio of hospitalization among whites, was .91, CI (.46, 1.79) p value .78, with a p-value for the interaction term of 0.02.

**Conclusions:** This study found that there were higher rates of admission, higher use among AI, and increased likelihood of admission among AIs compared to whites if presenting with stimulant use disorder. The numbers in these subgroups were small and confidence intervals were wide.
**Vitamin D, smoking, long-term disability and CNS integrity among clinically isolated syndrome patients: 11-year follow-up of BENEFIT**

**Background:** Information about long-term effects of vitamin D and smoking on Multiple sclerosis (MS) course is scarce. Consequently, we aimed to unravel effects of vitamin D and smoking in patients with clinically isolated syndrome (CIS), the earliest MS stage, followed over 11 years.

**Methods:** We included 277 CIS participants in 11-year follow-up of BENEFIT (Betaferon/Betaseron in Newly Emerging Multiple Sclerosis for Initial Treatment) for whom levels of 25-hydroxy-vitamin D (25(OH)D) were assessed at baseline, months 6, 12, 24, 54, 60 and 11 year, and cotinine (tobacco use) at 6, 12 and 24 months. We used linear mixed-effect models to predict the rate of change in EDSS and MSFC between 6-month and 11 years. Further, using linear and logistic regression models, we evaluated whether 25(OH)D and cotinine levels measured 6 to 24 months after the CIS contributed to predict MRI outcomes at 11 years.

**Results:** After adjusting for potential confounders, a 50nmol/l increment in 25(OH)D levels predicted less disability worsening (\(\beta_{EDSS\_increase}= -0.12, 95\% CI(-0.22, -0.02)\), \(p=0.02\), and \(\beta_{MSFC}=+0.092, 95\% CI(0.005,0.178)\), \(p=0.04\)), but were only inconsistently associated with MRI outcomes. Tobacco use during the first two years after clinical MS onset was not overall associated with worse long-term clinical and radiological outcomes over 11-years of disease course.

**Conclusions:** Vitamin D elevation after disease onset might be beneficial for long-term clinical and CNS integrity in MS while evidence for smoking cessation is milder.

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**County-Level Characteristics from the American Community Survey in relation to County-Case Rates of Hepatitis A in Kentucky: An Ecologic Study**

**Background:** Since November 2017, 97 Kentucky counties have reported hepatitis A outbreak cases, which is closely linked to the state’s opioid crisis.

**Methods:** HAV clusters were identified using GIS mapping. We then linked county-level characteristic variables from the American Community Survey between 2012-2016 to the county rates of HAV per 100,000. Secondary to high correlation, we used a principal components analysis to identify 7 variables regarding marital status, education, disability, grandparent responsibility for children, the GINI income inequality index, residential mobility and poverty. We used Poisson Regression for HAV case rates per 100,000 to estimate Relative Risks and 95% CI for the principal components and additional county-level variables of interest.

**Results:** Seven principal components explained 95.5% of the variation in socio-economic factors. The “extremely disadvantaged” had a RR of 1.46 (95% CI 1.23, 1.73) that attenuated after adjustment for race, age, and manufacturing (RR = 1.17 95% CI 0.97, 1.41). Those who were poor but having social capacity and residential mobility also had higher case rates (RR=1.20 95% CI 1.01, 1.43). Those who were poor, with high disability and had social and educational capacities had lower case rates (RR=0.78 95% CI 0.61, 1.00). Counties with a higher White population had higher HAV rates (RR=1.14 95% CI 1.07, 1.21). Counties with higher % of the population in the manufacturing industry had lower HAV rates (RR=0.97 95% CI 0.94, 1.00).

**Conclusions:** Several distinct county patterns were related to differential HAV case rates that describes the heterogeneity of the opioid epidemic in Kentucky.

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**Randomized controlled trial analyzed as a case-control study: an application to the Women’s Health Initiative study**

**Background:** Most of the causal inference methodologies have been developed and evaluated on prospective cohort studies, and there is a dearth of robust methods and analytic techniques for case-control studies. The proposed study designed and conducted a case-control analysis to validate the results against those from a randomized controlled trial (RCT) that examined the effects of combined estrogen-progestin (E+P) hormone therapy on coronary heart disease (CHD) among postmenopausal women aged 50-79 years at screening.

