Examining the Presence of Racial Bias in Dermatology Education and Its Reproduction in Practice

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For my mom and dad

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LIST OF ABBREVIATIONS

AAMC	Association of American Medical Colleges
ALM	Acral Lentiginous Melanoma
LMM	Lentigo Maligna Melanoma
NM	Nodular Melanoma
SSM	Superficial Spreading Melanoma

INTRODUCTION

Deidra McClover, a black woman, was 36 years old when she noticed symptoms of psoriasis in the fall of 2019. However, at the time, neither she nor her doctors, a primary care physician and a dermatologist, knew it was psoriasis. It took 9 months from her first flare-up to be properly diagnosed and in between that time, she was misdiagnosed twice (*What It's Like Being a Black Woman with Psoriasis*, 2021). There are stories like this one where people with darker skin have shared their late diagnosis or poor diagnosis of skin conditions because they, and the people that are supposed to know, did not know what was happening. There are a multitude of issues within the medical field stemming from racial bias in medicine that is detrimental to the health of people in the United States. Racial bias tends to be present in every aspect of the medical field, including dermatology, a field that focuses on treating and diagnosing skin conditions (Sauaia & Dellavalle, 2009).

Racial bias comes into play as skin conditions on darker skin tones being treated or diagnosed differently. One such example is in melanoma. While non-Hispanic white people are more likely to have melanoma with an incidence rate of 28 per 100,000 versus 1 per 100,000 for Black people and 5 per 100,000 for Hispanic people, Black and Hispanic people have a higher mortality rate with 40% and 14% respectively than their white counterparts who have a mortality rate of 11.4% (*Melanoma Incidence and Mortality, United States–2012–2016 | CDC*, 2020). Understanding the consequences of health disparities in dermatology will help to identify where and how racial bias is present.

There are plenty of reasons why health disparities, such as in the diagnosis of melanoma, exist in dermatology, but one important reason could start at the beginning: medical school education. In trying to understand the impact that dermatology education can have on

dermatology practice, it is important to note that, first, dermatology accounts for 4% of all outpatient visits. Additionally, skin diseases, the most common including eczema, psoriasis, acne, skin cancer, benign neoplasms, and skin infections, account for the fourth most common cause of non-fatal disease burden in the world (Bolognia et al., 2018). Once that is understood, a deeper look into how the added factor of race or skin tone can impact how a patient is treated is also incredibly important.

Dermatology is a specialty that is taught significantly less than other specialties (Buster et al., 2013). When it is taught, dermatology education has also been shown to be inadequate in medical schools in the United States. That is, inadequate means that practitioners did not feel as if their dermatology education prepared them enough to treat dermatologic conditions (Hansra et al., 2009). In addition to the general lack of sufficient dermatology education, there is even more insufficiency in the education of skin conditions on darker skin tones (Buster et al., 2013). The lack of adequate representation can be seen in both the curriculum and, more specifically, in the materials used to teach medical students. One example is the images present in medical textbooks of melanoma. Most of the pictures of melanoma are of lighter skin tones, leading to dermatologists not necessarily knowing where to look for melanoma or what melanoma looks like on darker skin (Louie and Wilkes, 2018). The miseducation due to racial underrepresentation in medical education materials can then lead to feelings of underpreparedness in treating patients by practitioners.

To combat feelings of under preparedness in treating patients of color, several sources were created by doctors and medical students to help provide visual cues to skin conditions on darker skin. Some examples include Skin of Color Society, a website that informs healthcare providers and the public about dermatologic skin conditions on skin of color, a textbook called

Dermatology for Skin of Color, and a handbook called Mind the Gap. While these sources are important and useful, they are currently used as supplementary materials to help make up for the lack of information provided to practitioners in medical school. Due to these materials being supplementary, they are not primary sources in the medical school curriculum.

Even though there has been some acknowledgement of the disparity in representation, it has been on individual levels. The work done by these individuals is important, but on a more institutional level, there is still a lag in incorporating more skin tones into the literature. My research question is: what does the representation of race look like in medical school materials, specifically medical textbooks and how does the lack of adequate information on race in dermatology inform how race is accounted for in practice? My thesis is that there is racial bias in dermatologic medical training and how that is reproduced in the disparities present in diagnosing skin diseases on darker skin. In order to answer my research question, I took a materials-based approach. I looked at 151 medical schools in the United States to see if dermatology was part of their curriculum and I also looked at medical textbooks to analyze if and how race is shown in images in the textbooks.

LITERATURE REVIEW

The combination of inadequate dermatology curriculum, lack of adequate representation of darker skin in medical textbooks, and then the feeling of under-preparedness of practitioners all represent the structural implications mentioned in Critical race theory. Critical race theory, in the public health realm, is a methodology that looks at how people of color live in a society characterized by structural racism in the United States (Freeman et al., 2017). Specifically, it looks at how structural racism that is, intentionally or unintentionally, perpetuated by individuals

influences health care decisions and outcomes on patients of color (Freeman et al., 2017). In the realm of dermatology education, this appears in ways such as disproportionate rates of darker skin representation leading to biases in diagnosing certain skin conditions, such as melanoma or Lyme disease.

Regarding overall dermatologic education in medical schools, the impact and importance of learning about dermatology and skin conditions are not solely seen with dermatologists. Primary care physicians may be the first point of contact for many patients when dealing with skin conditions, so dermatology education is important for them as well. In a 2009 survey, 37% of primary care physicians felt that their medical school adequately prepared them to diagnose common skin conditions (Hansra et al., 2009). This number constitutes a combination of physicians who did and did not complete a dermatology rotation in their residency. When looking at the physicians who did not complete a dermatology rotation, 25% said that their medical school curriculum adequately prepared them to diagnose common skin conditions (Hansra et al., 2009). The data collected from the survey represented community-based practitioners in Fresno and San Francisco and residents in residency in a variety of locations such as Texas, Massachusetts, Alabama, California, and Ohio, among others. The lack of preparedness experienced by these primary care physicians can be seen in how accurately they diagnose skin conditions. Since primary care physicians may be the first point of contact for many patients, they need to accurately diagnose skin conditions so that certain populations are not at a disadvantage in their health care, such as with melanoma diagnoses. However, non-dermatologists correctly diagnose dermatologic conditions in 20-50% of cases (Cahn et al., 2020).

The accuracy and feelings of preparedness come from preclinical and clinical education in dermatology during medical school. However, not all schools have dermatology sections built into their curricula, contributing to the feelings of being unprepared. Overall, based on both Hansra et al. (2009) and Cahn et al. (2020) studies, dermatologic education today in general is lacking due to feelings of under preparedness experienced by physicians.

While the general information about the dermatology curriculum in medical schools is important, both Hansra et al. (2009) and Cahn et al. (2020) failed to mention how the inadequacy of dermatology education impacts dermatologists and how they feel practicing in the field based on their educational experience in medical school. Both studies discuss the perceptions and actual consequences of this education for primary care physicians but leave out dermatologists and the consequences for them. Additionally, neither the Hansra et al. nor Cahn et al. study mentioned how the race of the patient is factored into the education and diagnosis accuracy, where one study fails to mention how prepared primary care physicians feel when diagnosing conditions on skin of color and the other fails to mention how accurately non-dermatologists diagnose skin conditions on skin of color. Both studies look at the overall impact of the lack of dermatology education for primary care physicians, not specifying dermatologists or how race factors into these issues, ignoring how a large population of practitioners and patients may be impacted by dermatology education, or the lack thereof, in medical schools.

Hansra et al. (2009) and Cahn et al. (2020) both mention how there is a lack of adequate dermatologic education and how that translates into patient care and provider preparedness. To expand, Buster et al. (2012). mentioned how in various studies it has become evident that medical students are not as exposed to dermatology as much as they are exposed to other specialties in medical school. In a 2009 study conducted by Major Patrick E. McCleskey,

Colonel Robert T. Gilson, and Richard L. DeVillez, it was found that the average amount of combined preclinical and clinical hours for dermatology required by medical schools was 16.3 hours which had decreased since a 1997 study where the average was 18 hours. While it does mention how little time is required to be spent on dermatology, it does not necessarily account for how much of those 16.3 hours are spent learning how skin conditions appear and are treated on different skin tones. Buster et al. (2012) addresses elements of race in dermatology education and the impact it has specifically on dermatologists, filling in where Hansra et al. (2009) and Cahn et al. (2020) fall short. 47% of the dermatologists and dermatology residents surveyed reported that their medical school inadequately taught them how to address skin conditions in black patients according to a 2011 survey (Buster et al.). This group also mentioned how part of the reason they felt their education was lacking was due to the lack of exposure to black patients and training materials, mentioning how there was a greater need for these things (Buster et al., 2012).

The combination of Hansra et al. (2009), Cahn et al. (2020), and Buster et al. (2012) show the overall feeling of unpreparedness shared by practitioners (primary care and dermatologists) to treat skin conditions in general, and more specifically, skin conditions on patients of color. These sources show where medical schools are falling short in educating their students in certain specialties and with certain races.

