9 The Abundance Index

Measuring variation in consumer behavior in the early modern Atlantic World

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Introduction

Historical archaeologists are uniquely positioned to address fine-grained questions about the contours and causes of variation in consumer behavior over time and space. The assemblages they excavate are the consequence of consumer preferences, purchasing decisions, and rates of artifact use, breakage, discard, and replacement. Assemblages are also linked to processes of modernity, as mass migration, mass marketing, and international trade dynamically shaped the acquisition and discard of goods.

In theory, assemblage variation should offer insight into this complex causal chain. However, in historical archaeology, studies of assemblage variation that take advantage of these unique strengths are rare. Articles in the most recent state-of-the-field volumes are nearly devoid of sustained engagement with archaeological data (Funari et al. 1999; Hall and Silliman 2006; Hicks and Beaudry 2006; Majewski and Gaimster 2009; Fogle et al. 2015). Current archaeological approaches to consumption, whether focused on a single site or multiple sites, veer more toward the historical than the archaeological, displaying a deeper commitment to secondary and occasionally primary documentary sources and with nods to the artifacts (recent exceptions include Neiman 2008; Galle 2010, 2011; E. Breen 2013, this volume; Bates 2015, this volume; Bloch 2015; Bloch and Agbe-Davies, this volume; Heath, this volume).

The reasons for historical archaeology's current low-level of engagement with actual artifact data when dealing with questions of consumption are complex and interwoven. Explaining variation in the archaeological record is a difficult task that requires attention to a host of variables, including occupation span and intensity, the social and economic contexts faced by the site's occupants, their cultural backgrounds, as well as excavation methods, and post-depositional processes. Compounding these difficulties are the decreased emphasis on material culture methods and data analysis in graduate programs and the popularity of theoretical frameworks that downplay the role of empirical evidence.

This chapter offers a novel method to measure artifact class abundance that helps overcome some of these difficulties. It uses that method to explore patterns of change and synchronic variation in the acquisition, use, and discard of refined ceramics that flooded Atlantic societies in the 18th century. In this case, an interest in cost, or level of investment, motivates the attempt to estimate variation in discard rates for different artifact types among assemblages. The question is this: how can we estimate variation in the discard rates of a particular artifact type, among different assemblages, based on counts of artifacts in those assemblages? To make matters concrete, let's say we want to estimate variation in the discard of Chinese porcelain based on artifact counts in two assemblages, one from 1770, and one from 1790. Do rates of discard increase or decrease over time? An increase in discard would imply an increased investment in porcelain, whereas a decrease would suggest the opposite, under the assumption that discarded vessels were replaced by new ones.

An initially intuitive approach would be to compute the relative frequency of porcelain, as a proportion of the entire ceramic assemblage. This approach would work, if the discard rates for the other ceramic types remained on average constant during this period. More generally, the hidden assumption here is that the discard rate for the artifact class in the denominator of the relative frequency is not changing. In the example, discard rates for other ware types are likely to be increasing. The period in question witnessed the "creamware revolution," during which Staffordshire wares, among them creamware, became wildly popular (Martin 1994). If rates of porcelain increased, but rates for creamware increased even more rapidly, tracking the change in the proportion of porcelain relative to all ceramics will be misleading, because the proportion of porcelain will be lower in the later assemblage. The inclusion of all other ceramic types in the denominator makes it harder for the archaeologist to determine if the constant discard rate assumption is true. The same problems arise for synchronic comparisons.

A promising way around this problem is to compute a special kind of relative frequency, which I have called an Abundance Index (Galle 2006, 2010, 2011). The idea here is to choose a single artifact class for the denominator whose discard rate is likely to be relatively constant across the assemblages being compared, or at least change in a way that is predictable and can be taken into account in the interpretation of patterns in the Abundance Index. A constant rate for the denominator guarantees that an increase or decrease in the proportion of porcelain accurately reflects change in the discard rate that, under the assumption that discarded vessels are replaced, is linked to cost. Choosing a single artifact class has the additional advantage of making the assumptions behind the analysis more transparent and opens the useful possibility of being able to compare results achieved with one denominator class with different candidate denominator classes.

The following is a case study on using the Abundance Index to measure enslaved consumers' investment in ceramics over time and space. My focus on enslaved consumers is dictated by the dataset, which is derived from the Digital Archaeological Archive of Comparative Slavery (DAACS 2016). I focus on ceramics precisely because that is where most archaeologists start when faced with an assemblage and because ceramics were an artifact class bound up in the earliest manifestations of the consumer revolution in the early modern world. However, the methods discussed in this article are applicable to all artifact types, from leaded glass tablewares and metal buttons, to imported tobacco pipes.

I set the stage by providing a brief background on the consumer revolution, its participants, and how their demand for novel goods shaped ceramic production. I then introduce the data, set out some basic expectations, and show how the Abundance Index reveals previously unmeasured variation in the patterns of ceramic discard on domestic slave sites in North America and Jamaica in the 18th and 19th centuries.

The consumer revolution

The past three decades have witnessed a growing consensus among social and economic historians that the "consumer revolution" was among the most important developments in the history of the early modern Atlantic World (Campbell 1987; Brewer and Porter 1993; DeVries 1993; Carson et al. 1994; T.H. Breen 2004; Styles and Vickery 2006). The availability and importance of material culture at all scales, from houses to ceramics, accelerated throughout the 17th, 18th, and early 19th centuries. During this same period, the Atlantic World was transformed by forced and voluntary migrations of people who spoke unfamiliar languages and employed different social customs. It was in this new world that the acquisition and use of consumer goods played an essential role in the strategies invented by people to communicate shifting social identities and economic status (C. Carson 1994, 2006).

By the middle of the 18th century, economic changes, manufacturing innovations, and the increasing presence of local stores, markets, and peddlers made some degree of non-essential consumption viable for almost everyone in the early modern Atlantic World (B. Carson 1990; Walsh 1992; C. Carson 1994; Martin 1994, 2008; Ashelford 1996; Styles and Vickery 2006; Gamble 2015). Consumers demanded access to novel forms of material culture and manufacturers responded by cleverly offering goods in a range of styles and costs. Why the increased demand for, and willingness to invest in, these new consumer goods? One hypothesis is that the appeal of the new material culture associated with the consumer revolution was its costliness relative to traditional alternatives (Neiman 2005). Novel goods, such as brightly printed calicos or creamy white, refined ceramic wares, were often more expensive than homespun fabrics and coarse earthenwares made in communal vessel forms. Owning and displaying such material culture demonstrated taste, access, knowledge, and financial means.

Scholars however, have struggled to demonstrate increases in the costs that households were willing to pay for novel costly goods related to the consumer revolution. The difficulty lies in their sources. Probate inventories and merchants' records provide rich evidence of 18th-century consumer zeal, and scholars deftly weave them into local and regional stories of consumer investment and display across the Atlantic World (T.H. Breen 1986, 2004; Martin 1989, 1994, 2008; Shammas 1990; E. Breen 2013). However, the widespread availability of manufactured goods at a range of price points resulted in the increasing investment in fashionable goods and comestibles that were often discarded or consumed before ever appearing in a probate inventory (C. Carson 2006). Despite the wealth of data contained in probate inventories, they are synchronic snapshots taken at the end of a household's acquisitive lifetime (Pogue 1993). Store accounts are similarly synchronic, showing the demand for goods at a specific time and place, averaged over the multiple diverse households that comprised its customers.

