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AFRICAN-AMERICAN AND WHITE INEQUALITY IN THE AMERICAN SOUTH: EVIDENCE FROM THE 19TH CENTURY MISSOURI STATE PRISON

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Abstract

The use of height data to measure living standards is now a well-established method in economic history. Moreover, a number of core findings in the literature are widely agreed upon. There are still some populations, places, and times, however, for which anthropometric evidence remains thin. One example is 19th century African-Americans in US border states. This paper introduces a new data set from the Missouri state prison to track black and white male heights from 1829 to 1913. Where modern blacks and whites come to comparable terminal statures when brought to maturity under optimal conditions, whites were persistently taller than blacks in this Missouri prison sample. Over time, black and white adult statures remained approximately constant throughout the 19th century, while black youth stature increased considerably during the antebellum period and decreased during Reconstruction.

JEL Code: N31, J15, J70, I12, I31.

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African-American and White Inequality in the American South: Evidence from the 19th Century Missouri State Prison System

1. Introduction

An anomalous finding has emerged where the physical stature of 19th century male African-American slaves increased during the antebellum period, while Northern white and free black statures declined. However, if Southern planters and overseers rationally manipulated slave nutrition and medical allocations to maximize slaveowner wealth, slave heights would have increased with antebellum slave values and probably decreased with the removal of the institution (Rees, Komlos, Long, Woitek, 2003, p. 22; Steckel, 1995; Komlos and Coclanis, 1997, p. 445; Komlos, 1998; Conrad and Meyer, 1964, p. 49). While the former has been well documented, the latter remains unresolved. When brought to maturity under optimal net nutritional conditions, blacks and whites should reach comparable adult terminal statures (Eveleth and Tanner, 1976, Appendix. Tables 5, 29, and 44; Tanner, 1977, pp. 341-342; Margo and Steckel, 1982); however, 19th century blacks were physically shorter than whites. By using a new source of 19th century Missouri prison records, the present study contrasts male heights of comparable blacks and whites in the American South from the antebellum period through the end of the 19th century.

The use of height data to measure living standards is now a well-established method in economic history. A populations' average stature reflects the cumulative

interaction between nutrition, disease exposure, work and the physical environment. By considering average versus individual stature, genetic differences are mitigated, leaving only the influence of economic and physical environments on stature. When diets, health and physical environments improve, average stature increases and decreases when diets become less nutritious, disease environments deteriorate or the physical environment places more stress on the body. Hence, stature provides significant insights into understanding historical processes and augments other welfare measures for 19th century blacks and whites in the American South.

The Missouri prison population is particularly interesting because it was a slave state with close proximity to major water ways, was agriculturally productive, and its population was racially polarized, where blacks faced considerable degrees of racial animosity from whites. Three questions are considered. First, how did black and white statures compare by race and how did they vary over the course of the 19th century? Because of slavery's interference with natural biological processes, we may expect that 19th century whites encountered more favorable biological conditions than blacks, and if average stature varied in Missouri around the time of the Civil War, such variation may have been due to institutional change. Second, how did Missouri inmate statures compare to other American statures? Missouri was unique because of its central location in America's 19th century transportation and migration revolutions while embracing the institution of slavery. Third, how did Missouri prison inmate statures vary by socioeconomic status and occupation, and which was most associated with stature variation?

2. Nineteenth Century Missouri

Missouri's most distinctive 19th century features were its physical environment, central location, politics and culture. Conjoined just north of Saint Louis, Missouri's most prominent physical features were the Mississippi and Missouri rivers, which are America's two longest rivers and were central to Missouri's economic development, transporting goods, and peoples and probably served as disease vectors. Missouri's economic system and biological conditions were also influenced by its Northern Plains, central Ozark plateau, and Southeastern Bootheel. The Northern Disected Till Plains were formed approximately 400,000 years ago by Nebraskan glaciation, and were the basis for Missouri's 19th century wheat and grain production (Figure 1). The Ozark plateau—historically settled by Scots-Irish immigrants—is a highland region in the southern half of Missouri, and during the 19th century, was mined for lead, and iron. The Ozark plateau is also suited for beef ranching and dairy production, which enhanced biological conditions. The Missouri Bootheal, located in the flattest and wettest part of Missouri, is part of the Mississippi Alluvial Delta, and is only a few hundred feet above sea level, and there generally is an inverse relationship between proximity to water and stature (Haines, Craig, and Weiss, 2003, p. 405; Craig and Weiss, 1998, p. 197-198, p. 205). These regional comparisons create a natural experiment to assess whether northern Missouri' agricultural productivity outpaced the biological benefits of access to dairy production and animal proteins in southern Missouri. Finally, Missouri's central location within America uniquely positioned it as a slave state but not part of the Black Belt, which is the Southern region of 623 counties that contain higher than average black

concentrations and form a belt-like swath across 11 states. Consequently, not part of the Black Belt but still part of the slave holding South, Missouri offers insight into black and white conditions in a slave state not part of the plantation South (Ransom and Sutch, 1977, pp. 73-78).

