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About UAID

- As the oldest student-led, national organization focused on health equity in the country, we aim to empower undergraduates to understand and address health inequities in the communities in which they live.

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Letter From the Editors

Dear Readers,

2022 and 2023 have been big years for UAID through our extensive work in forming mutual partnerships, engaging with 13 UAID Chapters nationwide and aiding their respective community health projects, and presenting research at the White House Conference on Hunger, Nutrition, and Health. And now, it is our distinct pleasure to present to you the inaugural edition of the United Against Inequities in Disease (UAID) Journal of Public Health, which showcases the rigorous and extensive work of student scholars within the various essential fields of public health and health equity. Within these pages you will find a collection of articles that we hope will challenge, enlighten, and embolden you to create a difference in your own community.

Over the course of putting together this edition of the UAID Journal of Public Health, we have come across many outstanding articles, and would like to thank every one of our authors for the time and effort they have put into their research and their corresponding manuscripts. We'd also like to thank the leadership at UAID, especially Sonia Pandit, Silicia Lomax, and Aditi Tuli, for their tireless support in this endeavor, and Hanna Hailemariam for the journal's graphic design and cover. Public Health is a vitally important field that affects each and every one of us every single day, and it is our mission to educate the next generation of public health leaders to foster individualized and population-level impacts via short-term and long-term change. We hope to see this journal continue to grow in the upcoming years and reach a larger audience. Thank you for your readership and support, and we look forward to seeing you again in the next issue.

Sincerely,
Shafkat Meraj & Lekhya Sathi
Co-Editors-in-Chief, the UAID Journal of Public Health

Standardizing the 2021 CKD-EPI Creatinine-Cystatin C eGFR Algorithm

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Abstract

The 2021 Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) creatinine-cystatin C equation is not systemically utilized amongst medical institutions, even though it produces the most accurate estimated glomerular filtration rate (eGFR) value. Instead, the 2021-CKD-EPI creatinine equation without the race factor is predominately utilized to determine kidney treatment even though race and creatinine levels are scientifically proven to have a slight positive correlation. Given that the exact degree of coefficient between race and creatinine is unquantifiable, continuous usage of the CKD-EPI creatinine based equations perpetuates disproportionately higher rates of kidney failure in Black patients by ensuring misdiagnosis of chronic kidney disease.

This paper will begin by evaluating existing literature supporting the inclusion and the exclusion of a racial coefficient factor in order to depict the diagnostic consequences of utilizing a creatinine based algorithm and advocate for the standardization of the 2021 CKD-EPI creatinine-cystatin C equation. The paper will also discuss primary research conducted with a practicing nephrologist which reveals that metabolic panels still display a racially adjusted eGFR value that is generated from the outdated 2009 CKD-EPI equation. Although this value is not used by nephrologists in clinical practice, this paper argues that its portrayal on patient lab panels is purposeless and likely incites misinterpretation and misuse by non-nephrologists with differing medical specialties.

Introduction

While Black African Americans constitute 13% of the population, they are three times more likely to suffer from kidney failure, make up more than 35% of patients on dialysis in the United States, and are less likely to receive kidney transplants than the general population (Smith, 2021). The cause of this disparity is multifaceted and includes biologic risk factors, such as hypertension and diabetes, and environmental and social factors, such as decreased access to healthcare, socioeconomic disadvantages, and racial biases (“10”, 2021). It has been heavily debated whether or not the equation that calculates eGFR is yet another systemic contributor to this racial health inequity. The eGFR is a mathematical formula commonly utilized in laboratory tests to measure how well the kidneys filter blood to remove waste and extra water. Clinicians utilize these equation-based eGFR thresholds to recommend referrals for nephrology care, initiate early patient-physician transplant discussions, and diagnose the severity stage of chronic kidney disease (CKD). Since the eGFR essentially dictates the trajectory of clinical treatment, the accuracy of the eGFR is of the utmost importance in order to treat patients of all races equitably and precisely.