**Methods:** A random sample of five controls per case were selected from the Women’s Health Initiative (WHI) RCT (N=16,608) using a risk-set sampling design. The hazard ratio (HR) of CHD (nonfatal myocardial infarction and CHD death) due to E+P therapy was estimated using conditional logistic regression models (within SAS PHREG procedure).

**Results:** Of 2,010 participants (335 cases and 1,675 controls) selected, 1,021 were in the E+P, and 989 were in the Placebo group, with a mean age of 63.7 ± 7.2 and 63.6 ± 7.2 years, respectively. The estimates from the case-control study (adjusted HR: 1.31; 95% CI: 1.03-1.67) are comparable to those estimated in the original WHI study (adjusted HR: 1.24; 95% CI: 1.00-1.54). Where sample size permitted, the estimates from the subgroup analyses were also consistent with the trend reported in the original study.

**Conclusion:** Results from a methodologically sound and appropriately analyzed case-control study are comparable to those from an RCT. Sample size may limit subgroup analysis. The findings have important implications for causal inference methodologies in case-control study, especially where RCTs may deem unfeasible or unethical.
**HIV risk behavior, risk perception, and risk reduction among people who inject drugs in 20 states, United States**

**Background:** Persons who inject drugs (PWID) are a hard-to-reach population. It is important to understand their perceptions of their own risk for HIV that may factor into decisions about seeking syringe service programs (SSPs) or pre-exposure prophylaxis (PrEP). This study explores HIV risk behavior, risk perceptions, and risk prevention among PWID.

**Methods:** Tests of association were used to analyze survey data from 9,778 PWID interviewed in 20 U.S. cites as part of CDC’s 2015 National HIV Behavioral Surveillance. We dichotomized risk perception of becoming infected with HIV in next 12 months (high, medium/low).

**Results:** Only 9.9% of participants perceived themselves to be at high-risk. A higher proportion of PWID sharing injection equipment or men PWID who had condomless sex with men perceived themselves to be at high-risk for HIV compared with those who did not share equipment (12.8% vs. 5.6%, p < 0.0001) or did not have condomless anal sex (23.0% vs. 8.7%, p < 0.0001), respectively. Higher-risk respondents were less likely to use SSPs in the past 12 months (9.3% vs 10.8%; p=0.02). There was no difference in PrEP use (9.7% [PrEP use among high-risk respondents] vs 9.5% [no use]; p=0.97).

**Conclusions:** PWID do not appear to perceive themselves at high risk for HIV, despite the fact that their self-reported risk behaviors place them at very high risk. This lack of self-perceived risk may explain their low uptake of SSP and PrEP. More needs to be done to educate PWID of their HIV risk and encourage them to utilize SSPs and PrEP.

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**The relationship between online health information seeking behavior and use of health care services**

**Background:** The number of people using the internet for health information seeking is increasing, but how this relates to health care utilization is unclear. A better understanding of the association between health-seekers and health care utilization may provide insight to guide future decisions on how online health information impacts utilization of services.

**Methods:** This study’s sample is from the Health Information National Trends Survey (HINTS) database (Cycle 1 of HINTS 5 in 2017), a nationally-representative mail survey administered in English and Spanish by the National Cancer Institute. The exposure of interest is online health information seeking and the outcome of interest is the number of visits to a doctor/nurse/health professional to obtain care in past 12 months.

**Results:** Overall, 71% of respondents looked for online health information for themselves (online health seekers). Online health seekers were more likely to be female (52.4% vs 47.5%), aged 40-60 than aged >60 (40.2% vs 36.3%), of higher education, and have 1 or fewer chronic disease conditions than those who were not online health seekers. Compared to respondents with no health care visits, online health seekers have 2.3 to 3.5-fold higher odds of having health care professional visits compared to those who do not look for health information online.

**Conclusions:** This study shows that people who look online for health information, compared to those who don’t, are more likely to see a health care professional at all levels of the outcome compared to those who have no health care visits in past 12 months.

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**Factors associated with unmet dental care needs of the US elderly population**

**Background:** Poor dental care access is a serious global public health issue. Although the US older adults have a significant dental care needs, the dental treatment tend to be undersupplied. Due to increasing baby boomers, improvement of dental care policy is a critical issue. This study examines factors associated with unmet dental care needs in USA seniors.

