

Supplementary Materials

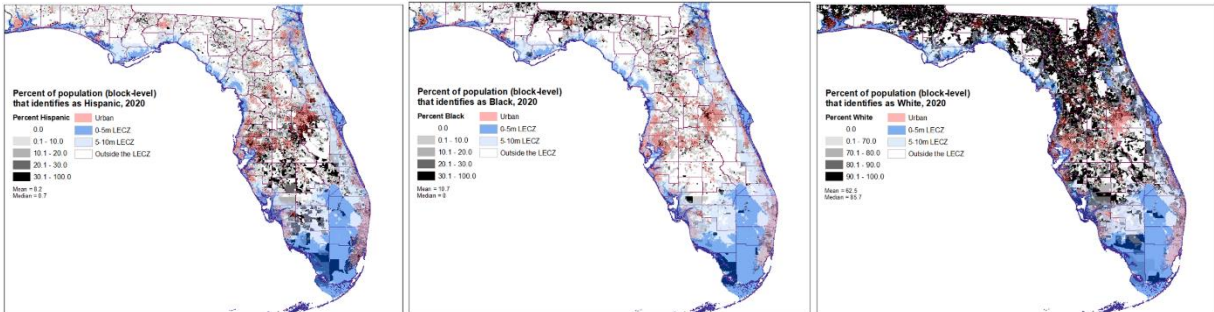
These materials are supplemental to the following paper:

Tagtachian, D., and D. Balk (2023), Uneven vulnerability: characterizing population composition and change in the low elevation coastal zone in the United States with a climate justice lens, 1990–2020. *Front. Environ. Sci.* 11:1111856. doi: 10.3389/fenvs.2023.1111856

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Figure S1. Percent of Population identified as Hispanic, Black and White, Florida, overlaid by urban areas and the Low Elevation Coastal Zone (LECZ), 2020.



Note: Classification shown in legend is not normalized across all three panels.

Figure S2.A-H. State-specific estimates for changes in the population by race and Hispanic origin, by rural/urban classification, within and outside the LECZ, from 1990 to 2020.

Note: The colors associated with each state are consistent across all graphs in Figure S2 but the y axis is not consistent across all graphs. Additionally, the panels are consistent: urban population within the LECZ by state (upper left panel), urban population outside the LECZ by state (upper right panel), rural population within the LECZ (bottom left panel), and the rural population outside the LECZ (bottom right panel).

Figure S2.A. Total Population

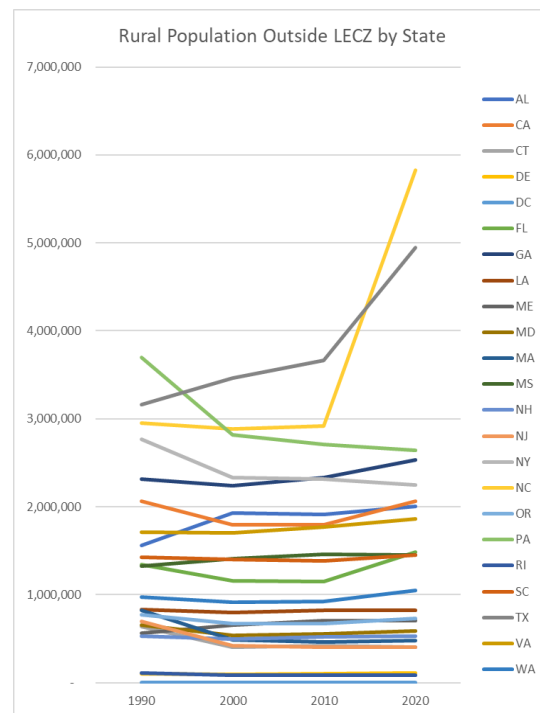
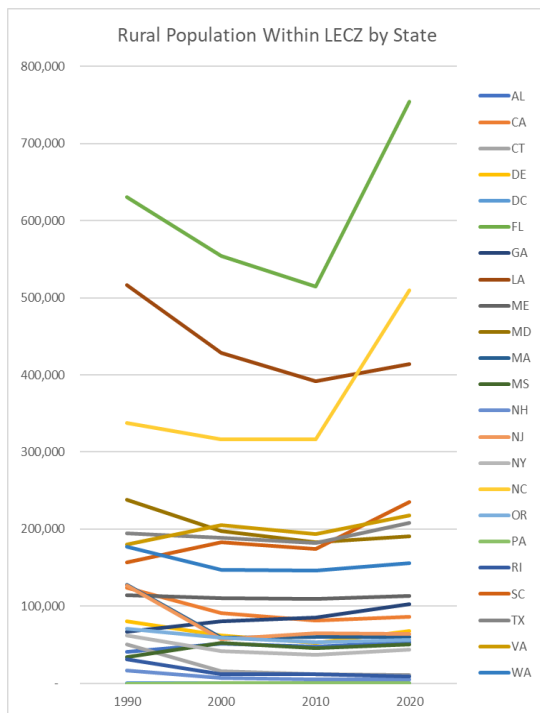
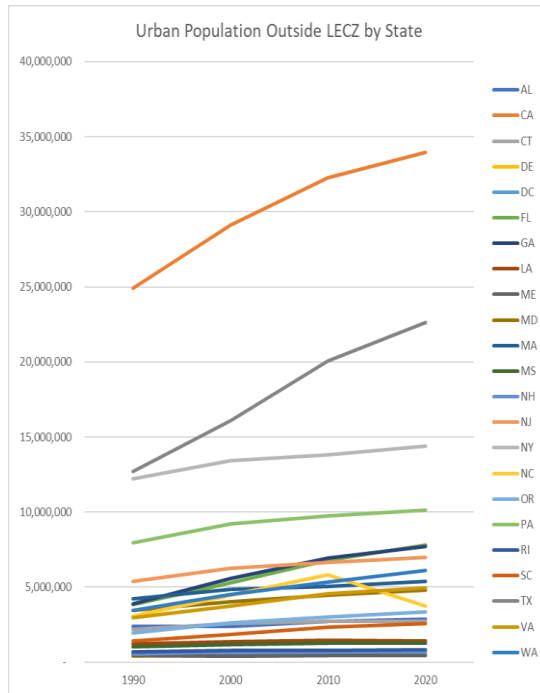
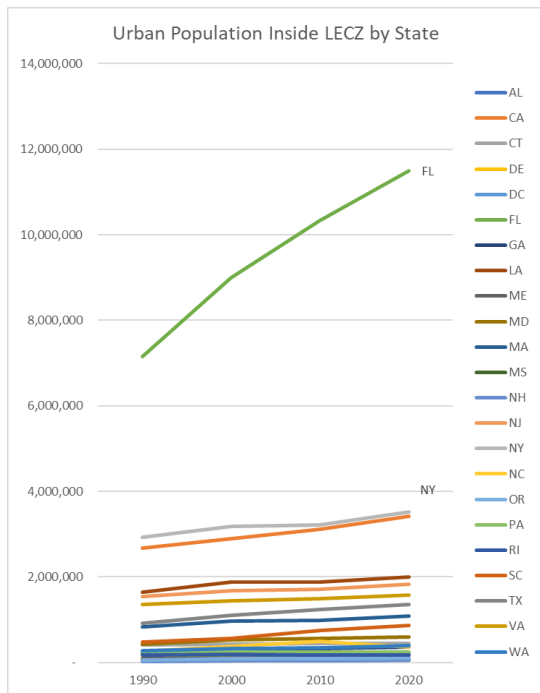