Taking Buster et al.'s 2012 analysis on medical school materials a step further, studies have been conducted to analyze the presence of darker skin tones in medical textbooks. One such study was conducted by Patricia Louie and Rima Wilkes. Louie and Wilkes (2018) focused on medical textbooks and how often skin of color is represented in medical textbooks and in what

way it is represented, adding data to the assumption that health inequalities in dermatologic practice can be tied back to dermatologic education in medical schools.

Formal medical school curricula emphasize the equality of care concerning race, but when looking at medical textbook imagery, lectures, case studies, and clinical training, there is an unequal representation of a variety of skin tones (Louie & Wilkes, 2018). As a result, minority patients are not taken into consideration, leading to health disparities. This occurs due to the correlation of medical school presentation to clinical views. Meaning, when certain races or skin tones are underrepresented or only represented in a certain context, how the skin tone is viewed in a clinical setting will be closely associated with how medical schools present skin tone. Subsequently leading to differences in diagnosing and treating certain patients by either missing early signs of a condition, misdiagnosing a skin condition, or not diagnosing a certain condition at all. Louie and Wilkes (2018) looked at the most frequently assigned textbooks in anatomy courses at 20 top-ranked medical schools and analyzed images where the skin was visible, eliminating images of bone, muscle, diagrams, and internal organs. They used the Massey-Martin Skin Color Scale, a scale of 10 hands showing skin colors ranging from 1, light skin, to 10, dark skin, to determine skin tones present in the textbooks (see Figure 1). When doing their analysis, they noticed there was an overall lack of diversity, specifically mentioning how some chapters in these textbooks completely omitted darker skin tones, so there was no visual aid to help students, and later physicians, recognize how skin conditions can appear on different skin tones. With skin cancer, only one of the four major textbooks analyzed provided an image of melanoma. The image in this textbook put light skin at the forefront and only showed what skin cancer looked like on light skin tones. Instead, the book used the text to tell medical students to look elsewhere on the body (nails, hands, feet) for patients with dark skin (Louie &

Wilkes, 2018). Since there is no visual representation of what skin cancer may look like on darker skin, some physicians could end up missing the signs which could lead to later diagnosis of melanoma in patients with darker skin.

The observations from Louie and Wilkes (2018) show an area where the general dermatology curriculum, specifically the textbooks used, needs to be improved. While Louie and Wilkes did look at general skin tone representation in textbooks, they did not do a deep dive into skin conditions. They focused mainly on overall representation for any disease. While they mentioned skin cancer at one point, they did a topical analysis on six of the most common types of cancer, skin cancer being one, but not being the primary focus of their analysis. Additionally, they did not look specifically at dermatology textbooks used and how a specialty that focuses on the skin can have a lack of adequate representation. Again, leading back to how materials being used in medical school curriculum for dermatology education are not sufficient in their content.

Louie and Wilkes not looking at dermatology textbooks is where Ademide Adelekun, Ginikanwa Onyekaba, and Jules B. Lipoff (2021) pick up. In a letter to the editor, Adelekun et al. (2021) expand on Louie and Wilkes' study, as well as a 2006 study on dermatology education materials conducted by Tobechi Ebede & Art Papier (2006), to discuss current elements of education materials for dermatology students and practicing dermatologists.

Adelekun et al. did a more current analysis in January 2021 on the dermatology textbooks studied in Ebede & Papier's (2006) study and found a similar representation of skin diseases on dark skin with only one textbook showing a 1% increase in representation (Adelekun et al., 2021). Adelekun et al. (2021) did focus specifically on images with dermatologic diseases and focused on a solely visual representation of skin phenotypes, unlike Ebede & Papier's (2006) study. Overall, Adelekun et al. (2021) did find possible racial bias in dermatology textbooks. For

common skin conditions, such as acne or rashes, darker skin was not equally represented, however in certain infectious diseases, such as syphilis, darker skin tones were equally represented. This difference between the two types of conditions shows underlying racism due to the history of associating Black people with syphilis and it also could be attributed to not having clear pictures of common skin conditions on darker skin.

Towards the end of the letter to the editor, Adelekun et al. (2021) did briefly mention the consequences, underdiagnosis of conditions, of racial biases in medical textbooks and they did also offer a possible fix to the issue which is including a side-by-side visual representation of different skin tones for different diseases. At the end of the letter, they suggest referring to specific textbooks that do specifically focus on patients of color. Where this source falls short is that they did exclude some images from their analysis, including images of nails, palms, and soles. As Louie and Wilkes (2018) mentioned in their analysis of medical textbooks, melanoma in darker patients is typically seen in those areas. Adelekum et al.'s (2021) study does not account for that, which means that they did not look to see if there were images of what could be, darker skin and they did not evaluate the quality of appearance of darker skin. Overall, the combination of Louie and Wilkes (2018) and Adelekum et al. (2021) studies show that darker skin tones are inadequately represented in medical imagery.

Where Louie and Wilkes used the Massey-Martin Skin Color Scale to conduct their analysis, Adelekun et al. (2021) and Ebede & Papier (2006) used the Fitzpatrick skin type classification. The Fitzpatrick skin type classification, a sun-reactive skin typing system, was created in 1975 by Thomas B. Fitzpatrick for white skin classification to select the right dose of UVA needed for a photochemotherapy treatment for psoriasis. The original scale included skin types I-IV, with I being "always burns, never tans" and IV being "rarely burns, tans easily."

People were classified based on their personal responses to questions about how their skin reacts when exposed to the sun. People with darker skin (types V and VI) were then later included (see Figure 2). This skin typing system has also been adopted by the FDA in creating guidelines for over-the-counter sunscreen (Fitzpatrick, 1988).

Combining all the studies done on dermatology curriculum and then the studies done on medical textbooks shows that, dermatology education is lacking and dermatology education with a focus on skin tones is severely lacking. Overall, the knowledge of both issues shows how education in medical school impacts the way practitioners can treat their patients. These elements of disparities in the medical school curriculum for dermatology show a structural issue within medical schools that impacts patients of color. No matter how well-intentioned a primary care physician or a dermatologist is, the structural issues in their education in dermatology during medical school perpetuate negative health outcomes on patients of color. To answer my research question of what the representation of race looks like in medical school materials and how the lack of adequate information on race in dermatology informs how race is accounted for in practice, I plan to expand on the previous research mentioned here and look at medical education in relation to race representation through the lens of critical race theory.

METHODS

To address the question of how the lack of adequate information on race in dermatology informs how race is accounted for in practice, a materials-based approach was taken. The aim of the research was to draw a connection between dermatologic health disparities and dermatology education. As seen in the literature review, dermatology education falls behind education in other specialties, so an initial gathering of data from all 151 AAMC accredited US medical schools'

websites regarding curriculum and medical textbooks used was conducted. The purpose of this was to see how many schools offer a dermatology section to, first, expose students to the field of dermatology and how skin conditions may appear differently, and second, to prepare students for a dermatology residency where they may come into contact with patients of color. The purpose of gathering data from the medical textbooks was to see the rate of representation of darker skin tones in medical education literature, meaning how darker skin tones are pictured in medical education literature.

The focus was solely on medical schools in the 50 states of the United States, as well as the District of Columbia, that are members of the Association of American Medical Colleges (AAMC), so medical schools that were in Canada or US territories, such as Puerto Rico, were excluded from data collection. The data collected from the 151 medical schools was their undergraduate (the four years of medical school) medical school curriculum. When looking at the curriculum, I looked for three aspects: an independent dermatology section in the curriculum, a dermatology section that is combined with another specialty, and dermatology offered only as an elective. To be specific, the keyword "dermatology" was searched for. If the content of the curriculum was not clear, the school was emailed for clarification on whether dermatology was offered. In doing this, I saw which schools may provide more education on dermatology.

There were two sets of textbooks that were analyzed for this paper. The first being general medical education textbooks, such as anatomy textbooks and diagnosing textbooks. General medical textbooks were used to gauge what dark skin representation looks like if a program did not have a dermatology program. The second was textbooks focused primarily on dermatology. To find the dermatology textbooks, the schools with independent dermatology programs had their course textbooks looked up through the school's website, or through

LibGuides. If the textbooks were not online, the school was emailed to determine what textbooks they used.

In gathering data on the general medical textbooks, 10 schools were randomly chosen. The medical schools were listed from 1 to 151 on an Excel spreadsheet. Using a random number generator, the number that was given was then matched to the school with that number on the spreadsheet. Those 10 schools then had their textbook list pulled from online textbook lists provided by the school, typically a LibGuides website specific to the school. The top three textbooks from those 10 schools, *Atlas of Human Anatomy* (2019)*, Bates' Guide to Physical Examination and History Taking* (2017), *Clinically Oriented Anatomy* (2018), were then used to analyze. The images analyzed were of real people, not illustrations. One textbook did only have illustrations, so those images were analyzed for that textbook only. Additionally, stock photos depicting a doctor-patient relationship and not specifically a diagnosing tactic were excluded. For dermatology textbooks, the schools with a sole dermatology section or a combined curriculum section had their dermatology textbook list pulled. The top three dermatology textbooks used in those programs, *Fitzpatrick's Color Atlas* (2017), *Principles of Dermatology* (2018), *Dermatology* (2018), were then analyzed. The number of times darker skin tones were present was counted and then analyzed. Darker skin tones were determined using the Fitzpatrick skin scale with a number of V (5) and VI (6). Using Fitzpatrick's definition, skin type V is considered brown skin and skin type VI is considered black skin. Skin types I-IV were all considered white using those definitions and were therefore excluded. Due to the COVID-19 pandemic and my remote position away from Vanderbilt's campus, online versions of the textbooks were used through access from Vanderbilt library. If an online textbook was not available, a hard copy was acquired from libraries near my place of residence.

