

Geographic Distribution of Prostate Cancer Incidence in the United States

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ESRI Health GIS Conference
Washington, DC
September 29, 2008



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Presentation Overview

- Background
- Methods
- Results
- Strengths and Limitations
- Conclusions

BACKGROUND

- Differences in geographic distribution of prostate cancer
 - Possible North-South gradient
- NPCR & SEER combined data sources
 - High quality cancer registry data from 1999-2004
 - 44 States and DC
 - 92% US population coverage

METHODS

- Invasive cancers
- Age-adjusted rates
- Estimated annual percentage change for linear trends

Age-Adjusted Incidence Rates by Race and Age Group, 1999-2004

Age Group	Total IR (95% CI)	White IR (95% CI)	Black IR (95% CI)	AI/AN IR (95% CI)	API IR (95% CI)
<30	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.0 (0, 0.1)	0.0 (0.0, 0.1)	0.0 (0.1, 4.0)
30-39	0.5 (0.4, 0.5)	0.4 (0.4, 0.4)	0.9 (0.8, 0.1)	0.2 (0.0, 0.6)	0.2 (0.3, 10.0)
40-49	21.8 (21.6, 22.1)	19 (18.8, 19.3)	45.7 (44.5, 46.9)	7 (5.6, 8.7)	5.5 (6.1, 281.0)
50-59	217.7 (216.8, 218.7)	201.9 (200.9, 202.9)	374.9 (370.7, 379.2)	85.3 (76.8, 92.2)	72.4 (75.3, 2461.0)
60-69	710.5 (708.3, 712.8)	672 (669.6, 674.3)	1075.2 (1065.7, 1084.7)	333.9 (315.7, 353.0)	326.4 (334.6, 6185.0)
70-79	971.2 (968.1, 974.3)	924.3 (921.1, 927.6)	1319 (1305.3, 1332.9)	514.9 (482.8, 548.5)	620.2 (635.2, 6738.0)
80+	744.4 (740.5, 748.4)	695.7 (691.7, 699.8)	1072.2 (1056.1, 1094.6)	485.3 (435.5, 539.4)	546.4 (568.3, 2531.0)
Total	161.5 (161.2, 161.8)	152.1 (151.8, 152.4)	240.8 (239.5, 242.1)	81.4 (78.5, 84.5)	87.4 (86.1, 88.8)
<50	4.8 (4.7, 4.8)	4.2 (4.1, 4.2)	9.9 (9.7, 10.2)	1.5 (1.2, 1.9)	1.2 (1.1, 1.4)
≥50	571.8 (570.7, 572.9)	539.4 (538.3, 540.5)	845.3 (840.5, 850.2)	290.7 (279.9, 301.7)	313.2 (308.5, 318.0)

Rate Ratios by Age Group and Race, 1999-2004

	Rate Ratio (95% CI)	P-Value
Black	~	~
White	0.63* (0.63, 0.64)	<0.0001
AI/AN	0.34* (0.33, 0.35)	<0.0001
API	0.36* (0.36, 0.37)	<0.0001

Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard; Confidence intervals are 95% for rates (Tiwari mod) and trends.

*The rate ratio indicates that the rate is significantly different than the rate for Black ($p < 0.05$).

Distribution of Grade at Diagnosis by Age Group and Race, 1999-2004

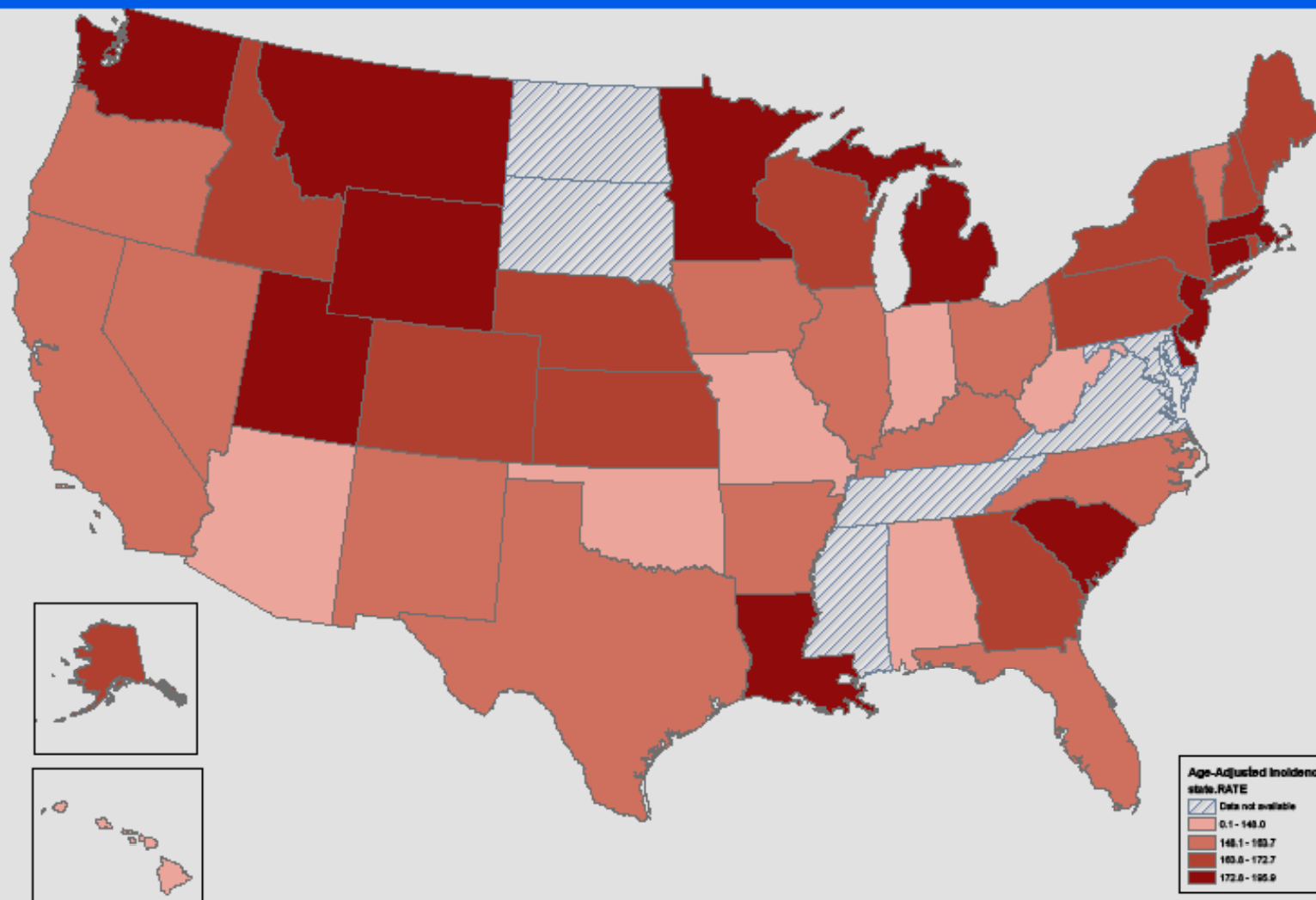
		Grade I Well Differentiated Count (Row%)	Grade II Moderately Differentiated Count (Row%)	Grade III Poorly Differentiated Count (Row%)	Grade IV Undifferentiated Count (Row%)	Unknown Count (Row%)
<30	White	2 (2%)	14 (15%)	13 (14%)	10 (11%)	56 (59%)
	Black	0 (0%)	2 (13%)	3 (20%)	0 (0%)	10 (67%)
	AI/AN	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
	API	0 (0%)	0 (0%)	0 (0%)	1 (25%)	3 (75%)
30-39	White	11 (3%)	271 (74%)	55 (15%)	2 (1%)	27 (7%)
	Black	5 (4%)	01 (60%)	22 (10%)	1 (1%)	10 (0%)
	AI/AN	0 (0%)	2 (100%)	0 (0%)	0 (0%)	0 (0%)
	API	0 (0%)	3 (30%)	4 (40%)	1 (10%)	2 (20%)
40-49	White	524 (3%)	14,017 (73%)	3,952 (21%)	70 (0%)	702 (4%)
	Black	176 (3%)	4,037 (69%)	1,314 (23%)	23 (0%)	278 (5%)
	AI/AN	6 (7%)	52 (64%)	20 (25%)	1 (1%)	2 (2%)
	API	6 (2%)	190 (68%)	74 (26%)	0 (0%)	11 (4%)
50-59	White	4,598 (3%)	110,352 (72%)	33,106 (21%)	456 (0%)	5,709 (4%)
	Black	899 (3%)	19,949 (67%)	7,554 (25%)	101 (0%)	1,494 (5%)
	AI/AN	18 (3%)	402 (63%)	182 (29%)	1 (0%)	31 (5%)
	API	61 (2%)	1,700 (69%)	601 (24%)	11 (0%)	94 (4%)
60-69	White	11,276 (4%)	216,798 (69%)	71,981 (23%)	1,027 (0%)	14,722 (5%)
	Black	1,843 (4%)	30,770 (63%)	12,871 (26%)	192 (0%)	3,065 (6%)
	AI/AN	46 (4%)	793 (64%)	332 (27%)	6 (0%)	60 (5%)
	API	187 (3%)	3,867 (63%)	1,836 (30%)	20 (0%)	231 (4%)
70-79	White	13,464 (4%)	198,143 (64%)	77,769 (25%)	1,220 (0%)	20,740 (7%)
	Black	1,381 (4%)	19,555 (58%)	9,613 (29%)	167 (1%)	2,839 (8%)
	AI/AN	39 (4%)	516 (57%)	283 (31%)	7 (1%)	67 (7%)
	API	243 (4%)	3,799 (58%)	2,242 (34%)	20 (0%)	294 (4%)
80+	White	4,605 (5%)	47,622 (48%)	34,117 (35%)	737 (1%)	11,422 (12%)
	Black	401 (4%)	4,057 (44%)	3,324 (36%)	79 (1%)	1,410 (15%)
	AI/AN	9 (4%)	104 (40%)	107 (42%)	2 (1%)	35 (14%)
	API	98 (4%)	1,019 (45%)	966 (43%)	13 (1%)	173 (8%)
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<50	White	537 (3%)	14,302 (73%)	4,020 (20%)	82 (0%)	785 (4%)
	Black	181 (3%)	4,120 (69%)	1,339 (22%)	24 (0%)	298 (5%)
	AI/AN	7 (8%)	54 (64%)	20 (24%)	1 (1%)	2 (2%)
	API	6 (2%)	193 (65%)	78 (26%)	2 (1%)	16 (5%)
≥50	White	33,943 (4%)	572,915 (65%)	216,973 (25%)	3,440 (0%)	52,593 (6%)
	Black	4,524 (4%)	74,331 (61%)	33,362 (27%)	539 (0%)	8,808 (7%)
	AI/AN	112 (4%)	1,815 (60%)	904 (30%)	16 (1%)	193 (6%)
	API	589 (3%)	10,385 (59%)	5,645 (32%)	64 (0%)	792 (5%)