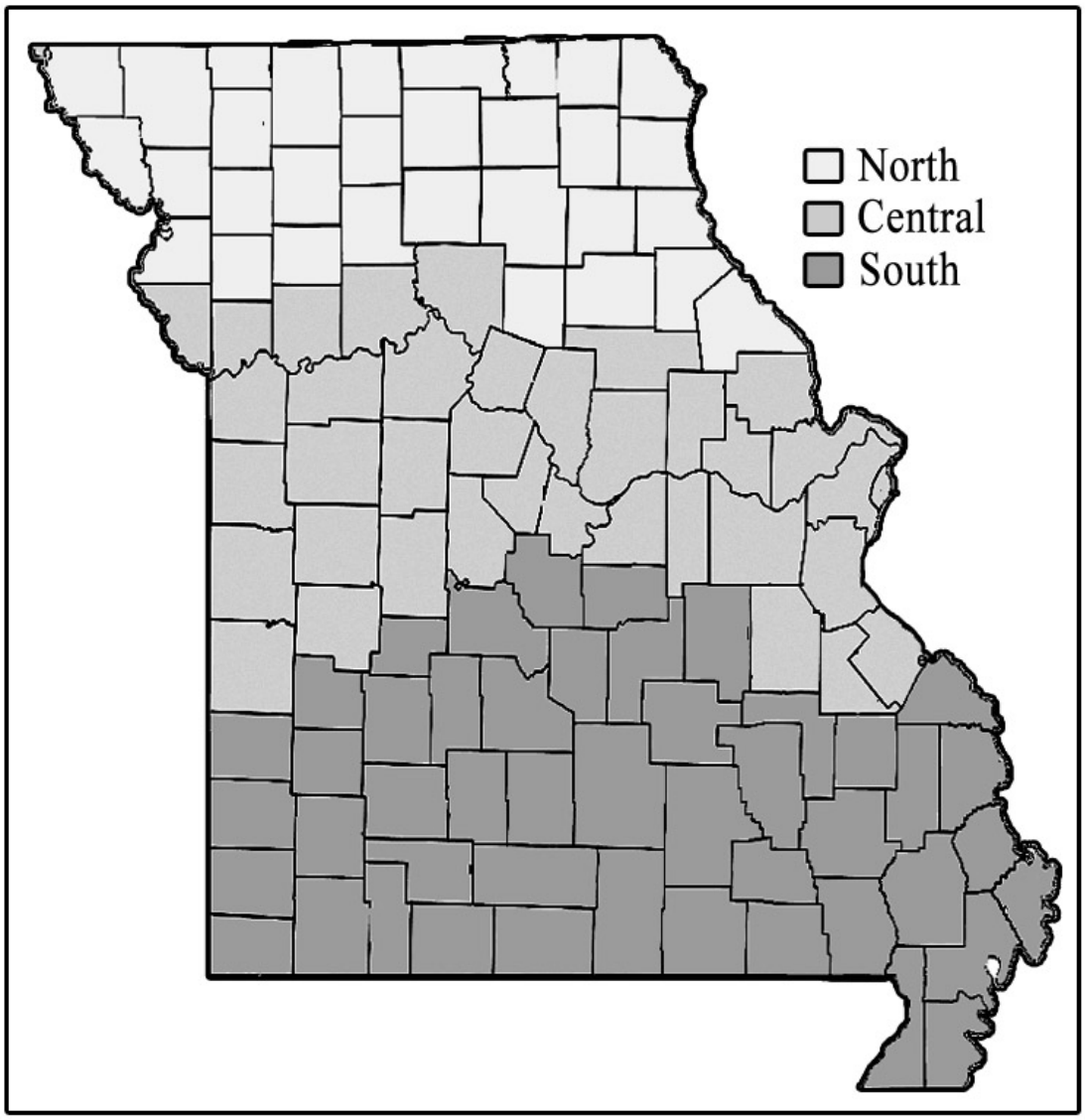


Figure 1, 19th Century Missouri Regions

Notes: Missouri's northern region consists of Adair, Clark, Knox, Lewis, Linn, Macon, Marion, Monroe, Pike, Putnam, Ralls, Randolph, Schuyler, Scotland, Shelby, Sullivan,

Andrew, Atchison, Buchanon, Caldwell, Clinton, Daviess, DeKalb, Gentry, Grundy, Harrison, Holt, Livingston, Mercer, Nodaway and Worth counties. The central region consists of Franklin, Jefferson, Lincoln, Montgomery, Saint Charles, Saint Francois, Saint Genevieve, Saint Louis, Warren, Washington, Audrian, Benton, Boone, Calloway, Carroll, Cole, Cooper, Chariton, Howard, Morgan, Osage, Pettis, Saline, Bates, Cass, Clay, Henry, Jackson, Johnson, Lafeyette, Platte, Ray, Saint Clair, Vernon counties. The southern regions consists of Bollinger, Butler, Cape Girardeau, Carter, Dunklin, Iron, Madison, Mississippi, New Madrid, Pemiscot, Perry, Reynolds, Ripley, Scott, Stoddard, Wayne, Camden, Crawford, Dent, Douglas, Gasconade, Howell, Laclede, Maries, Miller, Oregon, Ozark, Phelps, Pulaski, Shannon, Texas, Wright, Barry, Barton, Cedar, Christian, Dade, Dallas, Greene, Hickory, Jasper, Lawrence, McDonald, Newton, Polk, Stone, Taney, Webster counties.

3. Data

In 1821, the Missouri state legislature established a commission to decide where to locate the new state capitol, and Jefferson City was created specifically to serve as Missouri's center for government. Not void of political manipulation, other Missouri towns soon attempted to wrest the capitol from Jefferson City, and in 1832 governor John Miller suggested a state penitentiary be constructed in the city to strengthen its position as the state capitol. The prison was completed in 1836 and housed many of Missouri's lawless element in, what was at the time, America's western frontier.

To assess how 19th century black and white statures varied in the American South, over 30,000 male inmate records from between 1838 through 1920 Missouri state prison are examined, and stature comparisons are likely genuine because individuals were

incarcerated for criminal, not biological reasons. Stature measurements were taken at the time inmates were admitted to prison; therefore, stature reflects pre-incarceration conditions. Prison enumerators routinely recorded the date inmates were received, age at incarceration, complexion, nativity, stature, pre-incarceration occupation, and crime. Between 1890 and 1920, county of incarceration is also available, and provides residential and stature relationships.