RESULTS AND DISCUSSION

To fully understand the current aspects of medical school education through the lens of critical race theory, there first needs to be a historical backing into how medical education became a system in the first place. Medical education became a system when certain demographics were excluded from entering medical schools to become doctors. Women and minorities had restricted access to medical education,requiring these groups to find other ways to gain medical education and leaving the spots in most existing medical institutions to white men. Women and minorities typically gained their education through segregated institutions with only a few stories of success at the white male dominated institutions. There were 14 Black institutions that were set up as church missionary or proprietary institutions. This was the arrangement until the Flexner Report in 1910. The Flexner Report, released by Abraham Flexner, analyzed the academic rigor of medical institutions, comparing them to Johns Hopkins University, to decrease the number of medical institutions and improve the quality of teaching (Duffin, 2015). If the medical schools did not or could not live up to the standards, they would close. By 1923, only 2 of the 14 Black medical schools survived. This was due to the structural aspects that were impacting all medical schools, but also because there was targeted language towards Black institutions. Flexner's comments reflected white attitudes towards black people in general, but also more specifically in the realm of medicine such as black physicians having a limited role in practice and having less potential than their white counterparts (Savitt, 2006). Medical school admittance for women and minorities into the traditional white male medical space eventually became possible, but difficult. Until 1973, social pressures impacted limiting quotas on medical school admissions making it difficult for racial and religious minorities and

women to get into medical school (Duffin, 2015). This progression of medical education and medical school admittance displays the systemic nature of medical education that still has lasting effects today, such as the type of education that is received.

As mentioned earlier, widespread dermatologic education is lacking and in the dermatologic education that is present, darker skin tones are not sufficiently represented. Darker skin tones are less present in images than lighter skin tones or they are only mentioned as a footnote, resulting in less than ideal circumstances surrounding the diagnosing of skin conditions for patients of color. Having images depicting conditions on dark skin in addition to light skin provides a greater ability to accurately diagnose conditions. When speaking to both primary care providers and dermatologists, both groups felt as if their medical school education did not adequately prepare them to diagnose and treat skin conditions in the field of dermatology (Hansra et al., 2009). The lack of adequate education to treat any skin conditions, but more specifically skin conditions on various skin tones can be detrimental to a patient's health. The systemic failure to educate practitioners on dark skin has a negative impact on dark skin patients. The medical education system still centers light skin which leads to the perpetuation that light skin individuals are more impacted than darker skin individuals.

Medical School Curriculum

Dermatology as a Stand Alone Course.

Dermatology is not overwhelmingly taught in medical school. Often, doctors learn how to specialize in dermatology during the last two years of medical school through electives and during residency. Out of the 151 AAMC accredited medical schools in the US, five (5) had an independent dermatology course in either the pre-clerkship (typically years 1 and 2) or clerkship

(typically years 3 and 4) curriculum. For 6 medical schools, it was unclear if there was a stand alone dermatology course. There are very few programs that establish dermatology as an important enough part of the curriculum to warrant a stand alone course. These five programs have the most dermatology education available to students as it is required that they take the course. Having a stand alone course provides prospective dermatologists and primary care physicians with a solid footing into the field of dermatology. While these schools provide a background into dermatology, that is still only a small number of physicians relative to all future physicians who have a firm grasp on dermatology. As a result, there are more medical students who have less of an educational background in dermatology during their undergraduate medical career.

Dermatology as a Subsection

Instead of having a stand alone course in dermatology, more programs have small dermatology sections that are built into certain sections of the curriculum. Out of 151 medical programs, 84 had dermatology built into a section of their curriculum. Essentially, dermatology is given a short amount of time in a particular unit, most commonly the musculoskeletal unit, to be taught to medical students. It was unclear if 8 medical schools had dermatology programs built into a section of their curriculum. A combination of 91 out of 151 medical programs find dermatology relevant enough to include in some aspect in their required undergraduate medical school education. Adding the 5 programs with stand alone dermatology programs to the 84 programs with dermatology built into a section provides better odds for an educational background in dermatology. However, the programs with a dermatology subsection have less of a grasp of dermatology than those with a larger, sole unit in dermatology. Given that there are a wide array of topics that need to be covered in medical school, all subsections covered in

medical school are no more than a couple of weeks. As a result, it is difficult for medical students to get an in-depth understanding of dermatology conditions. Lacking a solid base in dermatology then requires a bulk of dermatology education to be placed in dermatology electives and residency programs.

Dermatology as an Elective Course

If students wish to gain more knowledge in dermatology, 137 medical programs offer dermatology electives that can be taken in the third or fourth year of medical school. There are 50 programs where medical students would have to rely solely on dermatology electives to fully prepare them for dermatology residencies. Schools that offer dermatology as an elective give prospective dermatologists first priority for limited spots or reserve the class for those individuals who plan to pursue a career in dermatology.

This means that primary care physicians are left with the bare minimum, putting them at a disadvantage in their education. It is essential for primary care physicians to receive some sort of dermatology education as they are typically the first point of contact for most patients. Physicians in primary care subspecialties, such as outpatient internists and family medicine physicians, dedicated at least 4% of their visits to dermatologic conditions (Hansra et al., 2009). Due to primary care physicians being the first point of contact, they need to be well versed, or at least somewhat familiar enough, in skin conditions to make the decision to either treat with them or send the patient out to a dermatologist. To become familiar with dermatologic conditions, primary care physicians would have to take it upon themselves to further their education by including supplemental information to adequately care for their patients overall. However, there is not enough focus on dermatology overall to provide students, specifically students who plan to go into primary care, with adequate information to prepare them to diagnose skin conditions.

Textbooks

Analysis of textbooks shows that for schools with and without substantial dermatology education, medical students are exposed more to medical conditions on white/light skin. Darker skin tones are poorly represented in these educational materials. In addition to the images in the textbook, language surrounding the conditions use phrases, such as “appears red or pink.” However, the description and the depiction of impacted individuals are not accurate for everyone. Young, white/light skin, and able-bodied individuals are seen as the normal in these textbooks. The consistent theme of the images shape provider perception of who is most likely to be impacted by conditions or diseases and how to go about treating them. These themes leave out a substantial part of society and provide a baseline of understanding what the medical education system views as “normal.” It is important to recognize the representation, or lack thereof, in these textbooks and reflect as to how those issues may impact a patient of color further down the road.

In the three general medical textbooks that were analyzed, dark skin representation in images were all less than 15%. This was the case when dealing with anatomical drawings and actual images of people.

Light skin is depicted and seen as the norm even if skin does not need to be represented. In *Atlas of Human Anatomy* by Netter, all the images were anatomical drawings with different artists throughout and a majority of the images were of white skin. Out of the 290 depictions of anatomy with skin present in this textbook, only 1 depicted dark skin. Dark skin representation in this textbook was at 0.34% of the total images. It is also important to note that this textbook was strictly an anatomy textbook, meaning there were no images depicting diseases or conditions where someone’s skin may be relevant to the image. The images present, again, were all

anatomical drawings with an outline of skin surrounding the anatomical drawings. The content of this textbook makes it clear that race is not at all relevant and essentially unnecessary to the information that is provided, but white/light skin is still seen as the default color for medicine. This textbook had the least amount of representation out of the three general textbooks analyzed, but the other two textbooks also have representation issues.

The next textbook, *Clinically Oriented Anatomy* by Moore was better in terms of representation. This textbook had images of real people with anatomical illustrations overlaid (see Figure 3). *Clinically Oriented Anatomy* is a balance of anatomical depictions and condition depictions. This textbook had a total of 316 images showing actual people. Out of those 316 images, 31 were of darker skin, making dark skin representation in this textbook 9.8% of the total images. This is significantly better than *Atlas of Human Anatomy*, but still not adequately representing dark skin. Most of the images of darker skin rested in one chapter. The textbook had a total of ten chapters and half of those chapters had zero images depicting dark skin. As this textbook has less diagnosing, similarly to *Atlas of Human Anatomy*, it may not be as important to have race represented, which means there should not really be a clear difference in representation. Since there is a large disparity, it shows that white/light skin is still seen as the default.