Distribution of Stage at Diagnosis by Age Group and Race, 1999-2004

		Localized Count (Row%)	Regional Count (Row%)	Distant Count (Row%)	Unstaged Count (Row%)
<30	White	19 (43%)	9 (20%)	10 (23%)	6 (14%)
	Black	2 (40%)	1 (20%)	1 (20%)	1 (20%)
	AI/AN	0 ~	0 ~	0 ~	0 ~
	API	0 (0%)	0 (0%)	1 (100%)	0 (0%)
30-39	White	150 (75%)	24 (12%)	13 (6%)	11 (5%)
	Black	49 (79%)	4 (6%)	4 (6%)	5 (8%)
	AI/AN	0 ~	0 ~	0 ~	0 ~
	API	4 (57%)	1 (14%)	2 (29%)	0 (0%)
40-49	White	7,986 (78%)	1,551 (15%)	297 (3%)	388 (4%)
	Black	2,430 (78%)	424 (14%)	118 (4%)	141 (5%)
	AI/AN	28 (58%)	13 (27%)	4 (8%)	3 (6%)
	API	113 (77%)	26 (18%)	2 (1%)	6 (4%)
50-59	White	64,787 (80%)	11,420 (14%)	1,607 (2%)	3,071 (4%)
	Black	12,346 (79%)	2,023 (13%)	577 (4%)	656 (4%)
	AI/AN	237 (74%)	51 (16%)	16 (5%)	17 (5%)
	API	1,034 (79%)	200 (15%)	43 (3%)	38 (3%)
60-69	White	130,590 (81%)	18,591 (12%)	3,372 (2%)	7,755 (5%)
	Black	20,017 (80%)	2,347 (9%)	1,075 (4%)	1,448 (6%)
	AI/AN	509 (76%)	92 (14%)	26 (4%)	44 (7%)
	API	2,570 (80%)	438 (14%)	94 (3%)	122 (4%)
70-79	White	130,606 (83%)	8,872 (6%)	4,751 (3%)	12,519 (8%)
	Black	13,382 (79%)	778 (5%)	1,137 (7%)	1,565 (9%)
	AI/AN	333 (75%)	40 (9%)	29 (7%)	41 (9%)
	API	2,840 (84%)	216 (6%)	149 (4%)	179 (5%)
80+	White	35,563 (71%)	2,080 (4%)	4,017 (8%)	8,079 (16%)
	Black	2,982 (64%)	197 (4%)	623 (13%)	820 (18%)
	AI/AN	82 (62%)	10 (8%)	13 (10%)	26 (20%)
	API	939 (79%)	41 (3%)	104 (9%)	107 (9%)
Age Group					
<50	White	8,155 (78%)	1,584 (15%)	320 (3%)	405 (4%)
	Black	2,481 (78%)	429 (13%)	123 (4%)	147 (5%)
	AI/AN	28 (58%)	13 (27%)	4 (8%)	3 (6%)
	API	117 (75%)	27 (17%)	5 (3%)	6 (4%)
≥50	White	361,546 (81%)	40,963 (9%)	13,747 (3%)	31,424 (7%)
	Black	48,727 (79%)	5,345 (9%)	3,412 (6%)	4,489 (7%)
	AI/AN	1,161 (74%)	193 (12%)	84 (5%)	128 (8%)
	API	7,383 (81%)	895 (10%)	390 (4%)	446 (5%)



