

Online Appendix

APPENDIX A: RECENT ANTHROPOMETRIC HISTORY PAPERS INCLUDED IN META-ANALYSIS

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APPENDIX B: TABULAR SUMMARY OF THE DATA USED IN THE META-ANALYSIS

MODERN ANTHROPOMETRIC HISTORY STUDIES

Author(s)	Year	Country	Region	First Year	Last Year	Age	Shortfall	Observations	First Height	Last Height	> 1cm Rev (y//n)	> 1cm Rev era	> 1cm Rev (y/n)	Rev era
Conscripts														
Popoff	1926	Bulgaria	National	1886	1901	19		645846	165.8	166.2	No		No	
Valaoras	1970	Greece	National	1907	1945	20	No	490000	168	167.2				
Valaoras	1970	Greece	National	1927	1945	20	No	468000	166.7	167.2	No		No	
Sandberg	1987	Sweden	National	1820	1849	21	QBE	3665	169.8	169.4	No		No	
Sobral	1990	Portugal	Lisbon	1910	1962	20	No	27692	164.7	171.1	No		No	
Sobral	1990	Portugal	Setubal	1910	1962	20	No	13437	163.9	169.8	No		No	
Sobral	1990	Portugal	Evora	1910	1962	20	No	7714	163.6	168.3	No		No	
Sobral	1990	Portugal	Beja	1910	1962	20	No	6501	163.1	168.4	No		No	
Shay	1994	Japan	National	1892	1937	20	No	10000000	156.1	160.3	No		No	
Martinez-Carrion	1994	Spain	Murcia	1840	1886	20	No	16735	160	162.7	No		No	
Hermanussen	1995	Germany	National	1938	1971	19.5	No	11851168	174	179.7	No		No	
Mironov	1995	Russia	National	1854	1891	20	No	5550000	162.1	165.4	No		No	
Drukker	1997	Netherlands	National	1863	1940	19.75	No		164.1	173.4	No		No	
Hauspie	1997	Belgium	National	1920	1980		No		165.5	175	No		No	
Hauspie	1997	Poland	National	1946	1976	19	No	70000	170.5	176.5	No		No	
Sandberg	1997	Sweden	National	1820	1965	20	QBE	2175000	167	179.3	No		No	
Greil	1998	W Germany	National	1956	1965	19.5	No		177.4	179.1	No		No	
Greil	1998	E Germany	National	1956	1965	17.9	No		175.2	176.5	No		No	
Martinez-Carrion	1998	Spain	Southeast	1840	1940	20.5	No	158383	162	166.2	Yes	1850s	Yes	1910s
Martinez-Carrion	1998	Spain	Elche	1871	1948	20	No	29329	162.9	166.9	No		No	
Sapounaki-Dracaki	1998	Greece	National	1927	1945	19	No	468056	166.7	167.2	No		No	

