

African Population, 1650 – 1950: Methods for New Estimates by Region

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ABSTRACT

This paper summarizes the methodology of a comprehensive project to estimate African population totals, by decade and for roughly 70 regions, throughout the African continent, for the period from 1650 to 1950. Primary emphasis is on describing the methods of estimating, simulating, and projecting African populations. Variables include vital rates (birth, death, migration), the migrations of enslaved persons (within Africa and departing from sub-Saharan Africa) as they affected population totals, and estimated decennial populations by region. Methodologies include analyses of crude vital rates and composition-specific vital rates, simulating levels of migration and the processes of population growth and decline, and Bayesian statistical methods for estimating error margins in population sizes and unknown values in the Atlantic slave trade. In addition, the paper includes a concise statement of preliminary results on the population estimates themselves, for the period from 1700 forward.

This project began with an exploration of the negative effects of export slave trade on African population in the eighteenth and nineteenth centuries. It grew by stages into a broader investigation of African population and migration over several centuries, with the objective of setting African population in the context of populations worldwide—to identify issues for which African demography has been similar to that of other world regions and, in contrast, to find issues for which African demography has been distinctive.

African data on demographic history are generally dispersed and in short supply, though with important exceptions. To maximize the utility of scarce and scattered data, my approach has emphasized, first, the linkage of a wide variety of data and data types and, second, developing and appropriating techniques for estimation of African demographic data. Two outstanding exceptions to the shortage of data result from the systematic assembly of data on the volume, composition, and direction of Atlantic slave trade (fifteenth through nineteenth centuries) and the even more systematic assembly of data on African population and vital rates for the period since 1950. In each case, large quantities of available data, collected through standard techniques of documentary research, were assembled into systematic datasets so that data throughout the collection could be assessed according to common standards. These two datasets, one on migration and the other on population, provide the basis for this overall analysis of African demographic history.

Two further areas of data collection have the potential to contribute substantially to the documentation of African population change: both focus on migration. For the export of captives from sub-Saharan Africa across the Sahara, the Red Sea, and the Indian Ocean—from the first millennium C.E. to the dawn of the twentieth century—a campaign of systematic collection of mostly qualitative but also quantitative data has clarified the overall picture significantly, and continues to provide significant new information. For the migration of Africans within the continent, especially from the eighteenth century to the present, substantial quantities of data exist within literatures focusing on slavery and economic change

in precolonial times, on labor migration and rebellion in colonial times, and on refugees and labor migration in postcolonial times. No team has yet stepped forward to systematize the data in either of these major topics in African demographic history, but the potential is there. While the work of locating, collating, and linking the scattered source materials in each of these areas was not previously feasible, new technology in data-mining makes each of these projects technically feasible, though still a large-scale project.

The present paper can be seen as a summary statement on the individual-level stage of work on this project of researching historical African population, in the hope and expectation that it will develop at the collaborative and interactive level. Along with my research assistants, I am now working to complete and systematize our estimates of African population and migration from 1650 to 1950. The data and estimates for population and migration presented in the accompanying tables are preliminary and indicative only, as the full implementation and interconnection of the various datasets and analytical techniques are still in course. At this stage, it is possible to present statements on the methodology of the study, and to do so by retracing the process by which they developed.¹

This project began in 1975 as an exploration of the implications of enslavement for a West African population. As this work continued, its scope expanded to consider the demographic and social effects of enslavement on African populations generally; then it expanded further to consider the magnitude and transformations in population throughout the African continent since 1650. As the project expanded it became more complex. Yet it also became more coherent, as the interaction among its various dimensions led to clarification along with complication. The book manuscript now in process, while by no means a complete statement on the history of African population, represents a summary and analysis in considerable breadth (Manning and Nickleach, in process). It builds upon steps in analytical advance, roughly in the order listed below.

Evolution and linkage of methods in the estimation of African population, 1650 – 1950

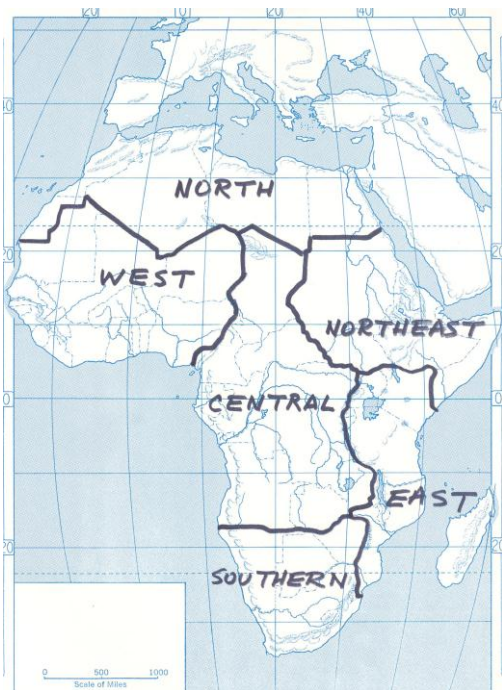
External Slave Trade as a factor in African population (Manning 1979, 1982). For the Bight of Benin 1690 – 1740, estimates in this work suggested that captive exports averaged over 2% of the regional population per year, which surely brought population decline. This raised the question of the demographic effects of enslavement more generally in Africa.

