Association of Nicotine Cessation Time on the Incidence of Recurrent Incisional Hernia Repair and Postoperative Surgical Site Occurrences

ACHQC QI Summit 2024

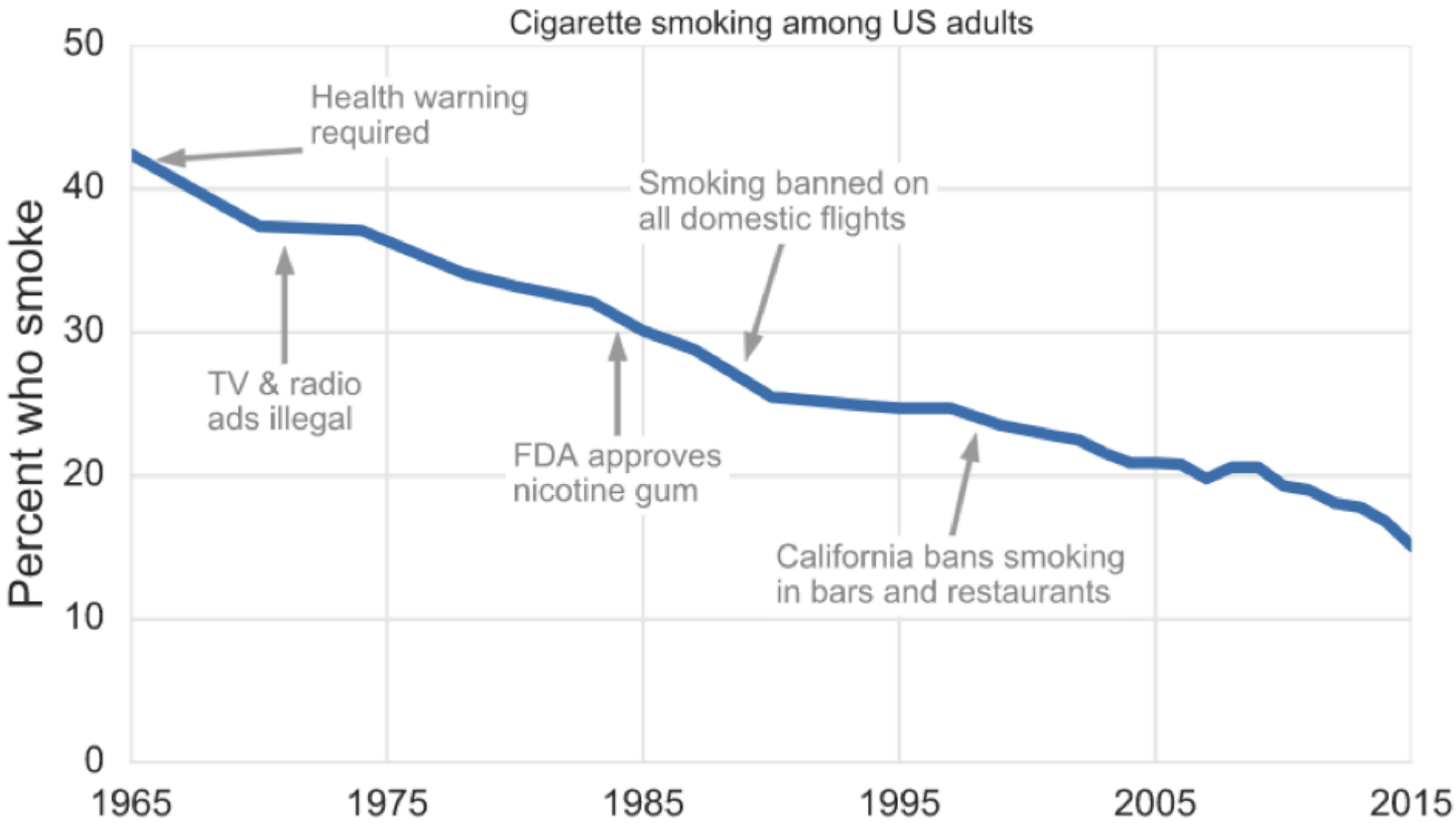
Andy W. Yang, MD PhD MBA, Patrick McBee MD, Nicholas Larsen MD, Matthew Reilly MD, Ryan Walters PhD, Molly Olson MD, and

Robert J. Fitzgibbons, MD

Smoking Facts

- Leads to disease and disability and harms nearly every organ of the body
- Leading cause of preventable death
- The tobacco industry spends billions of dollars each year on marketing cigarettes
- Smoking costs the united states billions of dollars each year
- Smoking is an independent predictor of postoperative complications across a variety of surgical procedures
- Health care costs are higher in current smokers
- In 2023, of those youth who ever tried e-cigarettes, approximately half reported currently using them, indicating that many youths who try e-cigarettes remain e-cigarette users