**Methods:** This study analyzed 5,466 adults aged 60 years and older who participated in prospective longitudinal survey of the NHANES from 2011 to 2016. Anderson Behavior Model was used. Predisposing (age, sex, ethnicity, marriage, education), enabling (Income, working, health insurance), need (oral health, toothache, dental caries, periodontal disease) factors associated with unmet dental needs in USA seniors, were analyzed using chi-square and multiple logistic regression analysis.

**Results:** 941 seniors (17.22%) have unmet dental care needs. Age, sex, ethnicity, marriage, education, income, working, insurance, health insurance, and oral health status, lead to significantly high unmet dental needs. Especially, participants with Medicare and Medicaid (n=502) have 4.2 times higher than private insurance (n=118). Economic reason (86.9%) was the top reason. After controlling all independent variable, 60-65 aged, female (OR:1.27 (1.07-1.52), p-value: 0.006), the lowest income, and Hispanic participants, have most significant association with unmet dental care needs.

**Conclusions:** Due to increasing baby boomers, it is significantly important to add dental policy and to expand Medicare/Medicaid dental coverage for low income.
### Long-term risk of colorectal cancer and related deaths after adenoma removal in a large, community-based population

**Background:** The long-term risks of colorectal cancer (CRC) and CRC-related deaths following adenoma removal are uncertain. Such data are needed to create evidence-based surveillance guidelines, which currently have wide variation in follow-up recommendations for some polyp types. In a large, community-based healthcare setting, we examined risks of CRC and related deaths by baseline colonoscopy adenoma findings.

**Methods:** Participants underwent a baseline colonoscopy between 2004-2010 across 21 medical centers; findings were categorized as no adenoma, low-risk adenoma, or high-risk adenoma. Participants were followed to the earliest of CRC diagnosis, death, health plan disenrollment, or 12/31/2017. Risks of CRC and related deaths among the high- and low-risk adenoma groups were compared with the no adenoma group using Cox regression adjusting for confounders.

**Results:** Among 186,046 patients, 64,422 met eligibility criteria; 45.7% were men, mean age was 61.6±7.1 years, and median follow-up time was 8.1 years from the baseline colonoscopy. Compared to the no-adenoma group, the high-risk adenoma group had a higher risk of CRC (hazard ratio (HR): 2.61; 95% confidence interval (CI): 1.87-3.63) and related deaths (HR: 3.94, 95% CI: 1.90-6.56), whereas the low-risk adenoma group did not have a significantly elevated risk of CRC (HR: 1.29; 95% CI: 0.89-1.88) or related deaths (HR: 0.65; 95% CI: 0.19-2.18).

**Conclusions:** High-risk adenomas were associated with an increased risk of CRC and CRC-related deaths, supporting early colonoscopy surveillance. Low-risk adenomas were not associated with a significantly increased risk of CRC or related deaths. These results can inform current disparate surveillance guidelines for low-risk adenomas.

### Educational Disparities in Influenza Immunization in the United States

**Background:** Influenza vaccination has been estimated to have saved approximately 40,000 lives between 2005 and 2014 in the U.S. alone. However, across the country and among counties in individual states, there are vast differences in vaccination rates. Studies have investigated the disparities amongst ethnic groups and socioeconomic status but the role of educational level and flu vaccination has not been studied.

**Methods:** Logistic regression was run on the 2017 National Health Institute Study. Receipt of the flu vaccine was the outcome and the exposure of interest was highest level of school completed. Data was gathered on the 33 counties in New Mexico to develop a prediction model on immunization rates and linear regression was run to test for a similar association of education level and flu vaccine.

**Results:** Individuals with a doctorate have 4.26 times the odds of receiving the vaccine compared to those with a HS degree after adjusting for insurance coverage, race, earnings and being a diabetic or asthmatic with a 95% CI (3.11, 5.83). This was supported by the New Mexican data, which showed that for every 10 unit increase in highly educated individuals, there is a 3.57% increase in the percentage of people receiving the flu vaccine after adjusting for similar covariates. The prediction model failed to perform at this scale.

