

ORIGINAL RESEARCH ARTICLE

## Integrating the micropolitan and state-level disparities in mortality of coexisting congestive heart failure and atrial fibrillation in the United States: A 20-year-long analysis

Supplementary Files

Table S1. Overall and gender-stratified trends in congestive heart failure- and atrial fibrillation-related mortality in the United States (age ≥ 25 years), 1999–2020

Year	Overall			Male			Female		
	AAMR per 100,000	95% confidence interval		AAMR per 100,000	95% confidence interval		AAMR per 100,000	95% confidence interval	
		Lower	Upper		Lower	Upper		Lower	Upper
Total	15.58	15.55	15.62	17.62	17.56	17.68	14.13	14.08	14.17
1999	11.43	11.27	11.58	12.21	11.92	12.49	10.83	10.64	11.02
2000	12.19	12.03	12.35	12.88	12.60	13.17	11.62	11.43	11.82
2001	12.38	12.21	12.54	13.17	12.88	13.45	11.78	11.58	11.98
2002	12.84	12.67	13.00	13.78	13.49	14.07	12.09	11.89	12.29
2003	13.12	12.96	13.29	14.06	13.77	14.35	12.38	12.18	12.58
2004	13.14	12.97	13.30	14.21	13.92	14.49	12.35	12.15	12.55
2005	14.13	13.96	14.30	15.17	14.87	15.46	13.43	13.23	13.64
2006	13.81	13.65	13.98	14.91	14.63	15.20	13.04	12.84	13.24
2007	13.79	13.63	13.95	14.88	14.60	15.16	12.98	12.78	13.17
2008	14.13	13.96	14.29	15.18	14.91	15.46	13.28	13.08	13.47
2009	13.82	13.66	13.98	15.13	14.85	15.40	12.85	12.66	13.05
2010	14.43	14.27	14.59	16.03	15.75	16.31	13.26	13.06	13.46
2011	14.97	14.80	15.13	16.54	16.27	16.82	13.86	13.66	14.05
2012	15.52	15.36	15.68	17.52	17.24	17.80	14.11	13.91	14.31
2013	16.20	16.03	16.36	18.09	17.81	18.37	14.82	14.62	15.02
2014	16.76	16.60	16.93	18.98	18.70	19.27	15.08	14.88	15.28
2015	17.88	17.71	18.05	20.26	19.98	20.55	16.09	15.88	16.30
2016	17.47	17.30	17.63	20.21	19.92	20.49	15.48	15.28	15.68
2017	18.43	18.26	18.60	21.40	21.11	21.69	16.28	16.07	16.48
2018	18.90	18.74	19.07	22.03	21.74	22.32	16.54	16.34	16.74
2019	19.20	19.03	19.37	22.63	22.34	22.91	16.67	16.47	16.87
2020	20.72	20.55	20.89	24.83	24.53	25.12	17.64	17.43	17.85

Abbreviation: AAMR: Age-adjusted mortality rate.

**Table S2. Race-stratified trends in congestive heart failure- and atrial fibrillation-related mortality in the United States (age ≥ 25 years), 1999–2020**

