



Race and Genetics

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Objectives

- Is there a genetic basis for race?
- Why do health disparities often exist along racial lines?
- What are the implications for us as family physicians?
- Further develop social and political understandings of race.

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What is race?

REPORT OF THE SUPERINTENDENT OF THE NINTH TABLE OF TRUE POPULATION.											
STATES AND TERRITORIES	Aggregate	White	Colored	Chinese	Total	Area of Inhabitants	Total	INDIAN			AVERAGE PER INHABITANT
								White	Black	Chinese	
United States	30,151,384	33,39,447	4,499,917	63,924	353,737	\$5,751,375	31,549	30,442	30,442	30,442	\$1,000
States	30,151,384	33,39,447	4,499,917	63,924	353,737	\$5,751,375	31,549	30,442	30,442	30,442	\$1,000
United States	30,151,384	33,39,447	4,499,917	63,924	353,737	\$5,751,375	31,549	30,442	30,442	30,442	\$1,000
District of Columbia	1,000	1,000	0	0	1,000	1,000	1,000	0	0	0	1,000
Alabama	996,002	916,298	4,752,510	24,179	375,167	91,269	90,375	90,375	90,375	90,375	1,000
Arkansas	494,471	504,115	321,149	16	826,736	46	46	46	46	46	1,000
California	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Connecticut	876,454	875,349	0,060	0	876,513	876,513	876,513	0	0	0	1,000
Delaware	106,431	106,324	0,074	0	106,405	106,405	106,405	0	0	0	1,000
Florida	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Georgia	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Illinois	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Indiana	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Iowa	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Kansas	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Louisiana	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Maine	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Maryland	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Massachusetts	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Michigan	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Minnesota	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Mississippi	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Missouri	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Montana	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Nebraska	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Nevada	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
New Hampshire	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
New Jersey	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
New Mexico	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
New York	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
North Carolina	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
North Dakota	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Oregon	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Pennsylvania	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Rhode Island	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
South Carolina	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Tennessee	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Texas	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Utah	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Vermont	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Virginia	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Washington	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
West Virginia	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Wisconsin	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000
Wyoming	1,000,000	999,999	0	0	1,000,000	1,000,000	1,000,000	0	0	0	1,000

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What is race?

"Race is indeed a pre-eminently *socio-historical* concept. Racial categories and the meaning of race are given concrete expression by the specific social relations and historical context in which they are embedded. Racial meanings have varied tremendously over time and between different societies."

- Michael Omi and Howard Winant

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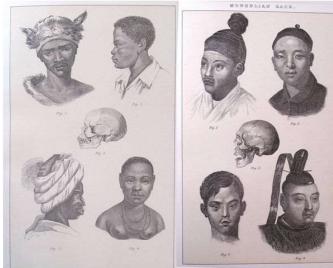
Is there a biologic basis for race?



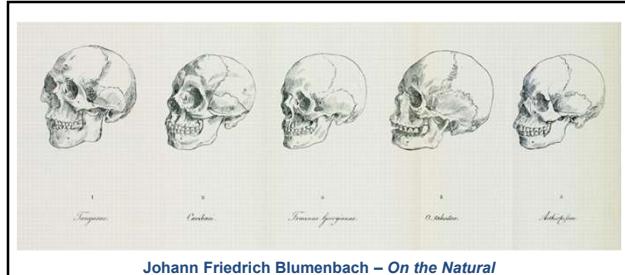
Carl Linnaeus - *Systema Naturae*, 1735-1778

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Georges Cuvier - *History of the Natural Sciences* (1829-1832)



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Johann Friedrich Blumenbach – *On the Natural Varieties of Mankind* (1795)

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Craniometry: Samuel Morton, MD PNAS (1849)

NATIVE AFRICAN FAMILY	62	59	65	60	63
AMERICAN-BOGUS NEGROES	12	19	70	82	
BOTTICELLI FAMILY	3	83	68	75	
ASIAN FAMILY	..				

