Ethnicity and immigration research using Statistics Canada's Canadian Community Health Survey (CCHS)

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SAS Health Users Group Meeting | April 8, 2016

Outline

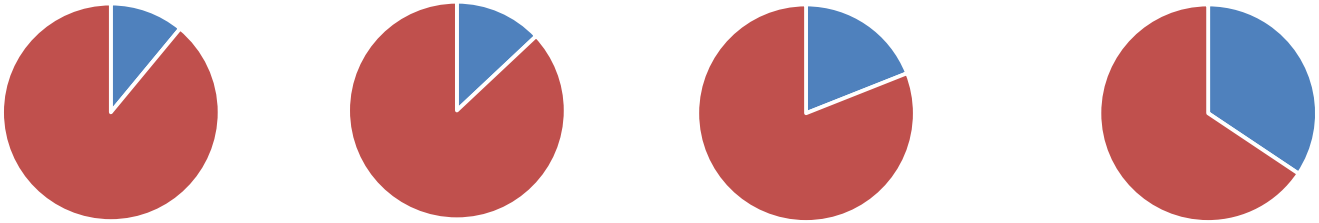
1. Ethnic diversity
2. Canadian Community Health Survey (CCHS)
    - Sample, variables
    - Strengths, limitations, challenges
3. Examples of published studies
    - 4 cardiovascular health studies
    - 1 validation study
    - 1 mental health study
4. Take home messages

Ethnic diversity in Canada

- One of the most ethnically diverse regions in the world
- Visible minorities:

  6.2 million (2011) ⇢ 11-14 million (2031)
- Proportion of visible minority population increasing:

  11% (1996) → 13% (2001) → 19% (2011) ⇢ 33% (2031)



- Ontario's 4 largest ethnic groups:

  White (75%), South Asian (8%), Chinese (5%), Black (4%)

Canadian Community Health Survey (CCHS)

- Cross-sectional survey conducted by Statistics Canada (prev. NPHS)
- Information related to health status, health care utilization and health determinants for Canadian population
- Annual component on general health (2001 – 2013) + Focused surveys on specific health topics
- Respondents are randomly sampled using a stratified, multistage, clustered area sampling strategy
- Data can be weighted to be representative of the Canadian population
- Response rates: ~ 66.8% to 84.7%

CCHS inclusion / exclusion criteria

Includes:

- Persons aged 12 or over living in private dwellings in health regions covering all provinces and territories

Excludes:

- Those living on Indian Reserves / Crown Lands
- Full-time members of the Canadian Forces
- Institutionalized population
- Residents of certain remote regions

Exclusions represent < 3% of Canadian population aged 12+

General CCHS variables

Sociodemographic variables
- age
- sex
- education
- income
- employment

Contact with health care professionals and health care utilization

General health
Chronic conditions
- diabetes
- hypertension
- heart disease
- cancer
- arthritis

etc…

Lifestyle and behavioural variables
- height
- weight
- physical activity
- fruit and vegetable consumption
- smoking
- alcohol consumption

CCHS – race / culture variable

- Q: "**People living in Canada come from many different cultural and racial backgrounds. Are you:"**

- ❑ White
- ❑ South Asian
- ❑ Chinese
- ❑ Black
- ❑ Korean
- ❑ Filipino
- ❑ Japanese
- ❑ South East Asian
- ❑ Arab
- ❑ West Asian
- ❑ Latin American
- ❑ Other (specify)

CCHS – immigration variables

- Immigrant status
- Age at time of immigration
- Country of birth
- Year of immigration to Canada

  (Length of time in Canada since immigration)

CCHS: strengths

- Population-based survey
- Large, representative sample
- Reliable estimates at health region level
- Collect socio-demographic, lifestyle, etc. not available in administrative databases
- Interviews conducted in multiple languages
- Cycles can be combined
- Trends over time
- Subset of CCHS linkable to ICES data (aka “linking files”)

CCHS: limitations, challenges

- Self-reported data
- Excludes: homeless, prison, long-term care, On-Reserve populations
- Relatively small sample size compared to other ICES holdings
- Potential biases may be introduced since some respondents may:
  - Not agree to participate in survey
  - “Refuse” “Don’t Know” responses → missing data
- Complex survey design → bootstrapping
- Content / wording of questions may change across cycles
- Major redesign in 2015 → caution when pooling / comparing

Examples of published studies

SAS® used for all data analyses

Example 1. CVD risk factor profiles

CMAJ RESEARCH

Comparison of cardiovascular risk profiles among ethnic groups using population health surveys between 1996 and 2007

Maria Chiu MSc, Peter C. Austin PhD, Douglas G. Manuel MD MSc, Jack V. Tu MD PhD

Previously published at www.cmaj.ca

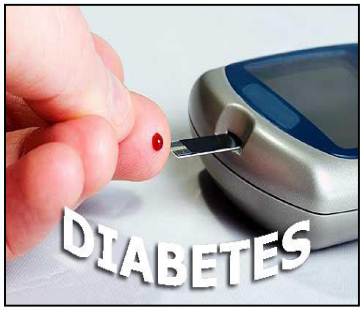
Abstract

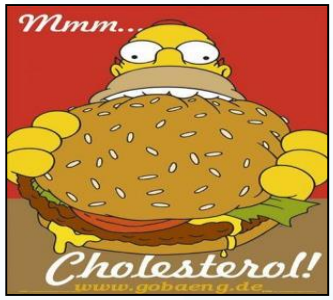
Background: Although people of South Asian, Chinese and black ethnic backgrounds represent about 60% of the world's population, most knowledge of cardiovascular risk is derived from studies conducted in white populations. We conducted a large, population-based comparison of cardiovascular risk among people of white, South Asian, Chinese and black ethnicity living in Ontario, Canada.

Methods: We examined the age- and sex-standardized prevalence of eight cardiovascular risk factors, heart disease and stroke among 154 653 white people, 3364 South Asian people, 3038 Chinese people and 2742 black people. For this study, we pooled respondent data from five cross-

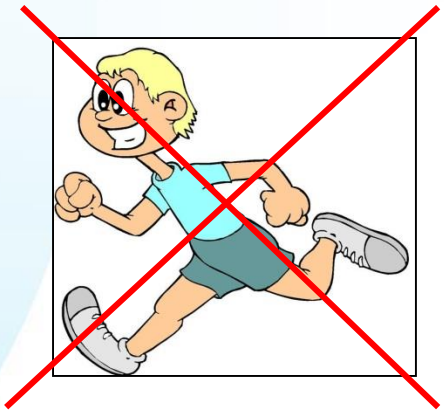
Cardiovascular diseases, including stroke, are the leading causes of death worldwide. Evidence from mortality studies suggests that the global burden of cardiovascular diseases is not shared equally across nations.[1,2] However, little is known about the relative distribution of cardiovascular risk factors and conditions across the world's four largest ethnic groups: white, South Asian, Chinese and black. Previous studies have documented differences in cardiovascular health across two or three ethnic groups, e.g., a higher risk of diabetes mellitus among South Asian people relative to the general population in Canada and the United Kingdom,[3,4] and a higher risk of hypertension and stroke in the black population than the white population in the United States.[5] These earlier studies were mostly con-

