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The Stature and Body Mass of Mexicans in the Nineteenth-Century United States

Nineteenth-century Mexico experienced considerable political and economic instability. Initially a Spanish colony, Mexico (New Spain), gained its independence in 1821. For the next fifty-five years, political power vacillated between various factions. The Textepuc Revolution of 1876 and the rise of the Porfiriato also altered Mexican political and economic arrangements even more drastically. Throughout this period, two similar Mexican groups resided in the American West—those born in Mexico and those born in the United States. This situation creates the conditions for a natural experiment to compare male prison inmates from the two groups—each identified as Mexicans at the time of incarceration and each maturing under different biological conditions and different political regimes. In nineteenth-century Mexico, these biological factors bore some relation to poorly developed political and economic institutions. Until the fourth quarter of the nineteenth century, Mexico's economy depended on an inefficient overland transportation system that kept the costs of domestic transportation high. On the northern side of the U.S. border, transportation costs fell and markets were integrated.[1]

The average stature of a population reflects the net cumulative difference between nutrition and the calories required for work and for resistance to disease. When diets, health, or physical

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1 John H. Coatsworth, "Obstacles to Economic Growth in Nineteenth Century Mexico," *American Historical Review,* LXXXIII (1978), 80–81; Friedrich Katz, "The Liberal Republic and the Porfiriato, 1867–1910," in Leslie Bethell (ed.), *Mexico since Independence* (New York, 1991), 49–124; Stephen Haber, "The Commitment Problem and Mexican Economic History," in Jeffrey Bortz, and *idem* (eds.), *The Mexican Economy: Essays on The Economic History of Institution, Revolution and Growth* (Stanford, 2002).

environments improve, average stature increases; it decreases when diets become less nutritious, disease environments deteriorate, or the physical environment places more stress on the body. The consideration of average rather than individual stature mitigates genetic differences, leaving only the net cumulative influence of the environment on stature.

The body mass index (BMI) reflects the net current balance between nutrition, disease, work, and the physical environment; the calculation of average BMI ensures that only current environmental influences remain. Hence, stature and BMI provide significant insights into historical processes, especially for nineteenth-century Mexican biological conditions, for which other indications of living standards may be scarce. The statures and BMIs of male Mexicans born in both Mexico and the United States can mark variations in biological living conditions, political instability, and economic circumstances.

The records of nineteenth-century U.S. prisons prove particularly useful in assessing biological markers, since prison data include reliable measurements for height and weight. Inmates were often from the lowest socioeconomic class, the one most vulnerable to economic change.[2]

The literature on late nineteenth- and early twentieth-century Mexican biological conditions during Mexico's earliest years of political and economic development is substantial. López-Alonso and Condey demonstrated that the height of Mexican soldiers born in the late nineteenth century remained approximately constant, despite Mexico's political instability, and Mexican heights in the early twentieth century were the same as they were in the 1870s. From a sample of Mexican-born prisoners in U.S. prisons, Carson also found that adult Mexican statures stagnated during the late nineteenth century. During the 1890s, young male Mexican statures declined by approximately 1 cm precisely when

2 Richard Steckel, "Slave Height Profiles from Coastwise Manifests," *Explorations in Economic History,* XVI (1979), 365–367; James M. Tanner, *Growth at Adolescence* (Springfield, Ill.,1962), 1–27; *idem,* "Growth in Height as a Measure and a Mirror of the Standard of Living," in John Komlos (ed.), *Stature, Living Standards, and Economic Development* (Chicago, 1994), 1–5; Robert W. Fogel, "Economic Growth, Population Theory and Physiology: The Bearing of Long-Term Processes on the Making of Economic Policy," *American Economic Review,* LXXXIV (1994), 375; Barry Bogin, *Patterns in Human Growth* (New York, 1988), 288; Komlos and Jörg Baten, "Anthropometric Research and the Development of Social Science History," *Social Science History,* XXVIII (2004), 199.

Porfirian Diaz undertook railroad construction to permit factor mobility. Inequality also increased during the Porfiriato because policies intended to stimulate rapid economic development tended to foreclose peasants and campesinos from opportunity.[3]

Goldstein found that early twentieth-century Mexican children born in the United States were taller than their Mexican-born parents, and that the children of Mexican immigrants were taller than the Mexicans who remained in Mexico. Kelly observed an early twentieth-century stature gradient running from north to south, northern Mexicans being taller than southern Mexicans. In an allied study on early twentieth-century indigenous Mexicans, Faulhaber also noticed this north-south stature gradient. What we do not know, however, is how the statures of Mexicans born in Mexico compared with those of Mexicans born in the United States over the course of the late nineteenth and early twentieth centuries. Nor do we know much about how the BMIs of Mexicans—whether of those born in Mexico or those born in the United States—varied during this period. This study of Mexican inmates in U.S. prisons extends Mexican stature data further back in time and offers new insights into the processes influencing Mexican BMIs.[4]

This article addresses two questions: First, how did political instability and economic fluctuation affect the biological conditions of Mexicans born in Central America, if at all, relative to Mexicans born in the United States? Second, given that Mexicans born in the United States were taller than those born in Mexico, did the nineteenth-century biological condition of Mexicans born in Mexico and of those born the United States converge, or were

