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A Post Bellum Paradox: Net Nutrition Variation by Socioeconomic Status, Gender and Race in the Late 19th Century

Abstract

When traditional measures for material conditions are scarce or unreliable, body mass, height, and weight are complements to standard income and wealth measures. A persistent question in welfare studies is the 19th century's 2nd and 3rd quarter's stature diminution, a pattern known as the antebellum paradox. However, the question may not be well stated nor experienced equally by women and non-white male samples. The late 19th century's political Granger, Greenback, and Populist movements may have affected farmer and non-farmer's net nutrition. Despite 19th and early 20th century US political movements, farmers had greater BMIs, taller statures, and heavier weights than non-farmers. From the 1870s through 1890s, women's body mass, height, and weight increased relative to men. Darker complexioned individuals had heavier weights and greater BMIs than their taller, fairer complexioned European counterparts, indicating that the traditional antebellum paradox needs to include women and non-European males and weight measures.

JEL-Codes: C100, C400, D100, I100, N300.

Keywords: gender, race, stature variation, cumulative net nutrition, nativity.

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A Post Bellum Paradox? Agricultural and Economic Variation by Socioeconomic Status, Gender, and Race

I. Introduction

When traditional income and wealth measures are scarce or unreliable, the body mass index (BMI), stature, and weight reflect material well-being during economic development. However, restricting economic well-being to only income and wealth overlooks other measures that have material and health effects, such as pollution, disease, and health improving technologies (Nordhaus, 2003, pp. 10 and 20; Gordon, 2015, pp. 8-13). Stature studies address a populations' cumulative net nutrition over time, and a much debated topic is the United States' 19^{th} century's 2^{nd} and 3^{rd} quarter's stature decline, a pattern known as the antebellum paradox (Komlos, 1987, pp. 754-760). Two views explain stature's antebellum decrease. Initial efforts focused on calories consumed over time, such as nutrition, urbanization, and industrialization (Margo and Steckel, 1993; Haines, Lee, and Craig, 2003; Carson, 2020; Carson, 2022b), and Komlos (1987, p. 916) finds that reduced calories were responsible for stature's antebellum decrease. On the other hand, Engerman (1997, p. 37), Coelho and McGuire (2000), and Brickley (1997) find that disease was responsible for stature's antebellum decrease. Fogel adds to the debate, and where he originally held that disease played the primary role, he later acknowledged nutrition's part (Floud et al 2011; Komlos, 2012). However, restricting studies to only white males overlooks net nutritional and material conditions that affected women and non-Europeans during US economic development. Rather than only stature variation, a more complete evaluation is complex and should account for BMI and weight by gender and race.

Cross-sectional variations are valuable to understand economic development, and despite widespread attention in the antebellum paradox, little attention is given to BMI and weight variation during the 1870's and 1890's agricultural contractions (Haines, Craig, and Weiss, 2003; Carson, 2020; Carson, 2022b; Zehetmayer, 2011; Zehetmayer, 2013). The 1873 and 1890-1893 contractions are two periods when economic growth were disrupted, as agriculture commercialized, and there was considerable economic, nutritional, and social change. However, these late 19th century agricultural and economic contractions are yet to consider BMI and weight variation as urbanization occurred, and there were multiple political movements related to socioeconomic status that affected the US labor market by gender, race, occupations, and urban status.

Before infrastructure and physical capital formulate, physical strength is required during early economic development, which was satisfied during the 19th century with considerable in-migration and occupational specialization (Bogin, 2001, p. 255; Rosenbloom, 2002). With increased migration to the western frontier, households took up agriculture, and the degree of occupational mobility reflects the similarity between regional sending and receiving labor markets (Ferrie, 1999, p. 72; Ferrie, 1997; Carson, 2005, p. 573; Carson, 2017). As households migrated to the western frontier, agricultural output increased and prices decreased, putting stress on both incumbent and immigrant western agricultural incomes and wealth. The Grangers, Greenbacks, and Populists are three social, political, and economic movements that promoted early agricultural interests in the face of technological and social change. However, these political movements are yet to be considered when net nutritional conditions varied by socioeconomic standards and region during this period of political populism.

It is against this backdrop that this study considers three questions in net nutrition during US 19th and early 20th century economic development. First, how did body mass, stature, and weight vary over time by occupations, and did farmers' net nutrition vary more than other socioeconomic groups? Agricultural workers' body mass, height, and weight were consistently higher than non-farmers, and farmer BMIs increased relative to non-farmers, indicating there was little net nutrition decline to support late 19th century populist movements. Second, how did net nutrition vary over time by gender? Between 1880 and the early 1900s, female net nutrition increased relative to males, indicating that physically active urban workers were subject to industrialization not experienced by women. Third, how did BMI, stature, and weight compare by race and urban status? Darker complexioned individuals had greater weights and BMIs than their fairer complexioned counterparts.

II. Agriculture Contraction and Political Response

The 1873 through 1896 agricultural and economic contractions were abrupt interruptions to Europe and North America's Second Industrial Revolutions and the beginning of a prolonged British economic contraction. Various factors account for the crisis, and unjustified optimism in the emerging railroad industry is a leading explanation. Railroads were pivotal in the North's Civil War victory, and after the Conflict, large-scale railroad construction encouraged by railroad land grants were associated with over optimistic construction (Chandler, 1977; Gordon, 2015, pp. 132-142; Levy, 2021). Railroad expansion continued with the 1873 Coinage Act (Kindleberger, 1996, p. 32), and when the Jay Cook & Company was unable to make payment on its Northern Pacific Railway debt, the financial crisis deepened, and the US economy entered crisis (Lamoreaux, 1985; White, 2017, pp. 262-266). Despite its origin, the 1873 US agricultural contraction had various effects between rural farmers and workers in non-agricultural sectors.

For a generation after the Civil War, southern agriculture contracted and reflected the South's deteriorating human capital and physical infrastructure (Woodward, 1951, pp. 175-204;

Brickley, 1997). Deteriorating post-war economic conditions were associated with a period of political and economic populism, which led to the formation of various political movements. The Grange movement began in 1867 when President Andrew Johnson's Agriculture Department's secretary—Oliver Kelley—went to the South to investigate conditions to improve Southern economic and agricultural conditions (Woodward, 1951, pp. 32-34, 82-83; Chandler, 1977, p. 230; Cochrane, 1979, pp. 95-97; Brands, 2010, pp. 480-482; White, 2017, pp. 217-218). By 1873, the Grange coalesced behind the national Grange movement to promote railroad rate regulations that promoted agricultural interests. By 1877 in *Munn vs. Illinois*, the US Supreme Court ruled that grain houses were a private utility in the public interest and could be regulated under federal law, which the National Grange supported because it set a maximum price that railroads could charge in shipping rates. The Grange movement was also social and went on to promote women's suffrage, affect senate elections, and promoted temperance within agriculture.

The Greenback movement led by Ohio Democrat—George Pendleton—advocated that the US government continue the 1863 issuance of large Greenback debt to fund the North's Civil War liquidity demands, which would have increased the money supply. Easy monetary policy redistributed purchasing power from large eastern banks to small western farmers (Kindahl, 1971, pp. 469-470; Woodword, 1951, pp. 81-85; Bradt, 2010, pp. 482-483). By 1873, the US public was polarized over the appropriate currency, and farmers appealed to Congress for the widespread issuance of Greenbacks with unlimited silver coinage, which inflated the currency and allowed farmers to repay their mortgages with depreciated currency. As a reaction to the 1873 Coinage Act, the 1878 Bland-Allison Act reduced specie and the money supply, which required the U.S. Treasury to purchase and circulate silver dollars that traded simultaneously with gold, creating a bimetallic currency. Although Pendleton's Plan remained popular among debtors—such as farmers—it was not adopted, and the Greenback movement failed because it lacked the political support and patronage shared by Democrats and Republicans.

The Populist Party was a third late 19^{th} century political movement that began among farmer alliances that also supported free and unlimited silver coinage. The Populists influenced 1890 local and state elections to put James B. Weaver in office but disintegrated in the early 20^{th} century (Woodward, 1951, pp. 242-263; Brands, 2010, pp. 491-506; Levy, 2021). Subsequently, the Grange, Greenback, and Populist movements are three political movements related to agriculture at the end of the 19^{th} and early 20^{th} centuries, whose policies sought to change the relative bargaining power between agriculture and commercial interests that were designed to increase agricultural wealth and improve farmer's living conditions. To the degree these economic and political events affected agriculture and net nutrition, farmer BMIs, height, and weight may be affected differently by race and gender between the agricultural and non-agricultural sectors. Subsequently, this study partitions individuals in the agricultural and non-agricultural sectors, genders, and race to evaluate net nutritional variation by socioeconomic status, gender, and race at the end of the 19^{th} century (Schneider, 2023, p. 12).