Unlike inventories and store accounts, the archaeological record contains the raw material for understanding and estimating variation in a household's investment in consumer goods over time. The assemblages we excavate from archaeological deposits are typically the result of many episodes of artifact acquisition, use, breakage, and discard, integrated over years or decades. This result means that in principle, variation in the frequency of a particular artifact class among assemblages is a function of discard rates. The key then is to come up with a method that takes assemblage counts for the artifact class of interest as input and yields a measure that scales linearly with the discard rate of the artifact class in question. If we assume that, over the period during which the assemblage in question accumulated, the failed or broken artifacts were discarded and replaced with new acquisitions, our discard rate measure will scale with the number and total cost of those replacements.

We can measure expenditures on the individual household level of the discarded goods, through an Abundance Index measure, and then compare the variation in discard rates, estimated by the index, among assemblages. Lastly, thanks to George Miller, archaeologists can measure the average cost of vessels discarded (Miller 1988; Bates 2015, this volume).

The creamware revolution

Ceramics are an ideal artifact for tracking regular investment in fashionable goods, one measure of engagement with the consumer revolution. Costs linked to displayable fashions were important determinants in the acquisition of ceramic vessels made in "refined wares." New vessel forms for the consumption of exotic beverages such as punch, tea, and coffee were introduced in the late 17th and early 18th centuries (Roth 1988; Martin 1994; Richards 1999; Harvey 2008), and forms such as mugs, cups, and plates replaced functional and more durable equivalents that had traditionally been made in wood, pewter, and coarse earthenware (Martin 1989, 1994). As Neiman has noted, these changes resulted in an increase in the costs paid by ceramic consumers. Tea, coffee, and punch required not only costly ingredients but also resource outlays for novel vessel forms made in the most current ceramic ware (Neiman 2005).

By the 1760s, the "creamware revolution," a term coined by Ann Smart Martin (1994) to describe the market's response to consumer demand for novel refined ceramics, was in full swing. Consumers at all scales scrambled for the newest creamware vessel forms and decorations. Starting in the 1770s, stores across the Chesapeake catering to middling farmers stocked successively fashionable varieties of refined wares (creamware, pearlware, and Chinese porcelain) in vessel forms once accessible to only the wealthiest customers (Martin1994:174). Colonists once set their tables with a mash-up of pewter, wood, coarse earthenware, stoneware, and refined earthenware vessels; Americans now primarily purchased refined earthenware tablewares for daily use (Martin 1994:178). Although certainly less expensive than pewter, ceramics suffered from high breakage rates that required frequent replacement, in the end making the transition away from pewter a more costly decision (Martin 1989; Neiman et al. 2000).

Consumers striving for the latest refined wares were surrounded by a marketplace full of less-expensive and more useful options. In addition to pewter, less-expensive, often locally produced coarse earthenware vessels were available in North America and the Caribbean throughout the 18th and 19th centuries (Bloch 2015; Bloch and Agbe-Davies, this volume). These vessels were useful and more durable in ways that fragile refined table and teawares were not. The least expensive option on mainland North American sites was colonoware, a handbuilt, low-fired, coarse earthenware manufactured across the Southeast and Middle Atlantic by Native Americans and enslaved African Americans from the mid-17th through mid-19th centuries (Ferguson 1992; Heath 1999; Steen 1999; Cooper and Smith 2007; Smith and Cooper 2011; Cobb and Depratter 2012:449). Similarly, from the 17th to the 19th centuries, enslaved Africans and their descendants throughout the Caribbean produced a host of coarse earthenware types using local clays (Heath 1988, 1990; Hauser and DeCorse 2003; Kelly et al. 2008; Hauser 2008, 2011). In Jamaica, this handbuilt pottery is known as Yabba or Afro-Caribbean ware (Mathewson 1972, 1973; Petersen et al. 1999; Ebanks 2000; Hauser 2008). Throughout North America and the Caribbean, these handbuilt coarse earthenwares were sold in markets and traded by peddlers and were purchased and used by free blacks and Creoles, slaves, and Europeans.

Analyzing ceramic acquisition over time and space

Despite the availability of these alternatives, even the poorest 18th-century consumers scrambled for the more fashionable, and initially more costly, refined ceramic wares made in the United Kingdom and China. Across the Atlantic World, enslaved men and women shopped in stores and markets. They traded and bartered with other slaves, free blacks, and their owners for items that were not part of weekly or yearly rations (Mintz and Hall 1970; Simmonds 1987; Baumgarten 1988; Beckles 1989, 1995; Walsh 1992; McDonald 1993; Hudson 1994; Berlin and Morgan 1995; Schlotterbeck 1995; Penningroth 2003; Heath 2004; Martin 2008). Plantation records demonstrate that enslaved men and women sold agricultural products and crafts to their owners, whereas a host of other primary sources indicate that enslaved people took the products of their labors directly to market (Heath 2004; Armstrong and Hauser, this volume). Archaeological evidence from 18th-century sites throughout North America and the Caribbean confirm that slaves earned money and that they spent a portion of what they earned acquiring fashionable consumer goods (Armstrong 1990; Higman 1998; Heath 1999, 2004; Hauser 2008; Galle 2010, 2011; Bates 2015; Reeves 2015).

Measuring enslaved consumers' investment in ceramics over time and space requires the creation of analytical units that are meaningfully linked to consumer behavior. In this case study, I want to track changing investment in costly refined ceramics whose acquisition was directly linked to the acceleration of the consumer revolution. In order to make reasonable arguments regarding the variation in consumer investment, I also need to track ceramic types that were not directly related to the consumer revolution, such as coarse earthenwares and stonewares used primarily for bulk processing and food storage activities.

I follow Deetz (1973, 1996) by grouping refined ceramic wares into a single analytical group that contains porcelain, thin-bodied stonewares, and refined earthenwares, including delft (Table 9.1). These ware types were specifically made in fashionable vessel forms with decorative elements directly linked to costly conspicuous consumption.

Like Deetz (1973, 1996), I also combine wheel-thrown coarse earthenware and utilitarian stoneware vessels of European, American, and Caribbean manufacture into a "Coarsewares" category. Vessel forms include trenchers, pipkins, mugs, milkpans, patty pans, and a host of storage containers (Table 9.1). Excluded from this category are locally produced, handbuilt coarse earthenwares, as archaeological data suggest that these wares may have functioned differently, in terms of use and acquisition, than imported and wheel-thrown coarse earthenwares and utilitarian stonewares. I have retained colonoware and handbuilt Caribbean coarse earthenwares as their own type category in this analysis to see what, if any, differences in discard can be detected.

Table 9.1 Ceramic Groups and Ware Types.

Analytical group	*Ceramic ware types*
Refined Wares	Astbury-Type; Black Basalt; Canary Ware; Chinese Porcelain; Creamware; Delftware (British and Dutch); English Soft-Paste Porcelain; Faience;
	Jackfield; Nottingham; Pearlware; Refined Red Agate; Rosso Antico; Slip Dip Stoneware; Tin-Enameled, unidentifiable; Turner Type; Wedgewood Green; Whieldon-Type Wares; White Salt Glaze Stoneware; Whiteware
Coarsewares	American Stoneware; British Stoneware; Buckley; Burslem; Caribbean Coarse Earthenware, wheel-thrown; Caribbean Coarse Earthenware, unidentifiable; Coarse Earthenware, unidentifiable;
	Frechen Brown; Fulham;
	German Stoneware; Iberian Ware; North Devon Gravel Tempered; North Devon Plain; Post-Medieval London Redware; Red Sandy Ware; Redware; Shaw; Slipware, North Italian; Slipware, North Midlands; Spanish Coarse Earthenware; Staffordshire Brown Stoneware; Staffordshire Mottled Glaze; Stoneware, unidentifiable; Westerwald/Rhenish
Colonoware	Colonoware; Caribbean Coarse Earthenware, handbuilt

The data

The growing availability of temporally and regionally diverse datasets, such as those offered by DAACS, is opening up opportunities for archaeologists to use data to better describe archaeological patterning at sites of slavery within and between regions. The ability to compare assemblages at a variety of scales – within sites, among sites, and among regions – makes it possible to discover unsuspected patterns and begin the process of framing and evaluating hypotheses that might explain them. DAACS currently offers the best available data for measuring trends among enslaved consumers during the 18th and 19th centuries, providing detailed archaeological data from over 80 sites of domestic and industrial slavery in North America and the Caribbean, including a handful of overseer's sites. DAACS provides context and artifact data that are generated using standardized classification and measurement protocols that facilitate data comparability across sites. Easy-to-use queries deliver the data directly to a researcher's desktop.