Demographic modeling of population size, structure, and migration (Manning 1981, 1990, 1991). A demographic model of population and migration, first presented in general and qualitative and general terms, showed the difference that comes from age/sex-specific rather than just crude-rate analysis (Manning 1981). The model was then implemented in a simulation first written in Pascal, then revised and updated in a series of other programming languages; a formal version of it was published separately (Manning and Griffiths 1988; Manning 1990b). Sensitivity analysis of data used in this simulation showed that the key factors in demographic change were the proportion of fertile women lost to enslavement and the overall rate of mortality (Manning 1988). Analysis relied on colonial population estimates for the 1930s, back-projected at assumed rates, and on contemporary estimates of levels of slave trade. Results of this work, summarized in a 1990 book, suggested that regional populations declined for large portions of West and Central Africa from 1730 to 1850, and for parts of East Africa from 1820 to 1890; the same results projected significant discrepancies in adult sex ratios within Africa (Manning 1990a).

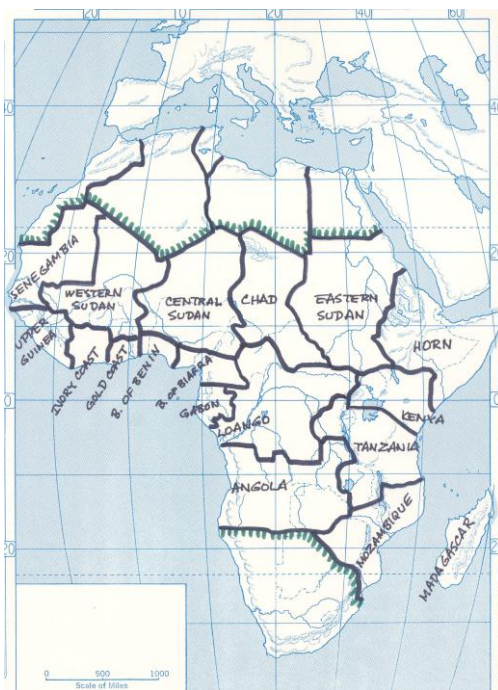
This collection of studies up to 1990 proposed substantially new hypotheses for the population history and social history of Africa and the African diaspora. It argued for a decline in the population of West and Central Africa from the early eighteenth century to the middle of the nineteenth century, and a decline in East African population during much of the nineteenth century. It proposed a set of demographic

and social implications stemming from the dominantly male flow of captives to the Americas, the dominantly female flow of captives from northern and eastern Africa, and the dominantly female enslavement within Africa. It emphasized the centrality of underlying mortality rates in determining the outcome of enslavement, as well as age and sex choices in enslavement and in partitioning of captives among competing destinations. Further hypotheses on the era of enslavement emphasized the movement of captives from interior to littoral regions within Africa and argued that female captives sent to the Americas were overwhelmingly from coastal regions, while male transatlantic captives were from both coastal and interior regions; it also showed the movement of captives from interior to littoral regions within Africa. But because it was not feasible to display the full details of the simulations and other calculations—either online or on CD-ROM, it was difficult for other scholars to test and verify the results. As a result, discussion and debate of these hypotheses and methods in analysis of African population did not advance far.²

Back-projection from known populations of 1950 and 1960 (Manning 2009, 2010). It took some time to understand that estimates of the eighteenth-century significance of African slave exports needed to be linked to late-twentieth-century data on African population. Accurate populations of Africa were first known for the time from 1950 forward: the 1950 population of the African continent is now estimated as having included 220 million persons. Data for 1950 and after have been repeatedly reworked by the United Nations Population Office (United Nations Population Office). From 2006, the present project has taken the approach of working backwards in time from well-documented 1950 population figures (rather than from vaguely estimated 1930 populations). At this point, therefore, the project took on the task of estimating regional African populations in the colonial era as well as the precolonial era. Completion of this work required three further methodological steps: selection of standard regions for population estimation, more thorough analysis of vital demographic rates and other social factors in determining net population change, and estimation of error margins in the resulting population projections through application of techniques of Bayesian statistics.



Map 1. Major African Regions



Map 2. Regions of Analysis

Selection of standard African regions. Populations and population projections were estimated within 66 African regions, based on colonial and post-colonial frontiers, territorial and provincial boundaries—organizing them so as to fit closely with demographic and commercial regions of precolonial slave trade—and were then projected back by decade through application of plausible rates of net population growth. Map 1 shows large-scale regions for Africa, following common modern terminology, but with some modifications to fit the historical logic and circumstances of slave trade. Map 2 shows 18 regions created out of twentieth-century jurisdictions that fit the main precolonial zones of slave trade. Each of the 18 regions was created out of an average of three territorial (national) and provincial units: Table B.1 indicates the names of all 66 territorial units included in this analysis.

