Exploring the Intersection of Obesity and Disparities in Pediatrics

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Disclosure Statement

Speaker:
Dr. Fatima Cody Stanford

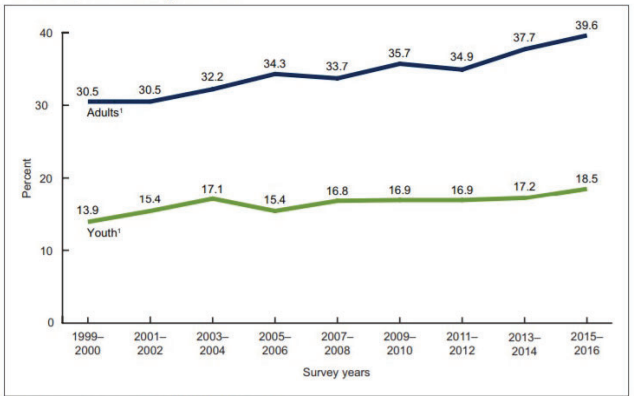
- Consultant: Calibrate, GoodRx, and Novo Nordisk
- Will not be discussing unlabeled/ unapproved use of drugs or products

Learning Objectives

- Discuss racial and ethnic disparities in the prevalence, treatment, and pathophysiology of obesity
- Evaluate the role of racism in our understanding of obesity in pediatrics
- Discern strategies to evaluate race as a social construct and not as a biologic phenomena

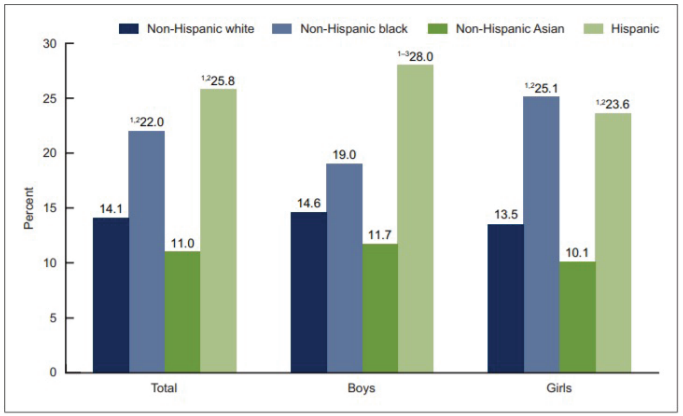
Disparities in prevalence, pathophysiology, and treatment of obesity in pediatrics

Trends in obesity among adults **AND** children and adolescents aged 2-19, by sex, United States, 1999 through 2015-2016



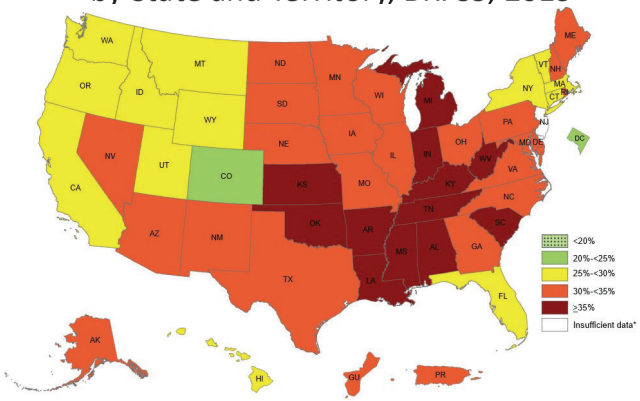
Source: CDC/NCHS, National Health and Nutrition Examination Surveys (NHANES) I–III; and NHANES, 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, 2011-2012, 2013-2014, 2015-2016

Prevalence of obesity among boys and girls aged 12-19 years, by race and ethnicity: United States, 2015-2016



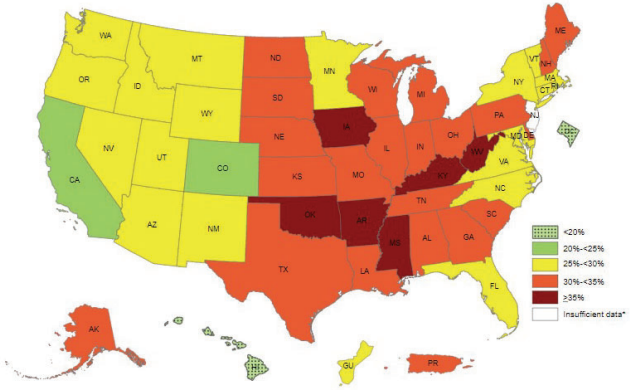
SOURCE: CDC/NCHS, National Health and Nutrition Examination Survey (NHANES), 2015-2016

