Nineteenth Century US African-American and White Female Statures: Insight from US Prison Records

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Abstract

Using a new source of 19th century state prison records, this study contrasts the biological living conditions of comparable US African-American and white female statures during economic development. Black and white female statures varied regionally, and white Southeastern and black Southwestern females reached the tallest statures. White females were consistently taller than black females. Black and white female statures also varied over time with emancipation and were similar to black male stature variation, indicating that 19th century female net cumulative biological living conditions were similar to the lowest ranks of US male society.

JEL-Code: I10, I12, J15, J16, N00.

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1. Introduction

Industrialization and modernization frequently bring about rising incomes, wages, and life expectancy, particularly in the long run (Komlos, 1985, 1987; Floud, Wachter and Gregory, 1990, pp. 272-273; Margo, 2000; Williamson and Lindert, 1980). However, in the short run economic change also creates social turmoil, such as increasing inequality, crime, and a more virulent disease environment, which leads to deteriorating biological conditions. Hence, industrialization's relationship with biological living conditions depends on which effect dominates. A large body of evidence indicates that during the earliest stages of 19th century US industrialization that the net effect on free populations was negative (Margo and Steckel, 1983; Cuff, 2005; p. 216; Carson, 2009, p. 151-154). A persistent yet unanswered question is how female statures and health varied during industrialization and economic development. Female statures may have improved with industrialization when material wealth increased or may have deteriorated if the effects of urbanization and industrialization disproportionately fell on females and young children. This paper, therefore, considers female stature variation during 19th century US industrialization and urbanization.

The use of height data to measure living standards is now a well-established method in economics (Fogel, 1994, p. 138; Strauss and Thomas, 1998; Deaton, 2008; Case and Paxson, 2008). A populations' average stature reflects the cumulative interaction between nutrition, disease exposure, work, and the physical environment (Steckel, 1979, pp. 365-367). 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. By considering average versus individual stature, genetic differences are mitigated, leaving only the influence of economic and physical environments on stature. Therefore, stature provides considerable insights into understanding historical processes and augments other 19th century black and white female welfare measures. However, because there was little motivation to record and preserve female statures, our understanding of 19th century US female stature variation remains limited (Komlos, 1992). By using a new source of US prison records, the present study contrasts similar black and white female statures throughout the 19th century.

It is against this backdrop that this paper addresses three questions concerning 19th century African-American and white female statures. First, how did female statures vary by US and international nativity? Black and white US females reached taller statures than females from other countries, and within the US, white Southeastern and black Southwestern females reached the tallest statures. Second, after controlling for both nativity and the physical environment, how did black and white female statures compare by race? Like males, white female statures were consistently taller than their black female counterparts, and there is limited evidence of a female mulatto stature advantage (Steckel, 1979; Bodenhorn, 1999 and 2001; Carson, 2008 and 2009). Third, how did female statures vary throughout the 19th century? Black and white female statures varied with US industrialization and emancipation, and female stature variation was similar to comparable US male stature variation.

2. Nineteenth Century US Prison Data

The data used here to study black and white female statures is part of a large 19th century prison sample. All state prison repositories were contacted and available records were acquired and entered into a master data set. These prison records include Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Maryland, Mississippi, Missouri, Montana, Nebraska, New Mexico, Ohio, Oregon, Pennsylvania, Philadelphia County, Tennessee, Texas, and Washington (Table 1). There are 7,397 19th century black and white female observations in the sample. Most black females were imprisoned in the Deep South or Border States—Maryland, Tennessee, and Texas. Most white females in the sample were imprisoned in Pennsylvania, Ohio, and Missouri. The Far West is also represented in the sample.

Table 1, Nineteenth Century US State Penitentiaries

	Black		*White*	
Prison	N	Percent	N	Percent
Arizona	8	.17	12	.42
California	8	.17	62	2.20
Colorado	103	2.25	177	6.27
Idaho	5	.11	12	.42
Illinois	51	1.12	153	5.42
Kansas	26	.57	37	1.31
Kentucky	94	2.06	37	1.31
Maryland	775	16.95	289	10.23
Missouri	578	12.64	354	12.54
Mississippi	182	3.98	3	.11
New Mexico	9	.20	17	.60
Ohio	230	5.03	386	13.67
Oregon	0	0	5	.18
Pennsylvania	238	5.20	295	10.45
Philadelphia	428	9.36	741	26.24
Tennessee	903	19.75	161	5.70
Texas	935	20.45	83	2.94
Total	4,573	100.00	2,824	100.00

Source: Data 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, Texas, Utah and Washington.