Vital rates of African populations over time (Manning 2009, 2010). The rates of birth, death, and migration, and the resulting rates of net population growth for African regions, are documented in some detail, including by age and sex, for Africa after 1950 (Tabutin and Shoumaker 2000, 2005). Calculation of these rates has required details on the numbers of events – birth, death, and migration – and parallel data on the size and structure of the populations at risk for birth, death, and migration. For Africa in the colonial era, significant data exist on vital events, but they have not been compiled systematically. While systematic study of colonial-era vital rates is generally on the research agenda, for this project a two-step shortcut was taken. First, it was assumed that African rates of net population growth, from 1850 through 1950, were similar to contemporaneous growth rates for other parts of the tropical world.³ This approach led to identification of “default” rates of African net population growth by decade. The decennial rates of population growth were based on contemporaneous net growth rates from the census of India—that is, rates of net population growth calculated for the most consistently documented provincial units of British India. Second, it was assumed that the specifics of regional African social and demographic influences could be estimated as modifications to the “default” rates for each territory and each decade. A relatively comprehensive set of estimates was thus developed to account for the regional specifics of African enslavement, political and economic change, and epidemic disease.⁴ The results of this analysis showed a 1900 population of continental Africa totaling roughly 140 million rather than the commonly assumed 100 million.

Bayesian statistics and error margins for population and migration (Manning and Nickleach, in process, Chapter 8, Chapter 9). Estimates of African population and migration have typically been carried out as deterministic calculations or through linear regressions, without regard to error margins. Thus, the imputed totals for Atlantic slave trade are specific numbers with no accompanying statement of error margins.⁵ The logic of Bayesian statistics provides a basis for estimating error margins in population estimates. It treats the coefficients in the equations estimating populations (or migrant flows) as statistical distributions rather than as constant parameters. It carries out multiple estimations of the coefficients based on an assumed character of the distribution, then shows the relative closeness of high, medium, and low estimates. The analysis is applied to three situations: to populations calculated from crude rates of growth for the period 1890 – 1950, to the estimation of missing values of captive embarkations on Atlantic slave ships, 1650 – 1870, and to the simulations of African population size, 1650 – 1890. For the first and third of these, the estimates are presented as high, medium, and low estimates of population, where high and low represent 5% probabilities.

Periods of analysis for African population (Tables A.1, B.1, C.1, D.1). As the analysis of historical African population became more comprehensive and detailed, it became clear that it should be divided into several periods, with different types or combinations of methods for the various periods. For the period from 1950 forward, the details provided by the United Nations and other international statistical offices are taken as definitive. For the period from 1950 back to 1890, the analysis is based on decennial projections of crude rates of net population change, where the crude rates for each region in each decade are adjusted

for a number of social, economic, demographic, and health factors—including the impact of enslavement in the earlier years of this period. For the period from 1890 back to 1790, the analysis accounts for the impact of the export slave trade (including its by-products in domestic enslavement) and also for the impact of the expanded nineteenth-century continental slave trade. For the period from 1790 back to 1650, the analysis accounts more simply for the impact of the export slave trade—including its by-products in domestic enslavement.

Crude-rate vs. composition-specific-rate analysis. The overlaps and distinctions in demographic analysis through crude rates and through age/sex-specific (or composition-specific) rates have become increasingly significant in the course of this analysis. In the earliest stage of this work, emphasizing age/sex-specific rates of migration was especially important in demonstrating that the capture and export of fertile women, even if they were a small portion of the total population, undermined the ability of remaining African populations to reproduce themselves. Work up to 1990, focusing on the eighteenth and nineteenth centuries, was entirely with age/sex-specific rates. On the other hand, work from 2005 on early twentieth-century populations focused on rates of net population change, crude rates which encompassed and summed the rates of fertility, mortality, and migration. The advantage of this approach is that it allowed for addition of assumed impact of other social factors on population change: refugee movements, economic change, environmental change, and disease, also expressed as crude rates of net population change. These additional factors have not yet been included in the age/sex-specific analysis for the period before 1890, though one could imagine attempts to add drought, epidemic, and other factors into the precolonial analysis. In general, crude rates and age/sex-specific rates are two different ways of summarizing the same data. That is, each crude rate should be associated with its age/sex-specific breakdown; each age/sex-specific set of rates should be associated with an overall crude rate. Overall, the interplay of these two organizations of the analysis draws attention to the need to ensure that the two formulations remain consistent with each other. Pursuing this issue will presumably lead to further changes in the overall analysis.

Atlantic slave trade: estimates of missing values (Manning and Nickleach, in process, Chapter 9; Tables C.3, C.4, C.5). Atlantic slave trade data, summarized in the Slave Voyages dataset, include data on 34,000 voyages (Eltis et al., www.slavevoyages.org). Nevertheless, most demographic data on captives are missing: data exist on captives disembarked for 10,000 voyages, on captives embarked for 8,000 voyages, on captive mortality for 3000 voyages, and on age/sex composition for 4000 voyages (Table C.4, Table C.5). Eltis and his colleagues developed “imputed” values to cover missing data through linear regression based on average cargo sizes. These results are crude-rate totals—that is, they are not broken down by age or sex, and they do not include error margins in the estimates. The numbers of voyages documented and the estimated total number of captives transported across the Atlantic has grown in the course of revising the Slave Voyages dataset, and will surely grow further with continuing research.

