Exploring Asian and Asian American Specific Body Mass Index Cut-Points

by
Lauren J. Lee

A THESIS

submitted to

Oregon State University

Honors College

in partial fulfillment of
the requirements for the
degree of

Honors Baccalaureate of Science in Public Health
(Honors Scholar)

Presented May 20, 2022
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AN ABSTRACT OF THE THESIS OF

Lauren J. Lee for the degree of Honors Baccalaureate of Science in Public Health presented on May 20, 2022. Title: Exploring Asian and Asian American Specific Body Mass Index Cut-Points.

Abstract approved: _____

Kari-Lyn Sakuma

Background: Body Mass Index (BMI) is used as a quick and inexpensive tool to measure populations at risk for a number of metabolic and chronic conditions. In part due to its simplicity BMI has been criticized for its inaccurate prediction concerning health outcomes. Due to the diversity in the United States, one of the potential remedies offered was to introduce race-based BMI cut-points to better predict the relationship between obesity, morbidity, and mortality. The purpose of this study was to explore Asian and Asian American specific BMI cut-points and its potential implications.

Methods: A scoping review of the literature was conducted through PubMed. Qualitative content and thematic analyses were conducted.

Results: Initial search resulted in twenty articles. Eleven studies met criteria for evaluation. Thematic analyses identified 1) Addressing disparities in morbidity and mortality 2) Lowering cut-points did not result in better clinical outcomes 3) Asian/Asian Americans are a multicultural, diverse group.

Conclusion: The BMI cut-points should not be lowered for Asian or Asian Americans in the United States.

Keywords: Asian and Asian American, BMI, Asian Specific BMI Cut-Points
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I understand that my project will become part of the permanent collection of Oregon State University, Honors College. My signature below authorizes release of my project to any reader upon request.

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Lauren J. Lee, Author

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INTRODUCTION/BACKGROUND

Obesity is an excess amount of fat, caused by the increase in size and number of fat cells in someone's body (National Institute of Health [NIH], 2022; World Health Organization [WHO], 2021; Centers for Disease Control and Prevention [CDC], 2022). Obesity is considered a serious medical condition that has been connected with a number of noncommunicable diseases such as metabolic syndrome, high blood pressure, atherosclerosis, heart disease, diabetes, sleep disorders and some cancers (WHO, 2022; NIH, 2022). People with obesity are at an increased risk for a number of different serious diseases and health conditions when compared to their counterparts (National Heart, Lung, and Blood Institute [NHLBI], 2013; Bhaskaran et al, 2014). In addition, obesity is affiliated with poorer mental health outcomes and reduced quality of life (Luppino et al 2010). In general, those who have obesity when compared to non-obese individuals are at an increased risk for many serious health diseases and health conditions (CDC, 2022).

Obesity has been steadily increasing in the US, from 1999 through 2018 obesity prevalence has increased from 30.5% to 42.4% and the prevalence of severe obesity has also increased from 4.7% to 9.2% (Hales et al, 2020). The Centers for Disease Control and Prevention (CDC) has a number of different surveillance systems conducted year after year to examine long term trends in public health specifically analyzing weight status in Americans and factors that influence it (CDC, 2021). Body Mass Index (BMI) is used as the population-level measure of overweight and obesity in the US and around the world (CDC, 2021; WHO, 2022).

BMI is a statistical index used to approximate body fat in people and is calculated by taking someone’s weight, in kilograms, divided by their height, in meters squared (WHO, 2021; NHLBI, 1998). Quetelet was a Belgian mathematician, astronomer, and statistician (Eknoyan,

2008). He concluded through cross sectional studies on growth that 'weight increases as the square of height' and this was known as the Quetelet Index until Ancel Keys named it Body Mass Index in 1972 (Eknoyan, 2008). The categories for BMI are of the following, someone is considered overweight if they have a BMI score of 25 kg/m^2 to 29.9 kg/m^2, obese is 30 kg/m^2 or above, 35 kg/m^2 is grossly obese, and above 40 kg/m^2 is morbidly obese (WHO, 1998; Nuttall, 2015). On the other end of the scale, someone with a BMI score under 18.5 kg/m^2 is considered underweight, with anything under 16.5kg/m^2 as severely underweight and normal weight is anything between 18.5 kg/m^2 to 24.9 kg/m^2 (WHO, 1998; Nuttall, 2015). The World Health Organization (WHO) has recommended these cut points since 1993 and has been adopted around the world as the standard criteria (WHO, 1995). BMI is used as a health indicator for the development of or the prevalence of weight-related and or obesity-related diseases and health issues and is frequently used in public health policies for things such as obesity prevention (Nuttall, 2015).