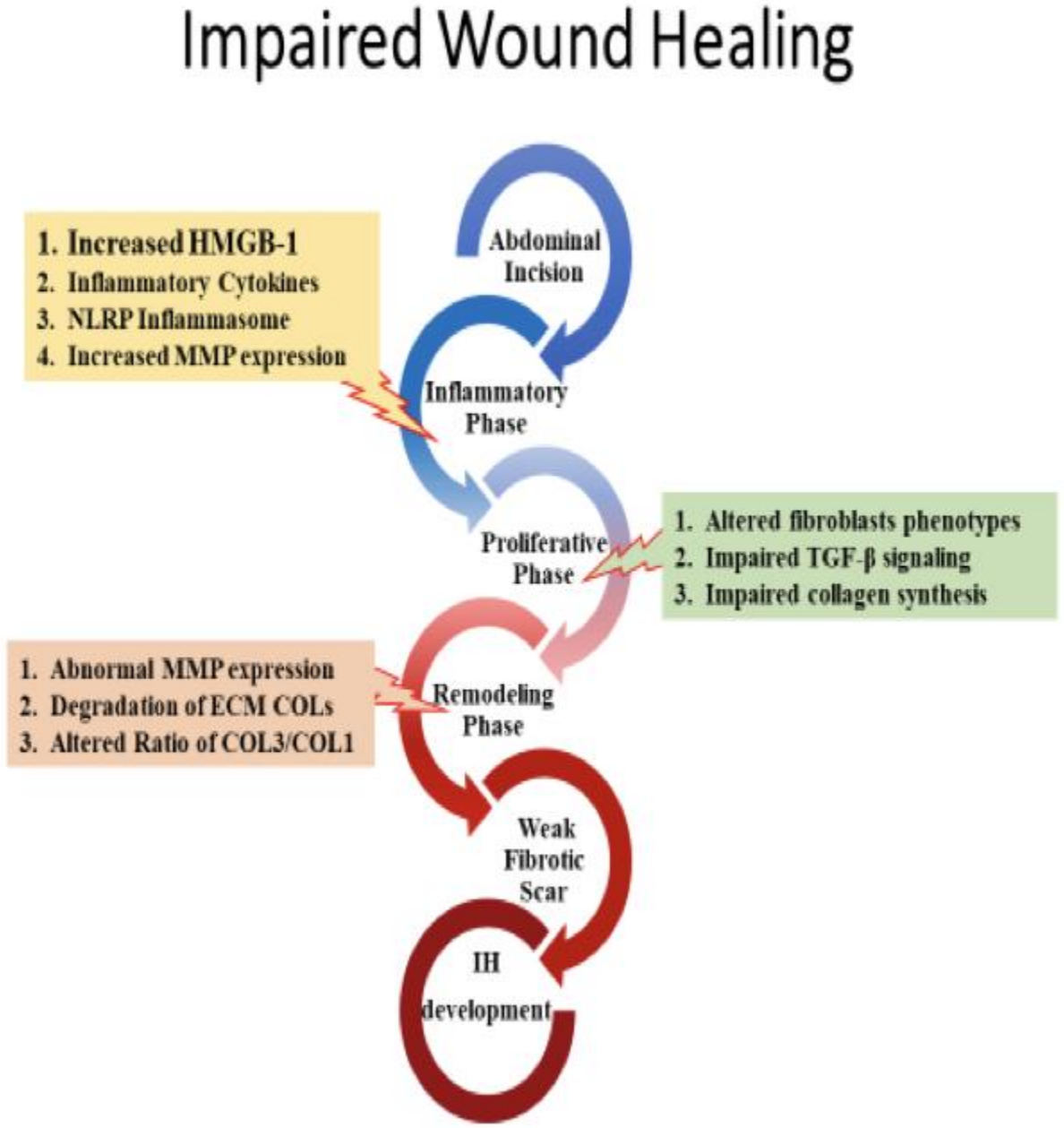
The US Smoking Rate is at an All-Time Low



Data source: https://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/ (US CDC)

ChartYourWorld.org

- Nicotine, carbon monoxide, and hydrogen cyanide are known to impair oxygen delivery resulting in impaired wound healing



Metastatic Emphysema

A Mechanism for Acquiring Inguinal Herniation

DONALD J. CANNON, PH.D., RAYMOND C. READ, M.D., F.A.C.S.