Margo and Steckel (1983) first reported a white US male antebellum stature diminution during the 19^{th} century's 2^{nd} and 3^{rd} quarters, which called into question the prevailing view that early US industrialization created broad-based economic growth (Komlos, 1998, p. 779). Komlos (1987) also finds that white statures decreased during the 19^{th} century's second and third quarters, a pattern known as the antebellum paradox. Various studies confirm the result (Craig, 2016; Fogel, 1986, pp. 462-463; Fogel, 2000, pp. 139-142); however, the proposition does not account for women and non-white populations or minorities (Schneider, 2023, p. 12). Steckel

(2000) and Coelho and Macquire (2000) debate the relative merits vs. disease to explain the decline.

A considerable literature demonstrates that height is inversely related to urbanization, and the US urbanized during the 19th century. Despite urbanization's harmful effects, 19th century households migrated to and remained in urban areas because urban areas' net benefits remained positive. Carson (2008, pp. 366-368), Zehetmeyer (2011), and Zehetmeyer (2013) show that 19th century urban statures were short compared to rural statures. This urban-stature relationship was noticed early (Fogel et al., 1979; Sokoloff and Viloflour, 1982), and multiple studies show a negative net urban effect (Margo and Steckel, 1983; Steckel and Haurin, 1994). Urban external effects were adversely affected by disease and higher relative food prices. These urban agglomeration effects may have been related to race. Higgs (1977, pp. 33-35) indicates that urban African-American's net nutrition may have been better because of more progressive urban institutions, better medical care, and urban areas may have allowed blacks greater consumption and health investment than rural areas when rural blacks were exposed to greater rural isolation that increased the likelihood of white-on-black violence. Nonetheless, urban locations provided positive effects from higher incomes and wealth that allowed some to benefit, yet the overall effect was negative. Subsequently, a considerable part of antebellum paradox by occupation may be related to 19th century urbanization experienced differently by race and gender.

III. Data

Height and weight data used in this study are part of an extensive effort to collect physical descriptions using 19th and early 20th century US prison records. Military and prison records are two sources used to study net nutritional conditions, and military records were an early source for stature studies (Fogel et al. 1978; Fogel et al. 1979). However, military records over-represent individuals classified as white, and underrepresent females and non-Europeans. Military records were also drawn from males of European ancestry, whereas prison records include women and various ethnic groups (Schneider, 2023, p. 12). In addition, military enlistment standards may have varied with conscription needs that may have been relaxed during active miliary periods, and early 19th century military records may have sampled individuals in higher socioeconomic groups. Prison records compliment military records to augment these military record short-comings. For example, prisons include females and minorities, creating a more diverse sample. Prison records are not, however, above scrutiny and may disproportionately include individuals from lower socio-economic groups who turned to crime for survival. Because physical measures with prisons were used to identify individuals within prison and in case they escaped and were recaptured, prison records are valuable and reliable sources to measure late 19th and early 20th century US net nutrition.

Each state prison was contacted on multiple occasions, and available and affordable prison records were entered into a master data set. State prisons used in this study are Arizona, Colorado, Idaho, Illinois, Kentucky, Mississippi, Missouri, Montana, Nebraska, New Mexico, Oregon, Pennsylvania's East and West Prisons, Philadelphia, Tennessee, Texas, Utah, and Washington. Physical descriptions and characteristics were recorded at the time of entry, subsequently, represent pre-incarceration conditions. Accurate physical descriptions were important because they had legal implications in case inmates escaped and were recaptured.

Race and gender are two characteristics that helped identify individuals within prisons. Prisoners of African and European ancestry were the two most prominent racial groups, and individuals of African ancestry were recorded as negro, light, medium, and dark black.

Individuals with European ancestry were recorded as light, medium, and dark. This European classification system is further supported because individuals claiming European birth were also recorded with the same light, medium, and dark classifications. Individuals of combined African and European ancestry were recorded as 'mulattos,' however, are described as 'mixed-race' in the results that follow. The Arizona and Montana prisons were the only institutions that, for at least a time, included both photographs and written complexion descriptions, and it is clear from these photographs that individuals reporting African and European ancestry are consistent with complexion descriptions used by enumerators to classify blacks and whites. There were also individuals with Mexican, Asian, and American Indian complexions in the sample. Gender was recorded as male and female; however, US state prisons did not consistently record women's pregnancy status.

There are international and domestic nativities within prison records that reflect migration flows that drew immigrants to the United States (Ferrie, 1999). International migrants are from Africa, Asia, Australia, Europe, Great Britain, Latin America, and Mexico. Domestic nativities are separated into Northeast, Middle Atlantic, Great Lakes, Plains, Southeast, Southwest, and Far West nativities (Carlino and Sill, 2000). Northeast nativity includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Islands, and Vermont. Middle Atlantic nativity includes Washington DC, Delaware, Maryland, New Jersey, Ney York, and Pennsylvania. The Great Lakes includes Illinois, Indiana, Michigan, Ohio, and Wisconsin. Plains nativity includes Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota. Southeast nativity includes Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Southwest nativity includes Arizona, New Mexico, Oklahoma, and Texas. Far West nativity includes California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

Occupations are the primary means of classifying socioeconomic status, which varied by gender. The most common female occupations were domestic laborers, such as household domestic labor and household servants. Women found some opportunity in skilled labor. However, their occupations—such as midwives, nurses, and tailoresses—served other women (Golden, 1990; Burnette, 2013, pp. 306-307). Enumerators also recorded pre-incarceration occupations and are classified here into five separate occupation groups. White collar workers are bankers, administrators, and physicians. Skilled workers are blacksmith, carpenters, and craftsmen. Farmers are farmers, ranchers, and dairymen. Unskilled workers are cooks, miners, and laborers. There are also workers with no listed occupation or are not decipherable, which are classified with no occupations.

Table 1, Farm and Non-Farm Late 19th and Early 20th Century Characteristics

	Farmer		*Non-Farmer*			*Farmer*		*Non-Farmer*	
Birth Decade	N	Percent	N	Percent	Observation Decade	N	Percent	N	Percent
1770s			12	.01	1840			22	.01
1790			21	.01	1845			211	.11
1795			30	.02	1850			612	.33
1800			68	.04	1855	6	.03	583	.32
1805	4	.02	118	.06	1860	3	.01	519	.28
1810	10	.05	268	.14	1865	9	.04	2,100	1.14
1815	40	.18	461	.25	1870	24	.11	4,021	2.18
1820	87	.40	742	.40	1875	148	.68	11,057	5.98
1825	143	.66	1,241	.67	1880	986	4.55	13,786	7.46
1830	224	1.03	2,008	1.09	1885	2,416	11.16	13,748	7.44
1835	287	1.33	2,742	1.48	1890	1,954	9.02	16,057	8.67
1840	345	1.59	4,500	2.43	1895	1,385	6.39	20,222	10.94
1845	520	2.40	7,320	3.96	1900	2,359	10.89	24,797	13.42
1850	787	3.63	11,389	6.16	1905	2,642	12.20	23,389	12.65
1855	1,175	5.43	14,409	7.80	1910	2,909	13.43	22,395	12.12
1860	1,660	7.66	16,517	8.94	1915	4,109	18.97	21,158	11.45
1865	2,110	9.74	17,505	9.47	1920	1,332	6.15	5,372	2.91
1870	2,280	10.53	20,073	10.86	1925	306	1.41	1,141	.62
1875	2,252	10.40	21,413	11.59	1930	395	1.82	1,393	.75
1880	2,456	11.34	20,418	11.05	1935	441	2.04	1,417	.77
1885	2,271	10.49	17,414	9.42	1940	234	1.08	831	.45
1890	2,133	9.85	13,398	7.25	Race				
1895	1,637	7.56	7,773	4.21	Native American	109	.50	325	.18
1900	759	3.50	2,918	1.58	Asian	15	.07	102	.06
1905	223	1.03	989	.54	Black	4,200	19.39	42,928	23.23
1910	166	.77	631	.34	Mexican	711	3.28	6,650	3.60
1915	69	.32	318	.17	Mixed-Race	2,929	13.52	26,330	14.25
1920	20	.09	135	.07	White	13,694	63.23	108,496	58.70
Ages					Residence				
Teens	2,822	13.03	26,127	14.14	Arizona	237	1.09	4,112	2.22
20s	9,963	46.00	92,849	50.23	Colorado	981	4.53	6,092	3.30
30s	4,470	20.64	39,648	21.45	Idaho	79	.36	699	.38
40s	2,502	11.55	16,715	9.04	Illinois	638	2.95	11,892	6.43
50s	1,315	6.07	6,835	3.70	Kentucky	689	3.18	13,091	7.08
60s	493	2.28	2,211	1.20	Missouri	1,809	8.35	19,810	10.72