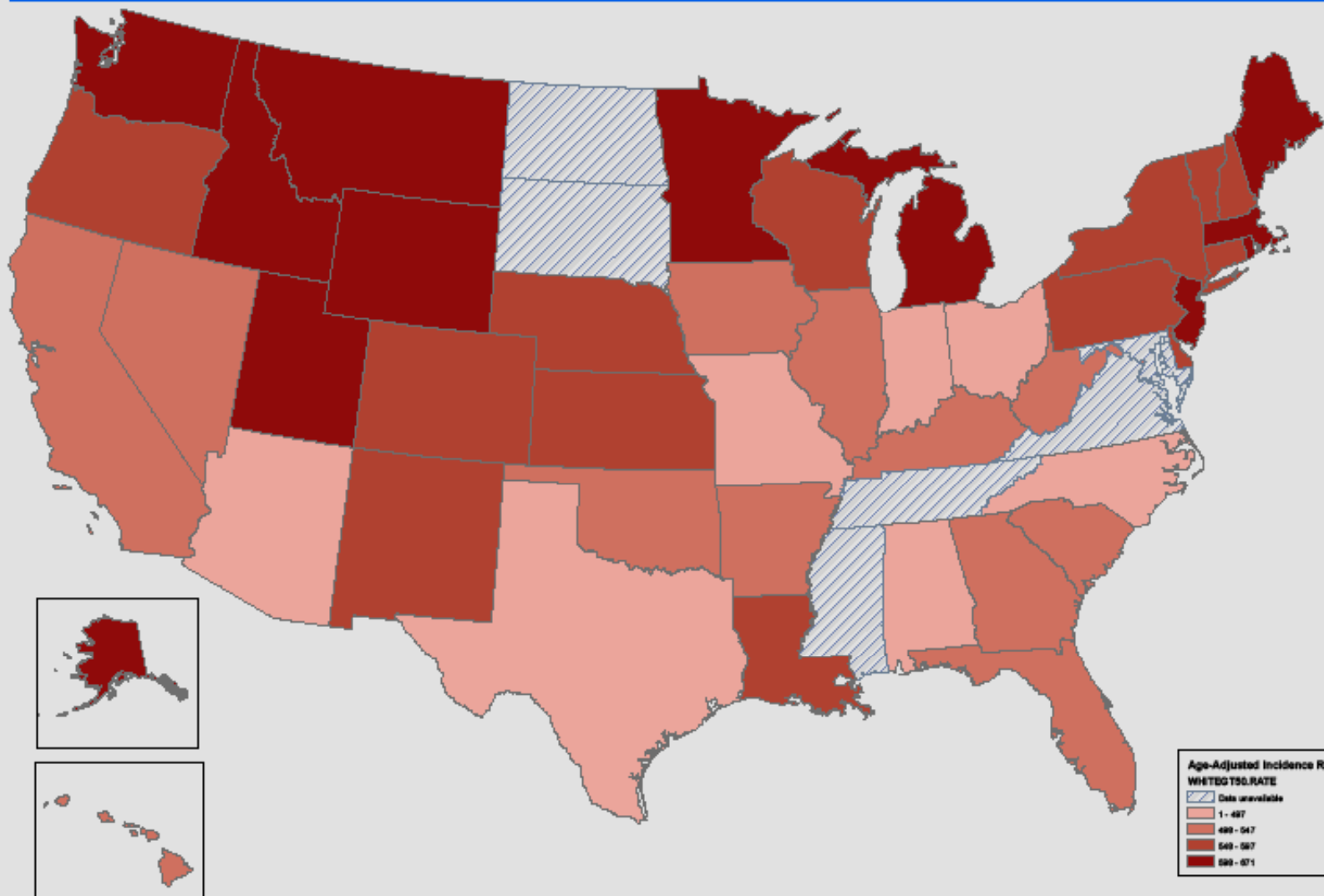
Prostate Cancer Incidence Rates All Races and Ages Combined 1999-2004



Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard



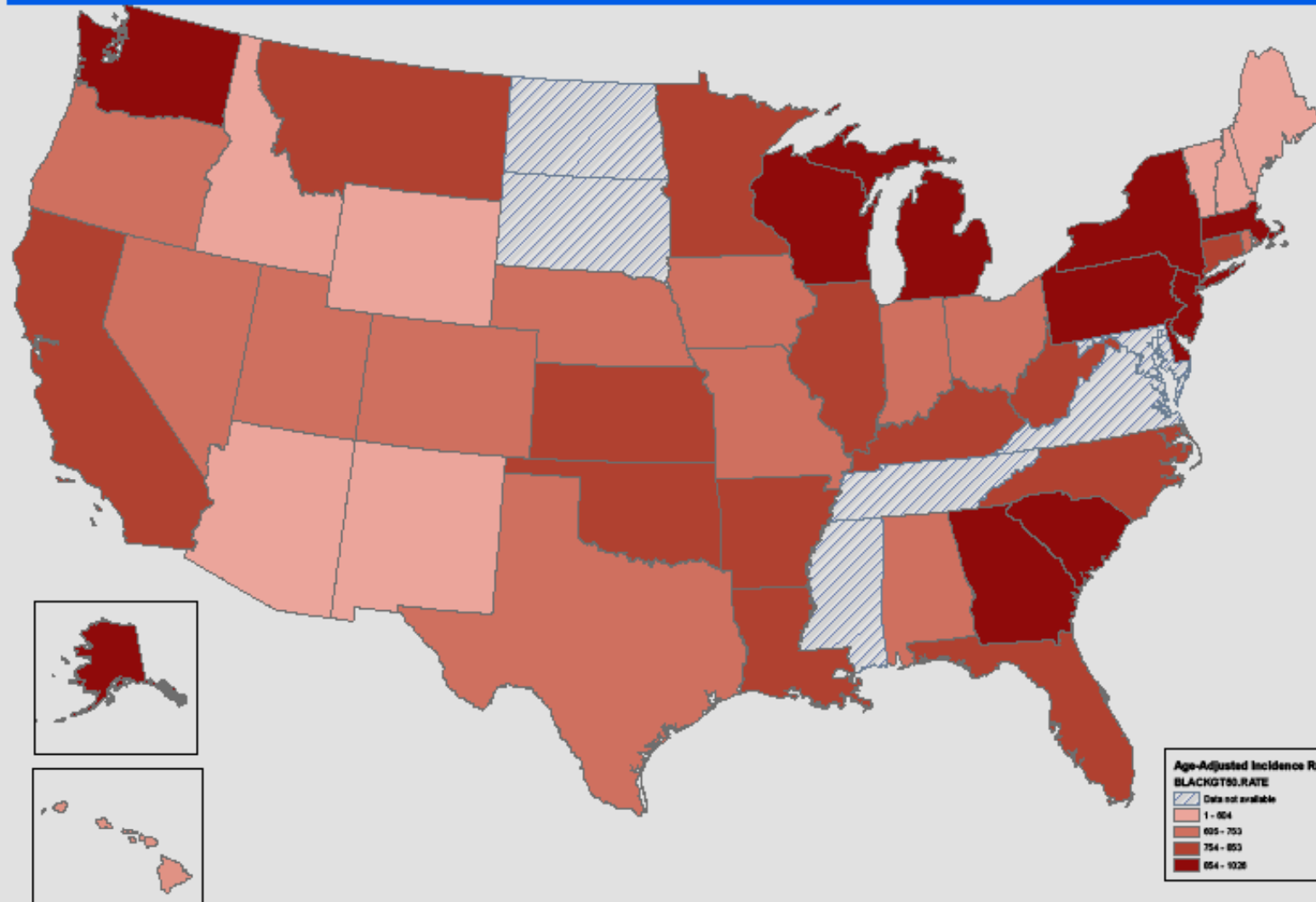
Prostate Cancer Incidence Rates White Males \geq 50 Years 1999-2004



Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard



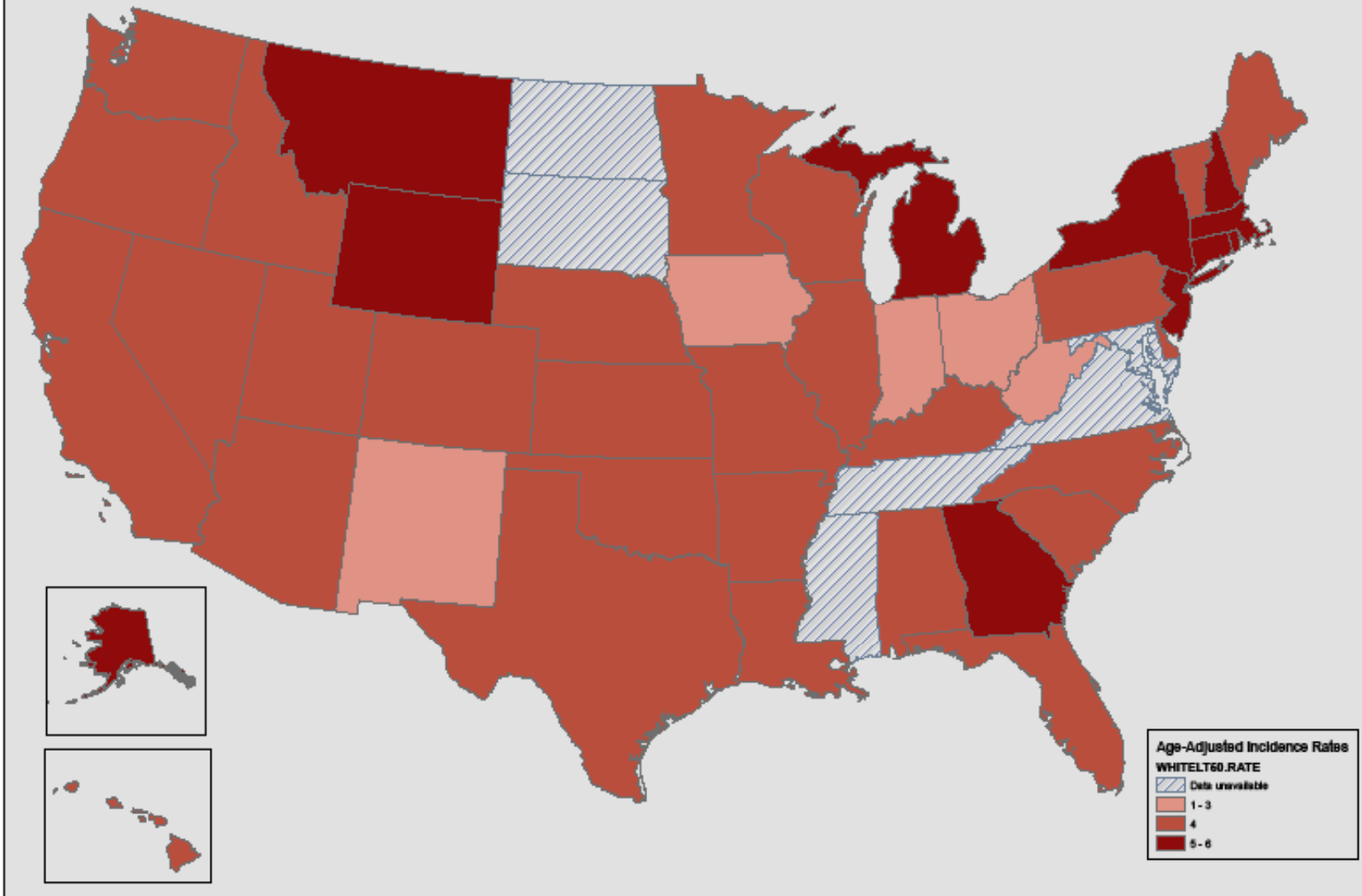
Prostate Cancer Incidence Rates Black Males \geq 50 Years 1999-2004



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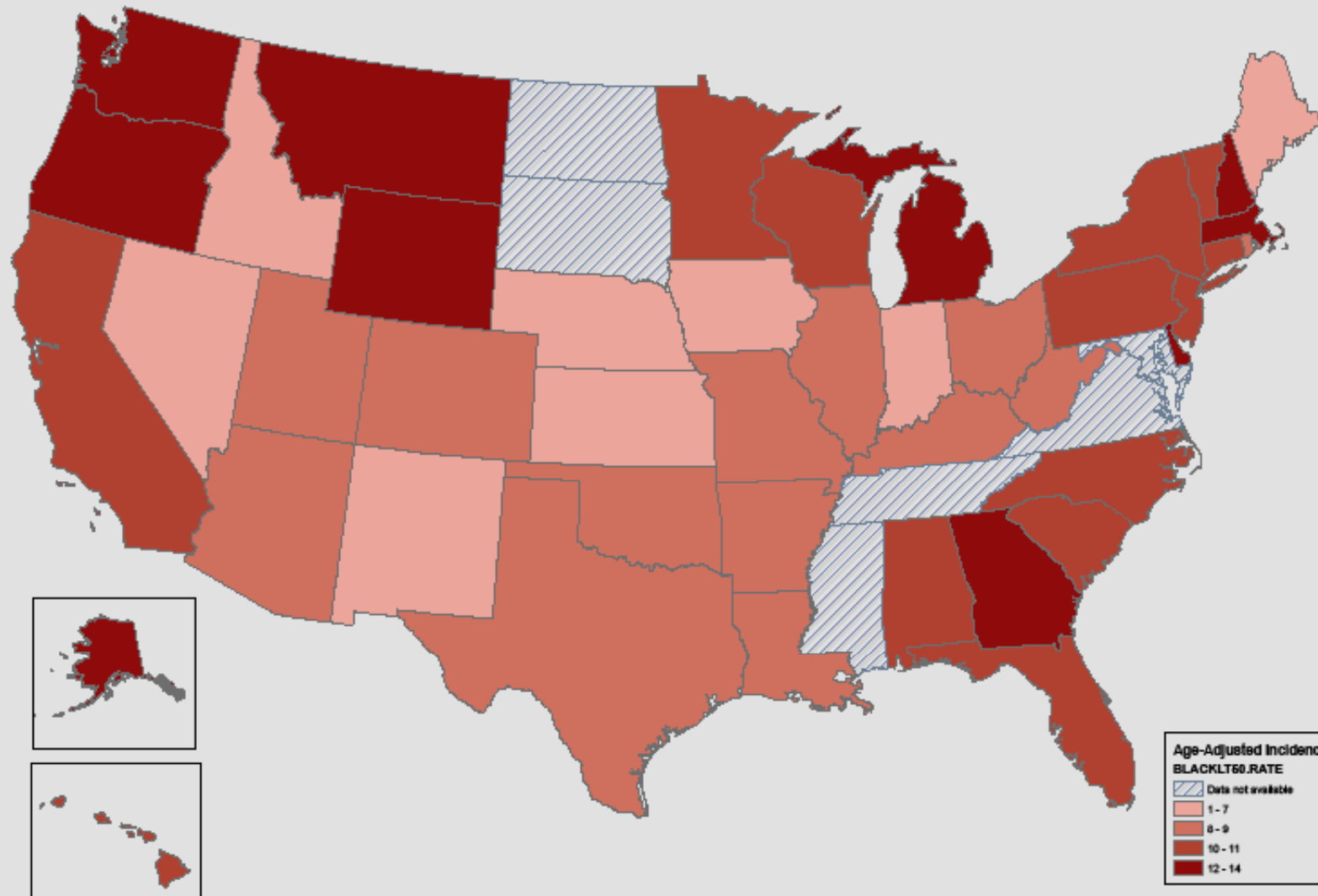
Prostate Cancer Incidence Rates White Males <50 Years 1999-2004



