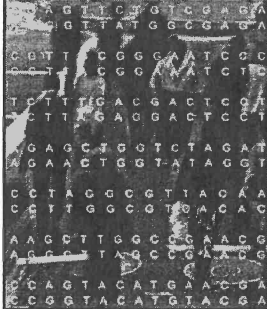


**Using Ethnogenetic Layering (EL) to  
Illuminate the Genetics of Health Disparities**



Fatimah L.C. Jackson, Ph.D.  
Professor  
Distinguished Scholar-Teacher  
University of Maryland  
College Park, MD 20742  
301.405.1431 and 301.405.7643  
fatimah@umd.edu

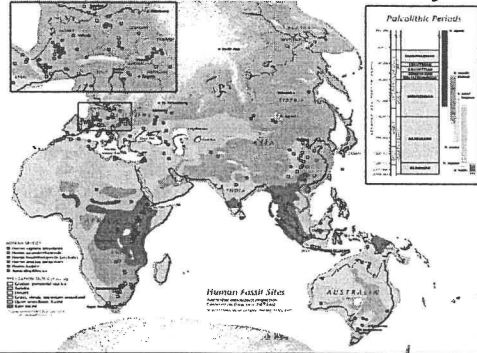
**The Problem and Its Solution**

Human heterogeneity and biocultural variability presents a challenge to the classical stratification models of epidemiology and public health. New approaches are needed to capture the nuance of human biodiversity. These new models must encompass relevant cultural/behavioral diversity, genetic variation, non-genetic biological differences, and be contextualized by appropriate biological lineage histories.

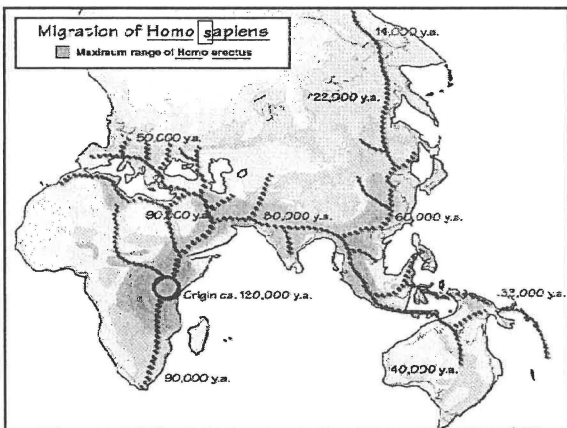
Can the perspective of biological anthropology contribute to the understanding of contemporary human variability and the resolution of existing human health inequities?

Yes! If we take human evolutionary history and population biology into account.

**First, we must reconstruct our conceptions of human variability!**

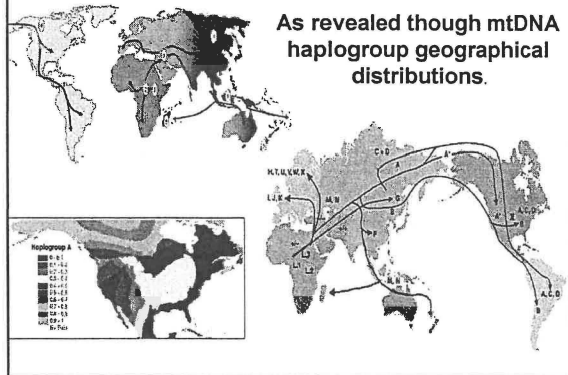


**Migration of Homo sapiens**



**The Peopling of the World**

As revealed through mtDNA haplogroup geographical distributions.



### Potential Genetic Diagnostic Markers for Breast Cancer

**Cell Cycle:** Cell Cycle Arrest and Checkpoint: MYC, RB1, TP53.  
Negative Regulation of the Cell Cycle: ATM, BAX, BRCA1, EGFR, ESR1, NME1, PTEN, RB1, TP53.  
Regulation of the Cell Cycle: BCL2, BRCA2, CCND1, CCNE1, CDK4, FGF3, FGF8, IGF2, MAPK3, PCNA, PRKCA, TGFA, TGFB1, TGFB2, TGFB3, VEGF.  
DNA Replication: CDK2, EGF, IGF1, PCNA.  
**Cell Growth and Proliferation:**  
Growth Factors and Cytokines: BMP6, CSF1, CSF3, EGF, FGF18, FGF3, FGF8, IGF1, IGF2, TGFA, TGFB1, TGFB2, TGFB3, TNF, VEGF.  
Positive Regulation of Cell Proliferation: CDK2, CSF1, CSF3, EGF, FGF18, FGF3, IGF1, VEGF.  
Negative Regulation of Cell Proliferation: BCL2, NME1, ODZ1, PLG.  
Regulation of Cell Growth: ESR2, IGFBP3, TP53, TSG101.  
Other Genes Involved in Cell Growth and Proliferation: AR, BRCA1, CDK4, EGFR, ERBB2, ERBB4, ESR1, MYC, PCNA, PRKD1, PRL.  
**Cell Differentiation:** CSF1, IGFBP3, TP53.