The standard way to calculate an eGFR is via a blood test that measures levels of creatinine, a bodily waste product associated with the normal breakdown of muscle tissue. Higher serum creatinine levels result in a lower eGFR value, which indicates that the kidneys are not filtering effectively to dispose of creatinine. Since Black individuals were reported to have more muscular mass relative to non-Black individuals and thus secrete higher creatinine levels, the diagnostic algorithm initially produced a low eGFR value (Hsu et al. 2008). However, this lower eGFR was not solely reflective of inherently worse kidney function but rather greater muscular mass relative to non-Black counterparts. To prevent this underestimation of eGFR and kidney health, a

race correction factor was multiplied to the eGFR value for Black kidney, thus resulting in the 2009 CKD-EPI eGFR equation. However, by September 23, 2021, the joint National Kidney Foundation-American Society of Nephrology (NKF-ASN) Task Force recommended the adoption of the eGFR 2021 CKD-EPI creatinine equation, which excludes a race coefficient, as well as increased national usage of the 2021 CKD-EPI creatinine-cystatin C equation without a race coefficient ("NKF-ASN, 2021").

Context

Both the 2009 and 2021 CKD-EPI creatinine based eGFR equations induce problematic and reductionistic clinical practices. The racial coefficient factor associated with the 2009 CKD-EPI eGFR equation overestimated kidney function for Black patients, leading to delayed referrals for specialist care, longer transplantation wait time, and poor accountability for the intersectionality of a Black patient's racial and ethnic identity (Bichell, 2021). On the other hand, since the 2021 CKD-EPI eGFR equation lacks a racial coefficient factor, it underestimated kidney function for Black kidney patients, thus reducing the number of African Americans eligible to donate kidneys and preventing prescription of higher dosages of medication (Diao et al. 2020).

The recommended 2021 CKD-EPI creatinine based equation is ultimately inaccurate because it disregards previously collected data showcasing biological differences in muscular mass, and it fails to explain racial disparities seen in CKD long before the existence of such formulas. As a result, racial differences in muscle mass and thus creatinine levels do contribute to reported kidney health, so its removal from the calculation may perpetuate other disparities. However, it is virtually impossible to quantify a coefficient factor that accurately represents the racial contribution on an individual basis without overestimating or underestimating kidney health. In essence, the ideal solution is to use an additional biomarker to measure kidney function that is independent of self-reported race or degree of genetic African ancestry, like serum cystatin C. Consequently, the NKF-ASN joint task force recommends combining creatinine and cystatin C filtration markers for this reason, especially for adults who are at risk for or already have chronic kidney disease, or for patients with abnormally high or low muscle mass. However, for more general purposes, the joint task force additionally recommends the usage of the 2021-CKD-EPI creatinine equation, which medical institutions utilize more frequently given the increased efficiency and convenience of acquiring serum creatinine measurements. Furthermore, at a medical institution where nephrology is considered a high performing specialty, lab results still portray a racially adjusted eGFR value computed from the 2009 CKD-EPI equation, indicating the likelihood that other medical institutions may similarly utilize this outdated equation for African American patients. Patients are not directly informed of the various equations available to calculate their eGFR value or the current methodology utilized to output their eGFR value, thus contributing to a lack of agency in their own medical decisions.

Literature Review Part I: History

Before kidney estimating algorithms were developed, acquiring the glomerular filtration rate (GFR) involved laborious and incomplete processes of chemical infusion and hours of blood and urine collection. To increase efficiency, kidney function-estimating equations were first developed in 1973 with the intention of estimating GFR from serum creatinine concentrations. Out of these initial equations, nephrologists primarily utilized the Cockcroft-Gault equation, which incorporated data from 249 White males, and it clearly lacked racial and sex diversity (Delgado et al., 2020). Although this equation excluded race from the formula, it overestimated kidney function by 10-20%, leading to higher drug dosing recommendations than intended ("Cockcroft-Gault Formula").

This diagnostic tool was later replaced by the 1999 Modification of Diet in Renal Diseases (MDRD) equation, which incorporated a race coefficient factor of 1.21 for Black patients exclusively (Utt, 2021). The researchers justified the racial correction by confirming that

a linear regression relationship existed between the Black race and eGFR, which initially made logical sense since previous research stated that Black people generally had more muscular mass (Levey, 1999). A greater muscular mass relative to White counterparts would result in a higher serum creatinine level and thus a lower eGFR value than the actual GFR of Black kidney patients. In order to reverse the lowering of the eGFR value and adjust for this effect of increased muscular mass, a race correction factor of 1.21 for Black patients was established in the MDRD equation and authenticated in the African American Study of Kidney Disease and Hypertension (Utt, 2021). The racial coefficient persisted for approximately twenty years since its inception, although it was decreased to 1.16 in the 2009 CKD-EPI equation. The 2009 CKD-EPI equation raised eGFR by 16% for Black individuals, presumably yielding a better estimate of kidney function for Black patients at the same levels of serum creatinine as other racial counterparts (Boulware et al., 2021).