BMI is considered the most useful, population level measure of obesity due to its simplicity and ease of use (WHO, 1998). As a whole, it is widely used because it is accepted as an indicator for defining specific categories of body mass as a health issue (Nuttall, 2015). In addition, it can be used to estimate the population level of obesity and the risks associated with it (WHO, 1998). BMI is currently the favored criterion due to the generally accepted idea that it is a fairly reliable indicator of body fatness for most people and that it can be considered as an alternative for direct measures of body fat (Heymsfield et al, 2016).

In 1993, the WHO established an Expert Consultation Group that was in charge of creating uniform criteria for BMI (WHO, 1998; Nuttall, 2015). WHO's Expert Consultation Group was comprised of numerous researchers with expertise ranging from nutrition to obesity

(WHO 1998). The criteria were as follows, someone was considered underweight if their BMI was between 15 to 19.9, normal was 20 to 24.9, overweight was 25 to 29.9, and obese was 30 to 35 or more ((WHO, 1998; Nuttall, 2015). When this was established by the WHO, the National Institutes of health (NIH) in the US categorized people with a BMI of 27.8 for men and 27.3 for women or greater as being overweight (Nuttall, 2015). The NIH based this criterion on an 85% cutoff point of people analyzed in the National Health and Nutrition Examination Study (NHANES) II (National Institutes of Health [NIH], 1985). Ultimately, the cutoff point set by the NIH was changed to better fit with the 4 categories in the WHO guidelines which meant that millions of Americans who right before were considered "normal", were then instantly considered "overweight" (Nuttall, 2015).

BMI is used for numerous different things, currently it is being used to establish obesity rates across race/ethnicity groups in the US and around the world (Heymsfield et al, 2016). Though there are questions about BMI's validity, "BMI does not account for the wide variation in body fat distribution and may not correspond to the same degree of fatness or associated health risk across different individuals and populations" (WHO, 1998). There are also questions about the validity of BMI when analyzed against race and ethnic groups (Heymsfield et al, 2016). In 2004, WHO gave an expert consult and recommended Asian-specific BMI cut-points, the expert consultant suggested lowering the BMI criterion for overweight from 25 to 23, and greater than 27.5 as obese for Asians (WHO Expert Consultation, 2004). This came about for 3 reasons: there was increasing evidence of a high prevalence of type 2 diabetes and increased cardiovascular risk factors in parts of Asia where the average BMI is below the cut off that defines overweight; two, there was increasing evidence that association between BMI and percentage of body fat; and three, body fat distribution differs across populations (WHO Expert

Consultation, 2004). Lastly, there was two previous tries to understand the WHO BMI cut-points in Asian and Pacific populations which sparked a growing debate on whether there are possible needs for developing different BMI cut-off points for different ethnic groups (WHO Expert Consultation, 2004).

While the simplicity of BMI makes it useful, it can also hide the full picture. For example, even when comorbidities are considered, the correlation of mortality rates with BMI does not take into consideration factors such as family history of diabetes, hypertension, coronary heart disease, metabolic syndrome and more (Nuttall, 2015). When using BMI, Healthcare providers may not take into consideration history of smoking, when in the life cycle obesity appeared, if the body weight is relatively stable or rapidly progressive (Nuttall, 1983; Chaudhry, Gannon, Nuttall, 2006). Many population-base studies only utilize the initial or given BMI, even though weight increases and heigh decreases with age, and weight gain can vary among individuals and so does loss of muscle mass (Nuttall, 2015; Forbes, Reina, 1970). Lastly, someone's occupation, medication-induced obesity, and how comorbidities are being treated tend to be left out, all things that can play a significant role in morbidity and mortality that BMI fails to consider (Nuttall, 2015).

Using BMI as an indicator for body fat percentage has been called into question, specifically due to its inability to consider anything other than weight and height. BMI measurement fails to consider anything other than weight and height which tends to obscure the full picture. This can cause situations where certain people, such as athletes, are considered obese when BMI is actually capturing higher weight due to higher muscle content, rather than fat composition. This misdiagnosis transpires because BMI does not distinguish between fat and fat-free mass such as muscles and bones, in addition, people can have varying levels of lean vs fat

mass at the same weight (Heymsfield et al, 2016). From an anatomical and metabolic perspective, obesity should reference an excessive accumulation of body fat, but BMIs ability as demonstrated with the example above has been questioned numerous times due to its limitations in considering only weight and height (Nuttall, 2015).