Valle	1998	Spain	National	1887	1933	20.5	No	40800	163.8	165.7	No	No		
Wheatcroft	1999	Russia	National	1853	1892	20	No	11709090	162.2	164.9	No	No		
Baten	2000	Germany	Bavaria	1815	1840	21	No	15000	166.3	165.9	No	No		
Danubio	2003	Italy	Abruzzo	1845	1954	18-20	No	823	161.3	172.6	No	No		
Federico	2003	Italy	National	1854	1913	20	No		162.4	166.1	No	No		
Sunder	2003	Norway	National	1930	1980	18	No		176.5	180	No	No		
Padez	2003	Portugal	National	1886	1980	18	No		163.2	172.1				
Alter	2004	Belgium	Limbourg	1795	1875	20	No	1446	163.6	166.5	Yes	1810s	No	
Alter	2004	Belgium	Sart	1785	1865	20	No	1130	158.7	165.6	No		No	
Alter	2004	Belgium	Tilleur	1815	1885	20	No	1553	164.4	166.2	Yes	1840s	No	
Alter	2004	Belgium	Verviers	1805	1845	20	No	1164	164.7	161.6	Yes	1810s	Yes	1840s
Gyenis	2004	Hungary	Six counties	1933	1998	18	No	17497	166	176	No		No	
Salvatore	2004	Argentina	Northwest	1916	1951	18	No	17693	165.1	167.2	No		No	
Salvatore	2004	Argentina	Buenos Aires	1900	1934	18	No	22594	168.1	170.2	No		No	
Arcaleni	2006	Italy	National	1854	1989	20.5	No		162.4	174.6	No		No	
Breschi	2006	Italy	Friuli	1846	1890	20	No	90320	166.2	166.6	Yes	1850s	No	
Bassino	2006	Japan	National	1900	1940	20	No	348000	156.4	159.8	No		No	
Lintsi	2006	Estonia	Tartu	1811	1998	17	No	1000	160.7	179.1	Yes	1910s	No	
Heyberger	2007	France	Four districts	1780	1920	18	No	237782	164	168	No		No	
Martinez-Carrion	2007	Spain	Leon-Castile	1837	1915	21	No	22778	161.2	163.8	Yes	1850s	No	
Martinez-Carrion	2007	Spain	Southeast	1837	1915	21	No	80391	162.2	165	No		No	
Baten	2009	Argentina	National	1870	1910	17-52	No	6953	167.6	167.8	No		No	
Lantzch	2009	Germany	Bavaria	1813	1842	21	No	20000	164	164.5	No		No	
Salvatore	2009	Argentina	Buenos Aires	1916	173	18	No	15500	170.5	173	Yes	1940s	No	
Maria-Dolores	2011	Spain	Castile-Leon	1837	1948	21	No	22778	161.2	163.8	Yes	1850s	No	
Maria-Dolores	2011	Spain	Southeast	1837	1948	21	No	80391	162.2	165	Yes	1850s	No	
Schoch	2012	Switzerland	Basel	1875	1905	21	No	20000	165	171.3	No		No	
Stolz	2013	Portugal		1830	1910	18-50	Trunc MLE	43189	163.6	164.3	No		No	
Ayuda	2014	Spain	Valencia	1859	1967	21	No	82039	163	171.3	No		No	