70s	87	.40	400	.22	Montana	1,622	7.49	9,388	5.08
80s	6	.03	46	.02	Mississippi	589	2.72	1,752	.95
					Nebraska	2,258	10.43	8,374	4.53
Nativity					New Mexico	545	2.52	3,186	1.72
International					Oregon	121	.56	2,405	1.30
Africa	3	.01	74	.04	PA, East	129	.60	9,237	5.00
Asia	8	.04	413	.22	PA, West	392	1.81	7,905	4.28
Australia	4	.02	134	.07	Philadelphia	19	.09	9,102	4.92
Britain	359	1.66	6,085	3.29	Tennessee	3,602	16.63	29,373	15.89
Canada	140	.65	1,758	.95	Texas	7,000	32.32	44,155	23.89
Europe	823	3.80	10,152	5.49	Utah	911	4.21	3,724	2.01
Latin America	6	.03	376	.20	Washington	37	.17	534	.29
Mexico	397	1.83	6,435	3.48	Urbanization	N	Percent	N	Percent
United States					Rural	20,535	94.81	142,286	76.98
Far West	843	3.89	4,816	2.61	Urban	1,123	5.19	42,545	23.02
Great Lakes	1,604	7.41	16,614	8.99	Gender				
Middle Atlantic	801	3.70	25,466	13.78	Female			4,689	2.54
Northeast	85	.39	2,254	1.22	Male	21,658	100.00	180,142	97.48
Plains	3,813	17.61	21,680	11.73					
Southeast	7,082	32.70	59,228	32.04					
Southwest	5,690	26.27	29,346	15.88					
	21,658	100.00	184,831	100.00					

Source: Arizona State Library, Archives and Public Records, 1700 W. Washington, Phoenix, AZ 85007; Colorado State Archives, 1313 Sherman Street, Room 120, Denver, CO 80203; California State Archives, 1020 O Street, Sacramento, CA 954814; Idaho State Archives, 2205 Old Penitentiary Road, Boise, Idaho 83712; Illinois State Archives, Margaret Cross Norton Building, Capital Complex, Springfield, IL 62756; Kentucky Department for

Libraries and Archives, 300 Coffee Tree Road, Frankfort, KY 40602; Maryland State Archives, 350 Rowe Building, Annapolis, MD 21401; Missouri State Archives, 600 West Main Street, Jefferson City, MO 65102; William F. Winter Archives and History Building, 200 North St., Jackson, MS 39201; Montana State Archives, 225 North Roberts, Helena, MT, 59620; Nebraska State Historical Society, 1500 R Street, Lincoln, Nebraska, 68501; New Mexico State Records and Archives, 1205 Camino Carlos Rey, Santa Fe, NM 87507; Ohio Archives Library, 800 E. 17th Avenue, Columbus, OH43211; Oregon State Archives, 800 Summer Street, Salem, OR 97310; Pennsylvania Historical and Museum Commission, 350 North Street, Harrisburg, PA 17120; Philadelphia City Archives, 3101 Market Street, Philadelphia, PA 19104; Tennessee State Library and Archives, 403 7th Avenue North, Nashville, TN 37243 and Texas State Library and Archives Commission, 1201 Brazos St., Austin TX 78701; Utah State Archives, 346 South Rio Grande Street, Salt Lake City, UT 84101; Washington State Archives, 1129 Washington Street Southeast, Olympia, WA 98504.

Prison samples are younger than the general population (Gottfredson and Hirshchi, 1990; Hirshchi and Gottfredson, 2004; Patterson, 2005, p. 43). In both historical and contemporary populations, crime is committed by the young, and 95 percent of the prison population consisted of individuals younger than age 50 (Table 1). Whites within prisons were the most common racial group, and individuals of African and mixed-race are the second largest population within prisons. Blacks within prisons are a larger proportion of the prison population relative to the general population (Haines, 2000; Steckel, 2000). The South is the most common residence within the sample, followed by the Middle Atlantic and Plains. While populations are concentrated in the South, Northeast, and Middle Atlantic, eight of the 18 prison facilities are in the West, and the West constitutes the largest geographic region for unskilled workers, and unskilled workers are the most prominent occupation group. Farmers within prisons are a smaller occupation group compared to the general population (Rosenblum, 2002, p. 88; Church et al, 2001; Gordon, 2015, pp. 53, 254-258). Most individuals were born in the 1880s and received in the 1910s.

IV. Comparative Net Nutritional Conditions by Gender and Race

We now consider late 19th and early 20th century net nutrition variation by socioeconomic status, gender, and race. To evaluate late 19th and early 20th century current and cumulative net nutrition, body mass, height, and weight are regressed on demographic, socioeconomic, nativity, and geographic characteristics.

Body Mass Index

$$BMI_i = \alpha + \theta_c Centimeters_i + \sum_{r=1}^{5} \theta_r Complexion_i + \sum_{a=14}^{80s} \theta_a Age_i + \sum_{n=1}^{14} \theta_n Nativity_i \qquad (1)$$

$$+ \sum_{l=1}^{17} \theta_l \,\mathrm{Re}\, sidence_i + \sum_{t=1840}^{20} \theta_t Obervation\,Year_i + \theta_u Urbanization_i + \varepsilon_i$$

Centimeters

$$Centimeters_i = \alpha + \sum_{r=1}^{5} \theta_r Complexion_i + \sum_{a=14}^{80s} \theta_a Age_i + \sum_{n=1}^{14} \theta_n Nativity_i \qquad (2)$$

$$+ \sum_{l=1}^{17} \theta_l \operatorname{Re} sidence_i + \sum_{t=1840}^{20} \theta_t Birth\,Year_i + \theta_u Urbanization_i + \varepsilon_i$$

Kilograms

$$Ki\log ram_i = \alpha + \theta_c Centimeters_i + \sum_{r=1}^{5} \theta_r Complexion_i + \sum_{a=14}^{80s} \theta_a Age_i + \sum_{n=1}^{14} \theta_n Nativity_i \qquad (3)$$

$$+ \sum_{l=1}^{17} \theta_l \operatorname{Re} sidence_i + \sum_{t=1840}^{20} \theta_t Obervation\,Year_i + \theta_u Urbanization_i + \varepsilon_i$$

Height in centimeters is included in BMI models to account for the inverse relationship between BMI and in height and weight models to account for the positive relationship between weight and height (Carson, 2009a; Carson, 2012; Carson, 2015a; Komlos and Carson, 2017). Black, mixed-race, Mexican, Asian, and Native American dummy variables are included for complexions to determine net nutrition variation by race. Annual youth age dummy variables are included for early stature growth, while adult decade age dummy variables are included to account for net nutrition variation at older ages. International nativity dummy variables are included for African, Asia, Australia, Great Britain, Canada, Europe, Latin America, and Mexico nativities. There are two ways to interpret BMI, height, and weight variation over time. Measured in the current period, BMIs and weight reflect current net nutrition by diverse cohorts at the time of measurement. Measured by birth year, stature reflects a cohort's cumulative net nutrition variation since birth (Carson, 2019, p. 32). Subsequently, birth decade dummy variables are included in height regressions, and observation period dummy variables are included in BMI and weight models.

Table 2, Late 19th and Early 20th Century Farm and non-Farm Body Mass, Height, and Weight

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
	Farmers	Non-Farmers	Farmers	Non-Farmers	Farmers	Non-Farmers
Intercept	34.15***	32.79***	170.59***	172.48***	-38.74***	-40.01***
Height						
Centimeters	-.065***	-.059***			.619***	.624***
Complexion						
White	Reference	Reference	Reference	Reference	Reference	Reference
Black	1.25***	1.15***	-2.35***	-2.16***	3.72***	3.37***
Mixed-Race	.989***	.873***	-1.78***	-1.58***	2.95***	2.58***
Mexican	.084	.069*	-4.35***	-4.10***	.338	.280**
Asian	-.570*	-.012	-2.32**	-3.09***	-1.78*	.087
Native-American	.189	.549***	-2.54***	-1.27***	.690	1.06***
Ages						
14	-3.77***	-3.39***	-6.80***	-11.90***	-10.05***	-8.65***
15	-2.67***	-2.80***	-7.30***	-8.19***	-7.18***	-7.50***
16	-1.73***	-2.10***	-4.34***	-5.32***	-4.91***	-5.82***
17	-1.47***	-1.48***	-2.62***	-3.24***	-4.24***	-4.19***
18	-.844***	-1.12***	-1.34***	-2.02***	-2.4****	-3.21***
19	-.664***	-.716***	-.659***	-1.23***	-1.96***	-2.08***
20	-.308***	-.432***	-.393*	-.492***	-.890***	-1.27***
21	-.134**	-.290***	-.237	-.221***	-.439**	-.839***
22	-.188***	-.165***	-.444**	-.153**	-.611***	-.496***
23-29	Reference	Reference	Reference	Reference	Reference	Reference
30s	.090**	.233***	-.110	-.100**	.285**	.367***
40s	.276***	.479***	-.915***	-.736***	.840***	1.41***
50s	.461***	.564***	-1.92***	-1.47***	1.38***	1.63***
60s	.333**	.452***	-2.76***	-2.42***	1.02**	1.31***
70s	.268	.204	-3.26***	-3.28***	.800	.619
80s	-.2.07**	-.331	-5.58**	-4.62***	-5.34*	-.820
Nativity						
International						
Africa	2.03***	.192	5.14*	-1.75**	6.17***	.518
Asia	-1.17	-2.25***	-3.85	-5.86***	-2.63	-6.18***
Australia	.215	-.231	4.79**	-.739	.549	-.551
Canada	.210	-.018	3.15***	-.431**	.563	-.029
Europe	.333	.707***	-.246	-2.53***	.937	2.04***
Britain	-.081	.010	-.080	-1.37***	-.243	.052
Latin American	-.637	-.446***	.037	.249	-1.81	-1.31***
Mexico	-.071	-.275***	.360	-1.96***	-.136	-.760***