Being in the overweight category in the BMI distribution has been shown in a number of recent studies that it may not be that detrimental to someone's health (Flegal, Graubard, Williamson, Gail 2005; Troiano, Frongillo, Sobal, Levitsky 1996). The NIH in their American Association of Retired Persons study followed 527,265 men and women between ages 50 to 71 years in the US (Nuttall, 2015). They followed them for up to 10 years and found that the lowest death rate in the entire group was among those in the "overweight" category (Nuttall, 2015). They found a broad range of BMIs between 23.5 to 30 had minor difference in mortality (Nuttall, 2015). The NHANES data going back to 1971 and up to 1994 also highlights that the relative mortality risk is lowest in men with a BMI of 25 to 30 from the ages of 25 to 70 (Flegal, Graubard, Williamson, Gail, 2005). The risk of mortality was affected little by BMI scores from 18.5 to 30 in all age categories and those older than 70 years showed negligible impact on death rate even if they were in the obese category (Nuttall, 2015). They found comparable results for women in the NHANES report (Zhu, Heo, Plankey, Faith, Allison, 2003). In fact, the lowest mortality was in those with a BMI of 27 (Nuttall, 2015). There seems to be a broad range over where BMI has little association with death rate, the range being between 21 to 30 but centered around a BMI range of 24 to 28 (Nuttall, 2015). This was not just recently discovered, in 1980 a summary of sixteen different population-based studies in which anthropometrically determined obesity was found to not be associated with increased mortality rate (Andres, 1980). A detailed analysis of Metropolitan Life Insurance data also suggests that there is little increase in mortality

rates in people with a degree of overweight less than 20% or more above the average for a given height and age (Keys et al, 1972).

AIMS OF THE STUDY

BMI is often used in healthcare settings as a cursory technique to recognize high risk populations. The current debate surrounding the utility of BMI as an indicator for poor health outcomes, coupled with the diversity of Asian/Asian American populations raise the question if race-based BMI cut-points can be effectively used to indicate high risk in these populations. The aims of my study are to analyze the current literature on race-based BMI cut-points for the Asian/Asian American population, find overarching themes in the literature and the possible implications.

METHODS

Data Collection

A review of scientific, peer-reviewed original study or literature review articles were conducted. We used the PubMed database and the advanced search builder to search for articles to review. To begin the search process and gain a general understanding of where the literature was at "body mass index"[MeSH Terms] OR ("body"[All Fields] AND "mass"[All Fields] AND "index"[All Fields]) OR "body mass index"[All Fields] was input into PubMed and this search yielded 255,985 articles. To narrow the results further, we added the following search terms ("asian americans"[MeSH Terms] OR ("asian"[All Fields] AND "americans"[All Fields]) OR "asian americans"[All Fields] OR ("asian"[All Fields] AND "american"[All Fields]) OR "asian american"[All Fields]) AND ("body mass index"[MeSH Terms] OR ("body"[All Fields] AND "mass"[All Fields] AND "index"[All Fields]) OR "body mass index"[All Fields]) was added to

the search term which yielded 1,195. "BMI"[All Fields] AND "cut"[All Fields] AND "offs"[All Fields] was added to the search terms to narrow the focus even more which then yielded 683.

To focus research further, these search terms were used "Asian"[All Fields] AND "American"[All Fields] AND "specific"[All Fields] AND "BMI"[All Fields] AND "cut"[All Fields] AND "offs"[All Fields] was added but this was too narrow, and the search came back up to zero. Thus "Asian-specific"[All Fields] AND ("obese"[All Fields] OR "obesity"[MeSH Terms] OR "obesity"[All Fields] OR "obese"[All Fields] OR "obesities"[All Fields] OR "obesity s"[All Fields]) AND ("cutoff"[All Fields] OR "cutoffs"[All Fields]) was inserted instead and ended up with 27 results. Lastly, to narrow even further ("asian americans"[MeSH Terms] OR ("asian"[All Fields] AND "americans"[All Fields]) OR "asian americans"[All Fields] OR ("asian"[All Fields] AND "american"[All Fields]) OR "asian american"[All Fields]) AND ("sensitivity and specificity"[MeSH Terms] OR ("sensitivity"[All Fields] AND "specificity"[All Fields]) OR "sensitivity and specificity"[All Fields] OR "specificity"[All Fields] OR "specific"[All Fields] OR "specifically"[All Fields] OR "specification"[All Fields] OR "specifications"[All Fields] OR "specificities"[All Fields] OR "specifics"[All Fields] OR "specificities"[All Fields] OR "specificity"[All Fields]) AND ("obese"[All Fields] OR "obesity"[MeSH Terms] OR "obesity"[All Fields] OR "obese"[All Fields] OR "obesities"[All Fields] OR "obesity s"[All Fields]) AND ("cutoff"[All Fields] OR "cutoffs"[All Fields]) was added, this final search came up with 20 articles. Through PubMed's Advanced search builder twenty articles were collected for this review to be further analyzed.