Since our previous work had indicated that veterans with inguinal herniation demonstrated qualitative and quantitative changes in connective tissue, we tested the hypothesis that a possible mechanism for the defect was chronic exposure to circulating proteases generated in the lung by cigarette smoke. We investigated 59 men (average age: 60 years) with either primary direct or indirect hernias. Most of the patients smoked. Circulating serum elastolytic activity was significantly greater in patients with direct hernias who smoked when compared with controls ($p < 0.001$). In addition, the serum alpha-1-antitrypsin inhibitory capacity was significantly lower in this category than controls ($p < 0.001$). Patients with indirect defects who smoked also had significantly higher elastolytic values but to a lesser degree ($p < 0.01$). Serum antiprotease and protein concentrations were within the normal range in all categories. Our results indicate that an imbalance between blood proteases and antiproteases, resulting from chronic smoking can damage connective tissue in the groin as well as the lung.

From the Veterans Administration Medical Center, Departments of Surgery and Biochemistry, University of Arkansas for Medical Sciences, Little Rock, Arkansas

attempts to refute Russell's ideas, those of Keith in 1923, and Harrison the previous year, were soon ignored. The former had written, "We are so apt to look on tendons, fascial structures and connective tissues as dead, passive structures. They are certainly alive, and the fact that hernias are so often multiple in middle-aged and old people leads one to suspect that a pathologic change in the connective tissues of the belly wall may render certain individuals particularly liable to hernia."[4] Harrison, in 1922, stated:

When we consider the dozens and hundreds of men

The American Journal of Surgery 216 (2018) 471–474

Contents lists available at ScienceDirect

The American Journal of Surgery

journal homepage: www.americanjournalofsurgery.com

The effect of smoking on 30-day outcomes in elective hernia repair

John O. DeLancey [a, b], Eddie Blay Jr. [a], D. Brock Hewitt [a], Kathryn Engelhardt [a, d], Karl Y. Bilimoria [a], Jane L. Holl [c], David D. Odell [a], Anthony D. Yang [a], Jonah J. Stulberg [a, *]

[a] Surgical Outcomes and Quality Improvement Center, Department of Surgery and Center for Healthcare Studies, Feinberg School of Medicine and Northwestern Medicine, Northwestern University, Chicago, IL, USA
[b] Department of Urology, Northwestern Feinberg School of Medicine, Northwestern University, Chicago, IL, USA
[c] Center for Healthcare Studies, Feinberg School of Medicine and Northwestern Medicine, Northwestern University, Chicago, IL, USA
[d] Department of Surgery, Medical University of South Carolina, Charleston, SC, USA

Current smokers experienced ↑ likelihood of:

- Reoperation (OR 1.23 [95% ci 1.11e1.36])
- Readmission (OR 1.24 [95% ci1.16e1.32])
- Death (OR 1.53 [95% ci 1.06e2.22])

In addition, smokers experienced ↑ risk of postoperative pulmonary, infectious, and wound complications

No increased risk of postoperative cardiac or thromboembolic events

Surg Endosc (2017) 31:2661–2666
DOI 10.1007/s00464-016-5280-4

The effect of tobacco use on outcomes of laparoscopic and open ventral hernia repairs: a review of the NSQIP dataset

John C. Kubasiak[1,2] · Mackenzie Landin[1] · Scott Schimpke[1] · Jennifer Poirier[1] · Jonathan A. Myers[1] · Keith W. Millikan[1] · Minh B. Luu[1]

Current smokers: ↑respiratory ($p = 0.0003$) and infectious complications ($p < 0.0001$)
Logistic regression: controlling for sex, age, type of surgery
↑ Respiratory complications, including pneumonia ($p < 0.0001$), and re-intubation ($p < 0.0001$)
Similar associations were seen on logistic regression if a patient ever smoked; including pneumonia ($p < 0.0001$), re-intubation ($p < 0.0001$), and failure to wean ($p < 0.0001$)

Surgery 166 (2019) 94–101

Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Impact of modifiable comorbidities on 30-day wound morbidity after open incisional hernia repair

Hemasat Alkhatib, MD[a,*], Luciano Tastaldi, MD[a], David M. Krpata, MD[a], Clayton C. Petro, MD[a], Li-Ching Huang, PhD[b], Sharon Phillips, MSPH[b], Aldo Fafaj, MD[a], Steven Rosenblatt, MD, FACS[a], Michael J. Rosen, MD, FACS[a], Ajita S. Prabhu, MD, FACS[a]

[a] *Center for Abdominal Core Health, Digestive Disease and Surgery Institute, The Cleveland Clinic Foundation, Cleveland, OH*
[b] *Department of Biostatistics, Vanderbilt University Medical Center, Nashville, TN*

- DM, obesity, and smoking cumulatively increase the risk of wound morbidity
- SSOPI most evident in patients with all three comorbidities and obese patients with diabetes

Surgery 165 (2019) 406–411

Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Does active smoking really matter before ventral hernia repair? An AHSQC analysis ☆,☆☆,★

Clayton C. Petro, MD*, Ivy N. Haskins, MD, Luciano Tastaldi, MD, Chao Tu, MS, David M. Krpata, MD, Michael J. Rosen, MD, FACS, Ajita S. Prabhu, MD, FACS