In further work now in progress, my colleagues and I are conducting a more thorough estimation of the missing values in the Slave Voyages dataset. This work uses the Bayesian technique of multiple estimations to use available information—on voyages, points of embarkation and disembarkation of captives, numbers of persons embarked and disembarked, and distribution of captives by age and sex—to fill in the missing data. Further, the process of estimation is to provide error margins for the various estimates of the flows of African captives across the Atlantic. As a result, we will have estimates, for each African region of embarkation, of the number of persons embarked in each decade, by age and sex. As part of the same process, we will have estimates, for each American region of disembarkation, of the number of persons disembarked in each decade, by age and sex—and also including their African region of origin. The embarkation figures (decade, region, age, and sex) are then to be implemented into the simulation of continental population.

Northern and Eastern slave trade (Table C.6). Estimates of the volume and composition of the northern and eastern slave trades—sending captives across the Sahara, the Red Sea, and the Indian Ocean—are based on much vaguer evidence. Work beginning in 1975 by Ralph Austen has done much to address this lacuna, and recent work on the Indian Ocean slave trade of the eighteenth and nineteenth centuries, especially by Gwyn Campbell, Abdul Sheriff, and Richard Allen, has added substantial detail (Allen 2004, Austen 1989, Campbell 2005, Sheriff 2005). There is nothing near to equivalent to the Slave Voyages dataset for the Atlantic slave trade, however. Nevertheless, detailed linkage and comparison of export slave-trade data for the various regions of Africa, as well as with estimates of the flows of continental enslavement, can be expected to clarify the overall patterns within this demographic system. In particular, estimated error margins must be attributed to the decennial estimates of slave exports from Africa's northern and eastern regions. It should be noted that continuing research has increased the estimated numbers of captives sent out of Eastern Africa from the seventeenth century through the nineteenth century, though in some cases further research has reduced estimated totals.

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Continental enslavement: qualitative, quantitative, and modeling analysis (Manning and Nickleach, in process, Chapter 6; Tables C.7, C.8). This study takes explicit account of continental enslavement, especially for the nineteenth century, first through assessment of the qualitative literature, then through a succession of three models, each allowing for a larger rate of enslavement. The initial model accounts for the number of people enslaved through collateral social damage engendered by the external demand for captives. The second model assumes that the level of enslavement in African regions expanded along with the export slave trade, then remained at the maximum level even as the export of slaves declined, up until the end of enslavement in each region that accompanied or followed after European colonization. The third model assumes that levels of enslavement in the nineteenth century expanded beyond those accompanying the export slave trade, based on expanding demand for captives on the African continent, until enslavement was halted in the wake of European colonization. Each of these models provides an assessment of the number of people enslaved and retained within Africa and also of the additional mortality resulting from capture and exposure in the course of enslavement.

Combining the elements: history backwards and forwards (Manning and Nickleach, in process, Chapter 10, Chapter 11). The analysis of African population is conducted in three periods, with breaks at 1790 and 1890, and applying overlapping methods in the three periods. Within each period, the analysis proceeds first by projecting populations backwards by decennial periods for each of the 66 regions, then by projecting forward to confirm the consistency of the results, and then by repeating the process until consistency is achieved. Error margins or tolerances are calculated for each region and each period. The regional results are then summed to provide overall population estimates for each slave-trading regions, for each of six continental regions, and for African as a whole. As this analysis moves backward and forward in time, a revision in data or assumptions for any decade in a given region requires an update of the estimates for all previous times in that region. In addition, the analysts must keep track of the interplay of the varying methods of analysis—in particular, the changing mix of crude and age/sex-specific analysis over time and the fact that the mix of analyses may differ from one part of the continent to another.

Initial summary of results

Overall results, as shown in Figure 1, reveal three main periods of African population change: rapid growth at over 2% per year from 1950 forward; show but accelerating growth of from 0.2% to 1% per year from 1890 to 1950; and stability with slight decline from 1700 to 1890. (It is presumed that the continental population in the century or so before 1700 grew at a slow rate of well under 0.5% per year.) The top line

on Figure 1 shows the continental population total; the second line, excluding the population of northern Africa, shows the total for sub-Saharan Africa. The third line, excluding northern and southern Africa, shows the total for the equatorial regions of Africa from which the overwhelming majority of captive Africans were taken.

The same data, presented in Table 1 as regional proportions of African population over this time, indicate modest but unmistakable shifts. Northern Africa and Southern Africa grew as a proportion of continental population, while West Africa and especially Central Africa declined as a proportion of continental population—although there has been some reversal of these trends during the past half century. The relative growth of population in the northern and southern regions of the continent was partly because they did not suffer the drain of out-migration from equatorial regions of Africa, and partly because migrants from equatorial Africa moved into the northern and southern regions.