Once the twenty articles were collected and placed in Box, the abstracts were skimmed to make sure all articles included discussed BMI and ethnic based BMI cut-points for Asian/Asian Americans. The inclusion criteria were that the article was printed in English, the population

under study had to include Asian and or Asian American populations, and BMI measures. Three articles were removed after an initial screening of abstracts for failure to include BMI and for failure to focus on Asian populations in the US. Once articles passed the initial screening, each article was read thoroughly, and a summary memo was created. Articles were excluded if they failed to address BMI for Asian Americans. In addition, articles that only utilized data from outside of the US were excluded as the focus of this review was on Asian/Asian Americans in the US. Articles that had both US and international data were included. The review process excluded seven more articles, resulting in ten articles being used in the final analysis. Reference tracing of the collected articles led to one additional article that fulfilled the inclusion criteria and were included in this review. See Figure 1 for visual depiction of the article search and inclusion/exclusion process.

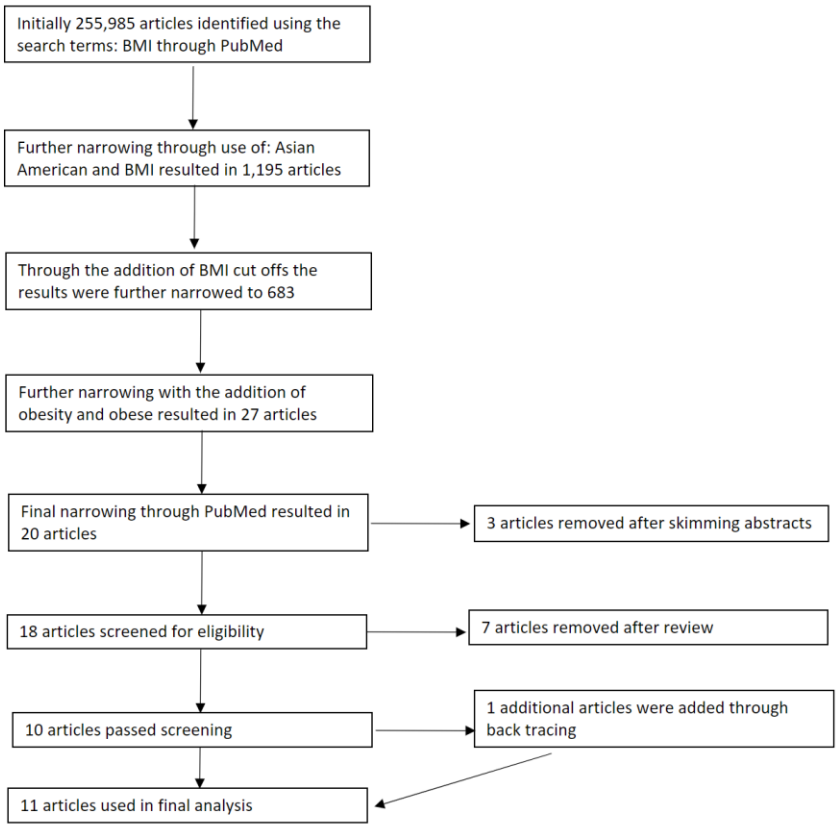

Figure 1. PubMed Search

Data Analysis

Each time an article was read, information on study sample, measures of adiposity, namely how BMI was used, and identified results and whether authors recommended the use of Asian based cut-points or not was extracted into a data table. For each article, a summary memo was written highlighting notable quotes, questions pertaining to the text, and what evidence they used to support their findings. During weeks 4 and 8 of the term over three terms a reflective memo was written by rereading the summary memos and drawing conclusions and ideas from the previous memos. Overall themes and outstanding ideas were recorded in the memos. Lastly, reflective memos were written at the end of the term over all the articles that had been read in the previous weeks. This occurred over a yearlong or three term time period. Data was analyzed and Thematic analysis was utilized across the studies (Saladaña, 2016). Through careful review, memos were written while reading the eleven articles, and common themes were identified across the literature (Saladaña, 2016).