Cleveland Clinic Department of General Surgery, Cleveland Clinic Comprehensive Hernia Center, OH

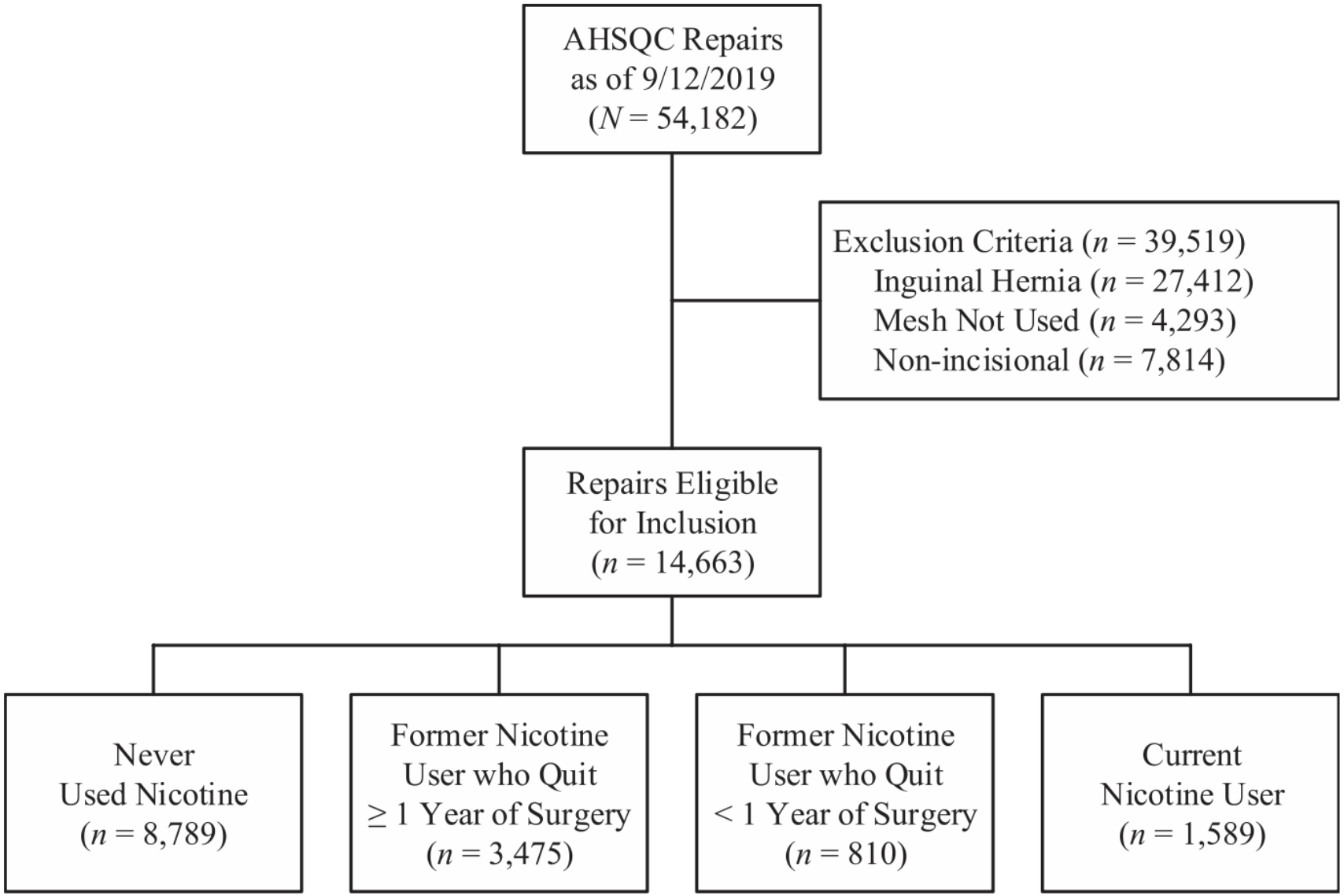


Table 1. Surgical Site Occurrence Inclusion Criteria.

Wound Cellulitis
Non-healing incisional wound
Fascial disruption
Skin or soft tissue ischemia
Skin or soft tissue necrosis
Wound serous drainage
Wound purulent drainage
Chronic sinus drainage
Localized stab wound infection
Stitch abscess
Seroma
Infected seroma
Hematoma
Infected hematoma
Exposed biologic mesh
Exposed synthetic mesh
Contaminated biologic mesh
Contaminated synthetic mesh
Infected biologic mesh
Mucocutaneous anastomosis disruption
Enterocutaneous fistula
Unspecified surgical site occurrence

Table 2. Baseline Demographic and Clinical Characteristics Stratified by Nicotine Use Status.