**Conclusions:** Across the nation, there appears to be a significant association between educational level and those who receive the flu vaccine. Other relevant factors may need to be accounted for at the state level.

### Adjuvant Steroid Therapy and Length of Hospital Stay in Pneumonia Patients

**Background:** Pneumonia is a leading cause of morbidity and mortality worldwide. Antimicrobial therapy is the main treatment. Recent trials have shown the benefits of steroid as an adjuvant therapy in reduce mortality and shorten length of hospital stay. However, the overall evidence is still unclear.

**Methods:** Electronic medically records of hospitalized patients with the diagnosis of pneumonia in 2015 to 2016 were reviewed. The exposure was a systemic steroid. The primary outcome was length of hospital stay (LOS). Secondary outcomes included inpatient mortality, transfer to tertiary care center and discharged disposition. Time-to-event analysis was used to analyze the association between steroid and LOS. We used multivariable logistic regression with propensity score for the secondary outcomes.

**Results:** A total of 441 patients were included in the study with 277(63%) patients received systemic steroids. There was an association of steroid with 21% reduction of LOS (HR 1.26, CI 1.03-1.54) and decrease inpatient mortality (OR 0.11, 95%CI 0.03-0.45). No association of steroid and the risk of transfer to tertiary care center and disposition were found. In subgroup analyses, patients in PSI class IV and V found to have the association of steroid and the shorter LOS (HR 1.38,95%CI 1.02-1.89, and HR 2.04,95%CI 1.11-3.74, respectively). However, only PSI class V associated with decrease inpatient mortality (OR 0.10, 95%CI 0.02-0.64). In COPD patients, steroid associated with shorten LOS (HR 1.42,95%CI 1.02-1.97) and decreased inpatient mortality (OR 0.17,95%CI 0.03-0.81).

**Conclusions:** Our study found that adjuvant therapy with systemic steroid associated with reduction of LOS in pneumonia patients.
How the High Acuity Unit Changes Mortality in the Intensive Care Unit

**Background:** High Acuity Units (HAUs) are becoming more prevalent in tertiary care centers to care for patients too sick for the hospital ward but not sick enough to require the Intensive Care Unit (ICU). Understanding how the existence of an HAU affects mortality for the sickest patients in the hospital, in the ICU, may help determine the value of building more HAUs.

**Methods:** In this before-after quasi-experimental retrospective cohort study, we compared in-hospital mortality between patients admitted to the ICU at Surrey Memorial Hospital before (control group) and after (treatment group) the HAU was created. We used both an unadjusted logistic regression model and one adjusted for age, gender, APACHE II score, admission location, and admission diagnosis. Sensitivity analyses were performed to assess and control for temporal confounding.

Secondary analyses were done using competing risks models to compare ICU and hospital length of stay (LOS) between groups.

**Results:** 3,360 patients were enrolled in this study, 2,376 in the treatment group and 984 in the control group. The unadjusted odds ratio of mortality in the treatment group compared to the control group was 0.82 (CI: 0.70-0.96, p-value: 0.012), the adjusted odds ratio was 0.71 (CI: 0.58-0.87, p-value: 0.001). There was a significant reduction in hospital LOS subhazard ratio: 1.15 (1.05 – 1.26, p-value: 0.003), median hospital LOS: 23 vs 27 days.

Conclusions: This study found that the creation of an HAU results in a reduction in in-hospital mortality and hospital LOS for patients admitted to the ICU.

Quality of life impairment of patients with vestibular stroke, acute peripheral vestibulopathy and recurrent vestibular disorders presenting in the emergency room

**Background:** Acute vertigo, dizziness and imbalance are common chief complaints in the emergency room. However, there are no systematic investigations about differences of quality of life (QOL) impairment between central and peripheral vestibular disorders.

**Methods:** Within the EMVERT study, 40 patients with vestibular stroke, 68 with acute unilateral peripheral vestibulopathy (AUPV) and 67 patients with recurrent vestibular disorders (RV, e.g., benign paroxysmal positional vertigo/Ménière’s disease/vestibular migraine) were recruited. During acute presentation, established QOL scores were assessed (primary outcome: EQ-5D-5L, secondary: Dizziness Handicap Inventory (DHI), EQ-VAS, major disability defined as modified Rankin Scale (mRS) 3-6). Patient characteristics were assessed by subitems of the ABCD2 and TriAGE+-score. Statistical complete case analysis included simple as well as multivariable linear and logistic regression models.