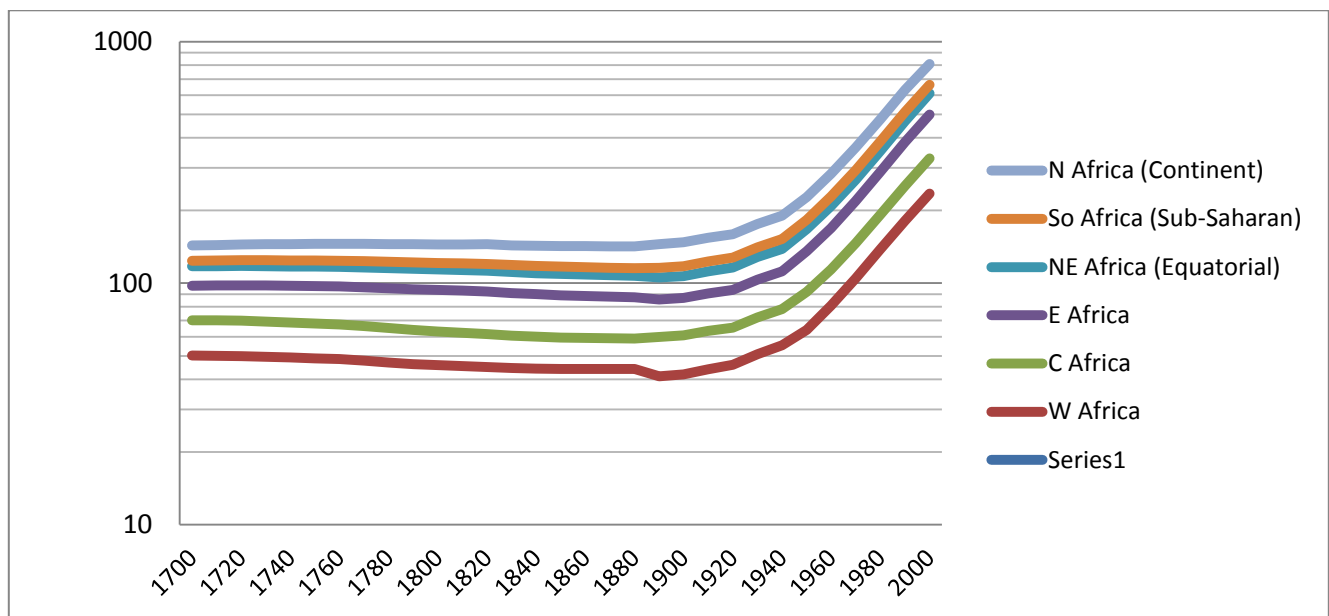


Figure 1.
Estimated African population (in millions) by region, 1700 – 2000.
Source: Tables A.1, B.1, C.1, D.1.

	1700	1790	1850	1900	1950	2000
North Africa	13.4	15.8	17.9	20.4	19.3	18.1
Southern Africa	4.6	5.1	5.6	7.2	6.8	6.4
Northeast Africa	13.8	13.9	14.0	13.5	14.1	13.7
East Africa	19.2	20.9	20.8	17.6	19.1	21.1
Central Africa	14.0	12.3	10.8	12.8	12.3	11.7
West Africa	35.1	31.9	31.0	25.4	28.2	29.1

Table 1. Percentages of African population by region, over time.
Source: Tables A.1, B.1, C.1, D.1.

For further detail on estimated African population over time, this concluding section works back from the most recent period to earlier times.

1950 – 2000: For the post-colonial era, continuing and significant declines in mortality brought expanded population growth. Expectation of life at birth rose from roughly 35 years throughout the continent in 1950 to 50 years in 1990. The devastating HIV-AIDS epidemic caused life expectation to decline during the next two decades, especially in southern Africa, but also in Central and Eastern Africa. More recently, expectations of life are again rebounding to 50 years and above. Overall, African growth rates were the highest in the world for much of the period after 1950. At the same time, the result of this dramatic growth was to bring African population back to one sixth of the total human population—the same as the proportion of Africans in world population of 1700.

1890 – 1950. For the colonial era, populations began growing in almost all territories at the beginning of the twentieth century. Colonial-era population estimates, however were badly flawed: they generally underestimated population totals and overestimated rates of growth. Nevertheless, the ample store of colonial data, with all its flaws, can ultimately provide a basis for useful reconstructions. Comparisons of African population with those of other tropical regions will surely be helpful. If, as these estimates show, African populations began to grow at the beginning of the twentieth century, one may ask about the principal reasons. Was it simply the end of enslavement? Was it the character of governance under colonialism? Was it a side-effect of economic growth in those regions that benefitted from export agriculture or mining? Or was it the African dimension of an overall improvement in global health conditions resulting from changing properties of diseases and new practices of public health? In addressing these questions, it must be remembered that Africa in 1890 held huge populations in slavery. The processes of their escape, emancipation, subordination in other forms of subjection, or other shifts in status took place only gradually. The dissolution of slavery appeared to be relatively complete in the 1930s, but almost nowhere did it proceed through outright emancipation of the slaves.