Fortunately, prison enumerators were quite thorough when recording inmate complexion and occupation. For instance, enumerators recorded African-Americans as blacks, copper and various shades of mulatto.[1] While mulatto inmates possessed genetic traits from both black and white ancestry, they were treated as blacks throughout 19th century America and are grouped here with black inmates. Enumerators recorded white inmate complexions as light, fair, dark and sallow. The white inmate complexion classification is further supported by the complexion of European immigrants, who were always of fair complexion and were also recorded as light, medium and dark.[2] Because the focus of this paper is American stature, immigrants are excluded from the analysis.

Enumerators recorded a broad continuum of occupations and defined them narrowly, recording over 200 different occupations. These occupations are classified

[1] Although positive relationship between stature and mulatto complexions have been observed in other samples, the Missouri prison recorded complexions were not recorded in sufficiently refined detail to highlight this relationship.

[2] I am currently collecting 19th century Irish prison records. Irish prison enumerators also used light, medium, dark, fresh and sallow to describe white prisoners in prisons from a traditionally white population. To date, only one inmate in an Irish prison has been recorded with a complexion consistent with African heritage and was identified as “negro.”.

into four categories. Workers who were merchants and high skilled workers are classified as white-collar workers; manufacturing, carpenters and craft workers are classified as skilled workers; workers in the agricultural sector are classified as farmers; laborers are classified as unskilled workers. Unfortunately, prison enumerators did not distinguish between farm and common laborers. This potentially overestimates the biological benefits of being a common laborer and underestimates the advantages of being a farm laborer. By having the same prison official record characteristics over much of the period, the consistency of the Missouri sample creates reliable comparisons across both race and time.

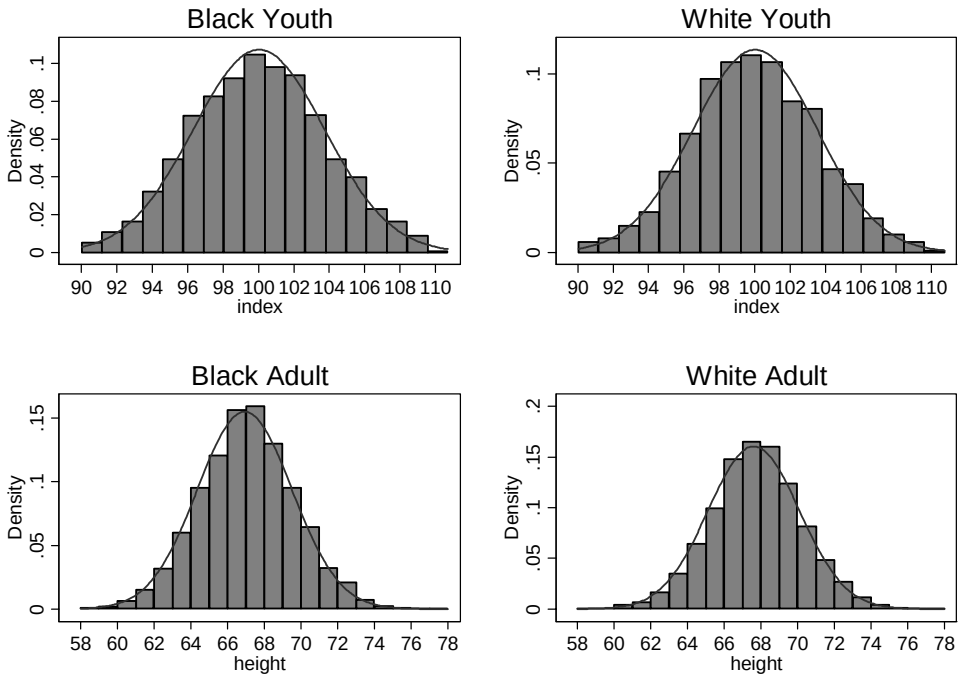
All historical height data have various selection biases. The prison data likely selected many of the materially poorest individuals, although there are skilled and agricultural workers in the sample (Table 1 and 2). While prison records are not random, the selectivity they represent has its own advantages in stature studies, such as being drawn from lower socioeconomic groups, who were more vulnerable to economic change (Bogin, 1991, p. 288; Cutler, 2004, p. 110). For the study of height as an indicator of biological variation, this kind of selection is preferable to that which marks many military records – minimum height requirements for service (Fogel, 1978, p. 85).[3]

A vital distinction in anthropometric studies is between adult and youth stature. Average adult stature reflects nutritional advantages, less environmental conditions, disease insults and calorie claims for work, and prolonged privation during formative

[3] Many 19th century and earlier stature measurements were rounded to the nearest inch or half inch. However, there was great care in recording inmate statures because accurate measurement may have had legal implications in the event that inmates escaped and later recaptured. Most inmates' statures were recorded at a quarter, eighth, and even sixteenth increments.

years can have permanent effects on adult stature. Since adults may undergo catch-up growth, youth stature is even more sensitive to immediate nutritional changes, environmental and disease environments (Godoy, 2005, p. 374-376). Because the direct effects of age on stature are different between youths and adults, their statures are considered separately here. Youths are inmates between the ages of 14 and 22; adults are inmates between the ages of 23 and 55. Since more adults than youths in the sample were born during the antebellum period, changes in adult stature better reflects the consequences of slavery on stature. Because the youth height distribution is itself a function of the age distribution, a youth stature index is constructed that standardizes for age to determine youth stature normality. First, the average stature for each youth age category is calculated. Second, each observation is then divided by the average stature for the relevant age group (Komlos, 1987, p. 899). Figure 2 demonstrates that black and white statures were distributed approximately normal.