	Never	Former ≥1 Year	Former <1 Year	Current
Age	59 [49-68]	64 [55-71]	55 [47-71]	54 [46-61]
Biological sex				
Male	41.9	53.4	46.0	45.8
Female	58.1	46.6	54.0	54.2
Race				
White	84.6	90.0	88.1	83.8
Black	8.5	5.9	8.4	12.2
Hispanic	4.4	2.6	2.1	2.1
Other	2.5	1.5	1.4	1.9
BMI	33 ± 7	33 ± 7	32 ± 7	32 ± 7
Comorbidities				
Hypertension	49.7	61.1	54.1	49.2
Diabetes	19.5	24.4	21.4	19.0
COPD	2.9	12.1	17.3	17.6
Functional status				
Independent	97.0	96.4	95.7	96.9
Partially dependent	2.4	3.1	3.6	2.7
Totally dependent	0.3	0.2	0.0	0.1
Hernia width	6 [4-12]	7 [4-12]	10 [6-15]	6 [3-10]
Concomitant procedure	21.1	21.4	24.4	18.5
Nicotine use				
Chewing	—	0.8	2.1	4.0
E-cigarette	—	—	0.9	1.8
Patch	—	—	0.8	0.4
Gum	—	—	—	0.3
Smoking	—	99.2	96.2	93.5

Note. Data presented as median [IQR], mean ± SD, or percent.