3 Moramay López-Alonso, "Height, Health, Nutrition and Wealth: A History of Living Standards in Mexico, 1870–1950," unpub. Ph.D. diss. (Stanford University, 2000); *idem* and Raul Porras Condey, "The Ups and Downs of Mexican Economic Growth: The Biological Standard of Living and Inequality," *Economics and Human Biology,* I (2003), 169–186; Carson, "The Biological Standard of Living in 19th Century Mexico and the American West," *Economics and Human Biology,* III (2005), 414–415; Haber, *Industry and Underdevelopment: The Industrialization of Mexico, 1890–1940* (Stanford, 1989), 16–18; Bortz and Haber, "The New Institutional Economics and Latin American Economic History," in *idem* (eds.), *Mexican Economy,* 1–20; Aurora Gomez-Galvarriato, "Measuring the Impact of Institutional Change in Capital-Labor Relations in the Mexican Textile Industry, 1900–1930," in *ibid,* 290.

4 Marcus Goldstein, *Demographic and Bodily Changes in Descendants of Mexican Immigrants* (Austin, 1943), 16–17; Arthur Randolph Kelly, *Physical Anthropology of a Mexican Population in Texas* (New Orleans, 1947), 18; Johanna Faulhaber, "The Anthropometry of Living Indians," in T. Dale Stewart (ed.), *Handbook of Middle American Indians* (Austin, 1970), IX, 94–96.

Mexico and the American West sufficiently different to prevent biological integration among similar Mexican cohorts? During the late nineteenth and early twentieth centuries, the economic and biological situation in Mexico among lower socioeconomic groups deteriorated; how these statistics varied for Mexicans born in Mexico and those born in the United States during this period remains to be seen.

DATA REGARDING MEXICANS IN U.S. PRISONS DURING THE NINETEENTH CENTURY Two common sources for heights in the nineteenth century are prison and military records. The data in this study of Mexican anthropometrics are a subset of a much larger nineteenth-century U.S. prison sample. All available records from U.S. state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. The four southwestern state prisons—in Arizona, Colorado, New Mexico, and Texas—provide the data of this study. Females and non-Mexicans are excluded from the analysis.

All historical height and weight data have various selection biases; in this respect, entry requirements, whether for prison or the military, are always a concern. Although prison records are not random samples, the inherent selectivity within them has its advantages—for instance, their tendency to favor lower socioeconomic groups. Moreover, since eligibility for incarceration was based on criminal, not biological, standards, prison records are a valuable source of important statistics. Since stature rarely had any relation to the crimes for which individuals were imprisoned, height variation within prison data is probably consistent with general Mexican biological conditions in the Southwest.[5]

Physical descriptions were recorded carefully in U.S. prisons at the time of incarceration; they served as means of identification when inmates escaped and were later re-captured. Prison officials recorded age, place of birth, crime, pre-incarceration occupation, race, height, and weight. Many of the institutions that took stature measurements in the nineteenth century rounded them to the

5 Bogin, *Human Growth,* 288; Komlos and Baten, "Anthropometric Research," 199; Steckel, "Stature and the Standard of Living," *Journal of Economic Literature,* XXX (1995), 1910.

nearest inch or half-inch, but most prison inmates were recorded at quarter- , eighth- , and even sixteenth-inch increments.

The fact that Mexican inmates were recorded as "Mexican" in the complexion column of the entry form permits a comparison of Mexican-born individuals to their U.S.-born counterparts. Since stature and BMIs are sensitive to age, inmates twenty-two years old and younger are classified herein as youths, and inmates twenty-three years old and older are classified as adults. Table 1, which summarizes each state prison's youth and adult populations, indicates that more than one-half of the Mexican-born inmates were incarcerated in Texas.

Most of the Mexicans in the sample were born during the mid-to-late nineteenth century, and most of them were unskilled workers (Table 1). Predictably, border states had higher concentrations of Mexican prisoners.

The majority of state prisons in the U.S. Southwest during the nineteenth century did not systematically document inmates' city of birth, only their state or country of origin. However, New Mexico's state prison documented the hometown of each Mexican inmate. All of the Mexicans from Mexico were born within that country's borders as determined by the 1848 border settlement with the United States; none of them claimed birth in a township that was to become part of the United States. Therefore, if the Mexican inmates in other southwestern prisons had backgrounds similar to those in the sample serving time in New Mexico, the Mexican inmates were most likely born within Mexico after the 1848 border settlement. Most inmates with identifiable hometowns were from Ciudad Juárez, Santa Rosalia, Chihuahua, Matamoros, and other northern provinces (Figure 1). Relatively few inmates were from Zacatecas and Mexico City provinces, the Yucatan Peninsula, or farther south; 80.9 percent were from northern provinces; 17.7 percent were from central provinces; and 1.4 percent were from southern provinces. The prison records of New Mexico show a slight north-south stature gradient for Mexicans born in Mexico, but it was not statistically significant. Because the date when Mexicans immigrated into the United States is not available, the extent to which the U.S. environment was responsible for their physical growth is not fully ascertainable. However, Goldstein discovered that early twentieth-century Mexican immigrants to the United States were 21.2 years old at time of im-