Cardiovascular risk factors





9 risk factors account for 90% of all MI risk



Yusuf et al., Lancet 2004

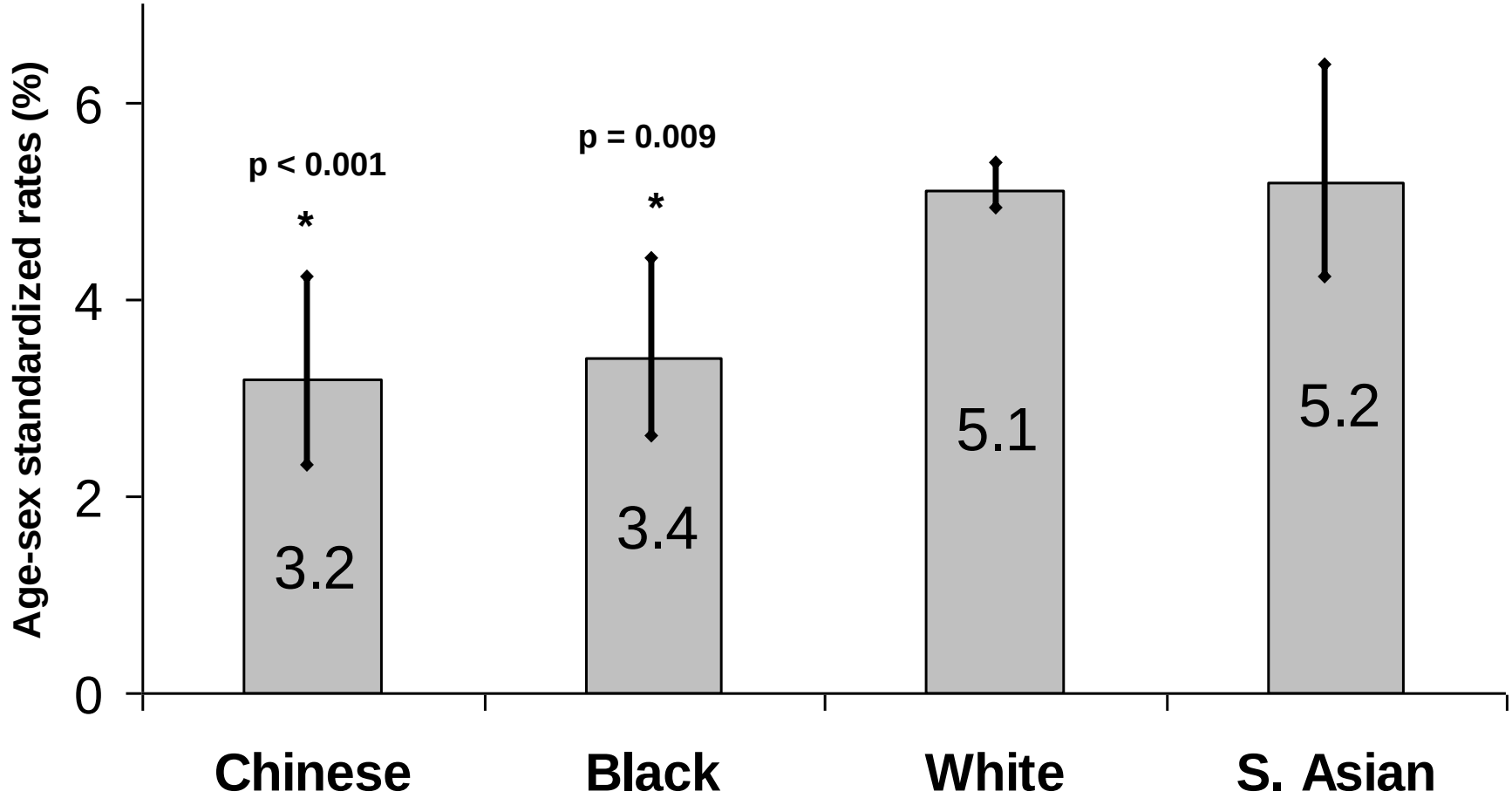
Pooled NPHS/CCHS 1996-2007:

Striking ethnic differences in prevalence of major CVD risk factors (%)

	Chinese	South Asian	White	Black
Smoking	**8.7**	**8.6**	**24.8**	11.4
Obesity	**2.5**	8.1	**14.8**	**14.1**
Diabetes	4.3	8.1	**4.2**	**8.5**
Hypertension	15.1	17.0	**13.7**	**19.8**
≥ 2 major risk factors	**4.3**	7.9	10.1	**11.1**

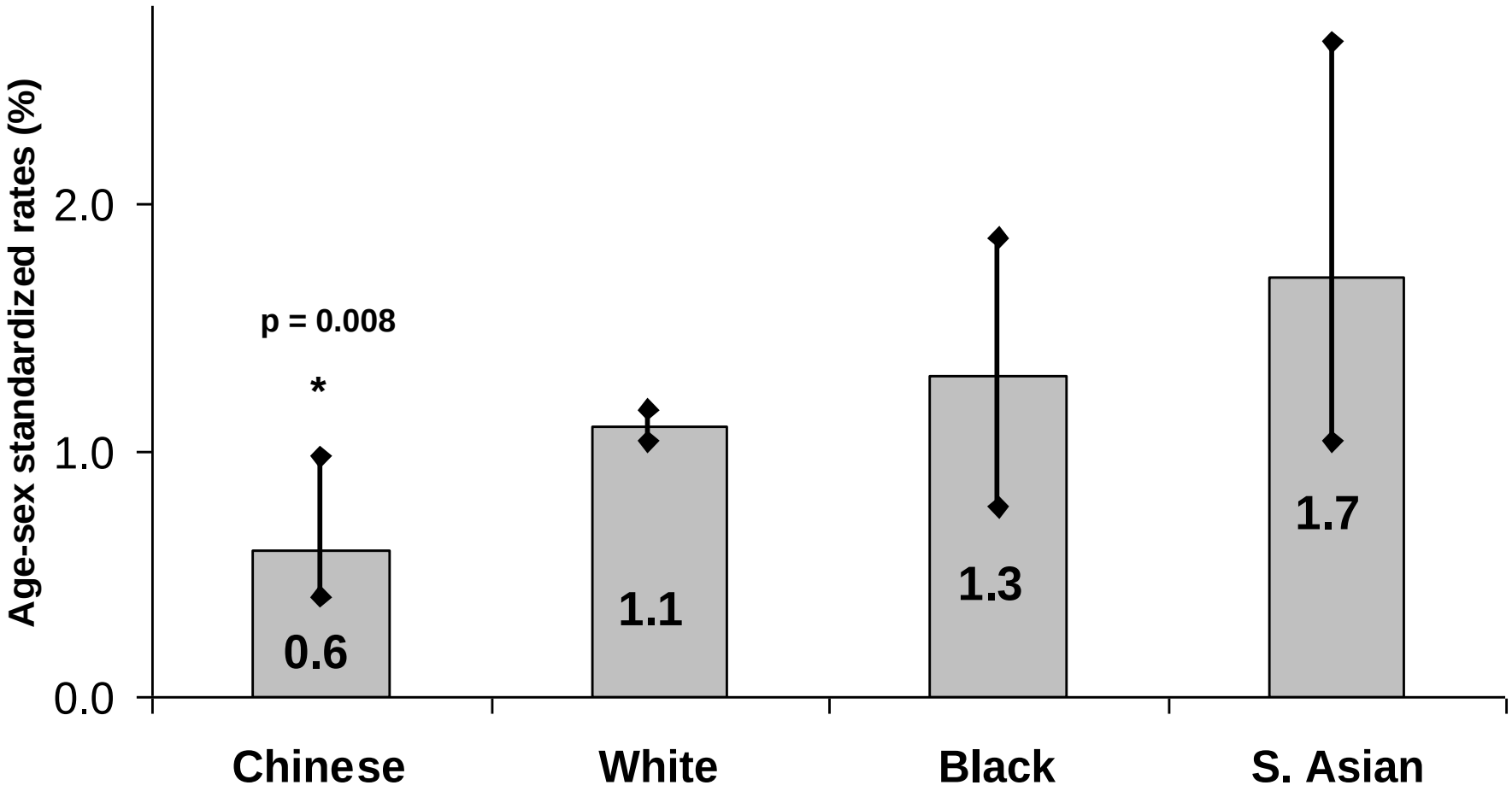
Chiu et al. CMAJ 2010

Prevalence of heart disease (%)



Standard Population: 2001 Ontario Census

Prevalence of stroke (%)



Standard Population: 2001 Ontario Census

Example 2. Recent immigrant vs. long-term residents

Canadian Journal of Cardiology 28 (2012) 20–26

Clinical Research

Cardiovascular Risk Factor Profiles of Recent Immigrants vs Long-term Residents of Ontario: A Multi-ethnic Study

Maria Chiu, MSc,[a,b] Peter C. Austin, PhD,[a,c] Douglas G. Manuel, MD, MSc,[a,c,d] and Jack V. Tu, MD, PhD[a,b,c,e]

[a] *Institute for Clinical Evaluative Sciences, University of Toronto, Toronto, Ontario, Canada*

[b] *Institute of Medical Science, University of Toronto, Toronto, Ontario, Canada*