Notes: Stature is in centimeters. The occupation classification scheme is consistent with Ferrie (1997).

All historical stature data have various biases, and prison and military records are the most common source of historical stature data. Since 19th century females were not soldiers, few institutions had a reason to record female statures (Fogel et al, 1978, p. 85; Sokoloff and Vilaflor, 1982, p. 457, Figure 1). Fortunately, prison records consistently enumerated female statures with their characteristics. However, the prison records are not above scrutiny, such as being drawn from lower socioeconomic groups, that segment of society most vulnerable to economic change (Bogin, 1991, p. 288; Komlos and Baten, 2004, p. 199). This selectivity is acceptable, because 19th century females' occupied social positions little higher than black males and other minorities. For height as an indicator of biological variation, the 19th century US female prison data creates an untapped source for black and white female statures that until the present study have remained unexamined.

Between 1812 and 1922, prison officials routinely recorded the dates inmates were received, age, complexion, nativity, height, pre-incarceration occupation, and crime. Physical descriptions were recorded by prison enumerators at the time of incarceration as a means of identification, therefore, reflect pre-incarceration conditions, and all records with complete age, stature, occupations, and nativity were collected. There also is concern over entry requirements, and arrests and prosecutions across states may have resulted in various selection biases that may affect the results of this analysis. However, black and white male stature variation in U. S. prisons is consistent with other stature studies (Steckel, 1979; Margo and Steckel, 1982; Nicholas and Steckel, 1991, pp. 941-943; Komlos, 1992; Komlos and Coclanis, 1997; Bodenhorn, 1999; Sunder, 2004). Because the purpose of this study is 19th century female statures, males are excluded from the analysis.[1]

African and European Americans within the 19th century US were from two prominent racial groups. Fortunately, inmate enumerators were quite thorough when recording inmate complexion, birth, and nativity. For example, enumerators recorded inmates' race in a complexion category, and African-Americans were recorded as black, light-black, dark-black, and various shades of mulatto (Komlos and Coclanis, 1997). Enumerators recorded white complexions as light, medium, dark, and fair. The white inmate complexion classification is further supported by European immigrant complexions, who were always of fair complexion and were also recorded as light,

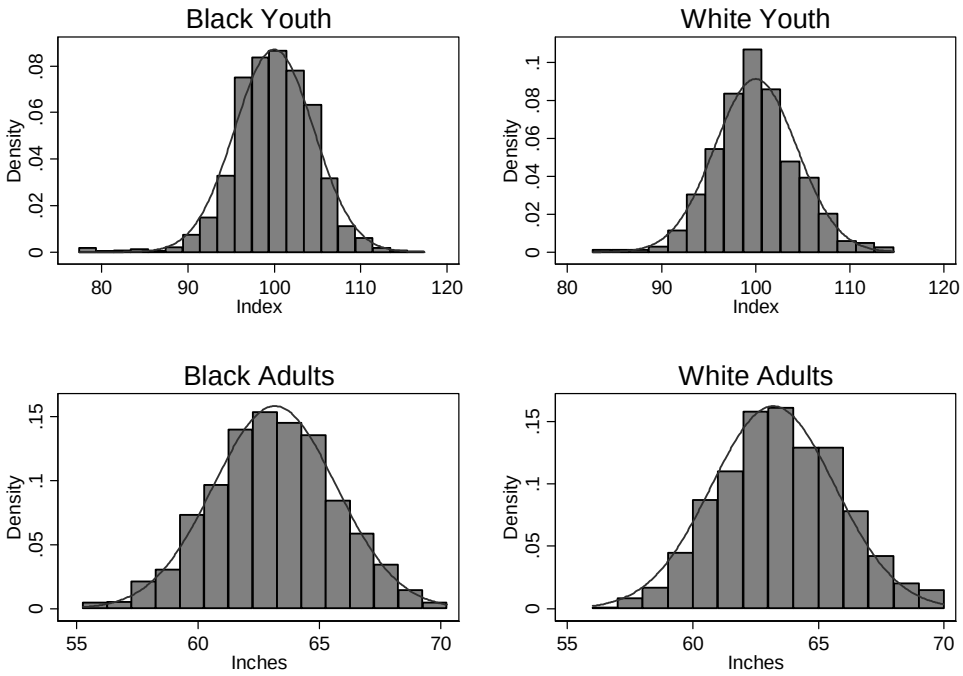
[1] We also do not know the degree to which each state housed males with females. However, existing records suggest males and females were kept separately.