The most thorough general medical textbook out of the three analyzed was *Bates' Guide to Physical Examination and History Taking*. The entire textbook focused on conditions and how to treat them. It consisted of 20 chapters, one of which was Skin, Hair, and Nails. *Bates'* had a total of 636 images that displayed skin color throughout the book and 68 of those were of dark skin, making the total dark skin representation 10.7% of the entire book. As *Atlas* and *Clinically Oriented Anatomy* had significantly less images, it is almost understandable that their

representation of darker skin did not break the 100s. However, with the number of total images in this textbook, there should be more depictions of dark skin. This trend is also clear in the Skin, Hair, and Nails chapter. This chapter contained more images than any other chapter at 157 images, however there were only 9 images (5.7%) that depicted dark skin. This chapter is an issue because it did focus on skin, hair, and nails. In the Skin, Hair, and Nails chapter, there were several conditions that were discussed, one even being melanoma. With melanoma, the diagnostic criteria was mentioned with pictures for each criterium. None of the pictures for the criteria included images for dark skin. In the section describing melanoma, there was not even an indication of where to look for darker skin patients. Instead, there was one image with a dark skin patient under another section, called melanonychia, that showed a dark streak on the nail. Based on the description next to the image, melanonychia is more of an aesthetic issue than anything else, making it pretty much harmless. However, the very last sentence of that description mentioned that doctors may test it just to make sure that it is not melanoma. There was no indication of the streak having the possibility of being cancerous until the very last sentence. As *Bates'* is different from the other two textbooks analyzed because it is more about how to diagnose and treat conditions, it is dangerous that darker skin is not adequately represented. The images in this textbook showed what conditions could look like on the body, but it did not show how conditions could appear on different skin colors, therefore making it difficult to accurately diagnose skin conditions on darker skin, putting those patients in danger if this textbook is not supplemented with another source that has more representation of darker skin.

With all three of these textbooks, it is apparent that dark skin is not considered. The trend of dark skin being an afterthought in educational materials then translates over into dark skin

being an afterthought in medical practice. There needs to be more representation in these general textbooks or patients will be at a disadvantage. While these textbooks are not specific to dermatology, the lack of representation of darker skin identifies areas where there needs to be improvement in educational materials in medical school.

Three dermatology textbooks were observed, *Principles of Dermatology*, *Dermatology*, and *Fitzpatrick's Color Atlas,* and four out of the six most commonly presented skin diseases were looked at. Doing case studies of acne vulgaris, atopic dermatitis, melanoma, and psoriasis allowed a depth of understanding to race in relation in common conditions. This means that doing these case studies allowed an inside view as to how race is represented and described in relation to the most common skin diseases ranging from minimal physical implications (acne vulgaris) to serious physical implications such as death (melanoma).

Acne Vulgaris

Acne vulgaris, more commonly known as acne, is a common skin condition that dermatologists routinely see (Marks & Miller, 2019). Acne has multiple causes and factors that impact how it appears and how it is treated. Typically, acne can appear as non-inflammatory lesions, called comedones consisting of two types (white heads and black heads), and inflammatory lesions appearing as papulopustules, nodules, and/or cysts (Marks & Miller, 2019). Acne is one of the most common skin conditions that does not discriminate amongst skin color. It affects everyone, regardless of race or skin color which means there should be a proportional amount of representation in dermatology textbooks. Individuals with light skin are not the only people affected by acne. Even though acne may not be life threatening or physically harmful to the individual, there is still a burden associated with having acne which showcases how important it is to treat acne for everyone impacted by it-regardless of skin color.

As previously mentioned, acne is incredibly common with 40-50 million people each year in the United States being impacted by acne, also resulting in a global dermatologic disease burden of 16% (Bolognia et al., 2018). Having acne, depending on the severity of it, can be extremely detrimental to an individual's self esteem leading to increased likelihood of social isolation, anxiety disorders, and depression (Bolognia et al., 2018).

Incidences of acne tend to have an onset time of puberty with peak occurrences happening during adolescence with 85% of individuals between the ages of 12 and 24 being affected by acne (Bolognia et al., 2018). Even though acne is typically associated with adolescence, people can get acne at any time in their life or can even still be affected by acne beyond adolescent years.

Understanding that acne is the most common skin condition that dermatologists see should mean that there is a proportional amount of people with different skin tones that they see, meaning that there should be an equal amount of representation in dermatology textbooks. While this would be the ideal circumstance, this is not at all the case. There was a combination of 54 images of acne vulgaris between all three dermatology textbooks. Out of those 54 images, a total of 5 were of skin type V or VI. The *Principles of Dermatology* textbook made up most of the dark skin representation with 3 out of 10 images. The *Dermatology* textbook made up the least amount of dark skin representation with 1 out of 26 images. As acne is incredibly common, affecting everyone regardless of race (Bolognia et al., 2018), there needs to be more representation in these textbooks. If darker skin is not represented under a common skin condition, that speaks for how darker skin may be represented in other, less common skin conditions. Additionally, treatments of the acne and just general treatment from the

dermatologists can differ based on not being as familiar with acne on darker skin. Darker skin patients are not considered in medical school textbooks or in practice.

Psoriasis

Psoriasis is a chronic, immune related skin disorder. It is commonly regarded as an autoimmune disease, however, there has not been an autoantigen that has been definitive as the primary reason for psoriasis, so instead, psoriasis is considered an immune-mediated disorder (Bolognia et al., 2018). Statistically, psoriasis does impact white Americans more than other races, but that does not mean that psoriasis does not impact other individuals. When looking up characteristics of psoriasis in the textbooks, it was commonly stated that psoriasis was characterized by "red" or "pink" lesions among other characteristics. On individuals with lighter skin, it is very easy to see red or pink, however that is not always the case for darker skin individuals. Having depictions of darker skin is important when the description does not align with reality for people with darker skin.

Psoriasis is characterized by plaques and scaly papules that can be localized in one area of the body or spread out. Typically, psoriasis is located on the scalp, elbows, and knees. How psoriasis works is due to an accelerated cell cycle. Essentially, cell turnover is increased exponentially with transit time for the cells to travel from one layer of skin to the next decreasing, which means that the process is occurring too quickly for the cells to shed (Marks & Miller, 2019). Due to the appearance of psoriasis, individuals may face social stigmatization from their peers, impacting daily life and self esteem.

Overall, there are 3-5 million people in the United States with psoriasis (Wolff et al., 2017). Psoriasis impacts about 4.6% of the white United States population in comparison to 0.4%-0.7% for Africans, African Americans, or Asians (Bolognia et al., 2018). Overwhelmingly,

this shows that white Americans are more impacted by psoriasis than other races in the United States. The onset of psoriasis can occur at any age, but most initial flare ups seem to occur between the ages of 20 and 30, where ~75% of patients had an onset before 40 years of age, and then again between the ages of 50 and 60.

There are several treatments that can be used to treat psoriasis, but one in particular stands out. This treatment is called photochemotherapy. The creation and implementation of this treatment is what prompted the creation of the Fitzpatrick skin color scale. Photochemotherapy is a pillar in psoriasis treatment. Initially, patients were exposed to either UVA or UVB light and followed that treatment with a topical or oral treatment. The same overall structure is used today, but a certain type of narrowband UVB was developed and proved to be effective, so that particular type of UVB is what is used in psoriasis treatment (Bolognia et al., 2018).

When people in the United States hear the term psoriasis, they may think of medication commercials for the treatment of psoriasis, such as Cosentyx. In commercials such as those, darker skin is not necessarily represented. This could be due to the fact that there is a huge difference in prevalence rates, however those commercials are used for the public to go to their doctor to ask about it. Dermatology textbooks are meant for doctors on the other end, to learn what psoriasis is, what it looks like, and possible treatments for it. It is the doctor's responsibility to know what to look for in their patients in order to accurately diagnose and treat psoriasis. Unlike acne, psoriasis does not have purely social implications, but actual physical implications as well. Additionally, there are a few more in depth treatments that may need to be tailored to an individual, such as photochemotherapy, based on their skin tone. Making these decisions cannot happen if doctors do not have adequate visual representation on a variety of skin tones.

Combining all of the images between the three textbooks, there were a total of 73 images. Only 3 images total between the three books represented dark skin. *Dermatology* had the most representation with 2 out of 32 images of dark skin and *Principles of Dermatology* had the least with 0 out of 5 images. While the overarching characteristics of psoriasis such as the plaques or scaly pustules are standard across the board regardless of skin tone, there are very specific images that come to mind when thinking of psoriasis, such as the color of the impacted area. As mentioned there are a few treatments that need to take skin color into account. That is why the Fitzpatrick skin scale, which is still used today, was expanded to include type V and VI skin colors. The original photochemotherapy treatments that were being used for light or white skin did not work for individuals with darker skin because of the differing UVA and UVB exposures. This addition to the scale is a prime example of why dark skin representation is important.

Atopic Dermatitis

Atopic dermatitis, or eczema, is the most common chronic inflammatory skin condition. Similarly to acne, it is expected that this would mean an adequate depiction of a variety of skin tones would be present in education materials such as dermatology textbooks. With atopic dermatitis, this is still not realistically the case. Out of all four conditions that were analyzed, atopic dermatitis had the most dark skin representation, but the representation was still below 30% of the total images. *Principles of Dermatology* had the least amount of images, but the most representation comparatively with 2 out of 4 images representing dark skin. On the other hand, *Dermatology* had the most images, but the least representation with 8 out of 37 images representing dark skin. When looking at the triggers for atopic dermatitis, it is very clear that just about anything could trigger it for anyone. Due to the commonality, it is clear that representation is important. One of the primary treatments of atopic dermatitis is education on the condition.