1790 – 1890. The shifts in enslavement in the nineteenth century were immense, and clearly contributed to overall African population change. As Figure 2 indicates, in the period from 1790 to 1820, the volume of the Atlantic slave trade peaked after a long expansion, then declined modestly. But in the same period the volume of slave exports to the north and east of sub-Saharan Africa increased by a factor

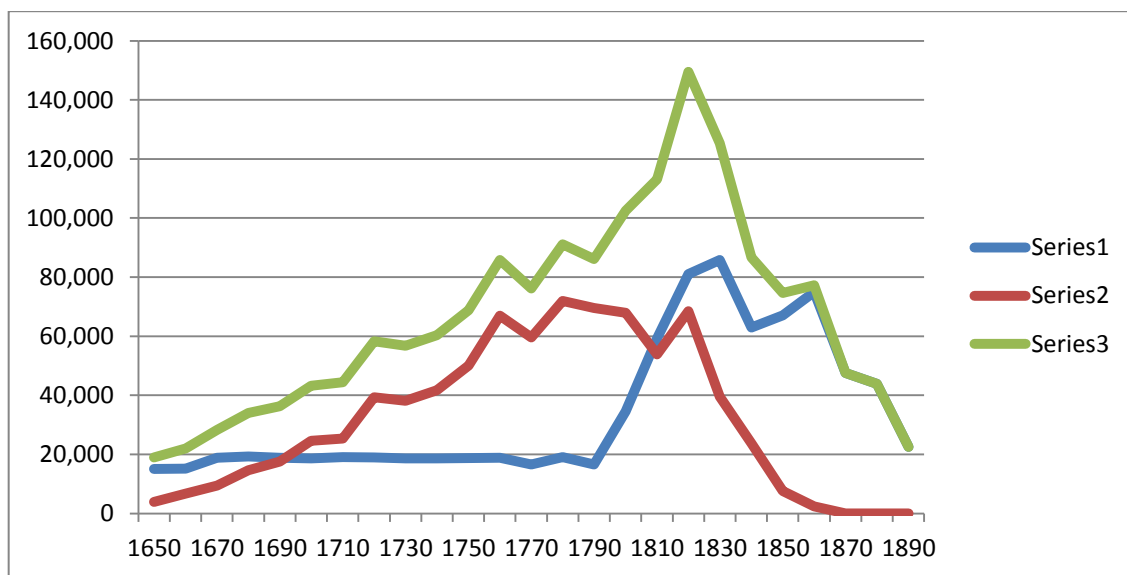


Figure 2.
Slave exports as proportion of total enslaved in Africa.
 Source: Tables C.3, C.6

of four, so that the total drain of export slave trade from sub-Saharan Africa nearly doubled over three decades. From 1820 to 1860 the volume of captive exports to the north and east declined only slightly, while exports from West and Central Africa declined precipitously.

In addition, for the contemporaneous continental enslavement of Africans, it appears that it expanded substantially for the whole period from 1820 to 1890, so that the end of further enslavement (basically in the 1890s, the high point of European conquest) left immense enslaved populations that faced complex fates. This project's analysis of continental enslavement has proceeded through developing three models. Model 1 proposes continental enslavement-related migration as a constant proportion of continental migrants and fatalities. Model 2 is identical to Model 1 up to the 1820s, then assumes that numbers of continental migrants and fatalities remain unchanged to 1890. Model 3 proposes expanding ratios of captive exports to continental enslavement. As estimated, it yields captive exports as 10% of the total number enslaved for 1790 - 1810, captive exports as 5% of total enslaved for 1830 - 1850, and captive exports as 2% of total enslaved for 1870 - 1890. The levels of continental enslavement and mortality thus increased sharply in nineteenth-century Africa, according to Model 3.

Available data on the age and sex structure of captives during the nineteenth century are not as detailed as for the eighteenth century, and for several reasons. The Atlantic Slave trade was illegal for much of the nineteenth century, so records are less common. The Indian Ocean slave trade was a large proportion of the total overseas trade in the nineteenth century, and detailed records (especially voyage-based records) are in short supply for that trade. Further, continental enslavement expanded greatly during the nineteenth century, but it was documented only in the rarest of circumstances. Despite all these weaknesses in the documentation, it should be possible to assemble documents on the age and sex of nineteenth-century captives by region, thus providing information on loss rates and recovery rates for African populations.

1700 - 1790. In response to the expanding Atlantic slave trade, populations of West and Central Africa declined steadily from 1700 to 1800. The export slave trade to the north and east of sub-Saharan Africa remained relatively stable; the populations of East and Northeast Africa, in that period, grew modestly. Since most transatlantic captives were male, the result for eighteenth-century Africa was that a significant shortage of adult males developed, especially in coastal regions, so that the ratio of adult males to females averaged some 75% to the normal ratio for West and Central Africa generally. Once the analysis of the Slave Voyages dataset through Bayesian statistics is completed, we will have improved estimates of gender ratios in the Atlantic slave trade.