**Results:** There were significant differences in QOL impairment measured by the EQ-5D-5L index score between patients groups in the simple (p=0.0001) as well in the multivariable linear regression model (p < 0.0001) after adjusting for age, sex, diabetes mellitus, hypertension, atrial fibrillation and brainstem/cerebellar dysfunction. More specifically, AUPV patients were more severely impaired compared to stroke patients. In the sensitivity analysis, results remained constant throughout the secondary outcomes such as DHI (p=0.016), EQ-VAS (p < 0.01) and major disability (p < 0.001) after adjusting for the same covariates.

Conclusions: During acute presentation, QOL impairment differs between central and peripheral disorders with worse impairment in AUPV compared to stroke. However, subjective QOL measures are not suited to differentiate between central and peripheral aetiology. Longitudinal studies are needed to develop stratified programs for aftercare in these patients.

Impact of provider treatment delay in early stage breast cancer on outcomes across public health services in South Brazil and Harris Health Texas

**Background:** Delays in diagnosis and treatment of early stage breast cancer is associated with increased rate of recurrence and death. Delays is classified as either patient delay (time from symptoms to diagnosis), or provider delay (time from diagnosis to therapy). It is unknown whether provider delay is a contributing factor to the poor outcomes of breast cancer for patients with low socioeconomic status in the US or Brazil.

**Methods:** Retrospective analysis of cohorts of women with low SES between Jan 1/2009 - Dec 31/2011 with stage I to III breast cancer in Harris Health hospitals and thee hospitals in Southern Brazil. Cox proportional hazards regression was used to evaluate association of time to treatment and risk of recurrence or death. The models was adjusted for age, breast cancer subtypes and stage. An adjusted logistic regression analysis evaluated the effect of time to treatment delay of 12 weeks on recurrence and death. Fisher exact test, and Mann–Whitney test were used for comparison of cohorts.

**Results:** Patients in South Brazil were older at diagnosis, less frequently diagnosed with stage I disease and more frequently diagnosed with higher stage, and high grade disease. The time from diagnosis to first therapy was similar between the cohorts – 9.4 w (Texas) vs 9.9 w (S. Brazil). There was patient delay in both cohorts. HR of recurrence or death was not increased with longer time to treatment.

**Conclusions:** Provider delay was not found to be significantly associated with increased rate of recurrence or death.
Comparing the effectiveness of reduced dose NOACs for stroke prevention in atrial fibrillation

**Background:** Atrial fibrillation is associated with an increased risk of ischemic stroke, but adequate oral anticoagulant treatment can lower the risk. We sought to examine the effectiveness of three reduced dose non-vitamin K antagonists oral anticoagulants (NOACs) using the Danish nationwide registries.

**Methods:** We specified a target trial of atrial fibrillation patients assigned to initiation of apixaban 2.5mg, dabigatran 110mg, or rivaroxaban 15mg. We emulated the trial it using observational data from Denmark between January 2013 and August 2018 and followed eligible patients for up to three years. We estimated the observational analogues of the intention-to-treat (ITT) and per-protocol treatment effects on ischemic stroke. We used stabilized inverse probability weights to account for time-varying prognostic factors that predicted protocol non-adherence.

**Results:** Among 27312 patients with atrial fibrillation, 6531 fulfilled the inclusion criteria and claimed a NOAC agent in reduced dose: 3722 apixaban, 1061 dabigatran, and 1748 rivaroxaban. The mean age was 83 years, 58% were females. During a median of 1.6 years of follow-up, 362 ischemic strokes (3.8 per 100 person-years) were observed. Compared with apixaban, the ITT hazard ratio (95% CI) of ischemic stroke was 1.14 (0.78-1.65) for dabigatran and 0.82 (0.62-1.09) for rivaroxaban. The corresponding per-protocol hazard ratio was 0.91 (0.63-1.31) for dabigatran, and 0.76 (0.55-1.06) for rivaroxaban.