Volunteers

Margo	1982	US	South	1820	1840	23-49	No	3651	169.8	168.8	No	No		
Margo	1983	US	National	1815	1840	25-49	No	4931	173.7	174.6	No	No		
Margo	1983	US	National	1815	1840	25-49	No	3260	173.8	174.9	No	No		
Margo	1983	US	National	1815	1840	25-49	No	1080	172.3	172.1	No	No		
Steedmann	1985	UK	54th regiment	1749	1778	21+	Yes	635	170.5	170.5	Yes	1750s	Yes	1760s
Sandberg	1987	Sweden	National	1720	1819	25-49	QBE	12513	167.1	168.8	Yes	1750s	Yes	1760s
Komlos	1989	Austria	Moravia	1730	1799	23-45	QBE	9847	166.4	164.6	Yes	1750s	Yes	1770s
Komlos	1989	Austria	Bohemia	1730	1799	23-45	QBE	13203	165.4	161.1	Yes	1750s	Yes	1770s
Komlos	1989	Austria	Galicia	1730	1789	23-45	QBE	5294	170.8	163.3	Yes	1740s	Yes	1750s
Komlos	1989	Austria	Lower Austria	1740	1799	23-45	QBE	5048	169.1	161.2	Yes	1750s	Yes	1770s
Steckel	1994	US	OH Natl Guard	1850	1905	23-49	No	13000	175.3	173.2	Yes	1850s	Yes	1880s
Haines	1998	US	New York	1815	1845	21-49	No	3041	171.6	172.3	Yes	1830s	No	
Komlos	1998	US	Upper South	1810	1840	20-70	No	3651	169.8	168.8	Yes	1830s	No	
Nicholas	1998	Australia	WWI soldiers	1874	1883	21-49	No	4676	172.5	170.9	Yes	1880s	No	
Nicholas	1998	Australia	WWII soldier	1895	1920	21-49	No	7025	171.5	172.7	No		No	
Salvatore	1998	Argentina	Buenos Aires	1785	1839	22-49	No	2024	158.2	160.1	No		No	
Komlos	2001	US	National	1720	1790	20+	Trunc MLE	3916	174	171.5	Yes	1740s	Yes	1790s
Whitwell	2001	Australia	East	1880	1920	21-49	No	11701	171.4	173	Yes	1880s	Yes	1890s
A'Hearn	2003	Italy	North	1740	1770	21	MLE	4000	167	166	Yes	1750s	No	
A'Hearn	2003	Italy	North	1775	1835	21	MLE	4000	165	164	Yes	1820s	No	
Komlos	2003	France	National	1670	1760	23+	Trunc MLE	28000	163	166	Yes	1710s	Yes	1750s
Cranfield	2007	Canada		1870	1880	21-49	No	2630	173.1	170.7	Yes	1880s	No	
Cranfield	2007	Canada		1870	1895	21-49	No	11345	171.2	170.5	No		No	
Komlos	2007	England	militia	1710	1735	23-50	No	1359	168	165.5	Yes	1720s	No	
Komlos	2007	Ireland	militia	1710	1735	23-50	No	1812	168	166.5	Yes	1720s	No	
Komlos	2007	Germany	Saxony	1715	1750		Trunc MLE	10083	164	164.5	No		No	
Lopez-Alonso	2007	Mexico	militia	1840	1899	23-50	Trunc MLE	6820	167	164.5	Yes	1870s	Yes	1880s
Lopez-Alonso	2007	Mexico	Soldiers	1870	1949	18-45	Trunc MLE	6236	165	165	Yes	1910s	No	
Shlomowitz	2007	Australia	Boer War	1861	1881	21-49	No	3096	173.9	172.9	No		No	
Inwood	2010	New Zealand	WWI	1870	1895	21-49	Trunc MLE	3051	171.4	171	No		No	
Inwood	2010	New Zealand	WWI	1870	1895	21-49	Trunc MLE	2731	170.3	170.8	No		No	

Cranfield	2011	Britain	WWI	1875	1894	21-49	Trunc MLE	4692	168.8	169.4	No	No		
Cranfield	2011	Australia	WWI	1875	1894	21-49	Trunc MLE	16038	170.7	170.3	No	No		
Cranfield	2011	Britain	WWI	1875	1894	21-49	Trunc MLE	15807	166	166.2	No	No		
Cranfield	2011	Canada	WWI	1875	1894	21-49	Trunc MLE	17488	169.4	168.7	No	No		
Zehetmayer	2011	US	National	1847	1894	18-50	Trunc MLE	41713	173	172	Yes	1850s	Yes	
Austin	2012	West Africa	Ghana	1800	1849	17-22	Trunc MLE	2241	167.2	164.6	Yes	1840s	Yes	
Riggs	2013	Scotland	Soldiers	1870	1899	25-45	Trunc MLE	1941	172	172.2	No	No		
Stolz	2013	Portugal	Soldiers	1720	1830	18-50	Trunc MLE	3450	163.6	163.6	No	No		
Others														
Margo	1982	US	South	1790	1840	23-49	No	9726	169.6	172.1	No	No		
Komlos	1986	Austria		1780	1804	17	No	1562	160.8	158.3	Yes	1790s	No	
Komlos	1987	US	National	1820	1879	17	No	996	169.4	170.3	No	No		
Komlos	1987	US	National	1820	1879	18	No	953	172	171.4	No	No		
Komlos	1987	US	National	1820	1879	19	No	829	173	172.6	Yes	1830s	Yes	1850s
Komlos	1987	US	National	1820	1879	20	No	610	173.5	173.4	Yes	1840s	Yes	1850s
Nicholas	1991	England	Rural	1770	1815	23+	No	3100	168	167.4	Yes	1780s	No	
Nicholas	1991	England	Urban	1770	1815	23+	No	1951	168.7	166.6	Yes	1780s	Yes	1790s
Komlos	1992	US	Maryland	1760	1840	21-50	No	6242	169	169.6	No	No		
Komlos	1993	England		1710	1750	23+	No	850	171.5	169.9	Yes	1730s	No	
Komlos	1993	Ireland		1710	1750	23+	No	1628	169.7	170.7	No	No		
Komlos	1994	US	Mulattoes	1720	1819	23+	No	544	173	175.3	No	No		
Komlos	1994	France	Paris	1780	1860	18	No	1838	171.1	171.7	Yes	1820s	No	
Komlos	1994	France	Provinces	1780	1860	18	No	11214	171.4	170.6	Yes	1830s	No	
Riggs	1994	Scotland	Glasgow	1800	1840		No	1500	169.5	169.7	Yes	1810s	Yes	1830s
Riggs	1994	Scotland	Rural	1800	1840		No	1500	170.9	170.9	Yes	1810s	No	
Wu	1994	US	Pittsburgh	1890	1950	21+	No	5826	173.6	178.7	No	No		
Wu	1994	US	Pittsburgh	1890	1950	21+	No	2101	172	177.4	No	No		
Brennan	1994	India	North	1840	1894	24-40	No	11870	160.5	163.7	Yes	1870s	No	
Brennan	1994	India	South	1863	1892	24-40	No	810	164.3	163.8	No	No		
Brennan	1997	India		1756	1803	23-70	No	1408	156.1	157.2	Yes	1770s	No	
Coclanis	1997	US	South	1860	1939	18	No	2023	174	179.1	Yes	1880s	No	