medium, and dark in US prisons.[2] While mulatto inmates possessed genetic traits from both European and African ancestry, they were treated as blacks in the 19th century US and when comparing whites to blacks, are grouped here with blacks.

Because the youth height distribution is itself a function of the age distribution, a youth height index is constructed that standardizes for age to determine if female youth statures were distributed symmetrically and whether there were arbitrary truncation points imposed on inmate stature either by law enforcement or state legislation. The age-adjusted youth stature index is calculated by first calculating the average stature for each age group; each observation is then divided by the average stature for that relevant age group (Komlos, 1987, p. 899). Figure 1 demonstrates that black and white female statures were distributed symmetrically and there is little evidence of age heaping or arbitrary truncation points.

[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, no inmate in an Irish prison has been recorded with a complexion consistent with African heritage.

Figure 1, Nineteenth Century Black and White Youth and Adult Stature Histograms



Source: See Table 1.

Table 2, National Prison Data White and Black Female Descriptive Statistics

	White				*Black*			
Ages	N	Percent	Mean	S.D.	N	Percent	Mean	S.D.
Teens	417	14.77	159.08	6.80	1,410	30.83	158.63	7.27
20s	1,213	42.95	160.67	6.83	2,256	49.33	160.13	7.01
30s	719	25.46	161.10	6.75	616	13.47	160.70	7.28
40s	330	11.69	159.69	6.39	202	4.42	159.88	7.29
50s	102	3.61	160.47	6.68	65	1.42	160.26	7.15
60s	43	1.52	157.74	7.29	24	.52	159.94	7.12
Birth Decade								
1770s	49	1.74	158.17	6.90	44	.96	158.65	5.12
1780s	64	2.27	159.04	6.56	70	1.52	158.28	7.61
1790s	86	3.05	159.90	6.40	180	3.94	158.73	6.64
1800s	45	1.59	159.36	7.83	215	4.70	157.78	6.31
1810s	84	2.97	159.62	7.56	175	3.83	157.41	7.15
1820s	150	5.31	158.90	6.68	129	2.82	157.78	7.29
1830s	263	9.31	159.02	6.32	139	3.04	158.29	7.25
1840s	492	17.42	159.75	6.65	353	7.72	158.49	7.91
1850s	483	17.10	159.88	6.96	517	11.31	158.39	8.06
1860s	353	12.50	161.44	6.26	612	13.38	160.24	6.88
1870s	359	12.71	161.80	6.48	965	21.10	161.01	7.07
1880s	264	9.35	162.28	6.80	829	18.13	160.78	6.78
1890s	132	4.67	161.04	7.64	345	7.54	160.69	6.22
Nativity								
North East	50	1.77	160.33	6.45	15	.33	158.88	6.07
Middle Atlantic	944	33.43	159.54	6.20	1,344	29.39	157.49	7.02
Great Lakes	503	17.81	161.79	7.21	183	4.00	160.15	6.05
Plains	279	9.88	162.32	6.76	446	9.75	161.25	7.14
Southeast	412	14.59	162.33	6.85	1,727	37.77	160.44	7.09
Southwest	80	2.83	160.39	7.81	812	17.76	161.14	7.04
Far West	77	2.73	160.54	6.83	16	.35	157.56	9.53
International Nativity								
Britain	379	13.42	158.34	6.17	9	.20	156.42	8.40
Europe	89	3.15	155.10	5.61	3	.07	157.06	2.64
Other	11	.39	157.60	3.24	18	.39	157.97	5.23
Total	2,824	100.00			4,573	100.00		

Source: See Table 1.