Figure 2, Nineteenth Century Missouri Black and White Stature Distributions



Source: See Tables 1 and 2.

Note: A normal distribution is superimposed on the stature histograms.

Table 1, Missouri Youth Stature by Birth, Occupation and Nativity

	White			*Black*				
Birth Decade	N	Percent	Centimeters	N	Percent	Centimeters	Percent Difference	Stature Difference
1810s	7	.11	173.36	0	0	na	.11	na
1820s	18	.27	171.48	4	.10	167.80	.17	3.68
1830s	11	.17	175.07	0	0	na	.17	na
1840s	120	1.8	170.93	16	.42	166.69	1.38	4.24
1850s	988	14.95	169.80	401	10.41	167.17	4.54	2.63
1860s	432	6.54	171.79	219	5.69	167.30	.85	4.49
1870s	1,636	24.76	171.48	1,051	27.29	168.98	-2.53	2.5
1880s	1,376	20.82	171.11	1,031	26.77	168.28	-5.95	2.83
1890s	1,832	27.72	171.18	1,012	26.27	168.45	1.45	2.73
1900s	188	2.85	170.29	118	3.06	168.08	-.21	2.21
Occupations								
White-Collar	537	8.16	170.41	99	2.57	168.05	5.59	2.36
Skilled	1,386	20.98	170.66	293	7.61	168.47	13.27	2.19
Farmer	1,087	16.45	171.99	318	8.26	170.05	13.19	1.94
Unskilled	3,598	54.54	171.02	3,142	81.57	168.15	-27.03	2.87
Nativity								
Great Lakes	1,172	17.74	170.54	195	5.06	167.74	12.68	2.80
Middle Atlantic	497	7.52	169.68	55	1.43	166.63	6.09	3.05
Northeast	71	1.07	168.44	7	.182	167.28	.888	1.16
Plains	3,854	58.32	171.41	2,614	67.86	168.16	-9.54	3.25
Southeast	747	11.30	171.30	815	21.16	168.77	-9.86	2.53
Southwest	147	2.23	170.63	125	3.25	170.10	-1.02	.53
Far West	120	1.82	170.96	41	1.06	170.68	.76	.28

Source: Date used to study black and white anthropometrics is a subset of a much larger 19th century prison sample. All available records from American state repositories have been acquired and entered into a master file. These records include Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah and Washington. Only prison records for inmates incarcerated in the Missouri prison are used in this project.

Notes: Stature is in centimeters. The occupation classification scheme is consistent with Ferrie (1997); The following geographic classification scheme is consistent with Carlino and Sill (2000): New England= CT, ME, MA, NH, RI and VT; Middle Atlantic= DE, DC, MD, NJ, NY, and PA; Great Lakes= IL, IN, MI, OH, and WI; Plains= IA, KS, MN, MO, NE, ND, and SD; South East= AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, and WV; South West= AZ, NM, OK, and TX; Far West= CA, CO, ID, MT, NV, OR, UT, WA, and WA. Stature difference is average white stature less average black stature. Proportion difference is white proportion less black proportion.

Table 2, Missouri Adult Stature by Birth, Occupation and Nativity

	White			*Black*				
Birth Decade	N	Percent	Centimeters	N	Percent	Centimeters	Percent Difference	Stature Difference
1800s	16	.12	170.10	1	.02	175.63	.10	-5.53
1810s	46	.34	171.93	4	.07	170.34	.27	1.59
1820s	164	1.20	170.85	34	.56	167.60	.64	3.25
1830s	382	2.80	171.60	62	1.02	171.29	1.78	.31
1840s	1,255	9.21	171.35	339	5.58	169.69	3.63	1.66
1850s	1,815	13.32	171.39	549	9.03	169.54	4.29	1.85
1860s	2,768	20.31	172.08	1,101	18.11	170.28	2.20	1.8
1870s	3,414	25.05	171.81	1,815	29.86	170.12	-4.81	1.69
1880s	2,747	20.13	171.50	1,657	27.26	169.94	-7.13	1.56
1890s	1,022	7.50	172.13	517	8.51	169.72	-1.01	2.41
Occupations								
White-Collar	1,658	12.17	171.57	292	4.80	170.26	-7.37	1.31
Skilled	4,322	31.71	171.47	1,002	16.48	169.23	15.23	2.24
Farmer	1,818	13.34	172.54	384	6.32	171.03	7.02	1.51
Unskilled	5,831	42.78	171.67	4,401	72.40	170.05	-29.62	1.62
Nativity								
Great Lakes	2,833	20.79	171.61	325	5.35	169.90	15.44	1.71
Middle Atlantic	1,473	10.81	170.26	146	2.40	169.04	8.41	1.22
Northeast	217	1.59	170.43	25	.41	171.40	1.18	-.97
Plains	6,528	47.90	171.92	3,368	55.40	169.65	-7.50	2.27
Southeast	2,095	15.37	172.18	1,937	31.86	170.56	-16.49	1.62
Southwest	252	1.85	172.73	216	3.55	170.60	-1.70	2.13
Far West	231	1.70	171.96	62	1.02	170.52	.68	1.44

Note: Stature is in centimeters. The occupation classification scheme is consistent with Ferrie (1997); The following geographic classification scheme is consistent with Carlino and Sill (2000): New England= CT, ME, MA, NH, RI and VT; Middle Atlantic= DE, DC, MD, NJ, NY, and PA; Great Lakes= IL, IN, MI, OH, and WI; Plains= IA, KS, MN, MO, NE, ND, and SD; South East= AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, and WV; South West= AZ, NM, OK, and TX; Far West= CA, CO, ID, MT, NV, OR, UT,

WA, and WA. Stature difference is average white stature less average black stature. Proportion difference is white proportion less black proportion.