National						
Northeast	Reference	Reference	Reference	Reference	Reference	Reference
Middle Atlantic	.082	-.111**	1.77**	-.258*	.212	-.291*
Great Lakes	.087	-.002	3.26***	.718***	.274	.018
Plains	.105	.027	4.07***	1.16***	.269	.081
Southeast	-.208	-.118**	3.99***	1.69***	-.623	-.343**
Southwest	-.195	-.093	4.17***	1.81***	-.562	-.279*
Far West	-.235	-.162***	3.12***	1.02***	-.759	-.478***
Residence						
Arizona	-.033	.083**	-1.99***	-2.10***	.066	.312**
Colorado	.660***	.510***	-1.70***	-1.55***	2.04***	1.52***
Idaho	.066	.209**	.140	-.273	.231	.642**
Illinois	.151	.003	-1.26***	-1.16***	.540	.044
Kentucky	-.782***	-.425***	-1.00***	-2.10***	-2.29***	-1.20***
Missouri	-.679***	-.705***	-1.59***	-1.61***	-1.95***	-2.00***
Mississippi	-.376***	-.175***	.652**	.245	-1.15***	-.565***
Montana	.993***	.731***	1.65***	1.24***	3.09***	2.22***
Nebraska	-.462***	.572***	-.401	-.222**	-1.28***	-1.64***
New Mexico	.148	.236***	-.416	-.926***	.457	.665***
Oregon	.579***	.780***	-.973	-2.18***	1.82***	2.33***
PA, East	-.318	-.394***	-2.43***	-3.10***	-.730	-1.05***
PA, West	.356**	.468***	-1.17***	-2.25***	1.17**	1.41***
Philadelphia	-.736	-.447***	-2.82**	-1.68***	-1.81	-1.23***
Tennessee	.183***	.357***	-1.29***	-2.03***	.575***	1.04***
Texas	Reference	Reference	Reference	Reference	Reference	Reference
Utah	.561***	.113**	1.10***	-.697***	1.77***	.403***
Washington	.253	-.197***	-2.46**	-2.29	1.01	-.491*
Year Received						
1840		2.47***				7.61***
1845		1.14***				3.39***
1850		.353***				1.06***
1855	-.765	.620***			-2.11	1.84***
1860	.777	1.13***			2.60	3.31***
1865	.360	.564***			1.12	1.63***
1870	.426	.446***			.935	1.26***
1875	.173	.330***			.530	.956***
1880	.089	.097***			.237	.274***
1885	.307***	.127***			.908***	.377***
1890	.222***	.188***			.655***	.546***
1895	.249***	.069***			.731***	.188***
1900	Reference	Reference			Reference	Reference
1905	.163**	-.035			.466**	-.100
1910	.027	-.064***			.096	-.180***
1915	.023	-.080***			.037	-.245***

1920	.046	.091**			.134	.233*
1925	.417**	.133			1.24**	.350
1930	.499***	.211**			1.46***	.597**
1935	.379**	.026			1.04**	.008
1940	-.056	.059			-.262	.058
Birth Year						
1770				.956		
1790				2.11**		
1795				3.71**		
1800				3.36***		
1805			1.75	3.31***		
1810			1.07	2.85***		
1815			-1.09	2.61***		
1820			1.29*	2.10***		
1825			1.68**	.699***		
1830			1.27**	.991***		
1835			1.04**	.669***		
1840			1.76***	.617***		
1845			.166	.573***		
1850			.671**	.406***		
1855			.558**	.435***		
1860			.794***	.360***		
1865			.273	.308***		
1870			.155	.158**		
1875			Reference	Reference		
1880			-.054	-.255***		
1885			-.161	-.202***		
1890			.061	-.049		
1900			.273	.150*		
1905			.735	1.72***		
1910			.819	1.99***		
1915			2.86***	3.40***		
Urbanization						
Rural	Reference	Reference	Reference	Reference	Reference	Reference
Urban	-.108	-.167***	-.296	-.828***	-.284	-.460***
N	21,658	180,142	21,658	180,142	21,658	180,142
R^2	.1235	.1254	.0874	.1191	.3191	.3553

Source: See Table 1.

Notes: *** Significant at .01; **Significant at .05; * significant at .10.

Three paths of inquiry are considered when evaluating late 19th and early 20th century body mass, height, and weight by social class. First, the antebellum paradox is the pattern where white US male average statures stagnated during the 19th century's second and third quarters (Margo and Steckel, 1983; Komlos 1987; Craig, 2016). However, little is known regarding the antebellum paradox for non-whites, women, and African-Americans (Schneider, 2023, p. 23). To the degree farmer's net nutrition was affected, their body mass, stature, and weight should have decreased compared to workers in non-agricultural occupations between 1870 and 1900 because their living standards decreased relative to non-farmers. However, farmer BMIs and weight increased between 1870 and 1900, and their height was little different than the mid-1870s (Table 2; Figures 1, 2, and 3). Moreover, farmer's net nutrition improved relative to non-farmers, and non-farmer's height was significantly lower between 1870 and 1900. Before and after the War, farmers and agricultural workers were consistently taller than non-farmers, with greater body mass and heavier weights (Gordon, 2015), indicating that despite political hyperbole, the Grangers, Greenbacks, and Populist movements had little effect on lower socioeconomic status net nutritional conditions.

While individual time coefficients reflect net nutrition over time, they do not, collectively measure birth and observation effects over time. Time series F-tests between unrestricted and restricted models indicate a measurable association between net nutrition and its variation over time. A joint test on farmer's BMs with time variables is F(17, 21,587)=3.21, p=.000. The non-farm joint BMI test is F(20,180,068)=29.78, p=.000. The farmers' joint stature time test is F(23, 21,582)=3.98, p=.000, while non-farmers' joint stature test is F(27, 180,062)=22.20, p=.000. Farmer's joint weight-time test is F(17,21,587)=3.21, p=.000. Non-farmer's joint time test is 29.71, p=.000, indicating that farm and non-farm net nutrition varied over time individually and collectively, and farmers did better than non-farmers during the post-bellum period when Grangers, Greenbacks, and Populists advocated pro-agricultural policies. Subsequently, farmer statures and cumulative net nutrition improved after 1875, BMI and weight increased with the 1873 and 1893 contractions, and the difference in farm minus non-farm net nutrition favored rural agricultural conditions (Figures 1, 2, and 3).

Table 3, Late 19th and Early 20th Century Body Mass, Height, and Weight by Gender

	Males			*Females*		
	BMI Model 1	Centimeters Model 2	Kilograms Model 3	BMI Model 4	Centimeters Model 5	Kilograms Model 6
Intercept	32.83***	172.36***	-40.18***	41.65***	160.27***	-15.10***
Height						
Centimeters	-.059***		.624***	-.117***		.462***
Complexion						
White	Reference	Reference	Reference	Reference	Reference	Reference
Black	1.15***	-2.22***	3.37***	.449***	-.784***	1.14***
Mixed-Race	.880***	-1.63***	2.60***	.371***	-1.04***	.942**
Mexican	.063	-4.18***	.266**	-.565	-4.86***	-1.74
Asian	-.130	-2.94***	-.291			
Native-American	.492***	-1.56***	1.46***	.990	-.434	2.40
Ages						
14	-3.42***	-11.72***	-8.72***	-3.50***	-6.92***	-8.45***
15	-2.79***	-8.19***	-7.47***	-2.84***	-1.09	-7.17***
16	-2.06***	-5.28***	-5.72***	-1.53***	-2.41***	-3.90***
17	-1.47***	-3.22***	-4.19***	-1.37***	-1.00**	-3.49***
18	-1.09***	-1.99***	-3.12***	-.896***	-.921**	-2.35***
19	-.710***	-1.22***	-2.07***	-.757***	-.613	-2.06***
20	-.420***	-.526***	-1.23***	-.289	-1.19**	-.808
21	-.272***	-.251***	-.794***	-.499**	-.045	-1.44**
22	-.168***	-.204***	-.509***	-.452**	-.161	-1.20**
23-29	Reference	Reference	Reference	Reference	Reference	Reference
30s	.219***	-.076*	.649***	1.15***	.458	2.93***
40s	.465***	-.684***	1.37***	1.59***	-.238	4.10***
50s	.573***	-1.40***	1.67***	1.50***	.816	3.85***
60s	.464***	-2.32***	1.36***	1.45**	-1.11	3.64**
70s	.253*	-3.35***	.757*	4.46***	-.868	11.41***
80s	-.526	-4.65***	-1.33			
Nativity						
International						
Africa	.269	-1.44**	.763			
Asia	-2.21***	-5.82***	-6.03***			
Australia	-.228	-.572	-.547			
Canada	.013	-.216	.062	.205	2.24*	.307
Europe	.699***	-2.40***	2.02***	.900	-1.22	1.98
Britain	.022	-1.32***	.088	-.234	1.11	-.900
Latin America	-.451***	.289	-1.32***			
Mexico	-.248***	-1.81***	-.675***			
National						
Northeast	Reference	Reference	Reference	Reference	Reference	Reference