Prevalence† of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2019



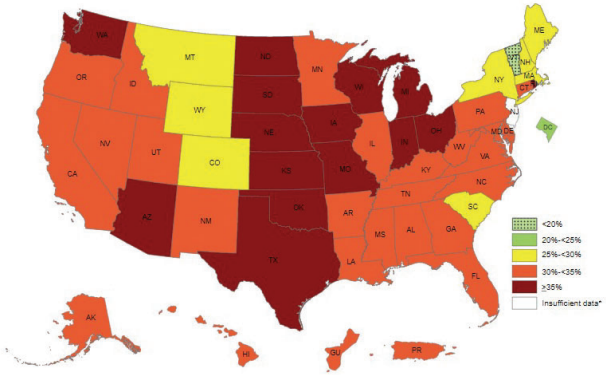
Prevalence† of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2019

Non-Hispanic White Adults



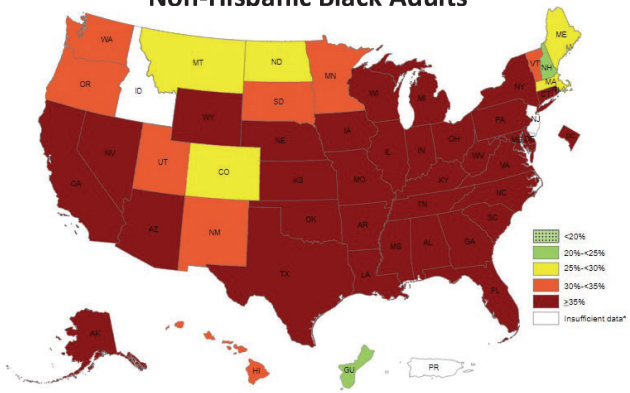
Prevalence† of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2019

Hispanic Adults

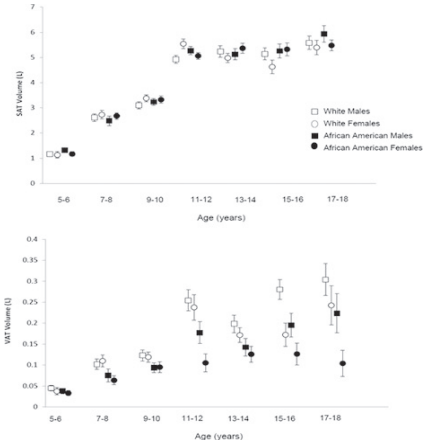


Prevalence† of Self-Reported Obesity Among U.S. Adults by State and Territory, BRFSS, 2019

Non-Hispanic Black Adults



Ethnic and Sex Differences in Visceral and Subcutaneous in Children and Adolescents



- Age-adjusted Total Body Fat was greater in African Americans (P = 0.017) and females (P < 0.0001) compared with Whites and males, respectively.
- The demonstrated ethnic and sex differences are important confounders in the prevalence of obesity and in the assignment of disease risk in children and adolescents.

VAT: Visceral Adipose Tissue

SAT: Subcutaneous Adipose Tissue

Ethnic and sex differences in visceral, subcutaneous, and total body fat in children and adolescents, Volume: 21, Issue: 6, Pages: 1251-1255

Insulin, Estrogen, and Fat Mass in African-American vs. European American adolescent girls

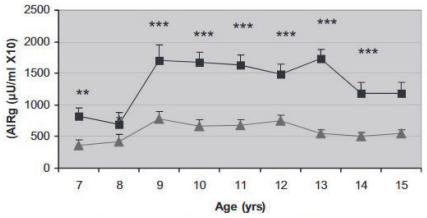


FIG. 1. Comparison by age for AIRg in AA (■) and EA (▲) girls. Multivariate linear regression modeling indicated significant age ($P < 0.001$) and race ($P < 0.001$) effects. *Error bars*, SEM. **, $P < 0.01$; ***, $P < 0.001$.