Before 1700. The volume of transatlantic slave trade before 1700 was lower than that across the Sahara, Red Sea, and Indian Ocean. For the Atlantic coast, the overall numbers of captive exports were small enough that slave exports did not bring population growth to a halt, except in the most heavily-hit regions, including Angola, the Bight of Benin, and Senegambia. Thus, the African continent and all of its regions appear to have experienced modest population growth in the seventeenth century. Does this mean that we should project slow rates of growth backward in time from 1650 to the still-more-distant past? Not necessarily. Archaeological research, especially in Ghana, has brought up the possibility that African populations, dense in the early fourteenth century, declined sharply at the time of the Black Death in Eurasia. According to this scenario, populations would have risen rapidly from the late fourteenth century in parallel to those of Europe and Asia.

Comparisons of Africa and other world regions. Figure 3 provides a schematic comparison of population totals by continental region from 1700 to 2000, relying mostly on figures developed by Angus Maddison, and comparing Maddison's estimates for Africa with those developed in the present study.

Western Europe’s apparent steady population growth across three centuries contrasts rather sharply with the shifts from slow to rapid growth for other regions. In the eighteenth and nineteenth centuries, African population remained relatively constant at a time when all other continental regions were experiencing growth, including rapid growth in the Americas and China.

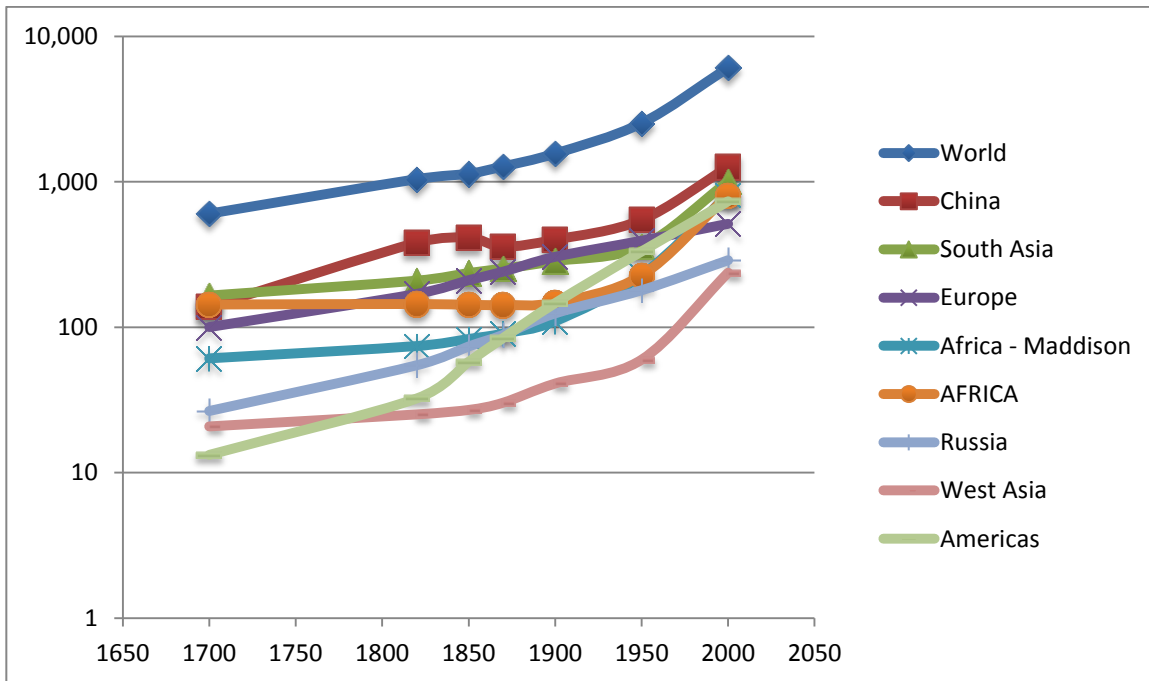


Figure 3. African Population (in millions) in Global Context, 1700 – 2000.

African mortality has been consistently high in comparison with other regions. Such high levels of mortality, however, did not prevent African populations from growing to relatively high levels of density in comparison with other regions: the relative low point in African population density came at the beginning of the twentieth century. African migration, in contrast, was relatively high in comparison to other regions up to the mid-nineteenth century, when Europe and Asia became the principal foyers of out-migration for a century. Thereafter, from the 1950s, African migration rates again reached those of other regions.

APPENDICES: see attached Excel file, “AfricaPop.xlsx”.

N.B. Each table is shown in a separate sheet within the Excel file.