Notes: Stature is in centimeters. Youth age is between ages 15 and 22. 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 WY. Stature difference is average white stature less average black stature.

Table 2 presents black and white female inmates' height, age, birth decade, and nativity proportions. Although average statures are included, they are not reliable because of possible compositional effects, which are accounted for in the regression models that follow. Whites were a smaller portion of the prison population than blacks; 38 percent of the US female prison population was white. Age percentages demonstrate that black females were incarcerated at younger ages, while whites were incarcerated at older ages. Southern law evolved to favor plantation law, which allowed slave owners to recover slave labor on plantations while slaves were punished (Komlos and Coclanis, 1997, p. 436; Wahl, 1996, 1997; Friedman, 1993). Black females took up larger female proportions after emancipation. However, with passage of the 13th amendment, slave owners no longer had claims on black labor, and free black females who broke the law were turned over to state penal systems to exact their social debt.

3. The Comparative Effects of Demographics, Socioeconomic Characteristics on Black and White Female Statures

Nineteenth century black and white female statures were related to race, age, birth year, and nativity. We test which of these variables were associated with 19th century US black and white female stature variation.

$$\text{Cent}_i = \alpha + \sum_{r=1}^{2} \beta_r \text{Race}_r + \sum_{a=1}^{14} \beta_a \text{Age}_i + \sum_{b=1}^{13} \beta_b \text{Birth Decade}_i + \sum_{j=1}^{10} \beta_j \text{Nativity}_i + \varepsilon_i$$

Dummy variables are included for black and mulatto complexions. Youth dummy variables are added for ages 14 through 22; adult age dummies are included in ten-year age dummies between their 30s and 60s. Birth decade dummy variables are in ten-year intervals from 1770 and 1899. Nativity dummy variables are included for US regional birth and foreign nativities.

Table 3's model 1 combines both black and white females. Model 2 omits international migration and considers only black and white females who were born in the US. Model 3 regresses white female statures on characteristics, while model 4 does the same for blacks.

Table 3, National Female Stature Models by Race

	Model 1, Total Sample	*S.E.*	*Model 2, Non-Migrants*	*S.E.*	*Model 3, Whites*	*S.E.*	*Model 4, Blacks*	*S.E.*
Intercept	162.65***	.314	162.67***	.318	163.07***	.499	161.07***	.353
Race								
Black	-1.45***	.208	-1.48***	.210			Reference	
Mulatto	-1.16***	.243	-1.20***	.245			.264	.218
White	Reference		Reference		Reference			
Ages								
14	-7.06***	.936	-7.05***	.935	-6.24***	2.46	-7.12***	.977
15	-3.32***	.798	-3.33***	.819	-2.96*	1.75	-3.35***	.891
16	-2.83***	.492	-2.80***	.493	-3.24***	1.12	-2.82***	.547
17	-1.37***	.354	-1.35***	.360	-2.53***	.582	-1.09***	.432
18	-1.26***	.318	-1.18***	.321	-1.54***	.613	-1.20***	.375
19	-1.00***	.340	-1.07***	.342	-1.26*	.689	-.895**	.388
20	-.731**	.355	-.728**	.360	-1.34**	.672	-.574	.421
21	-.594*	.355	-.631*	.361	-.018	.678	-.883**	.413
22	-.533	.365	-.548	.370	-.143	.593	-.737*	.459
23-29	Reference		Reference		Reference		Reference	
30s	.761***	.245	.689***	.259	.872**	.354	.562	.349
40s	.056	.344	.115	.379	-.055	.436	.256	.572
50s	.846	.544	1.15*	.628	.917	.696	.692	.928
60s	-.630	.926	-.400	.956	-1.66	1.17	.871	1.57
Birth Period								
1770	-1.33*	.705	-.383	.750	-2.08**	1.06	-.688	947
1780	-1.12*	.655	-.696	.709	-1.71**	.861	-.695	.993
1790	.169	.492	.313	.513	-.278	.775	.552	.661
1800	-.679	.486	-.512	.494	-.766	1.15	-.417	.588
1810	-.831*	.507	-.786	.520	-.770	.868	-.659	.648
1820	-1.18**	.488	-.944*	.535	-1.56**	.662	-.869	.745
1830	-1.15***	.419	-.785*	.474	-1.53***	.545	-.800	.704
1840	-1.01***	.348	-1.11***	.365	-1.21***	.475	-.955*	.530
1850	-1.25***	.323	-1.34***	.329	-1.24***	.463	-1.35***	.452
1860	Reference		Reference		Reference		Reference	
1870	.229	.284	.253	.285	-.300	.470	.458	.356
1880	.115	.299	.142	.301	.215	.542	.138	.367
1890	-.160	.380	-.145	.381	-.941	.755	.180	.443
Nativity								
Northeast	-1.54*	.798	-1.58*	.795	-1.97**	.971	-.762	1.41
Middle Atlantic	-2.35***	.263	-2.45***	.266	-2.32***	.416	-2.53***	.379
Great Lakes	-.307	.315	-.318	.315	-.423	.466	-.525	.476
Plains	.281	.304	.284	.304	-.173	.522	.518	.383
Southeast	Reference		Reference		Reference		Reference	