The reality is that there could be a difference in how an individual is educated based on their skin color. This is not necessarily due to blatant racism, but due to the fact that practitioners themselves may not be fully educated on how atopic dermatitis can appear on dark skin and the best ways to work to treat it (Burgin et al., n.d.).

Atopic dermatitis is defined as an acute, subacute, or chronic relapsing skin disorder. Similarly to psoriasis, atopic dermatitis has flare-ups where the skin becomes leathery and patchy due to scratching. Atopic dermatitis is actually known as the "itch that rashes" due to the fact that rubbing or scratching an area can initiate these flare-ups. Atopic dermatitis actually has a variety of triggers such as microbial agents, food allergies, different seasons, stress, and types of clothing such as (Wolff et al., 2017). There are three subsets of atopic dermatitis depending on the age of onset: early-onset type beginning in the first 2 years of life, late-onset type beginning after puberty, and senile-onset type beginning after 60 years of age (Bolognia et al., 2018).

Atopic dermatitis is more common in children with a prevalence peak of 15-20% in childhood, typically after 2 months of age. By the age of 5, 90% of all people who will develop atopic dermatitis have also developed it (Marks & Miller, 2019). While that does seem like a lot of people, 90% of people with early-onset dermatitis tend to outgrow it by the time they reach adolescence (Marks & Miller, 2019).

Atopic dermatitis is a chronic disease with relapsing flare-ups so treatments can differ. Originally, short-term treatment regimens were used for acute flare-ups, but as we learned more about the mechanisms of atopic dermatitis, long-term maintenance is now recommended. Treatment can include education of atopic dermatitis and its triggers, gentle skin care, moisturizer use, and anti-inflammatory therapy (Bolognia et al., 2018).

As previously mentioned, education on atopic dermatitis and its triggers is one course of treatment for the disease. Allowing poor representation of dark skin in textbooks makes it difficult for doctors to know what it looks like on dark skin, which in turn makes it difficult to educate the patient on their condition. This is a prime example of critical race theory. The medical education system fails their students in understanding conditions on different skin colors which then fails dark skin patients leading to health disparities. It may not be the individual doctor's intention to delay diagnosis, as was the case with Deidra McClover mentioned earlier, but because doctors are participants in this system, they perpetuate health disparities.

Melanoma

Melanoma is a form of skin cancer arising from the malignant transformation of melanocytes in the skin. It is actually the most common type of skin cancer found in young adults. Incidence rates of melanoma have been increasing every year with the annual increase of incidence being between 3% and 7% (Bolognia et al., 2018). The mortality rates In order to have better survival rates of melanoma, early detection is key.

In order to diagnose melanoma, there are several diagnostic clues. One, which has been made most widely known to the public, is the ABCDEs (Asymmetry, Border irregularity, Color, Diameter, and Evolving) of melanoma. This diagnostic criteria has been used to determine if a spot on the body should be looked at to determine if it is cancerous. Additionally, dermatologists may use the EFG rule which stands for elevated, firm, and growing. Using these tools can help to diagnose certain spots on a patient. However, diagnostic accuracy for melanoma is below 75% or 90% if using dermoscopy (Bolognia et al., 2018). This means that certain melanoma can still be missed. Part of this discrepancy could be due to the fact that there are four types of melanoma

that are recognized: superficial spreading melanoma, nodular melanoma, lentigo maligna melanoma, and acral lentiginous melanoma. The first three mentioned do primarily impact those individuals with lighter skin, however it is important to understand that they are not the only individuals that can get those particular types of melanoma. Having poor representation in medical educational materials then leads to the melanoma health disparity with skin cancer being more prevalent in non-Hispanic white people, but having a higher mortality rate in Hispanic and Black individuals (Buster et al., 2013).

Melanoma primarily affecting light skin. There are three types of melanoma that primarily impact individuals with light skin: superficial spreading melanoma, nodular melanoma, and lentigo maligna melanoma. These specific subtypes of melanoma make up the majority of all melanoma cases, which is where we see higher prevalence rates in non-Hispanic white people.

First, superficial spreading melanoma (SSM) is the most common type of melanoma in people with fair/light skin, coming in at 70% of all melanoma cases, but 2% of brown or black skin individuals also get this type of melanoma (Wolff et al., 2017). It typically occurs between the ages of 30 and 60 years old and appears on the trunk of men and the legs of women. Women do tend to have a slightly higher incidence rate than men in this particular type of melanoma. Superficial spreading melanoma is typically a range of brown to black in color with irregular, notched borders and an elevated, flat lesion. While this particular melanoma is more common in individuals with lighter skin, it was clear that darker skin individuals can get this type of melanoma. However, there was no depiction of what it could look like on dark skin in the textbooks that were analyzed. All of the images were of light skin.

Nodular melanoma (NM) is the second most common type of melanoma in people with fair/light skin, accounting for 15-30% of all melanoma cases (Bolognia et al., 2018). Even

though NM is the second most common type of melanoma in people with fair/light skin, it can occur in all races. This type of melanoma can occur anywhere on the body but is typically on the trunk of the body and the head and neck. Most times NM is present, it is ranging in blue to black in color and is uniformly elevated, but on the rare occasion, it can appear lighter in color, like a red or pink (Bolognia et al., 2018). Again, the color depictions are clear on lighter skin, but it can be harder to distinguish on darker skin.

Lentigo maligna melanoma (LMM) is one of the least common types of melanoma ranging from approximately 5-10% of all melanoma cases. It typically occurs in older individuals with chronically sun-damaged skin, making this type of melanoma rare in brown and black skin individuals. This type of melanoma frequently occurs on the face, neck, and forearms.

In the analysis of melanoma as a whole and more specifically, these three types of melanoma, there were no images of dark skin. This could be due to the fact that the prevalence of these types of melanoma in dark skin individuals is rare. However, even if it is rare for individuals with dark skin, it is not impossible to get these types of melanoma. All three types of melanoma that were mentioned in the textbooks mentioned certain colors that accompany the lesion. Along with those color descriptions there were images of what that would look like on light skin. The images on light skin show enough of a differentiation in color to tell if there are notched borders or an irregular shape, however it is unsure if the same could be said for dark skin as there are no images to tell what that would look like or if it would be easy to pick out as abnormal and possibly cancerous. Looking at the images in the books, it was easy to see how the color and shape of these lesions would stand out against light skin. As melanoma is the deadliest

skin condition that has been analyzed, more depictions of dark skin are necessary to make sure that patients are being diagnosed and treated in a timely manner to increase survival chances.

Acral Lentiginous Melanoma (ALM). Acral lentiginous melanoma (ALM) is fairly uncommon in relation to the other types of melanoma, accounting for ~5% of all melanomas. ALM appears on the palms of the hands, soles of the feet, and around the nail (see Figure 4). While the incidence of ALM is the same across racial lines, people with darker skin have a disproportionate percentage of ALM because they rarely have other sun-related types of melanoma. In lighter skin tones, ALM makes up about 7-9% of all melanoma cases, but for African Americans, typically with darker skin, it makes up 50-70% of all melanoma cases.

ALM is typically a slow developing tumor that is asymmetric with irregular borders and ranges from brown to black in color. Due to the places this type of melanoma is most frequently found, there is difficulty in differentiating ALM from other non-cancerous lesions leading to a primary misdiagnosis in one-third of all patients. Due to both, this type of melanoma is diagnosed at a later stage, making the survival rate poor.

Out of all four melanoma subtypes, this acral lentiginous melanoma was the only one that had a depiction of darker skin. In addition to being the only melanoma that had an image of darker skin, only one textbook, *Principles of Dermatology*, showed what it would look like on dark skin. The image was of the cancer in what appeared to be a very advanced stage of the melanoma on the sole of the individual's foot (see Figure 5). While that is better than the other two textbooks, there were no other images. Due to the locations this type of melanoma could appear in, the appearance of the melanoma could differ drastically based on where it is. There was no image of what an earlier stage version looked like anywhere on the body and there was no image in any of the textbooks that showed what it could look like on the nail bed or on the

palm in darker skin individuals. The lack of imagery further contributes to delayed diagnosis or misdiagnosis. It is already difficult to differentiate ALM from other, benign skin conditions or lesions such as melanonychia, but that difficulty is increased when there are not even images to help show what melanoma in those typical areas would look like.