The DAACS data used in this chapter are drawn from ceramic assemblages from 97 North American domestic slave site occupations and 23 Caribbean site occupations at 21 plantations that date from 1700 to 1850 (Table 9.2).

Table 9.2 Archaeological Sites and Occupational Phases.

Site	*Occupation phase*	*Binford pipe stem date*	*BLUE MCD*	*Plantation*	*Region*
Utopia II	01	1718		Utopia	Greater Chesapeake
44JC298	N/A	1719		Governor's Land	Greater Chesapeake
Ashcomb's Quarter	02		1723	N/A	Greater Chesapeake
South Grove	01	1726		Mount Vernon	Greater Chesapeake
Utopia II	2a	1726		Utopia	Greater Chesapeake
Utopia II	2b	1727		Utopia	Greater Chesapeake
Fairfield Quarter	01	1730		Fairfield	Greater Chesapeake
South Grove	02	1733		Mount Vernon	Greater Chesapeake
South Grove	03	1744		Mount Vernon	Greater Chesapeake
Richneck Quarter	01	1745		Richneck	Greater Chesapeake
North Hill	01		1746	Poplar Forest	Greater Chesapeake
Utopia III	2b	1746		Utopia	Greater Chesapeake
House for Families	01		1747	Mount Vernon	Greater Chesapeake
Utopia III	P01a	1748		Utopia	Greater Chesapeake
Fairfield Quarter	02	1752		Fairfield	Greater Chesapeake
Utopia III	02a	1751		Utopia	Greater Chesapeake
Richneck Quarter	02	1752		Richneck	Greater Chesapeake
Utopia III	01b	1753		Utopia	Greater Chesapeake
Richneck Quarter	03	1754		Richneck	Greater Chesapeake
South Grove	04	1757		Mount Vernon	Greater Chesapeake
Utopia IV	02	1760		Utopia	Greater Chesapeake
Utopia IV	01	1762		Utopia	Greater Chesapeake
Pope Site	02		1769	N/A	Greater Chesapeake
Building t	01		1769	Monticello	Greater Chesapeake
Fairfield Quarter	03	1772		Fairfield	Greater Chesapeake

(Continued)

Table 9.2 (Continued)

Site	*Occupation phase*	*Binford pipe stem date*	*BLUE MCD*	*Plantation*	*Region*
South Grove	05	1772		Mount Vernon	Greater Chesapeake
Palace Lands Quarter	N/A	1755		Not Applicable	Greater Chesapeake
House for Families	02		1775	Mount Vernon	Greater Chesapeake
Building n	01		1776	Monticello	Greater Chesapeake
Building o	01		1776	Monticello	Greater Chesapeake
Site 7	N/A		1776	Monticello	Greater Chesapeake
House for Families	03		1779	Mount Vernon	Greater Chesapeake
ST116	N/A		1780	Stratford Hall	Greater Chesapeake
Building l	01		1784	Monticello	Greater Chesapeake
Building n	02		1785	Monticello	Greater Chesapeake
Building o	02		1786	Monticello	Greater Chesapeake
Site 8	N/A		1786	Monticello	Greater Chesapeake
Building m	01		1788	Monticello	Greater Chesapeake
MRS 2	01		1788	Monticello	Greater Chesapeake
Pope Site	03		1789		
Building l	02		1790	Monticello	Greater Chesapeake
Building m	02		1790	Monticello	Greater Chesapeake
North Hill	02		1790	Poplar Forest	Greater Chesapeake
Building o	03		1792	Monticello	Greater Chesapeake
Building l	03		1793	Monticello	Greater Chesapeake
Quarter	02		1794	Poplar Forest	Greater Chesapeake
Building t	02		1794	Monticello	Greater Chesapeake
Building D/j	02		1795	Monticello	Greater Chesapeake
Building l	04		1795	Monticello	Greater Chesapeake
Building m	03		1795	Monticello	Greater Chesapeake
MRS2	02		1795	Monticello	Greater Chesapeake
North Hill	03		1795	Poplar Forest	Greater Chesapeake
Quarter	01		1795	Poplar Forest	Greater Chesapeake

Site	*Occupation phase*	*Binford pipe stem date*	*BLUE MCD*	*Plantation*	*Region*
Quarter	03		1795	Poplar Forest	Greater Chesapeake
Building r	01		1795	Monticello	Greater Chesapeake
Building l	05		1796	Monticello	Greater Chesapeake
Building n	03		1796	Monticello	Greater Chesapeake
Building s	01		1796	Monticello	Greater Chesapeake
Building D/j	03		1797	Monticello	Greater Chesapeake
Building i	01		1797	Monticello	Greater Chesapeake
Building o	04		1797	Monticello	Greater Chesapeake
Quarter	04		1797	Poplar Forest	Greater Chesapeake
Building r	02		1797	Monticello	Greater Chesapeake
Elizabeth Hemings	N/A		1798	Monticello	Greater Chesapeake
Building m	04		1798	Monticello	Greater Chesapeake
Building c	N/A		1801	Monticello	Greater Chesapeake
Building o	05		1802	Monticello	Greater Chesapeake
Building s	02		1803	Monticello	Greater Chesapeake
Building t	03		1803	Monticello	Greater Chesapeake
Building n	04		1804	Monticello	Greater Chesapeake
Building r	03		1805	Monticello	Greater Chesapeake
Building l	06		1806	Monticello	Greater Chesapeake
Building s	03		1811	Monticello	Greater Chesapeake
MRS2	03		1812	Monticello	Greater Chesapeake
Building r	04		1815	Monticello	Greater Chesapeake
Stagville Cabin	N/A		1815	Stagville	Greater Chesapeake
Building i	02		1822	Monticello	Greater Chesapeake
MRS2	04		1825	Monticello	Greater Chesapeake
Building t	04		1827	Monticello	Greater Chesapeake
Building s	04		1832	Monticello	Greater Chesapeake
38BK245	01		1760	Curriboo	South Carolina
38BK76	01		1765	Yaughan	South Carolina
38BK76	02		1784	Yaughan	South Carolina
Middleburg Village	N/A		1787	Middleburg	South Carolina
38BK245	02		1788	Curriboo	South Carolina

(Continued)

Table 9.2 (Continued)