**Conclusions:** We used observational data to emulate a target trial to contrast three different NOACs, where rivaroxaban was associated with a lower risk of ischemic stroke. The differences in treatment effect estimates according to the analytic approach underline the need for controlling for time-varying confounders for adherence.

The effect of radiotherapy on cause specific survival in locally advanced rectal cancer through eras of changing surgical approach

**Background:** In the 1980s to 1990s, there was a shift in surgical approach for rectal cancers to the total mesorectal excision (TME), which lead to doubling of cancer specific survival (CSS). Previous population-level studies have not accounted for this change when assessing the effect of radiotherapy. It is unknown if the relative effect of radiotherapy on cancer outcomes is influenced by surgical approach.

**Methods:** Patients with locally advanced rectal adenocarcinoma in the Surveillance, Epidemiology, and End Results (SEER) program were included. Cox regression and competing risk analysis were used to determine the effect of radiotherapy on CSS in the pre-TME era (1973-1981), the transitional era (1982-1999) and the TME era (2000-2015).

**Results:** 64623 patients were identified with a median follow-up of 47 months. 65% received radiotherapy. 37.3% died of rectal cancer. Radiotherapy use in the TME era improved CSS with a subdistribution hazard ratio of 0.80 (p 0.001) but was associated with worse survival in the pre-TME era (SHR 1.44, p 0.001) and transitional era (SHR 1.22, p 0.001). An interaction between nodal status and radiotherapy was noted, with node-positive patients benefiting from radiotherapy in transitional and TME eras (HR 0.90, p 0.009 & HR 0.66, p 0.001).

**Conclusions:** CSS has improved with the implementation of the TME. In the modern era, radiotherapy was associated with improved CSS. The detriment in CSS with radiotherapy in other eras may stem from radiotherapy use being associated with other adverse clinical features not measured in SEER. Radiotherapy does not seem to counteract the consequences of a non-TME surgery.

Operative case volumes in sub-Saharan Africa: survey and operative case log review to define the optimal minimum for training

**Background:** Globally, there is substantial need for surgical care, but access is limited. To address this, the Pan-African Academy of Christian Surgeons (PAACS) trains surgeons throughout Africa. In the United States, to ensure adequate operative experience, the Accreditation Council for Graduate Medical Education (ACGME) sets a minimum number of cases, overall (850) and by category, that general surgery trainees must complete. Throughout Africa, operative cases necessary for training (OCNT) are not defined.

**Methods:** To define the optimal minimum OCNT throughout Africa, PAACS surgery residency program directors and graduates were invited to participate in an electronic survey about the preferred minimum OCNT. We analyzed case logs from PAACS trainees for their actual experience and compared the experience with that of ACGME trainees. Median, percentiles, and nonparametric tests were utilized to describe and analyze the data with STATAv14.2.

**Results:** For 20 PAACS graduate case logs, 38,267 operations were classified into ACGME categories. Overall median volume was 1448 major cases (10%:1095-90%:992) compared to 993 (10%:867-90%:1171) for ACGME (p=0.0001). Forty participants (16 faculty, 24 graduates), from 14 countries, completed the survey recommending a minimum of 1000 (10%:500-90%:2000) major cases. Contrasting with ACGME training, PAACS surgeons experienced and desired more breadth and volume for OCNT. Optimal
Degree and Field of Study (2019):
MPH Epidemiology

minimum OCNT were constructed from survey responses with modifications from ACGME minimums and actual trainee experience.

Conclusions: General surgery experience throughout Africa is broader than in the United States and training must reflect this. The proposed minimum OCNT incorporates desires of faculty and graduates while balancing actual trainee experience.

Does a Black Child in Pain Receive Less Pain Medication than a White Child? : Analysis of U.S. Emergency Room Data from the National Hospital Ambulatory Medical Care Survey (NHAMCS) - 2010 through 2015

Background: A challenge in pediatric pain management is mitigation of debilitating pain while exercising restrained prescribing of medications with abuse potential. Further complicating the challenge is evidence, some conflicting, that racial disparity exists in pain management. This study aimed to analyze the relationship between race and analgesics in the pediatric population in US emergency departments.