Table 1 Nineteenth-Century Mexicans in U.S. Southwestern State Prisons

	MEXICANS		MEXICANS BORN IN THE U.S.		MEXICANS BORN IN MEXICO	
BIRTH YEAR	N	PERCENT	N	PERCENT	N	PERCENT
1830s	111	1.22	24	.70	87	1.52
1840s	372	4.07	80	2.34	292	5.11
1850s	982	10.76	259	7.58	723	12.66
1860s	1,766	19.34	582	17.03	1,184	20.73
1870s	2,169	23.76	855	25.01	1,314	23.00
1880s	2,136	23.40	890	26.04	1,246	21.81
1890s	1,458	15.97	657	19.22	801	14.02
1900s	136	1.49	71	2.08	65	1.14
Total	9,130	100.00	3,418	100.00	5,712	100.00

	MEXICANS		MEXICANS BORN IN THE US		MEXICANS BORN IN MEXICO	
OCCUPATIONS	N	PERCENT	N	PERCENT	N	PERCENT
White-collar	149	1.63	64	1.87	85	1.49
Skilled	986	10.80	296	8.66	690	12.08
Farmer	620	6.79	310	9.07	310	5.43
Unskilled	7,176	78.60	2,663	77.91	4,513	79.01
No occupation	199	2.18	85	2.49	114	2.00
Total	9,130	100.00	3,418	100.00	5,712	100.00

Table 1 (Continued)

		MEXICAN		MEXICANS BORN IN THE U.S.		MEXICANS BORN IN MEXICO		1900 CENSUS POPULATION	
PRISON	YEARS	N	PERCENT	N	PERCENT	N	PERCENT	N	PERCENT
Arizona	1888–1919	2,149	23.54	428	12.52	1,712	30.13	122,931	3.15
Colorado	1871–1925	180	1.97	84	2.46	96	1.68	539,700	13.82
New Mexico	1884–1917	1,905	20.87	1,349	39.47	556	9.73	195,310	5.00
Texas	1873–1919	4,896	53.63	1,557	45.55	3,339	58.46	3,048,710	78.04
Total	1851–1925	9,130	100.00	3,418	100.00	5,712	100.00	3,906,651	100.00

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

Fig. 1 Mexicans Born in Mexico in the Nineteenth-Century New Mexico Prison

NOTE The numbers represent the inmates in the New Mexico prison who were born in each Mexican province. The northern provinces are Baja California, Baja California Sur, Chihuahua, Coahuila, Durango, Nuevo Leon, Sinaloa, Sonora, and Tamaúlipas. The central provinces are Aguascalientes, Colima, Guanajuato, Querétaro, Hidalgo, México, Tlaxcala, Federal District, Michoacán, Morelos, Nayarit, Puebla, San Luis Potosi, Veracruz, and Zacatecas. The southern provinces are Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, and Yucatan.

SOURCE Map is from Derek F. Roberts and Marshall T. Newman, "Physiological Studies," in T. Dale Stewart (ed.), *Handbook of Middle American Indians* (Austin, 1970), IX, 150.

migration, indicating that stature growth had ceased by the time of migration, and thus that the statures of Mexicans born in Mexico reflected Mexican biological conditions.[6]

Stature and crime may be related to biological conditions through the relative effects of privation. The proportions of crimes committed are reported according to six categories: physical assault, fraud, murder, sexual assault, theft, and other (Table 2).

6 Goldstein, *Demographic and Bodily Changes,* 15, 24.

Table 2 Nineteenth-Century Mexican Youth and Adult Crime Proportions

CRIME	MEXICAN YOUTH	MEAN STATURE	MEAN BMI	MEXICAN ADULTS	MEAN STATURE	MEAN BMI
Physical assault	9.25	167.06	22.79	14.80	167.20	23.11
Fraud	4.64	166.98	22.25	4.44	168.17	23.02
Murder	8.10	166.79	22.40	13.00	167.33	23.13
Sexual offense	3.26	166.28	22.55	5.67	167.64	23.11
Theft	70.18	166.97	22.38	54.16	167.51	23.06
Other crimes	4.57	168.56	22.13	7.93	167.67	23.33
DECADE RECEIVED						
1850s						
Murder	0.00	NA	NA	11.76	165.42	NA
Theft	100.00	165.42	NA	64.71	170.58	NA
1860s						
Murder	14.81	167.05	NA	19.20	168.10	NA
Theft	62.96	164.73	NA	56.00	167.01	NA
1870s						
Murder	4.65	168.28	22.67	14.44	166.35	22.91
Theft	75.58	166.51	23.04	67.38	167.42	23.35
1880s						
Murder	6.14	169.47	22.05	13.61	167.15	23.07
Theft	79.06	167.72	22.10	65.42	168.51	23.00
1890s						
Murder	8.10	166.95	22.39	11.61	168.91	23.02
Theft	70.20	166.93	22.39	58.45	167.44	23.08
1900s						
Murder	9.81	166.73	21.78	14.03	167.09	23.22
Theft	64.71	166.31	22.59	47.39	167.28	23.24