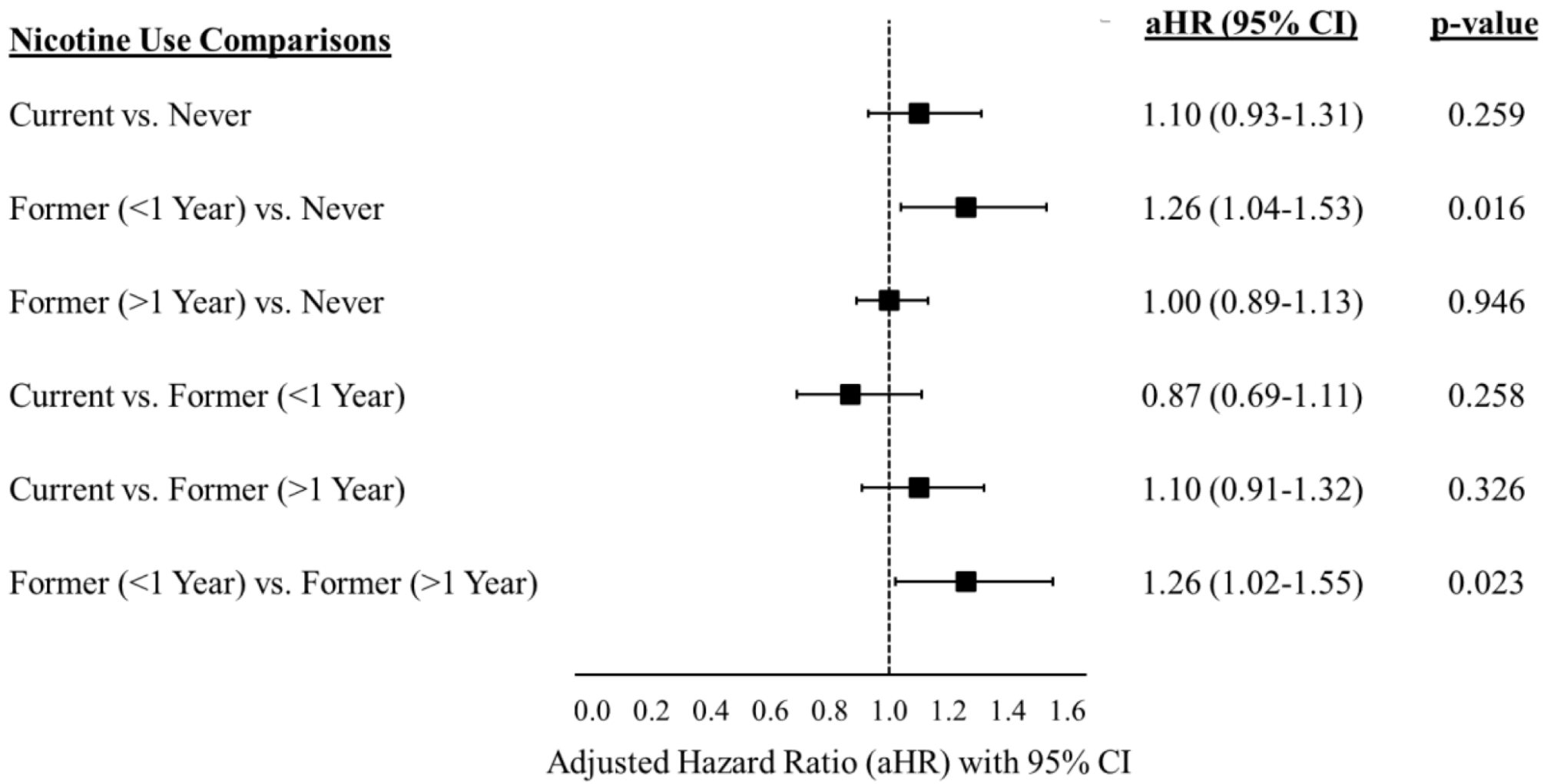


Figure S1. Adjusted hazard ratio for risk of recurrence. The reference group for hazard ratios is found after the "vs." with hazard ratios >1.0 indicating greater risk of the outcome. For example, the adjusted hazard ratio of 1.10 for Current vs Never indicates that current nicotine users had 10% greater risk of recurrence compared to those who never used nicotine. Horizontal error bars represent 95% confidence intervals; confidence intervals excluding 1 are statistically significant.

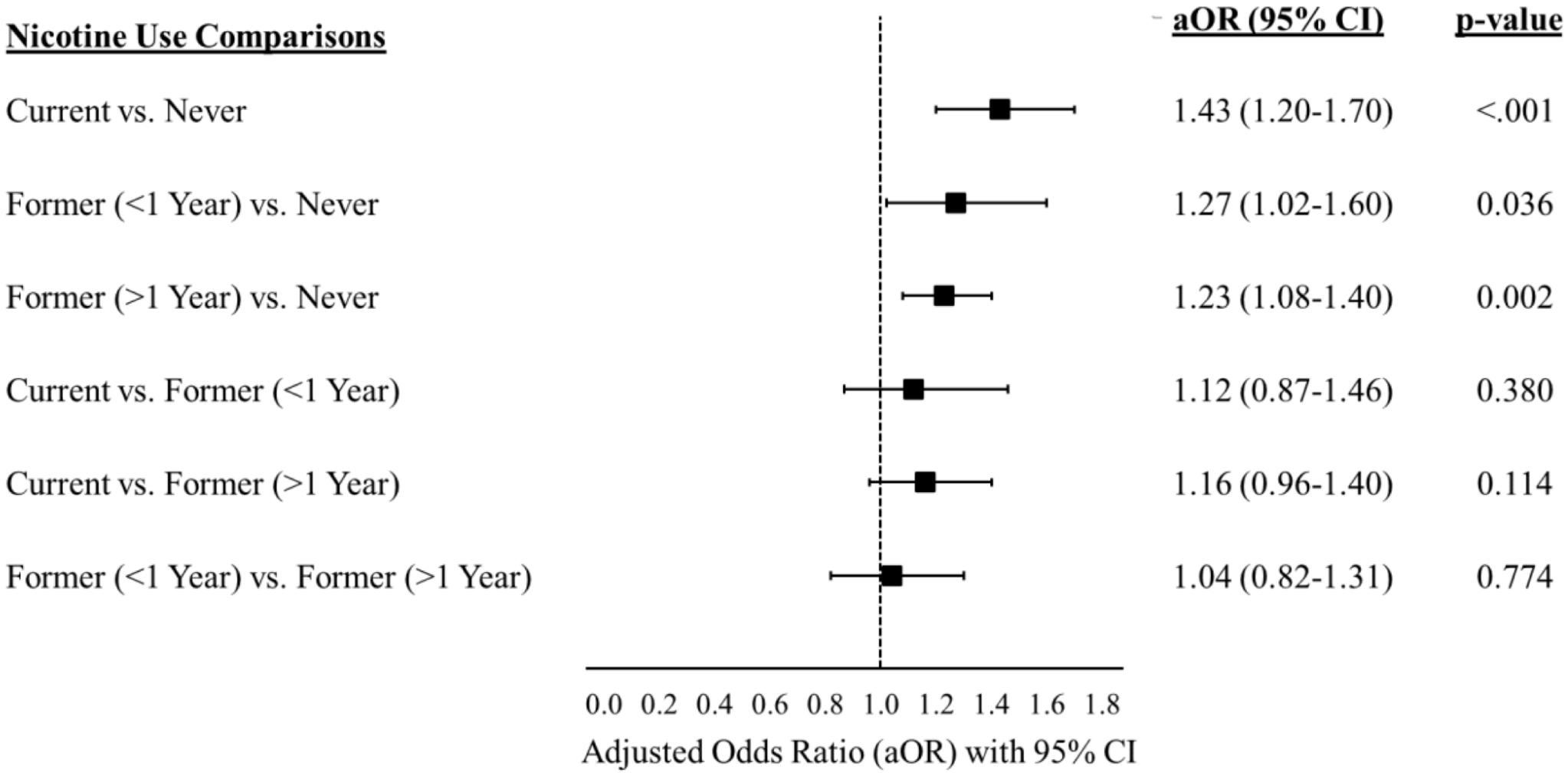


Figure S2. Adjusted odds ratio for SSO. The reference group for odds ratios is found after the "vs." with odds ratios >1.0 indicating greater odds of the outcome. For example, the adjusted odds ratio of 1.43 for Current vs Never indicates that current nicotine users had 43% greater odds of SSO compared to those who never used nicotine. Horizontal error bars represent 95% confidence intervals; confidence intervals excluding 1 are statistically significant.