Methods: Secondary analysis of the 2010 - 2015 National Hospital Ambulatory Medical Care Survey (NHAMCS) for those < 25 who had pain-related ‘reason for visit’ (RFV) or pain score > = 1. The 2015 sample was 4588 visits, representing 30,467,880 nationwide. Regression controlled for gender, age, payer, triage, MSA, residency program, hospital racial makeup, and region.

Results: In 2015, there was no significant effect of a child’s race on whether or not she received analgesic. (Black AOR 0.82 (0.67-1.02 p < 0.08); Hispanic AOR 1.03, (0.82-1.35, p < 0.80)). However, black children were less likely than white children to receive narcotics (AOR 0.70 (0.53-0.93, p=0.01). In 2010, black children were half as likely to receive a narcotic (AOR 0.49, 0.35-0.67, p < 0.00), and in 2011, 0.65 times as likely (0.47-0.91, p=0.01).

Conclusions: This study revealed black children continue to receive less narcotic pain medicine than white children. Rather than relying on, or limiting by, physician diagnosis for ascertainment of pain, this study sought to use instead two patient-reported measures. This novel approach with NHAMCS data in the pediatric ED population adds to literature on healthcare-based racial disparity as well as literature on how best to capture analgesic need.

Assessing the Effects of Facebook Fake News on the People’s Perception of E-cigarette

Background: The recent proliferation of fake news in public health led to a growing concern that fake news will not only mislead people to engage in very dangerous public health practices but seriously undermine the works of health officials and researchers all together.

Methods: Machine learning and NLP were used to distinguish between fake news and real news, and analyze comments reflecting attitudes and perceptions. Also, fisher’s exact test was used to assess the significance of prevalence odds ratio.

Results: After analyzing 200 posts, 92% (n=184) of sample posts were negative to e-cigarettes, 7% (n=14) were positive, and 1% (n=2) were neutral to e-cigarettes. 58% (n=107) were biased, or fake news, with the average accuracy rate of 86.9% while 42% (n=77) were unbiased, or real news. However, among 14 positive posts, only 29% (n=4) were deemed biased while 71% (n=10) were not. Among 42,460 comments, 8,640 were negative to using e-cigarettes while 8,220 were positive, 460 were neutral, and 25,100 were being not relevant. After the weighted analysis of risk vs benefit, in both fake and real news people responded more aggressively on the risks of e-cigarette than benefits, having prevalence odds ratio of 17.8 and 16.1 respectively.

Conclusions: The prevalence of fake news on the Facebook public posts is higher than that of real news. The risks of e-cigarette were the dominant public posts and overpopulate the discussions on Facebook. The association between the prevalence of fake news and its impact on people’s perceptions could not be accurately established.

A comprehensive analysis of the direct and indirect costs of multiple sclerosis

Background: Multiple sclerosis (MS) has variable symptoms and levels of disability, therefore health-related costs are variable. Some variation in the literature, however, is due to differences in study methodology. We assessed the direct and indirect costs of MS using data from the Sonya Silfka Longitudinal Multiple Sclerosis Study.

Methods: We examined participant responses to describe patient out-of-pocket (OOP) and total (payer) costs by healthcare domain, and to estimate indirect costs based on reported employment, income, work-loss days.

Results: We found high OOP and total costs for medications and visits to hospitals. Costs were also high for frequently used domains: home care, complementary and alternative medicine, and mental health. Among those who used home care, 68 % used only unpaid care. Indirect costs included lower employment, lower income, and more work-loss days than the general population. Among those not working, $ 20,857 of annual income was lost due to disease.

Conclusions: This summary captures the financial scope of living with MS, and highlights areas of high cost and low utilization (mental health), hidden costs (unpaid home care) and the considerable indirect costs of lost employment.
Risk factors for Mycobacterium ulcerans infection in sub-Saharan Africa: A Systematic Review and Meta-Analysis

Background: The Buruli ulcer is a severely disfiguring chronic skin disease caused by Mycobacterium ulcerans. The development of a primary preventive public health strategy has been complicated by an uncertain mode of transmission as well as reported inconsistencies regarding individual risk factors. The objectives of this systematic review and meta-analysis are to summarize risk factor evidence, increase the precision of risk estimates, and explore sources of heterogeneity among study results. The most recent systematic review of M. ulcerans risk factors was published in 2010, and did not include a meta-analysis.