Site	*Occupation phase*	*Binford pipe stem date*	*BLUE MCD*	*Plantation*	*Region*
38BK75	03		1788	Yaughan	South Carolin
38BK75	02		1789	Yaughan	South Carolina
38BK76	03		1791	Yaughan	South Carolina
38BK75	01		1793	Yaughan	South Carolina
KES	01		1802	The Hermitage	Tennessee
Cabin 3	01		1805	The Hermitage	Tennessee
KES	02		1807	The Hermitage	Tennessee
Cabin 3	02		1816	The Hermitage	Tennessee
KES	03		1817	The Hermitage	Tennessee
Cabin 3	03		1825	The Hermitage	Tennessee
KES	04		1832	The Hermitage	Tennessee
Cabin 3	04		1835	The Hermitage	Tennessee
Good Hope Village	01		1793	Good Hope	Jamaica
Good Hope Village	02		1797	Good Hope	Jamaica
Good Hope Village	03		1804	Good Hope	Jamaica
Good Hope Village	04		1820	Good Hope	Jamaica
Papine Village	01		1790	Papine	Jamaica
Papine Village	02 Diversified		1796	Papine	Jamaica
Papine Village	03 Diversified		1802	Papine	Jamaica
Stewart Castle Village			1794	Stewart Castle	Jamaica
Stewart Castle Village	02 Diversified		1799	Stewart Castle	Jamaica
House 15	P01		1785	Seville	Jamaica
House 15	P02		1792	Seville	Jamaica
House 15	03 Diversified		1800	Seville	Jamaica
House 16	01		1766	Seville	Jamaica
House 16	02		1783	Seville	Jamaica
House 16	03 Diversified		1790	Seville	Jamaica
House 16	04 Diversified		1790	Seville	Jamaica
Mona Great House	01		1764	Mona	Jamaica
Mona Great House	02		1771	Mona	Jamaica
Mona Great House	03		1779	Mona	Jamaica
Mona Village	01		1773	Mona	Jamaica
Mona Village	02		1790	Mona	Jamaica
Mona Village	03		1790	Mona	Jamaica

Estimating the pattern of variation in ceramic discard

Dating the sites and site occupations

Effectively dating an assemblage is critical for any archaeological analysis, and it is especially important when working with data from multiple assemblages and sites whose occupations span over a hundred years. Assemblage dates derive from seriation-based methods that use correspondence analysis of ware type frequencies and mean ceramic dates to produce and evaluate intra-site chronologies for each site in the archive. DAACS staff members use standardized analytical methods for each site to develop and assign ceramic assemblages from excavated contexts to site-specific occupation phases (see Neiman et al. 2003 for technical details). The use of common analytical methods is designed to increase comparability among phases at different sites. For sites with temporal signatures indicating multiple occupational phases, a mean ceramic date (MCD), Best Linear Unbiased Estimate mean ceramic date (BLUE MCD[1]) (9.1) and terminus post quem (TPQ) are assigned to each intra-site phase. The phases are recorded in the DAACS Phase field of the database and available through the DAACS Context Query.[2] Sites without phases are assigned a site-wide MCD, BLUE MCD, and TPQ.[3]

Sites occupied prior to the "creamware revolution" present a challenging problem when assigning dates. Sites whose occupation dates before 1750 are dominated by ceramic types with long manufacturing spans, and fashionable ceramic types with short manufacturing spans are rare. When we try to use MCDs to date early 18th-century sites, the results are often not in the correct relative order, based on evidence from independent sources like stratigraphy, seriation of other artifact classes, or documents. Recent analysis using ceramic and pipe stem data from 78 assemblages dating from 1700 to 1850 indicates that the mean pipe stem bore diameters correlate reasonably well with time through the mid-18th century. They are particularly effective for dating sites occupied prior to 1750. However, the rate of bore diameter decrease slows after 1750, rendering mean pipe stem bore diameter dates less accurate for this later period (Smith et al. 2008). Serendipitously, the introduction of refined ceramic wares types with great decorative variability and short manufacturing spans began in the 1740s and 1750s, allowing archaeologists to use MCDs as the more accurate way of telling time on sites post-dating 1750. In this analysis, for sites that documents tell us were occupied prior to 1750, I use Binford mean tobacco pipe bore diameter dates (Binford 1962). For sites that were occupied after 1750, I use BLUE MCDs (Table 9.2).

Expectations

With the dataset defined, we can return to the case study's central question: how can archaeologists best measure the use and discard of fashionable refined ceramics on 18th- and 19th-century enslaved household sites over time and space?

Documents tell us that enslaved people engaged with local markets for consumer goods and the archaeological record indicates that many enslaved households owned and used costly ceramic vessels made in the most fashionable wares with current decorations. It is easy to outline a series of plausible expectations for the data. Based on what we know about the consumer revolution and slaves' participation in local and regional markets, we should expect to see that the discard of refined ceramic wares increased during the third quarter of the 18th century on slave sites in North America and the Caribbean as these wares became accessible in local stores and markets, and as enslaved men and women had increasing opportunity and incentive to purchase fashionable ceramics. At the same time, we might expect a decrease in the discard of coarsewares throughout the 18th century as refined ceramics took the place of many coarse earthenware mugs and trenchers.

To test these expectations, we need a measure that is sensitive to the discard rate for refined ceramics and therefore the acquisition rate, which presumably is a function of how much people invested in refined ceramics per year. However, the acquisition and discard of refined ceramics did not occur in a vacuum. They were part of a larger household economy in which other consumer choices directly impacted what was purchased and when. A household with the ability to purchase many expensive ceramic tablewares likely had a similar ability to invest in other costly consumer goods. In other cases, households may have chosen to only invest in specific fashionable goods, for a host of social and economic reasons (Galle 2010). This lack of independence in the acquisition of different artifact types in the same assemblage is why we need to more carefully consider how we quantify type abundances.

Relative frequencies

Relative frequencies are one of the most commonly used measures of assemblage variation. They are ideal for seriation and related chronology methods such as mean ceramic dates and pipe stem bore diameter dating. They are problematic, however, if one is interested in reliably measuring variation in discard patterns, because they are based on the assumption that the discard rate of the artifact class in the numerator is independent of the discard rates for all the artifact classes that make up the denominator. But we know that independence is rarely the case. A household with the ability to purchase expensive ceramic tablewares likely had a similar ability to invest in other costly consumer goods. A positive correlation between the discard rates of the numerator artifact class and any other artifact class that contributes to the total sample size in the denominator would attenuate variation in percentages between sites (Neiman et al. 2000:47; Galle 2004:45). Conversely, there may be a negative correlation among artifact classes which would serve to inflate variation among sites.

For traditional relative frequencies of a given ceramic type, relative to *all* other ceramic types,[4] to provide an accurate picture of discard, the discard rate of *all the other ceramic types* must be constant. A constant discard rate of all other ceramic types, within a single site and between sites, is highly unlikely. As a result, archaeologists need a measure that is sensitive to the discard of not simply the artifact being measured, but also the other artifact classes that comprise the assemblage.

The Abundance Index

An Abundance Index, a variant of a relative frequency, is a promising solution. Abundance indices provide estimates of discard rates relative to a baseline discard rate, with the assumption that the base discard rate of the denominator class either does not change or, if it does change, it does so in a predictable manner. As a result, we only have to be concerned with correlated discard rate variation in a single denominator class, not many artifact classes. An Abundance Index is estimated as: AI = (Artifact Group 1)/(Artifact Group 1) + (Artifact Group 2), where Group 1 is the artifact group whose variation we are interested in measuring and Group 2 represents the class whose discard rate we hypothesize is constant across the assemblages being compared.

There is a useful analogy between this method for estimating variation in discard rates and measures of large and small mammal frequency used in optimal foraging applications (Ugan and Bright 2001). Abundance Indices (AI) have been successfully used to analyze discard rates at a number of historic-period sites, from late 18th-century slave quarter sites at Monticello (Neiman et al. 2000) and early-to-mid-19th-century sites at The Hermitage (Galle 2004) to other 18th- and 19th-century slave sites in the Chesapeake and Caribbean (Galle 2006, 2010, 2011; Bates 2015, this volume).

