

Appendix
Association Between Number of Preventive Care Guidelines and Preventive Care Utilization by Patients
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Appendix Table 1. Adjusted Rate Ratios and AORs^a

Variable	Number of guideline-recommended preventive services						p for trend
	1	2	3	4	5	≥6	
Utilization of any single preventive service, ARR (95% CI)							
Overall	ref	0.74 (0.73, 0.75)	0.64 (0.63, 0.65)	0.58 (0.58, 0.59)	0.53 (0.52, 0.54)	0.51 (0.49, 0.52)	<0.001
By number of disease risk factors							
0	ref	0.74 (0.73, 0.76)	0.68 (0.65, 0.70)	0.54 (0.51, 0.57)	–	–	<0.001
1	–	ref	0.82 (0.81, 0.84)	0.75 (0.73, 0.78)	0.59 (0.56, 0.62)	–	<0.001
2	–	–	ref	0.85 (0.83, 0.86)	0.76 (0.74, 0.79)	0.61 (0.58, 0.64)	<0.001
≥3	–	–	–	ref	0.886 (0.83, 0.89)	0.80 (0.76, 0.85)	<0.001
By specific disease risk factors ^b							
Current smoker	–	ref	0.95 (0.90, 1.00)	0.99 (0.93, 1.05)	0.99 (0.91, 1.07)	1.06 (0.97, 1.17)	0.075
Obese	–	ref	0.94 (0.92, 0.96)	0.93 (0.90, 0.96)	0.87 (0.84, 0.91)	0.86 (0.82, 0.91)	<0.001
Diabetes	–	ref	0.79 (0.75, 0.84)	0.73 (0.68, 0.77)	0.67 (0.62, 0.73)	0.63 (0.57, 0.70)	<0.001
Hypertension	–	ref	0.75 (0.73, 0.77)	0.63 (0.61, 0.65)	0.55 (0.53, 0.57)	0.48 (0.46, 0.50)	<0.001
Hyperlipidemia	–	ref	0.86 (0.84, 0.88)	0.81 (0.79, 0.83)	0.77 (0.74, 0.80)	0.74 (0.70, 0.77)	<0.001
Outcome-based services ^b	ref	1.34 (1.31, 1.37)	1.60 (1.55, 1.65)	1.82 (1.72, 1.92)	1.78 (1.50, 2.11)	–	<0.001
All outcome-based services except obesity reduction	ref	0.95 (0.93, 0.98)	0.88 (0.85, 0.91)	0.83 (0.79, 0.87)	–	–	<0.001
Receipt-based services ^c	ref	0.72 (0.71, 0.74)	0.67 (0.64, 0.69)	0.55 (0.52, 0.58)	0.36 (0.14, 0.92)	–	<0.001
Utilization of specific preventive services, AOR (95% CI)							
Tobacco cessation	–	ref	1.02 (0.89, 1.18)	1.05 (0.91, 1.21)	0.93 (0.79, 1.10)	0.88 (0.73, 1.07)	0.12
Obesity reduction	–	ref	1.06 (1.00, 1.11)	1.08 (1.02, 1.14)	1.10 (1.04, 1.18)	1.12 (1.04, 1.22)	<0.001
Hypertension control	–	ref	0.96 (0.89, 1.04)	0.83 (0.77, 0.90)	0.72 (0.65, 0.78)	0.63 (0.57, 0.69)	<0.001
Lipids reduction	–	ref	0.98	0.95	0.85	0.72	<0.001

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			(0.93, 1.04)	(0.89, 1.01)	(0.79, 0.91)	(0.65, 0.78)	
Glycemic control	–	ref	0.89	0.88	0.78	0.63	<0.001
			(0.73, 1.08)	(0.72, 1.07)	(0.64, 0.96)	(0.50, 0.78)	
Breast cancer screening	–	ref	0.79	0.57	0.46	0.37	<0.001
			(0.72, 0.87)	(0.52, 0.63)	(0.42, 0.51)	(0.33, 0.41)	
Cervical cancer screening	–	ref	0.97	0.98	0.85	0.63	<0.001
			(0.88, 1.08)	(0.88, 1.09)	(0.76, 0.96)	(0.54, 0.73)	
Colorectal cancer screening	–	ref	0.93	0.79	0.66	0.53	<0.001
			(0.89, 0.97)	(0.76, 0.83)	(0.62, 0.70)	(0.49, 0.58)	
Abdominal aortic aneurysm screening	–	ref	0.94	1.03	0.65	0.51	0.055
			(0.75, 1.19)	(0.80, 1.32)	(0.44, 0.95)	(0.25, 1.04)	
Osteoporosis screening	–	ref	0.71	0.52	0.34	0.20	<0.001
			(0.51, 0.99)	(0.37, 0.73)	(0.24, 0.49)	(0.13, 0.30)	
Influenza vaccination	ref	1.10	1.03	0.97	0.90	0.85	<0.001
			(1.06, 1.13)	(0.99, 1.06)	(0.93, 1.01)	(0.85, 0.95)	(0.78, 0.92)