Coclanis	1997	US	South	1860	1939	17	No	2054	171.5	178.3	Yes	1890s	No	
Gill	1998	Korea		1925	1970	20-60	No	191558	166	171	No		No	
Gill	1998	Korea		1910	1930	20	No	489	166	166	No		No	
Nicholas	1998	Australia	National	1895	1931	20+	No	2310	171.8	171.7	No		No	
Grubb	1999	England		1710	1750	22+	No	392	167.4	170.9	Yes	1730s	No	
Grubb	1999	Ireland		1710	1750	22+	No	1200	166.9	172.2	No		No	
Johnson	1999	England		1812	1857	23-49	No	8612	165.6	164.8	Yes	1840s	Yes	1850s
Baten	2000	Germany	Bavaria	1815	1887	24-49	No	1582	170.5	170.6	Yes	1820s	Yes	1850s
Olds	2003	Taiwan	National	1882	1910	23-49	No	115700	162.7	163.9	No		No	
Gyenis	2004	Hungary	4 colleges	1935	1990	20	No	9805	170.9	178.9	Yes	1940s	No	
Sunder	2004	US	TN-whites	1830	1859	23+	No	803	173.7	174.4	Yes	1850s	No	
Sunder	2004	US	TN-blacks	1830	1859	23+	No	1804	169.5	173.6	Yes	1840s	No	
Morgan	2004	China		1880	1929	23-59	No	9462	166.2	168	No		No	
Carson	2005	US	Mexican	1840	1890	22-55	No	3883	167	166	Yes	1850s	No	
Carson	2005	US	Hispanic	1840	1890	22-55	No	20919	172	173	No		No	
Danubio	2005	Italy	National	1848	1951	30-70	No	1834	166.8	166	Yes	1880s	No	
Bassino	2006	Japan		1900	1940	20	No	10000	160.9	162.5	No		No	
Carson	2006	China		1810	1879	22-55	No	1187	166.3	163.4	Yes	1820s	Yes	1860s
Carson	2006	US	West	1810	1879	22-55	No	3911	167.4	170.4	Yes	1830s	No	
Guntupalli	2006	India		1915	1944	20-49	No	26154	163.5	164.2	No		No	
Tatrek	2006	US	Ohio	1795	1845	23-45	No	2554	174.2	173.2	No		No	
Vignerova	2006	Czech	National	1951	2001	17.5	No	14000	172.6	180.3	No		No	
Carson	2007	US	Mexican	1870	1920	23-55	No	6402	166.6	165.7	Yes	1920s	No	
Carson	2007	China	South	1820	1869	23-55	No	1154	164.8	163	No		No	
Cranfield	2007	Canada		1845	1870	21-49	No	1824	173.3	172.8	No		No	
Godoy	2007	Puerto Rico	National	1888	1928	35-79	No	9805	164.4	165.6	Yes	1890s	No	
Lopez-Alonso	2007	Mexico	National	1860	1920	18+	No	16612	164.8	168.1	No		No	
Meisel	2007	Columbia	National	1870	1919		No	10390	167.4	168.6	No		No	
Meisel	2007	Columbia	National	1905	1985		No	9321776	162.1	171	No		No	
Morgan	2007	Taiwan	National	1906	1945	21-39	No	1838	165.1	167.5	Yes	1900s	No	
Shlomowitz	2007	Australia	NSW	1827	1881	30-34	No	453	172.6	169.5	Yes	1870s	Yes	1880s
Shlomowitz	2007	Australia	NSW	1837	1886	25-29	No	700	172.7	168.7	Yes	1870s	Yes	1880s
Loesch	2000	Australia	East	1876	1975	17	No		166	176.6				
Carson	2008	Mexico	Northern	1830	1909	15-60	No	5712	169.4	166.2	Yes	1840s	No	