Southwest	.404	.287	.403	.287	-1.96**	.928	.643**	.3045
Far West	-2.09***	.770	-2.09***	.771	-1.99**	.847	-3.28	2.19
International Nativity								
Europe	-6.52***	.650			-6.75***	.722	-3.45**	1.35
British	-3.56***	.425			-3.68***	.513	-4.17	2.75
Other International	-2.84***	.828			-4.20***	1.11	-1.97*	1.14
N	7,397		6,885		2,824		4,573	
R^2	.0781		.0727		.0887		.0756	
F	18.00		16.46		9.20		10.72	

Source: See Table 1.

Notes: See Table 2 notes for birth classification.

Three paths of enquiry are considered when comparing 19th century black and white female statures. First, black and white female statures varied by nativity, and after controlling for other variables, white Southeastern and black Southwestern females were taller than their counterparts from elsewhere within the US (Table 3). Part of the Southern stature advantage was related to Southern agriculture. The 19th century opening of the New South to agriculture increased Southern agricultural productivity, which was higher than elsewhere within the US (Higgs, 1977, p. 24; Margo and Steckel, 1982, p. 519; Komlos and Coclanis, 1997, p. 443). Before the Civil War, the South was self-sufficient in food production and relatively high white wages may have also influenced Southern white female statures (Fogel, 1994, pp. 89, 132-133). After the Civil War, Southern wages in the West South Central were in general lower than Midwest wages and comparable to those in the Middle Atlantic region. Black females from the Great Lakes were taller than black females from the Northeast and Plains. US born females were also taller than their British and European-born counterparts.

Second, it is striking the degree to which white female statures exceed black statures, which is significant because modern black and white statures have the ability to reach comparable levels when brought to maturity under similar biological conditions (Eveleth and Tanner, 1976; Tanner, 1977; Steckel 1995, p. 1910; Barondess et al., 1997, p. 968; Komlos and Baur, 2004, pp. 64 and 69; Nelson et al., 1993, pp. 18-20; Godoy et al., 2005, pp. 472-473; Margo and Steckel, 1982, p. 519). Moreover, compositional effects can not explain the black-white stature differential, which was due, in part, to whites' access to meat and better nutrition (Margo and Steckel, 1982 pp. 514-515, 517, and 519). Much has also been written about the 19th century male mulatto stature advantage, and mulatto females may have been taller than their darker complexioned counterparts, indicating that, although it was less pronounced, there may have been a 19th century US female mulatto stature advantage (Steckel, 1979; Bodenhorn, 1999 and 2001; Carson, 2008 and 2009).