Due to the impact melanoma has on individuals with darker skin resulting in higher mortality rates, it would make sense for the dermatology textbooks to include more images on what melanoma looks like on dark skin. The combined images in the melanoma chapter in all of the textbooks had the least amount of dark skin representation coming in at 1 out 83 images or 1.2% of all visual representation. The one image was of the melanoma type most common for dark skinned individuals, acral lentiginous melanoma, and present in one book: *Principles of Dermatology.* Being able to tell the difference between a non-cancerous lesion and a cancerous lesion are incredibly important. For the one image of ALM on a nail bed, the skin was white. However, it has been shown that ALM can be mistaken for melanonychia, a benign condition that occurs on the nail bed, occurs more frequently in darker individuals, and can look similar to ALM. To not have an image of ALM on the nail on darker skin is dangerous as mistaking the cancer, which is most common in dark skin individuals, with a benign lesion, also most common in dark skin individuals, can severely delay diagnosis, in turn decreasing survival rates. While one image is better than none, it is insufficient to the overarching education of melanoma obtained by doctors.

Exposure to different skin colors during medical education is important in making sure that darker skin tones are not completely left out of receiving adequate treatment. The lack of dark skin representation shows the structural racism at play in the medical education system, specifically with the type of education and knowledge given to medical students. Since future

doctors may not know what a disease looks like on darker skin, they then perpetuate the structural racism and it is reproduced in the outcomes for patients with darker skin. This is how critical race theory takes shape in the realm of medicine.

LIMITATIONS

The skin color scale used in this paper, the Fitzpatrick scale, was created in 1987 and consisted of three different scales showing a progression of skin color due to sun exposure. It started with skin that was unexposed to the sun with no tan and ended with skin seven days post sun exposure with a tan. This scale has proved useful in many different ways, such as ensuring accurate doses of UVB radiation for psoriasis treatment, however the scale also has downfalls. First, the scale is completely subjective. If a researcher is not using the criteria questions set forth by Fitzpatrick, such as the analysis done in this paper, skin color could be perceived differently by different people. Additionally, it appears that most modern versions of the scale base the categorizations on the last scale used by Fitzpatrick (i.e. the seven day post sun exposure scale) depicting more gradual changes in skin color (see Figure 6).

There is also an issue that people do not fall neatly into six categories of skin color, especially when looking at pictures and it is unclear if the skin color is unexposed to the sun, meaning there is no tan, or if it was exposed to the sun. When looking at the scale Fitzpatrick created and is in his paper, there is a drastic difference in sun-unexposed skin type IV and skin type V in the first two scales. This is an issue when looking at images as the researcher cannot contact the person in the images to ask how their skin reacts to sun exposure, making it difficult to accurately place people into a category.

Even though darker skin individuals have lower incidence rates in all of these skin conditions, it does not mean that there are none. Having very little to no representation of dark

skin in medical education is detrimental to the health of dark skin individuals. There is no visual guide to what these conditions could look like on dark skin, so for the individuals who do have these conditions and do come in to receive treatment, they are put at an extreme disadvantage. For textbooks such as *Dermatology* and *Color Atlas*, it makes no sense to not have depictions of darker skin. *Dermatology* was the most in depth textbook about dermatologic conditions that was studied and *Color Atlas* used images to help depict diseases. The lack of dark skin imagery in general medical textbooks and dermatology textbooks goes back to the importance of understanding critical race theory. The insufficient representation makes doctors less educated on conditions on dark skin. This means that they cannot treat dark skin patients to the best of their ability, further perpetuating harm on dark skin patients.

CONCLUSION

Dermatology, a specialty focusing on skin, does a poor job in educating future dermatologists and other doctors on how to care for dark skin. Multiple studies have shown how dark skin is not represented in medical education materials, yet there have not been any changes to the educational structure, resulting in feelings of under preparedness. Primary care physicians and doctors feel as if their dermatology education did not prepare them to adequately treat dermatologic conditions. As seen, there are very few programs that offer a sole dermatology course in their curriculum meaning medical students from other programs have to find ways to supplement their education in order to accurately treat patients. This could be done through textbooks, but the textbooks that are most popular in medical school for general education and dermatology education only expand on a certain group. There is little to no representation of dark skin within these textbooks. Since primary care physicians and dermatologists made it clear that they felt underprepared with the education that they do have, an education with a strong

emphasis on lighter skin, it is reasonable to assume that they feel even less prepared to diagnose dermatologic skin conditions on darker skin tones.

The representation should already be included in medical education textbooks; individuals should not have to create supplementary materials on what skin conditions look like for dark skin. Having to include supplementary materials on dark skin also decreases the chance that providers who do not actively think to include dark skin will learn how to care for dark skin.

In order to combat feelings of under preparedness in treating patients of color, several sources were created by doctors and medical students to help provide visual cues to skin conditions on darker skin. First, Dr. Susan C. Taylor created the Skin of Color Society, a website that informs healthcare providers and the public about dermatologic conditions on skin of color. While working to educate these populations about dermatologic conditions on skin of color, there are also partnerships nationally and internationally to ensure that there is success in treating everyone with skin of color. These partnerships are with dermatologists, professional medical organizations, and other community, corporate, and industry groups. In addition to creating the Skin of Color Society, Dr. Taylor also created a textbook called Dermatology for Skin of Color in order to teach doctors and medical students what skin conditions look like on skin of color. Many dermatologists did find this to be helpful and an imperative part of their practice, but they, as well as Dr. Taylor, expressed frustration with the fact that even today, there has to be supplemental information provided in order to accurately diagnose all patients with different types of skin tones ("Lack of Darker Skin in Textbooks, Journals Harms Patients of Color," 2020). In addition, similarly to how Dr. Taylor created a textbook to show dermatology conditions on skin of color, one Black medical student in London, Malone Mukwende, sought to address the lack of skin of color representation. He recognized how when discussing how certain

symptoms could appear on skin (i.e. blue-ish tint or a red rash) and general skin conditions, that darker skin tones were left out and not really addressed. In order to solve this, Mukwende, as part of a student-staff partnership program, created a handbook called Mind the Gap. This handbook details clinical symptoms and the appropriate language needed to describe what conditions look like on darker skin. As of August 2020, the handbook is free and available to download on Mukwende's website, Black and Brown Skin (*Mind the Gap Handbook Now Freely Available Online*, 2020). While Mind the Gap and Black and Brown Skin were created by a medical student in London, the reasoning behind creating it speaks to the issues that are present in the United States as well.

Both Dr. Taylor and Malone Mukwende created sources that could be used to help improve dermatologic treatment for darker skin patients. They both recognized and understood the implications of not having accurate representation of dark skin in medical education materials: patients with darker skin are at a disadvantage. These sources have already been created, but now they need to be implemented into medical, more specifically, dermatology education materials. Ideally, newer editions of the most popular medical and dermatology textbooks would include more images of darker skin, such as a side-by-side of light skin versus dark skin, or even showing a condition on a scale of skin color ranging from light to dark. Another option is to require the use of the *Dermatology for Skin of Color* textbook in dermatology courses. There needs to be more of an effort into including dark skin in educational materials, because lives depend on it. The current educational materials used in medical schools show an antiquated view on who is affected by medical disorders and diseases and how they are affected. In order to increase physician preparedness and improve the care received by darker skin patients, darker skin needs to be represented in the educational materials in medical school.

If darker skin is not included appropriately in medical education materials, the same issues of improper and inadequate care for darker skin patients will be repeated. These changes need to be made on an institutional level as well as a national level to make progress towards improving the dermatologic health for patients with dark skin.

FIGURES

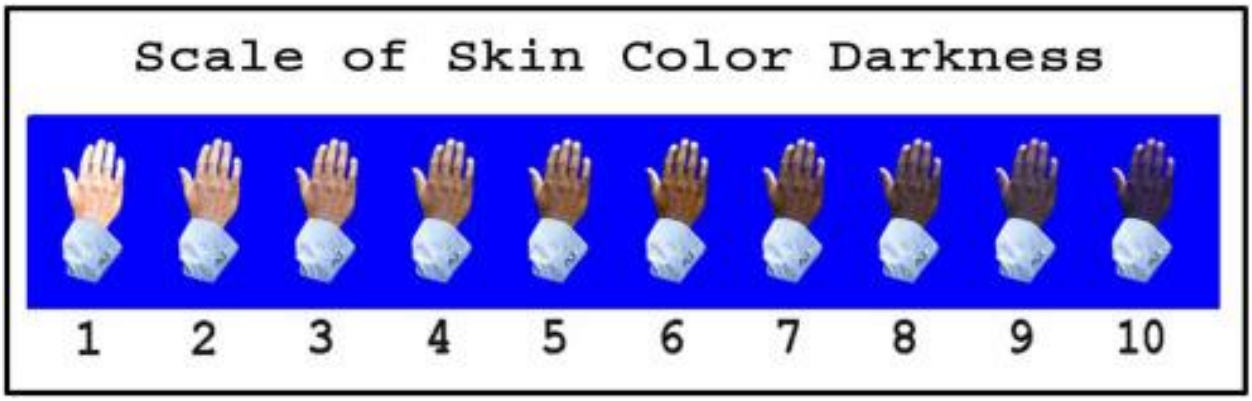

Figure 1. Massey-Martin Scale. From Louie and Wilkes (2018)