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

Throughout the nineteenth century, a higher percentage of Mexican youths born in Mexico and in the United States were incarcerated for theft than for any other crime, whereas adults were incarcerated more for all other crimes. Since murder and theft are the most representative violent and nonviolent crimes, their proportions are presented over time to assess whether changing stature may have been the result of changes in biological processes or

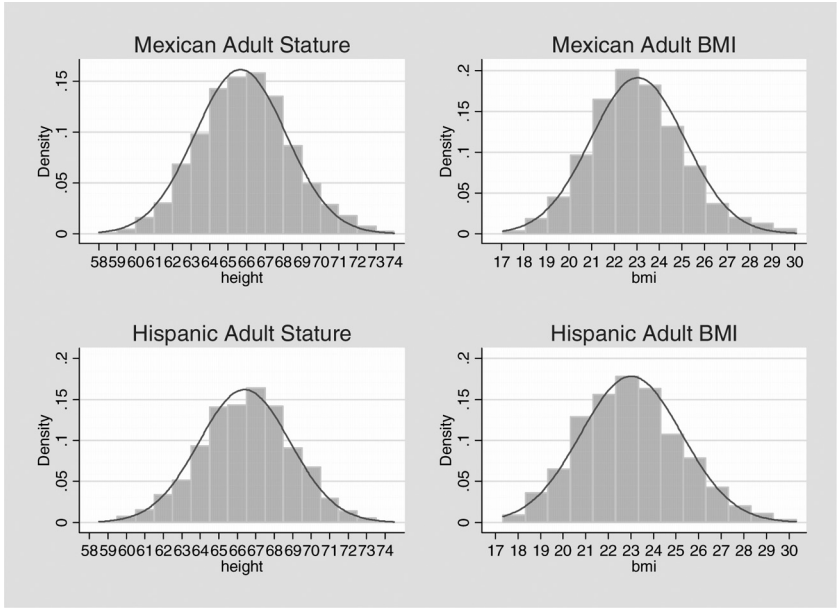
Table 3 Physical Stature of Nineteenth-Century Mexicans by Crime

	MEXICAN YOUTH STATURE	*P*-VALUE	MEXICAN ADULT STATURE	*P*-VALUE	MEXICAN YOUTH BMI	*P*-VALUE	MEXICAN ADULT BMI	*P*-VALUE
Intercept	168.56	<.01	166.970	<.01	22.130	<.01	23.340	<.01
Assault	−1.50	.05	.223	.54	.668	<.01	−.224	.13
Fraud	−1.58	.06	1.200	.01	.118	.64	−.318	.09
Murder	−1.77	.02	.363	.34	.278	.26	−.202	.17
Sexual offense	−2.28	.02	.677	.16	.435	.20	−.228	.16
Theft	−1.59	.01	.549	.10	.259	.20	−.275	.03
Other offense	Reference		Reference		Reference		Reference	
N	2,606		6,524		2,606		6,524	
R^2	.0032		.0013		.0044		.0003	

NOTE Control group is composed of Mexicans incarcerated for crimes other than assault, fraud, murder, sexual offense, or theft.

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

Fig. 2 Mexican Adult Stature and Body-Mass Histogram with Descriptive Stature and BMI



	MEAN	MEDIAN	STANDARD DEVIATION	SKEWNESS	KURTOSIS	N
Adult Mexican stature	65.66	65.75	2.54	−.030	.855	4,280
Adult Hispanic stature	66.40	66.5	2.59	−.116	3.20	2,280
Adult Mexican bmi	23.09	22.94	2.27	.700	1.12	4,280
Adult Hispanic bmi	23.11	22.95	2.47	.793	2.44	2,280

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

changes in the types of inmates incarcerated. The stature and BMIs of youths and adults by type of crime committed did not differ appreciably from those of the remainder of the sample. Nor were Mexican statures systematically explained by the types of crimes committed (Table 3).

A common difficulty in analyzing military samples is the application of a minimum stature requirement, which does not apply

to this sample. Hence, adult Mexican stature distributions approximate the norm. Likewise, no conditions were placed on inmates' BMI distributions, which are, for all intents and purposes, also normal (Figure 2).[7]

DEMOGRAPHIC AND SOCIOECONOMIC EFFECTS ON MEXICAN STATURE AND BMI

Mexican Stature In the nineteenth century American Southwest, stature differences between Mexicans born in Mexico and those born in the United States likely reflect the environments in which they came to maturity. Table 4 presents regressions for Mexican stature on age, birth, and occupational variables. Because youth stature is most sensitive to age effects, five teenage binary variables are included (15, 16, 17, 18, and 19); four 10-year adult binary variables are included (30–39, 40–49, 50–59, and 60 or older). Binary birth-decade variables are included to account for birth between 1830 and 1899. Average stature also varied by occupation, which may have been a good indicator for parental occupation as well, thus indicating the socioeconomic status under which inmates came to maturity.[8]

Four occupational variables are included—white-collar, skilled, farmer, and unskilled. Merchants and highly skilled workers are classified as white-collar; light manufacturers, craft workers, and carpenters are classified as skilled workers; workers in the agricultural sector are classified as farmers; and laborers and miners are classified as unskilled workers (see the Appendix for a complete list of occupations by category). Stature and BMI standardized regression coefficients are also used to adjust for the fact that certain

7 The test for juvenile normality is complicated given that juvenile heights are skewed to the right at the beginning of the growth spurt and skewed to the left at the end of it—a phenomenon caused by early and late maturers. Kenneth Sokoloff and Georgia Villaflor, "Early Achievement of Modern Stature in America," *Social Science History,* VI (1982), 457; Fogel et al., "Economics of Mortality in North America, 1650–1910: A Description of a Research Project," *Historical Methods,* XI (1978), 75–108.