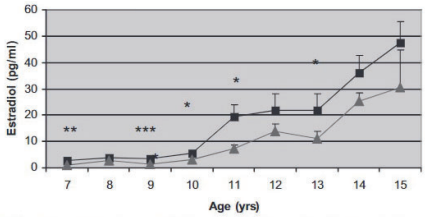


FIG. 2. Comparison in serum E2 concentration by age in AA (■) and EA (▲) girls. Multivariate linear regression modeling indicated significant age ($P < 0.001$) and race ($P < 0.05$) effects as well as age by race interaction ($P < 0.001$). *Error bars*, SEM. *, $P < 0.05$; **, $P < 0.01$; ***, $P < 0.001$.

J Clin Endocrinol Metab. 2008 Jul;93(7):2610-5. doi: 10.1210/jc.2007-2776.

Insulin, Estrogen, and Fat Mass in African-American vs. European American adolescent girls

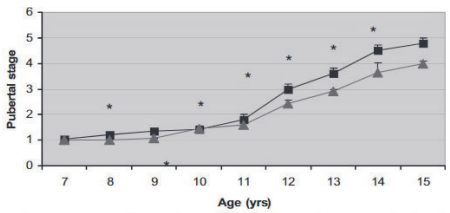


FIG. 3. Racial differences in progression though puberty in AA (■) and EA (▲) girls. *Error bars*, SEM. *, $P < 0.05$.

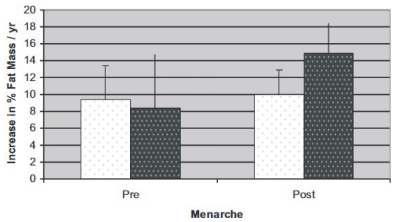
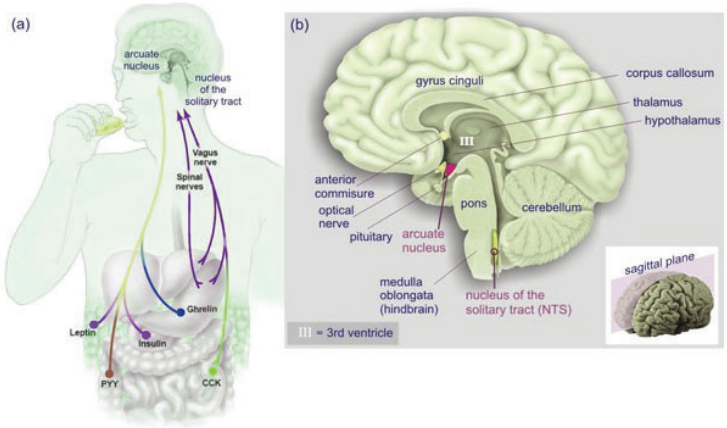


FIG. 4. Comparison between increase in percent fat before and after menarche in AA (*shaded bars*) and EA (*unshaded bars*) girls.

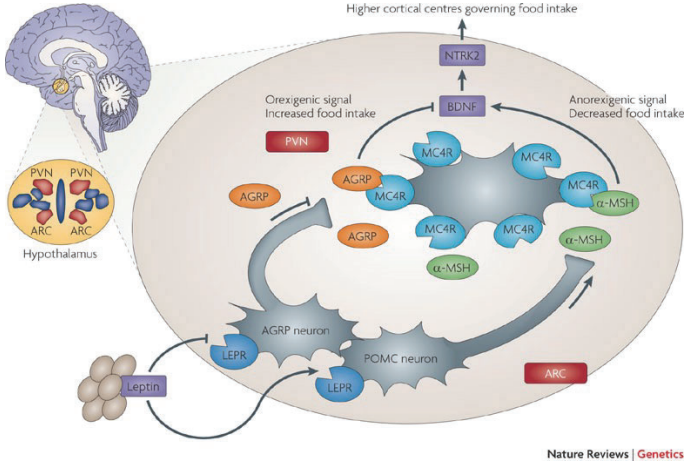
J Clin Endocrinol Metab. 2008 Jul;93(7):2610-5. doi: 10.1210/jc.2007-2776.