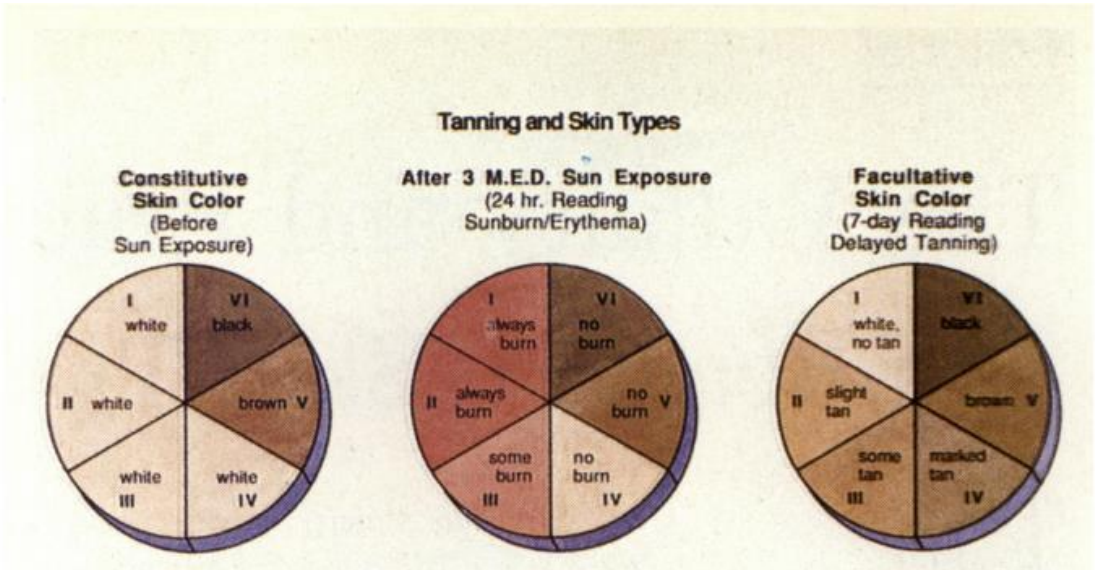

Figure 2. Fitzpatrick skin type classification. (Fitzpatrick, 1988)

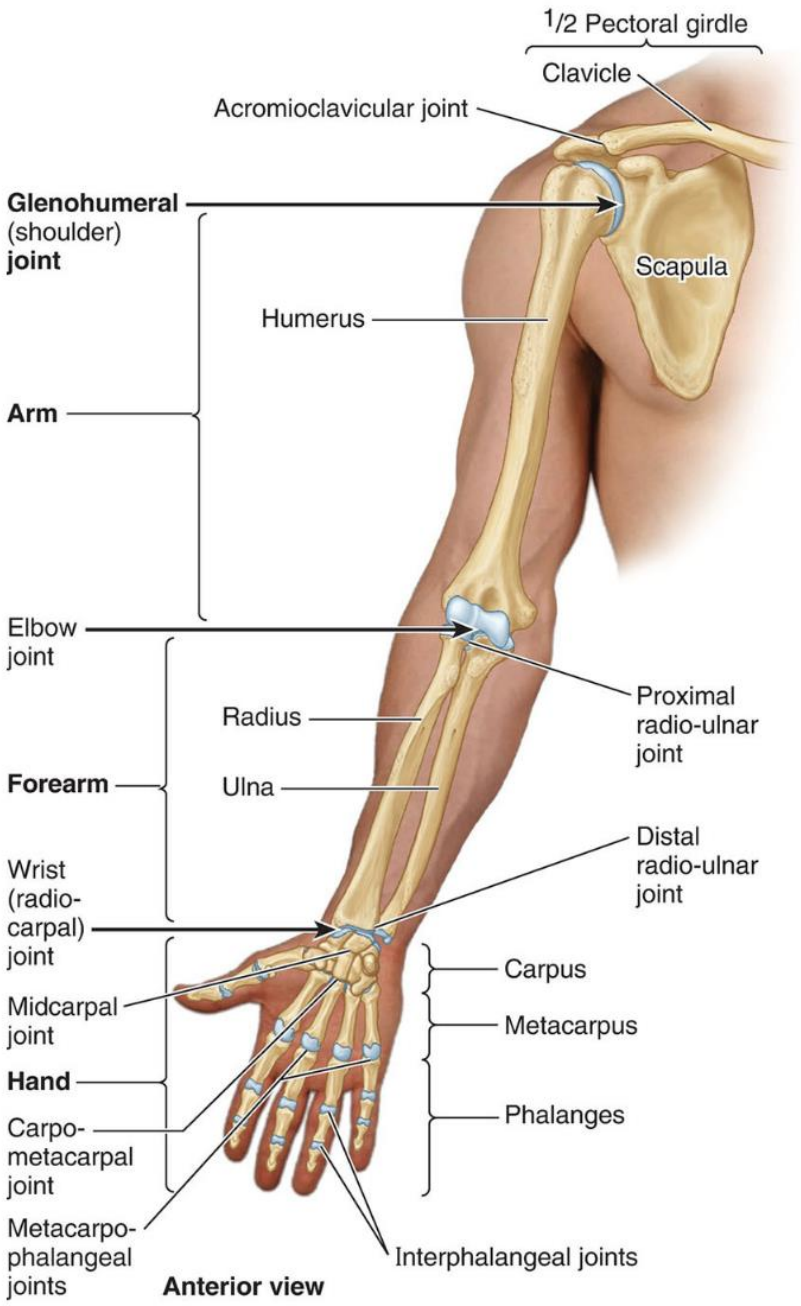

Figure 3. Anatomical Overlay. (Clinically Oriented Anatomy)

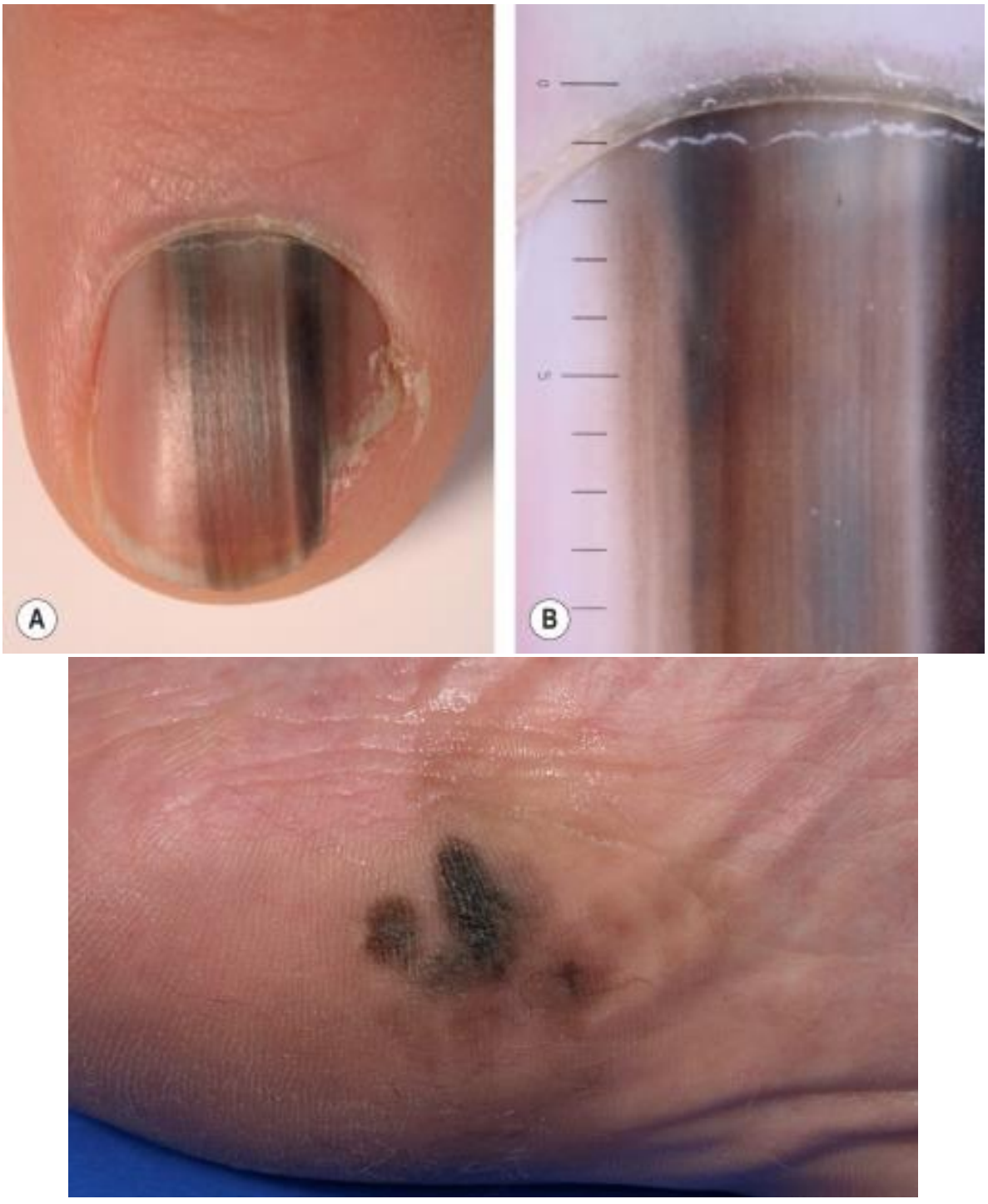

Figure 4. Acral Lentiginous Melanoma (Bolognia et al., 2018)