Tables 1 and 2 present average heights and proportions for black and white males incarcerated in the 19th century Missouri prison by birth year, occupations, and nativity. Whites born before the Civil War took up proportionally larger shares of the population than black inmates born before the Civil War. Southern slave law evolved to favor plantation law, which generally allowed slave-owners to recover slave labor on plantations while the slave was punished (Wahl, 1996 and 1997; Friedman, 1993, pp. 84-106). However, with passage of the 13th Amendment, slave-owners no longer had claims on black labor, and free blacks who broke the law were turned over to the Missouri penal system to exact their social debt.

Occupations reflect socio-economic status, and while prison inmates typically come from the lower working class, there was a sizable share of inmates from white-collar and skilled occupations. White inmates were 154 and 92 percent, respectively, more likely than blacks to occupy white-collar and skilled occupations. Even in agriculture, whites were more likely than blacks to come from planting and stock raising occupations. The difference, of course, was in the unskilled category. Blacks were 69 percent more likely than whites to occupy unskilled occupations, making occupations within the Missouri prison segregated; white-collar, skilled, and agricultural occupations were filled by whites, and unskilled occupations were filled by blacks. Nativity within the Missouri prison was mostly from Plains states, which includes Missouri.

Table 3, Nineteenth Century Missouri Census Household Head Occupations by Race

	1860	*1870*		*1880*		*1900*	
	White	Black	White	Black	White	Black	White
White-Collar	8.52	0	9.22	1.62	10.14	6.05	12.61
Skilled	12.53	2.07	12.77	2.43	12.55	1.91	15.10
Farmer	57.27	19.31	54.31	24.29	55.16	14.97	43.31
Unskilled	21.22	78.62	23.70	67.61	20.62	77.07	28.68
No Occupation	.46	0	0	4.05	1.54	0	.30

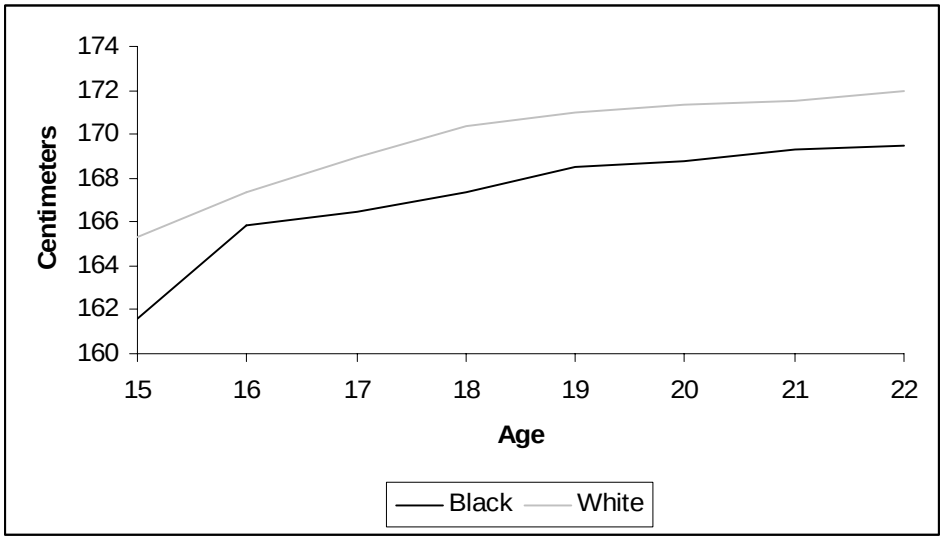
Source: Steven Ruggles, Matthew Sobek, Trent Alexander, Catherine A. Fitch, Ronald Goeken, Patricia Kelly Hall, Miriam King, and Chad Ronnander. *Integrated Public Use Microdata Series: Version 3.0* [Machine-readable database]. Minneapolis, MN: Minnesota Population Center [producer and distributor], 2004.

How well prison records reflect socioeconomic processes of Missouri's general population is assessed by comparing the Missouri prison records to Missouri's decennial federal census. Table 3 illustrates that blacks in Missouri censuses were predictably less likely than whites to be white-collar, skilled workers and farmers, and were more likely to be unskilled workers. These striking occupational differences between blacks and whites were due primarily to Southern institutional arrangements. Under slavery, blacks were trained in plantation skills, and did not choose the occupations they desired (Ransom and Sutch 1977, p. 17; David and Temin, 1976, p. 45-46). After emancipation, blacks could not acquire the skills they desired because they were denied access to the education and training to facilitate their upward occupational advance into white-collar and skilled occupations.[4] Moreover, blacks faced rigid hiring policies after slavery was

[4] Ransom and Sutch. *One Kind of Freedom*, pp. 28-30, 177-179; In the face of postbellum Reconstruction, blacks demonstrated remarkable resilience to acquire what had so long been denied them. Marable,

abolished and were unlikely to be hired into skilled positions.[5] Missouri urbanized along racial lines. In 1860, 19.39 percent of Missouri whites lived in urban locations. By 1900, 35.55 percent of Missouri whites lived in urban locations; 58.60 percent of blacks lived in urban locations.

Figure 3, Missouri Youth Black and White Stature Profiles



"Politics of Black Land Tenure," p. 140, suggests that by 1910 blacks had succeeded to a limited degree to attain economic advancement. Despite exclusion from general human capital accumulation acquired in more traditional educational institutions, blacks banded together to establish institutions where they could acquire market specific skills. Examples include the Agricultural and Mechanical College for Negroes, the Utica Institute and Booker T. Washington's Tuskegee Institute, pp. 145-147. Southern blacks also attempted black owned banks, 144-145. Unfortunately, these extraordinary examples of black progress during Reconstruction did little to influence black biological living conditions at the lower ordinal ranks of late 19th century southern society.