8 Dora Costa, "Height, Wealth and Disease among the Native-Born in the Rural Antebellum North," *Social Science History,* XVII (1993), 367; Robert Margo and Steckel, "Nutrition and Health of Slaves and Antebellum Southern Whites," in Fogel and Stanley E. Engerman (eds.), *Conditions of Slave Life and the Transition to Freedom. II. Without Consent or Contract: The Rise and Fall of American Slavery* (New York, 1992), 520; S. Goya Wannamethee et al., "Influence of Father's Social Class on Cardiovascular Disease in Middle-Aged Men," *Lancet,* CCCILVIII (1996), 1259–1263; Maria Nyström-Peck and Olle Lundberg, "Short Stature as an Effect of Social Conditions in Childhood," *Social Science Medicine,* XL (1995), 733–738.

variables have larger standard deviations than others and to illustrate the comparative relationship between stature and BMI. Models 1 and 2 in Table 4 present regressions for the statures of Mexicans born in Mexico on birth cohorts, occupations, and residence; models 3 and 4 do so for Mexicans born in the United States; and models 5 and 6 do so for the combined sample.[9]

Consistent with the findings of Lopez-Alonso, Condey, and Carson, the stature of Mexicans born in Mexico who later lived in the American Southwest declined throughout the nineteenth century (Figure 3). This decline coincided with Mexico's tumultuous political and economic climate. The 1830s and 1840s brought General Antonio López de Santa Anna—a self-styled "Napoleon of the West"—to power. Between 1846 and 1848, Mexico and the United States engaged in a bloody war that determined who would control what is now the U.S. Southwest, and for twenty years thereafter, various factions vied for power in Mexico. At the same time, as U.S. political and economic institutions began to come of age in the Southwest, the average statures of Mexicans born in the United States underwent an unambiguous, sustained increase of 3 cm.[10]

Standardized coefficients demonstrate that Mexican birth had the most significant and negative association with stature, indicating that the two groups experienced different net cumulative biological conditions, even though they differed only by birthplace. Part of the stature advantage for Mexicans born in the United States was probably attributable to diet, specifically animal proteins and calcium, the latter necessary for healthy bone growth. As a rule, diets in Mexico were vegetarian; staples included beans, rice, chilies, bread, and tortillas. The major source of calcium for Mexicans born in Mexico was the limestone used to crush the corn or flour for the preparation of tortillas. However, since both Mexi-

9 Tanner, "Hormonal, Genetic and Environmental Factors Controlling Growth," in G.A. Harrison et al. (eds.), *Human Biology: An Introduction to Human Evolution, Variation, Growth and Ecology* (New York, 1977), 335–351; Emmanuel Le Roy Ladurie, "The Conscripts of 1968: A Study of the Correlation between Geographical Mobility, Delinquency and Physical Stature and Other Aspects of the Situation of the Young Frenchman Called to Do Military Service That Year," in Ben Reynolds and Sian Reynolds (eds.), *The Territory of the Historian* (Chicago, 1979), 33–60; Margo and Steckel, "Nutrition and Health of Slaves."

10 Lopez-Alonso, "Ups and Downs"; Carson, "Mexican Statures"; Colin M. MacLachlan and William H. Beezley, *El Gran Pueblo: A History of Greater Mexico*. (Upper Saddle River, N.J., 1999; orig. pub. 1994).

Table 4 Stature Regression Models for Mexicans Born in Mexico and Mexicans Born in the United States