The inclusion of this racial coefficient in the equation initiated profound controversy within the nephrology community as it potentially delayed diagnostic benchmarks for CKD and kidney transplantation while failing to consider the genetic and ethnic intersectionality of individual Black patients. To date, there is no conclusive evidence portraying that race correction directly results in health disparities for Black kidney patients (Delgado et al., 2020). However, experimental research began to suggest that removal of the coefficient significantly increased the likelihood of achieving the nephrology and transplant referral threshold, thus reducing transplant referral time by 1.9 years and nephrology referral time by 3.6 years among Black individuals (Boulware et al., 2021; Zelnick et al., 2021).

The implications of these experimental findings and discussions in literature in light of disproportionately higher rates of COVID-19 infection, morbidity, and mortality initiated the formation of the NKF-ASN Joint Task Force in August of 2020. The task force recommended the use of a new eGFR 2021 CKD-EPI creatinine equation that estimates kidney function without a race variable along with increased usage of a confirmatory cystatin C and serum creatinine laboratory test ("NKF and ASN Release New Way to Diagnose Kidney Diseases").

Literature Review Part II: Current Research

Although some institutions have begun omitting the Black race in their eGFR computations in response to the NKF-ASN joint task force's guidelines, the accuracy of this approach compared with measured GFR has not yet been evaluated and could paradoxically underestimate eGFR. With a validation dataset of 12 studies and 4050 participants of which 14.3% were Black, Inker et al. 2021 determined that omitting race from the 2009 CKD-EPI creatinine based equation underestimated GFR by 7.1 mL/min/1.73 m^2. Instead, this study, which also included three task force members, found that new equations that included data on both creatinine and cystatin C but omitted race were most accurate in computing eGFR and displaying the smallest amount of bias in Black patients (Inker et al. 2021). Findings from the Hsu et al. 2021 study produced the same results, thus validating the accuracy and reproducibility of combining creatinine and cystatin C filtration markers to support better clinical decisions than either marker alone. The Hsu et al. 2021 authors further elaborated on the drawbacks of utilizing solely serum creatinine levels to calculate eGFR without race, elucidating how it introduced a systematic misclassification that could not be eliminated even when numerous non-GFR determinants of creatinine levels were accounted for, such as body composition metrics and urinary creatinine excretion (Hsu et al., 2021). In essence, the researchers distinguished how the presence of *immeasurable* markers lead to different serum creatinine levels between different racial groups, thus highlighting how the removal of race will not accurately estimate eGFR with only serum creatinine levels incorporated into the eGFR equation.

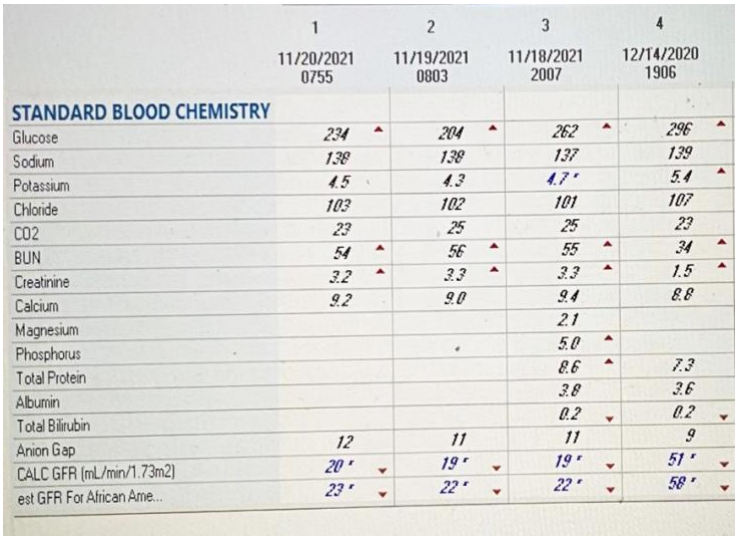
However, creatinine is not the only biomarker indicative of kidney functioning. Cystatin C is another biomarker protein produced by all nucleated cells that similarly gets filtered out of the blood by the kidneys

("Cystatin C", 2021). Similar to creatinine, higher serum concentrations of cystatin C indicate that the kidneys are not able to properly filter the blood at a normal rate, causing accumulation of cystatin C in the blood. Since serum cystatin C concentrations are less susceptible to factors that affect muscle mass such as age, diet, sex, and physical activity, individuals with similar kidney function will have similar serum concentrations of cystatin C ("NKF-ASN"). This inherent property of cystatin C ensures that race is not required in eGFR equations that rely on serum cystatin C levels.