Figure S2.B. Annual Growth Rate for Total Population



Figure S2.C. White Population, single race

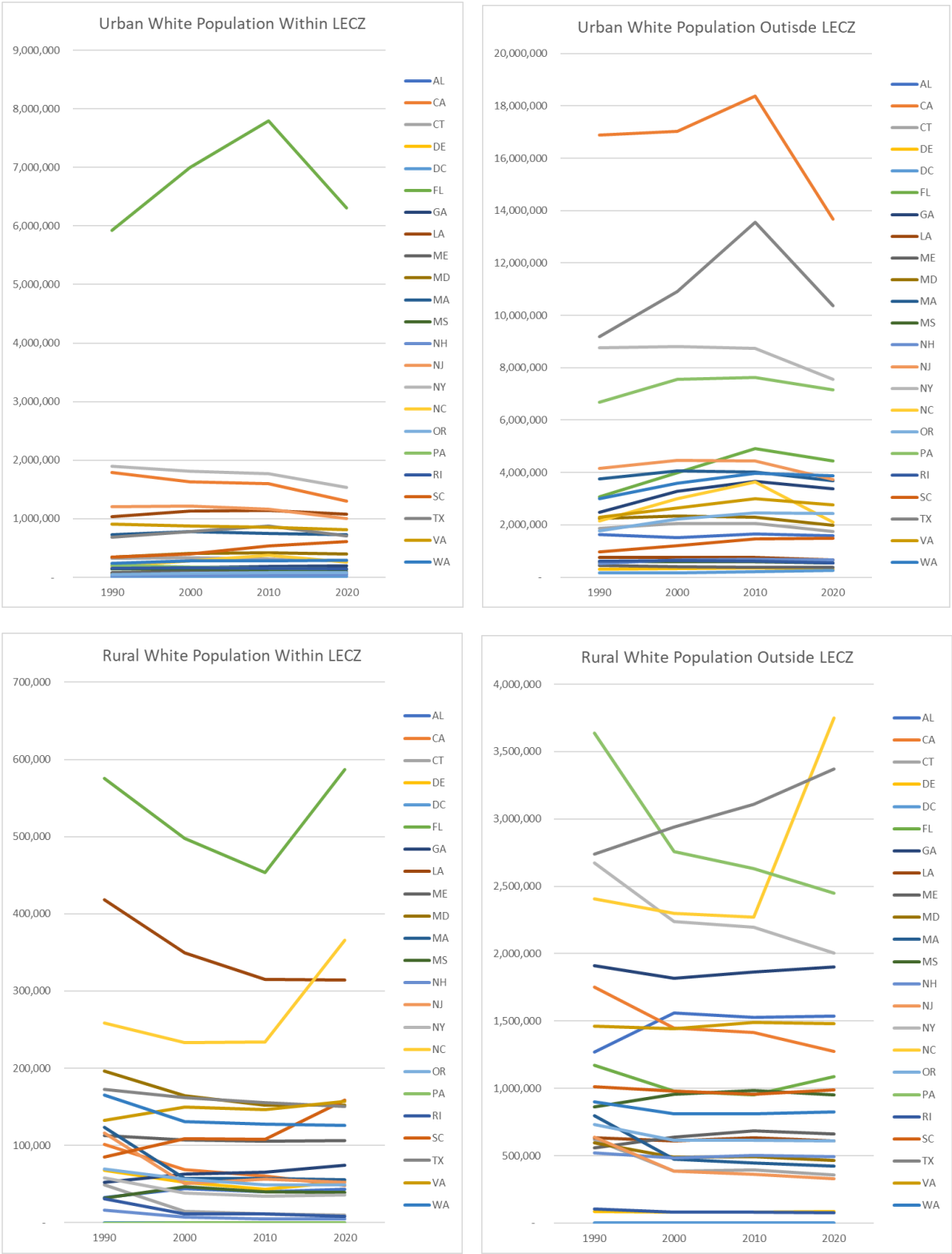


Figure S2.D. Black Population, single race

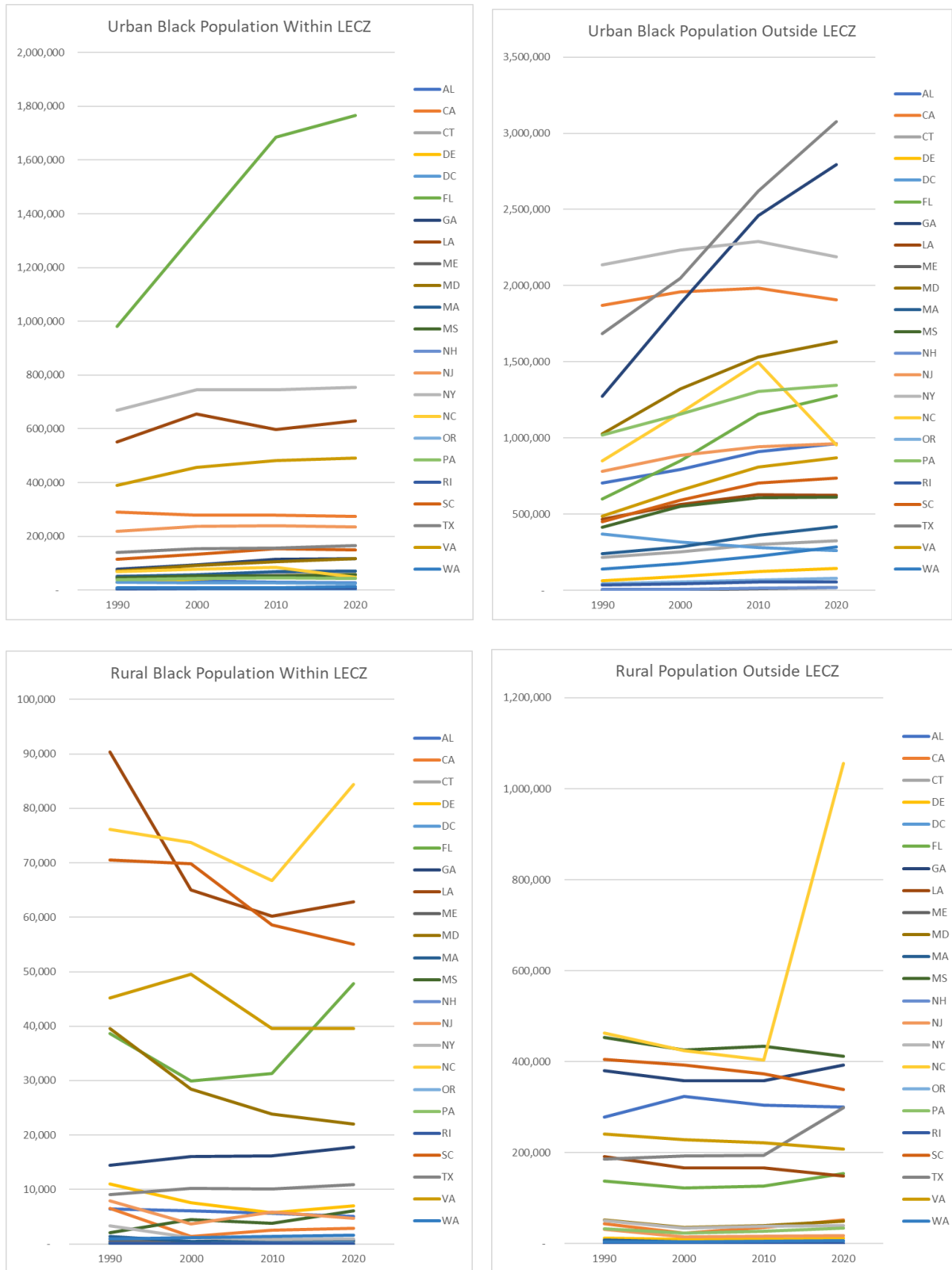


Figure S2.E. Asian Population, single race

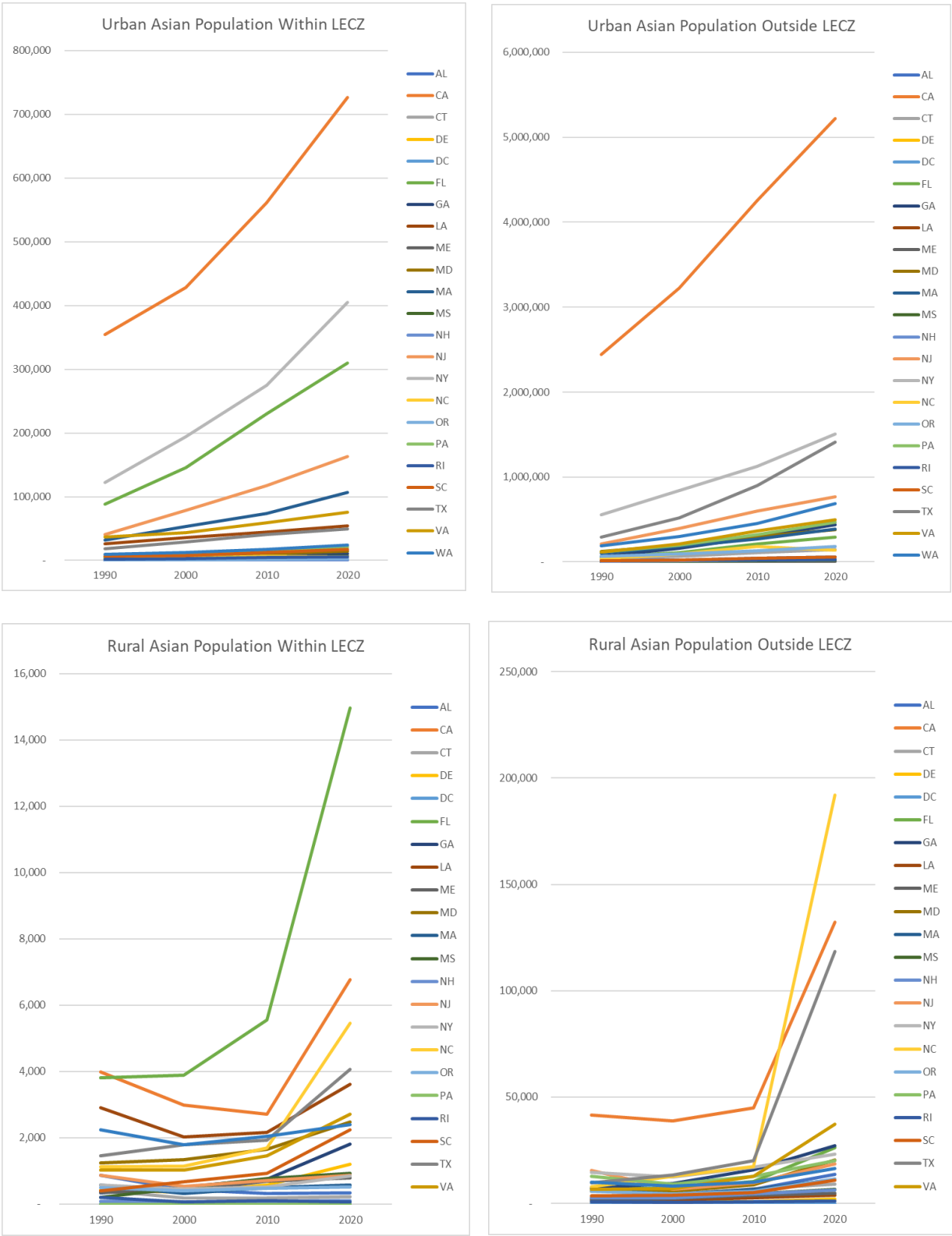


Figure S2.F. Hispanic Population, any race

