

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. ICD-9-CM codes used to build the study cohort

Procedure	ICD-9-CM code
Aortic valve surgery replacement with bioprosthesis	35.21
Aortic valve surgery replacement with mechanical prosthesis	35.22
Coronary artery bypass graft surgery	36.10 – 36.16
Tricuspid valve surgery	35.14, 35.27, 35.28
Endocarditis	421.0, 421.1, 421.9
Mitral valve surgery	35.12

ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification

eTable 2. Characteristics of Patients Hospitalized for Aortic Valve Surgery, 1999-2011

	No. (%) of Patients												
	999	000	001	002	003	004	005	006	007	008	009	010	011
No. of patients	4 568	5 460	6 598	7 845	8 186	9 226	8 687	9 134	8 039	8 905	0 418	0 780	1 380
Demographics													
Age, mean (SD), y	6.1 (5.9)	6.4 (5.9)	6.4 (5.9)	6.5 (6.0)	6.5 (6.0)	6.6 (6.1)	6.5 (6.2)	6.6 (6.2)	6.8 (6.3)	6.8 (6.4)	6.9 (6.5)	7.0 (6.6)	7.1 (6.7)
Women	0 509 (42.8)	0 912 (42.9)	1 234 (42.2)	1 692 (42.0)	1 873 (42.1)	2 085 (41.4)	1 902 (41.5)	1 854 (40.7)	1 644 (41.5)	1 635 (40.3)	2 364 (40.6)	2 301 (40.0)	2 645 (40.3)
White	3 033 (93.8)	3 815 (93.5)	4 958 (93.8)	6 028 (93.5)	6 365 (93.5)	7 264 (93.3)	6 780 (93.4)	7 291 (93.7)	6 239 (93.6)	7 108 (93.8)	8 504 (93.7)	8 765 (93.5)	9 316 (93.4)
Black	57 (3.5)	68 (3.4)	70 (3.3)	38 (3.4)	40 (3.3)	006 (3.4)	36 (3.3)	61 (3.3)	96 (3.2)	45 (3.3)	62 (3.2)	014 (3.3)	013 (3.2)
Other racea	78 (2.8)	77 (3.1)	70 (2.9)	79 (3.2)	81 (3.1)	56 (3.3)	71 (3.4)	82 (3.0)	04 (3.2)	52 (2.9)	52 (3.1)	001 (3.3)	051 (3.3)

Risk factors and cardiovascular conditions													
Hypertension	2 736 (51.8)	3 613 (53.5)	4 940 (56.2)	5 827 (56.8)	6 238 (57.6)	7 333 (59.3)	6 901 (58.9)	6 847 (57.8)	6 881 (60.2)	7 934 (62.0)	8 544 (61.0)	8 863 (61.3)	0 613 (65.7)
Diabetes mellitus	168 (21.0)	488 (21.6)	852 (22.0)	313 (22.7)	660 (23.6)	996 (23.9)	204 (25.1)	196 (24.7)	130 (25.4)	432 (25.7)	841 (25.8)	911 (25.7)	679 (27.7)
Atherosclerotic disease	4 904 (60.7)	5 640 (61.4)	6 231 (61.0)	7 162 (61.6)	7 214 (61.1)	7 897 (61.2)	7 194 (59.9)	7 230 (59.1)	6 430 (58.6)	7 140 (59.3)	7 372 (57.1)	7 282 (56.1)	7 954 (57.2)
Unstable angina	321 (5.4)	363 (5.4)	293 (4.9)	156 (4.2)	143 (4.1)	015 (3.5)	48 (3.3)	52 (2.9)	30 (3.0)	83 (2.7)	97 (2.6)	16 (2.3)	78 (2.5)
Prior myocardial infarction	29 (3.8)	95 (3.9)	027 (3.9)	030 (3.7)	067 (3.8)	059 (3.6)	096 (3.8)	026 (3.5)	046 (3.7)	117 (3.9)	250 (4.1)	273 (4.1)	270 (4.0)
Prior heart failure	510 (18.4)	624 (18.2)	743 (17.8)	803 (17.2)	824 (17.1)	896 (16.8)	732 (16.5)	595 (15.8)	493 (16.0)	677 (16.2)	957 (16.3)	068 (16.5)	534 (17.6)
Peripheral vascular disease	363 (5.5)	439 (5.7)	582 (5.9)	641 (5.9)	727 (6.1)	725 (5.9)	746 (6.1)	775 (6.1)	696 (6.0)	864 (6.4)	904 (6.3)	837 (6.0)	991 (6.3)
Stroke	26 (0.9)	73 (1.1)	78 (1.0)	95 (1.1)	81 (1.0)	35 (0.8)	89 (1.0)	91 (1.0)	93 (1.0)	07 (1.1)	07 (1.0)	48 (1.1)	79 (1.2)
Cerebrovascular disease other than stroke													