Literature Review Part III: Primary Research

The NKF-ASN joint task force, the Inker et al. 2021 study, and the Hsu et al. 2021 study concluded that estimating eGFR with serum creatinine and cystatin C without race produced the least amount of bias and the greatest amount of accuracy since this estimate does not rely on self-reported race or degree of genetic African ancestry. Researcher U interviewed a nephrologist (Dr. X), who opted to remain an anonymous source, to procure a clearer and comprehensive understanding of how successfully a prominent medical institution adhered to the new NKF-ASN recommendations.

Dr. X began working at a prominent medical institution nationally accredited for nephrology as a high performing specialty several months before the NKF-ASN joint task force published their clinical recommendations, meaning that Dr. X directly observed changes in the presentation of the metabolic panel that portrays the eGFR. As portrayed in the image attached below of an example patient metabolic panel, Dr. X demonstrated that the CALC GFR is currently processed through the recommended 2021 CKD-EPI creatinine based equation. However, the basic metabolic panel provided for each Black kidney patient still presents an additional eGFR for African Americans that was calculated with the 2009 CKD-EPI creatinine based equation, which includes the race coefficient in its calculation. Dr. X emphasized that the inclusion of this category within the metabolic panel is useless since the nephrologists at the medical institution were advised not to make clinical decisions with this value. Dr. X cautioned how non-nephrologists that read these metabolic panels may not be aware of this distinction and thus may consequently rely on the "est GFR For African Ame.." value to make nephrologist or kidney transplant referrals.



	1 11/20/2021 0755	2 11/19/2021 0803	3 11/18/2021 2007	4 12/14/2020 1906
STANDARD BLOOD CHEMISTRY				
Glucose	234 ▲	204 ▲	262 ▲	296 ▲
Sodium	138	138	137	139
Potassium	4.5	4.3	4.7 *	5.4 ▲
Chloride	103	102	101	107
CO2	23	25	25	23
BUN	54 ▲	56 ▲	55 ▲	34 ▲
Creatinine	3.2 ▲	3.3 ▲	3.3 ▲	1.5 ▲
Calcium	9.2	9.0	9.4	8.8
Magnesium			2.1	
Phosphorus			5.0 ▲	
Total Protein			8.6 ▲	7.3
Albumin			3.8	3.6
Total Bilirubin			0.2 ▼	0.2 ▼
Anion Gap	12	11	11	9
CALC GFR (mL/min/1.73m2)	20 * ▼	19 * ▼	19 * ▼	51 * ▼
est GFR For African Ame...	23 * ▼	22 * ▼	22 * ▼	58 * ▼

Figure 1: The metabolic panel of a Black kidney patient utilized by nephrologists to determine the course of kidney treatment. The "est GFR For African Ame…" row demonstrates continuous usage of the 2009 CKD-EPI creatinine equation for Black kidney patients, in spite of the NKF-ASN joint task force discouraging the usage of this equation.

Although Dr. X was aware that the combined creatinine and cystatin C equation increased accuracy, they revealed that cystatin C was not readily utilized to determine eGFR since ordering this test was more expensive and took three to five days to receive results. On the contrary, ordering a creatinine test "has a much shorter turnaround period, does not require a separate order, and is received with the basic metabolic panel". Their responses depicted how cystatin C is not readily available in all laboratories and how the creatinine-based equation is thus more adequate for many clinical purposes.

In response to the debate over whether or not a racial coefficient should exist for the eGFR creatinine based equation, Dr. X seemed to approve of the removal of the race factor, offering the example that the eGFR should be manipulated to a greater degree for a White body builder relative to a Black individual with less muscle mass, irrespective of race. Given that racial categories are dynamic and continue to be redefined in medicine, Dr. X interestingly stated that the debate should be reconsidered to consider the lack of patient-physician transparency regarding these profound changes in calculating eGFR. While the nephrology unit at their medical institution held mock debates extensively discussing the removal of race from the creatinine equation in abidance with updates from the NKF-ASN joint task force, patients remained uninformed. Dr. X stressed how problematic it is for Black patients to be kept unaware of how their race may dictate their clinical treatment with a creatinine based equation.