Notes: This table presents the ARRs and AORs that were used to inform the results in Table 3 of the manuscript. The rate of utilization of most preventive services was lower when the number of guideline-recommended preventive services was higher. N=80,773 patients across 390,778 person-years.

^aResults were adjusted for demographics (sex, race, ethnicity, marital status, health insurance, median household income by race in each patients' Census block group, primary care geographic location, and calendar year). Analyses included a random effect for each patient. SEs were clustered by patient.

^bTobacco cessation; control of obesity, hypertension, lipids, and blood glucose.

^cScreening for breast, cervical, and colorectal cancers, abdominal aortic aneurysm, and osteoporosis.

ARR, adjusted rate ratio

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Appendix Table 2. Sensitivity Analyses^a

Preventive care utilization	Number of guideline-recommended preventive services						p for trend
	1	2	3	4	5	≥6	
Utilization of any single preventive service, adjusted rate per 100 eligible services (95% CI)							
With obesity control threshold redefined as weight loss ≥10% ^b	38.59 (38.07, 39.11)	30.69 (30.39, 30.98)	27.29 (27.09, 27.49)	25.81 (25.49, 26.12)	24.35 (23.85, 24.84)	24.25 (23.52, 24.99)	<0.001
Excluding influenza vaccination ^c	30.90 (30.40, 31.40)	27.38 (27.14, 27.62)	25.62 (25.38, 25.87)	24.35 (23.92, 24.78)	22.80 (22.15, 23.44)	24.47 (23.41, 25.53)	<0.001
Including only patients with a primary care visit ≥30 minutes long ^c	40.31 (39.64, 40.98)	31.84 (31.44, 32.24)	27.36 (27.03, 27.70)	25.49 (25.05, 25.92)	23.51 (22.85, 24.17)	22.05 (21.05, 23.04)	<0.001
Including only patients with a primary care visit ≤20 minutes long ^d	39.40 (38.84, 39.96)	32.25 (31.90, 32.60)	28.69 (28.45, 28.93)	26.61 (26.28, 26.94)	24.81 (24.32, 25.31)	24.66 (23.92, 25.40)	<0.001
Including all patients regardless of comorbidity ^e	42.15 (41.68, 42.61)	33.44 (33.17, 33.71)	29.82 (29.66, 29.99)	28.15 (27.89, 28.40)	26.71 (26.30, 27.12)	27.02 (26.40, 27.65)	<0.001
By year ^f							
2009	28.95 (28.29, 29.63)	26.84 (26.26, 27.42)	24.27 (23.79, 24.75)	22.91 (22.37, 23.45)	21.33 (20.60, 22.06)	21.06 (19.95, 22.16)	<0.001
2010	31.41 (30.69, 32.13)	27.41 (26.90, 27.93)	24.12 (23.68, 24.56)	21.96 (21.49, 22.44)	19.56 (18.93, 20.19)	19.36 (18.48, 20.25)	<0.001
2011	38.86 (38.02, 39.71)	28.95 (28.46, 29.43)	24.77 (24.36, 25.19)	21.97 (21.51, 22.43)	19.27 (18.67, 19.87)	19.13 (18.26, 19.99)	<0.001
2012	43.72 (42.88, 44.57)	32.47 (31.99, 32.96)	27.10 (26.69, 27.52)	23.91 (23.44, 24.39)	22.02 (21.37, 22.67)	22.01 (19.16, 21.02)	<0.001
2013	48.65 (47.82, 49.48)	35.13 (34.65, 35.61)	29.16 (28.73, 29.60)	26.19 (25.69, 26.69)	22.83 (22.13, 23.53)	21.55 (20.55, 22.56)	<0.001
2014	50.78 (49.98, 51.57)	36.67 (36.19, 37.15)	30.93 (30.49, 31.38)	27.80 (27.25, 28.34)	24.93 (24.17, 25.69)	21.77 (20.73, 22.81)	<0.001
2015	51.97 (51.13, 52.82)	40.16 (39.63, 40.68)	34.80 (34.31, 35.29)	31.41 (30.82, 31.99)	28.57 (27.73, 29.40)	26.24 (25.08, 27.39)	<0.001
All outcome-based services except obesity reduction	26.67 (26.23, 27.12)	25.83 (24.75, 26.91)	24.33 (22.51, 26.15)	18.96 (15.81, 22.11)	–	–	0.010
Adjusted rate ratios that were used to inform the above results, ARR (95% CI)							
Utilization of any single preventive service							
With obesity control threshold redefined as weight loss ≥10% ^b	ref	0.74 (0.73, 0.74)	0.67 (0.66, 0.68)	0.65 (0.64, 0.67)	0.63 (0.61, 0.65)	0.64 (0.61, 0.66)	<0.001
Excluding influenza vaccination ^c	ref	0.84 (0.83, 0.85)	0.77 (0.75, 0.79)	0.72 (0.70, 0.74)	0.68 (0.65, 0.71)	0.60 (0.56, 0.63)	<0.001
Including only patients with a primary care visit ≥30 minutes long ^c	ref	0.75 (0.74, 0.76)	0.66 (0.65, 0.67)	0.62 (0.61, 0.64)	0.58 (0.56, 0.61)	0.55 (0.52, 0.58)	<0.001