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	014 (4.1)	066 (4.2)	157 (4.3)	118 (4.0)	095 (3.9)	121 (3.8)	144 (4.0)	102 (3.8)	078 (3.8)	113 (3.9)	138 (3.7)	094 (3.6)	228 (3.9)
Geriatric conditions													
Dementia	76 (1.1)	95 (1.2)	18 (1.2)	56 (1.3)	60 (1.3)	37 (1.5)	04 (1.4)	50 (1.5)	24 (1.5)	77 (1.7)	40 (1.8)	99 (1.9)	88 (2.2)
Functional disability	10 (0.9)	27 (0.9)	11 (0.8)	44 (0.9)	37 (0.8)	79 (1.0)	02 (0.7)	37 (0.8)	28 (0.8)	09 (1.1)	10 (1.0)	04 (1.0)	36 (1.1)
Malnutrition	37 (1.4)	80 (1.5)	96 (1.5)	92 (1.8)	12 (1.8)	62 (1.9)	11 (2.1)	80 (2.3)	79 (2.8)	028 (3.6)	218 (4.0)	330 (4.3)	433 (4.6)
Other conditions													
Renal failure	01 (2.4)	49 (2.5)	75 (2.9)	85 (3.2)	51 (3.4)	068 (3.7)	226 (4.3)	780 (6.1)	122 (7.6)	263 (7.8)	554 (8.4)	922 (9.5)	271 (10.4)
Chronic obstructive pulmonary disease	656 (19.0)	903 (19.3)	362 (20.2)	729 (20.6)	784 (20.5)	943 (20.3)	170 (21.5)	170 (21.2)	759 (20.5)	504 (15.6)	595 (15.1)	582 (14.9)	092 (16.2)
Pneumonia	673 (6.8)	712 (6.7)	830 (6.9)	925 (6.9)	963 (7.0)	164 (7.4)	226 (7.8)	229 (7.7)	163 (7.7)	721 (9.4)	779 (9.1)	903 (9.4)	042 (9.7)
Respiratory failure	58 (2.3)	71 (2.2)	69 (2.1)	99 (2.2)	90 (2.1)	86 (2.0)	25 (2.2)	70 (2.6)	25 (3.3)	020 (3.5)	107 (3.6)	206 (3.9)	414 (4.5)
Liver disease													

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	70 (0.7)	40 (0.5)	89 (0.7)	94 (0.7)	10 (0.7)	01 (0.7)	21 (0.8)	90 (0.7)	93 (0.7)	13 (0.7)	40 (0.8)	28 (0.7)	06 (1.0)
Cancer	188 (4.8)	229 (4.8)	237 (4.7)	342 (4.8)	338 (4.7)	378 (4.7)	373 (4.8)	363 (4.7)	304 (4.7)	370 (4.7)	372 (4.5)	410 (4.6)	487 (4.7)
Major psychiatric disorders	08 (0.8)	33 (0.9)	45 (0.9)	47 (0.9)	36 (0.8)	34 (0.8)	50 (0.9)	39 (0.8)	41 (0.9)	17 (1.1)	18 (1.0)	36 (1.1)	62 (1.2)
Depression	88 (2.0)	75 (2.3)	88 (2.6)	30 (2.6)	49 (3.0)	22 (3.2)	76 (3.1)	41 (2.9)	89 (3.2)	63 (3.3)	60 (3.2)	71 (3.2)	203 (3.8)
Trauma in past year	24 (2.9)	99 (2.7)	10 (3.0)	03 (3.2)	009 (3.6)	091 (3.7)	080 (3.8)	124 (3.9)	058 (3.8)	081 (3.7)	86 (3.2)	096 (3.6)	182 (3.8)

^aOther race includes Asian, Hispanic, North American Native, or other not specified.

eTable 3. Hospitalization Rates for Aortic Valve Surgery, 1999-2011

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Person-years	26 479 079	26 768 087	27 553 904	28 345 999	28 821 487	29 109 293	29 157 293	28 452 501	27 899 732	27 675 586	27 343 436	27 696 576	27 958 093
No. of patients													
Overall	24 568	25 460	26 598	27 845	28 186	29 226	28 687	29 134	28 039	28 905	30 418	30 780	31 380
AVR													
Without CABG	10 589	11 182	11 778	12 600	12 735	13 318	13 140	13 639	13 635	14 516	15 994	16 779	17 901
With CABG	13 979	14 278	14 820	15 245	15 451	15 908	15 547	15 495	14 404	14 389	14 424	14 001	13 479
Rates per 100 000 person-years													
Overall	93	95	97	98	98	100	98	102	100	104	111	111	112
Age, y													
65-74	82	81	81	82	82	83	81	83	79	83	86	85	86
75-84	125	130	134	137	136	140	138	147	147	152	167	168	168
≥85	48	53	53	55	56	61	58	59	64	72	79	83	91
Sex													