[c] *Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada*

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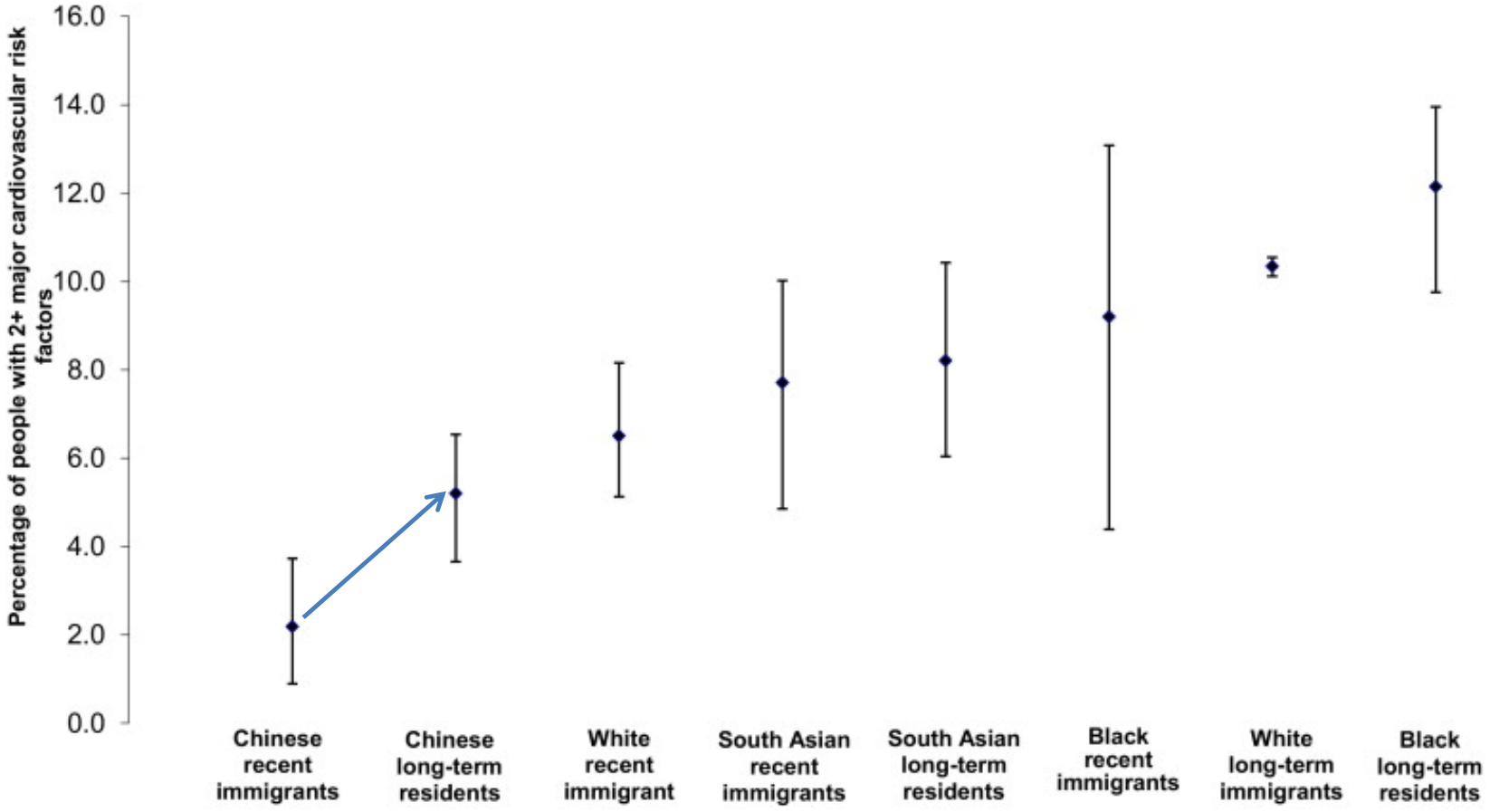
[e] *Schulich Heart Centre, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ontario, Canada*

CVD risk profiles of long-term residents worse than recent immigrants across all ethnic groups

Greatest percent difference observed in the Chinese group



Example 3. CVD risk factor trends over 12-year period

Open Access Research

BMJ Open

Temporal trends in cardiovascular disease risk factors among white, South Asian, Chinese and black groups in Ontario, Canada, 2001 to 2012: a population-based study

Maria Chiu,[1] Laura C Maclagan,[1] Jack V Tu,[2,3,4] Baiju R Shah[1,5]

To cite: Chiu M, Maclagan LC, Tu JV, *et al*. Temporal trends in cardiovascular disease risk factors among white, South Asian, Chinese and black groups in Ontario, Canada, 2001 to 2012: a population-based study. *BMJ Open* 2015;**5**:e007232. doi:10.1136/bmjopen-2014-007232

▶ Prepublication history

ABSTRACT

Objectives: To determine ethnic-specific temporal trends in cardiovascular risk factors in Ontario between 2001 and 2012.

Design: A population-based repeated cross-sectional study.

Setting: Ontario, Canada.

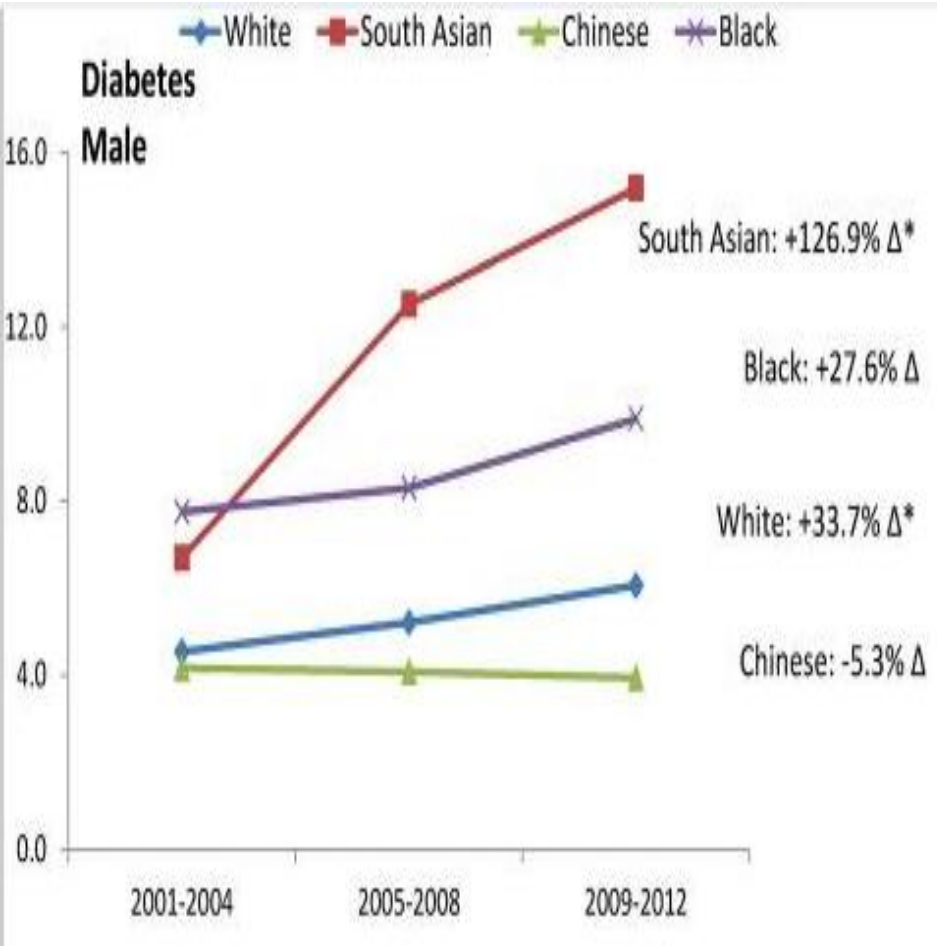
Participants: 219 276 participants of the Canadian Community Health Survey (205 326 white, 5620 South Asian, 4368 Chinese and 3962 black) during the period 2001 to 2012.

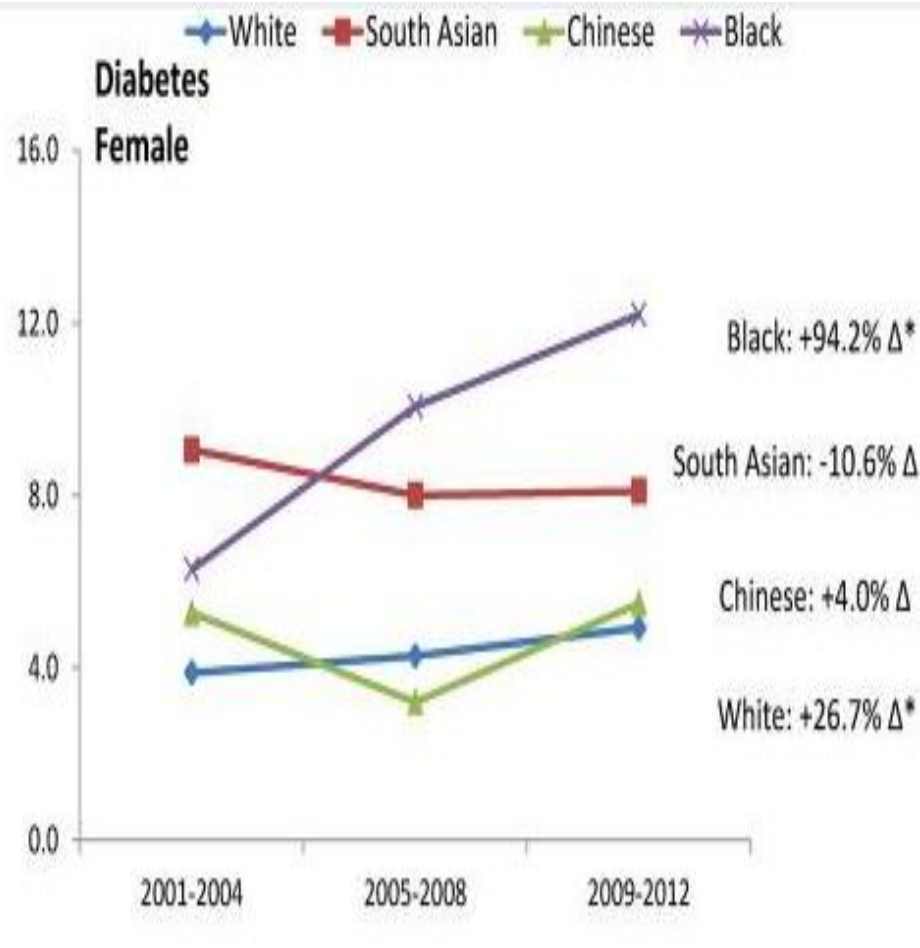
Main outcome measures: Age-standardised ethnic-