TABLE I Showing the Ratio of the Rates in various ethnic groups to the rate of the Negro, and the Ratio of the Negro to the Rate of the White.					
RACES AND FAMILIES.		Rate	Lengthened	Mean	Rate
		Rate	Lengthened	Mean	Rate
MODERN CZECHIAN GROUP.					
TYPICAL FAMILY.					
Grosser, <i>et al.</i>	14	114	78	66	100
Grosser, <i>et al.</i> , <i>discrepancy</i>	14	97	62	55	82
Dobrovolny, <i>et al.</i>	10	94	65	61	77
CZECH FAMILY.					
Grosser, <i>et al.</i>	8	72	78	76	100
Dobrovolny, <i>et al.</i>	20	200	67	67	100
SLOVAK FAMILY.					
Grosser, <i>et al.</i>	10	80	65	65	100
MORAVIAN FAMILY.					
Grosser, <i>et al.</i>	7	64	66	65	100
ANCIENT CZECHIAN GROUP.					
TYPICAL FAMILY.					
Grosser, <i>et al.</i>	18	97	74	85	100
Slovensky, <i>et al.</i>	15	80	66	67	100
SLOVAK FAMILY.					
Grosser, <i>et al.</i>	6	51	79	82	100
MALAY GROUP.					
MALAY FAMILY.					
Grosser, <i>et al.</i>	30	87	69	68	100
Grosser, <i>et al.</i> , <i>discrepancy</i>	30	77	69	68	100
AMERICAN GROUP.					
TYPICAL FAMILY.					
Grosser, <i>et al.</i>	112	111	58	52	100
Grosser, <i>et al.</i> , <i>discrepancy</i>	112	92	58	52	100
Barabas, <i>et al.</i>	102	104	58	52	100
Loring, <i>et al.</i>	102	104	58	52	100
CHINESE GROUP.					
NATIVE AMERICAN FAMILY.					
American, <i>et al.</i>	62	93	62	57	100
Grosser, <i>et al.</i>	62	93	62	57	100

Thomas Murrell, MD
"Syphilis and the
American Negro." *JAMA*,

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Is there a biologic basis for race?

- July 8, 1950: UNESCO "Statement on Race" declared that race "is not so much a biological phenomenon as a social myth."
- 1951: revised statement: "it is possible, though not proved, that some types of innate capacity for intellectual and emotional response are

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Is there a genetic basis for race?

- Richard Lewontin, 1960s: 85% of all genetic variation is between two people in a local population

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Is there a genetic basis for race?

- 1990 Human Genome Project
- 1998 Celera Genomics
- June 26, 2000:
human species
cannot be divided into
biological races



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Is there a genetic basis for race?

- Human species cannot be divided into biological races
- Humans are 99.9% genetically identical
- 0.1% of genetic difference is meaningful but not organized by race

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Clinical variation in genetic difference:

Genetic differences are characterized by gradual changes across geographic regions, not sharp, categorical distinctions (races)

Regional distinctions (races)

The search for genetic variation

- Structure: program that divides sampled individuals into a pre-defined number of clusters based on genetic sequences
- Rosenberg, et. al 2002: used Structure to analyze DNA from 1,056 individuals representing 52 global populations and identified 5 main genetic clusters
 - 5 genetic clusters corresponding to major geographic regions: **Africa, Eurasia, East Asia, Oceania, America**

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The search for genetic variation

- Rosenberg, et. al 2002: DNA from 1,056 individuals representing 52 global populations used Structure to identify 5 main genetic clusters
 - Structure makes computational guesses according to an arbitrary number of genetic clusters pre-determined by the computer user: analysis setting the range at 6-20 clusters showed multiple ways to divide the sampled individuals
 - Within-group variation (93-95% of genetic variability) > between-group variation (5% of genetic variability)

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The search for genetic variation

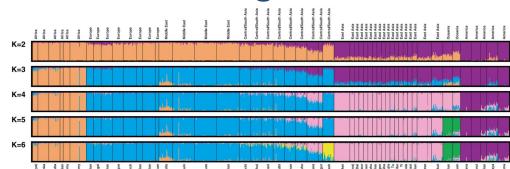


Fig. 1. Estimated population structure. Each individual is represented by a thin vertical line, which is partitioned into K colored segments that represent the probability of individual membership in K different clusters. The figure shows separate individuals of different populations. Populations are labeled below the figure, with their regional affiliations above it. Ten structure runs at each K produced nearly identical individual membership coefficients, having pairwise similarity coefficients above 0.97, with the exceptions of comparisons between Kikuyu and Kalash at $K = 2$, between Kikuyu and Mandinka at $K = 3$, and one run at $K = 6$ that separated Kikuyu instead of Kalash. The figure shown for a given K is based on the highest probability run at that K .

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The search for genetic variation

- "Genetic differences among human populations derive mainly from gradations in allele frequencies rather than from distinctive 'diagnostic' genotypes."
 - Rosenberg, et. al



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What about geography?

- Can humans be naturally organized into definable, genetically cohesive populations?
- Geographic boundary lines are political, not drawn by natural barriers, and do not correlate to genetic variation frequencies.
- The idea of continental populations as natural groupings is grounded in the concept of populations as natural, isolated, and static.

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What about ancestry?

- The statistical analysis of genomic science (differences in frequencies) translates poorly to describing the ancestry of a single individual (absolute genetic distinctions between groups).

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If not biology, what is race?

- There are no biological races in the human species.
- Race *must* be a political category.
- “Race is a political system that will not be brought down with scientific evidence alone. Race persists neither because it is scientifically valid nor because its invalidity remains to be proven. Race persists because it continues to be *politically useful*.”

– Dorothy Roberts, *Fatal Invention*

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What is race?