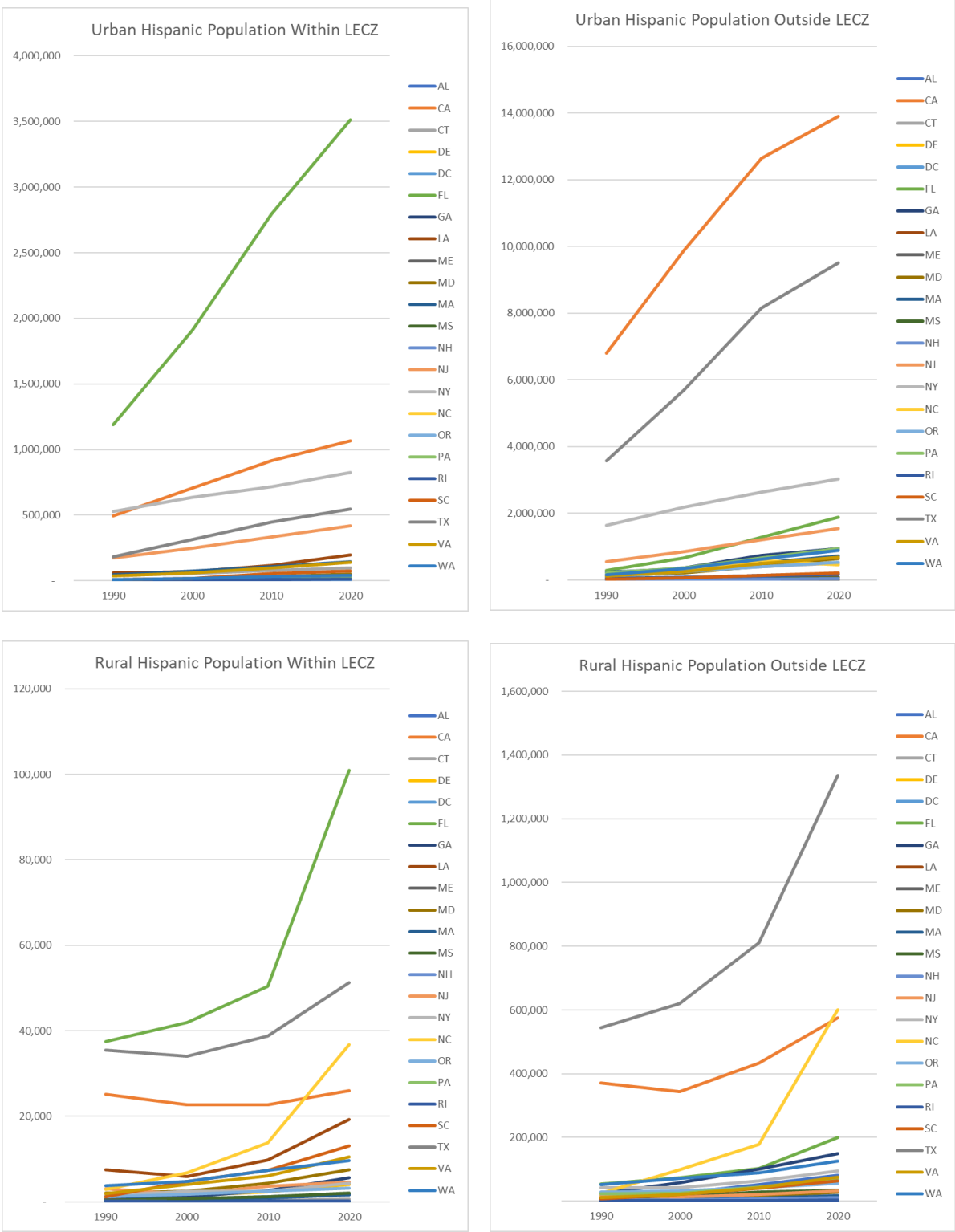


Figure S2.G. Other, single race

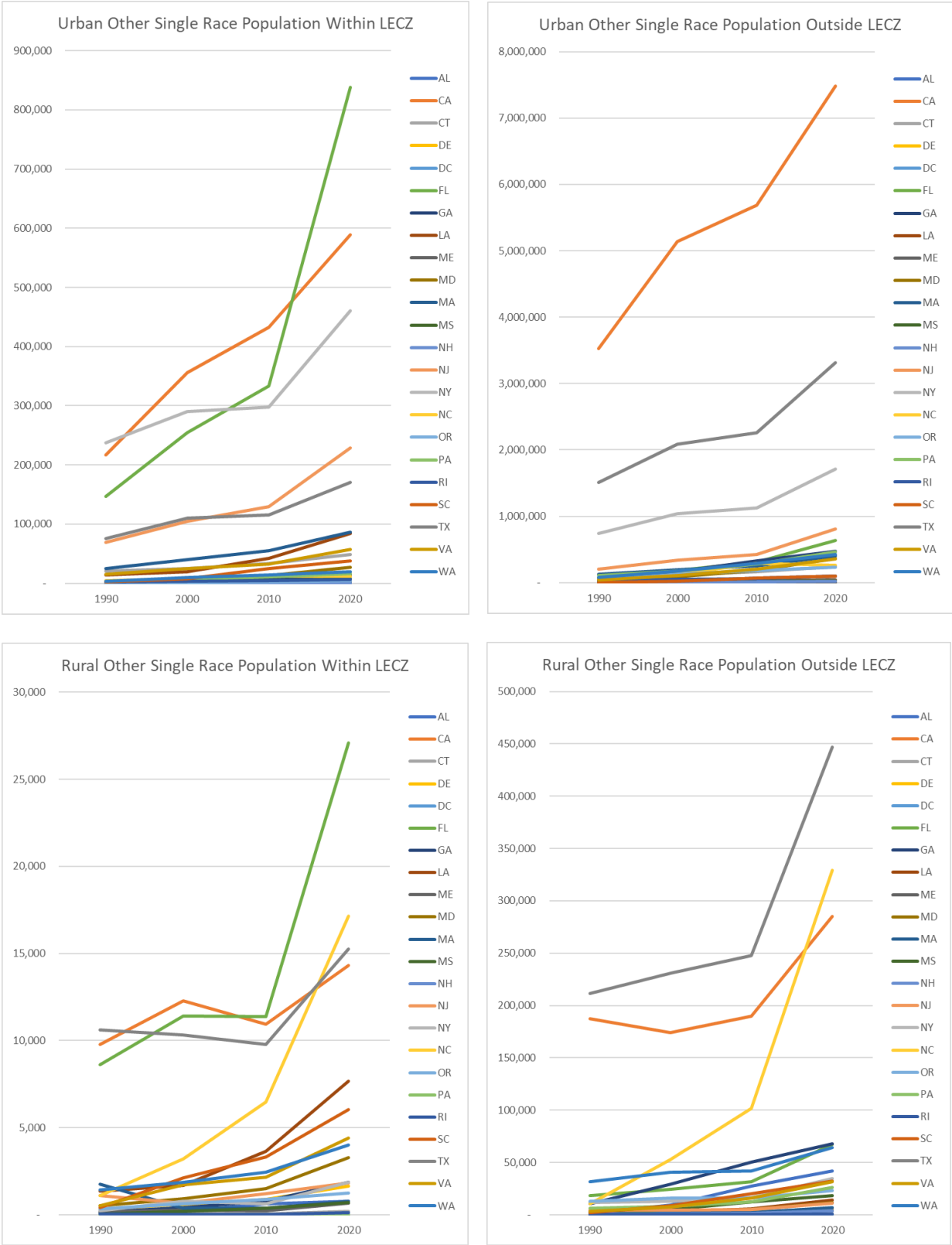


Figure S2.H. Two or More Races (NB: variable introduced in 2000 Census)

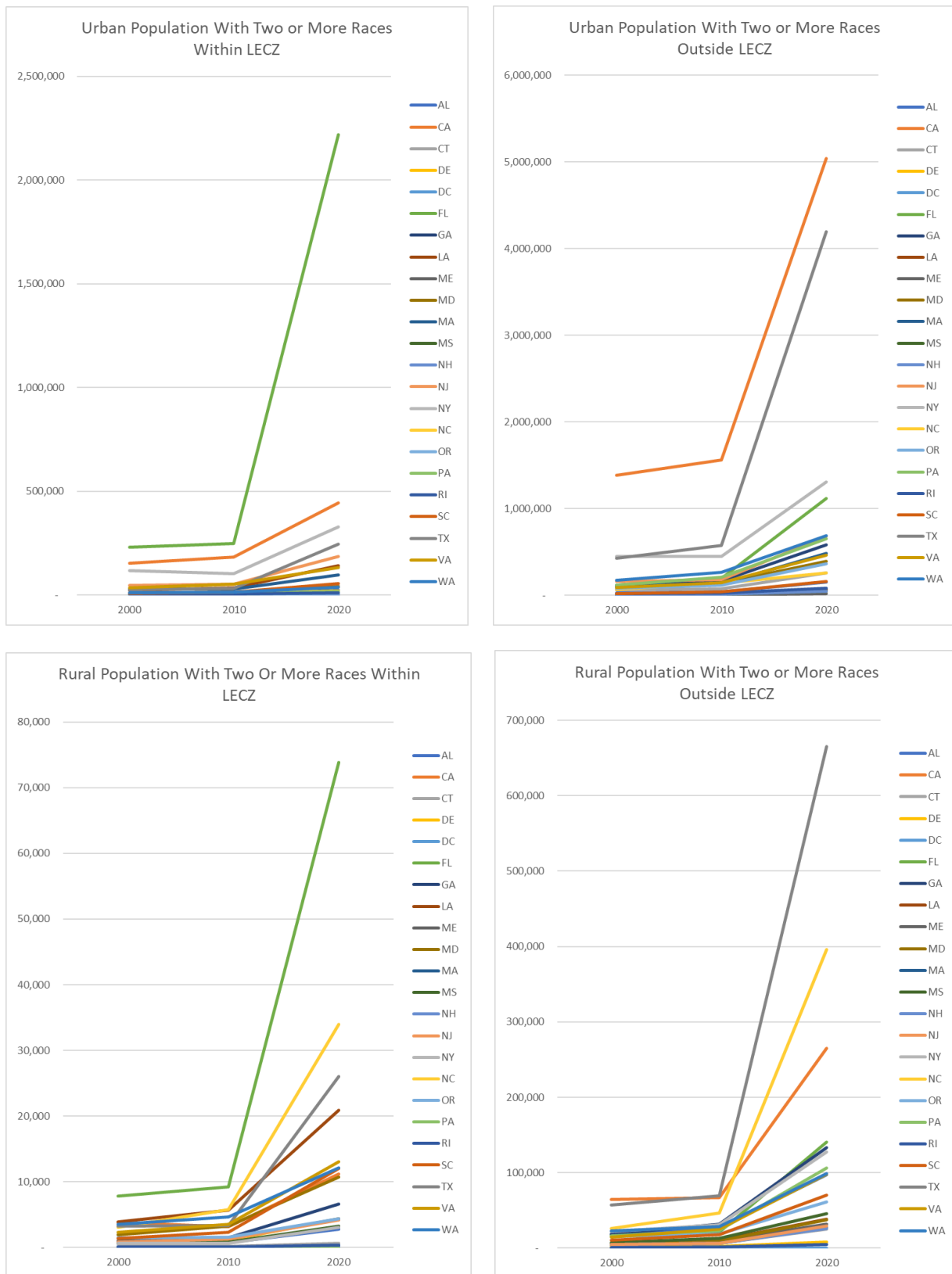


Figure S3.A-C. Annual growth rates for total, occupied, and vacant housing units within and outside the LECZ by urban/rural classification, 1990-2020