Strengths and limitations of this study

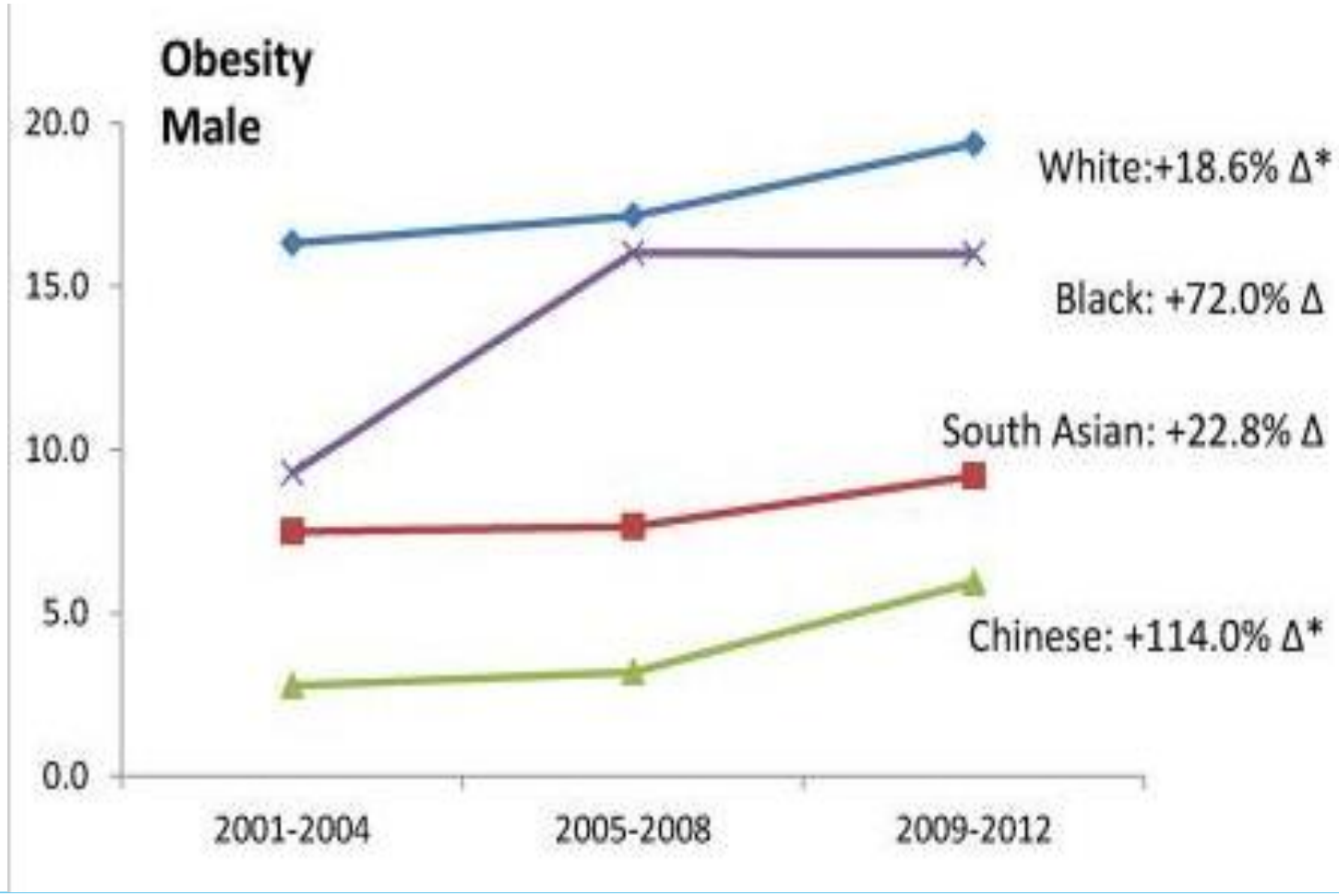
- This is the first study to examine temporal trends in the prevalence of cardiovascular risk factors across Canada's four major ethnic groups.
- Comprehensive cardiovascular risk factor data were available for a large representative population-based sample over a 12-year period.
- Limitations of the study are the use of self-reported data and the lack of information on lipids and details on diet.

Prevalence of diabetes doubled among South Asian males and black females





Prevalence of obesity more than doubled among Chinese males



Example 4. Body-mass index (BMI) cutpoints

Epidemiology/Health Services Research
ORIGINAL ARTICLE

Deriving Ethnic-Specific BMI Cutoff Points for Assessing Diabetes Risk

MARIA CHIU, MSC[1,2]
PETER C. AUSTIN, PHD[1,3]
DOUGLAS G. MANUEL, MD, MSC[1,3,4,5,6]
BAIJU R. SHAH, MD, PHD[1,7]
JACK V. TU, MD, PHD[1,2,3,8]

OBJECTIVE—The definition of obesity (BMI ≥30 kg/m^2), a key risk factor of diabetes, is widely used in white populations; however, its appropriateness in nonwhite populations has been questioned. We compared the incidence rates of diabetes across white, South Asian, Chinese, and black populations and identified equivalent ethnic-specific BMI cutoff values for assessing diabetes risk.

RESEARCH DESIGN AND METHODS—We conducted a multiethnic cohort study of 59,824 nondiabetic adults aged ≥30 years living in Ontario, Canada. Subjects were identified from Statistics Canada's population health surveys and followed for up to 12.8 years for diabetes incidence using record linkages to multiple health administrative databases.

RESULTS—The median duration of follow-up was 6 years. After adjusting for age, sex, socio-demographic characteristics, and BMI, the risk of diabetes was significantly higher among South Asian (hazard ratio 3.40, $P < 0.001$), black (1.99, $P < 0.001$), and Chinese (1.87, $P = 0.002$)

populations has been questioned (6). Recognizing this, a World Health Organization (WHO) expert panel was convened in 2002 to discuss the potential for developing Asian-specific BMI cutoff points for obesity (7). The consultation concluded that with the data available at the time, there was no clear BMI cutoff point that would be universally applicable to Asians and that the prespecified BMI ranges would be retained (i.e., underweight <18.5 kg/m^2, normal 18.5 to <25 kg/m^2, overweight 25 to <30 kg/m^2, and obese ≥30 kg/m^2) for assessing the risk of obesity-related chronic diseases. Nevertheless, the WHO expert panel recommended potential BMI categories for public health