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Including only patients with a primary care visit ≤20 minutes long ^d	ref	0.75 (0.74, 0.76)	0.68 (0.67, 0.69)	0.65 (0.64, 0.67)	0.62 (0.60, 0.64)	0.63 (0.61, 0.66)	<0.001
Including all patients regardless of comorbidity ^e	ref	0.73 (0.73, 0.74)	0.67 (0.66, 0.68)	0.64 (0.63, 0.65)	0.62 (0.61, 0.64)	0.64 (0.62, 0.66)	<0.001
By year^f							
2009	ref	0.82 (0.79, 0.84)	0.74 (0.71, 0.76)	0.70 (0.67, 0.72)	0.66 (0.63, 0.69)	0.65 (0.61, 0.69)	<0.001
2010	ref	0.80 (0.77, 0.82)	0.71 (0.69, 0.73)	0.65 (0.63, 0.67)	0.59 (0.57, 0.61)	0.59 (0.56, 0.62)	<0.001
2011	ref	0.70 (0.69, 0.72)	0.61 (0.59, 0.63)	0.54 (0.53, 0.56)	0.49 (0.47, 0.51)	0.49 (0.46, 0.51)	<0.001
2012	ref	0.72 (0.70, 0.74)	0.61 (0.59, 0.62)	0.54 (0.53, 0.56)	0.50 (0.48, 0.52)	0.47 (0.44, 0.49)	<0.001
2013	ref	0.70 (0.68, 0.71)	0.59 (0.57, 0.60)	0.54 (0.52, 0.55)	0.47 (0.45, 0.49)	0.45 (0.43, 0.48)	<0.001
2014	ref	0.69 (0.68, 0.71)	0.59 (0.58, 0.61)	0.54 (0.53, 0.55)	0.49 (0.47, 0.50)	0.43 (0.41, 0.45)	<0.001
2015	ref	0.75 (0.73, 0.76)	0.66 (0.64, 0.67)	0.60 (0.59, 0.62)	0.55 (0.53, 0.57)	0.51 (0.49, 0.54)	<0.001

Notes: Sensitivity analyses were consistent with results presented in Table 3 of the manuscript.

^aResults were adjusted for demographics (sex, race, ethnicity, marital status, health insurance, median household income by race in each patients' Census block group, primary care geographic location and calendar year). Analyses included a random effect for each patient. SEs were clustered by patient.

^b78,141 patients across 334,181 person-years.

^c52,008 patients across 135,609 person-years.

^d106,128 patients across 254,038 person-years.

^e105,955 patients across 554,145 person-years.

^fAnalyses by year were conducted without random effects and without year as a covariate because only 1 year was included at a time. Results are not shown for 2008 which was the baseline year to assess preventive care service eligibility.

ARR, adjusted rate ratio