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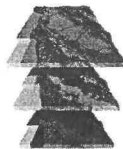
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## Ethnogenetic Layering Approaches

Ethnogenetic layering is a new tool to better understand the role of population substructuring in identifying and assessing the biological, cultural, and biocultural risks underlying health disparities.



We have focused our research on groups that live in and/or have ancestral origins from one of three US regions: the Chesapeake Bay area, the Carolina Coast area, or the Mississippi Delta.

We have developed a strategy to collect and analyse geographical patterns of biological lineage data and micro-ethnic affinity within an ethnohistorical framework.

Regional frequencies of significant biocultural factors correlated with health outcomes have been identified to develop a predictive model for assessing group susceptibilities.

We have developed modified version of phenotype segregation network analysis to pinpoint specific genetic, cultural/behavioral, non-genetic biological contributions to existing health disparities.

Glucose

**If significant macroethnic differences exist in the distribution of functional variants of these loci, what specific microethnic differences exist?**

**OLD APPROACH**

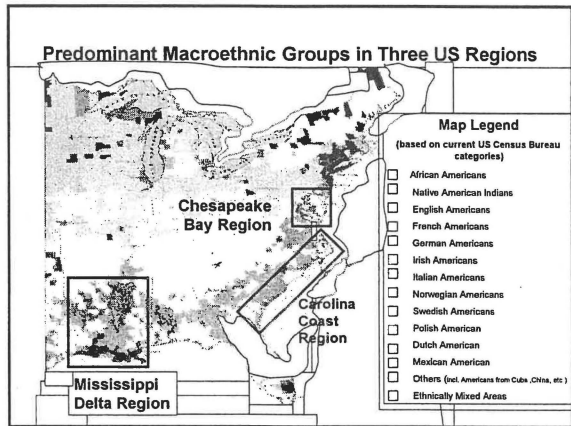
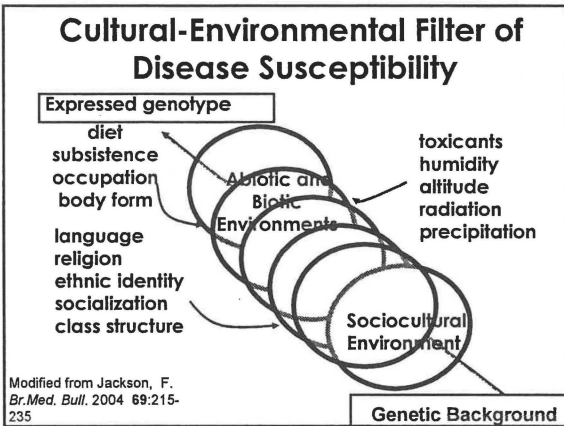
**Cancer Incidence and Death Rates**

(Number of new cases each year) per 100,000 individuals (1992-1999).

| Group                  | Both Sexes    | Males         | Females       |
|------------------------|---------------|---------------|---------------|
| African-American       | 526.6 (267.3) | 703.6 (369.0) | 404.8 (204.5) |
| European-American      | 480.4 (205.1) | 568.2 (258.1) | 424.4 (171.2) |
| Asian/Pacific Islander | 348.6 (128.6) | 408.9 (160.6) | 306.5 (104.4) |
| Hispanic/Latino        | 329.6 (129.2) | 393.1 (163.7) | 290.5 (105.7) |
| Amer Ind/Alaska Nat    | 244.6 (128.6) | 277.7 (154.5) | 224.2 (104.4) |