Available Models

Incorporating cystatin C into the calculation for eGFR through The Lund Model

The use of cystatin C as a filtration clinical marker in GFR originated in Sweden in 1994, where physicians utilize a combined creatinine-cystatin C equation to choose the optimal eGFR for either a screening or a specific clinical indication. This practice, termed the Lund Model, constitutes simultaneous usage of both a cystatin C equation and a creatinine equation, and then taking the average value as the final eGFR value. However, if the independent outputs from the cystatin C equation and the creatinine equation differ by more than 40%, then physicians evaluate clinical data to identify reasons for not using only one of the two prediction equations. This evaluation ensures that the chosen estimate is least likely to be biased based on clinical characteristics. For example, in cases where a patient ages or experiences severe muscle loss (e.g. paralysis, immobilization, malnutrition), creatinine will not be as reliable as a GFR predictor as cystatin C, thus contributing to a >40% difference in eGFR output from the individual creatinine and cystatin C equations. Consequently, clinicians are given the leeway to choose the eGFR value from the cystatin C equation over the creatinine equation and the combined creatinine and cystatin C equation. Similarly, if a patient is treated with higher doses of glucocorticoids, the combined prediction equation will be less reliable, so clinicians can choose to compute eGFR with only the creatinine prediction equation. If no explanation for a >40% difference from both of the predicted GFRs is offered, an invasive gold standard determination of GFR is performed, which is more expensive, slower, and not as risk-free (Grubb et al., 2010).

As demonstrated through the description of the Lund Model, the eGFR is not readily computed through one simple equation as seen in the United States, and requires critical clinical evaluation and analysis. By providing clear thresholds that specify when cystatin C and creatinine markers should be used separately, together, or not at all, the Lund Model individualizes patient treatment and helps guide clinical decisions that not only maximize the accuracy of the eGFR but also account for the racial diversity of patients.

Analysis & Synthesis

Thus far, three equations that compute the eGFR value were discussed within this proposal: the 2021 CKD-EPI creatinine-based equation, the 2009 CKD-EPI creatinine-based equation, and the 2021 CKD-EPI combined creatinine and cystatin C equation. The following sections will address the advantages and disadvantages of each equation to fully convey the inaccuracies of the 2021 and 2009 CKD-EPI creatinine-based equations, portray the lack of confirmatory bias in this analysis, and delve into the decision-making process that informed my position to support the implementation of the 2021 CKD-EPI combined creatinine and cystatin C equation.

2021 CKD-EPI Creatinine Equation

When I first began my research on eGFR algorithms, my position was that the removal of the race coefficient from a creatinine-based equation would successfully counter racial disparities reproduced in

nephrology patient care and diagnostic treatment. However, experimental research conducted after the released NKF-ASN recommendations demonstrated that the resulting eGFR is not close to the actual GFR if race is omitted from the creatinine equation. These findings indicate that there is some degree of misclassification that occurs in the creatinine-based equation without the race term, even if other biomarkers closely related to creatinine levels are included in the formula. This inaccuracy is dangerously harmful as the underestimation of eGFR can lead to overdiagnosis of kidney disease, and thus, disqualification from receiving higher dosages of medication or donating a kidney.

Omitting the race term is not just clinically inaccurate but also unrepresentative of the multi-faceted evolution and complex history of racial disparities in kidney disease. Firstly, collecting scientific and medical data on African Americans does not occur often as evidenced by the historic lack of diversity in medical studies. Omitting a race factor discards the available data collected on the muscular body composition and creatinine secretion of African Americans. Secondly, racial disparities existed in kidney disease far before any formula existed, indicating that race, specifically genetic ancestry, may somewhat predispose kidney health.

Regardless of the disadvantages associated with this equation, the exclusion of the racial coefficient offers a prominent advantage that, in my opinion, supersedes the weaknesses of this equation that were listed above. Including a racial factor for only Black individuals fails to capture the complexity of patients' racial and ethnic identities because it assumes that all patients can either be Black or non-Black. By failing to account for intersectional identities, this assumption forces clinicians into absurdly reductionistic practices and decision-making. Although this equation better accounts for the diversity of patients in the US, much work is still required to implement an equation that does not include race but rather induces equity in the diagnosis and management of kidney disease.