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Men	131	133	136	138	136	141	137	143	138	145	153	154	154
Women	67	69	69	70	71	71	70	72	73	74	80	78	80
Race													
White	100	102	104	106	106	109	107	111	109	114	122	122	123
Black	42	42	40	42	41	43	41	43	42	44	45	46	45
Other race ^a	48	51	48	50	48	51	51	46	49	45	51	52	51
AVR													
Without CABG	40	42	43	44	44	46	45	48	49	52	58	61	64
With CABG	53	53	54	54	54	55	53	54	52	52	53	51	48

Abbreviation: AVR, aortic valve replacement; CABG, coronary artery bypass graft.

^aOther race includes Asian, Hispanic, North American Native, or other not specified

eTable 4. Age-sex-race-adjusted annual trends in rates of aortic valve replacements, overall and by subgroups

Condition	Incidence rate ratio	95% CI lower	95% CI upper
Overall	1.017	1.016	1.018
Age			
65-74	1.004	1.002	1.005
75-84	1.024	1.023	1.026
85+	1.045	1.041	1.048
Race			
White			
Male	1.017	1.015	1.018
Female	1.020	1.018	1.022
Black			
Male	1.004	0.998	1.011
Female	1.014	1.007	1.020
Other Race			
Male	1.001	0.994	1.007
Female	1.005	0.997	1.013
AVR with CABG	0.995	0.994	0.997
Age			
65-74	0.983	0.981	0.985
75-84	1.003	1.001	1.005
85+	1.009	1.004	1.014
Race			
White			
Male	0.998	0.996	0.999
Female	0.992	0.990	0.995
Black			
Male	0.995	0.986	1.005
Female	0.999	0.990	1.009
Other Race			
Male	0.988	0.979	0.997
Female	0.976	0.963	0.988

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AVR without CABG	1.041	1.039	1.042
Age			
65-74	1.025	1.023	1.027
75-84	1.049	1.047	1.052
85+	1.084	1.079	1.089
Race			
White			
Male	1.044	1.041	1.046
Female	1.041	1.039	1.044
Black			
Male	1.012	1.003	1.021
Female	1.024	1.015	1.034
Other Race			
Male	1.016	1.006	1.026
Female	1.025	1.015	1.036