- Table A.1. African population by region, 1950 – 2000
- Table B.1. African population by region, 1890 – 2000
- Table B.2. Vital rates, 1890 - 1950
- Table C.1. African population by region, 1790 – 1890
- Table C.2. Vital rates, 1790 – 1890.
- Table C.3. Atlantic trade (Eltis estimates)
- Table C.4. Missing data on Atlantic trade
- Table C.5. Missing data on Atlantic trade
- Table C.6. Northern & Eastern slave trade
- Table C.7. Continental enslavement, 1790 – 1890, Model 2
- Table C.8. Continental enslavement, 1790 – 1890, Model 3
- Table D.1. African population by region, 1700 – 1790

REFERENCES

- Allen, Richard B. 2004. "The Mascarene Slave-Trade and Labour Migration in the Indian Ocean during the Eighteenth and Nineteenth Centuries," in Gwyn Campbell, ed., *Structure of Slavery*, 33 - 50.
- Austen, Ralph A. 1989. "The 19th Century Islamic Slave Trade from East Africa (Swahili and Red Sea Coasts): A Tentative Census," in William Gervase Clarence-Smith, ed., *The Economics of the Indian Ocean Slave Trade in the Nineteenth Century* (London: Frank Cass), 21 – 44.
- Campbell, Gwyn. 2005. *An Economic History of Imperial Madagascar: 1750 – 1895. The Rise and Fall of an Island Empire*. Cambridge: Cambridge University Press.
- Curtin, Philip D. 1969. *The Atlantic Slave Trade: A Census*. Madison: University of Wisconsin Press.
- Eltis, David, et al. *Slave Voyages*. www.slavevoyages.org.
- Maddison, Angus. 2010. "Statistics on World Population, GDP, and Per Capita GDP, 1 – 2008 AD (horizontal file)." <http://www.ggdc.net/maddison/Maddison.htm>
- Manning, Patrick. 1979. "The Slave trade in the Bight of Benin, 1640 - 1960". Gemery and Hogendorn, *The Uncommon Market: Essays in the Economic History of the Atlantic Slave Trade* (New York: Academic Press), 109-141.
- _____. 1981. "The enslavement of Africans: a demographic model." *Canadian Journal of African Studies* 15: 499 - 526.
- _____. 1982. *Slavery, Colonialism, and Economic Growth in Dahomey, 1640 – 1960*. Cambridge: Cambridge University Press.
- _____. 1988. "The Impact of Slave Trade Exports on the Population of the Western Coast of Africa, 1700-1850." Serge Daget, ed., *De la Traite a l'esclavage*, 2 vols. (Paris, Societe francaise d'histoire d'Outre-Mer), II:111-34.
- _____. 1990a. *Slavery and African Life: Occidental, Oriental, and African Slave Trades*. Cambridge: Cambridge University Press.
- _____. 1990b. "Slave Trade: The Formal Demography of a Global System." *Social Science History* 14, 2, 255-79.
- _____. 1990c. "Slavery and the Slave Trade in Colonial Africa." *Journal of African History* 31: 135 - 140.
- _____. 1996. "Introduction." Manning, ed., *Slave Trades, 1500 - 1800: Globalization of Forced Labour*, Aldershot, UK, Variorum, xv - xxxiv.
- _____. 2009. "Replication data for: African Population Estimates, 1850-1960", <http://hdl.handle.net/1902.1/15281> World-Historical Dataverse [Distributor] V1 [Version].
- _____. 2010. "African Population: Projections, 1851-1961." Karl Ittmann, Dennis D. Cordell, and Gregory Maddox, eds., *The Demographics of Empire: The Colonial Order and the Creation of Knowledge*, (Athens, OH: Ohio University Press), pp. 245-275.
- Manning, Patrick, and William S. Griffiths. 1988. "Divining the unprovable: simulating the demography of African slavery." *Journal of Interdisciplinary History* 19: 177 - 201.
- Manning, Patrick, and Scott Nickleach. In progress. "African Population: The Eras of Enslavement and Colonization."
- Sheriff, Abdul. 2005. "The slave trade and its fallout in the Persian Gulf," in Gwyn Campbell, ed., *Abolition and its Aftermath* (London: Routledge), 103 - 119.
- Tabutin, Dominique, and Bruno Shoumaker. 2000. "La démographie de l'Afrique au sud du Sahara des années 1950 aux années 2000: Synthèse des changements et bilan statistique." *Population* 59, 3-4: 521 - 621.

Tabutin, Dominique, and Bruno Shoumaker. 2005. "La démographie du monde arabe et du Moyen-Orient des années 1950 aux années 2000. Synthèse des changements et bilan statistique." *Population* 60, 5-6: 611 - 724.

United Nations Population Division. http://esa.un.org/wpp/unpp/panel_population.htm.

NOTES

¹ It is a commonplace in review of methods for the researcher to capitulate the actual stages of research is not generally the best way to explain the logic of analysis.

² For much of the time from 1996 to 2006, I maintained an interactive, online version of the demographic simulation, comparing migration of captives from western Africa with migration of captives across the Sahara and migration of free people from Europe.

³ The analysis of Manning 2010 projected populations back to 1850 with this methodology; in subsequent work, this method was applied only as far back as 1890. The revised population estimates for 1850 – 1880, shown in Table C.1, show larger populations.

⁴ These estimates are given in Tables B3 through B12 of Manning 2009, the dataset associated with Manning 2010.

⁵ Curtin's proposed a general margin of error of 20% for his estimate of the volume of the Atlantic slave trade, but did not derive that figure from any specific analysis (Curtin, 1969).

⁶ For increases and decreases in recent estimates of East African slave exports, see Campbell 2005 and Sheriff 2005.