Middle Atlantic	-.099*	-.159	-.256	.058	1.09	-.133
Great Lakes	.024	.869***	.100	.272	1.73*	.443
Plains	.073	1.39***	.217	.158	1.89**	.100
Southeast	-.106	1.87***	-.307*	-.174	1.81**	-.720
Southwest	-.069	2.01***	-.202	.035	2.62***	-.225
Far West	-.134**	1.18***	-.400**	.052	1.16	-.180
Residence						
Arizona	.065	-2.14***	.266**	.947	-3.04*	2.14
Colorado	.540***	-1.57***	1.62***	.081	-.069	.293
Idaho	.174**	-.302	.542**	1.11	-.239	3.40
Illinois	.016	-1.17***	.057	.374	.361	1.02
Kentucky	-.455***	-2.06***	-1.29***	.290	-.400	.823
Missouri	-.716***	-1.65***	-2.04***	.331	1.50***	.756
Mississippi	-.716***	-.389**	-.565***	.430	2.84**	1.10
Montana	.772***	1.30***	2.35***	.138	.461	.367
Nebraska	-.532***	-.325***	-1.52***	.211	1.51*	.602
New Mexico	.222***	-.845***	.632***	-.380	-.285	-.695
Oregon	.758***	-2.10***	2.27***	-.093	.992	.114
PA, East	-.395***	-3.08***	-1.05***	.522	-1.73**	1.35
PA, West	.466***	-2.18***	1.41***	1.28***	-.191	3.26***
Philadelphia	-.435***	-1.62***	-1.18***	-986**	-1.44**	-2.30**
Tennessee	.349***	-1.92***	1.02***	-.100	1.58***	-.188
Texas	Reference	Reference	Reference	Reference	Reference	Reference
Utah	.196***	-.367***	.654***	.204	-.909	.628
Washington	-.180*	-2.30***	-.423	-.092	-5.64**	-.364
Year Received						
1840	2.51***		7.70***			
1845	1.17***		3.47***			
1850	.379***		1.14***			
1855	.629***		1.87***			
1860	1.15***		3.38***			
1865	.575***		1.67***	2.18**		5.33**
1870	.452***		1.27***	1.19***		2.79***
1875	.330***		.955***	.170		.331
1880	.105***		.295***	-.178		-.478
1885	.164***		.484***	.184		.537
1890	.198***		.573***	-.334		-.901
1895	.083***		.230	-.490**		-1.28**
1900	Reference		Reference	Reference		Reference
1905	-.018		-052	-.221		-.532
1910	-.053**		-.147**	.411*		1.02
1915	-.054**		-.172***	.594**		1.42**
1920	.088**		.233**	.417		1.06
1925	.192**		.537**	-1.06*		-3.11*

1930	.269***		.771***	-.094		-.476
1935	.101		.233	-3.89***		-9.86***
1940	.019		-.049			
Birth Year						
1770		.907				
1790		1.98**				
1795		3.60**				
1800		3.24***				
1805		3.17***				
1810		2.70***				
1815		2.26***			-1.42	
1820		2.01***			-.351	
1825		.812***			-.546	
1830		.990***			-.908	
1835		.693***			-1.70	
1840		.669***			.146	
1845		.522***			-.295	
1850		.402***			-.406	
1855		.437***			-.743	
1860		.407***			-.678	
1865		.326***			.425	
1870		.196***			.322	
1875		Reference			Reference	
1880		-.194***			-.659*	
1885		-.145**			.065	
1890		.047			-.538	
1895		.307***			-.539	
1900		.559***			.946	
1905		1.71***			1.21	
1910		1.95***			4.53**	
1915		3.49***			-3.20***	
1920		4.32***				
Urbanization						
Rural	Reference	Reference	Reference	Reference	Reference	Reference
Urban	-.188***	-.889***	-.522	.293*	-1.30***	.758*
N	201,800	201,800	201,800	4,689	4,689	4,689
R^2	.1238	.1201	.3535	.1390	.0693	.1974

Source: See Table 1.

Notes: *** Significant at .01; **Significant at .05; * significant at .10.

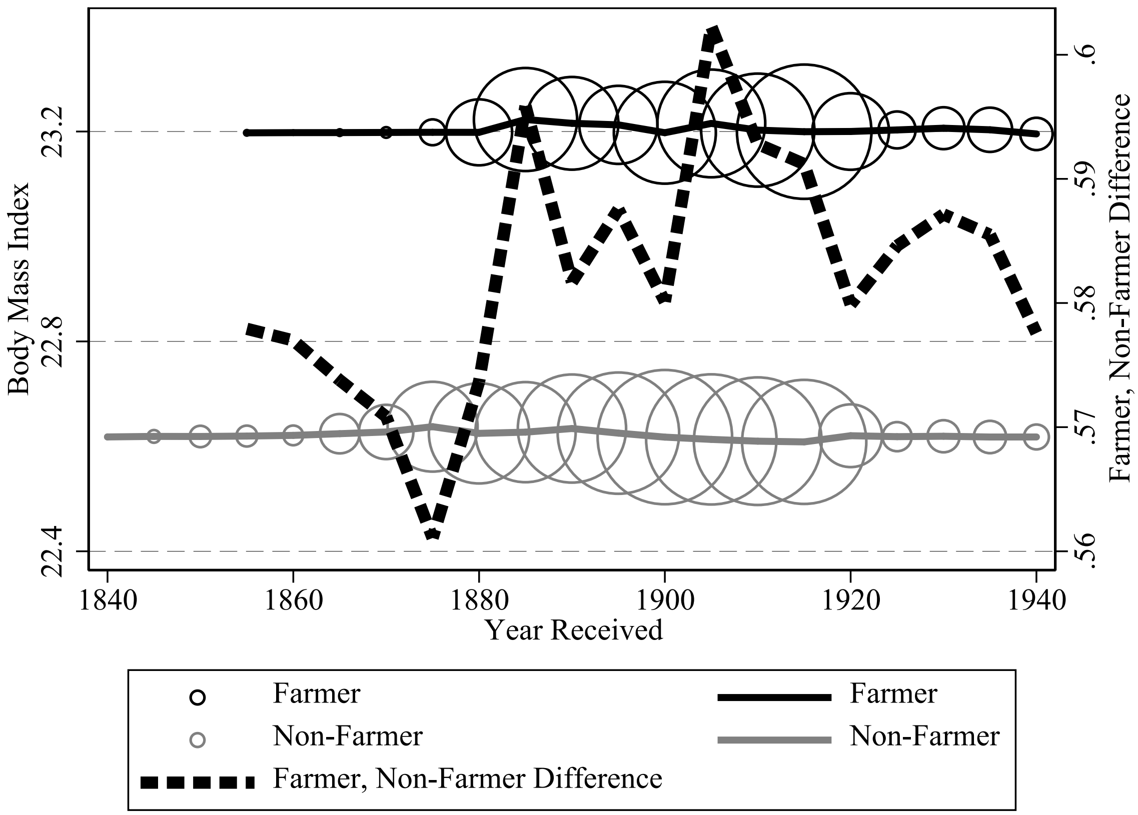

Figure 1 Body Mass Index Variation over time by Farmers vs. Non-Farmers

Source: See Tables 1 and 3.