Abbreviation: AVR, Aortic Valve Replacement; CABG, Coronary Artery Bypass Graft

eTable 5. Outcomes of Aortic Valve Surgery, 1999-2011

	% (95% CI)												
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Overall													
No. of patients	24 568	25 460	26 598	27 845	28 186	29 226	28 687	29 134	28 039	28 905	30 418	30 780	31 380
30-d Mortality Rates													
Overall	7.6 (7.27-7.93)	7.1 (6.83-7.47)	7.3 (6.97-7.60)	6.9 (6.61-7.21)	7.1 (6.85-7.45)	6.8 (6.50-7.08)	6.0 (5.69-6.24)	5.9 (5.67-6.21)	5.5 (5.25-5.79)	5.6 (5.34-5.88)	5.5 (5.21-5.72)	5.0 (4.76-5.25)	4.2 (3.95-4.39)
Age, y													
65-74	5.9 (5.43-6.35)	5.6 (5.15-6.06)	5.7 (5.29-6.19)	5.6 (5.13-6.00)	5.6 (5.15-6.02)	5.3 (4.91-5.75)	4.6 (4.17-4.96)	4.6 (4.24-5.03)	4.5 (4.16-4.97)	4.1 (3.74-4.49)	4.2 (3.86-4.61)	4.1 (3.71-4.44)	3.3 (2.94-3.59)
75-84	8.2 (7.72-8.70)	7.7 (7.23-8.15)	7.8 (7.37-8.28)	7.4 (6.97-7.83)	7.6 (7.15-8.02)	7.0 (6.62-7.44)	6.3 (5.96-6.75)	6.4 (6.00-6.78)	5.6 (5.26-6.02)	6.0 (5.60-6.39)	5.7 (5.34-6.10)	5.0 (4.64-5.34)	4.4 (4.07-4.73)
≥85	12.3 (11.0-13.8)	10.8 (9.60-12.1)	10.8 (9.60-12.1)	9.8 (8.68-11.0)	11.1 (9.99-12.4)	11.2 (10.1-12.3)	9.3 (8.27-10.4)	8.5 (7.50-9.50)	8.1 (7.18-9.10)	8.7 (7.78-9.66)	8.1 (7.23-8.94)	7.6 (6.81-8.43)	5.8 (5.12-6.49)
Sex													
Men	6.9 (6.44-7.29)	6.4 (6.01-6.81)	6.6 (6.22-7.01)	6.5 (6.12-6.89)	6.6 (6.21-6.98)	6.2 (5.86-6.58)	5.2 (4.91-5.59)	5.2 (4.86-5.53)	4.8 (4.51-5.17)	5.0 (4.70-5.36)	5.0 (4.67-5.31)	4.6 (4.32-4.93)	3.7 (3.48-4.03)
Women	8.6 (8.05-9.13)	8.1 (7.64-8.68)	8.2 (7.70-8.72)	7.5 (7.00-7.97)	7.9 (7.43-8.41)	7.6 (7.14-8.09)	7.0 (6.52-7.45)	7.0 (6.57-7.49)	6.5 (6.04-6.94)	6.5 (6.02-6.93)	6.2 (5.74-6.59)	5.6 (5.18-6.00)	4.8 (4.42-5.17)
Race													
White	7.5 (7.16-7.84)	7.0 (6.72-7.37)	7.2 (6.91-7.56)	6.9 (6.55-7.16)	7.2 (6.87-7.50)	6.7 (6.44-7.03)	5.9 (5.61-6.17)	5.9 (5.58-6.14)	5.4 (5.12-5.67)	5.5 (5.28-5.83)	5.4 (5.13-5.66)	5.0 (4.72-5.22)	4.1 (3.88-4.33)
Black	9.5 (7.58-11.6)	9.7 (7.79-11.8)	9.0 (7.15-11.1)	8.1 (6.44-10.0)	6.7 (5.19-8.49)	8.2 (6.54-10.0)	7.9 (6.26-9.82)	7.3 (5.72-9.11)	7.8 (6.14-9.77)	6.1 (4.69-7.86)	6.0 (4.61-7.72)	6.9 (5.42-8.64)	5.0 (3.77-6.57)
Other	8.7 (6.69-11.1)	7.7 (5.94-9.83)	6.9 (5.20-8.91)	7.3 (5.65-9.20)	6.6 (5.04-8.43)	7.0 (5.47-8.82)	6.2 (4.75-7.88)	7.0 (5.43-8.92)	6.9 (5.30-8.71)	6.8 (5.21-8.71)	7.0 (5.50-8.85)	4.1 (2.96-5.52)	5.1 (3.88-6.65)
AVR													
Without CABG	6.6 (6.15-7.11)	6.6 (6.19-7.12)	6.5 (6.02-6.91)	6.3 (5.85-6.71)	5.9 (5.48-6.30)	6.0 (5.57-6.39)	4.8 (4.44-5.18)	4.9 (4.58-5.31)	4.6 (4.24-4.95)	4.6 (4.30-4.99)	4.5 (4.22-4.87)	4.3 (3.97-4.59)	3.5 (3.21-3.75)
With CABG	8.3 (7.89-8.82)	7.6 (7.14-8.01)	7.9 (7.51-8.38)	7.4 (7.02-7.86)	8.2 (7.77-8.64)	7.5 (7.09-7.92)	6.9 (6.54-7.35)	6.8 (6.45-7.25)	6.4 (5.99-6.80)	6.6 (6.20-7.02)	6.5 (6.09-6.90)	5.9 (5.47-6.25)	5.1 (4.76-5.51)
1-y Mortality Rate													
Overall	13.6 (13.1-14.0)	12.9 (12.5-13.3)	13.7 (13.3-14.2)	13.3 (12.9-13.7)	13.4 (13.0-13.8)	12.9 (12.5-13.3)	12.6 (12.2-13.0)	12.2 (11.9-12.6)	11.9 (11.6-12.3)	12.1 (11.7-12.5)	11.5 (11.2-11.9)	11.0 (10.7-11.4)	10.9 (10.6-11.3)
Age, y													
65-74	10.5 (9.89-11.1)	9.9 (9.29-10.5)	10.3 (9.74-10.9)	10.4 (9.82-11.0)	10.0 (9.46-10.6)	9.9 (9.39-10.5)	9.6 (9.02-10.1)	9.0 (8.50-9.58)	8.8 (8.27-9.37)	8.6 (8.08-9.14)	8.3 (7.77-8.79)	8.2 (7.68-8.69)	8.2 (7.67-8.66)