[5] Maloney, "Degrees of Inequality" and "African Americans in the 20th Century"; Fite, "The Agricultural Trap in the South," p. 46, suggests that there were insufficient non-farm occupations to absorb the surplus of southern farm labor hours that resulted from emancipation. Moreover, blacks faced more rigid hiring opportunities because the available factory jobs that were available were restricted to whites, p. 46.

Source: see Table 4.

The youth height pattern by age is itself noteworthy, and whites were ubiquitously taller than blacks (Figure 3). While 15 year old black stature growth was impressive, it was less impressive after 16, which is consistent with Cuff (2005, p. 16) and Steckel (1979, pp. 374-376). Taller white youth stature in the Missouri prison indicates that biological disparity started early and lasted throughout life.

4. Stature, Birth Period, Occupations and Nativity

Black and white statures were related to age, socioeconomic status and birth cohorts; they were also related to nativity, residence within Missouri and proximity to the Mississippi and Missouri rivers. Tables 4 and 5 regress individual youth and adult statures on observable characteristics. Models 1 in both Tables 4 and 5 regress stature on the entire black and white samples. To compare how Missouri biological conditions contrasted with the rest of the United States, Model 2 regresses only Missouri-born male stature on characteristics. Model 3 regresses stature on only white male characteristics, while Model 4 does the same for blacks. By using Table 4 and 5's birth decade coefficients, Figure 4 isolates black and white stature variation over time.

Table 4, Missouri Youth Stature by Age, Birth, Occupations and Nativity

	All (Coeff)	(P-Value)	*Missouri* (Coeff)	(P-Value)	*White* (Coeff)	(P-Value)	*Black* (Coeff)	(P-Value)
Intercept	171.98	<.01	173.39	<.01	172.61	<.01	166.55	<.01
Black	-2.75	<.01	-2.99	<.01				
Ages								
15	-7.35	<.01	-6.62	<.01	-6.51	<.01	-7.63	<.01
16	-4.06	<.01	-4.05	<.01	-4.50	<.01	-3.68	<.01
17	-3.05	<.01	-2.78	<.01	-3.02	<.01	-3.08	<.01
18	-1.84	<.01	-1.63	<.01	-1.65	<.01	-2.18	<.01
19	-1.01	<.01	-1.03	<.01	-1.07	<.01	-.895	.01
20	-.686	<.01	-.412	.14	-.66	.01	-.811	.02
21	-.297	.14	-.142	.61	-.379	.12	-.152	.67
22	Ref.		Ref.		Ref.		Ref.	
Birth Cohort								
Before 1840	Ref.		Ref.		Ref.		Ref.	
1850	-.828	.13	-2.33	.23	-1.17	.04	1.46	.38
1860	.447	.43	-1.11	.57	.497	.41	1.95	.25
1870	.482	.36	-1.12	.56	-.076	.89	3.09	.06
1880	.194	.72	-1.32	.49	-.290	.61	2.69	.10
1890	.125	.81	-1.44	.45	-.345	.54	2.63	.11
1900	.333	.60	-.997	.61	-.316	.65	3.22	.07
Occupations								
White-collar	-.680	.01	-1.06	<.01	-.770	<.01	-.289	.65
Skilled	.325	.09	-.333	.21	-.448	.03	.037	.94
Farmer	1.13	<.01	1.74	<.01	.825	<.01	1.99	<.01
Unskilled	Ref.		Ref.		Ref.		Ref.	
Birth Region								
Northeast	-2.32	<.01	Missouri-born only		-2.67	<.01	-.597	.74
Middle Atlantic	-1.12	<.01			-1.27	<.01	-1.20	.21
Great Lakes	-.582	<.01			-.754	<.01	-.205	.67
Plains	Ref.				Ref.		Ref.	
Southeast	.203	.41			-.029	.93	.531	.16
Southwest	.478	.23			-.507	.34	1.71	<.01
Far West	.422	.44			-.395	.51	2.80	.02
Black Belt	.142	.67			.084	.86	.040	.93
N	10,460		5,825		6,608		3,852	
R^2	.0806		.0986		.0426		.0537	

Source: See Table 1.

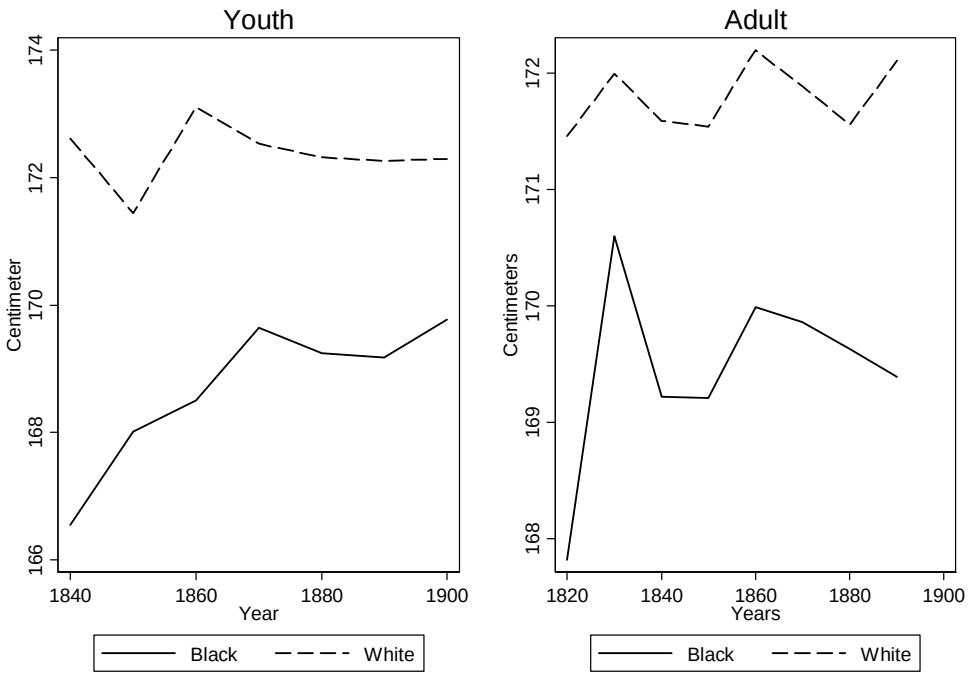
Notes: The US geographic classification scheme is consistent with Carlino and Sill (2000): New England= CT, ME, MA, NH, RI and VT; Middle Atlantic= DE, DC, MD, NJ, NY, and PA; Great Lakes= IL, IN, MI, OH, and WI; Plains= IA, KS, MN, MO, NE, ND, and SD; South East= AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, and WV; South West= AZ, NM, OK, and TX; Far West= CA, CO, ID, MT, NV, OR, UT, WA, and WA.