Chiu et al. Diabetes Care 2011

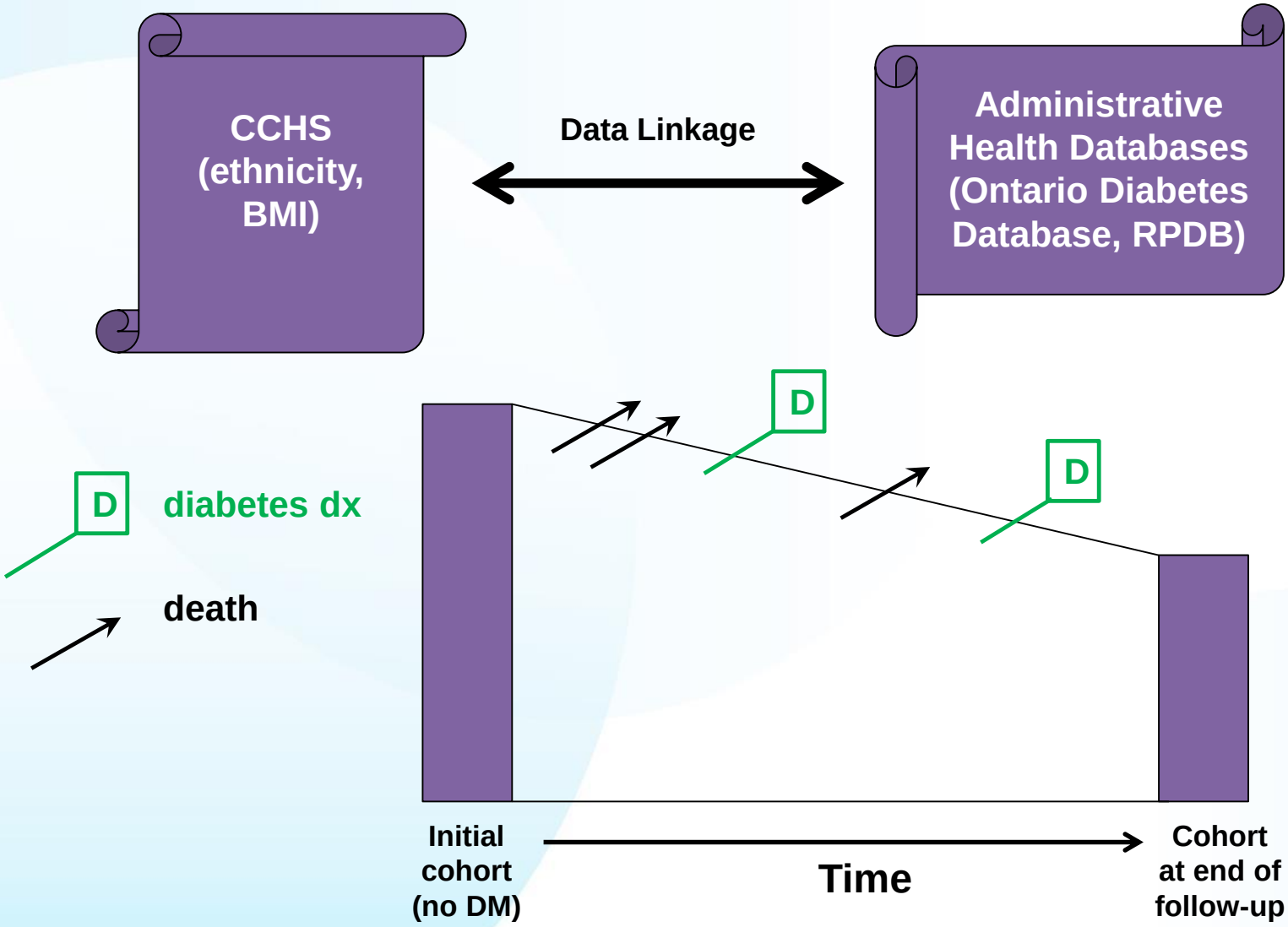
Standard definitions of weight

BMI: 30 kg/m^2

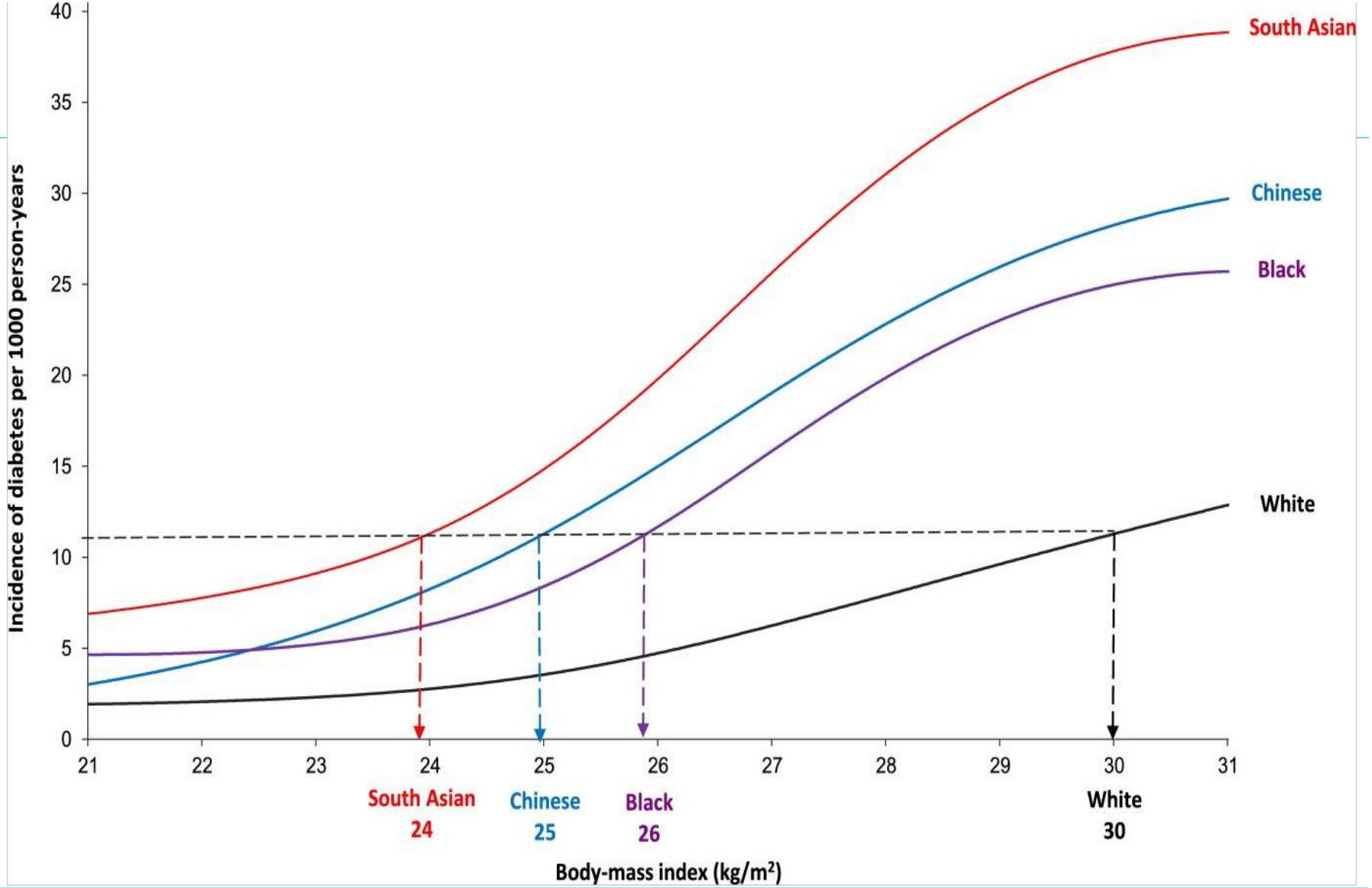
Normal	Overweight	Obese	Severely obese	Morbidly obese
BMI 18.5 – 24.9	BMI 25 – 29.9	BMI 30-34.9	BMI 35 – 39.9	BMI 40+

Research Question: Should BMI cutoff point be lowered for Asian and Black ethnic groups?

How we found ethnic-specific BMI cutoff values…



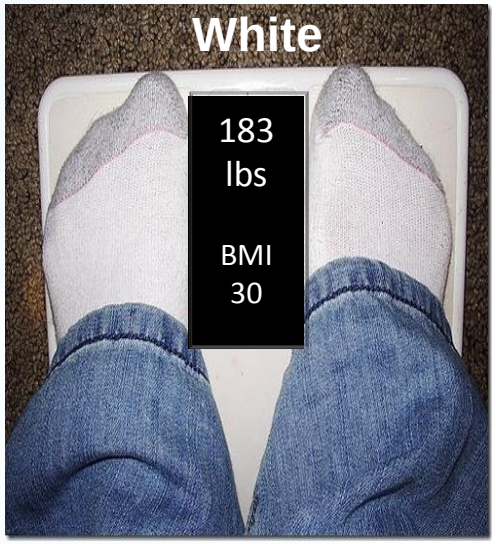
Lower BMI cutoff values for Asian and Black groups

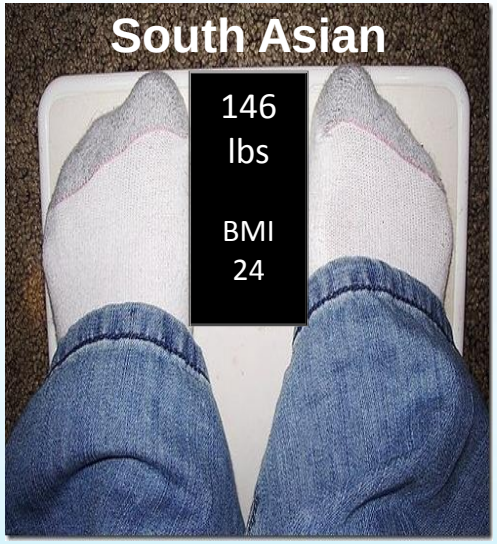


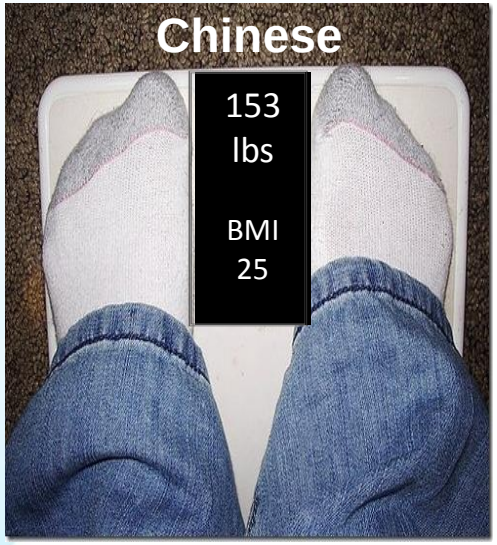
Chiu et al. Diabetes Care 2011

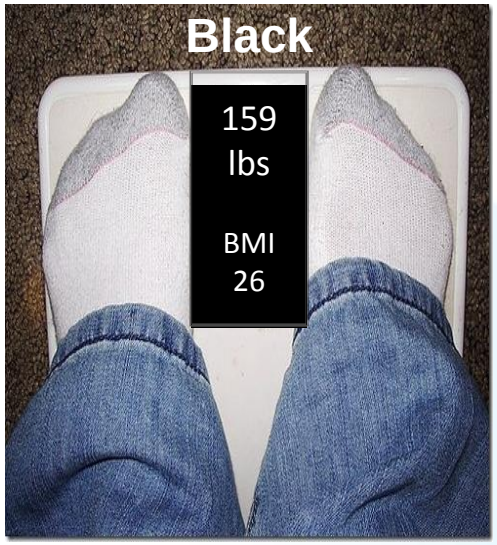
What does this mean?