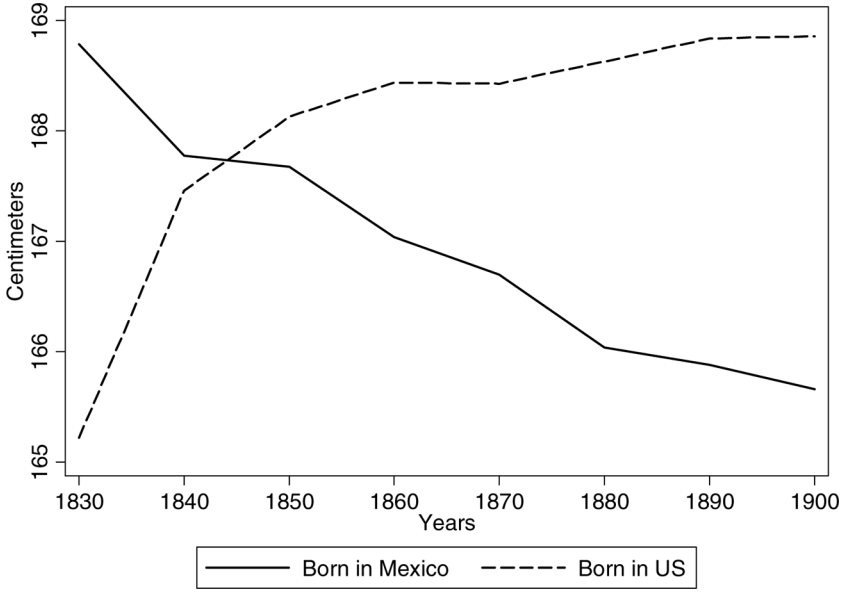
	MEXICANS BORN IN MEXICO			MEXICANS BORN IN THE U.S.			TOTAL		
	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED
Intercept	167.27	<.01		168.33	<.01		168.49	<.01	
Age									
15	−3.58	.01	−.026	−6.28	<.01	−.070	−5.10	<.01	−.046
16	−3.17	<.01	−.045	−3.55	<.01	−.058	−3.44	<.01	−.051
17	−1.71	.02	−.032	−2.93	<.01	−.069	−2.24	<.01	−.046
18	−1.92	<.01	−.053	−.739	.13	−.026	−1.33	<.01	−.040
19	−.653	.14	−.020	−1.62	<.01	−.057	−1.13	<.01	−.037
20–29	Reference		Reference	Reference		Reference	Reference		Reference
30–39	−.804	<.01	−.054	−.171	.57	−.011	−.547	<.01	−.035
40–49	−2.35	<.01	−.110	−1.15	.02	−.045	−1.91	<.01	−.084
50–59	−3.23	<.01	−.108	−.144	.88	−.003	−.283	.59	−.008
60+	−.947	.28	−.016	−2.47	.12	−.032	−3.52	<.01	−.054
Birth decade									
1830	2.09	.03	.040	−3.21	.13	−.041	.622	.49	.011
1840	1.08	.02	.037	−.976	.24	−.023	.439	.29	.013
1850	.977	<.01	.050	−.304	.53	−.012	.545	.04	.026
1860	.338	.20	.021	.010	.98	5.6	.213	.31	.013
1870	Reference		Reference	Reference		Reference	Reference		Reference
1880	−.659	.01	−.042	.193	.53	.013	−.308	.12	.020
1890	−.816	<.01	−.044	.407	.26	.025	−.235	.32	.013
1900	−1.04	.21	−.017	.428	.63	.009	−.371	.54	−.007

Table 4 (Continued)

	MEXICANS BORN IN MEXICO			MEXICANS BORN IN THE U.S.			TOTAL		
	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED
Occupations									
White-collar	1.19	.14	.022	1.41	.21	.030	1.31	.05	.025
Skilled	.309	.61	.016	−.305	.74	−.013	.083	.87	.004
Farmer	1.04	.11	.036	1.210	.18	.053	1.260	.02	.049
Unskilled	.763	.17	.048	.267	.75	.017	.567	.24	.036
No Occupation	Reference		Reference	Reference		Reference	Reference		Reference
Nativity									
Mexican	NA		NA	NA		NA	−1.79	<.01	−.133
Mexicans born in the U.S.	Reference		Reference	Reference		Reference	Reference		Reference
Prison									
Arizona	−.187	.55	−.013	−.348	.31	−.018	.163	.45	.011
Colorado	−.718	.32	−.014	−2.71	<.01	−.065	−1.42	<.01	−.030
New Mexico	Reference		Reference	Reference		Reference	Reference		Reference
Texas	−.863	<.01	−.066	.482	.05	.037	−.043	.82	−.003
N	5,712			3,418			9,130		
R	.0233			.0289			.0354		

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

Fig. 3 Stature Profiles of Mexicans Born in Mexico and Mexicans Born in the United States



NOTE The birth-year coefficients are those presented in Table 4, weighted by prison populations. "Years" represents birth year.

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

cans born in Mexico and those born in the United States used stones to crush flour, this calcium source is unlikely to explain the stature differential between the two groups. Mexico's failing agriculture during the early twentieth century (Mexican agriculture in 1918 was only 66 percent of Mexican agriculture in 1910) correlates heavily with the declining Mexican statures.[11]

Gamio and Cardoso indicated that the diets of Mexicans born in the United States during the nineteenth century were aug-

11 Justin Tortolani, Edward McCarthy, and Paul Sponseller, "Bone Mineral Density Deficiency in Children," *Journal of the American Academy of Orthopedic Surgeons,* X (2002), 57–66; Manuel Gamio, *Mexican Immigration to the United States* (New York, 1969), 140; Lawrence A. Cardoso, *Mexican Emigration to the United States, 1897–1931* (Tucson, 1980), 41.

mented with animal proteins, and that the relative price of food was lower in the United States than in Mexico. Moreover, by 1900, Mexicans born in the United States benefited from improved canning processes, refrigerated freight cars, and large-scale commercial farms, which gave them greater access to animal proteins and dairy products—plausible sources for the stature difference between the two groups.[12]