Methods: PubMed, EMBASE and EBSCO were searched to identify eligible studies published before January 28, 2019. Reference lists of previous reviews were searched to identify additional citations. Outcomes were extracted according to PRISMA guidelines. Effect measures were pooled utilizing a random-effects model.

Results: In total, 26 studies met inclusion criteria for the systematic review and 17 studies contributed observations to the meta-analysis. 19 distinct risk factors underwent meta-analysis. Significant between-study heterogeneity was evident in 12. In subgroup analyses, matching factors were a source of heterogeneity for two pooled estimates. Cumulative meta-analyses by study size revealed evidence of small study effects in four pooled estimates. Sensitivity analyses by risk of bias revealed heterogeneity in four pooled estimates.

Conclusions: This systematic review and meta-analysis suggests that between-study heterogeneity limits the ability to synthesize and meaningfully interpret M. ulcerans risk factor data. Sources of heterogeneity include matching factors and risk of bias. Small study effects are an additional likely source of bias.

Travel Distance and Hospital Volume: Effects on Treatment Outcomes for Extremity Soft Tissue Sarcoma

Background: Regionalization of sarcoma care has been proposed to improve patient outcomes. Concerns exist regarding burdens of increased travel distance and its effects on patient care.

Methods: Retrospective cohort study using the NCDB. Individuals with extremity soft tissue sarcoma (Stage I-III) who underwent resection were included. Travel distance and hospital volume were categorized into quartiles. Alternating Kaplan-Meier, logistic-regression, and Cox proportional-hazard models were used for analysis.

Results: 11,979 subjects were included. Median hospital volume was 5 cases/year. Median travel distance was 16.7 miles; subjects who traveled longer distances were more likely to be treated at high-volume centers. When only distance or volume were included in the analysis, the fourth quartile volume group was associated with improved overall survival. When both distance and volume were included in the model, only volume was associated with improved survival (Table 1). Analysis of volume and distance as continuous variables showed similar results. Treatment at higher volume centers was associated with increased odds of obtaining R0-resections, but had no effect on limb amputations. Secondary analysis to determine optimal hospital volume associated with improved outcomes demonstrated a survival benefit if performing > 12 cases/yr. Hospitals performing > 5 cases/yr had higher odds of obtaining R0-resections.

Conclusions: This study suggests that the association between longer travel distances (distance-bias effect) for treatment of extremity soft tissue sarcoma, and improved outcomes is mediated by higher hospital volumes. The benefits of receiving treatment at specialized sarcoma centers may outweigh inconveniences associated with longer travel distances, further supporting a regionalization of sarcoma care.

Associations between lifestyle habits and health-related quality of life: Findings from the Behavioral Risk Factor Surveillance System, 2017

Background: Certain lifestyle habits are positively correlated with improved health, as evidenced by physiological biomarkers. Less definitively established is the relationship between lifestyle habits and self-perceived, health-related quality of life. Given the norm in clinical settings to emphasize lab-based outcomes, additionally emphasizing experience-based outcomes may strengthen patient motivation to adopt such habits. This study aimed to determine the relationship between common lifestyle habits and health-related quality of life measures, using data from the 2017 Behavioral Risk Factor Surveillance System (BRFSS). Logistic regression modeling was performed on data from the 2017 BRFSS, an annual survey of health behaviors, health conditions, and the use of preventive services by adults in the United States. The primary exposures were aerobic activity, muscle strengthening activity, fruit and vegetable consumption, binge drinking, cigarette use, smokeless tobacco use, electronic cigarette use, and a composite score representing all exposures. The primary outcome was self-perceived general health. Secondary outcomes were the number of physically and mentally unhealthy days over a 30-day period.

Results: Compared to 0, engaging in only 1 to 2, or only 3 to 4 lifestyle habits was associated with an increased odds of reporting health status as fair/poor (1.94 and 1.37, respectively), while engaging in 5 to 6 or in all 7 lifestyle habits was associated with decreased odds (.70 and .47, respectively). Associations were also found with individual habits.
Conclusions: Engaging in certain healthy lifestyle habits, as well as in 5 or more habits altogether, is associated with greater self-perceived, health-related quality of life.