Year	American Indian or Alaska Native			Asian or Pacific Islander			Black or African American			White			Hispanic or Latino		
	AAMR per 100,000	95% confidence interval Lower	Upper	AAMR per 100,000	95% confidence interval Lower	Upper	AAMR per 100,000	95% confidence interval Lower	Upper	AAMR per 100,000	95% confidence interval Lower	Upper	AAMR per 100,000	95% confidence interval Lower	Upper
Total	9.59	9.21	9.98	6.72	6.59	6.84	9.77	9.67	9.87	16.42	16.39	16.46	8.01	7.91	8.12
1999	7.01	5.03	9.51	5.62	4.76	6.47	7.07	6.62	7.51	11.89	11.72	12.06	5.57	5.00	6.14
2000	5.63	3.96	7.76	4.45	3.72	5.18	7.37	6.92	7.82	12.79	12.61	12.97	5.75	5.19	6.30
2001	6.99	5.14	9.30	5.19	4.45	5.93	7.35	6.90	7.79	12.97	12.80	13.15	5.91	5.35	6.46
2002	8.68	6.62	11.17	5.37	4.63	6.11	7.90	7.43	8.36	13.41	13.23	13.58	6.09	5.55	6.64
2003	8.20	6.22	10.60	5.43	4.71	6.15	8.36	7.88	8.83	13.72	13.55	13.90	6.59	6.03	7.14
2004	6.28	4.63	8.33	6.20	5.47	6.94	8.27	7.80	8.73	13.71	13.54	13.89	6.32	5.79	6.85
2005	8.52	6.59	10.84	5.99	5.30	6.69	8.71	8.24	9.18	14.84	14.66	15.02	7.04	6.50	7.59
2006	7.62	5.89	9.69	6.38	5.69	7.07	8.24	7.78	8.69	14.51	14.33	14.68	6.51	6.01	7.02
2007	8.52	6.68	10.71	5.88	5.24	6.52	8.38	7.92	8.83	14.47	14.29	14.65	6.69	6.19	7.19
2008	8.91	7.08	11.08	6.24	5.60	6.89	8.87	8.41	9.33	14.81	14.64	14.99	7.25	6.75	7.76
2009	9.06	7.26	11.18	6.56	5.92	7.20	8.13	7.70	8.56	14.56	14.39	14.73	6.66	6.19	7.12
2010	8.53	6.82	10.53	6.96	6.32	7.60	8.38	7.95	8.82	15.20	15.03	15.38	7.23	6.75	7.71
2011	9.59	7.76	11.41	6.87	6.26	7.47	8.86	8.42	9.29	15.84	15.66	16.01	7.28	6.82	7.74
2012	9.38	7.65	11.12	6.15	5.60	6.69	9.97	9.52	10.43	16.37	16.19	16.55	7.90	7.44	8.36
2013	11.11	9.29	12.93	6.78	6.23	7.34	9.84	9.40	10.28	17.15	16.97	17.33	7.80	7.36	8.25
2014	11.18	9.39	12.97	6.69	6.16	7.22	10.67	10.21	11.12	17.73	17.55	17.92	7.98	7.54	8.41
2015	10.79	9.12	12.46	6.61	6.11	7.12	11.14	10.68	11.59	19.03	18.84	19.22	9.02	8.58	9.47
2016	10.16	8.57	11.74	7.41	6.88	7.93	10.31	9.89	10.74	18.65	18.47	18.84	9.01	8.58	9.45
2017	9.98	8.44	11.53	7.11	6.61	7.60	11.59	11.14	12.03	19.72	19.53	19.91	9.25	8.83	9.68
2018	11.53	9.95	13.11	7.64	7.14	8.13	11.76	11.32	12.20	20.21	20.02	20.40	9.48	9.06	9.90
2019	10.75	9.26	12.25	7.21	6.74	7.68	12.12	11.67	12.56	20.61	20.42	20.80	9.38	8.97	9.79
2020	12.13	10.61	13.66	8.32	7.83	8.81	14.13	13.67	14.60	22.11	21.92	22.30	10.85	10.41	11.28

Abbreviation: AAMR: Age-adjusted mortality rate.

**Table S3. State-wise mortality trends due to congestive heart failure- and atrial fibrillation-related mortality (age ≥ 25 years), 1999–2020**