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75-84	14.6 (14.0-15.3)	14.0 (13.4-14.6)	15.0 (14.4-15.6)	14.3 (13.7-14.8)	14.3 (13.7-14.9)	13.5 (13.0-14.1)	13.3 (12.8-13.9)	13.2 (12.7-13.8)	12.8 (12.3-13.4)	12.7 (12.2-13.3)	12.4 (11.9-12.9)	11.3 (10.8-11.9)	11.1 (10.6-11.6)
≥85	22.2 (20.4-24.0)	19.7 (18.1-21.3)	20.9 (19.3-22.6)	19.8 (18.3-21.4)	22.6 (21.0-24.2)	21.2 (19.7-22.7)	19.9 (18.5-21.4)	18.7 (17.3-20.1)	18.2 (16.9-19.6)	20.3 (19.0-21.6)	17.7 (16.5-18.9)	17.4 (16.3-18.6)	17.5 (16.4-18.6)
Sex													
Men	12.8 (12.3-13.4)	12.1 (11.6-12.7)	12.9 (12.4-13.5)	12.7 (12.2-13.2)	12.5 (12.0-13.0)	12.3 (11.8-12.8)	11.6 (11.1-12.1)	11.6 (11.1-12.1)	11.1 (10.7-11.6)	11.5 (11.1-12.0)	11.0 (10.5-11.4)	10.5 (10.0-10.9)	10.6 (10.1-11.0)
Women	14.5 (13.9-15.2)	13.9 (13.3-14.6)	14.9 (14.2-15.5)	14.1 (13.5-14.8)	14.7 (14.1-15.4)	13.8 (13.2-14.5)	14.0 (13.4-14.6)	13.2 (12.6-13.8)	13.1 (12.5-13.7)	12.9 (12.3-13.5)	12.4 (11.8-13.0)	11.8 (11.2-12.4)	11.5 (10.9-12.0)
LOS, median (IQR), d													
Total	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)	7 (5)
Preprocedure	1 (3)	1 (3)	1 (3)	1 (3)	1 (3)	1 (3)	1 (3)	0 (2)	0 (2)	0 (2)	0 (2)	0 (2)	0 (2)
Postprocedure	6 (4)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)	6 (5)
Race													
White	13.3 (12.9-13.8)	12.7 (12.3-13.2)	13.6 (13.2-14.1)	13.1 (12.7-13.5)	13.4 (13.0-13.9)	12.8 (12.4-13.2)	12.4 (12.0-12.8)	12.1 (11.7-12.4)	11.7 (11.4-12.1)	12.0 (11.6-12.4)	11.4 (11.0-11.8)	10.9 (10.5-11.2)	10.8 (10.5-11.2)
Black	17.7 (15.2-20.5)	16.9 (14.5-19.6)	17.2 (14.8-19.9)	18.1 (15.7-20.7)	14.7 (12.5-17.1)	14.9 (12.8-17.3)	17.9 (15.5-20.6)	16.4 (14.2-18.9)	16.3 (13.9-18.9)	14.0 (11.8-16.3)	14.7 (12.5-17.1)	14.8 (12.7-17.1)	14.1 (12.0-16.4)
Other	15.6 (13.0-18.6)	13.6 (11.3-16.3)	13.2 (10.9-15.9)	12.9 (10.7-15.3)	11.7 (9.64-14.0)	13.7 (11.6-16.1)	12.8 (10.7-15.0)	12.9 (10.8-15.3)	13.5 (11.3-15.9)	14.3 (12.0-16.9)	12.9 (10.9-15.2)	10.6 (8.75-12.7)	11.1 (9.29-13.2)
AVR													
Without CABG	12.1 (11.5-12.7)	11.8 (11.2-12.4)	12.4 (11.9-13.1)	12.0 (11.4-12.6)	11.5 (11.0-12.1)	11.7 (11.2-12.3)	10.1 (9.61-10.7)	10.5 (9.96-11.0)	10.4 (9.90-10.9)	10.3 (9.86-10.9)	10.0 (9.57-10.5)	9.9 (9.45-10.4)	9.9 (9.44-10.3)
With CABG	14.7 (14.2-15.3)	13.8 (13.3-14.4)	14.8 (14.2-15.4)	14.4 (13.8-14.9)	15.0 (14.5-15.6)	14.0 (13.4-14.5)	14.6 (14.1-15.2)	13.8 (13.3-14.4)	13.4 (12.9-14.0)	13.9 (13.3-14.5)	13.2 (12.7-13.8)	12.3 (11.8-12.9)	12.3 (11.8-12.9)
30-Readmission Rates													
Overall	21.5 (20.9-22.0)	21.4 (20.9-22.0)	20.9 (20.4-21.4)	21.7 (21.2-22.2)	21.1 (20.6-21.6)	21.6 (21.2-22.1)	20.9 (20.5-21.4)	21.3 (20.8-21.8)	21.2 (20.7-21.6)	21.0 (20.5-21.5)	20.7 (20.2-21.1)	20.1 (19.6-20.6)	19.6 (19.2-20.0)
AVR													
Without CABG	20.6 (19.8-21.4)	20.9 (20.1-21.7)	20.0 (19.3-20.8)	20.8 (20.0-21.5)	20.1 (19.3-20.8)	20.9 (20.1-21.6)	19.5 (18.8-20.2)	20.2 (19.5-20.9)	20.1 (19.4-20.8)	19.9 (19.3-20.6)	19.9 (19.3-20.6)	19.2 (18.6-19.8)	19.0 (18.5-19.6)
With CABG	22.2 (21.5-22.9)	21.9 (21.2-22.6)	21.7 (21.0-22.4)	22.5 (21.8-23.2)	22.0 (21.3-22.7)	22.3 (21.7-23.0)	22.2 (21.5-22.8)	22.2 (21.6-22.9)	22.2 (21.5-22.9)	22.1 (21.4-22.9)	21.5 (20.8-22.2)	21.2 (20.5-21.9)	19.9 (19.2-20.6)