For an average 5’6” person …









Chiu et al. Diabetes Care 2011

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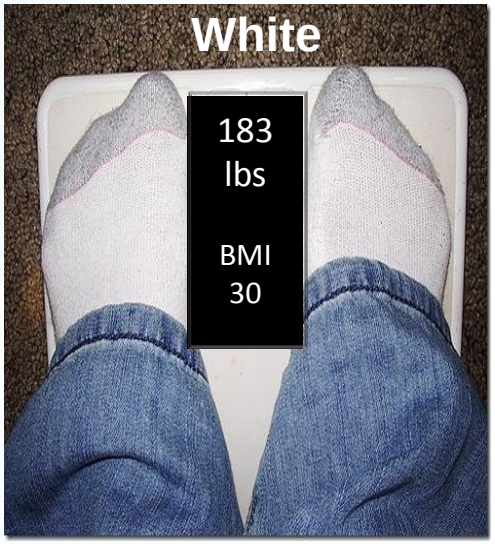

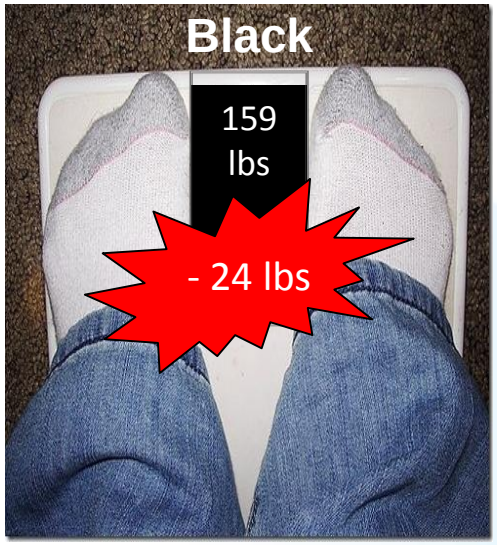

Chiu et al. Diabetes Care 2011


the heart.org
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Media Headlines

Heart health tied to ethnicity

Largest comparison of cardiovascular risk profiles of Canada's four major ethnic groups

Rising diabetes, obesity rates putting ethnic groups' heart health at risk: study

Heart disease risk soars among South Asian males, black men and women

Some ethnic Canadians suddenly sicker than before, new study finds

Heart health declines with longer stay in Canada

Striking ethnic differences in cardiovascular risk factors

Immigrant health declines the longer in Canada, especially Chinese: study

The longer immigrants stay in Canada, the more likely they are to become obese, get diabetes, and suffer from heart disease.

Canadian lifestyle hazardous to immigrant health

Western diet dangerous for immigrants: study

Newer Canadian immigrants have fewer heart health risks

Reasons for heart disease among ethnicities more than skin deep, study says

Obesity cutoffs lower for ethnic groups in Canada

Long settled Chinese are more vulnerable to cardiovascular events

Study suggests some ethnic Canadians facing increased risk of heart attack and stroke

Example 5. ETHNIC surnames algorithm

CCHS used to validate

Shah *et al. BMC Medical Research Methodology* 2010, **10**:42
http://www.biomedcentral.com/1471-2288/10/42

BMC Medical Research Methodology

RESEARCH ARTICLE Open Access

Surname lists to identify South Asian and Chinese ethnicity from secondary data in Ontario, Canada: a validation study

Baiju R Shah*[1,2,3], Maria Chiu[1,2], Shubarna Amin[2], Meera Ramani[2], Sharon Sadry[2] and Jack V Tu[1,2,3]

Abstract

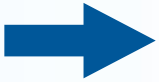
Background: Surname lists are useful for identifying cohorts of ethnic minority patients from secondary data sources. This study sought to develop and validate lists to identify people of South Asian and Chinese origin.

Methods: Comprehensive lists of South Asian and Chinese surnames were reviewed to identify those that uniquely belonged to the ethnic minority group. Surnames that were common in other populations, communities or ethnic groups were specifically excluded. These surname lists were applied to the Registered Persons Database, a registry of the health card numbers assigned to all residents of the Canadian province of Ontario, so that all residents were assigned to South Asian ethnicity, Chinese ethnicity or the General Population. Ethnic assignment was validated against self-identified ethnicity through linkage with responses to the Canadian Community Health Survey.

Results: The final surname lists included 9,950 South Asian surnames and 1,133 Chinese surnames. All 16,688,384 current and former residents of Ontario were assigned to South Asian ethnicity, Chinese ethnicity or the General Population based on their surnames. Among 69,859 respondents to the Canadian Community Health Survey, both lists

Creation of the ICES "ETHNIC" database

Health card number	Surname	First name
1234567890	Bell	Roberta
1234567891	Gagnon	Marie
1234567892	Cheng	Edwin
1234567893	Kumar	Meera
1234567894	Yuan	Ming
1234567895	Banerjee	Ashok
1234567896	Hirohito	Yuriko
1234567897	Phillips	Esther
1234567898	Baxter	



Encrypted number	VM Group
9130247107	General population
5296116002	General population
2005356387	Chinese
1978201900	South Asian
7046119776	Chinese
5981782028	South Asian
0624191570	General population
1973712240	General population
4927194750	

Surname-based ethnicity validated against CCHS self-reported ethnicity

Specificity for both Chinese and South Asian groups: 99.7%

Shah B, Chiu M, et al. BMC Med Res Methodol 2010

Validation of the ETHNIC data file

Linked with CCHS data to evaluate surname-derived ethnicity against self-reported ethnicity

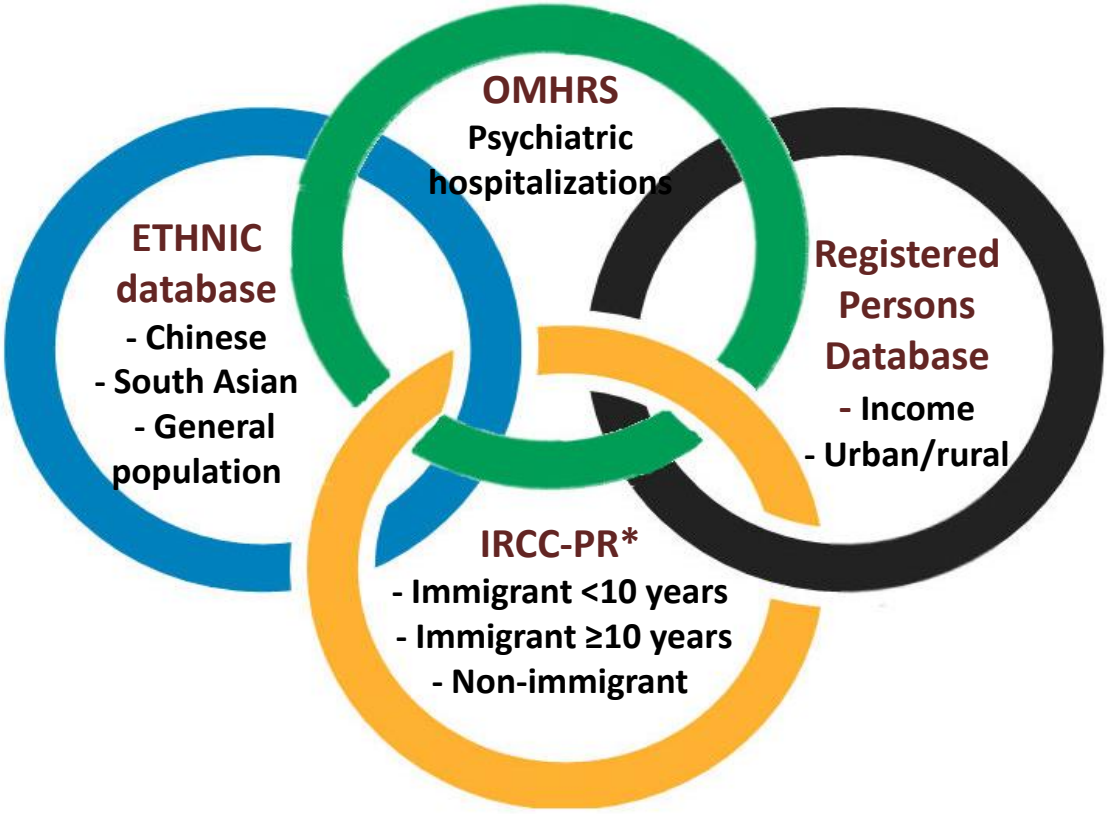
South Asian	
Sensitivity	50.4%
Specificity	99.7%
PPV	89.3%
NPV	97.2%

Chinese	
Sensitivity	80.2%
Specificity	99.7%
PPV	91.9%
NPV	99.2%

Shah B, Chiu M, et al. BMC Med Res Methodol 2010

Example 6. Using the ETHNIC data base to answer: Do Chinese and South Asian patients differ from the general population in mental illness severity at hospital presentation?