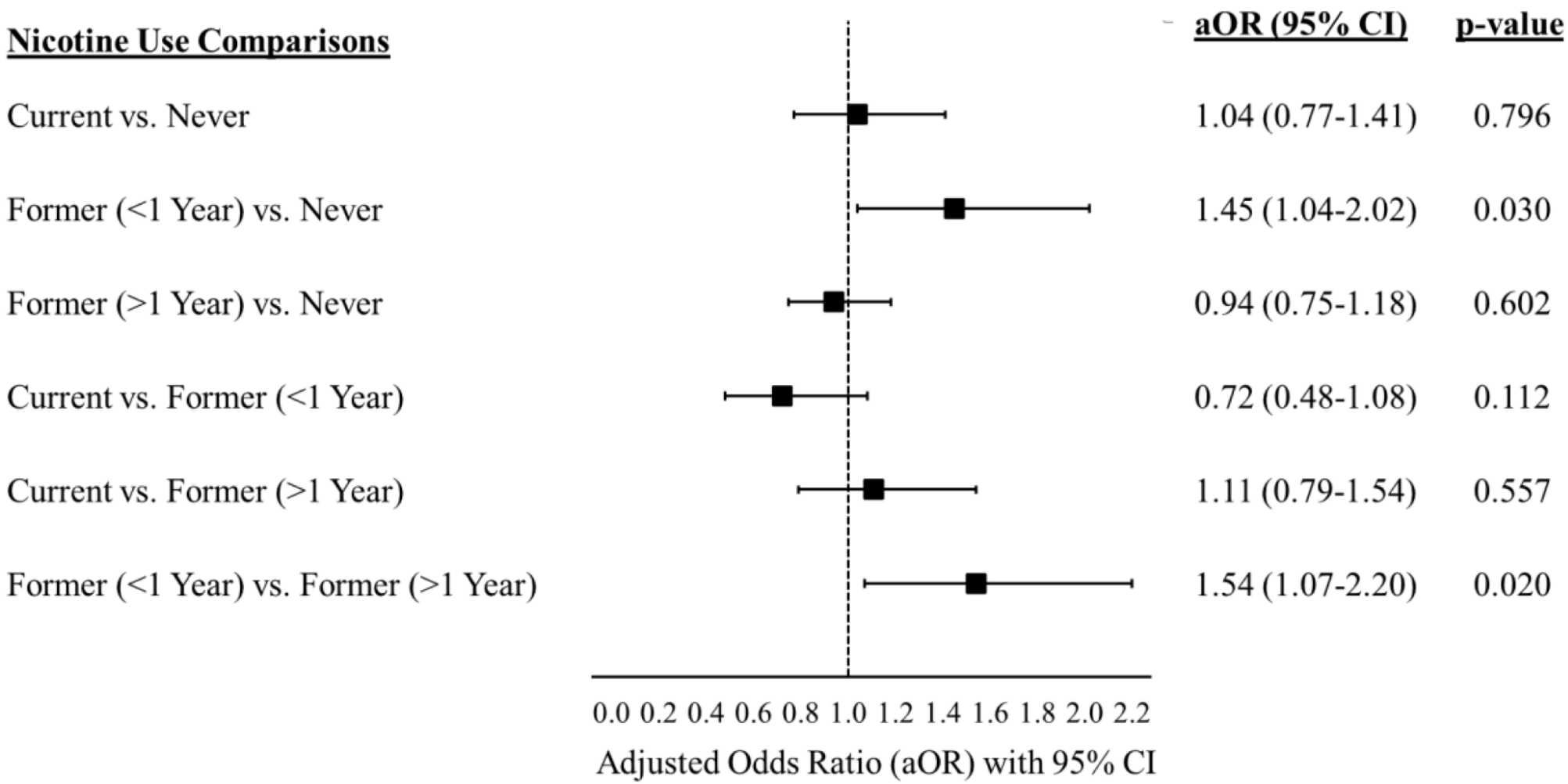


Figure S3. Adjusted odds ratios for SSI. The reference group for odds ratios is found after the "vs." with odds ratios >1.0 indicating greater odds of the outcome. For example, the adjusted odds ratio of 1.04 for Current vs Never indicates that current nicotine users had 4% greater odds of SSI compared to those who never used nicotine. Horizontal error bars represent 95% confidence intervals; confidence intervals excluding 1 are statistically significant.