2009 CKD-EPI Creatinine Equation

Though the 2009 CKD-EPI creatinine-based equation accounted for an association between creatinine and race by including a racial coefficient, it still harbored inaccurate clinical assumptions that ultimately led to its complete removal from laboratory settings at medical institutions. These disadvantages include failure to capture the intersectional identities of patients and overestimation of kidney functioning for Black individuals, which may have indirectly led to delayed nephrology referrals and increased kidney transplantation wait time.

One of the most fundamental consequences of still utilizing this equation in laboratory settings is that it directly refutes recommendations from the NKF-ASN joint task force, two organizations that comprise almost all practicing nephrologists in the United States. Consequently, it would be illogical to backtrack to an outdated equation that produces a significantly higher eGFR value for Black individuals. Even if this eGFR value is not directly incorporated into clinical practice at medical institutions, its purposeless display on a metabolic panel may lead non-nephrologists to utilize this incorrect value since they are likely unaware of recommendations unassociated with their specialty.

2021 CKD-EPI Combined Creatinine and Cystatin C Equation

After considering the drawbacks and advantages of the exclusion and inclusion of the racial coefficient in the CKD-EPI creatinine equations, my current standing position is that race is an unreliable proxy of health since it serves more significantly as a social construct than a biological construct. Furthermore, quantifying a numeric value that is representative of the exact biologic contribution of race to creatinine levels and thus to eGFR is virtually impossible and impractical for research purposes, especially when other biomarkers of kidney function fully independent of race exist, such as cystatin C. As evidenced by experimental research conducted by Inker et al. 2021 and Hsu et al. 2021, inputting serum cystatin C levels into the 2021 CKD-EPI

combined creatinine and cystatin C based equation provides the most accurate reading of eGFR while portraying the least amount of bias in Black patients. This novel finding suggests that utilizing both filtration markers will support better clinical decisions than either marker alone, which aligns with recommendations from the NKF-ASN joint task force.

Despite these clinical advantages of incorporating cystatin C, Dr. X revealed that creatinine lab results are much more convenient and accessible in a clinical setting since it allows for a quicker turnaround period of results. From the perspective of laboratory medical professionals, it is understandable to prefer assaying serum creatinine levels since the quicker turnaround period of this test accommodates increased patient influx, thus making the workload for the laboratory scientists and staff much more manageable. Furthermore, as Dr. X mentioned, serum creatinine tests are not as costly compared to serum cystatin C tests. Given that medical laboratories order a vast majority of laboratory tests for a multitude of diseases, buying a more expensive test may impose a financial strain and bypass budgetary limits. Thus, it is reasonable to purchase a cheaper test that still abides with clinical recommendations from the NKF-ASN task force from the perspective of a laboratory scientist and manager. However, from the perspective of a physician, it would be unethical and socially unjust to continue using an equation that outputs staggeringly worse kidney health outcomes for Black individuals. Such occurrences contribute to increased medical mistrust within the African American community, especially for those who are becoming aware that their race may be a reason why they are unable to receive preventative health measures quickly.

Ultimately, the dual positionalities of laboratory scientists and practicing nephrologists presents a conflicting dilemma on how to best address this problem. Consequently, the next section will advocate for potential solutions that address not just both sides of this predicament, but also the lack of transparency that occurs between patient and physician.

Proposed Solutions

Standardizing the 2021-CKD EPI combined creatinine and cystatin C equation

As established by experimental research and advised by the NKF-ASN joint task force, the 2021 CKD-EPI combined creatinine and cystatin C equation should be standardized in laboratory settings to output the most precise eGFR values for individuals of all races and thus combat racial disparities in kidney disease that are reproduced in clinical settings. Secondly, the levels of serum cystatin C used in the calculation of eGFR from this equation must be portrayed on each patient's metabolic panel, just as serum creatinine levels are displayed on each patient's metabolic panel. To advocate for the implementation of this equation and these changes to the metabolic panel, this section will refute the disadvantages associated with utilizing cystatin C in a laboratory setting.

A primary concern that many laboratory scientists and clinicians have is that labs cannot readily measure cystatin C to accommodate the patient influx. However, serum cystatin C is now an automated test that can be measured on any automated chemistry platform, meaning that the clinical laboratories at medical institutions must take measures to become familiar with the new assay, as with any new test. The test for serum cystatin C may initially be perceived as a "send-out" test that takes additional time to acquire results because the clinical chemistry personnel may not have perceived high demand for cystatin C (Shlipak et al., 2021). If clinical laboratories actively take action to adopt familiarity and experience with the assay for serum cystatin C, this filtration biomarker will subsequently become much more accessible and convenient.