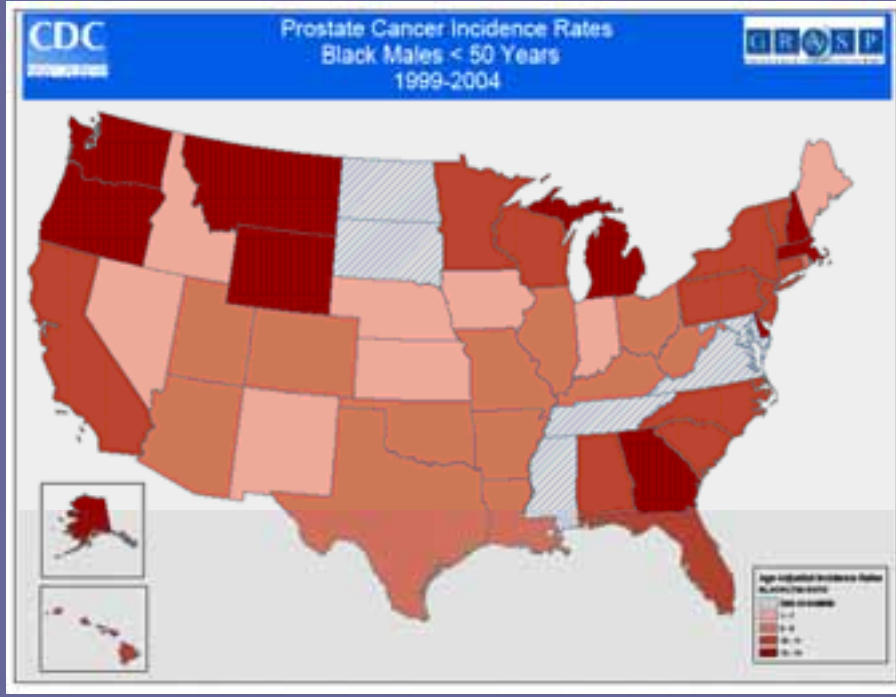
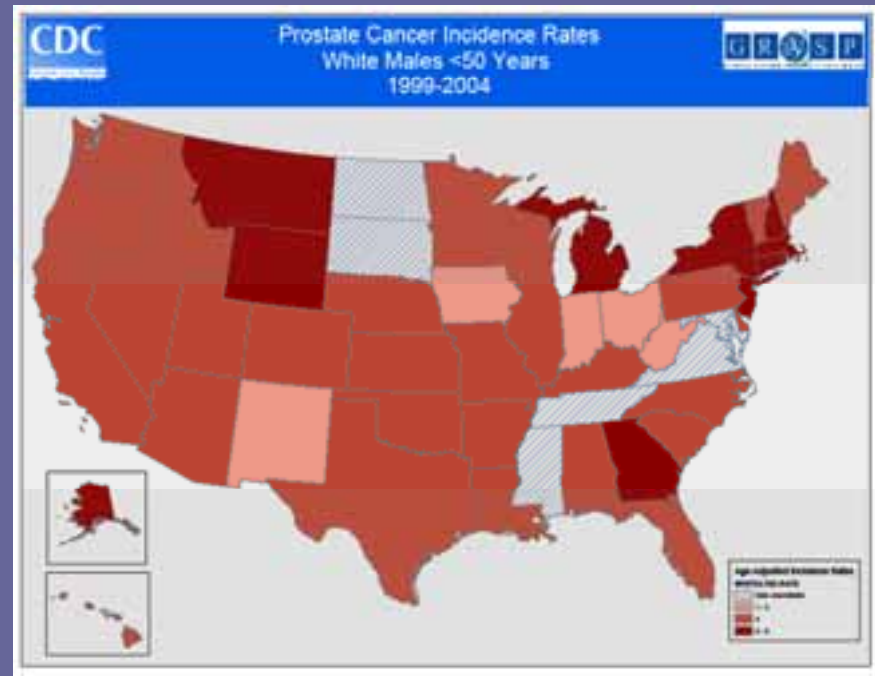
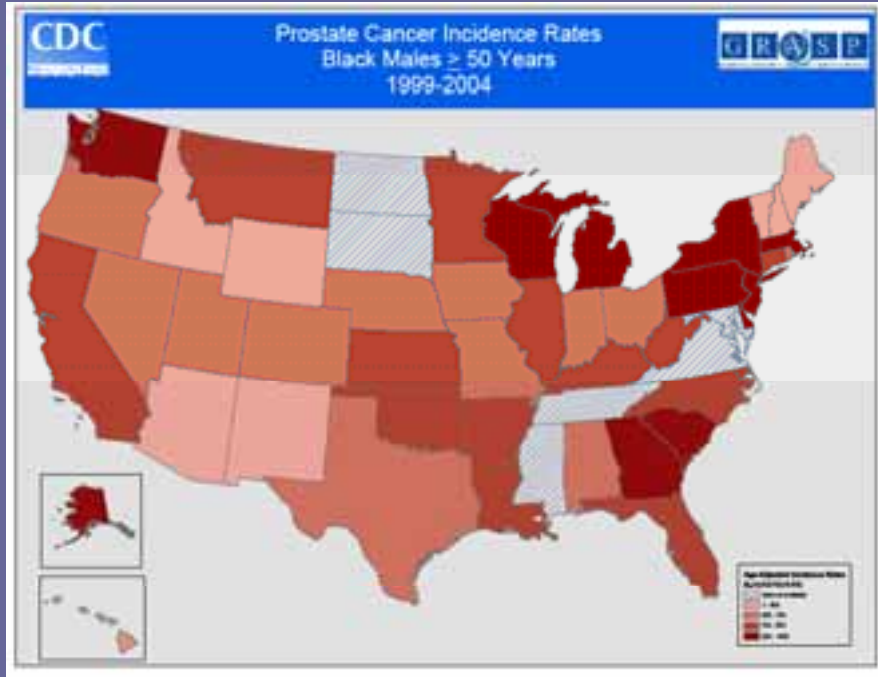
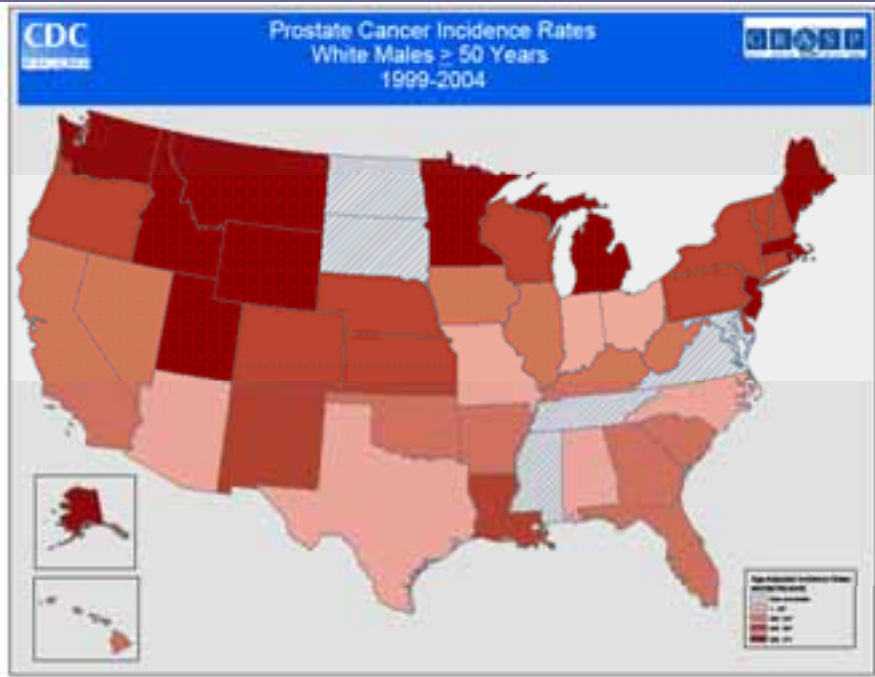
Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard



Prostate Cancer Incidence Rates Black Males < 50 Years 1999-2004



Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard



Annual Percentage Change: 1999-2004

All Races Combined

STATE	APC Trend
District of Columbia	-6.4*
Florida	-5.1*
Oregon	-5.0*
Kentucky	-4.1*
Missouri	-4.0*
Nebraska	-3.8*
Massachusetts	-3.7*
Michigan	-3.5*
Arizona	-3.4*
Colorado	-3.3*
Ohio	-3.2*
Iowa	-3.1*
Wisconsin	-3.1*
Texas	-2.7*
Washington	-2.7*
Maryland	~
South Dakota	~
Tennessee	~
Virginia	~
Alabama	2.3
Arkansas	0.9
Nevada	0.6
Utah	0.6
Louisiana	0.1
Delaware	-0.3
Montana	-0.4
Minnesota	-0.7
New Hampshire	-0.8
Oklahoma	-1.0
Idaho	-1.2
Indiana	-1.2
Kansas	-1.3
Georgia	-1.4
Hawaii	-1.4
Maine	-1.4
New Mexico	-1.5
California	-1.7
North Carolina	-1.7
Illinois	-1.8
New York	-2.1
South Carolina	-2.5
Vermont	-2.7
Wyoming	-2.9
Pennsylvania	-3.6
Alaska	-4.0
Connecticut	-4.0
New Jersey	-4.1
West Virginia	-4.7
Rhode Island	-5.2

*The APC is significantly different from zero ($p < 0.05$).