The mere fact that Mexicans born in the United States tended to be taller does not necessarily indicate that U.S. biological conditions were superior to those in Mexico because northern Mexicans were also taller than their southern-born counterparts. Nevertheless, since the statures of most northern Mexican indigenous groups remained stationary or declined, and the statures of Mexicans born in the United States increased, better nutrition and biological conditions in the United States provide a reasonable explanation for the discrepancy in heights. Mexican white-collar workers and farmers reached the tallest statures, indicating that white-collar workers and self-sufficient Mexican farmers also came to maturity under net cumulative biological conditions that surpassed those under which skilled and unskilled workers matured.[13]

Mexican Body Mass Index Factors associated with BMI variation are similar to those that influence stature variation. When diet, health, or physical environment improves, average BMIs increase; they decrease when these factors suffer. Table 5 presents Mexican BMIs regressed on age, year received, socioeconomic status, and residence.[14]

Unlike stature trends, the Mexican BMI trends indicate that Mexicans born in Mexico and in the United States encountered similar biological circumstances in the U.S. Southwest (Figure 4). Between 1870 and 1920, average BMIs of Mexicans born in Mexico remained approximately constant. The BMIs of Mexicans born in the United States began much higher than the BMIs of Mexicans born in Mexico, but the two figures converged rapidly. Between

12 Gamio, *Mexican Immigration,* 140–146; Cardoso, *Mexican Emigration,* 41; Lee A. Craig, Barry Goodwin, and Thomas Grennes, "The Effect of Mechanical Refrigeration and Nutrition in the U.S.," *Social Science History,* XXVIII (2004), 325–336; Carey McWilliams, *North from Mexico: The Spanish-Speaking People of the United States* (Philadelphia, 1949).

13 Faulhaber, "Anthropometry of Living Indians."

14 Fogel, "Economic Growth, Population Theory and Physiology," 375.

Table 5 BMI Regression Models for Mexicans Born in Mexico and Mexicans Born in the United States

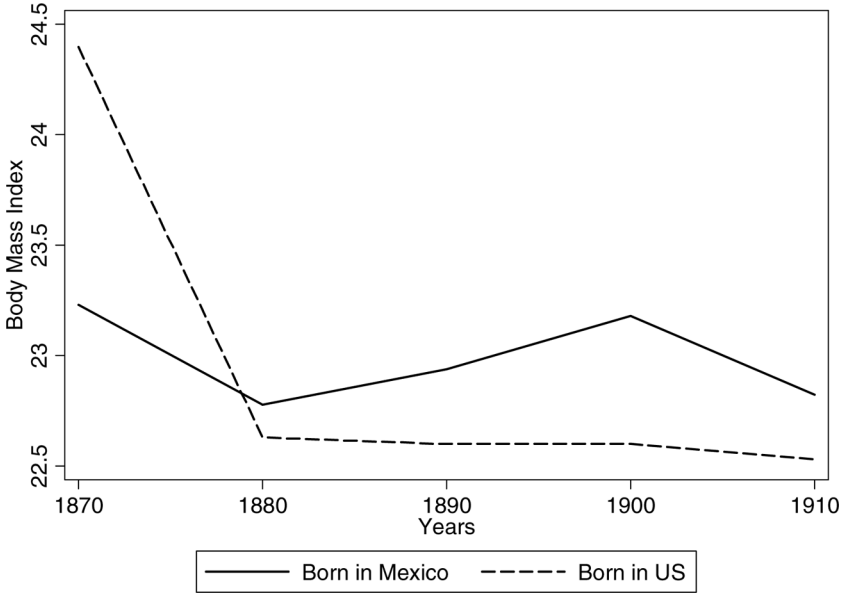
	MEXICANS BORN IN MEXICO			MEXICANS BORN IN THE US			TOTAL		
	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED
Intercept	23.36	<.01		22.69	<.01		22.96	<.01	
Age									
15	−2.40	<.01	−.051	−1.72	<.01	−.052	−2.02	<.01	−.051
16	−.935	<.01	−.038	−.813	.01	.036	−.882	<.01	−.037
17	−1.00	<.01	−.054	−.963	<.01	−.061	−.992	<.01	−.058
18	−.674	<.01	−.054	−.997	<.01	−.094	−.823	<.01	−.071
19	−.734	<.01	−.066	−.444	<.01	−.043	−.590	<.01	−.055
20–29	Reference		Reference	Reference		Reference	Reference		Reference
30–39	.307	<.01	.059	.457	<.01	.077	.360	<.01	.066
40–49	.440	<.01	.059	.576	<.01	.062	.493	<.01	.062
50–59	.451	.02	.038	.664	.07	.043	.027	.89	.002
60+	−.523	.15	−.025	.574	.40	.020	.112	.71	.005
Decade received									
1870	.292	.08	.022	1.80	<.01	.070	.510	<.01	.032
1880	−.159	.12	−.023	.033	.85	.004	−.100	.27	−.013
1890	Reference		Reference	Reference		Reference	Reference		Reference
1900	.243	<.01	.049	3.3	.99	6.2	.153	.02	.030
1910	−.115	.17	−.024	−.170	.12	−.035	−.121	.06	−.026

Table 5 (Continued)