Abbreviation: AVR, aortic valve replacement; CABG, coronary artery bypass graft surgery; IQR, interquartile range

eTable 6. Age-sex-race-comorbidity-adjusted annual trends in 30-day mortality rates of aortic valve replacements, overall and by subgroups

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Condition	Odds ratio	95% CI lower	95% CI upper
Overall	0.959	0.956	0.963
Age			
65-74	0.963	0.956	0.969
75-84	0.958	0.953	0.963
85+	0.951	0.942	0.960
Race			
White			
Male	0.954	0.949	0.959
Female	0.951	0.946	0.957
Black			
Male	0.929	0.903	0.956
Female	0.956	0.934	0.979
Other Race			
Male	0.947	0.923	0.971
Female	0.980	0.953	1.009
AVR with CABG	0.966	0.962	0.971
Age			
65-74	0.971	0.962	0.980
75-84	0.965	0.958	0.972
85+	0.956	0.944	0.968
Race			
White			
Male	0.961	0.954	0.967
Female	0.958	0.951	0.966
Black			
Male	0.958	0.925	0.993
Female	0.968	0.937	0.999
Other Race			
Male	0.946	0.916	0.976
Female	1.000	0.963	1.038
AVR without CABG	0.953	0.947	0.958

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Age			
65-74	0.953	0.943	0.962
75-84	0.951	0.944	0.959
85+	0.948	0.934	0.961
Race			
White			
Male	0.944	0.936	0.952
Female	0.949	0.941	0.957
Black			
Male	0.903	0.873	0.934
Female	0.947	0.917	0.977
Other Race			
Male	0.970	0.936	1.004
Female	0.973	0.940	1.008

Abbreviation: AVR, Aortic Valve Replacement; CABG, Coronary Artery Bypass Graft

eTable 7. Age-sex-race-comorbidity-adjusted annual trends in 1-year mortality rates of aortic valve replacements, overall and by subgroups

Condition	Odds ratio	95% CI lower	95% CI upper
Overall	0.975	0.972	0.977
Age			
65-74	0.972	0.967	0.977
75-84	0.974	0.970	0.978
85+	0.975	0.968	0.982
Race			
White			
Male	0.973	0.969	0.976
Female	0.966	0.961	0.970
Black			
Male	0.961	0.942	0.980
Female	0.958	0.941	0.976
Other Race			
Male	0.957	0.938	0.977
Female	0.986	0.964	1.009
AVR with CABG	0.979	0.975	0.983
Age			
65-74	0.979	0.972	0.986
75-84	0.977	0.972	0.982
85+	0.979	0.969	0.988
Race			
White			
Male	0.976	0.971	0.981
Female	0.969	0.963	0.975
Black			
Male	0.974	0.946	1.003
Female	0.970	0.944	0.997
Other Race			
Male	0.950	0.924	0.977

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Female	1.008	0.975	1.042
AVR without CABG	0.972	0.968	0.977
Age			
65-74	0.967	0.959	0.974
75-84	0.973	0.967	0.978
85+	0.976	0.966	0.986
Race			
White			
Male	0.969	0.963	0.975
Female	0.968	0.962	0.974
Black			
Male	0.944	0.920	0.970
Female	0.947	0.923	0.972
Other Race			
Male	0.971	0.942	1.000
Female	0.976	0.947	1.006

Abbreviation: AVR, Aortic Valve Replacement; CABG, Coronary Artery Bypass Graft

eTable 8. Age-sex-race-comorbidity-adjusted annual trends in 30-day readmission rates of aortic valve replacements, overall and by subgroups