RESULTS

Table 1. Articles Found in Initial Search

Author	Year	Title	Conclusions
Battie et al	2016	Comparison of body mass index, waist circumference, and waist to height ratio in the prediction of hypertension and diabetes mellitus: Filipino-American women cardiovascular study	Concluded that Asian BMI and waist circumference (WC) thresholds should be used for hypertension (HTN) and diabetes mellitus (DM) screening in Filipino-American women to reduce false negatives.
Enas et al	2008	Reducing the Burden of Coronary Artery Disease in India: Challenges and Opportunities	Concludes that Asian specific BMI cut points for overweight, and obesity should be used as a screening tool.
Gao et al	2020	Association between maternal pre-pregnancy body mass index	Concludes that Asian Specific BMI cutoffs should be used and suggest that

		and risk of preterm birth in more than 1 million Asian American mothers	it should be used in clinical settings as a screening tool for assessing risk of preterm birth for Asian American mothers.
Gordon-Larsen et al	2004	Five-year obesity incidence in the transition period between adolescence and adulthood: the National Longitudinal Study of Adolescent Health	Concludes that there is an increase trend in adolescence and young adults becoming and remaining obese. Prevention and treatments are needed.
Gordon-Larsen et al	2003	The Relationship of Ethnicity, Socioeconomic Factors, and Overweight in U.S. Adolescents	Concludes that efforts to decrease overweight disparities between ethnic groups should look beyond income and education.
Gordon-Larsen et al	2007	Maternal Obesity is Associated with younger age at obesity onset in US adolescent offspring followed into adulthood	Concluded that having a mother hat was obese was associated with earlier age at obesity onset across all race/ethnic groups.
Kuerban	2020	Beyond Asian-Specific Cutoffs: Gender Effects on the Predictability of Body Mass Index, Waist Circumference, and Waist Circumference to Height Ratio on Hemoglobin A1c	Concludes that Asian specific cut-points should be used for WC and Waist to Height Ratio (WHtR) as a screening tool for developing type 2 diabetes.
Pu et al	2015	Racial/Ethnic Differences in Gestational Diabetes Prevalence and Contribution of Common Risk Factors	Conclude that Asian specific BMI cut-points should be used for Asian Mothers for screening and intervention purposes.
Rosenbaum et al	2013	Racial/Ethnic Differences in Clinical and Biochemical Type 2 Diabetes Mellitus Risk Factors in Children	Suggest that BMI and WC should have ethnic specific cut off points as a screening tool.
Younes & Bugianesi	2019	NASH in Lean Individuals	Focused on Nonalcoholic Fatty liver disease (NAFLD) and concludes that ethnic based cut-points, especially for Asians could be helpful as a screening tool in diagnosing NAFLD.

Articles Found through Back tracing

Table 2. Article Found Through Back Tracing			
Authors	**Year**	**Title**	**Results**
Jih et al	2014	Using appropriate body mass index cut points for overweight and obesity among Asian Americans	Concluded that Filipinos should be a priority population for overweight and obesity screening. Found that Filipinos, Vietnamese, Korean, South Asians and Japanese have higher diabetes prevalence at lower BMI cut points.

Out of the twenty articles found through PubMed, ten articles made the inclusion criteria, and an additional article (Jih et al; 2014) was added after it was found through back-tracing reference sections of articles for other relevant studies (see table 1 and table 2). Of the eleven articles that met the inclusion criteria and went through further analysis, eight of them conclude that ethnic based cut-points should be used as screening tools for a number of chronic health conditions in Asian Americans (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019). These articles suggested utilizing the Asian specific BMI cut-points as a screening tool for a number of different chronic health conditions, but they did not recommend utilizing the new cut-points to redefine overweight and obesity in Asian/Asian American populations (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019). Of those eight articles, all of them suggested that the standard BMI criteria would underestimate their risk factors for a number of health issues related to adiposity (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi,

2019). All of the eight articles that suggested using ethnic based cut-points as screening tools for Asian/Asian Americans followed the WHO's ethnic based cut-points (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019). Eight of the articles highlight that Asian/Asian Americans had a number of different chronic health concerns that occurred at lower BMI's when compared to their white counter parts (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019).