	MEXICANS BORN IN MEXICO			MEXICANS BORN IN THE US			TOTAL		
	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED	OLS	*P*-VALUE	STANDARDIZED
Occupations									
White-collar	−.528	.11	−.029	−.202	.63	−.011	−.377	.15	−.021
Skilled	−.349	.13	−.051	.299	.32	.035	−.111	.55	−.015
Farmer	.517	.04	.052	.324	.28	.039	.386	.05	.042
Unskilled	−.076	.72	−.014	.292	.29	.051	.073	.67	.013
No occupation	Reference		Reference	Reference		Reference	Reference		Reference
Nativity									
Mexican	NA		NA	NA		NA	.081	.14	.017
Mexicans born in the U.S.	Reference		Reference	Reference		Reference	Reference		Reference
Prison									
Arizona	−.543	<.01	−.111	−.201	.13	−.028	−.359	<.01	−.066
Colorado	−.075	.75	−.004	.276	.30	.018	.135	.44	.008
New Mexico	Reference		Reference	Reference		Reference	Reference		Reference
Texas	−.439	<.01	−.097	−.161	.08	−.034	−.267	<.01	−.058
N	5,712			3,418			9,130		
R	.0416			.0446			.0383		

SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

Fig. 4 BMI Profiles of Mexicans Born in Mexico and Mexicans Born in the United States



NOTE The observation-year coefficients are those presented in Table 5, weighted by prison populations. "Years" represents years of measurement.
SOURCE Data used to study Mexican anthropometrics is a subset of a much larger nineteenth-century prison sample. All available records from American state repositories have been entered into a master file, including those from Arizona, California, Colorado, Idaho, Illinois, Kansas, Kentucky, Missouri, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Washington. Prison records used in this manuscript are from Arizona, Colorado, New Mexico, and Texas.

1870 and 1880, the BMIs of Mexicans born in Mexico and of those born in the United States declined by 1.9 and 7.2 percent, respectively, and thereafter remained approximately constant. The BMIs of Mexicans born in Mexico and of those born in the United States both declined during the fourth quarter of the nineteenth century, precisely when Diaz and the Porfiriato were promoting national transportation and mineral extraction for economic development.

Farmers had heavier BMIs than Mexicans in other socioeconomic groups by only 1 percent, indicating that Mexican farmers were only marginally more robust than Mexican workers in other occupations. Part of this difference may be due to physical activity.

Mexican skilled workers expended between 1.5 and 2.5 energy-requirement multiples of sleeping basal metabolic rate, whereas agricultural workers expended between 2.5 and 6.8 energy-requirement multiples of sleeping basal metabolic rate. Therefore, Mexican rural farmers' nutritional advantages were possibly offset by greater physical activity.[15]

The diets and nutrition of Mexicans born in the United States were probably more favorable than the diets and nutrition of Mexicans born in Mexico. Porfirio Díaz's drive toward rapid industrialization in Mexico did not benefit lower-class Mexicans, and Porfiriato changes to institutional property arrangements virtually excluded Mexican lower classes from real property ownership, thereby further jeopardizing their biological welfare. The height differential between Mexicans born in the United States and those born in Mexico indicates that although the two groups shared a common genetic background, the cumulative biological conditions of the two groups were vastly different. The BMIs of both Mexicans born in Mexico and those born in the United States decreased throughout the late nineteenth and early twentieth centuries, becoming similar after the 1870s. Consequently, throughout the second half of the nineteenth century, cumulative biological conditions did not converge. Mexicans born in Mexico became smaller, shorter, and thinner, while Mexicans born in the United States grew taller and thinner, suggesting that trans-border Mexican biological living conditions in the American West did not fully integrate.[16]

15 *Ibid.*
16 Cardoso, *Mexican Emigration,* 42.

APPENDIX: MEXICAN OCCUPATIONS

WHITE-COLLAR			
Actor	Baker	Barber	Book keeper
Butcher	Clerk	Druggist	Electrician
Merchant	Musician	Nurse	Photographer
School teacher			
SKILLED			
Carpenter	Blacksmith	Boilermaker	Brick maker
Brickmason	Cabinetmaker	Cigar maker	Cook
Craftsman	Engineer	Gambler	Glassblower
Harness maker	Horseshoer	Machinist	Mason
Machinist	Mason	Mechanic	Molder
Painter	Plasterer	Plumber	Printer
Saddler	Shoemaker	Tailor	Tanner
Telegraph operator	Tinsmith	Upholsterer	Wheelwright
FARMERS			
Cattleman	Dairyman	Farmer	Rancher
Stockman			
UNSKILLED			
Apprentice	Bartender	Boot black	Brakeman
Chauffer	Coachman	Cowboy	Fireman
Gardener	Herder	Hostler	Housekeeper
Laborer	Miner	Porter	Railroad laborer
Sailor	Servant	Soldier	Teamster
Truck driver	Waiter		

NOTE This occupational classification replicates that used by Joseph P. Ferrie, "The Entry into the U.S. Labor Market of Antebellum European Immigrants, 1840–1860," *Explorations in Economic History,* XXXIV (1997), 325; *idem, Yankeys Now* (New York, 1999).