State	Deaths	Age-adjusted mortality rate per 100,000 deaths	95% confidence interval		% of total deaths
			Lower	Upper	
Oregon	16,479	25.65	25.26	26.04	2.21
Washington	23,147	23.53	23.23	23.84	3.11
Rhode Island	4,838	23.43	22.76	24.1	0.65
Vermont	2,522	23.29	22.38	24.21	0.34
North Dakota	3,153	23.26	22.43	24.08	0.42
Minnesota	20,031	22.68	22.36	22.99	2.69
West Virginia	7,338	22.17	21.66	22.68	0.99
Oklahoma	12,446	21.7	21.32	22.09	1.67
Ohio	40,241	20.71	20.51	20.91	5.40
Idaho	4,411	20.12	19.53	20.72	0.59
Nebraska	6,259	19.46	18.97	19.95	0.84
New Hampshire	4,132	19.38	18.78	19.97	0.55
Kentucky	12,157	19.03	18.69	19.37	1.63
Colorado	11,704	18.78	18.44	19.12	1.57
South Dakota	2,930	18.69	18	19.37	0.39
Wyoming	1,424	18.01	17.07	18.95	0.19
California	92,171	17.89	17.77	18	12.38
Tennessee	16,451	17.68	17.41	17.96	2.21
Alaska	887	17.52	16.34	18.7	0.12
Iowa	10,586	17.47	17.14	17.81	1.42
North Carolina	23,624	17.38	17.16	17.6	3.17
South Carolina	11,676	17.37	17.06	17.69	1.57
Indiana	17,077	17.19	16.93	17.45	2.29
Maine	4,295	17.17	16.66	17.69	0.58
Texas	49,767	17.15	17	17.3	6.68
Mississippi	7,267	17.1	16.7	17.49	0.98
Utah	4,734	17.05	16.56	17.54	0.64
Pennsylvania	42,216	16.95	16.78	17.11	5.67
Wisconsin	16,517	16.83	16.57	17.09	2.22
Montana	2,853	16.56	15.95	17.17	0.38
Maryland	12,889	15.4	15.14	15.67	1.73
Connecticut	10,299	15.31	15.01	15.61	1.38
Michigan	23,482	14.52	14.33	14.71	3.15
Delaware	2,053	14.39	13.76	15.01	0.28
Arkansas	6,541	13.93	13.59	14.27	0.88
Missouri	13,830	13.88	13.65	14.12	1.86
Kansas	6,731	13.74	13.41	14.07	0.90
Alabama	9,813	13.6	13.33	13.87	1.32

(Cont'd...)

Table S3. (Continued)

State	Deaths	Age-adjusted mortality rate per 100,000 deaths	95% confidence interval		% of total deaths
			Lower	Upper	
Massachusetts	15,924	13.45	13.24	13.66	2.14
Virginia	14,467	13.18	12.96	13.39	1.94
New Jersey	19,417	13.11	12.92	13.29	2.61
Illinois	25,543	12.87	12.71	13.02	3.43
New Mexico	3,623	12.22	11.82	12.62	0.49
Louisiana	6,988	11.04	10.78	11.3	0.94
New York	36,151	11.01	10.89	11.12	4.86
Georgia	12,032	10.84	10.65	11.04	1.62
Hawaii	2,405	9.91	9.51	10.31	0.32
Arizona	9,682	9.9	9.7	10.1	1.30
Florida	35,886	9.16	9.07	9.26	4.82
District of Columbia	751	8.63	8.01	9.25	0.10
Nevada	2,725	8.61	8.28	8.94	0.37

Note: Arranged by state with the highest AAMR to the lowest AAMR. Abbreviation: AAMR: Age-adjusted mortality rate.

**Table S4. Urbanization-stratified trends in congestive heart failure- and atrial fibrillation-related mortality in the United States (age ≥ 25 years), 1999–2020**