Reviewing the data, eight of the articles suggested utilizing the Asian based BMI cut-points as a screening tool to catch those at risk for several chronic conditions. They did not however suggest redefining overweight and obesity for the Asian/Asian American population using the Asian specific BMI cut-points. Three themes emerged that could be separated into two categories: in support and not in support of using ethnic-based cut-points. In support of ethnic-based cut-points, the theme that arose was 1) Using lower BMI cut-points to address disparities in morbidity and mortality. Themes that arose that were against using ethnic-based cut-points for Asian/Asian Americans were: 2) Lowering cut-points did not result in better clinical outcomes and 3) Asians are multicultural, diverse group.

Theme 1: Using lower BMI cut-points to address disparities

The theme that emerged in support of using Asian/Asian American specific cut-points was addressing disparities in morbidity and mortality. Several of the articles suggested that the standard BMI criterion fail to accurately predict a number of health issues when analyzing the Asian/Asian American population and that Asian/Asian Americans have disproportionately higher rates of a number of chronic conditions when compared to white populations. Battie et al,

(2016) highlighted that Filipino Americans suffer disproportionately from metabolic and cardiovascular disorders with high rates of hypertension. Pu et al, (2015) stated that Asian Americans have a much higher prevalence of Gestational diabetes mellitus compared with non-Hispanic whites even though Asian/Asian Americans were at lower pre-pregnancy BMI. These articles suggested that at a lower BMI Asian/Asian Americans tended to be at higher risk of metabolic syndrome, type 2 diabetes risk, higher percentage of visceral fat and body fat accumulation (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019). This suggest that a number of Asian/Asian Americans are being missed in screenings for a number of health conditions and proposed using Asian/Asian American specific BMI cut-points.

Using Asian specific BMI cut-points, which are lower than the current standard cut-points, significantly increased the pool of Asian/Asian Americans who would be considered overweight and obese and can then be identified earlier as at risk for a number of chronic health conditions. The articles analyzed utilized ethnic specific BMI cut-points to address some of the short comings of BMI for Asians. Many suggested that the Asian specific cut-points set by the WHO were better at assessing Asians/Asian American risk factors for a number of health issues ranging from chronic conditions such as diabetes, preterm birth, coronary artery disease to obesity (see Enas et al, 2008; Gao et al, 2020; Pu et al, 2015; Rosenbaum et al, 2013).

Theme 2: Lowering cut-points did not result in better clinical outcomes

Several studies noted that lowering cut-points did not result in better clinical outcomes. Enas et al. (2008), and Gao et al. (2020), argue that lowering of the BMI cut-points for Asians would increase those who could be screened for better health outcomes, Battie et al (2016) explicitly stated that these lower thresholds should not be used to redefine BMI thresholds for

overweight and obesity because lowering the cut-points did not produce better morbidity or mortality for Asian/Asian Americans. All eight articles only suggested utilizing the Asian specific BMI cut-points as screening purposes for different health conditions rather than using the Asian specific BMI cut-points as the new criterion for overweight and obesity in said population. Battie et al (2016) also found that the new threshold had a high rate of false positives when measuring for diabetes mellitus. With increased sensitivity there is also a trade-off with specificity, thereby increasing the risk of false positives.

Theme 3: Asians are multicultural, diverse group.

Most of the studies acknowledge that Asians are a diverse group. Using BMI across different Asian subpopulations were noted as problematic because the cut-points worked well with some Asian/Asian American subgroups but not others. Battie et al (2016) found that there was not consensus on a specific cut point. For example, higher cut points were better suited for South Asians compared to East Asians (Battie et al, 2016).

DISCUSSION

This study aimed to analyze if race-based BMI cut-points for Asian/Asian Americans was a necessary addition. An investigation was conducted using a scoping literature review to analyze how studies considered Asian/Asian American based BMI cut-points. Our findings identified three themes and within each theme, there were some mixed results. However, collectively, our overall findings suggest that BMI cut-points should not be lowered for Asian Americans.

Arguments that support Asian/Asian American specific BMI cut-points focused on addressing disparities observed in obesity-related morbidity and mortality. They relied on

lowering the standard BMI cut-points to capture a larger pool of Asians/Asian Americans who may be at-risk for those diseases. Results from the analysis supported Asian/Asian American specific BMI cut-points as a screening tool. This is because as a screener, it would capture more Asian/Asian Americans at risk for hypertension, diabetes mellitus, coronary artery disease, preterm birth, overweight/obesity, and gestational diabetes mellitus (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban, 2020; Pu et al, 2015; Rosenbaum et al, 2013). It was also common to see the recommendation of combining lower BMI screening score with another measurement tool such as waist circumference to get a more all-encompassing and accurate review (Kuerban, 2020). It was suggested to also use Asian based cut-points for waist circumference (Kuerban, 2020).