Figure S3.A. Total Housing Units

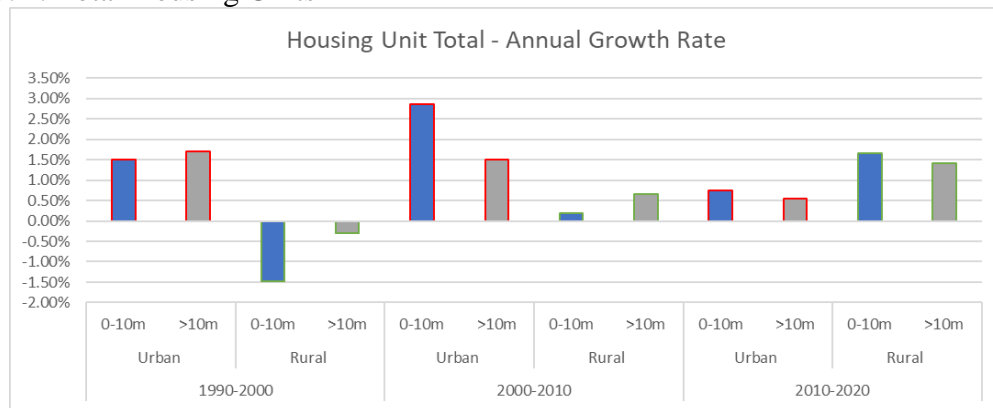


Figure S3.B. Occupied Housing Units

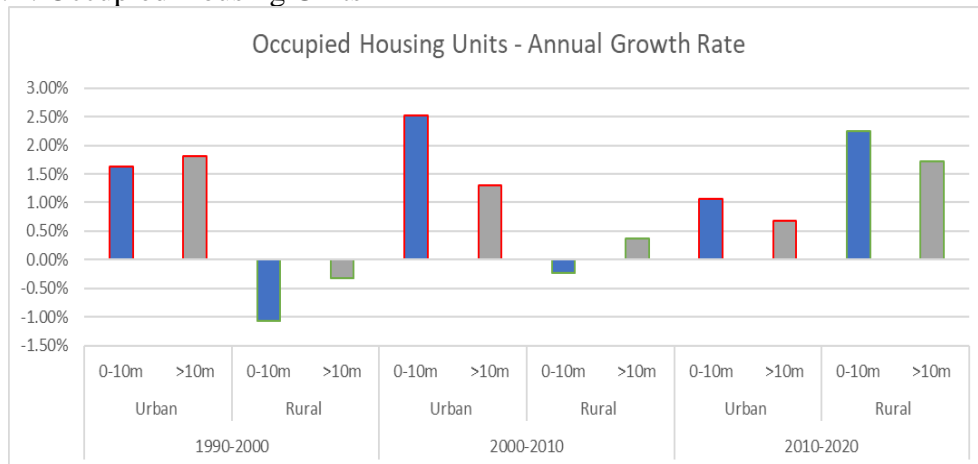


Figure S3.C. Vacant Housing Units

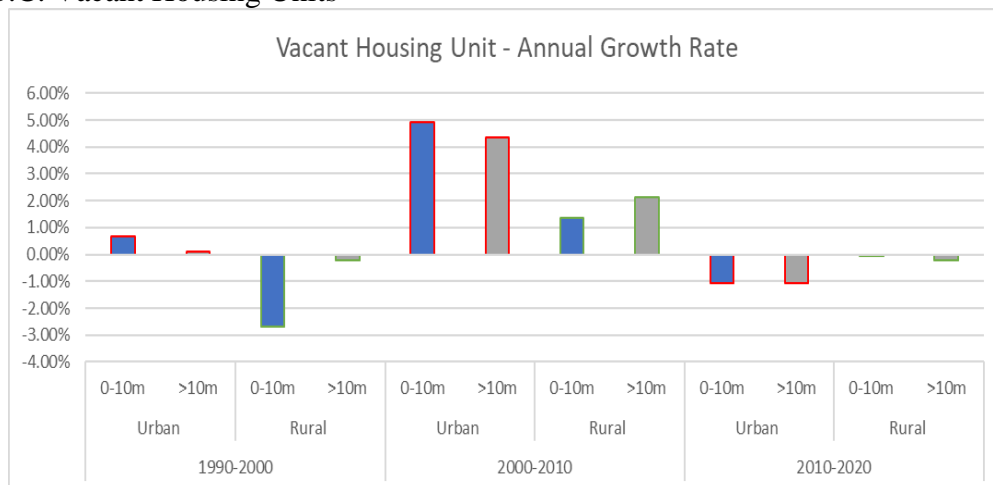
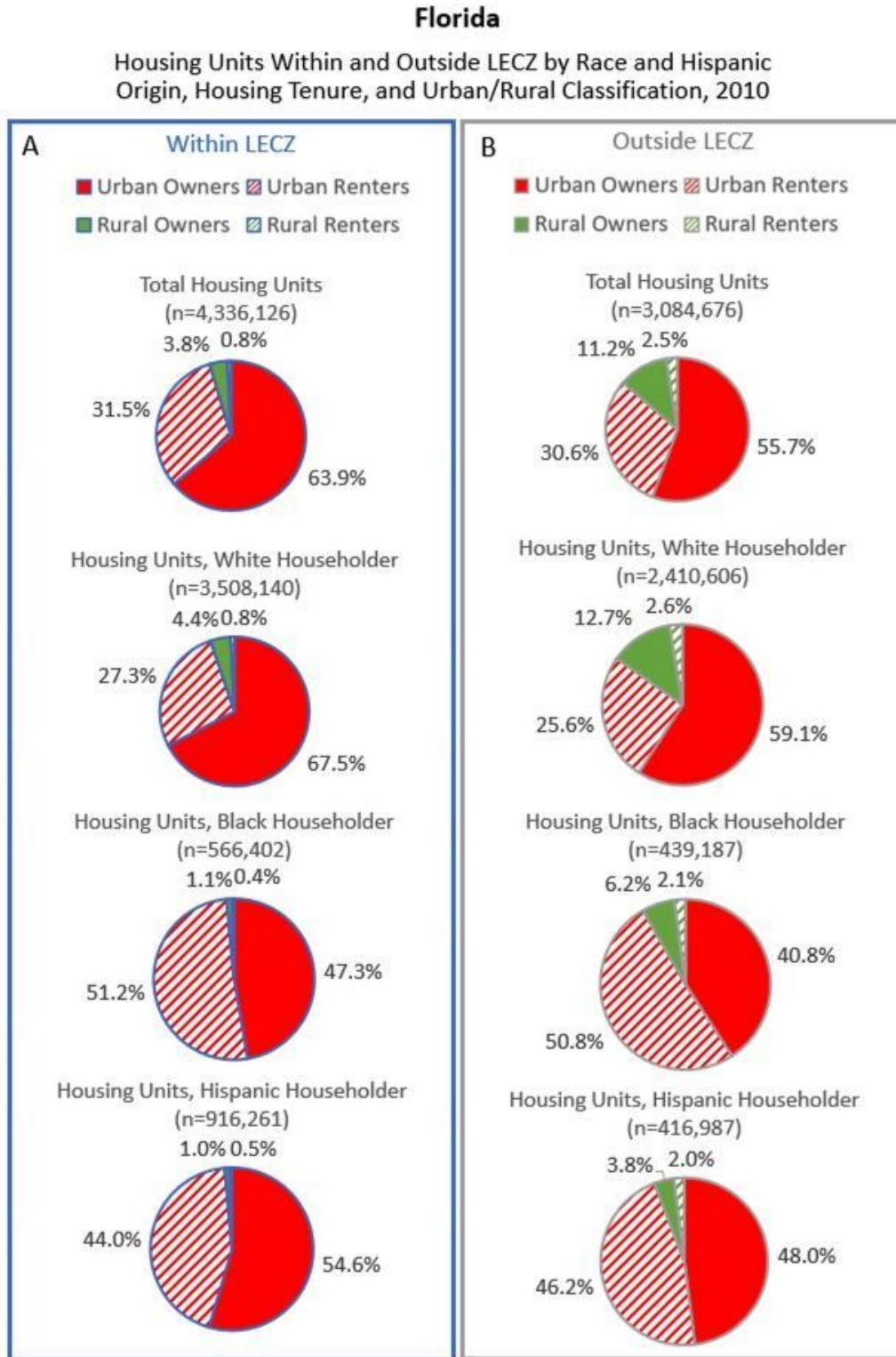


Figure S4.A-L. Housing Units, 2010, for Florida (A-D), New York (E-H), and Louisiana (I-L), by race and Hispanic origin, and housing tenure, comparisons organized by within vs. outside LECZ by Race and Hispanic Origin, Housing Tenure, and by urban vs. rural classification



Florida

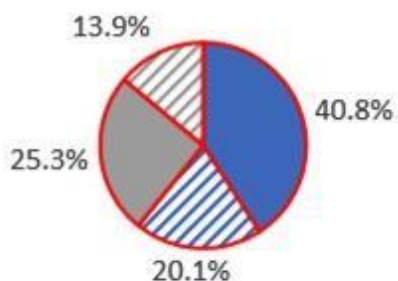
Housing Units by Urban/Rural Classification by Race and Hispanic Origin, Housing Tenure, and Within and Outside LECZ, 2010

C

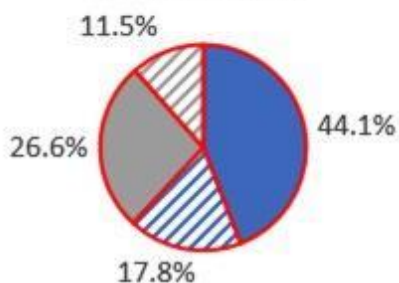
Urban

■ LECZ Owners ■ LECZ Renters
■ >10m Owners ■ >10m Renters

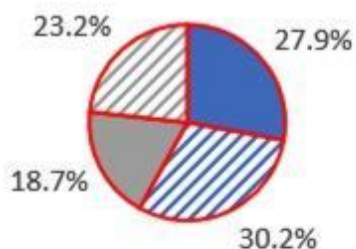
Total Housing Units
(n=6,797,351)



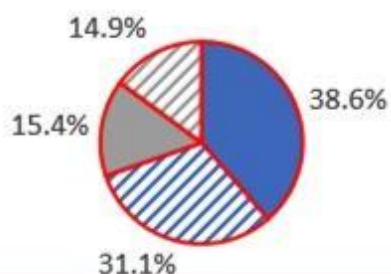
Housing Units, White Householder
(n=5,366,788)



Housing Units, Black Householder
(n=960,554)



Housing Units, Hispanic Householder
(n=1,295,847)