Table 5, Missouri Adult Stature by Birth, Occupations and Nativity

	All (Coeff)	(P-Value)	*Missouri* (Coeff)	(P-Value)	*White* (Coeff)	(P-Value)	*Black* (Coeff)	(P-Value)
Intercept	171.15	<.01	172.20	<.01	171.46	<.01	167.82	<.01
Black	-1.98	<.01	-2.22	<.01				
Birth Cohort								
1820	Ref.				Ref.		Ref.	
1830	.851	.11	Ref.		.537	.80	2.78	.04
1840	.305	.51	-.310	.78	.131	.80	1.40	.23
1850	.268	.55	-.654	.55	.082	.87	1.39	.23
1860	.964	.03	-.047	.97	.737	.13	2.17	.06
1870	.725	.10	-.242	.82	.426	.38	2.04	.07
1880	.450	.32	-.427	.69	.098	.84	1.81	.11
1890	.739	.11	-.387	.72	.645	.21	1.57	.17
Occupations								
White-collar	-.037	.82	-.468	.07	-.036	.84	.138	.72
Skilled	-.265	.02	-.526	<.01	-.101	.43	-.835	<.01
Farmer	.795	<.01	1.28	<.01	.764	<.01	1.09	<.01
Unskilled	Ref.		Ref.		Ref.		Ref.	
Birth Region								
Northeast	-.933	.02	Missouri-born only		-1.38	<.01	1.92	.19
Middle Atlantic	-1.30	<.01			-1.52	<.01	-.263	.634
Great Lakes	-.134	.32			-.280	.05	.323	.40
Plains	Ref.				Ref.		Ref.	
Southeast	.523	<.01			.249	.20	.954	<.01
Southwest	.870	<.01			.850	.05	.969	.04
Far West	.330	.38			.099	.82	1.04	.15
Black Belt	.117	.58			.093	.76	-.009	.98
N	19,708		8,804		13,629		6,079	
R^2	.0249		.0347		.0118		.0113	

Source: See Table 2.

Figure 4, Missouri 19th Century Black and White Stature



Source: See Tables 4 and 5.

Two general patterns emerge when comparing black and white stature variations. First, it is striking the degree to which average white stature exceeds black stature.[6] This is even more significant since modern black and white statures are comparable when brought to maturity under optimal biological conditions (Eveleth and Tanner, 1976; Tanner, 1977; Steckel, 1995, p. 1910; Barondess, Nelson and Schlaen, 1997, p. 968; Komlos and Baur, 2004, pp. 64, 69; Nelson et al., 1993, pp. 18-20; Godoy et al, 2005, pp.

[6] Margo, and Steckel "Work, Disease and Diets," pp. 514-515, 517 and 519, find that southern whites were nearly 2 inches taller than southern blacks, and that compositional effects can not explain the difference; Margo, and Steckel, "Heights of American Slaves," p. 519.

472-473). However, comparison of 19th century blacks and whites in Missouri confirms that blacks were physically shorter than whites.

Figure 4's second pattern is that both black and white average statures approximately varied with institutional change (Conrad and Meyer, 1964, pp. 50 and 75). During the antebellum period, black youth stature increased by over two centimeters, while young white statures remained constant at 172 centimeters, and young black statures may have declined during Reconstruction. Adult black statures increased during the early antebellum period, while adult white statures remained approximately constant throughout the 19th century. Missouri-born adults were also considerably taller than other inmates for much of the century, however declined after slavery.

For several other categories, expected patterns hold. Black and white farmers were taller than white-collar, skilled and unskilled individuals. Individuals from the Southwest were taller than those from the Plains (Margo, 2000, pp. 72-73, Tables 3A.10 and 3A11; Rosenbloom, 2002, pp. 53, 124-125). Although Southern wages were generally lower than Northern wages, West South Central laborer wages were comparable to those in the Middle-Atlantic regions. Moreover, limited skilled immigration to the Southwest created a relative scarcity of skilled labor, which may have increased their material and biological conditions (Rosenbloom, 2002, pp. 53, 124-125)

Table 6, Missouri Youth and Adult Stature Regression with Residence and Proximity to Water, 1890-