~ Statistic could not be calculated.

Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard

White

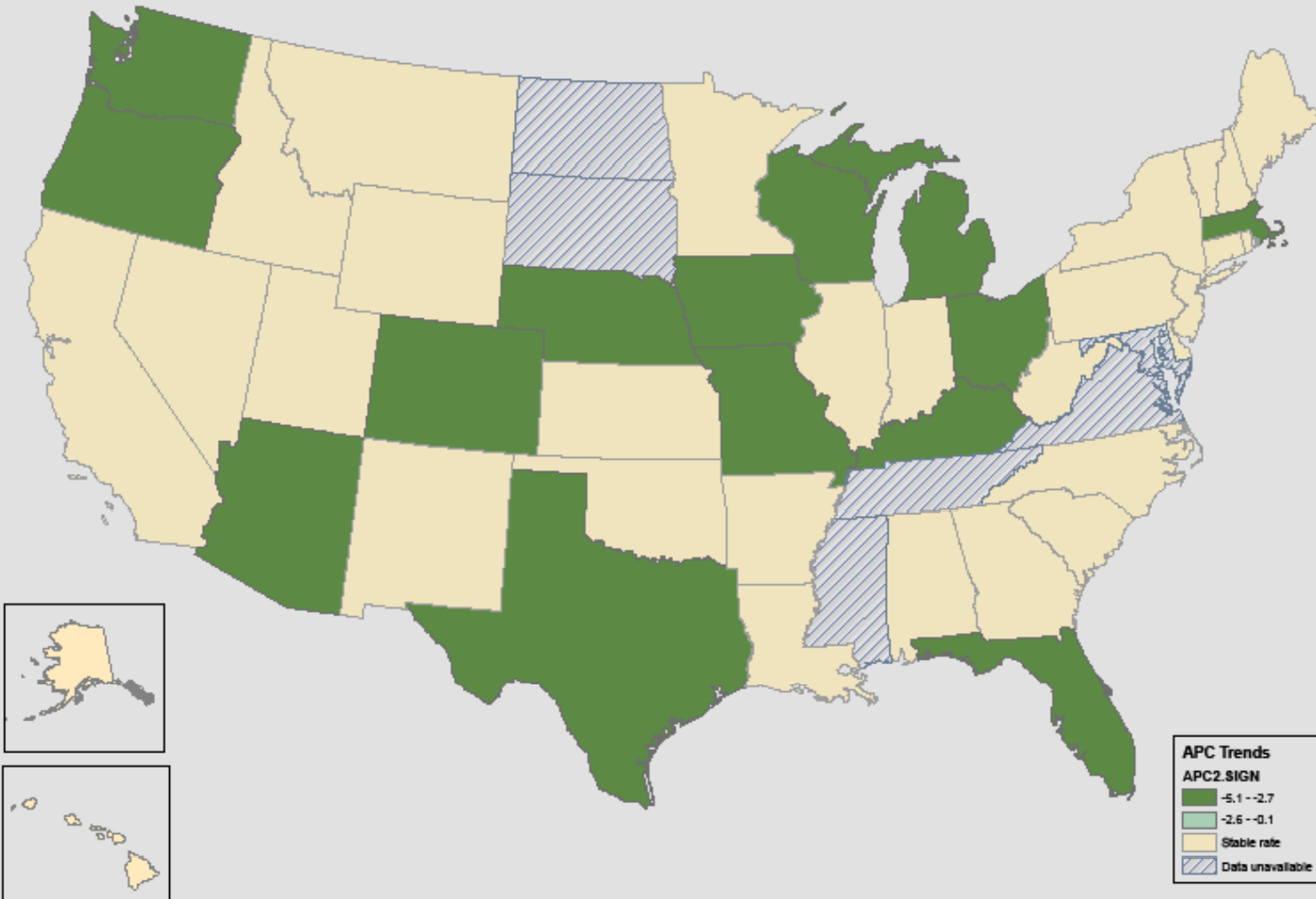
State	APC Trend
Rhode Island	-5.8*
Florida	-5.4*
Kentucky	-5.1*
Oregon	-5.0*
Colorado	-4.9*
Ohio	-4.8*
Michigan	-4.7*
Nebraska	-4.4*
Texas	-4.1*
Arizona	-4.0*
Missouri	-3.9*
Iowa	-3.7*
Massachusetts	-3.7*
Wisconsin	-3.4*
Washington	-3.0*
Mississippi	~
North Dakota	~
South Dakota	~
Tennessee	~
Virginia	~
Alabama	2.9
Arkansas	1.5
Utah	0.4
Montana	0.1
Nevada	-0.3
Hawaii	-0.4
Louisiana	-0.6
Delaware	-0.9
Oklahoma	-0.9
Idaho	-1.1
Indiana	-1.2
New Hampshire	-1.2
New Mexico	-1.2
California	-1.6
Georgia	-1.8
Maine	-1.8
Minnesota	-2.0
New York	-2.2
North Carolina	-2.3
Illinois	-2.6
South Carolina	-2.7
Vermont	-2.7
Wyoming	-3.5
Connecticut	-3.8
Pennsylvania	-3.8
Alaska	-4.7
West Virginia	-4.7
New Jersey	-5.1
District of Columbia	-6.8

Black

State	APC Trend
West Virginia	-7.0*
District of Columbia	-6.4*
Missouri	-5.4*
Florida	-4.6*
Ohio	-4.3*
California	-3.9*
New York	-2.9*
Mississippi	~
Montana	~
North Dakota	~
South Dakota	~
Tennessee	~
Vermont	~
Virginia	~
Wyoming	~
Idaho	17.0
Alabama	3.1
Minnesota	1.2
Wisconsin	1.1
Louisiana	0.9
North Carolina	0.1
Delaware	-0.4
Pennsylvania	-0.7
Georgia	-1.1
Colorado	-1.7
Nebraska	-2.1
Texas	-2.1
South Carolina	-2.2
Arkansas	-2.5
Illinois	-2.5
Arizona	-2.7
Washington	-2.9
Kentucky	-3.0
Massachusetts	-3.0
Oklahoma	-3.2
Maine	-3.4
Indiana	-3.6
New Jersey	-3.6
Nevada	-3.7
Michigan	-3.9
Utah	-3.9
Connecticut	-4.2
New Hampshire	-4.3
Kansas	-5.2
Rhode Island	-5.5
Oregon	-6.4
Alaska	-7.3
Iowa	-8.0
Hawaii	-8.7
New Mexico	-11.4