Data linkage



*Immigrant, Refugee and Citizenship Canada Permanent Residence database

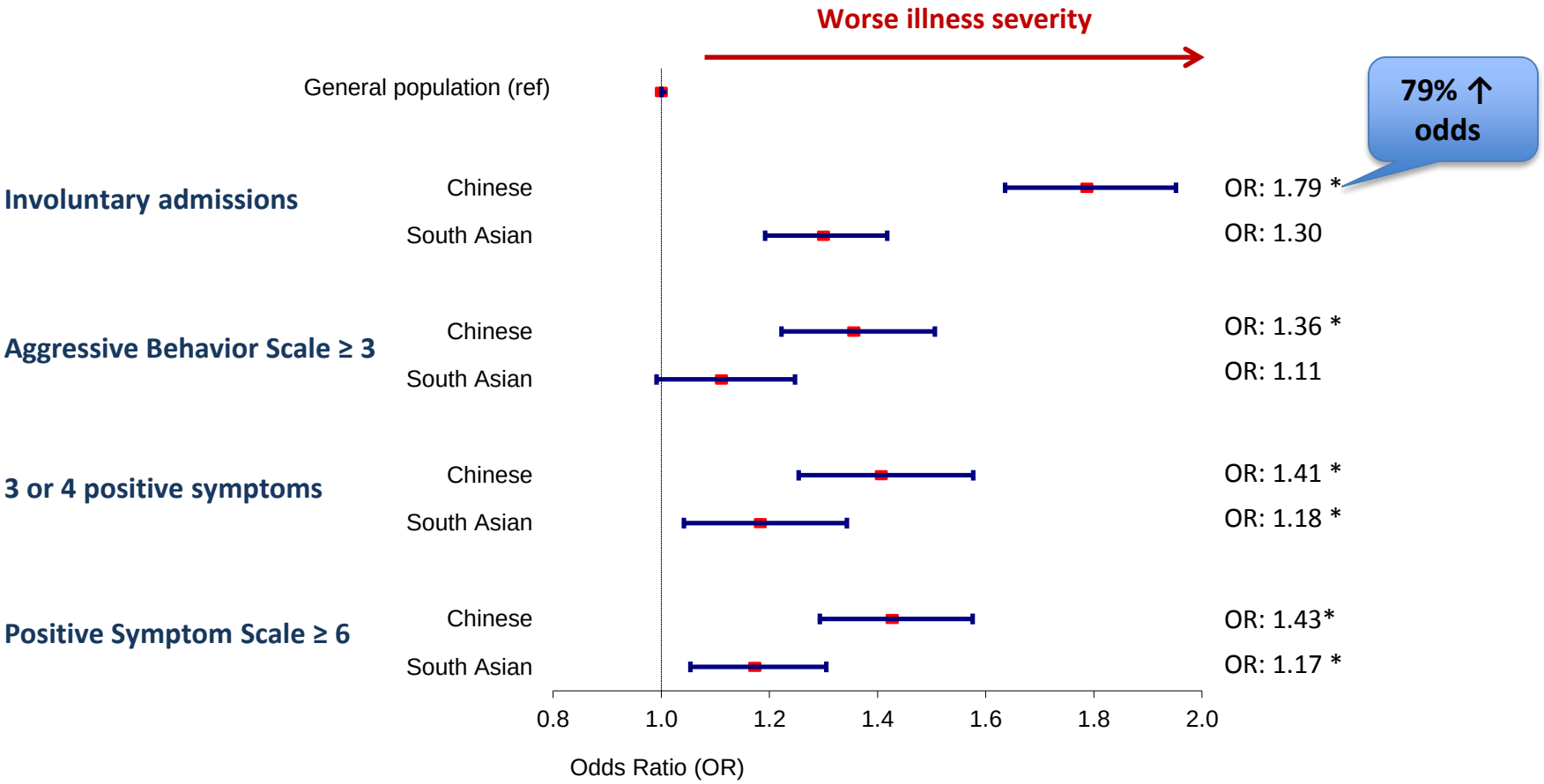
Study population

Ontario Mental Health Reporting System (OMHRS) database admissions
April 2006 - March 2013
Adults aged 19 - 105 years

N= 130,856 patients
Chinese: 2,517
South Asian: 2,398
General population: 125,941

Chiu et al. *J Clin Psych* (In Press):

Chinese and South Asian patients had significantly worse illness severity, even after adjustment for diagnosis, etc.



Adjustment for age, sex, income, education, immigration status, marital status, urban/rural dwelling, discharge diagnosis
* Statistically significant

Take home messages

- Wide range of ethnic / immigrant studies possible with CCHS data
- 3 main sources of ethnicity / immigrant data at ICES:

- My suggestion: Consult / collaborate with colleague with experience with these data sets
- My hope: We continue to learn more about how ethnicity and immigration status impacts health

Thank You

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Extra slides

Definitions

- Race: a social construct used to describe a group of people who share similar and distinct physical characteristics

- Ethnicity: a category of people who identify with each other based on common ancestral, social, cultural or national experience (i.e. shared cultural heritage, ancestry, history, homeland, language, religion, ritual, cuisine, dressing style, art, physical appearance)

- Immigrant: a person who comes to live permanently in a foreign country

Anemone, Robert L. (2011). "Race and biological diversity in humans". Race and Human Diversity: A Bicultural Approach. Upper Saddle River, NJ: Prentice Hall. pp. 1–10.

Oxford Dictionaries. Oxford University Press. Retrieved 28 December 2013

People, James; Bailey, Garrick (2010). Humanity: An Introduction to Cultural Anthropology (9th ed.). Wadsworth Cengage learning. p. 389.

Ontario component of CCHS at ICES

	Shared	Linking
Cycle 1.1 (2001)	x	x
Cycle 1.2 (2002)	x	x
Cycle 2.1 (2003)	x	x
Cycle 2.2 (2004)	x	x
Cycle 3.1 (2005)	x	x
CCHS 2007-2008	x	x
CCHS 2009-2010	x	x
CCHS 2011-2012	x	x
CCHS 2013	x	

Example 3. CVD risk factors over 12-year period

- Prevalence of diabetes doubled among South Asian males and Black females
- Prevalence of obesity doubled among Chinese males

Open Access Research

BMJ Open

Temporal trends in cardiovascular disease risk factors among white, South Asian, Chinese and black groups in Ontario, Canada, 2001 to 2012: a population-based study

Maria Chiu,[1] Laura C Maclagan,[1] Jack V Tu,[2,3,4] Baiju R Shah[1,5]

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Example 2. Recent immigrant vs. long-term residents

- CVD risk profiles of long-term residents worse than recent immigrants across all ethnic groups
- Greatest percent difference observed in the Chinese group