Year	Large Central Metro					Large Fringe Metro					Medium Metro					Small Metro					Micropolitan (Nonmetro)					Noncore (Nonmetro)				
	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval	Age-adjusted mortality rate	Lower 95% confidence interval	Upper 95% confidence interval			
Total	13.32	13.25	13.38	14.5	14.43	14.57	16.52	16.44	16.6	17.24	17.13	17.36	18.61	18.49	18.74	18.61	18.49	18.74	18.18	18.04	18.32	18.61	18.49	18.74	18.18	18.04	18.32			
1999	10.14	9.85	10.42	11.06	10.72	11.39	11.66	11.31	12.01	12.64	12.1	13.17	13.2	12.68	13.72	13.2	12.68	13.72	12.34	11.79	12.89	13.2	12.68	13.72	12.34	11.79	12.89			
2000	10.61	10.33	10.9	11.95	11.61	12.29	12.65	12.29	13.02	13.24	12.7	13.78	13.97	13.44	14.51	13.97	13.44	14.51	13.42	12.85	13.99	13.97	13.44	14.51	13.42	12.85	13.99			
2001	10.94	10.65	11.23	11.55	11.22	11.88	12.97	12.6	13.33	13.65	13.11	14.2	14.27	13.73	14.81	14.27	13.73	14.81	13.95	13.37	14.53	14.27	13.73	14.81	13.95	13.37	14.53			
2002	11.23	10.94	11.52	12.12	11.78	12.46	13.33	12.97	13.7	13.97	13.42	14.51	14.99	14.45	15.54	14.99	14.45	15.54	14.59	14	15.18	14.99	14.45	15.54	14.59	14	15.18			
2003	11.55	11.25	11.84	12.14	11.81	12.47	13.9	13.53	14.27	13.84	13.3	14.38	15.11	14.57	15.66	15.11	14.57	15.66	15.5	14.89	16.11	15.11	14.57	15.66	15.5	14.89	16.11			
2004	11.65	11.36	11.94	12.16	11.83	12.49	13.71	13.35	14.08	14.13	13.6	14.67	15.81	15.25	16.36	15.81	15.25	16.36	14.53	13.94	15.12	15.81	15.25	16.36	14.53	13.94	15.12			
2005	12.29	12	12.59	13.06	12.72	13.39	15.13	14.75	15.51	15.5	14.94	16.06	16.73	16.16	17.3	16.73	16.16	17.3	15.98	15.36	16.6	16.73	16.16	17.3	15.98	15.36	16.6			
2006	12.23	11.93	12.52	12.41	12.09	12.74	14.93	14.56	15.3	15.18	14.63	15.72	16.39	15.83	16.94	16.39	15.83	16.94	15.47	14.86	16.07	16.39	15.83	16.94	15.47	14.86	16.07			
2007	12.1	11.81	12.39	12.47	12.15	12.79	14.98	14.61	15.35	15.19	14.65	15.73	16.21	15.66	16.77	16.21	15.66	16.77	15.26	14.66	15.86	16.21	15.66	16.77	15.26	14.66	15.86			
2008	12.34	12.05	12.63	12.7	12.38	13.02	15.14	14.77	15.5	15.13	14.6	15.66	16.9	16.34	17.46	16.9	16.34	17.46	16.75	16.12	17.37	16.9	16.34	17.46	16.75	16.12	17.37			
2009	12.15	11.87	12.44	12.38	12.07	12.69	14.57	14.21	14.92	15.2	14.67	15.73	16.77	16.22	17.33	16.77	16.22	17.33	16.36	15.75	16.98	16.77	16.22	17.33	16.36	15.75	16.98			
2010	12.67	12.38	12.96	13.5	13.17	13.82	15.02	14.66	15.37	15.81	15.27	16.34	16.77	16.22	17.32	16.77	16.22	17.32	16.61	16	17.23	16.77	16.22	17.32	16.61	16	17.23			
2011	13.09	12.8	13.39	13.98	13.66	14.3	15.48	15.13	15.84	17.29	16.74	17.84	17.56	17	18.12	17.56	17	18.12	17.1	16.48	17.72	17.56	17	18.12	17.1	16.48	17.72			
2012	13.52	13.23	13.81	14.33	14.01	14.65	16.13	15.77	16.49	17.69	17.14	18.24	17.91	17.36	18.47	17.91	17.36	18.47	18.8	18.15	19.44	17.91	17.36	18.47	18.8	18.15	19.44			
2013	14.24	13.94	14.54	14.86	14.54	15.19	17.11	16.75	17.48	18.44	17.89	19	19.12	18.55	19.69	19.12	18.55	19.69	18.38	17.74	19.01	19.12	18.55	19.69	18.38	17.74	19.01			
2014	14.6	14.3	14.89	15.34	15.02	15.67	17.82	17.46	18.19	18.16	17.61	18.71	20.18	19.59	20.76	20.18	19.59	20.76	19.72	19.07	20.37	20.18	19.59	20.76	19.72	19.07	20.37			
2015	15.23	14.93	15.53	16.65	16.32	16.99	18.95	18.57	19.32	19.63	19.07	20.19	21.97	21.37	22.58	21.97	21.37	22.58	21.01	20.34	21.68	21.97	21.37	22.58	21.01	20.34	21.68			
2016	14.84	14.55	15.14	15.82	15.5	16.14	19.11	18.74	19.49	19.51	18.95	20.07	20.96	20.37	21.55	20.96	20.37	21.55	20.71	20.05	21.37	20.96	20.37	21.55	20.71	20.05	21.37			
2017	15.08	14.79	15.37	16.99	16.66	17.32	19.87	19.49	20.25	21.08	20.5	21.65	23.02	22.41	23.63	23.02	22.41	23.63	22.06	21.39	22.74	23.02	22.41	23.63	22.06	21.39	22.74			
2018	15.35	15.06	15.65	17.6	17.27	17.92	20.29	19.91	20.66	20.86	20.3	21.42	23.4	22.79	24.01	23.4	22.79	24.01	24.04	23.34	24.74	23.4	22.79	24.01	24.04	23.34	24.74			
2019	15.31	15.02	15.6	18.11	17.78	18.44	20.44	20.07	20.81	21.01	20.45	21.57	24.42	23.8	25.04	24.42	23.8	25.04	24.88	24.17	25.59	24.42	23.8	25.04	24.88	24.17	25.59			
2020	16.53	16.23	16.82	19.57	19.23	19.91	21.49	21.12	21.87	23.76	23.17	24.35	26.63	25.99	27.27	26.63	25.99	27.27	26.58	25.86	27.31	26.63	25.99	27.27	26.58	25.86	27.31			