The real challenge for any analysis using an Abundance Index, however, is finding an Artifact Group 2 with a discard rate that is either relatively constant across sites or that has a discard rate that varies predictably over time. An artifact class whose discard is relatively constant through time is ideal, however an artifact class that decreases or increases predictably through time could be used as the baseline Artifact Group 2 artifact class, provided it is acknowledged that the predictable variation will artificially inflate or deflate our estimates of variation in discard rate for the Artifact Group 1.

Past research using abundance indices have used several lines of evidence to determine the most reliable Artifact Group 2 (Galle 2004, 2006, 2010, 2011; Bates 2015). The first step is considering which artifact classes, or groups, would most likely be discarded with some uniformity on sites of slavery in the 18th and early 19th centuries. Nails, brick, mortar, window glass, and other architectural artifacts are not likely uniformly distributed across sites in North America and Jamaica because architectural technology varied greatly. It is expected that costly leaded glass and refined ceramics were introduced during the consumer revolution and required financial resources to acquire; therefore their presence will vary depending on when the site was occupied and the ability of the residents to acquire these fashionable goods. Other artifact types, such as tools, adornment items, and toys are found in sample sizes that are often too small to be useful. Tobacco pipes and non-wine bottle glass tend to be skewed temporally, with tobacco pipes in much greater quantities in the 18th century and semi-molded or molded glass vessels only appearing in significant quantities in the later 19th century.

Wine bottles were ubiquitous on sites occupied during the late 17th to early 19th centuries, regularly finding their way to sites where, after their original contents were drained, they were reused as storage containers for other liquids. Recent analyses of 18th-century slave quarters sites in the greater Chesapeake and Jamaica indicate that the discard of wine bottle glass had no correlation with time, meaning that the presence of wine bottle sherds at these sites neither increased nor decreased through time (Galle 2006, 2010, 2011; Bates 2015). Comparing relative frequencies and abundance indices that use wine bottle glass as Artifact Group 2 demonstrates the efficacy of wine bottles as the denominator class and the problems inherent in basic relative frequencies.

Comparing relative frequencies to Abundance Indexes

Let's look first at the relative frequencies of refined and coarsewares from North American and Jamaican assemblages (Figures 9.1a and 9.1b).[5] In both regions, the frequency of refined wares, relative to *all* ceramics, increases dramatically from 1760 to 1800. It levels off around 1805 and remains high through the 1850s. Enslaved people residing in the greater Chesapeake significantly increased the proportions of refined ceramics used in their households after 1750 (Figure 9.1a). In contrast, South Carolina sites exhibit surprisingly low relative frequencies of refined wares on sites whose occupations date to the height of the consumer revolution. Not surprisingly, mid-19th-century sites from The Hermitage, in Tennessee, have high frequencies of refined ceramics.

Given the arithmetical relationships built into proportions, the converse is true for coarsewares, whose frequency steadily declines through the 18th century, comprising less than 15% of all assemblages that postdate 1800 (Figure 9.2a and 9.2b). In South Carolina, the low frequencies of both refined and coarsewares are balanced by high frequencies of likely locally produced colonoware (Figure 9.3a). Figure 9.4 is also clear confirmation that colonoware is much more common on pre-1760, pre-consumer revolution sites in the Chesapeake and that there are much greater proportions of colonoware on domestic slave sites in South Carolina than in Virginia, Maryland, or North Carolina. Comparing Figures 9.1a to 9.2a and 9.3a, one might be tempted to argue that enslaved men and women in the Greater Chesapeake had greater market access, and greater ability to spend money on fashionable refined ceramics than their counterparts in South Carolina.

Although the trends are not inaccurate, they are misleading, if we read variation in proportions as measures of variation in discard rates. For the discard rate interpretation to be correct, the discard rates of the denominator classes must be constant across all assemblages, but this clearly cannot be the case across all three proportions, because two of the types serve as denominator classes for the third. For example, coarse earthenware and colonoware are the denominator classes for the refined earthenware proportion, whereas refined earthenware and colonoware are the denominator for the coarse earthenware proportion.

A different picture of artifact abundance emerges when ceramics are removed from the denominator class. Figures 9.4 through 9.6 display variation in discard patterns measured using an Abundance Index that uses wine bottle glass as the independent artifact class in the denominator (AI = Artifact Group 1/Artifact Group 1 + Wine Bottle Glass). By replacing the denominator with an artifact class independent of the discard of other ceramic types, significant differences in refined ceramic consumption, especially from 1780 to 1810, become clear.

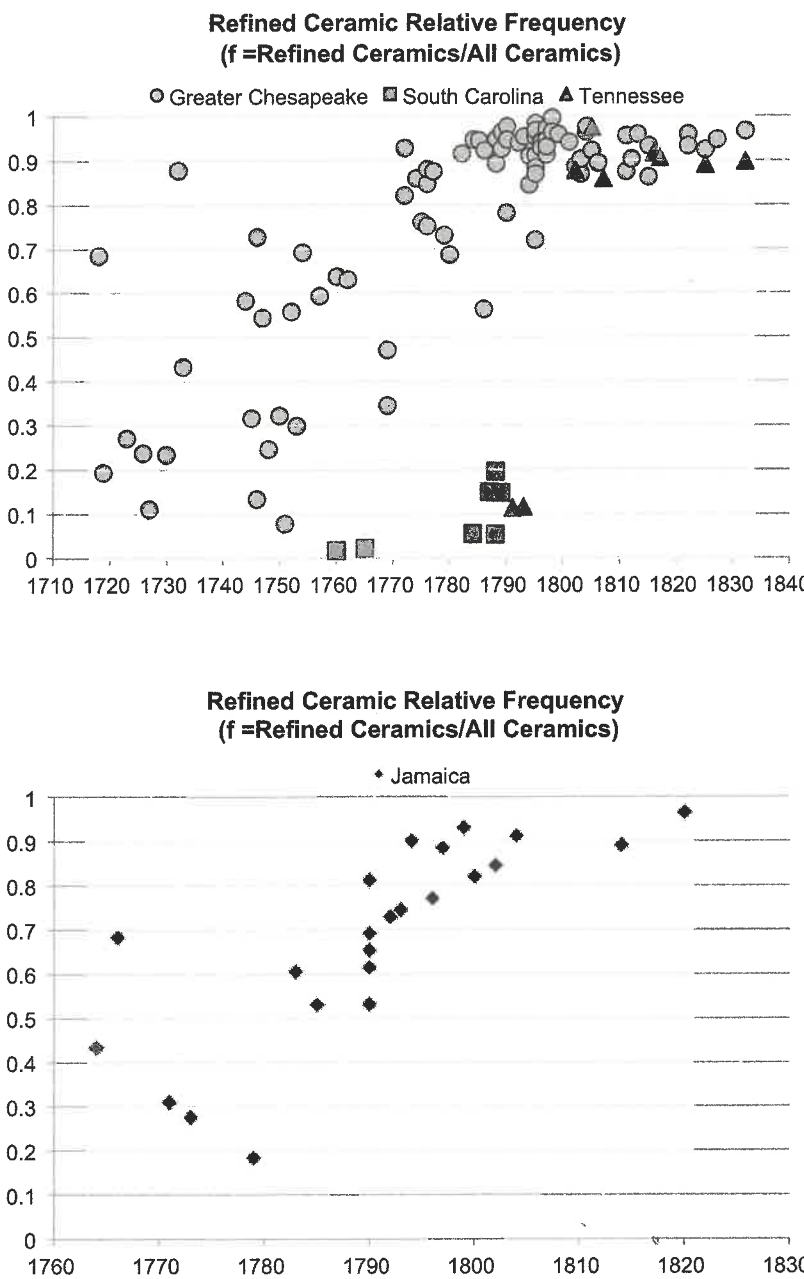

Figure 9.1 Relative frequencies of refined wares by region in North American slave site assemblages (9.1a) and in Jamaican slave assemblages (9.1b).