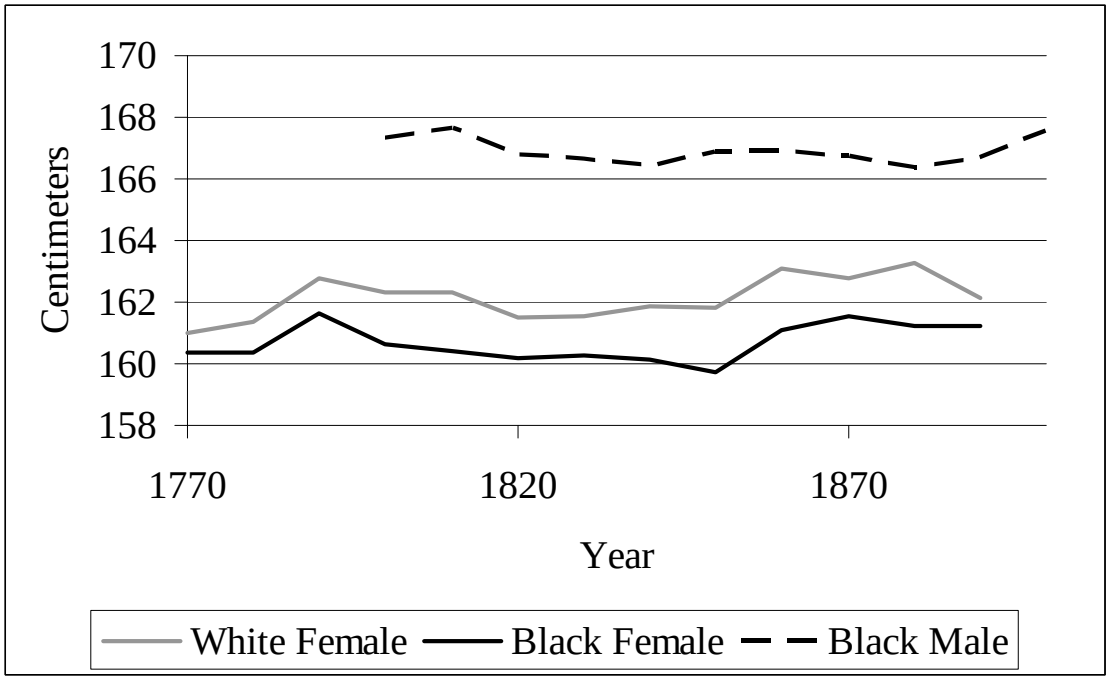


Figure 2, Nineteenth Century Black and White Female Stature Variation by Birth Period
Source: See Table 3, Models 3 and 4. Black male statures are from Carson (2008).

Third, black and white female statures varied considerably over the course of the 19th century (Figure 2). Between 1770 and 1810, white female statures increased by over one cm. Although black female statures increased between 1770 and 1790, the late 18th century black female stature decline began earlier than for early 19th century white females. Between 1820 and 1850, both black and white female statures stagnated (Komlos, 1992, p. 311). This 19th century black female stature decline is even more striking compared to black male statures over the same period. Between 1840 and 1860, black male statures increased by nearly one cm, indicating that black females probably did not share in the late antebellum prosperity experienced by black males (Carson, 2008, pp. 822-825; Carson, 2009, pp. 154-157). Similar to the trend in black male statures, white female statures increased in the decade prior to the Civil War and declined once the institution of slavery was eliminated (Carson, 2009, p. 154), indicating that the economic and biological disruptions created by the removal of slavery fell on Southern females. The 1890's white female stature decline also corresponds with the 1890's economic turmoil, and statures are related with stages of the business cycle (Woitek, 2003). To sustain farm production as economic and nutritional conditions varied, households reallocated nutritional allotments to males who were engaged in agricultural production, and black and white female biological living conditions disproportionately experienced the sting of 19th century US economic development. Female stature variation, therefore,

suggests that 19th century female statures and health bore the brunt of US industrialization.