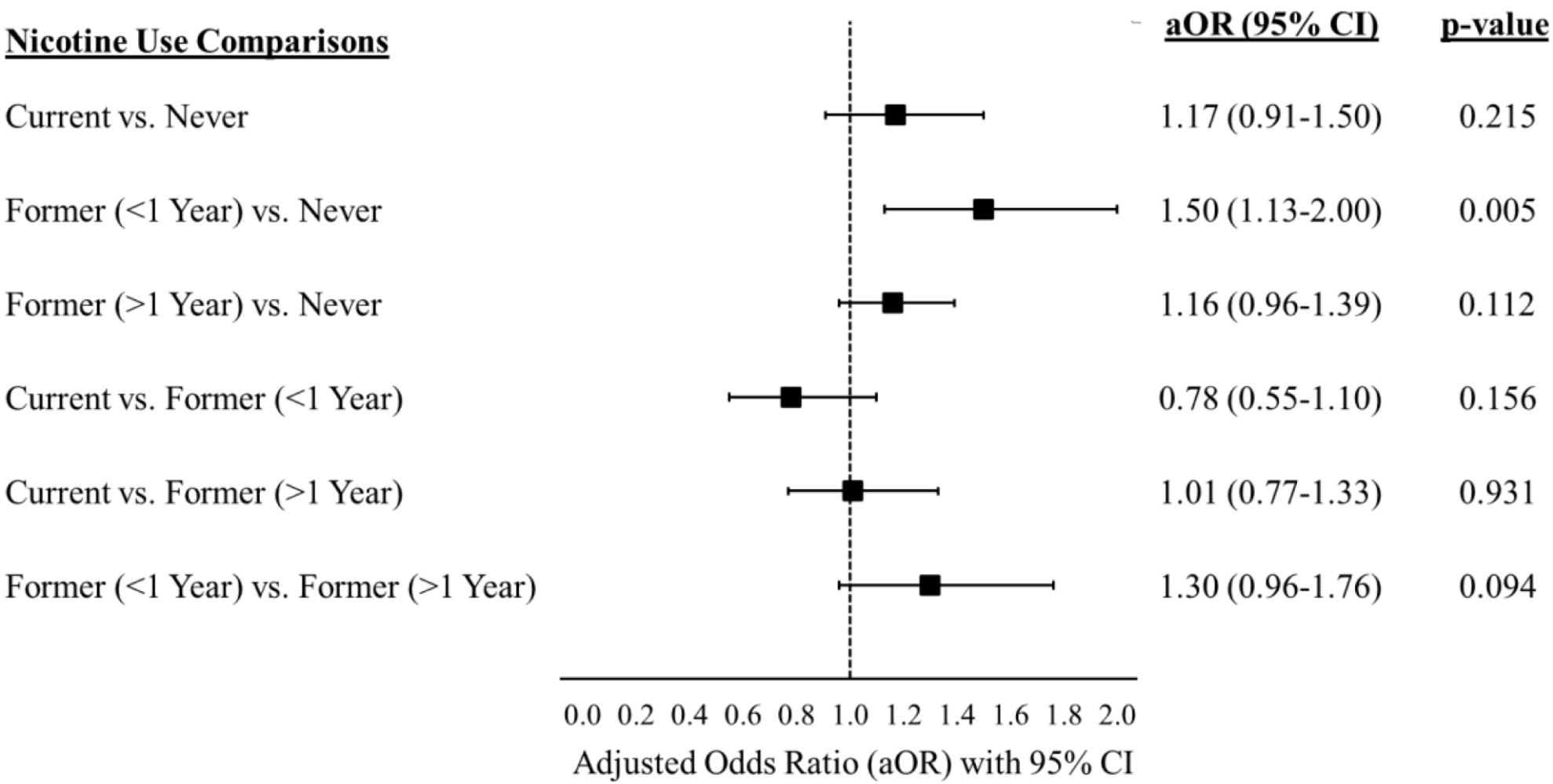


Figure S4. Adjusted odds ratios for SSOPI. The reference group for odds ratios is found after the "vs." with odds ratios >1.0 indicating greater odds of the outcome. For example, the adjusted odds ratio of 1.17 for Current vs Never indicates that current nicotine users had 17% greater odds of SSOPI compared to those who never used nicotine. Horizontal error bars represent 95% confidence intervals; confidence intervals excluding 1 are statistically significant.

AndyYang@Creighton.edu

ACHQC℠
ABDOMINAL CORE HEALTH QUALITY COLLABORATIVE

CREIGHTON™

CHI Health