Canadian Journal of Cardiology 28 (2012) 20–26

Clinical Research

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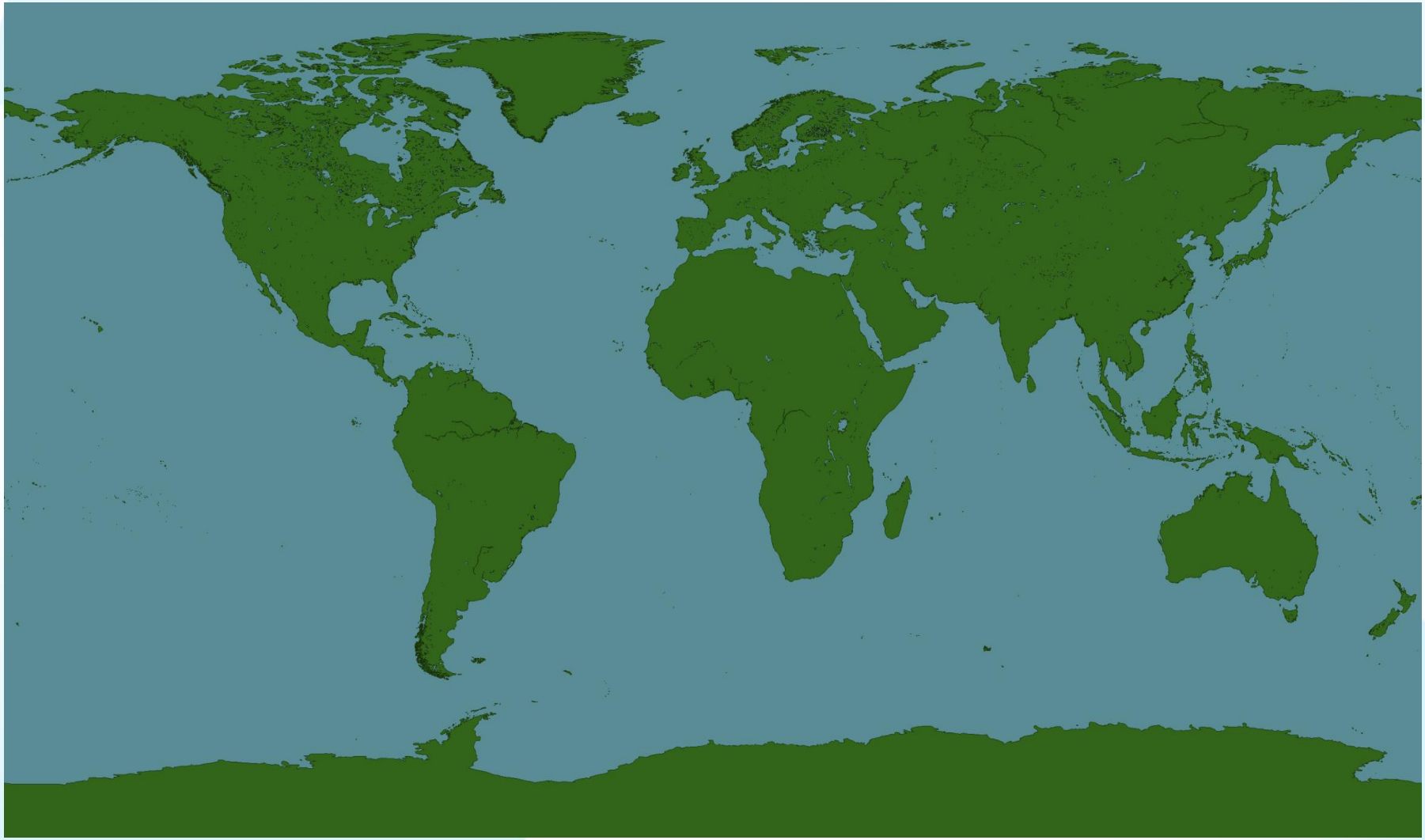
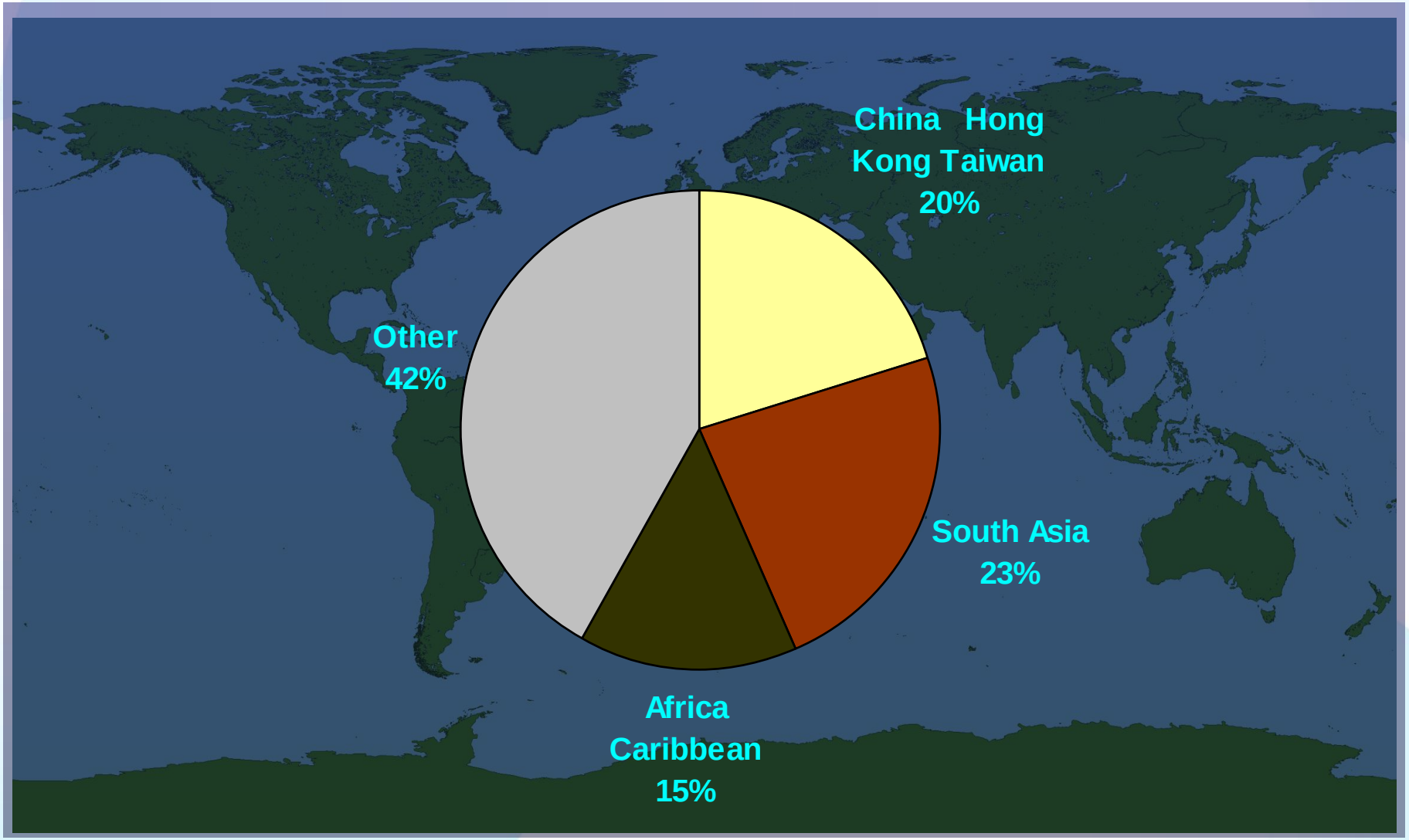
World's population: 7 billion (2011)



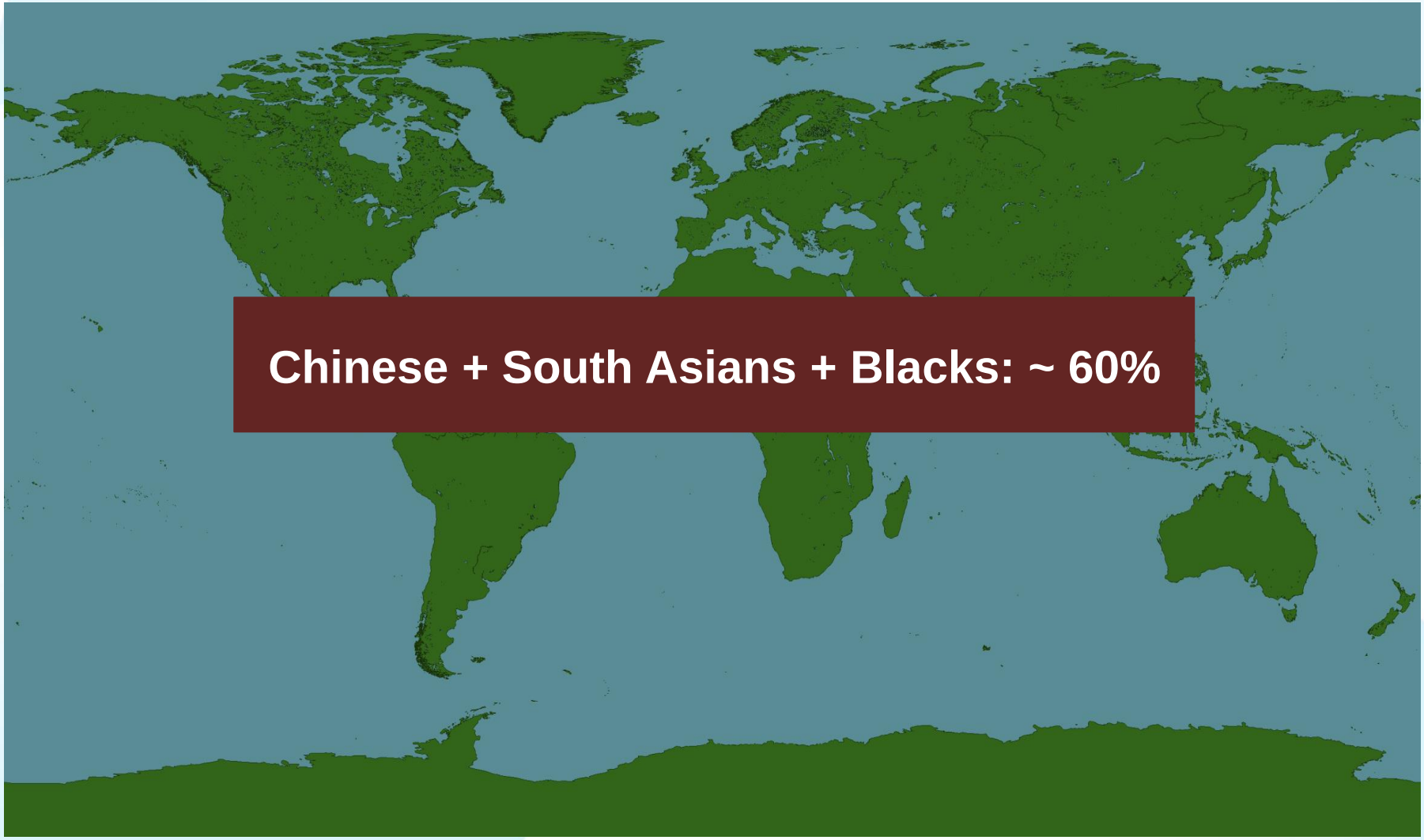
National Population Clocks, 2011
Population Division of the United Nations Department of Economic and Social Affairs

World's population: 7 billion (2011)



National Population Clocks, 2011
Population Division of the United Nations Department of Economic and Social Affairs

World's major racial-ethnic groups



National Population Clocks, 2011
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