Condition	Hazard ratio	95% CI lower	95% CI upper
Overall	0.989	0.987	0.991
Age			
65-74	0.984	0.981	0.988
75-84	0.990	0.987	0.993
85+	0.993	0.988	0.999
Race			
White			
Male	0.988	0.986	0.991
Female	0.989	0.986	0.992
Black			
Male	0.990	0.975	1.006
Female	0.988	0.974	1.003
Other Race			
Male	0.987	0.972	1.003
Female	1.000	0.983	1.016
AVR with CABG	0.992	0.989	0.995
Age			
65-74	0.988	0.983	0.993
75-84	0.993	0.989	0.997
85+	0.998	0.990	1.006
Race			
White			
Male	0.991	0.988	0.995
Female	0.993	0.988	0.998
Black			
Male	1.003	0.980	1.026
Female	1.000	0.977	1.022
Other Race			
Male	0.992	0.971	1.013
Female	1.000	0.975	1.025

AVR without CABG	0.987	0.984	0.989
Age			
65-74	0.982	0.977	0.987
75-84	0.989	0.985	0.993
85+	0.991	0.982	0.999
Race			
White			
Male	0.986	0.981	0.990
Female	0.987	0.983	0.992
Black			
Male	0.978	0.957	0.999
Female	0.980	0.961	0.999
Other Race			
Male	0.982	0.959	1.005
Female	1.002	0.980	1.025

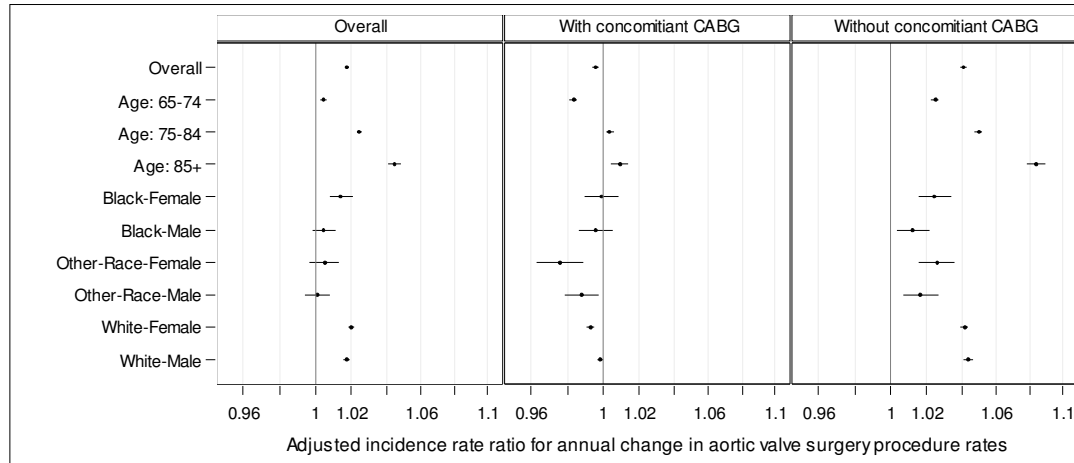
Abbreviation: AVR, Aortic Valve Replacement; CABG, Coronary Artery Bypass Graft

eTable 9.. Trends in the type of AVR and utilization of concomitant CABG, 1999-2011.