**Table S5. Region stratified trends in congestive heart failure- and atrial fibrillation-related mortality in the United States (age ≥ 25 years), 1999–2020**

Year	Northeast			Midwest			South			West		
	AAMR per 100,000	95% confidence interval		AAMR per 100,000	95% confidence interval		AAMR per 100,000	95% confidence interval		AAMR per 100,000	95% confidence interval	
		Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
Total	14.14	14.07	14.22	16.78	16.7	16.86	14.36	14.3	14.41	17.55	17.46	17.63
1999	11.25	10.92	11.59	12.5	12.16	12.83	10.04	9.78	10.29	12.64	12.27	13.02
2000	11.82	11.48	12.17	13.21	12.86	13.55	11.05	10.78	11.31	13.34	12.95	13.72
2001	12.17	11.82	12.51	13.38	13.04	13.72	11.26	11	11.53	13.27	12.89	13.65
2002	11.85	11.51	12.19	14.31	13.96	14.66	11.62	11.35	11.89	14.06	13.68	14.45
2003	11.97	11.63	12.3	14.35	14	14.7	12.07	11.8	12.34	14.61	14.22	15
2004	12.34	12	12.68	14.01	13.67	14.35	11.7	11.43	11.96	15.23	14.84	15.62
2005	13.01	12.66	13.36	15.5	15.14	15.86	12.79	12.52	13.07	15.99	15.59	16.39
2006	12.62	12.28	12.96	14.87	14.52	15.22	12.5	12.23	12.76	16.03	15.64	16.42
2007	12.4	12.06	12.73	14.8	14.46	15.15	12.63	12.37	12.9	15.87	15.49	16.25
2008	12.91	12.57	13.25	15.71	15.36	16.07	12.41	12.15	12.66	16.3	15.92	16.68
2009	12.65	12.32	12.98	14.68	14.34	15.02	12.55	12.3	12.81	16.04	15.66	16.41
2010	13.5	13.16	13.85	15.18	14.83	15.52	12.93	12.67	13.19	16.83	16.45	17.21
2011	13.81	13.46	14.15	16.48	16.12	16.83	13.24	12.99	13.5	17.34	16.96	17.72
2012	14.38	14.03	14.73	16.87	16.51	17.22	14.14	13.88	14.41	17.31	16.94	17.69
2013	15.16	14.81	15.52	17.18	16.83	17.54	14.7	14.44	14.97	18.5	18.12	18.88
2014	15.66	15.3	16.02	17.9	17.54	18.26	15.4	15.13	15.66	18.6	18.22	18.98
2015	16.4	16.03	16.77	19.56	19.18	19.93	16.36	16.09	16.63	19.86	19.48	20.25
2016	15.71	15.35	16.07	18.51	18.15	18.87	16.08	15.82	16.34	20.13	19.75	20.51
2017	16.13	15.78	16.49	20.02	19.65	20.4	17.37	17.1	17.64	20.51	20.13	20.89
2018	16.74	16.38	17.1	20.79	20.41	21.16	17.88	17.61	18.15	20.42	20.05	20.8
2019	16.28	15.92	16.63	20.98	20.6	21.35	18.62	18.35	18.89	20.81	20.44	21.19
2020	18.26	17.89	18.64	23.01	22.62	23.4	19.73	19.46	20.01	22.05	21.67	22.42

Abbreviation: AAMR: Age-adjusted mortality rate.