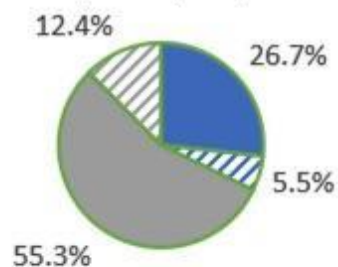


D

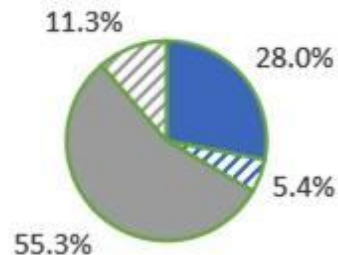
Rural

■ LECZ Owners ■ LECZ Renters
■ >10m Owners ■ >10m Renters

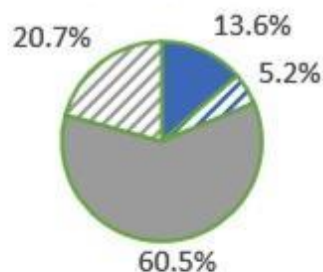
Total Housing Units
(n=623,451)



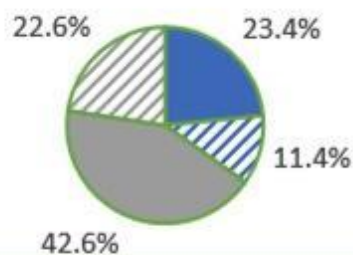
Housing Units, White Householder
(n=551,958)



Housing Units, Black Householder
(n=45,035)

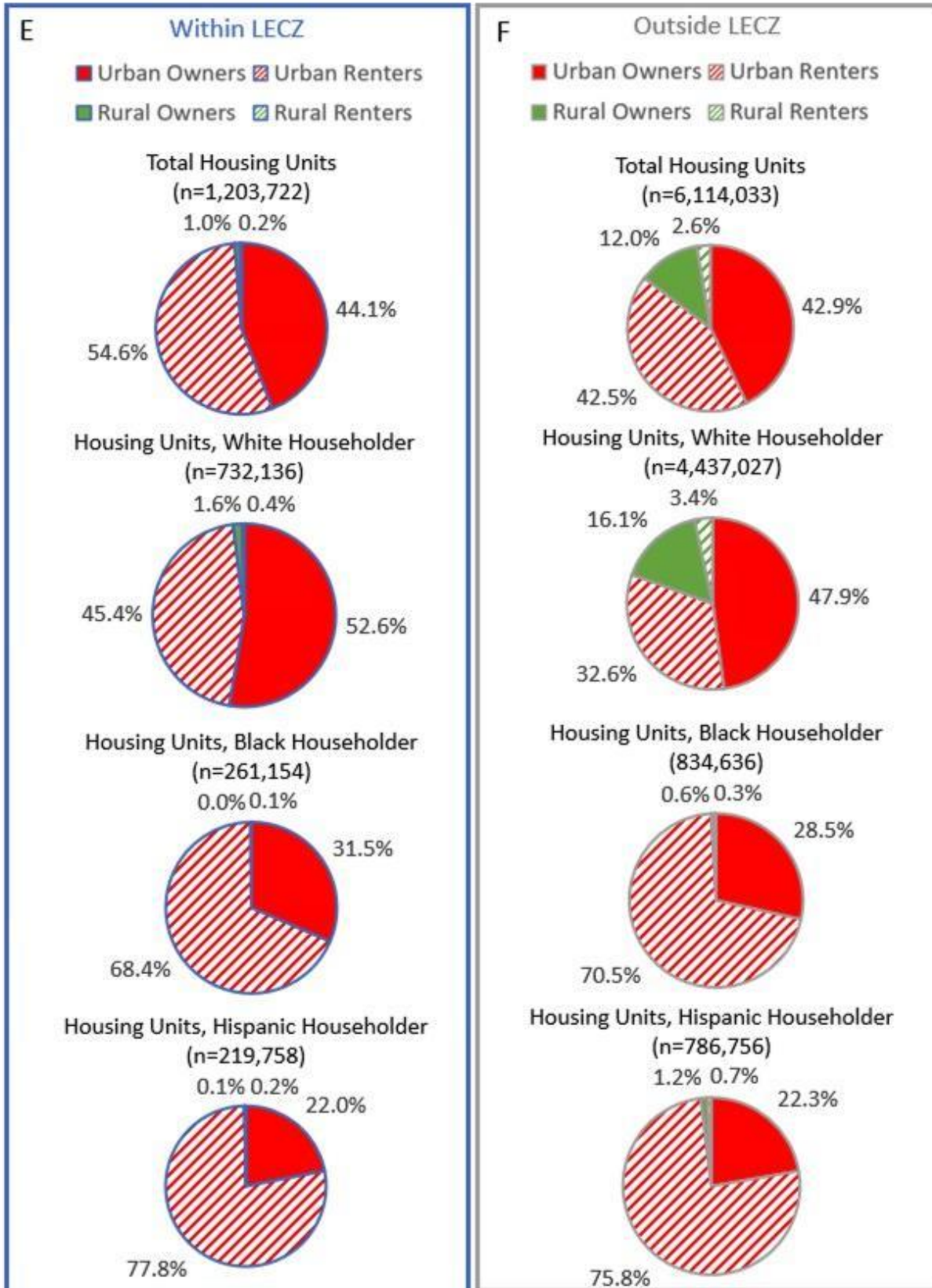


Housing Units, Hispanic Householder
(n=37,401)



New York

Housing Units Within and Outside LECZ by Race and Hispanic Origin, Housing Tenure, and Urban/Rural Classification, 2010



New York

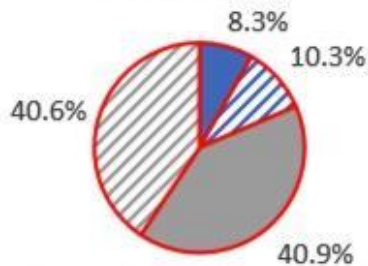
Housing Units by Urban/Rural Classification by Race and Hispanic Origin, Housing Tenure, and Within and Outside LECZ, 2010

G

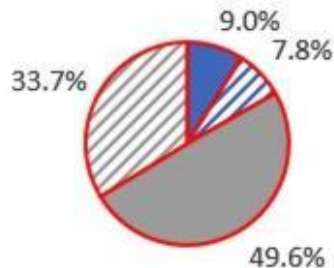
Urban

■ LECZ Owners ■ LECZ Renters
■ >10m Owners ■ >10m Renters

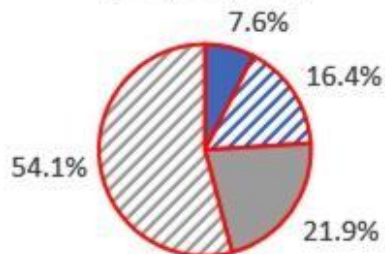
Total Housing Units
(n=6,407,939)



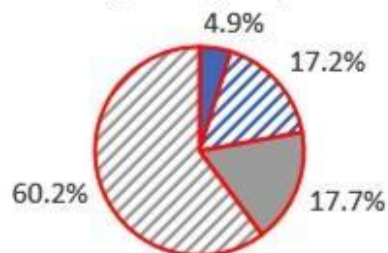
Housing Units, White Householder
(n=4,289,073)



Housing Units, Black Householder
(n=1,087,629)



Housing Units, Hispanic Householder
(n=990,822)

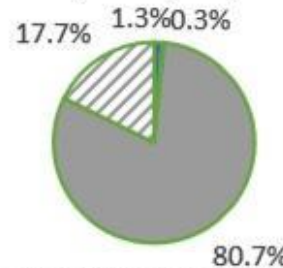


H

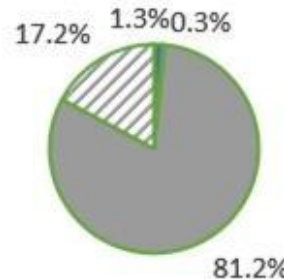
Rural

■ LECZ Owners ■ LECZ Renters
■ >10m Owners ■ >10m Renters

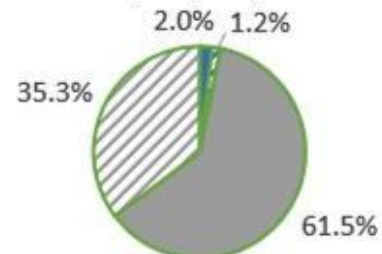
Total Housing Units
(n=909,816)



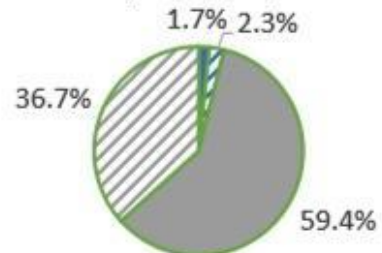
Housing Units, White Householder
(n=880,090)



Housing Units, Black Householder
(n=8,161)