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

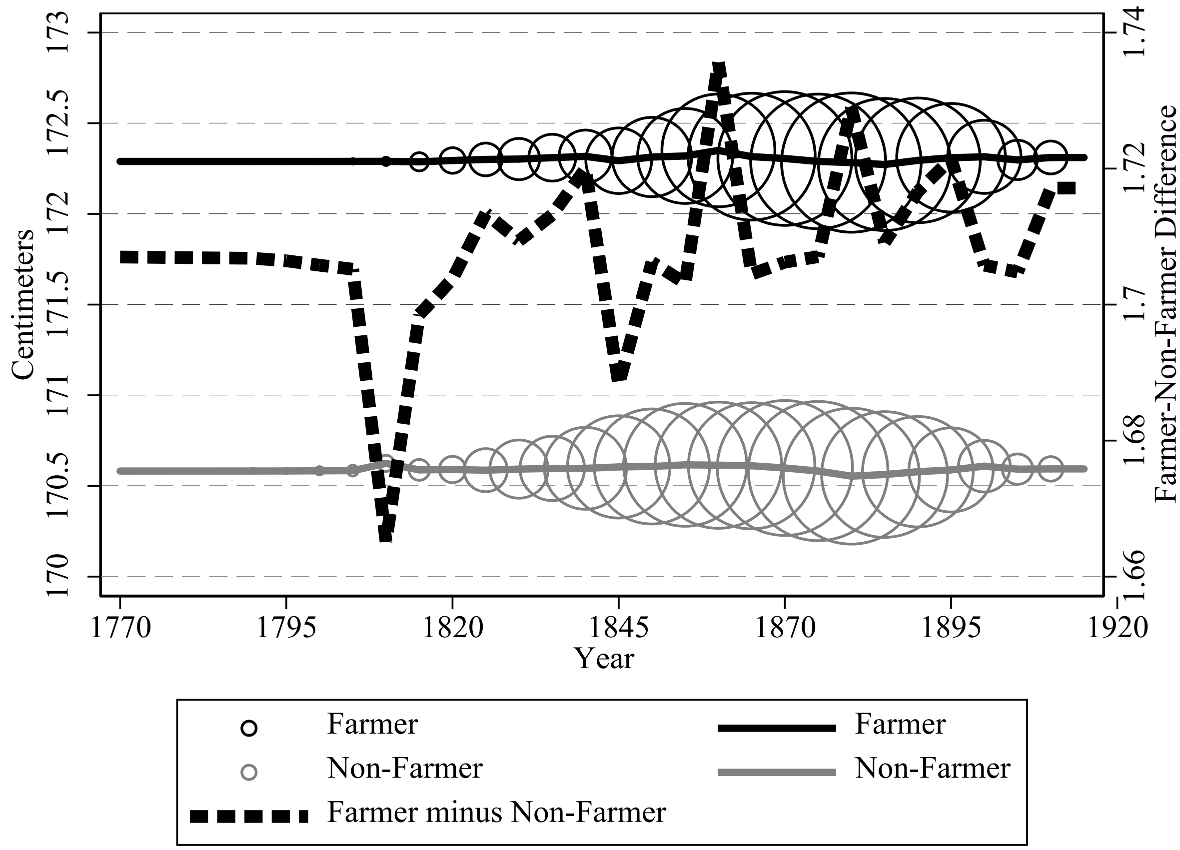

Figure 2, Height Variation over time by Farmers vs. Non-Farmers

Source: See Tables 1 and 2.

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

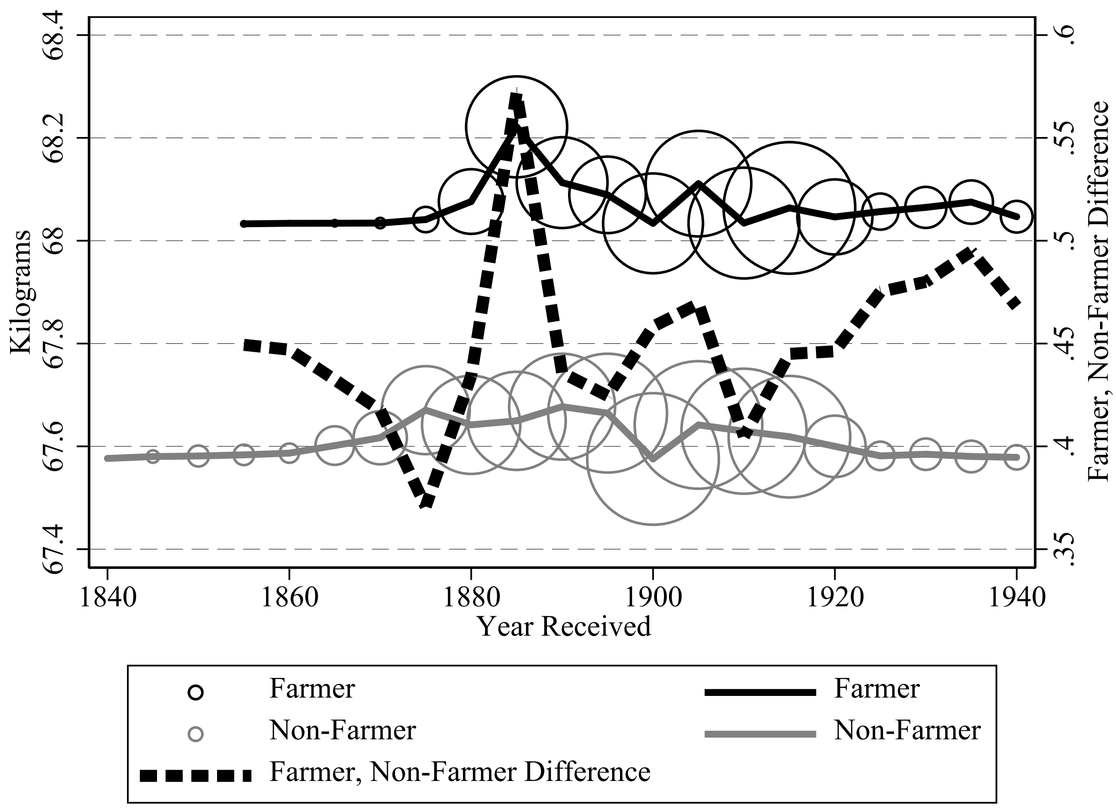

Figure 3, Weight Variation over time by Farmers vs. Non-Farmers

Source: See Tables 1 and 2.

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

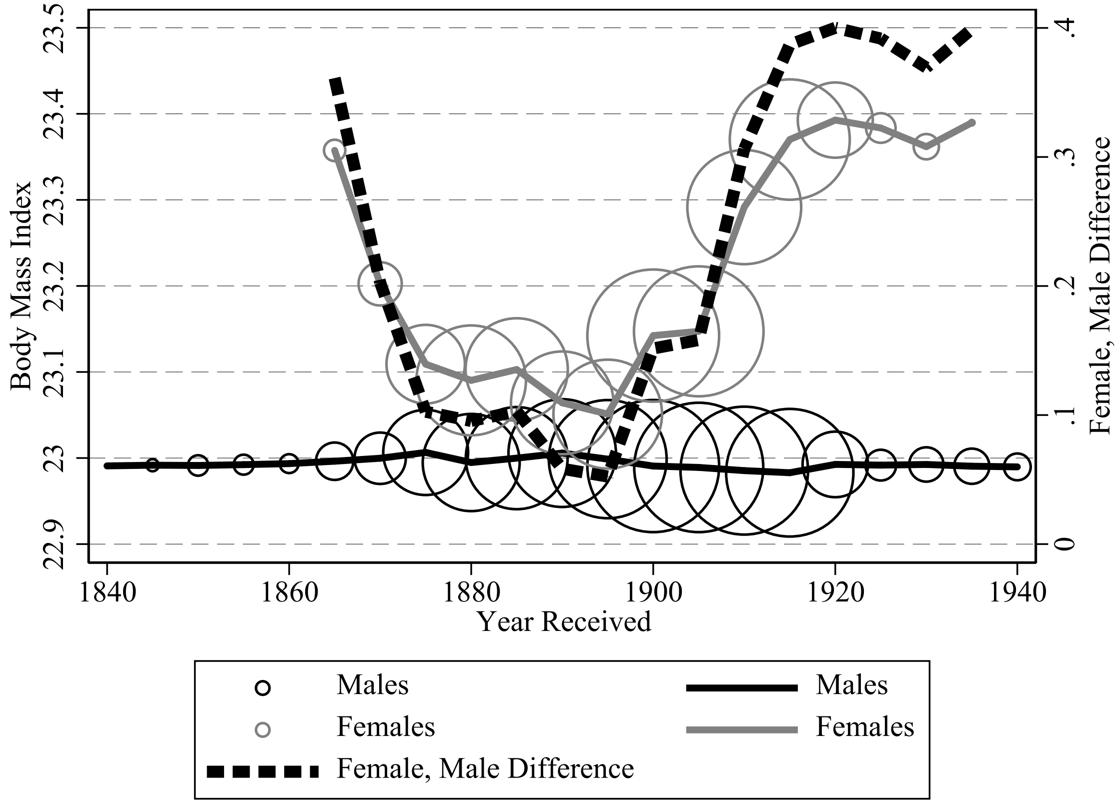

Figure 4 Body Mass Index Variation over time by Gender

Source: See Tables 1 and 3.