The American Diabetes Association (ADA) in their January 2015 issue, began recommending that diabetes screening for Asian Americans with a BMI of 23 or higher (Hsu et al, 2015). The ADA stated that they found Asian/Asian Americans had an increased prevalence for diabetes at lower BMI (Hsu et al, 2015). Though the ADA did state that Park et al (2014) found no evidence of an increased total mortality risk for Asian/Asian Americans within the BMI range of 20 to 25 and because of this they stated that "the aim of this position statement is not to redefine BMI cut points that constitute overweight and obesity thresholds as they relate to mortality or morbidity in Asian Americans. Instead, the intent is to clarify how to use BMI as a simple initial screening tool to identify Asian Americans who may have diabetes or be at risk for future diabetes" (Hsu et al, 2015).

Whenever a threshold is lowered, the number of participants that are now included will increase. This goes for lowering the BMI for Asian/Asian Americans, if the overweight category cut-point is lowered to BMI = 23 then a larger portion of Asian/Asian Americans will be labeled

as overweight. The authors suggested that by increasing the pool of people who qualify as high risk (I.e., overweight or at risk for a certain chronic condition), the more cases of the disease being tested for would be caught earlier. One issue with this is the high positivity rate, Battie et al (2016) found that the Asian/Asian American specific BMI cut off had a high false positivity rate when connected to identifying type 2 diabetes. Thresholds for any screening/testing purposes need to balance sensitivity and specificity, so that the test can have inclusive screening methods while also having a small number of false positives (Battie et al, 2016).

These articles highlighted that many Asian/Asian Americans especially specific subgroups suffer disproportionately high rates of the chronic health issues listed above. The same articles also attribute risk factors of chronic conditions to be strongly connected to overweight and obesity (See Battie et al, 2016; Enas et al, 2008; Gao et al, 2020; Jih et al, 2014; Kuerban, 2020; Pu et al, 2015; Rosenbaum et al, 2013; Younes & Bugianesi, 2019). However, these articles fail to consider how other factors could be contributing when it comes to risk factors for a number of chronic health conditions. They do not consider how environment, socioeconomic status, immigration status, education status, language and disability may affect Asian/Asian Americans risk factors. The authors also rarely if at all address some of the shortcomings of BMI. Instead, the authors focus on overweight/obesity in the population and how the standard BMI is not accurately catching those at risk. This ultimately leads the authors to suggest utilizing Asian specific BMI cut-points not to redefine overweight and obesity but as an option to increase the accuracy of BMI as a screening tool for chronic health conditions.

The arguments that were not in support of using Asian ethnic based cut-points were Theme 2) lower cut-points did not result in better outcomes and Theme 3) Asians are a multicultural diverse group.

The first theme not in support of creating an Asian/Asian American specific BMI cut-point was that the lowering of cut-points did not results in better outcomes. Battie et al, (2016) stated that the Asian/Asian American specific cut-points had a high false positivity rate when screening for hypertension and diabetes. In addition, they cited that Park et al, (2014) found that there was no increased risk for total mortality among Asian/Asian Americans who were within the BMI range of 20 to <25 kg/m^2. Battie et al, (2016) also highlights that there is increasingly more evidence that not all obese subjects are at an increased cardiovascular risk. Jih et al (2014) also discusses the obesity paradox, that overweight or obese individuals may have better health outcomes when it comes to morality when compared to normal weight in diabetes and cardiovascular disease.

While a high false positivity rate may not seem that detrimental given the simplicity of a BMI calculation to researchers and healthcare professionals, it could weigh heavily on the patient. Being labeled as overweight or obese can cause significant stigma in healthcare and everyday life. Weight stigma, and weight discrimination is quite common in the US. Weight stigma and discrimination has been associated with a phycological stress response and a significant risk factor for depression (Puhl & Heuer, 2010). Self-reported and experimental research has found that healthcare professionals believe a number of negative stereotypes about overweight and obese patients (Puhl & Heuer, 2010). For example, providers believe that their obese patients are "lazy, lacking in self-discipline, dishonest, unintelligent, annoying, and noncompliant with treatment" (Puhl & Heuer, 2010). This in turn affects health outcomes, they found that health providers spend less time with overweight patients and also spend less time giving health education (Puhl & Heuer, 2010). Before jumping to lowering BMI thresholds, the larger implications that lowering the BMI could cause should be addressed, especially when it

can affect quality of care which in turn affects people's health. Currently, none of the major US health agencies have adopted an ethnic based cutoff for Asian Americans.