- Our understandings of race are constantly formed and re-formed by legal, economic, cultural, educational, and medical institutions
 - From slavery to Jim Crow to mass incarceration
 - Citizenship cases: Ah Yup, Bhagat Singh Thind, Takao Ozawa
 - Cultural representation and stereotypes, from minstrel shows to Hollywood to the music industry
 - GI bill, Federal Housing Authority and redlining
 - Immigration laws: Chinese immigration act, Asiatic barred zones, 1965 immigration laws
 - Post-9/11 Islamophobia and surveillance of Muslim communities
 - The model minority myth

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Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites

Kelly M. Hoffman^{a,1}, Sophie Trawalter^a, Jordan R. Axt^a, and M. Norman Oliver^{b,c}

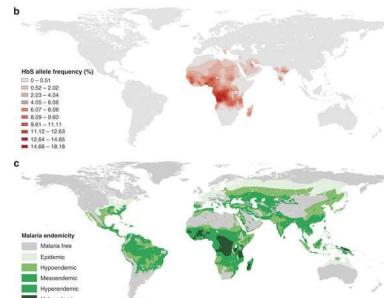
Item	Study 1: Online sample (n = 92)	First years			Residents (n = 20)
		(n = 63)	(n = 72)	(n = 59)	
Blacks age more slowly than whites*	2	20	28	12	14
Blacks' nerve endings are less sensitive than whites*	20	8	14	0	4
Black people's faces change more quickly than white's	39	29	17	5	4
Whites have larger brains than blacks	12	2	3	0	50
Whites are less susceptible to heart disease than blacks*	43	63	83	66	50
Blacks are more susceptible to heart disease than whites*	42	66	87	56	57
Whites have a better sense of hearing compared with blacks	10	3	7	0	0
Blacks have a better sense of hearing compared with whites	58	40	42	22	25
Blacks have denser, stronger bones than whites*	39	25	78	41	20
Blacks have a more sensitive sense of taste than whites	20	10	18	3	7
Whites have a more sensitive sense of taste than blacks	16	8	3	2	4
Black couples are significantly more fertile than white couples	17	10	15	2	7
Whites are less fertile than blacks	39	49	63	64	66
Blacks are better at detecting movement than whites	18	14	15	5	11
Blacks have stronger immune systems than whites	18	14	15	5	11
False belief task: greater (11 items) vs. 250	22.43 (22.83)	14.86 (15.48)	15.91 (19.34)	4.78 (9.89)	7.14 (14.50)
Range	0-100	0-81.82	0-90.51	0-54.55	0-43.64
Combined mean (SD) (medical sample only)		15.58 (17.38)			

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Sickle cell allele prevalence and malaria endemicity

Only 99.5% of African Americans have sickle cell disease.

SCD is common in other tropical regions.



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If there are no biological differences between races, how do we explain racial disparities in health outcomes?



How do we understand racial health disparities?

- We need to understand diseases in their social contexts, as politically produced diseases, and use social and political interventions to improve health outcomes.

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Racial health disparities

- MI outcomes
- Breast cancer disparities
- Preterm delivery and preterm birth
- Sickle cell disease
- Allostatic load
- Epigenetics
- Stress exposure in utero

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Social policy improves health outcomes

- Creation of Medicaid and Medicare
- War on Poverty
- Civil Rights Act of 1964
- Court-ordered school desegregation

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What do we do now?

- Intrapersonal
 - Implicit bias training
- Interpersonal
 - Teach medical students this material – race is not biological
 - Stop assuming race, ask patients what they identify
 - Think critically about whether race modifiers are relevant
 - Learn medical Spanish
- Institutional
 - Start centering pregnancy groups
 - Representation matters!
- Structural
 - Teach organizing skills
 - Advocate for social safety net
 - Talk to your elected officials

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Q&A

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Action steps

- Identify strategic goals at your home institution.
- Who are potential allies, opposition, or unknown?
- Under what condition might the decision makers change make the difference?

“An appropriate strategy should have as its starting point the defeasible presumption that blacks and whites are biologically the same with respect to disease and treatment. Presumptions can be overturned, of course, and the strategy should recognize the possibility that biological difference in some contexts are possible. But the presumption of equality acknowledges that historically the greatest harm has come from the willingness to impute biological differences rather than the willingness to overlook them.”

– Patricia King, The Dangers of Difference, 1992

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Acknowledgements

- Roberts, Dorothy. *Fatal Invention: How Science, Politics, and Big Business Re-Create Race in the Twenty-First Century*. New York: The New Press, 2011.
- Fields, Karen and Barbara Fields. *Racecraft: The Soul of Inequality in American Life*. Verso, 2014.
- Omi, Michael and Howard Winant. *Racial Formation in the United States: From the 1960s to the 1990s*. Routledge, 1994.
- Thanks to: Viviana Martinez-Bianchi, Duke Family Medicine, and the AAFP!

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