Carson	2008	US	Southwest	1830	1909	15-60	No	3418	165.1	168.8	Yes	1840s	No	
Maloney	2008	US	OH-white	1780	1880	23-55	No	17337	172.5	171.9	No		No	
Maloney	2008	US	OH-black	1800	1880	23-55	No	3520	173	170	Yes	1820s	Yes	1840s
Onge	2008	US	National	1870	1980	16+	No	6027	179.3	189.1	Yes	1940s	No	
Webb	2008	Czech	Six towns	1933	1957	45-70	No	3073	172.7	176.9	No		No	
Webb	2008	Poland	Krakow	1933	1957	45-70	No	4295	170	174.9	No		No	
Webb	2008	Russia	Novosibirsk	1933	1957	45-70	No	3892	169.1	173.1	No		No	
Baten	2009	Brazil	Rio	1810	1880	22-50	No	6771	164.6	166.4	No		No	
Baten	2009	Peru	Lima	1820	1880	23-50	No	1139	164	168	Yes	1840s	No	
Choi	2009	Korea		1890	1916	20-40	No	1738	163.9	164.5	No		No	
Choi	2009	Korea		1903	1960	20+	No	1300000	157	171	No		No	
Choi	2009	Korea		1927	1960	20+	No	6417	169	167.5	Yes	1930s	No	
Morgan	2009	China	South	1820	1879	20+	No	1492	163.6	163	No		No	
Wheatcroft	2009	Russia	Peasants	1857	1896	20+	No	2718	163.9	165.6	Yes	1870s	No	
Wheatcroft	2009	Russia	Urban	1916	1957	18+	No	11135	167	172.4	No		No	
Bodenhorn	2010	US	NY	1795	1844	18+	No	790	179.3	174.4	Yes	1800s	Yes	1830s
Bodenhorn	2010	US	NY	1815	1849	18+	No	151	179.3	173.4	Yes	1820s	Yes	1840s
Hiermeyer	2010	US		1860	1884	16-21	No	2468	171.9	173.3	No		No	
Kim	2011	Korea		1880	1920	25-30	No	6346	158.4	160.2	No		No	
Pak	2011	North Korea		1931	1986	20-70	No	2045	163.5	165.6	Yes	1980s	No	
Bodenhorn	2012	US	PA	1819	1854	21	No	1262	169.3	168.7	No		No	
Riggs	2013	Scotland	Aberdeen	1860	1889	25-46	No	569	171.3	171	No		No	
de Oliveria	2014	Brazil	National	1950	1980	21-53	No	8350	168.2	170.8	No		No	
Bodenhorn	2015	US	Va-Md	1787	1842	21	No	4223	169.9	170.1	Yes	1810s	Yes	1830s