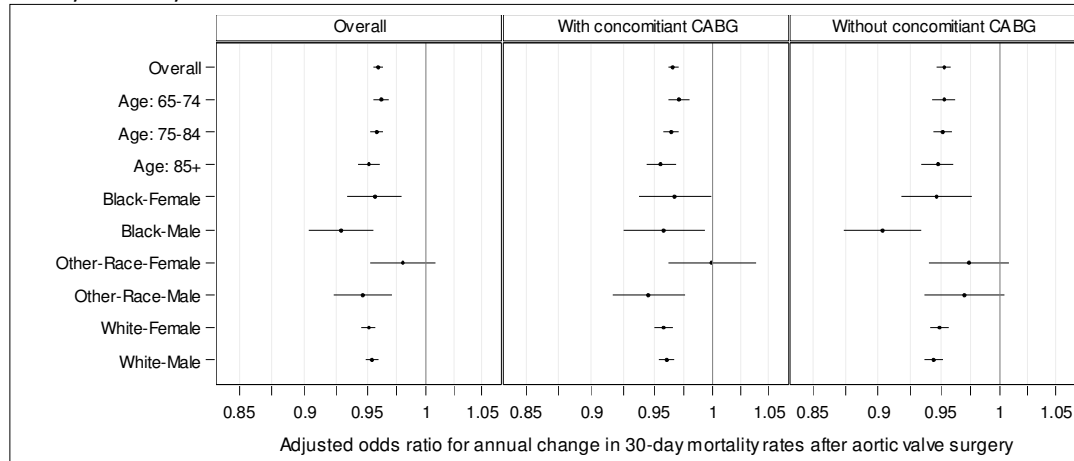
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Replacement with bioprosthesis (%)	44.1	48.2	51.6	55.5	58.6	61.4	64.4	67.9	69.7	70.6	71.2	72.3	72.7
Replacement with mechanical prosthesis (%)	55.9	51.8	48.4	44.6	41.4	38.6	35.7	32.1	30.3	29.4	28.8	27.7	27.3
Utilization of bioprosthesis													
<i>By age, %</i>													
65-74, y	37.1	42.2	45.5	49.2	53.2	56.4	59.8	63.8	65.7	67.1	68.0	68.9	69.5
75-84, y	48.2	51.3	54.7	59.0	61.2	64.0	66.9	70.1	71.7	72.5	72.4	74.0	74.2
≥85, y	53.8	56.5	59.6	61.5	66.3	67.0	68.9	71.9	73.9	74.1	75.8	75.5	76.1
<i>By gender, %</i>													
Men	44.3	48.4	52.3	55.8	58.7	61.8	64.8	68.2	69.9	71.1	71.3	73.2	73.0
Women	43.9	47.9	50.6	55.0	58.5	60.8	63.7	67.5	69.4	70.0	71.0	71.0	72.2
<i>By race, %</i>													
White	44.5	48.7	52.1	56.2	59.1	62.0	64.8	68.3	70.1	71.0	71.6	72.6	73.1
Black	40.0	42.5	43.5	46.0	51.6	52.2	58.1	61.3	60.3	62.5	62.0	66.0	64.7
Other	35.6	38.5	44.9	44.8	51.1	54.6	58.8	63.8	66.6	67.6	68.2	69.1	69.7
Utilization of mechanical prosthesis													
<i>By age, %</i>													
65-74, y	63.0	57.9	54.5	50.8	46.8	43.7	40.3	36.2	34.4	33.0	32.0	31.1	30.5
75-84, y	51.8	48.8	45.3	41.0	38.8	36.0	33.1	29.9	28.3	27.5	27.6	26.0	25.8
≥85, y	46.2	43.5	40.4	38.5	33.7	33.0	31.1	28.1	26.1	25.9	24.2	24.5	23.9
<i>By gender, %</i>													
Men	55.7	51.7	47.7	44.2	41.3	38.2	35.2	31.8	30.1	28.9	28.7	26.8	27.0
Women	56.1	52.1	49.5	45.0	41.5	39.2	36.3	32.5	30.6	30.0	29.0	29.0	27.8
<i>By race, %</i>													
White	55.5	51.3	47.9	43.9	40.9	38.0	35.2	31.7	29.9	29.0	28.4	27.4	26.9
Black	60.0	57.5	56.6	54.1	48.4	47.8	41.9	38.7	39.8	37.5	38.2	34.0	35.3
Other	64.5	61.5	55.1	55.2	48.9	45.4	41.2	36.2	33.4	32.4	31.8	30.9	30.4

Abbreviation: AVR, Aortic Valve Replacement; CABG, Coronary Artery Bypass Graft

eFigure. Annual Change Rates in Procedure, Mortality, and Readmission
Aortic Valve Surgery Rates

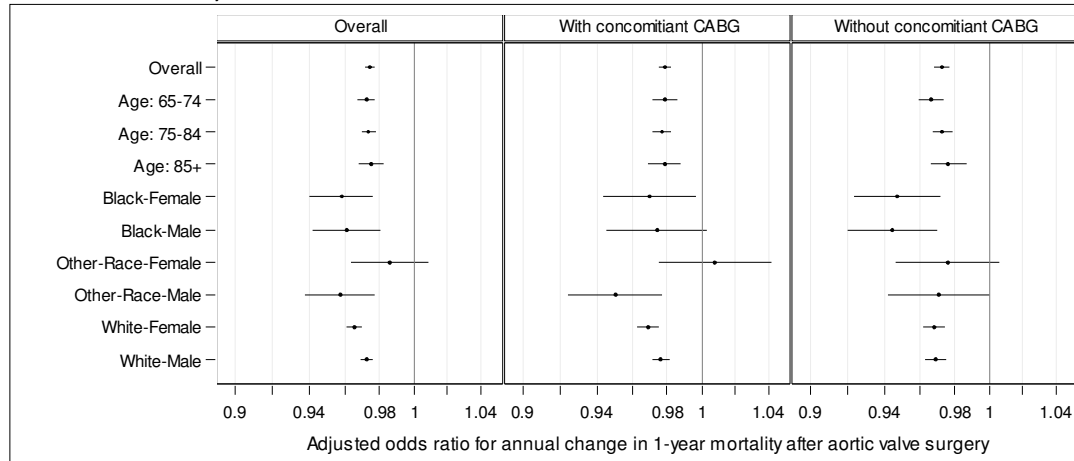


30-Day Mortality



eFigure. Annual Change Rates in Procedure, Mortality, and Readmission (continued)

One-Year Mortality Rates



Thirty-Day Readmission Rates After Aortic Valve Surgery