The second theme not in support of implementing an Asian/Asian American specific BMI cut-point was that the Asian/Asian American population is incredibly diverse. This grouping encompasses more than twenty different counties with a wide range of environments and histories that shape them (Budiman & Ruiz, 2021). The US Department of Health and Human Services Office of Minority Health defines Asian Americans as "people having origins in any of the original peoples of the East Asia, Southeast Asia, or the Indian subcontinent" (US Department of Health and Human Services Office of Minority Health, 2021). Having an Asian/Asian American specific cut point may not work for all of the subgroups it incorporates. Battie et al (2016) found that there was not consensus on a specific cut point. For example, higher cut points were better suited for South Asians compared to East Asians (Battie et al, 2016). This might be due to environment and history of South Asians. It was also articulated that immigration also plays a significant role and that Asian/Asian Americans BMI can be affected by how long they have resided in the US (Battie et al, 2016).

In fact, there is debate on whether the adoption of Asian specific BMI cut points specifically in Westernized countries is necessary (Jih et al., 2014). Jih et al (2014) states that "Asian ethnicity-specific BMI cut points for overweight/obesity may be warranted to best account for potential variation in lifestyle and dietary factors and the relationship of BMI with body fat for each Asian population". While it seems like an admirable suggestion, it is not feasible to suggest creating a specific cut point for every different subgroup under the Asian/Asian American group. According to the US 2020 Census the next largest racial group after whites was Asian alone or in combination group (twenty-four million). This also does not

consider multiracial groups, not just Asian/Asian Americans, with the multiracial population continues to grow exponentially. The US population who identified as multiracial grew by 276% since 2010 according to the 2020 Census data (United States Census Bureau, 2021). Given these findings, BMI should not be changed for an ethnic specific BMI for Asian/Asian Americans, because there are no clear definitions of Asian and Asian Americans, and it cannot account for the diversity across so many different groups of people.

LIMITATIONS AND FUTURE DIRECTIONS

This analysis was not a comprehensive meta-analysis, it was a scoping literature review, so it was not exhaustive in the breadth and depth. Because this was not an exhaustive literature review, some important articles could have been missed. This scoping literature review was used to gather evidence on where the field stood on Asian BMI cut-points and identify major overarching themes. Future studies could benefit from systematic reviews to build a more comprehensive study. This analysis was only conducted by the primary author who is an Asian American and majoring in public health and on the premedical track. Because the analysis was only done with the primary author there could have been some unknown bias. In the future, a larger team with more coders would be able to discuss and analysis a larger review to get a more comprehensive analysis.

After this scoping literature review the data seems to point to not recommending race base BMI cut-points to redefine overweight and obesity for Asian/Asian American populations in the US. This is due to BMIs lack of accuracy in predicting morbidity and mortality overall and for the diversity of the Asian/Asian American group and for potentially negative implications. Changing the BMI cut-points for Asian/Asian Americans in relation to the obesity and overweight category seems shortsighted when there is “no evidence of an increased total

mortality risk for Asian Americans within the BMI range of 20 to 25" (Hsu et al, 2015, Battie et al, 2016). Though the data does seem to suggest that it may be beneficial to change the BMI threshold for screening of certain chronic diseases such as Type 2 Diabetes, which the ADA has already done. Finally, it is important to consider that race and ethnicity are socially constructed, and health disparities observed are not based in genetic make-up of these groups of people. Thus, while some view utilizing a modified population-level measure for obesity to screen for higher risk patients who are Asian or Asian American may help to categorize them earlier, it does not result in better clinical treatment or outcomes and assumes that Asians and Asian Americans have a homogenous body type.

CONCLUSION

Asian/Asian American specific BMI cut-points should not be used to redefine overweight and obesity in this population. Asian/Asian American specific BMI is unable to distinguish between Asian subpopulation risks, and there was no evidence of an increased mortality risk for Asian/Asian Americans within the lower thresh hold BMI range of 20 to 25, Due to these findings, we conclude that race-based BMI cut-points should not be used for Asian/Asian American populations in relation to obesity and overweight in the US.

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