APPENDIX C: UNION ARMY DATA SET CONSTRUCTION

Sequential selection criteria:

46,551	observations in Full Union Army Sample
-7,210	not in union army cohort
-168	bad enlistment year (not in 1861–1865)
-12	bad enlistment month
-118	height in feet (rh_feet1) missing
-7	height feet <4' (7) >7'11"(0)
-357	height inches missing (rh_inch1)
38,679	remaining observations at this point
-26,488	None of 3 age measures in [23,30]
-3,956	Not born in US
8,235	Basic sample

Information on the enlistment year comes from the variable “lstdt1_1” which measures “Likely date of first enlistment.” We require this variable to contain unambiguous information on the year and month of enlistment. Missing day of enlistment we assume is the 15th of the month.

Height in feet comes from the variable “rh_feet1” and the inches over the foot comes from the variable “rh_inch1.” We convert the height measures to inches.

We define born in the US as “rb_stat1” being coded for one of the 50 states or District of Columbia or the generic United States. If “rb_stat1” is blank, we use information in “rb_stat2” to determine birthplace in United States.

We examine three different ways to measure age. The first comes directly from the variable “lstag1_1” which measures integer age at first enlistment. The second comes from the reported data of birth (“rb_date1”) and the date of enlistment. We require a valid year of birth (23,140 missing). We assume any observation with a valid birth year but a missing month of birth was born on 1 July. Any other missing birth day we recoded to the 15th. We use the information on the year, month, and day of birth and enlistment to construct the integer age (truncated, not rounded) for this second measure at time of enlistment. Our third measure consists of those observations whose values of these two measures agree. We also examined an age at enlistment defined as enlistment year minus birth year, but found no substantive differences when we used that that measure instead of the second measure.

We use information on the minimum height requirements reported in Komlos (1998b). In particular, we impose the following minimum height requirements in the estimations:

April 1861 - August 1861	64.5”
September 1861 - December 1864	63.0”
January 1865 – April 1865	60.0”

We also truncate all heights from above at 80". The reduced sample maximum likelihood estimator we use with the Union Army data assumes a continuous normal distribution with truncation from below at the above minimum height requirements and truncated from above at 80".

1. Sample selection criteria for reported age at enlistment

8,235	Basic Sample				
	-143		missing age		
	-363		age < 23		
	-113		age > 30		
	-154		height < Minimum height requirement		
	-4		Height > 80"		
7,458	Age measure 1 sample				

Variable	Obs	Mean	Std. Dev.	Min	Max
height	7,458	68.46544	2.359465	60	78
age_en_var	7,458	25.88107	2.26445	23	30
enlist_yr	7,458	1862.484	1.319055	1861	1865

2. Sample selection criteria for age at enlistment from birth date and enlistment date

8,235	Basic Sample				
	-4,334		missing age		
	-450		age < 23		
	-144		age > 30		
	-62		height < Minimum height requirement		
	0		Height > 80"		
3,245	Age measure 2 sample				

Variable	Obs	Mean	Std. Dev.	Min	Max
height	3,245	68.53318	2.34197	61	77.75
age_en_var	3,245	25.81757	2.237722	23	30
enlist_yr	3,245	1862.491	1.324504	1861	1865

3. Sample selection criteria for age at enlistment agreement

8,235	Basic Sample	
	-6,391	any difference in above integer ages
	-107	age < 23
	0	age > 30
	-62	height < Minimum height requirement
	0	Height > 80"
1,695	Age measure 3 sample	

Variable	Obs	Mean	Std. Dev.	Min	Max
height	1,695	68.62556	2.29131	61	77.75
age_en_var	1,695	25.72389	2.245129	23	30
enlist_yr	1,695	1862.519	1.319897	1861	1865