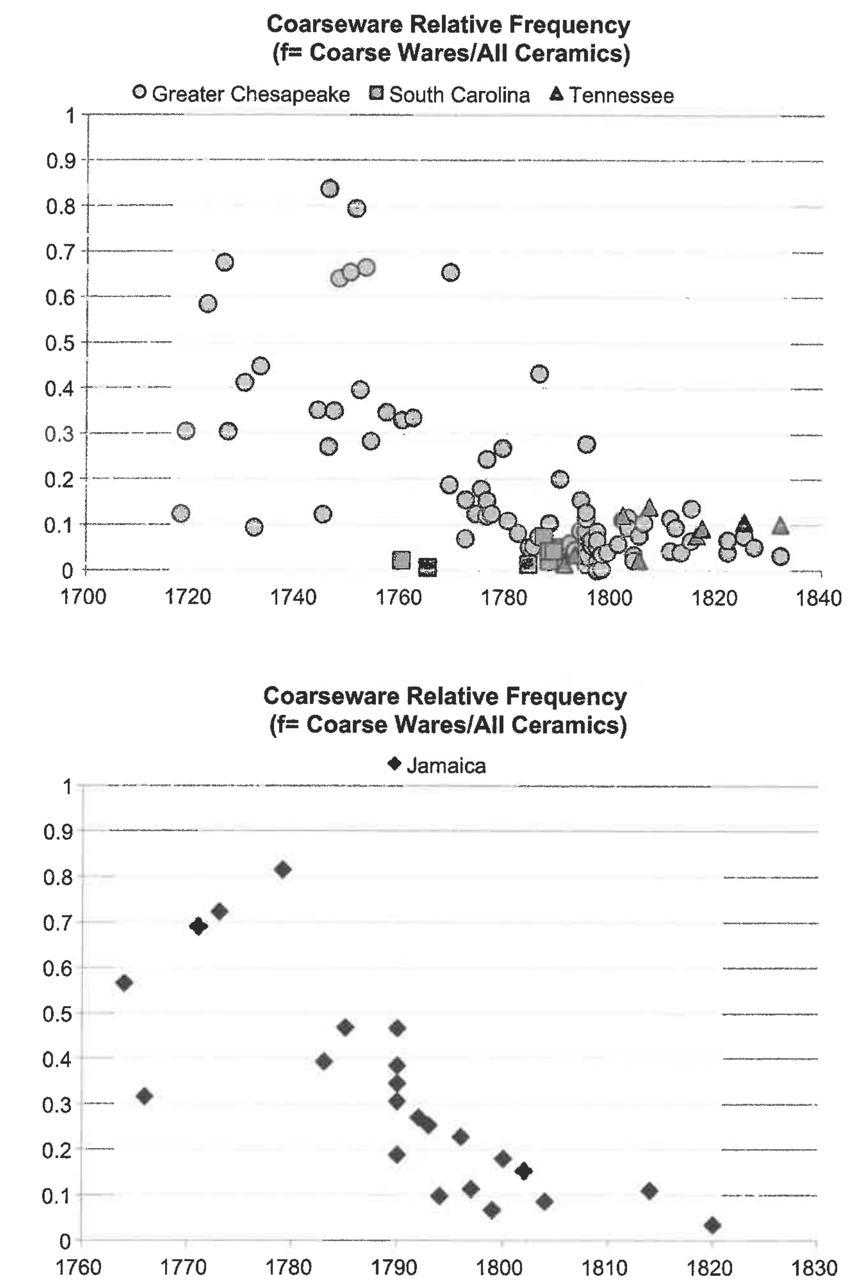

Figure 9.2 Relative frequencies of coarseware by region in North American slave site assemblages (9.2a) and in Jamaican slave assemblages (9.2b).

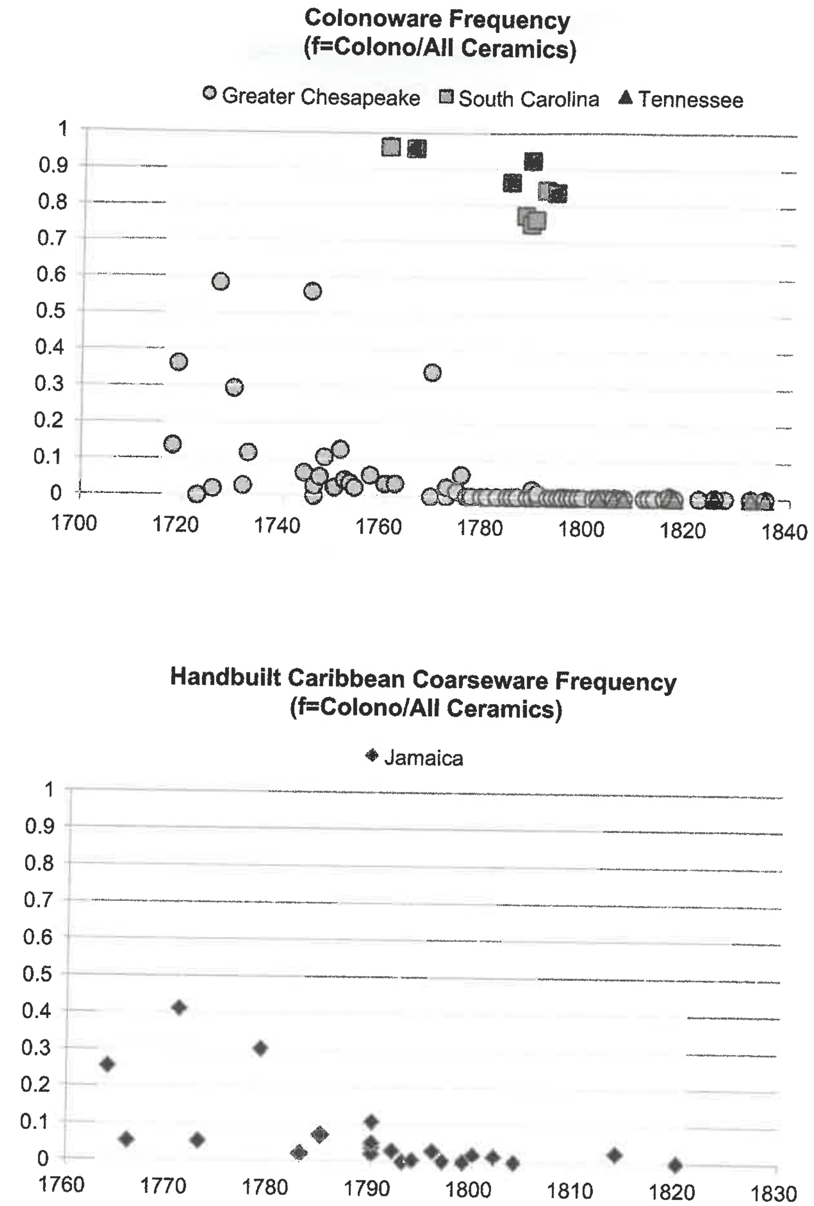

Figure 9.3 Relative frequencies of colonoware by region in Nŏrth American slave site assemblages (9.3a) and handbuilt Caribbean coarsewares in Jamaican slave assemblages (9.3b).