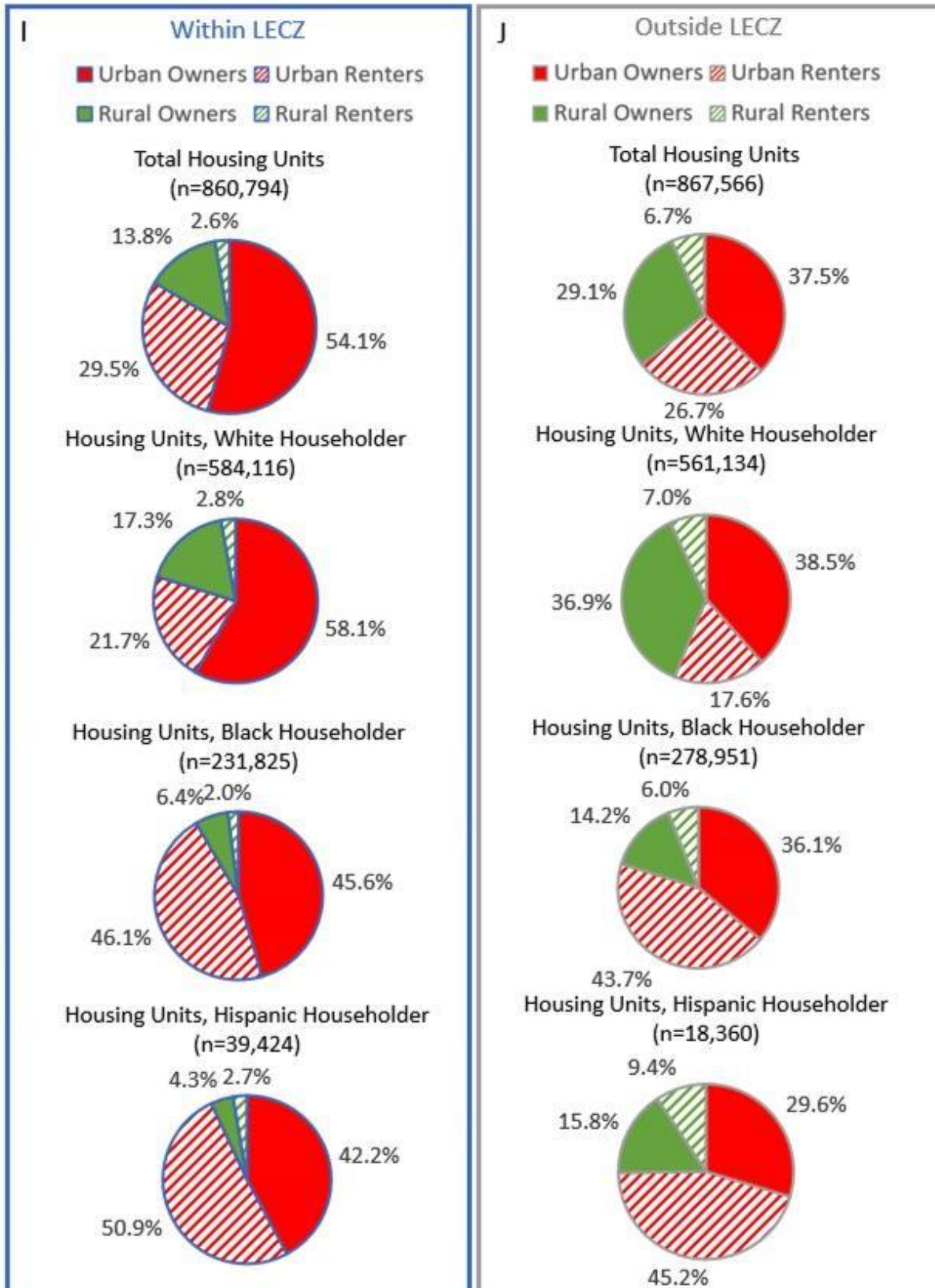


Housing Units, Hispanic Householder
(n=15,692)



Louisiana

Housing Units Within and Outside LECZ by Race and Hispanic Origin, Housing Tenure, and Urban/Rural Classification, 2010



Louisiana

Housing Units by Urban/Rural Classification by Race and Hispanic Origin, Housing Tenure, and Within and Outside LECZ, 2010

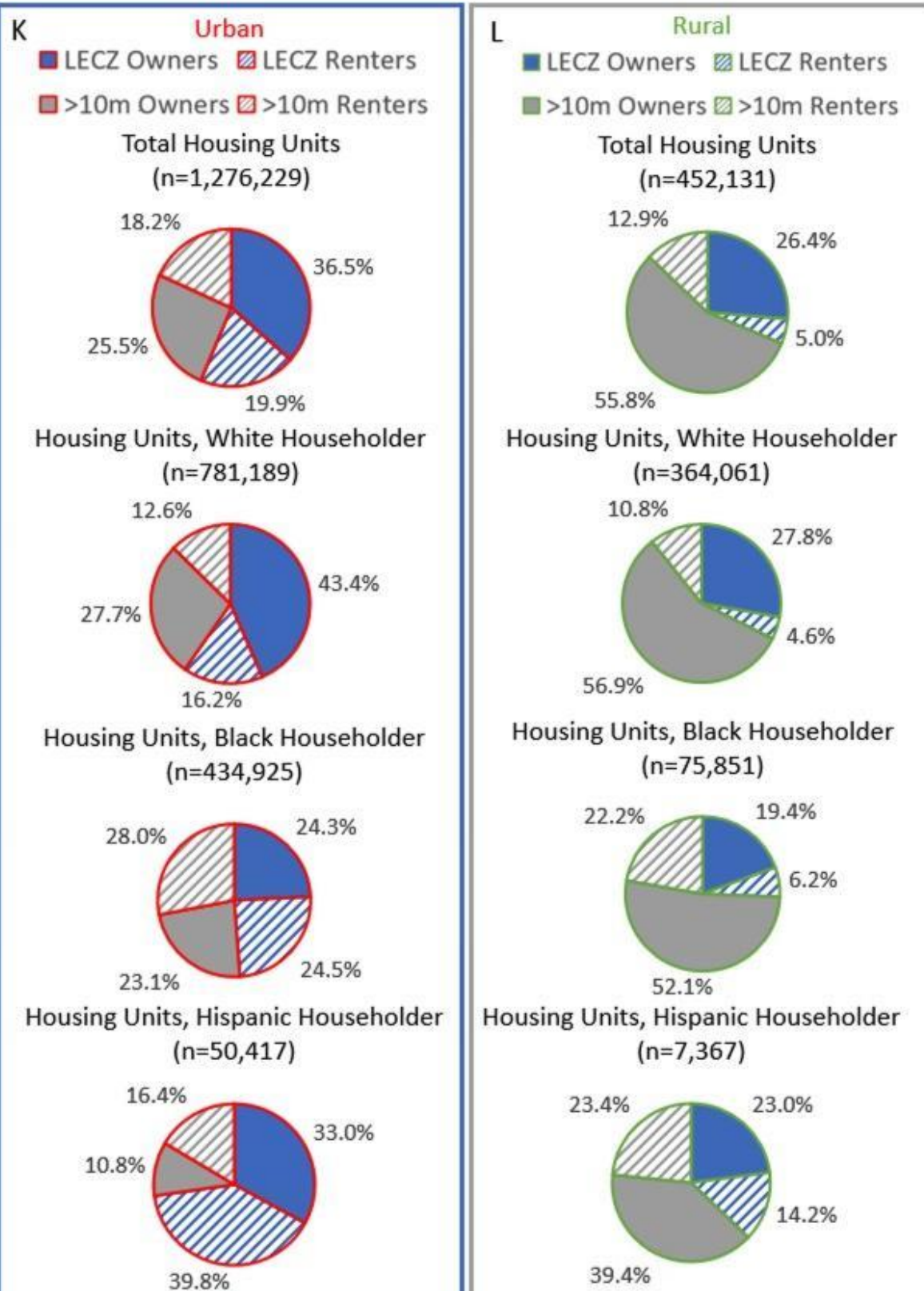


Figure S5.A-B. Annual Growth Rates (1990-2010) for housing units by housing tenure and race or Hispanic origin of householder for Florida, New York, and Louisiana