Regulation of Food Intake



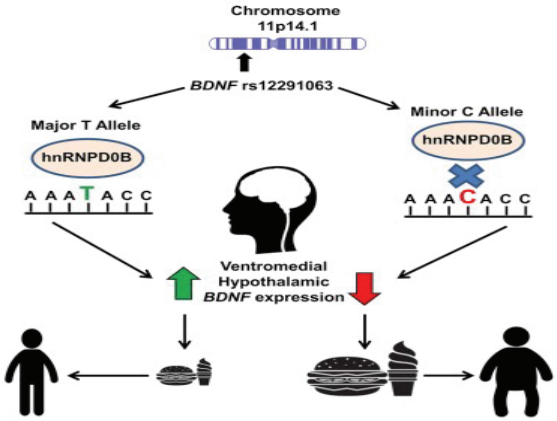
http://www.cellbiol.net/ste/alpobesity2.php

Regulation of Food Intake



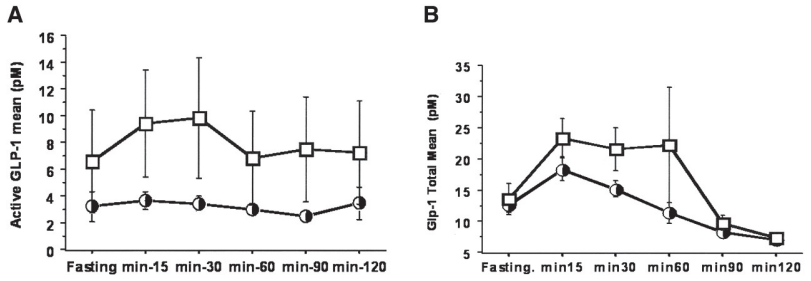
Nature Reviews Genetics **10**, 431-442 (July 2009)

BDNF Regulation and Obesity



Cell Rep. 2015 Nov 10;13(6):1073-80.

Basal and stimulated concentrations of GLP-1active (A) and GLP-1total (B) during the OGTT (75-g glucose load during the 2-h test) in adolescent African Americans (○) and Caucasians with obesity (□)



Pedro A. Velásquez-Mieyer et al. Dia Care 2008;31:770-775

©2008 by American Diabetes Association

American Diabetes Association

Obesity Disparities in Early Life

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Racial and Ethnic Disparities in Early Childhood

- Nationally representative data from ~10,700 children in the Early Childhood Longitudinal Study Birth Cohort who were followed from age 9 months through kindergarten entry.
- African American children had the highest prevalence of risk factors, whereas Asian children had the lowest prevalence.
- The major contributor to the BMI *z* score gap was the rate of infant weight gain during the first 9 months of life → strong predictor of BMI *z* score at kindergarten entry.
- The rate of infant weight gain accounted for between 14.9% and 70.5% of explained disparities between white children and their racial and/or ethnic minority peers.
- Gaps in socioeconomic status were another important contributor that explained disparities, especially those between white and Hispanic children.
- Early childhood risk factors, such as fruit and vegetable consumption and television viewing, played less important roles in explaining racial and/or ethnic differences in children's BMI *z* score

Pediatrics. 2018 Jan;141(1):e20170865.

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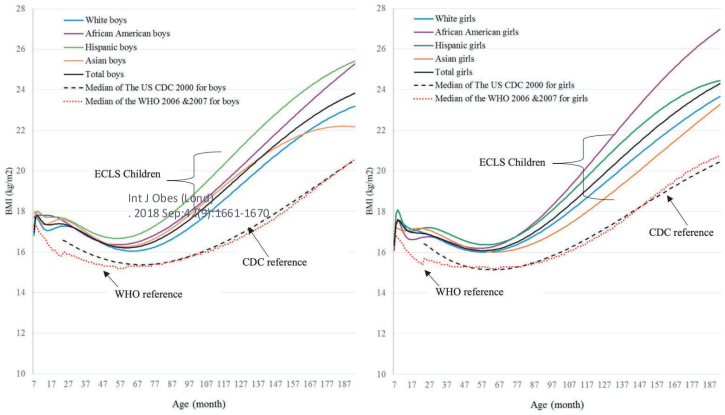
Ethnic disparities in childhood BMI trajectories and obesity and potential causes



Int J Obes (Lond). 2018 Sep;42(9):1661-1670

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Obesity Interventions in Racial and Ethnic Minorities