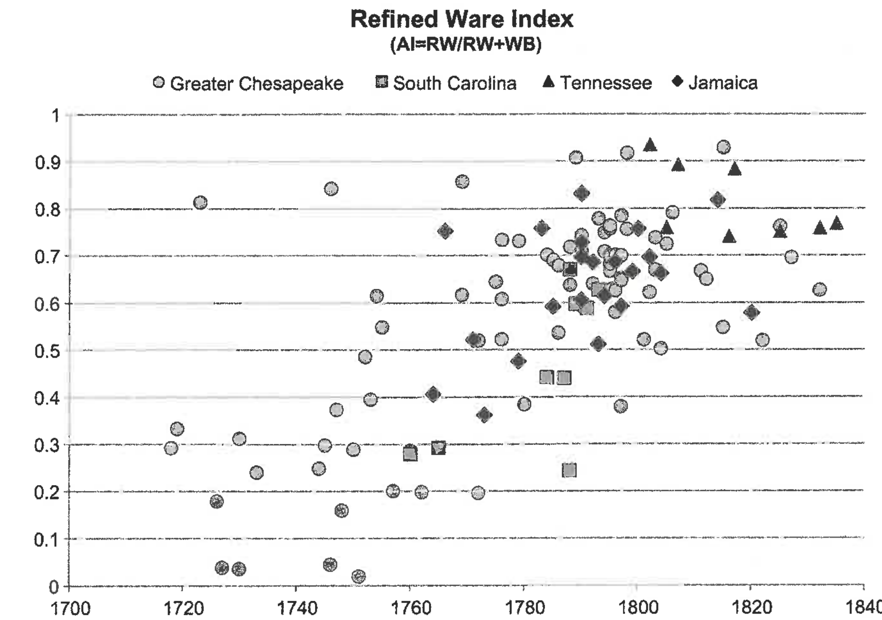

Figure 9.4 Abundance Index for refined wares from North American and Jamaican slave sites.

Refined ceramic abundance still increases over time, however the meteoric rise in refined ceramic consumption seen in the relative frequencies is tempered in the Abundance Indices (Figure 9.4). The Indices point to greater variation in refined ceramic discard among Chesapeake households with post-1780 mean ceramic dates. Greater variability in refined ceramic discard is also evident in the Hermitage occupations. This variability, although subtle, is crucial. It suggests that enslaved households in both the Chesapeake and Tennessee had greater differential access to refined ceramics than suggested by relative frequencies, which show what appear to be steadily high levels of refined ceramic consumption by all post-1800 enslaved households.

The most significant difference can be seen in data for the South Carolina sites (Figure 9.4). South Carolina's refined ceramic proportions, relative to all ceramics, suggest that enslaved households discarded significantly fewer refined ceramics in comparison to those living in the greater Chesapeake and Tennessee. However, South Carolina's refined ware Abundance Indices fall solidly in the middle of the temporal trend in North American refined ceramic consumption. When coarsewares and colonoware are removed from the denominator class, it becomes clear that enslaved men and women in South Carolina may have acquired expensive refined ceramics at rates comparable to slaves living in the greater Chesapeake at the same time.

Enslaved households living on sugar plantations in Jamaica discarded refined wares at rates similar to enslaved households in North America (Figure 9.4). This pattern is striking, given the brutality of sugar production's relentless gang-based labor system, which historians uniformly agree was directly responsible for high death rates and negative natural increase on Jamaica in the 18th and 19th centuries (Higman 1976). Enslaved people living on sugar estates in Jamaica discarded significantly fewer costly goods than slaves living on coffee plantations. Task-based labor requirements on coffee plantations enabled enslaved men and women to develop occupational skills they could parlay into cash (Galle 2011). Similarly, it appears that slaves laboring on diversifying sugar plantations – operations that grew multiple crops, invested heavily in livestock, or sold water and land rights – also had greater access to material goods (Galle and Francis-Brown 2013). Here, site occupations on diversifying sugar plantations have among the highest discard rates from Jamaica.

Patterns in coarseware abundance in all regions also display greater variation among sites than reflected in relative frequencies, again showing that people in South Carolina discarded as much coarseware as their

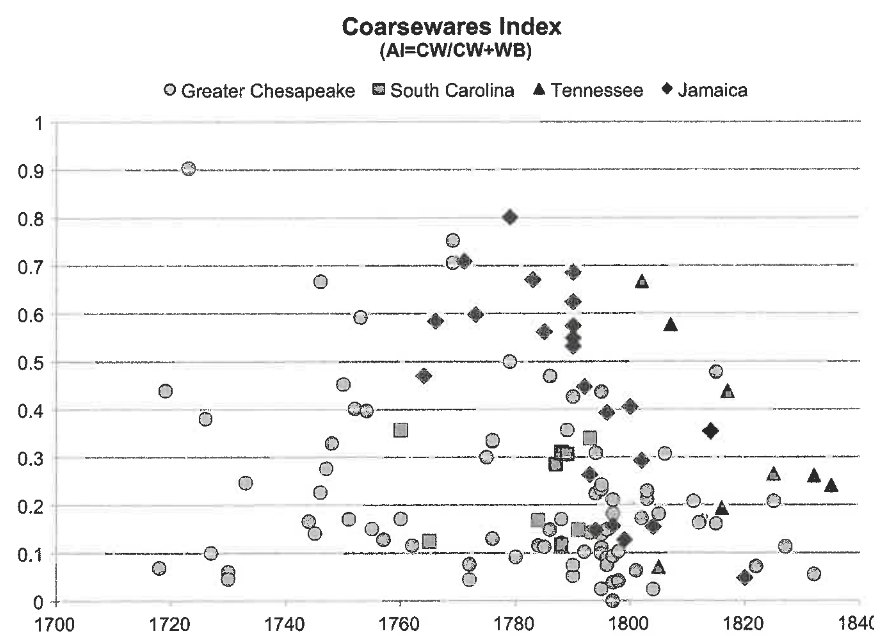

Figure 9.5 Abundance Index for coarsewares from North American and Jamaican slave sites.

contemporaries in the Chesapeake (Figure 9.5). Interestingly, Jamaican sites have some of the highest rates of coarseware discard from 1770 to 1815. These rates may be evidence of the continuation and growth of Jamaica's provision ground system, in which Jamaican slaves were required to grow much of their own food, which needed to be processed, stored, and transported to market. As a result, demand for these wares for bulk processing and storage of household-grown food may have been greater among enslaved households in Jamaica.