	Whites Coeff.	p-value	*Blacks* Coeff.	p-value	*Youths* Coeff.	p-value	*Adults* Coeff.	p-value
Intercept	171.42	<.01	166.78	<.01	171.82	<.01	170.67	<.01
Black					-2.43	<.01	-1.65	<.01
Ages								
17	-3.45	<.01	-3.86	<.01	-3.09	<.01		
18	-1.48	<.01	-2.41	<.01	-1.34	<.01		
19	-1.32	<.01	-1.27	<.01	-.847	<.01		
20	-.391	.23	-.963	.05	-.130	.69		
21	.147	.65	-.542	.17	.319	.33		
22	-.378	.23	-.494	.21	Reference			
23-55	Reference		Reference					
Birth Cohort								
1850	Reference		Reference				Reference	
1860	-.175	.78	3.00	.08			.441	.47
1870	.122	.84	3.33	.04			.792	.17
1880	-.104	.97	3.08	.08	Reference		.630	.27
1890	.341	.57	2.93	.08	-.060	.83	.933	.11
1900	.400	.60	3.83	.03	.155	.75		
Occupations								
White-collar	-.003	.99	.139	.76	-.348	.38	.111	.64
Skilled	.156	.36	-.549	.14	-.285	.35	-.048	.79
Farmer	.764	<.01	1.29	.01	1.39	<.01	.637	.02
Unskilled	Reference		Reference		Reference		Reference	
Birth Region								
Northeast	-.978	.15	2.55	.08	-2.52	.04	.078	.91
Middle Atlantic	-1.19	<.01	-.991	.24	-1.27	.04	-1.01	<.01
Great Lakes	-.444	.02	.726	.13	-1.12	<.01	.106	.62
Plains	Reference		Reference					
Southeast	.661	.02	1.39	<.01	.203	.62	1.25	<.01
West	.524	.11	1.13	<.01	.520	.23	.850	<.01
Black Belt	-.498	.29	-.322	.43	.012	.98	-.440	.22
Missouri								

County								
North	.419	.04	.046	.88	.381	.22	.196	.33
Central	Reference		Reference					
South	.592	<.01	.674	.03	-.003	.99	.770	<.01
Mississippi River	-.536	<.01	-1.20	<.01	-.933	<.01	.685	<.01
R^2	.0178		.0327		.0668		.0291	
N	7,852		4,293		3,781		8,364	

Source: See Table 1.

Notes: See Table 1 for American nativity classification. See Figure 4 for Missouri classification.

Using over 7,800 observations for inmates received between 1890 and 1920, the relationship between residence at time of incarceration, proximity to water and stature are evaluated (Table 6). Missouri residence augments patterns already observed in two ways. First, regions are classified into three general categories: Northern, Central and Southern Missouri (Figure 1). Northern Missouri was composed mostly of fertile farmlands formed during Nebraskan glaciacian; Central Missouri had greater population concentrations, and early industrial centers near Saint Louis; Southern Missouri had greater access to animal proteins and dairy products (Figure 1). Individuals from southern Missouri counties were taller than individuals from northern counties. While southern Missouri was closer to the South's slavery stronghold, Missouri's southern Ozark's specialized in beef production, and animal fats and dairy production were propitious to stature growth, indicating that proximity to animal and dairy products contributed more to human growth than access to grains (Cuff, 2005, pp. 207, 216).

Nineteenth century roximity to water may have been related to stature in at least one of two ways.[7] Close proximity to major water ways created access to trade routes, which may have improved biological conditions because agricultural products were more easily imported; access to water would have had a positive relationship with stature. Alternatively, proximity to rivers can be a drain on local resources because agricultural products can be more easily exported, which is likely the case with Missouri's agricultural surplus. Closer proximity to rivers also increases exposure to disease vectors, such as insects and bacteria.[8] Malaria and yellow fever are two insect-born diseases spread by mosquitoes. Tubular bascilli and vibrio cholerae are two bacteria diseases causing tuberculosis and cholera, which were prominent 19th century diseases, all prominent diseases in the 19th century South (Crimmens and Condran, 1983, p. 33; Breeden, 1985). Higher disease rates in regions with closer proximity to water, in turn, would have increased calorie requirements used to fend off disease, taking precious calories away from stature growth. In this case, access to rivers would have a negative relationship with stature (Cuff, 2005, p. 217). The overall effect of close proximity to a major waterway in Missouri was negative, which held for both whites and blacks, indicating water access was a biological drain in 19th century agriculturally rich farmlands.

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[7] Missouri counties that share a border with the Mississippi river are Clark, Lewis, Marion, Ralls, Pike, Lincoln, Saint Charles, Saint Genevieve, Saint Louis, Jefferson, Perry, Cape Girardeau, Scott, Mississippi, New Madrid, and Pemiscot counties.

[8] Haines, Craig and Weis, "The Short and the Dead," p. 395; Craig and Weiss, 1998, 197-198.

5. Conclusion

Black stature in the 19th century American South increased during the antebellum period, yet experienced a significant decline with the removal of slavery, which is consistent with the Rees, et al, hypothesis that Southern slave owners and overseers consciously manipulating slave food and health allocations to maximize slave-owners' wealth. However, once removed, black statures experienced a short-run diminution, which recovered by the end of the 19th century. On the other hand, white youth stature was roughly constant throughout the antebellum period but was adversely affected by the removal of slavery and Reconstruction, indicating that institutional change in the American South influenced both blacks and whites. The Missouri prison sample confirms several other patterns observed in other 19th century American samples. First, blacks and whites from the South were taller than their northerly born counterparts, suggesting that although the South experienced higher disease rates, the net benefit from Southern nativity was positive. Second, farmers consistently benefited from close proximity to nutritious food sources, mild disease environments and removal from population centers. Stature was also sensitive to proximity to water and individuals in counties that shared borders with the Mississippi or Missouri Rivers were consistently shorter than those who did not. The Missouri sample also contrasts the prominent types of agriculture related to stature growth. Northern Missouri specialized in grain, which contains essential amino acids related to growth. However, southern Missouri was suitable for animal husbandry and dairy production, which contributed more to stature growth than access to grains, and Southern Missourians reached taller statures than elsewhere within the state.

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