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

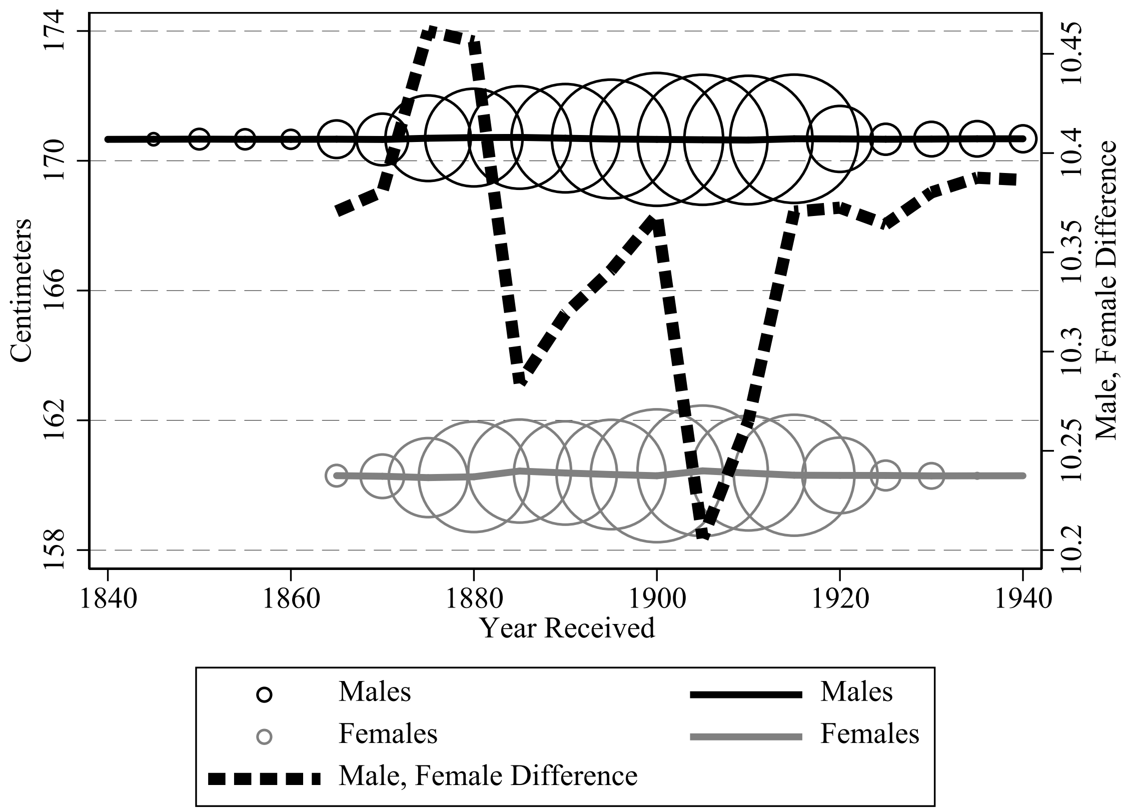

Figure 5, Height Variation over time by Gender

Source: See Tables 1 and 3

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

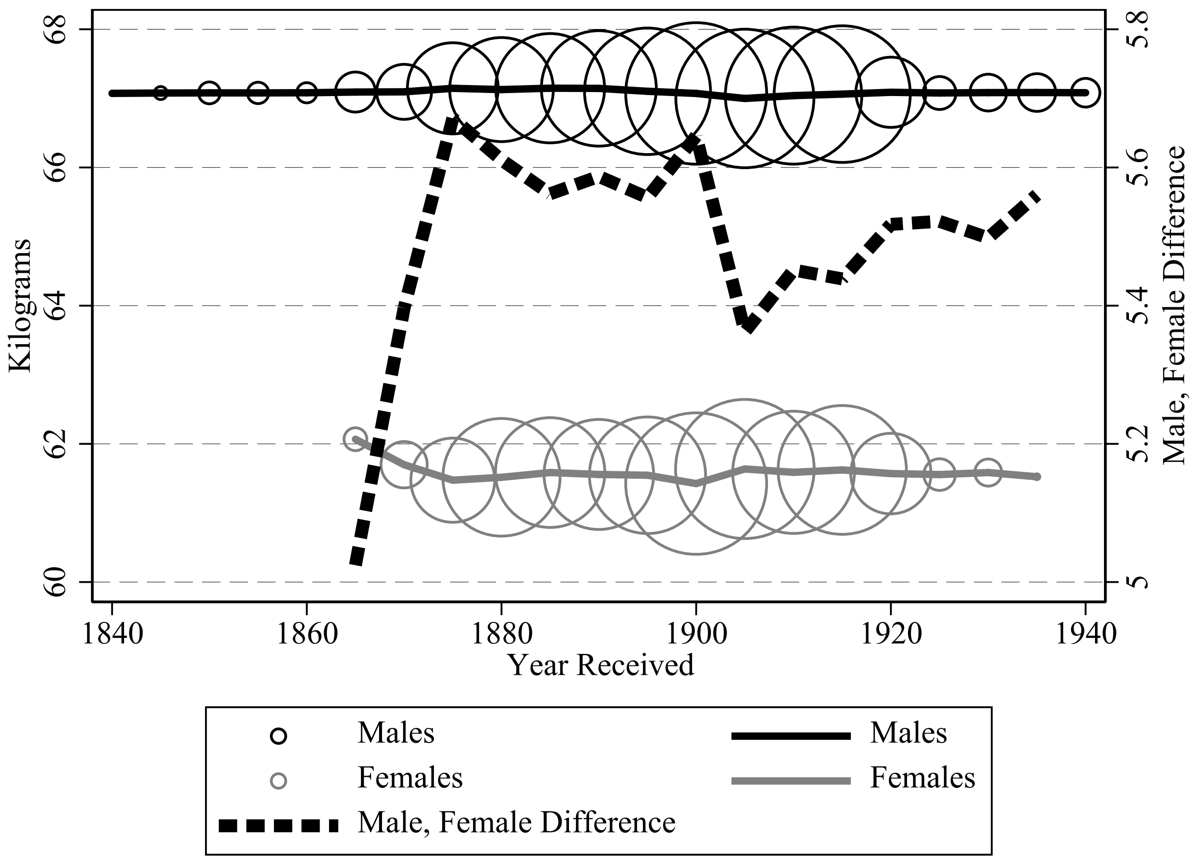

Figure 6, Weight Variation over time by Gender

Source: See Tables 1 and 3.

Notes: Coefficients weighted by sample size within each decade. Hollow circles weight each decade to the sample.

Second, net nutritional conditions also varied by gender, both within the household and within the economy (Oren, 1973; Carson, 2018; Carson, 2022a). Household resources are shared resources (Oren, 1973, pp. 107 and 110), and household income and wealth mask individual net nutrition variation within the household—particularly for mothers—who suppress their personal consumption during periods of dietary stress to reallocate nutrition to children, creating material and net nutritional inequality within the household. However, nutritionally deficient adolescent males may have greater stature reductions compared to females under similar stature shortages (Frayer and Wolpoff, 1985, p. 429; Carson, 2023). Female average BMIs were high in the early 1870s and decreased considerably in the late 1870s to remain constant until the early 20th century (Table 3). Figure 4 indicates that male body mass index values remained constant around 30 throughout the late 19th and early 20th centuries. The female-male BMI difference followed the 1870 female body mass decrease and remained lower until the early 19th century. Gender-related statures were less plastic than body mass and weight values and remained constant (Figure 1, 2, and 3), and male weights decreased relative to female weights, which remained high until the early 20th century (Figure 3). Subsequently, between 1860 and 1890, female net nutrition improved relative to men, and current male net nutrition varied less over the post-bellum period then females.

Third, Steckel (1979) was the first to show that fairer complexioned individuals were consistently taller than darker complexioned individuals. Bodenhorn (1999) finds that fairer complexioned 19th century white and mixed-race individuals were taller than darker complexioned individuals and suggests the stature difference is due to social preferences that disproportionately favored individuals with fairer complexions (Bodenhorn, 1999, pp. 983 and 994; Bodenhorn, 2002, pp. 21 and 43-44). However, if taller urban mixed race net nutrition persisted because of social preferences, white weights and body mass should have been greater than darker complexioned blacks. In fact the opposite is true, and darker complexioned individuals had greater weights and higher BMIs than their white counterparts (Table 3). Johnson (1941, pp. 256-257) and Fogel and Engerman (1974, p. 132) show that mixed-race individuals were more common in urban locations. Net nutrition by birth and residence illustrate that northeastern blacks were shorter (Carson, 2008; Carson, 2009b), and Higgs (1977, pp. 33-35) indicates that rural black net nutrition may have been lower if rural Jim Crow policies and racial intimidation prevailed in rural locations. Because there are urban-racial agglomeration effects, greater urban mixed-race populations may have created better urban black and mixed race net nutritional conditions, and part of the BMI, height, and weight differences by race may have biological origins (Carson, 2015a; Carson, 2015b).