Perhaps the most intriguing pattern begging to be plumbed further is seen in Figure 9.6, the colonoware index. As expected, the colonoware discard rates relative to wine bottle glass were exceptionally high on all three South Carolina plantations. These South Carolina households had nearly equal access to colonoware, but greater variation in the discard of refined ceramics. Does this suggest that the colonoware on these sites was produced onsite or close enough that acquiring the wares incurred little or no cost, unlike acquiring refined ceramics? The three site occupations with the highest colonoware discard, Curriboo 38BK245 Phase 1, Yaughan 38BK76 Phase 01, and Middleburg, also had the lowest refined ceramic discard rate. For researchers looking to explore what drives these differences, next steps here might include applying Miller's CC index to the refined ceramics from

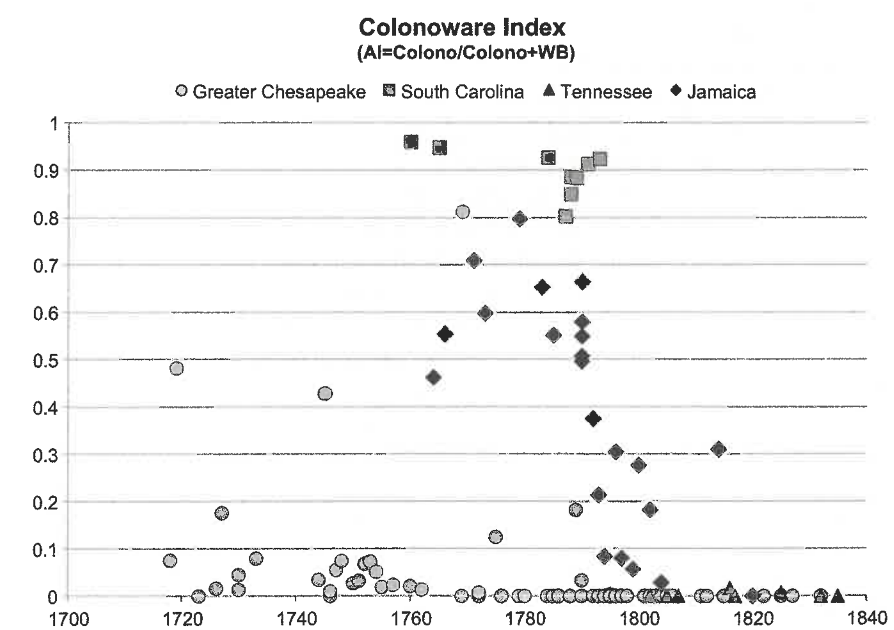

Figure 9.6 Abundance Index for colonowares and handbuilt Caribbean coarsewares from North American and Jamaican slave sites.

the South Carolina sites to see if the refined wares at these sites were also significantly cheaper than those on the other South Carolina sites (Bates 2015, this volume). In the Chesapeake, high colonoware discard is not linked to low refined ware discard, at least based on our current small sample. Both JC298 and Richneck Quarter Phase 1, two early sites with some of the higher colonoware discard rates in the Chesapeake, also have relatively high refined discard for that region.

Perhaps most interesting for future research, is that handbuilt Caribbean coarse earthenware declines dramatically from 1790 to 1820. Unlike colonoware discard in North America, handbuilt Caribbean coarse earthenwares follow nearly the same trend as wheel-thrown coarseware discard in Jamaica (Figure 9.6). Enslaved households in Jamaica discarded both locally-produced and imported wheel-thrown, often glazed, coarsewares at similar rates. There is no evidence of regional or temporal preferences for handbuilt coarsewares, unlike South Carolina's heavy reliance on colonoware.

An invitation

In lieu of a conclusion, I offer an invitation. The foregoing analysis demonstrates how the Abundance Index ameliorates some of the ambiguities embedded in relative frequencies, and highlights trends masked by methods that don't use an independent baseline artifact class. But what do these compelling trends suggest about how enslaved laborers engaged in the consumer revolution? The acquisition and display of costly, fashionable ceramics was a strategy employed by enslaved people to communicate in a culturally and linguistically complex world (Galle 2006, 2010, 2011). In both Virginia and Jamaica, plantation type and increasing agricultural diversification were critical factors in an enslaved person's motivation and ability to engage with local markets for more than comestibles. These variables were directly linked to an enslaved person's ability to earn money, obtain approved mobility, and interact with other people – both free and enslaved – off the plantation (Galle 2010, 2011). Through market participation, enslaved women and men did not simply express their identities. Many strategically and successfully selected goods to help create and navigate complex relationships in an increasingly competitive social and economic environment.

Lynsey Bates has recently demonstrated that occupants of slave villages in Jamaica that were associated with higher-quality provision grounds, allocated to enslaved households for cultivation, had greater investment in the more costly, decorated ceramic wares and forms than villagers with access to lower-quality grounds (Bates 2015, 2016). Her application of the Miller CC index to abundance measures from Jamaica slave village sites is an important new method for evaluating the level of investment in specific refined ceramic vessel forms and decorations (Bates 2015, this volume).

Finally, Lindsay Bloch's (2015:194) groundbreaking study in the Chesapeake indicates that within the same plantation, there was shared access to the same coarse earthenwares, with "no status-based differences associated with wares from different places." Her search of twenty 18th-century Virginia store accounts also suggests that whereas slaves were purchasing many other fashionable items, there is only one instance of an enslaved person purchasing coarse earthenware vessels and the size of the order suggests he may have been purchasing for his owner (Bloch 2015:195). It is possible that in Virginia, imported coarse earthenware vessels were purchased in bulk and distributed to enslaved, indentured, and free residents of each plantation, freeing up personal funds for the acquisition of more fashionable wares.

This new comparative research is making headway in answering previously open questions about how and why enslaved people participated in the consumer revolution. We are able to evaluate their participation and explain their motives precisely because we seriously engage with large, comparative datasets by devising models and testing them with the data that are unique to the field of archaeology. There is much more work to be done unraveling the strategies enslaved women and men used to negotiate their lives across the Atlantic World. The archaeological record provides compelling and novel data. Go forth with the Abundance Index measure and start interrogating your data! It is only when we engage fully with our assemblages that we can offer descriptions, and suggest explanations, for past human behavior.

Acknowledgements

Many thanks to Barbara Heath, Eleanor Breen and Lori Lee for inviting me to contribute to this volume. This chapter has benefited greatly from their comments, as well as from discussions with Fraser Neiman, Lynsey Bates, Lindsay Bloch, Elizabeth Bollwerk, and Leslie Cooper. Fraser Neiman has played a critical role in the development of the Abundance Index, and has contributed significantly to my thinking about its use. Finally, I want to express my appreciation to the archaeologists who share their data with The Digital Archaeological Archive of Comparative Slavery. DAACS is funded through generous grants from the Andrew W. Mellon Foundation and the National Endowment for the Humanities. Without their support, large-scale comparative archaeological studies of slavery would not be possible.

Notes

1

$$MCD_{blue} = \frac{\sum_{i=1}^{t} m_i p_i \left(\frac{1}{s_i/6}\right)^2}{\sum_{i=1}^{t} p_i \left(\frac{1}{s_i/6}\right)^2} \tag{9.1}$$

Where m_i is the manufacturing midpoint for the *i'th* ceramic type, p_i is its relative frequency, and s_i is its manufacturing span. The idea here is to weigh the manufacturing midpoint not only by the frequency of each type, but also inversely by the variance of the response function that describes the trajectory of change over time in the popularity or relative frequency of the type. It is assumed that over time, the relative frequency of each type roughly follows a Gaussian response function, with the manufacturing start date three standard deviations below the manufacturing midpoint, and the manufacturing end date three standard deviations above it. This implies that $s_i/6$ is a reasonable estimate of the response function's standard deviation and its square is a reasonable estimate of the variance.

2 DAACS Context Queries: http://www.daacs.org/query-the-database/context-queries/.

3 DAACS occupational phase assignments are located in the DAACS Phase field of the Context Table in the DAACS database (http://www.daacs.org/about-the-database/daacs-cataloging-manual/) and can be accessed through DAACS Mean Ceramic Date Queries: http://www.daacs.org/query-the-database/meanceramicdate-queries/.

4 Where in any given assemblage f = Ceramic Ware Type A/All Ceramic Ware Types.

5 Relative Frequencies calculated as f = Ceramic Type/All Ceramic Types.

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