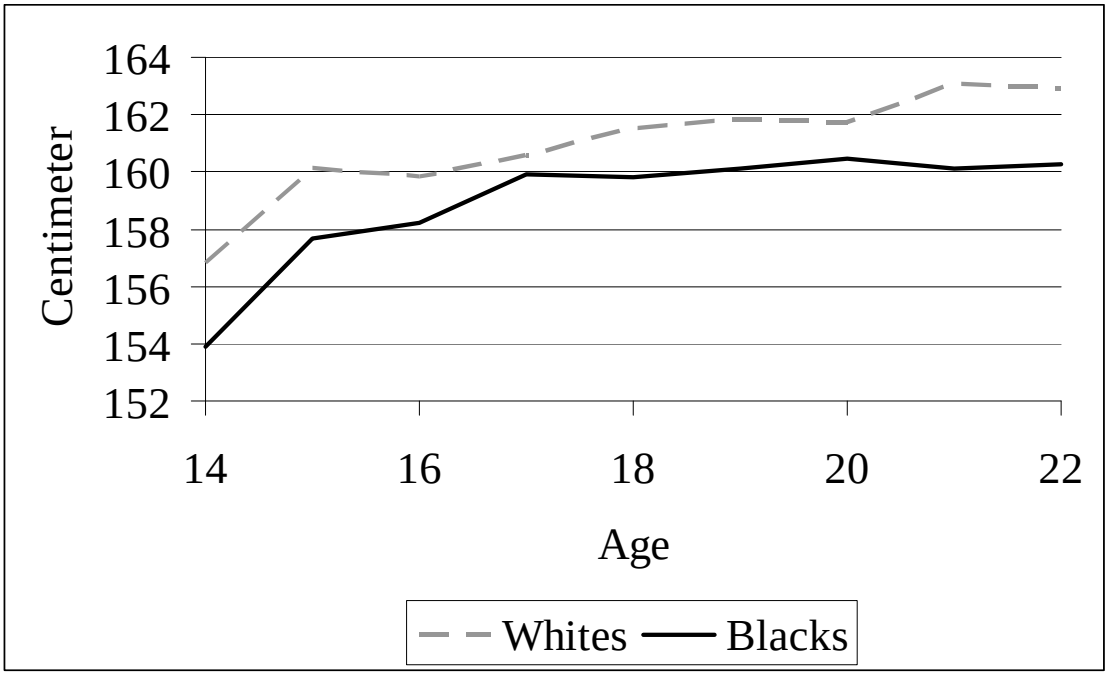


Figure 3, Nineteenth Century Black and White Female Stature Variation by Age

Source: See Table 3, Models 3 and 4.

Other patterns are consistent with expectations, and the youth height pattern by age is itself noteworthy. Stature is related to age, and delayed adult stature is a sign of inferior biological conditions (Figure 3). The relationship is further complicated by sexual dimorphism between males and females, and although females reach shorter terminal statures, female teen growth spurts begin earlier than males and end about 18 months earlier (Tanner, 1977). We, therefore, expect that young adult female terminal

statures are reached between 17 and 19 years old.[3] Nineteenth century female statures increased rapidly with age in their early teen years, and black female statures reached adult terminal statures by age 17, which is comparable to that found by Komlos (1992). However, white female statures continued to increase into their 20s, suggesting that 19th century black females reached terminal statures by their late teens, while young white female stature growth continued into their 20s. Therefore, 19th century female stature variation was the result of a complex set of demographic, nativity, and socioeconomic characteristics, and female stature variation was similar to the lowest socioeconomic status 19th century males.

4. Conclusion

Nineteenth century males reached taller statures than females, and because females did not serve in the military or commit a sufficient number of crimes to produce sufficiently large samples of females, 19th century female stature studies have been slow to emerge. This project, however, collects female statures from several 19th century US state penitentiaries and sheds new light on the status of 19th century black and white female biological living conditions during industrialization. First, white Southeastern and black Southwestern female statures were taller than elsewhere within the US and internationally, suggesting superior biological environments that accrued to North American females. Second, like male statures, white females were taller than black females, and there is limited evidence of a 19th century female mulatto stature advantage. Third, black and white female statures varied throughout the 19th century industrialization, emancipation, and were similar to stature variation experienced by the

[3] Males typically reach taller terminal statures than females between 18 and 21 years of age.

lowest segment of 19th century male society, indicating that 19th century females disproportionately experienced biological disruption during economic development. Therefore, 19th century black and white female stature variation was the result of a complex set of socioeconomic variables, and female stature variation was similar to the stature variation among the lowest male African-American economic and social class.

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