Other patterns are consistent with expectations. Greater access to regional nutrition was associated with taller statures and heavier weights. For example, net nutrition varied regionally, and the South was agriculturally more productive in corn, pork, and beef than other regions. In 1860, average Southern corn production was 34.03 bushels of corn per person compared to the North's 9.25 bushels per person. The South's average pork production was 1.27 swine per capita per annum, compared to the North's .65 swine per capita (Hilliard, 1972, Tables 10, 3, and 6). The South produced 3.16 times as much corn per capita as the North, 96 percent more cattle, and 90.58 percent more pork than the North. Cattle and diary are compliments in production; however, because of temperature differentials and poor dairy storage in the South, individuals in the South consumed less milk, and milk is related to stature growth (Baten and Murray, 2000, pp. 361, 364-367; Wiley, 2005). Subsequently, Southern net nutrition was higher than the North, and Northeastern and Middle Atlantic net nutrition was lower than elsewhere within the US.

V. Urban-Rural BMI, Height, and Weight Decompositions by Occupation and Gender

Characteristic coefficients illustrate individual net nutrition variation. They do not, however, indicate collective net nutrition variation between gender and race for collective returns by characteristics. To isolate 19th and early 20th century net nutrition by combined characteristics, let γ_h and γ_l be high and low individual's BMI, height, and weight returns by demographic, socioeconomic status, and residential characteristics. High and low response variable gaps separate net nutritional conditions into structural and compositional characteristics, and structural differences are explained by differences across characteristics, while composition effects illustrate net nutrition variation with average characteristics.

$$\gamma_h = \theta_{oh} + \theta_{1h} X_h \qquad (4)$$

$$\gamma_l = \theta_{ol} + \theta_{1l} X_l \qquad (5)$$

Decompositions partition dependent variable differences into returns to characteristics and average characteristics. Oaxaca-Binder decompositions are a statistical technique that partition dependent variable differences into returns to characteristics and mean return characteristics.

$$\Delta\gamma = \gamma_h - \gamma_l = \alpha_h + \beta_h X_h - \alpha_l - \beta_l X_l \qquad (6)$$

Adding $-\beta_h X_l + \beta_h X_l$ to Equation 6 is high returns to characteristics observed at low characteristics decomposition, and adding $-\beta_l X_h + \beta_l X_h$ to Equation 6 is a low returns to characteristics at high returns to average characteristics.

$$\gamma_h - \gamma_l = (\alpha_h - \alpha_h) + (\beta_h - \beta_l) X_l + (X_h - X_l) \beta_h \qquad (7)$$

$$\gamma_h - \gamma_l = \left(\alpha_h - \alpha_h\right) + \left(\beta_h - \beta_l\right) X_h + \left(X_h - X_l\right) \beta_l \qquad (8)$$

Equations 7 and 8 first right-hand side components are autonomous net nutrition values independent of returns or average characteristics. The second component is the share of dependent net nutritional structural differences due to returns to characteristics. The third component is dependent net nutritional difference share due to returns to average compositional characteristics. Equation 7 is dependent variable differences observed at low average characteristics. Equation 8 is dependent variable differences at high average characteristics and lower returns to characteristics

Table 4, Farm, Non-Farm Body Mass, Height, and Weight Decomposition by Agricultural Status

Panel A				
BMI	Structural	Composition	Structural	Composition
Levels	$(\beta_F - \beta_{NF})\bar{X}_{NF}$	$(\bar{X}_F - \bar{X}_{NF})\beta_F$	$(\beta_F - \beta_{NF})\bar{X}_F$	$(\bar{X}_F - \bar{X}_{NF})\beta_{NF}$
Sum	.338	-.026	.275	.037
Total		.312		.312
Proportions				
Intercept	4.36		4.36	
Height	-3.28	-.395	-3.32	-.359
Complexion	.124	-.144	.107	-.127
Ages	-.067	.218	-.121	.272
Nativity	-.047	-.095	-.135	-.004
Residence	-.269	.293	-.346	.370
Observation Period	.217	-.025	.324	-.132
Urban	.045	.064	.001	.099
Sum	1.08	-.084	.881	.119
Total		1		1
Panel B				
Height				
Levels				
Sum	4.65	1.04	4.60	1.09
Total		5.69		5.69
Proportions				
Intercept	.332		.332	
Complexion	-.015	.016	-.014	.016
Ages	2.49^{-4}	.006	2.49^{-4}	.006
Nativity	.406	.089	.423	.072
Residence	.052	.077	.052	.077
Observation Period	.011	-.007	.010	-.005
Urban	.022	.010	.005	.027
Sum	.808	.192	.808	.192
Total		1		1
Panel C				
Weight				
Levels				
Sum	.680	1.42	.708	1.39
Total		2.10		2.10
Proportions				
Intercept	.605		.605	
Height	-.406	.558	-.411	.563

Complexion	.063	-.063	.056	-.056
Ages	.001	.093	-.022	.116
Nativity	-.028	-.042	-.066	-.005
Residence	-.024	.116	.030	.063
Observation Period	.094	-.010	.141	-.058
Urban	.020	.025	.004	.040
Sum	.324	.676	.337	.663
Total		1		1

Source: See Tables 1, 2, 3, and 4.

Table 4 partitions farm and non-farm BMIs, stature, and weight into structural and composition differences by height, demographic, and urban status. Overall, non-farmer BMI and weight returns to height were greater than farmers, indicating that non-farmers, who had short statures, had greater returns to current net nutrition from cumulative net nutrition. Non-farmer BMI returns to residence, ages, and nativity were greater than farmers. For BMI, height, and weight, returns to characteristics were greater than returns to average characteristics.

Table 5, Male-Female Body Mass, Height, and Weight Decompositions

Panel A				
BMI	Structural	Composition	Structural	Composition
Levels	$(\beta_M - \beta_F)\overline{X}_F$	$(\overline{X}_M - \overline{X}_F)\beta_M$	$(\beta_M - \beta_F)\overline{X}_M$	$(\overline{X}_M - \overline{X}_F)\beta_F$
Sum	.350	-.623	.781	-1.05
Total		-.273		-.273
Proportions				
Intercept	32.32		32.32	
Height	-34.19	2.15	-36.31	4.26
Complexion	-1.44	.948	-.911	.416
Ages	1.13	-.627	1.30	-.792
Nativity	.172	-.019	.168	-.115
Residence	.320	.054	-.137	.033
Observation Period	-.062	-.041	.601	-.226
Urban	.464	-.182	0	.283
Sum	-1.28	2.28	-2.86	3.86
Total		1.		1
Panel B				
Height				
Levels				
Sum	9.18	.785	9.81	.157
Total		9.96		9.96
Proportions				
Intercept	1.21		1.21	
Complexion	-.067	.042	-.038	.013
Ages	-.063	.032	-.048	.017
Nativity	-.053	-.023	-.062	.014
Residence	-.160	.018	-.139	.004
Birth Period	.040	.006	.048	-.002
Urban	.011	.004	.009	.006
Sum	.921	.079	.984	.016
Total		1		1
Panel C				
Weight				
Levels				
Sum	-6.07	6.59	-4.50	5.03
Total		.522		.522
Proportions				
Intercept	-48.03		-48.03	
Height	49.91	11.88	52.99	8.80
Complexion	2.42	-1.45	1.53	-.563
Ages	-1.59	.917	-1.73	1.06
Nativity	.303	.033	.167	.168

Residence	-.432	-.075	-.792	.285
Observation Period	-13.56	1.28	-12.23	-.053
Urban	-.646	.047	-.531	-.068
Sum	-11.63	12.63	-8.63	9.63
Total		1		1

Source: See Tables 1, 2, and 3.

Table 5 partitions male and female BMIs, stature, and weight into structural and composition differences by height, demographic, and urban status. Panels A through C are segregated into BMI, height, and weight decompositions. Autonomous BMI component differences was nearly offset by females' greater of rate of return to stature (Table 4, Panel A). Women also had higher BMI returns associated with residence, age, and nativity. Male BMI returns were higher with complexion and observation period, and males were consistently taller than females with nativity, residence, observation period, and ages. Males had greater weights associated with returns to complexion and observation periods that was offset by female's weight composition. Females had greater weight returns associated with height and nativity.

VI. Conclusion

Income and wealth are two traditional measures for material living standards that overlook pollution, disease, and health improving technologies. To account for current and cumulative net nutrition variation over time and by characteristics, his study uses body mass, height, and weight by gender and complexions as compliments to income and wealth. Stature studies address a population's cumulative net nutrition overtime, and a much debated pattern is the 19th century's 2nd and 3rd quarter's stature diminution, a pattern known as the antebellum paradox. However, restricting stature studies to only white males neglects material and net nutritional conditions that affected women and non-Europeans during economic development. The agricultural and economic contractions of the late 19th century are overlooked areas in net nutritional studies, and this study shows that contrary to populist rhetoric, farm relative to non-farm net nutrition improved during the post-bellum period. Net nutrition variation by gender indicates that female BMIs increased relative to males between 1860 and the early 1900s. Darker complexioned individuals had greater weight and higher BMIs than whites. Subsequently, rather than a post-bellum agricultural net nutrition decline, farmer net nutrition improved relative to non-farmers, and female net nutrition may have improved relative to men in the early 20th century.

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