Figure S5.A. Owner Occupied Housing Units

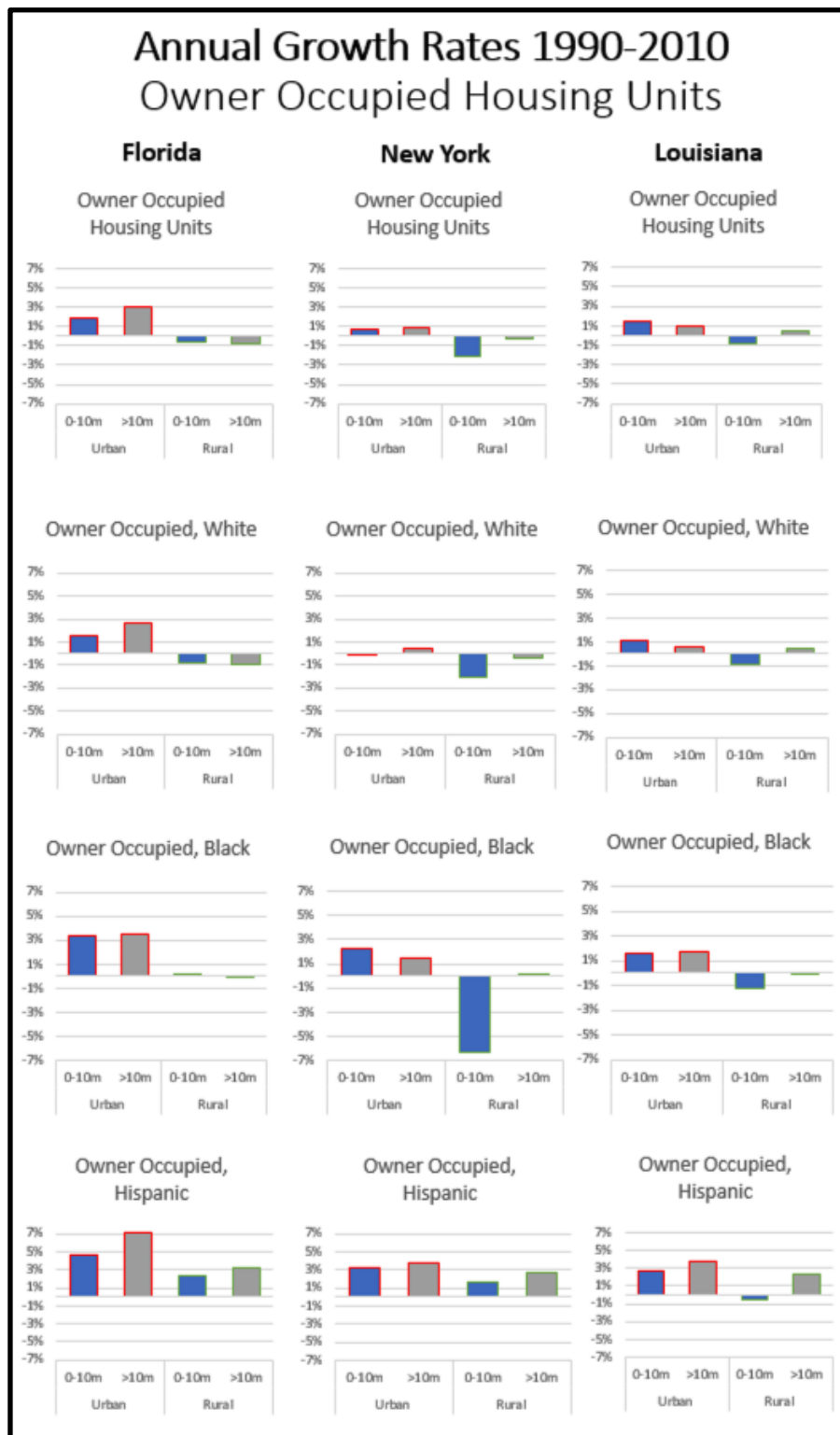


Figure S5.B. Renter Occupied Housing Units

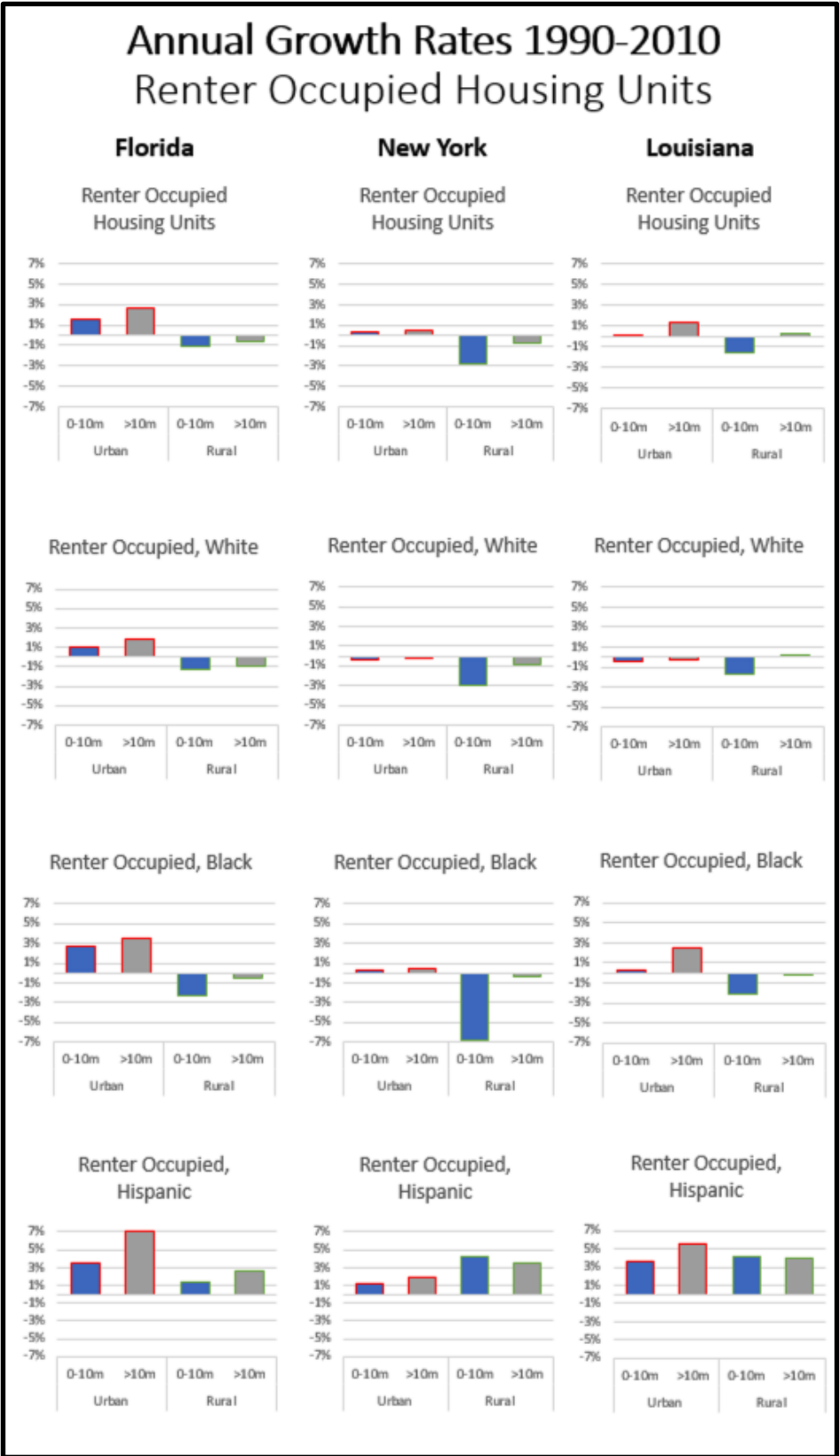


Figure S6.A-D. Average median age, by urban and rural, in 2000 and 2010 in and outside the LECZ (for all LECZ states, Florida, Louisiana and New York)

Figure S6.A. Coastal States

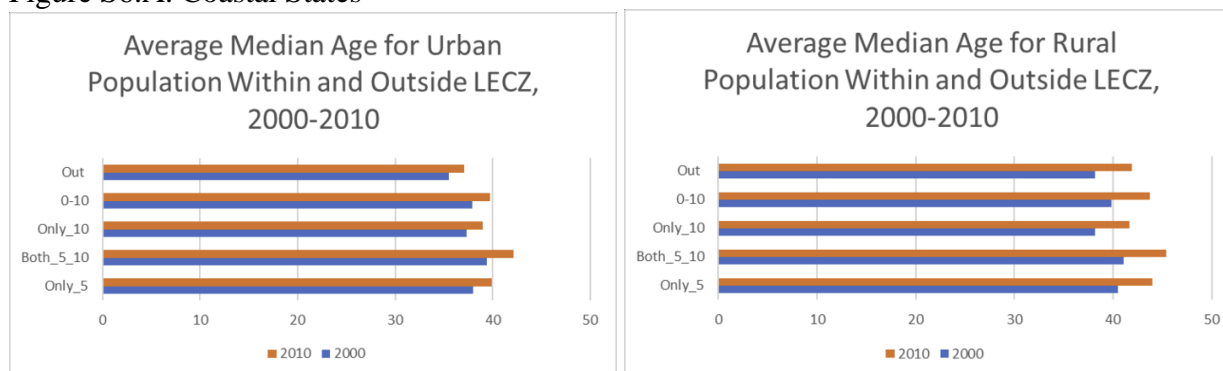


Figure S6.B. Florida

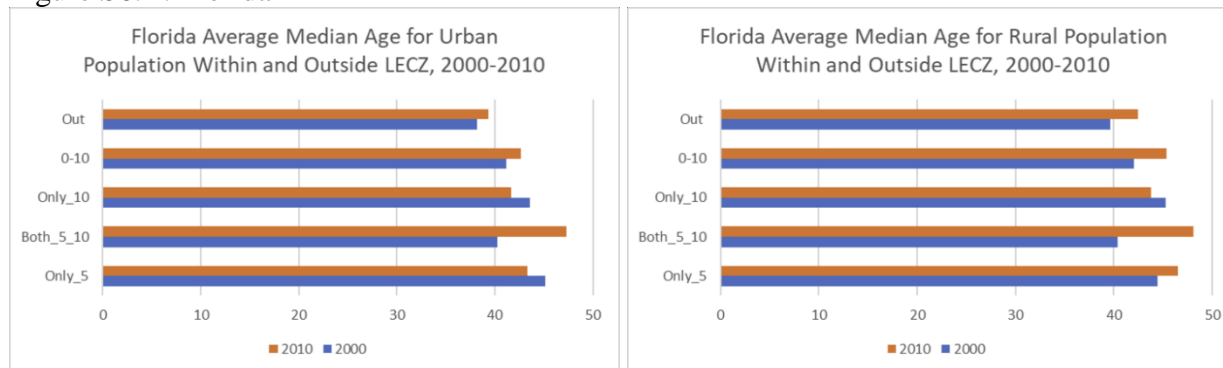


Figure S6.C. New York

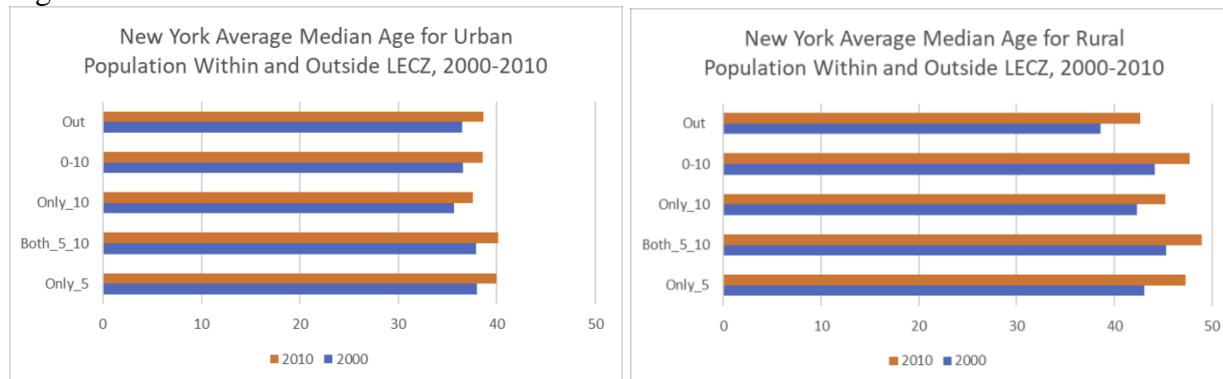
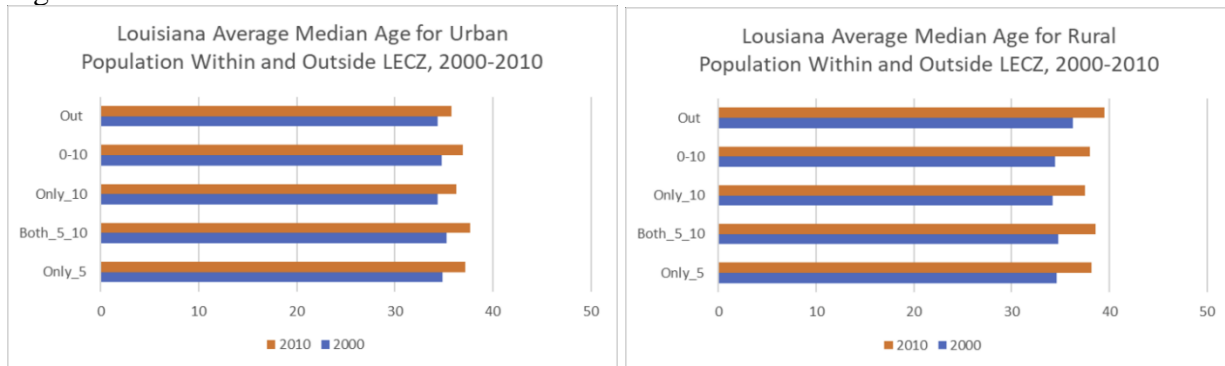


Figure S6.D. Louisiana



Tables

Table S1. Urban and Rural population totals (000s) and percentages in the 0-10m LECZ and outside of all coastal states, 1990 and 2020