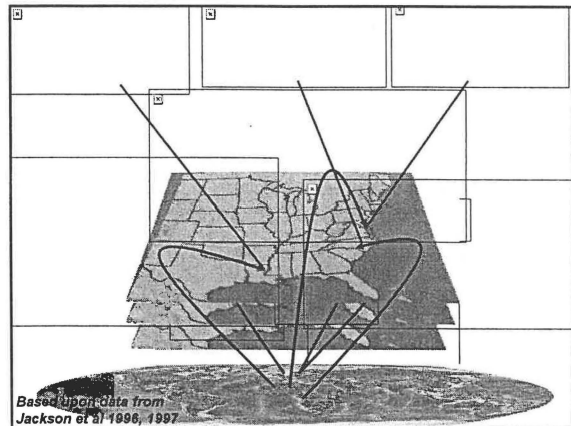
**Not accurate; based on selected, non-representative groups.**

Modified from National Cancer Institute data presented at:  
[http://newscenter.cancer.gov/BenchMarks/archives/2002\\_05/related\\_article.html](http://newscenter.cancer.gov/BenchMarks/archives/2002_05/related_article.html)



**Our Approach:**

**Ethnogenetic Layering**



**Foundation Microethnic Groups (MEGs) of the Chesapeake Bay Region**

**Major African Deportation Areas to the Chesapeake Bay Region**

|                         |                  |
|-------------------------|------------------|
| Bight of Bonny 38%      | Senegambia 15%   |
| West Central Africa 16% | Upper Guinea 11% |
| Gold Coast 16%          | Mozambique 4%    |

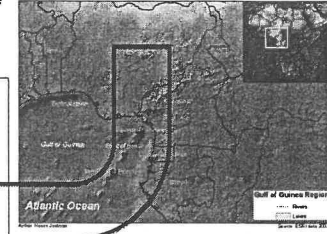
**Major Founding European Colonial Groups Represented in the Chesapeake Bay Region**

|                |            |        |
|----------------|------------|--------|
| Ulster English | Scot       | German |
| Irish          | Scot-Irish | Welsh  |

**Major Founding Native American Indian Groups Indigenous to the Chesapeake Bay Region**

|               |                  |              |
|---------------|------------------|--------------|
| Amonsoquath   | Nottoway         | Powhatan     |
| Rappahannock  | Renape           | Shakori      |
| Assatague     | Occaneechi-Sapon | Chickahominy |
| Chesapeake    | Piscataway       | Patuxent     |
| Dogues        | Pomouik          | Mannahaac    |
| Haliwa-Saponi | Chowanoc         | Secotan      |
| Meherrin      | Nanticoke        | Nansemond    |
|               | Weapemecc        |              |

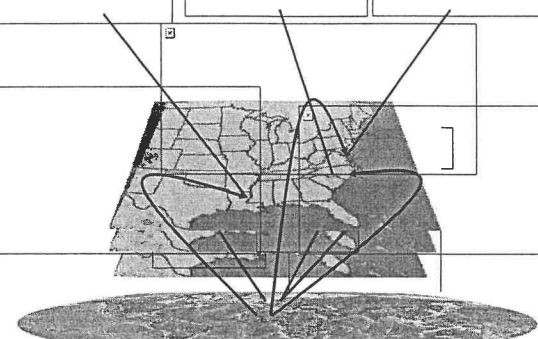
**Likely Genetic Connections Between the Bight of Bonny and the Chesapeake Bay Populations**



The largest component of Africans brought to the Chesapeake Bay came from the hinterlands of the Bight of Bonny West Africa. This area includes SE Nigeria, W Cameroon, Equatorial Guinea, and N Gabon.

Jackson 2008 Amer J Hum Biol. In press

Jackson 2006 Transforming Anthropology 14(2):126-130.



**Recently Published Methods Paper on EL**

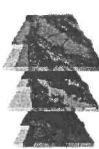

Jackson, FLC 2008 Ethnogenetic Layering (EL): An alternative to the traditional race model in human variation and health disparity studies. *Annals of Human Biology* Mar-Apr;35(2):121-144.

URL: <http://www.informaworld.com/10.1080/03014460801941752>

**Recently Published Applications Paper based on EL**

Jackson, FLC 2008 Ancestral links of Chesapeake Bay region African Americans to specific Bight of Bonny (West Africa) microethnic groups and increased frequency of aggressive breast cancer in both regions. *American Journal of Human Biology* 20:165-173.

URL: <http://www3.interscience.wiley.com/cgi-bin/abstract/117890563/ABSTRACT?CRETRY=1&SRETR>

**NEW!**

**Latest Complement to our Ethnogenetic Layering Approach:**

**Phenotype Segregation Network Analysis of Microethnic Groups for Candidate Gene, Cultural/Behavioral, non-genetic Biological Component Identification**