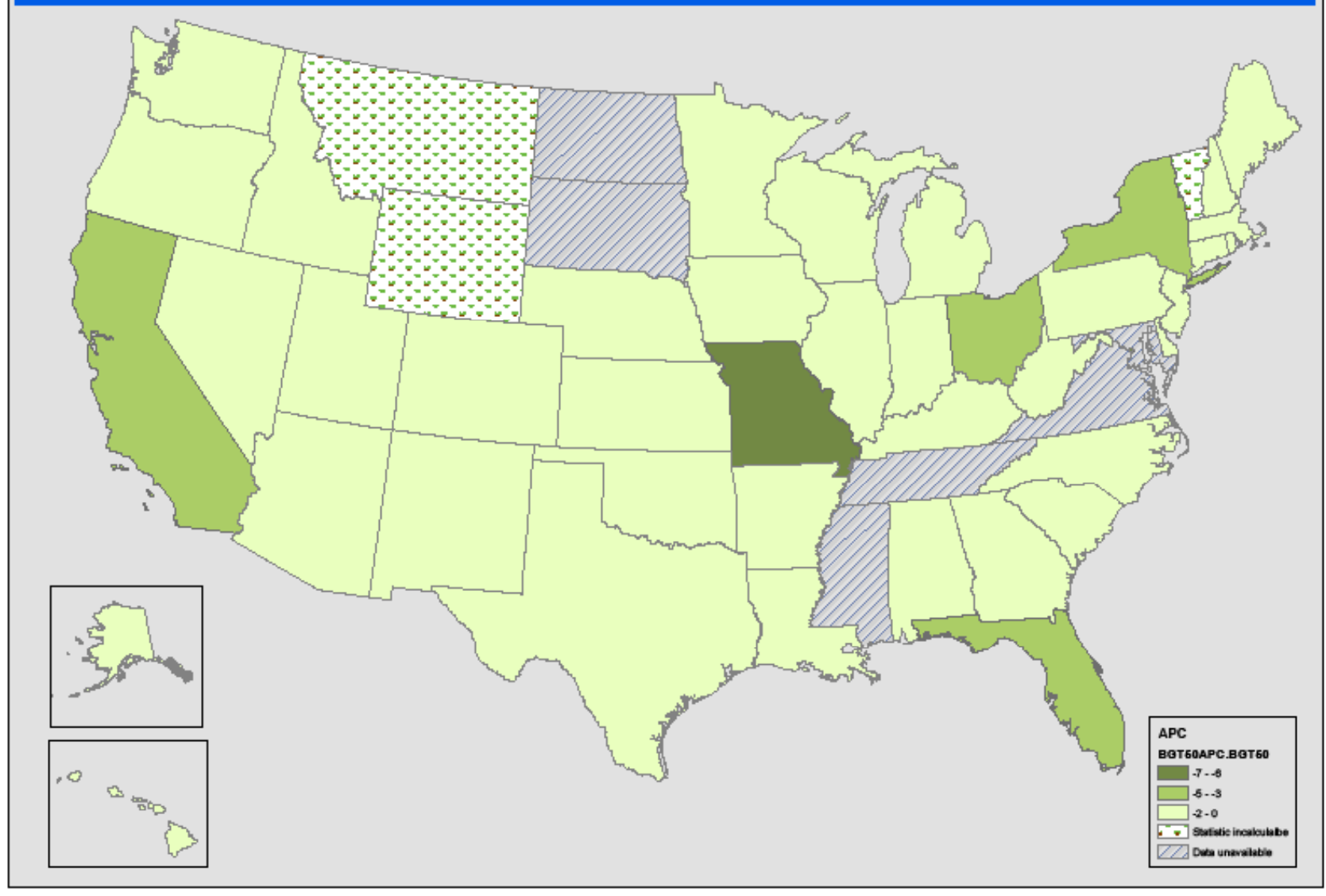
Prostate Cancer Incidence Rate Trends Annual Percentage Change, All Races and Ages Combined 1999-2004



Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard
Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.



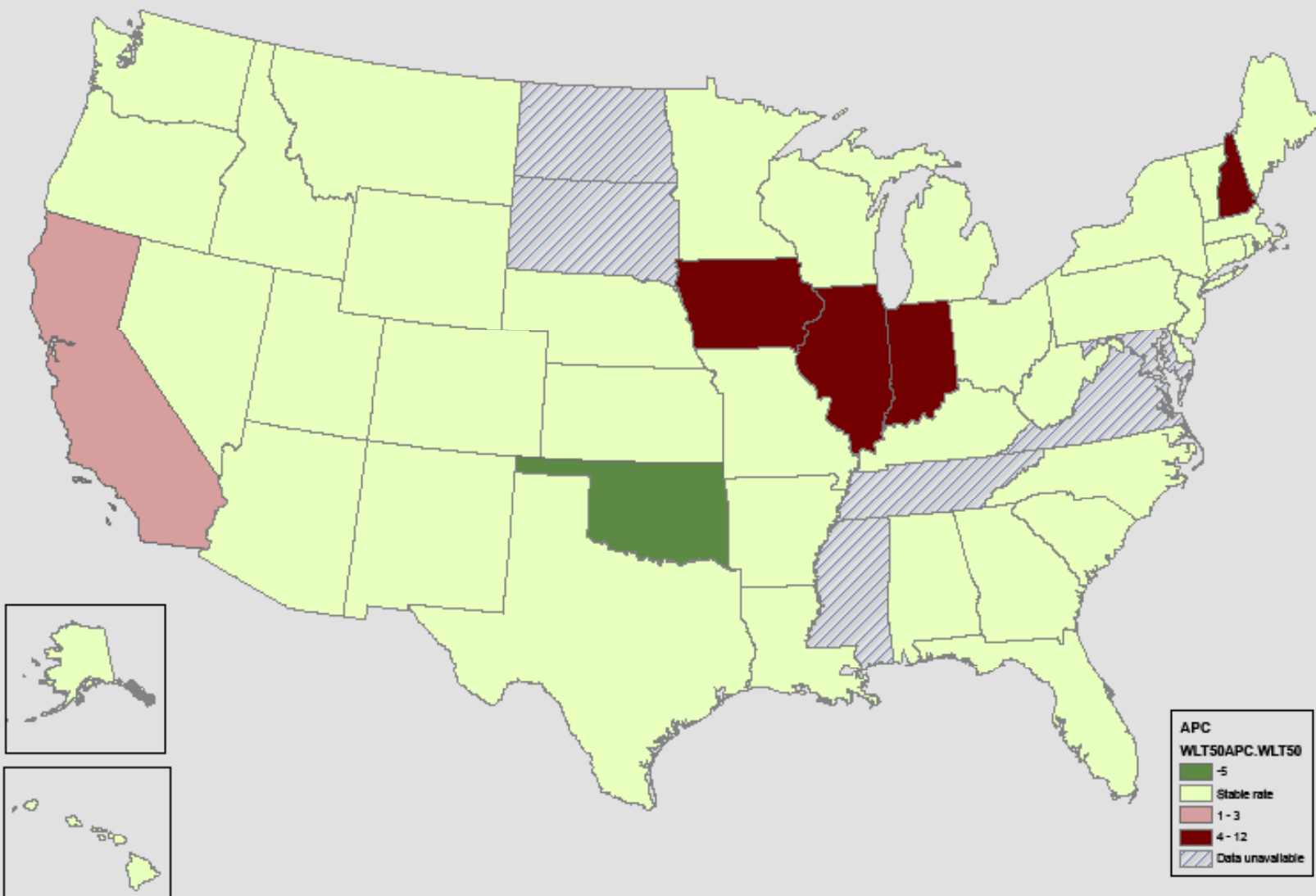
Prostate Cancer Incidence Rate Trends Annual Percentage Change, Black Males > 50 Years 1999-2004



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Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

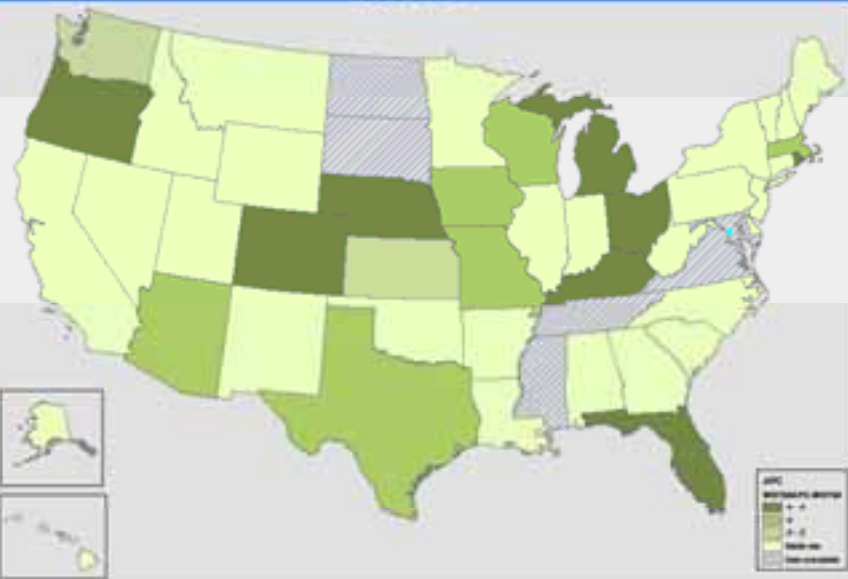


Prostate Cancer Incidence Rate Trends Annual Percent Change, White Males <50 Years 1999-2004