Figure 5. Acral Lentiginous Melanoma. (Marks & Miller, 2019)

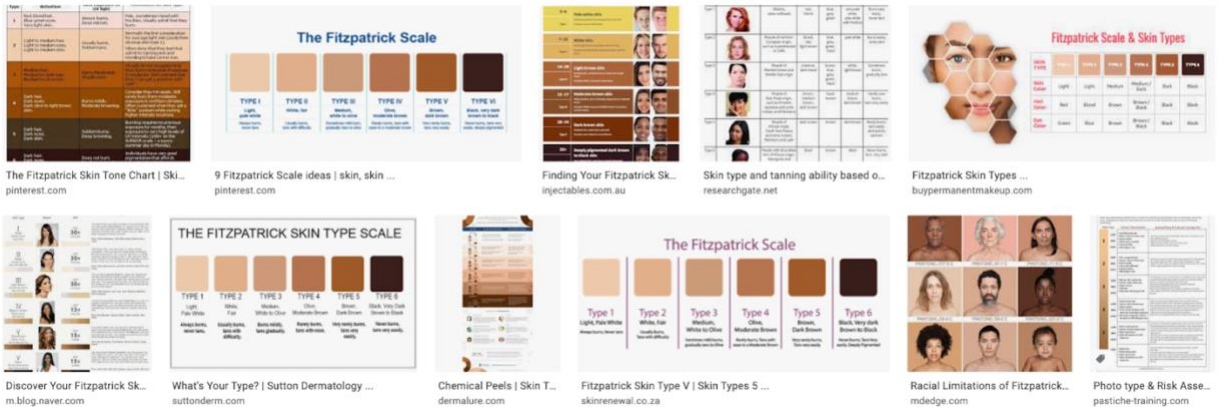

Figure 6. Screenshot of Google images search for Fitzpatrick skin scale.

REFERENCES

Adelekun, A., Onyekaba, G., & Lipoff, J. B. (2021). Skin color in dermatology textbooks: An updated evaluation and analysis. *Journal of the American Academy of Dermatology*, *84*(1), 194–196. https://doi.org/10.1016/j.jaad.2020.04.084

Bolognia, J. L., Schaffer, J. V., & Cerroni, L. (Eds.). (2018). *Dermatology* (4th ed.). Elsevier.

Burgin, S., Dlova, N. C., & Goldsmith, L. A. (n.d.). Dermatological education for the 21st century: Prioritizing diversity. *British Journal of Dermatology*, *n/a*(n/a). https://doi.org/10.1111/bjd.19663

Buster, K. J., Stevens, E. I., & Elmets, C. A. (2012). Dermatologic health disparities. *Dermatologic Clinics*, *30*(1), 53–viii. https://doi.org/10.1016/j.det.2011.08.002

Cahn, B., Harper, H., Halverstam, C., & Lipoff, J. B. (2020). Current Status of Dermatologic Education in US Medical Schools. *JAMA Dermatology*, *156*(4), 468–470.

Cuevas, A. G., O'Brien, K., & Saha, S. (2016). African American experiences in healthcare: "I always feel like I'm getting skipped over." *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association*, *35*(9), 987–995. https://doi.org/10.1037/hea0000368

Culp, M. B., & Lunsford, N. B. (2019). Melanoma Among Non-Hispanic Black Americans. *Preventing Chronic Disease*, *16*, 180640. https://doi.org/10.5888/pcd16.180640

Duffin, J. (2015). On Becoming and Being a Doctor. In *History of Medicine: A Scandalously Short Introduction* (2nd ed.). University of Toronto Press. https://app.perusall.com/courses/mhs-3120-01-medicine-technology-and-soc-2020f-645239810/duffinjacalyn_2010_onbecomingandbeingadoctor?assignmentId=sLdxJJcqyRjjAJY9Q&part=1

Ebede, T., & Papier, A. (2006). Disparities in dermatology educational resources. *Journal of the American Academy of Dermatology*, *55*(4), 687–690. https://doi.org/10.1016/j.jaad.2005.10.068

Fitzpatrick, T. B. (1988). The Validity and Practicality of Sun-Reactive Skin Types I Through VI. *Archives of Dermatology*, *124*(6), 869. https://doi.org/10.1001/archderm.1988.01670060015008

Freeman, R., Gwadz, M. V., Silverman, E., Kutnick, A., Leonard, N. R., Ritchie, A. S., Reed, J., & Martinez, B. Y. (2017). Critical race theory as a tool for understanding poor engagement along the HIV care continuum among African American/Black and Hispanic persons living with HIV in the United States: A qualitative exploration. *International Journal for Equity in Health*, *16*(1), 54. https://doi.org/10.1186/s12939-017-0549-3

Hansra, N. K., O'Sullivan, P., Chen, C. L., & Berger, T. G. (2009). Medical school dermatology curriculum: Are we adequately preparing primary care physicians? *Journal of the American Academy of Dermatology*, *61*(1), 23-29.e1. https://doi.org/10.1016/j.jaad.2008.11.912

Lack of darker skin in textbooks, journals harms patients of color. (2020, July 21). *STAT*. https://www.statnews.com/2020/07/21/dermatology-faces-reckoning-lack-of-darker-skin-in-textbooks-journals-harms-patients-of-color/

Lester, J. C., Taylor, S. C., & Chren, M.-M. (2019). Under-representation of skin of colour in dermatology images: Not just an educational issue. *British Journal of Dermatology*, *180*(6), 1521–1522. https://doi.org/10.1111/bjd.17608

Louie, P., & Wilkes, R. (2018). Representations of race and skin tone in medical textbook imagery. *Social Science & Medicine*, *202*, 38–42. https://doi.org/10.1016/j.socscimed.2018.02.023

Marks, J. G., & Miller, J. J. (2019). *Lookingbill and Marks' Principles of Dermatology—ClinicalKey* (6th ed.). Elsevier. https://www-clinicalkey-com.proxy.library.vanderbilt.edu/#!/browse/book/3-s2.0-C20150008814

McCleskey, P. E., Gilson, R. T., & DeVillez, R. L. (2009). Medical Student Core Curriculum in Dermatology Survey. *Journal of the American Academy of Dermatology*, *61*(1), 30-35.e4. https://doi.org/10.1016/j.jaad.2008.10.066

Melanoma Incidence and Mortality, United States–2012–2016 | CDC. (2020, September 16). https://www.cdc.gov/cancer/uscs/about/data-briefs/no9-melanoma-incidence-mortality-UnitedStates-2012-2016.htm

Mind the Gap handbook now freely available online. (2020, August). https://www.sgul.ac.uk/news/mind-the-gap-handbook-now-freely-available-online

Nijhawan, R. I., Jacob, S. E., & Woolery-Lloyd, H. (2008). Skin of color education in dermatology residency programs: Does residency training reflect the changing demographics of the United States? *Journal of the American Academy of Dermatology*, *59*(4), 615–618. https://doi.org/10.1016/j.jaad.2008.06.024

Passby, L. (2020). Melanin matters: Ethnic diversity in dermatology textbooks. *Medical Teacher*, *0*(0), 1–1. https://doi.org/10.1080/0142159X.2020.1802000

Racial Disparities in Dermatology Training: The Impact on Black Patients. (n.d.). Retrieved June 15, 2021, from https://www.mdedge.com/dermatology/article/233023/diversity-medicine/racial-disparities-dermatology-training-impact-black

Sachdeva, S. (2009). Fitzpatrick skin typing: Applications in dermatology. *Indian Journal of Dermatology, Venereology, and Leprology*, *75*(1), 93. Gale General OneFile.

Sauaia, A., & Dellavalle, R. (n.d.). Health Care Inequities: An Introduction for Dermatology Providers- ClinicalKey. *Dermatologic Clinics*, *27*(2), 103–107.

Savitt, T. (2006). Abraham Flexner and the Black Medical Schools—ProQuest. *Journal of the National Medical Association*, *98*(9), 1415–1424.

Skin typing: Fitzpatrick grading and others- ClinicalKey. (n.d.). Retrieved June 15, 2021, from https://www-clinicalkey-com.proxy.library.vanderbilt.edu/#!/content/playContent/1-s2.0-S0738081X1930121X?scrollTo=%23bb0075

Takeshita, J. (2018). Identifying Disparities in Dermatology: The Importance of Measuring Differences That Matter. *JAMA Dermatology*, *154*(11), 1251. https://doi.org/10.1001/jamadermatol.2018.2938

What It's Like Being a Black Woman with Psoriasis. (2021, January 26). Healthline. https://www.healthline.com/health/psoriasis/my-psoriasis-journey-with-black-skin

Wolff, K., Johnson, R. A., Saavedra, A. P., & Roh, E. K. (2017). *Fitzpatrick's Color Atlas and Synopsis of Clinical Dermatology* (8th ed.). McGraw-Hill Education.