Population subgroup	Urban or Rural	1990				2020			
		LECZ		In all Coastal States		LECZ		In all Coastal States	
		0-10	>10	Total	(%)	0-10	>10	Total	(%)
Total Population	Urban	22,146	100,797	122,943	18.0%	30,593	146,110	176,703	17.3%
	Rural	3,380	30,986	34,366	9.8%	3,409	34,417	37,826	9.0%
	Total	25,526	131,783	157,309	16.2%	34,002	180,527	214,529	15.9%
Single Race, White alone	Urban	16,592	74,327	90,919	18.3%	16,370	75,375	91,746	17.8%
	Rural	2,867	27,087	29,954	9.6%	2,592	25,735	28,327	9.2%
	Total	19,459	101,413	120,872	16.1%	18,962	101,111	120,073	15.8%
Single Race, Black alone	Urban	3,861	14,870	18,731	20.6%	5,115	21,535	26,649	19.2%
	Rural	425	2,984	3,409	12.5%	370	3,545	3,916	9.5%
	Total	4,286	17,854	22,140	19.4%	5,485	25,080	30,565	18.0%
Asian and Pacific Islander, alone	Urban	769	4,281	5,050	15.2%	-	-	-	-
	Rural	23	173	196	11.7%	-	-	-	-
	Total	792	4,454	5,246	15.1%	-	-	-	-
Asian Alone	Urban	-	-	-	-	2,030	12,831	14,861	13.7%
	Rural	-	-	-	-	53	713	766	6.9%
	Total	-	-	-	-	2,083	13,544	15,627	13.3%
Single Other Race	Urban	844	6,650	7,494	11.3%	2,725	17,630	20,355	13.4%
	Rural	39	522	561	7.0%	111	1,531	1,642	6.8%
	Total	883	7,172	8,055	11.0%	2,836	19,161	21,997	12.9%
Two or More Races	Urban	-	-	-	-	4,107	17,179	21,286	19.3%
	Rural	-	-	-	-	251	2,535	2,786	9.0%
	Total	-	-	-	-	4,358	19,714	24,072	18.1%
Hispanic (any race)	Urban	2,819	14,162	16,981	16.6%	7,283	37,035	44,318	16.4%
	Rural	129	1,254	1,383	9.3%	305	3,629	3,934	7.8%
	Total	2,948	15,416	18,364	16.1%	7,588	40,664	48,253	15.7%

Table S2. Urban and Rural population totals (000s) and percentages in the 0-10m LECZ of all coastal states, Florida, New York, Louisiana, 1990-2020

State	Urban or Rural	1990				2020			
		LECZ		State		LECZ		State	
		0-10	>10	Total	%	0-10	>10	Total	%
FL	Urban	7,153	3,814	10,967	65.22%	11,495	7,803	19,297	59.57%
	Rural	630	1,340	1,971	31.99%	755	1,486	2,240	33.69%
	Total	7,783	5,154	12,938	60.16%	12,249	9,288	21,538	56.87%
NY	Urban	2,935	12,230	15,164	19.35%	3,515	14,394	17,910	19.63%
	Rural	62	2,764	2,826	2.20%	43	2,248	2,291	1.89%
	Total	2,997	14,994	17,990	16.66%	3,559	16,642	20,201	17.62%
LA	Urban	1,640	1,231	2,872	57.12%	2,007	1,416	3,423	58.63%
	Rural	517	831	1,348	38.34%	414	821	1,234	33.52%
	Total	2,157	2,063	4,220	51.12%	2,421	2,237	4,658	51.98%

Table S3. Total housing units within and outside the LECZ by urban/rural classification, 1990-2020

Total Housing Units			
1990	Urban	0-10	9,709,593
		>10	40,119,040
	Rural	0-10	1,700,958
		>10	12,762,375
	Total Housing Units		
2020	Urban	0-10	13,944,864
		>10	58,401,862
	Rural	0-10	1,765,311
		>10	15,226,351
	Total Housing Units		

Table S4. Average median age, by urban and rural, in 2000 and 2010 in and outside the LECZ (for all LECZ states, Florida, Louisiana and New York)

		Coastal States				Florida				Louisiana				New York			
		2000	2010	Δ	% change	2000	2010	Δ	% change	2000	2010	Δ	% change	2000	2010	Δ	% change
Total		36.35	38.27	1.92	5.27	40.12	41.50	1.39	3.45	34.89	37.14	2.25	6.45	36.51	38.65	2.14	5.86
Urban		35.93	37.55	1.61	4.49	40.08	41.32	1.24	3.10	34.60	36.45	1.85	5.35	36.20	38.08	1.88	5.19
Rural		38.31	42.04	3.73	9.74	40.43	43.36	2.93	7.25	35.65	39.02	3.37	9.44	38.66	42.77	4.11	10.63
L E C Z	0-10m (in)	38.09	40.11	2.02	5.30	41.25	42.75	1.50	3.63	34.73	37.14	2.42	6.96	36.60	38.57	1.97	5.39
	0-5m only	38.20	40.21	2.02	5.28	43.66	43.42	-0.24	-0.55	34.84	37.32	2.48	7.13	37.99	39.99	2.00	5.27
	0-5m & 0-10m	39.76	42.72	2.96	7.45	45.03	47.38	2.36	5.23	35.09	37.98	2.89	8.24	37.86	40.16	2.30	6.07
	5-10m only	37.41	39.13	1.73	4.61	40.23	41.72	1.49	3.71	34.36	36.56	2.20	6.41	35.68	37.54	1.86	5.21
	>10 m (out)	36.02	37.93	1.91	5.30	38.43	39.80	1.37	3.56	35.06	37.14	2.08	5.92	36.49	38.66	2.17	5.96
U r b a n	0-10m	37.90	39.76	1.86	4.91	41.20	42.62	1.42	3.44	34.78	36.96	2.18	6.26	36.50	38.46	1.96	5.38
	0-5m only	37.96	39.86	1.90	5.00	45.10	43.28	-1.82	-4.03	34.86	37.23	2.37	6.80	37.94	39.93	1.99	5.25
	0-5m & 0-10m	39.44	42.13	2.69	6.83	40.22	47.31	7.08	17.61	35.32	37.68	2.35	6.66	37.63	39.89	2.26	6.01
	5-10m only	37.35	38.97	1.62	4.34	43.54	41.64	-1.90	-4.37	34.40	36.30	1.90	5.54	35.64	37.50	1.86	5.23
	>10 m	35.52	37.10	1.58	4.45	38.17	39.36	1.19	3.11	34.35	35.79	1.44	4.19	36.13	37.99	1.86	5.15
R u r a l	0-10m	39.81	43.70	3.88	9.75	42.07	45.39	3.32	7.88	34.48	38.01	3.53	10.24	44.11	47.73	3.62	8.20
	0-5m only	40.51	44.00	3.49	8.61	44.45	46.50	2.04	4.60	34.57	38.13	3.56	10.31	43.03	47.32	4.29	9.98
	0-5m & 0-10m	41.10	45.42	4.32	10.52	40.38	48.11	7.73	19.14	34.74	38.56	3.82	10.99	45.29	48.94	3.65	8.06
	5-10m only	38.17	41.68	3.51	9.20	45.30	43.81	-1.49	-3.29	34.23	37.55	3.32	9.69	42.30	45.21	2.91	6.87
	>10 m	38.15	41.88	3.73	9.76	39.64	42.44	2.81	7.08	36.28	39.50	3.21	8.85	38.56	42.69	4.13	10.71

Note: Yellow highlight represents a difference in the median age from 2000 to 2010 that is higher than the difference for the total region, whether the coastal states, Florida, Louisiana, or New York.

Table S5.A-C. Distribution of housing units by race and Hispanic origin of householder, 2010

Table S5.A. Distribution of housing units by race and Hispanic origin of householder by housing tenure, within and outside the LECZ by urban/rural classification for coastal states, 2010

Housing Tenure	Race/Hispanic Origin	2010			
		Urban		Rural	
		0-10 M	> 10 M	0-10 M	> 10 M
Owner Occupied Housing Units	Total	8.93%	40.98%	1.19%	12.11%
	White	9.85%	43.41%	1.42%	14.69%
	Black	7.10%	30.93%	0.81%	6.64%
	Hispanic	7.68%	34.99%	0.26%	3.10%
Renter Occupied Housing Units	Total	5.81%	27.86%	0.27%	2.84%
	White	4.87%	22.37%	0.29%	3.09%
	Black	9.56%	42.10%	0.29%	2.56%
	Hispanic	8.93%	43.11%	0.16%	1.78%

Note: The denominator for each cell above is the total housing units for the householders of that particular race, for example 9.85% of all housing units with a White householder (the sum of all housing units: urban, rural, owner-occupied, and renter-occupied) were urban owner-occupied housing units in the LECZ.

Table S5.B. Distribution of housing units by race and Hispanic origin of householders by housing tenure in the LECZ for coastal states, 2010

Housing Tenure	Race/Hispanic Origin	0-10	>10	TOTAL
Owner Occupied Housing Units	Total	10.1%	53.1%	63.2%
	White	11.3%	58.1%	69.4%
	Black	7.9%	37.6%	45.5%
	Hispanic	7.9%	38.1%	46.0%
Renter Occupied Housing Units	Total	6.1%	30.7%	36.8%
	White	5.2%	25.5%	30.6%
	Black	9.9%	44.7%	54.5%
	Hispanic	9.1%	44.9%	54.0%
Owner and Renter Occupied Housing Units	Total	16.2%	83.8%	100.0%
	White	16.4%	83.6%	100.0%
	Black	17.8%	82.2%	100.0%
	Hispanic	17.0%	83.0%	100.0%

Note: This table is similar to S5.A. but is not disaggregated by urban/rural classification.

Table S5.C. Distribution of housing units in the LECZ by race and Hispanic origin of householders, housing tenure, and urban/rural classification for coastal states, 2010

	Urban		Rural	
	Owner Occupied	Renter Occupied	Owner Occupied	Renter Occupied
Total	17.90%	17.26%	8.95%	8.81%
White	18.49%	17.88%	8.80%	8.61%
Black	18.67%	18.51%	10.90%	10.08%
Hispanic	17.99%	17.16%	7.64%	8.46%

Note: Instead of looking at the shares of the total housing units for the householders of a particular race or Hispanic origin, the table above shows the share of the total housing units by housing tenure and race/Hispanic origin of householders that are located in the LECZ. For example, 18.49% of the total urban owner-occupied housing units with White householders live in the LECZ.