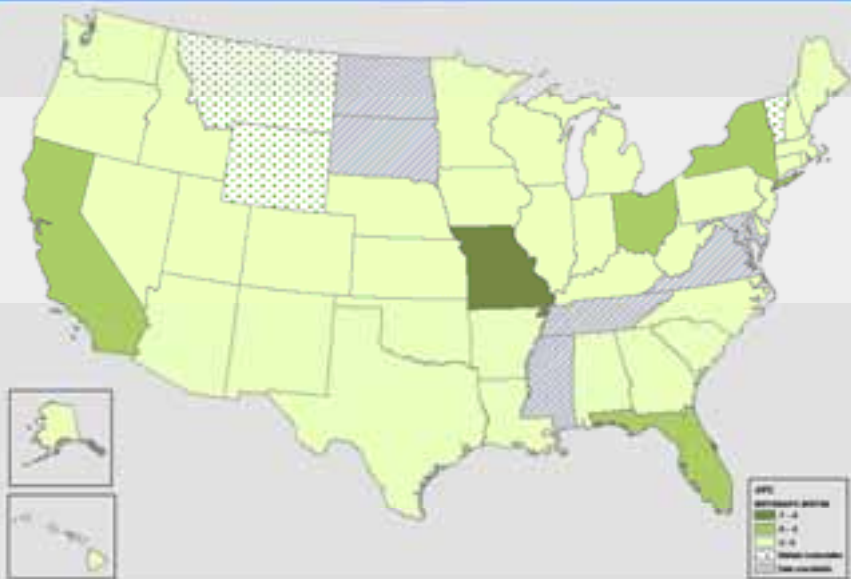


Rates are per 100,000 and age-adjusted to the 2000 US Std Population (19 age groups - Census P25-1130) standard
Percent changes were calculated using 1 year for each end point; APCs were calculated using weighted least squares method.

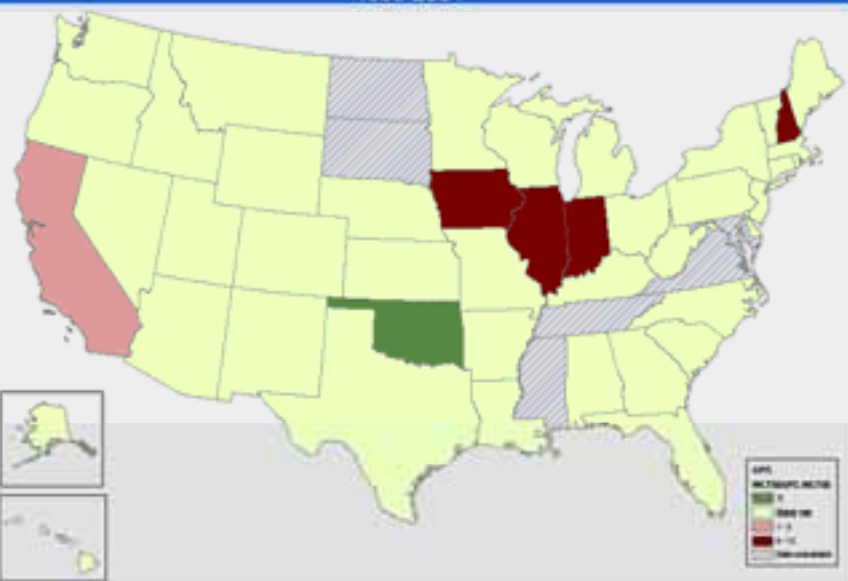
Prostate Cancer Incidence Rate Trends
Annual Percent Change, White Males ≥ 50 Years
1999-2004



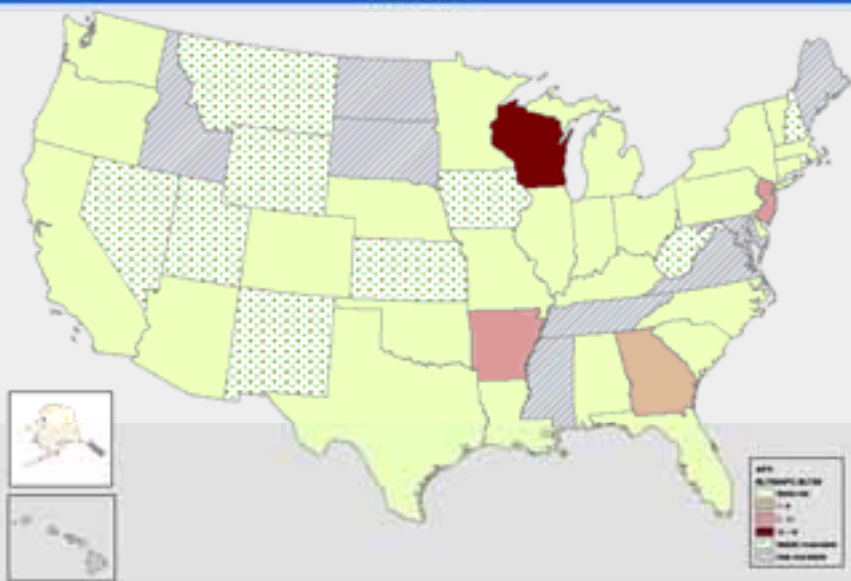
Prostate Cancer Incidence Rate Trends
Annual Percentage Change, Black Males ≥ 50 Years
1999-2004



Prostate Cancer Incidence Rate Trends
Annual Percent Change, White Males < 50 Years
1999-2004



Prostate Cancer Incidence Rate Trends
Annual Percent Change, Black Males < 50 Years
1999-2004



Results Summary

- Age-adjusted incidence rates
 - Range: 122/100,000 (AZ), 220/100,000 (DC)
 - National average: 161.5/100,000
- Rates increasing more than 2-times for Black men in both age groups.
- Some states with highest rates among White men ≥ 50 also had the highest rates among Black men <50 .
- When examining estimates for all races and ages combined it appears that rates are decreasing.
- APC, combined races and ages 15 states with decreasing rates for white males, ranging from 3 (MS) to 6 (RI); 7 states with decreasing rates for black males, ranging from 3(NY) to 7 (WV).
- Most states the rates are stable.
- Where rates are increasing, they are increasing for both White and Black men <50
- Among men ≥ 50 , rates are decreasing in more states for Whites than Blacks.

Strengths and Limitations

- Most complete national data source
- First opportunity to analyze recent trends with national data
- Use of State as geographic unit of analysis
- Lack of additional information regarding PSA testing rates
- Reporting delays

Conclusions

- There are definite differences in rates by age group, race, and geographic area
- Follow-up analyses evaluating the incidence of prostate cancer at a finer geographic unit of analysis would provide greater insight.
- These results may be helpful to comprehensive cancer control programs to evaluate prostate cancer awareness activities by age group, race, and geographic area.

Acknowledgements

National Program of Cancer Registries

Division of Cancer Prevention and Control:

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Katrina Trivers, PhD

Lisa Richardson, MD

Geospatial Research, Analysis, and Services Program:

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Questions?

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