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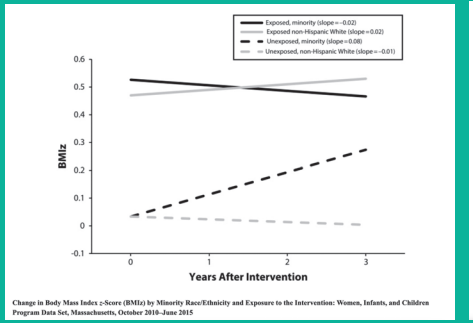
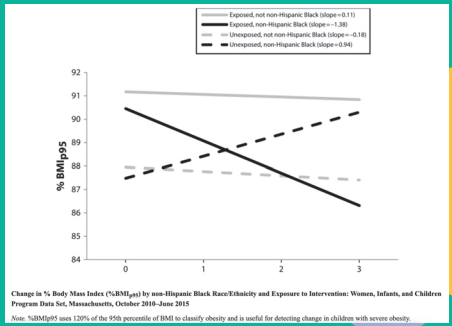
Racial/Ethnic Differences in the Effectiveness of a Multisector Childhood Obesity Prevention Intervention



Change in Body Mass Index z-Score (BMIz) by Minority Race/Ethnicity and Exposure to the Intervention: Women, Infants, and Children Program Data Set, Massachusetts, October 2010–June 2015



Change in % Body Mass Index (%BMIp95) by non-Hispanic Black Race/Ethnicity and Exposure to Intervention: Women, Infants, and Children Program Data Set, Massachusetts, October 2010–June 2015

Note. %BMIp95 uses 120% of the 95th percentile of BMI to classify obesity and is useful for detecting change in children with severe obesity.

Am J Public Health. 2018 Sep;108(9):1200-1206.

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Religiosity and Excess Weight Among African-American Adolescents: The Jackson Heart KIDS Study

- Examined the relationship between religious practices, spirituality, and excess weight among African-American adolescents (N = 212) residing in the Deep South.
- Results from modified Poisson regression analysis indicated that adolescents who prayed daily had a lower prevalence of excess weight (PR 0.77 [95% CI 0.62-0.96]) than those who did not.
- This relationship was only significant for 12–15-year-old participants in age-stratified analysis.

J Relig Health . 2020 Feb;59(1):223-233.

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Adjusted analysis of utilization of MBS based on combined NHANES and NIS data using Cochran-Mantel-Haenszel method

Adjusted analysis of utilization of MBS			
	OR	95%CI	*P* value
Female sex	5.84	5.26–6.50	<.001
Race			
White	ref	---	---
Black	.50	.45–.57	<.001
Hispanic	.46	.42–.52	<.001
Insurance			
Private	ref	---	---
Medicaid	.92	.83–1.01	.07

Surg Obes Relat Dis. 2020 Mar;16(3):414-419. doi: 10.1016/j.soard.2019.11.020. Epub 2019 Dec 4. PMID: 31917198

15-year-old Hispanic Girl s/p RYGB

Reliance on race as a biological variable

Race often attributed to:
- physical phenotype (e.g., skin color, facial and hair features)

Mistaken tendency to see "racial" characteristics as:
- biological features of a person or population.

Supports claims of:
- racial superiority
- racial purity
- apartheid
- genocide

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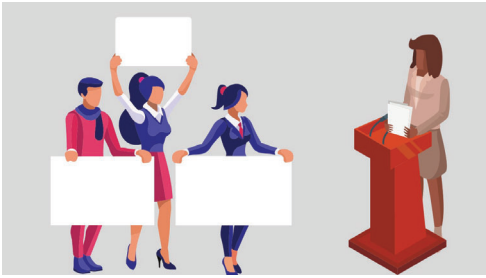
Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Race emerged as a socio-political concept both to classify humans and to justify a group's dominance over another



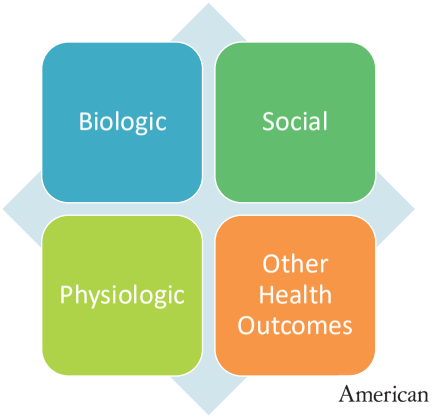
Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Race as a social construct NOT a biologic variable

- Applied to very large proportions of humanity
- Large genetic variability within any such single grouping any genetic differences
- Any between groupings are trivial relative to the equivalent genetic similarities

Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Racism and Its Link to Health



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Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Racism and Obesity

Racism scores were created from 8 questions asked in 1997 and 2009 about the frequency of:

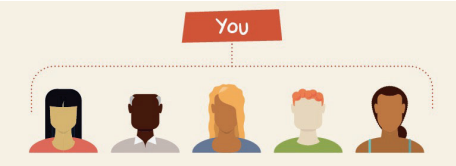
- "everyday" racism →people act as if you are dishonest
- "lifetime" racism →unfair treatment on the job

4,315 incident cases of obesity identified from 1997 through 2009 in Black Women's Health Study

Everyday racism and **lifetime racism**--> increased incidence of obesity

Cozier YC and colleagues. Am J Epidemiol. 2014 Apr 1;179(7):875-83. PMID: 24585257

Reliance on Race as a Reliable and Static Variable



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Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Lack of clarity on methods used to categorize race

"Racial categories have variously been assigned to research subjects by investigators, medical examiners, hospital admitting clerks, and others generating further opportunities for **prejudice** and **misclassification** to impact scientific data."

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Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Use of Race as a Proxy for Social Class

- Racial prejudice compounds socioeconomic barriers to health care and services
- Racial discrimination can lead directly to economic inequalities, so exposure to such stresses, as well as social class itself, merit assessment in research studies

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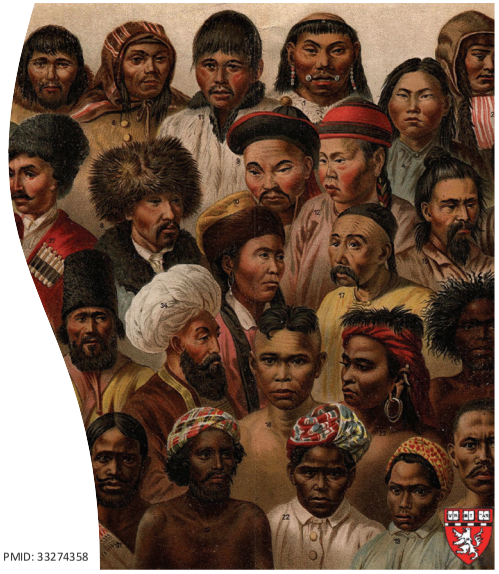
Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Conflating Race and Ethnicity

"**RACE**"→used to describe racial categories based on physical appearance

"**ETHNICITY**" to describe traditions, lifestyle, language, diet, and values

"**ANCESTRY**"to describe ancestry informative markers based on genetic or genomic data



Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Race and Racial Discrimination

Discrimination affects:

- Physical and social environments in which people live
- Their access to healthy diets
- Their opportunities for healthy behaviors, such as physical activity

Activation of the stress response has a wide range of metabolic effects that may interact with the above and may influence a wide range of exposures or outcomes in obesity studies

Components of ethnicity relevant to variability in cardiometabolic risk

Biological Component	Example
DNA content	Frequency of ApoE polymorphism
Gene effect	Physiological effect of FTO gene
DNA Expression	Global DNA methylation
Life history	Growth and Maturation
Biological ageing	Telomere attrition
Morphology	Body composition
Proteomics	Protein markers of cardiovascular disease
Microbiome	Genetic variability of the biota
Biochemistry	Inflammatory response
Physiology	Blood pressure
Behavior	Physical Exercise
Physical Environment	Quality of urban environment
Social environment	Social support networks
Education	Educational opportunities and attainment
Access to healthcare	Bureaucratic procedures
Healthcare	Clinical Management
Commercial Pressures	Targeting by commercial companies
Exposure to discrimination	Negative targeting of identity
Values and beliefs	Values and beliefs relating to foods

Recommendations

- Biomedical researchers, especially those in the field of obesity, should abandon the use of racial categories to explain biologic phenomena
- Social determinants of health are not limited to race and ethnicity
- When race or ethnicity are characterized, specify the method with which these classifications were made
- Full descriptions of ethnic background may well include dietary pattern descriptions
- Words matter

Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Conclusion

- Our responsibility to raise consciousness about how the routine use of race in the obesity literature might reflect or promote systemic racism, whereas instead our goal should be to highlight racial inequities that should be vigorously opposed.
- Realization of the inherent limitations and possible adverse consequences of our routine characterization of research populations along limited and imperfect racial categories, as well as the commitment to not conflate race with biology, can be a step in the obesity community bending the proverbial arc of history towards justice.

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Duggan CP and colleagues. Am J Clin Nutr. 2020 Dec 10;112(6):1409-1414. PMID: 33274358

Thank you!

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