Another primary concern that many laboratory scientists have is the expensive cost of utilizing cystatin C for routine eGFR measurement. Although cystatin C is automated and the labor costs are minimal, the high expense is associated with the reagents of cystatin. The cystatin C reagents cost approximately $4 per test, which is approximately twenty times the cost of a

creatinine test using the Jaffe reaction ($0.20) and three times the cost of an enzymatic creatinine assay ($1.50). However, only looking at these cost comparisons may be misleading since this cost is less than or equivalent to the cost of common laboratory tests that physicians order, which range from $2.76 to $15 (Shlipak et al., 2021). Therefore, the cost of this test should not prevent its use as a test of kidney function, especially in medical systems with more than adequate healthcare resources like university medical systems.

Standardizing the use of the 2021-CKD EPI combined creatinine and cystatin C equation enables further precision in diagnosis and treatment and facilitates moving beyond biological race. Therefore, serum cystatin C assays must be acquired at medical institutions such that the output from this equation can be implemented into the metabolic panels for each patient. Even the Lund Model, as described in the Available Models section of this proposal, recognizes that "GFR-prediction equations based upon both cystatin C and creatinine seem to have better diagnostic performance than prediction equations based upon only one of these GFR-markers" (Grubb et al., 2010.)

Regardless of the diagnostic advantage of the combined equation, the Lund Model also recognizes that it is not sufficient for all clinical situations. For example, if the patient has severe muscle loss or is treated with higher doses of glucocorticoids, then the combined equation would not provide the most accurate eGFR output since one filtration marker alone would provide a stronger estimate. Thereby, the Lund Model specifies that a >40% difference in output from a creatinine based equation and a cystatin C based equation requires further clinical discretion, which allows physicians to choose whether or not eGFR should be calculated with both filtration markers. Similarly, nephrologists in the US can gauge how accurate an eGFR output may be only if the metabolic panel portrays a separate row for serum cystatin C levels in addition to the separate row for serum creatinine levels. With this methodology, physicians will be able to observe whether or not there is a stark contrast in creatinine and cystatin C levels and thus make a much more clinically informed decision on which eGFR equation should be utilized. Although further epidemiologic and experimental research is required to quantify how much of a difference is indicative of inaccurate eGFR output from the combined equation, this practice will help individualize patient treatment by accounting for their diverse clinical situations and backgrounds.

Conclusion

The 2021 Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) creatinine-based equation utilized at medical institutions does not accurately calculate eGFR and thus underestimates kidney functioning for Black individuals. The inaccuracy of the eGFR promotes misdiagnoses of CKD, especially when declaring the severity stage and treatment options. This proposal evaluated literature supporting the inclusion and exclusion of the racial coefficient factor from the CKD-EPI creatinine equation as well as the consequences of solely utilizing a creatinine-based equation to calculate eGFR. In addition to amplifying worse kidney health outcomes for Black patients, these consequences also include increasing medical mistrust within the African American community and widening the patient-healthcare provider power imbalance. To mitigate these consequences and reassess the creatinine-based eGFR algorithm for racial bias, the solutions offered within this proposal consequently targeted the equation itself. The primary solution involves incorporating increased usage of serum cystatin C levels with the combined 2021 CKD-EPI creatinine and cystatin C equation, thus aligning with recommendations from the NKF-ASN joint task force. It is hoped that these recommendations will be incorporated to rightfully treat patients of all races precisely and equitably, provide patients with more agency in their own medical decisions, and make physicians more race-conscious when making clinical decisions regarding kidney treatment for Black patients.

References

"10 Major Causes of Kidney Disease." *National Kidney Foundation*, 4 Nov. 2021, https://www.kidney.org/atoz/content/kidneydiscauses.

"Cystatin C." *Testing.com*, 9 Nov. 2021, https://www.testing.com/tests/cystatin-c/.

"Estimated Glomerular Filtration Rate (Egfr)." *National Kidney Foundation*, 23 Sept. 2021, https://www.kidney.org/atoz/content/gfr.

"NKF and ASN Release New Way to Diagnose Kidney Diseases." *National Kidney Foundation*, 23 Sept. 2021, https://www.kidney.org/news/nkf-and-asn-release-new-way-to-diagnose-kidney-diseases.

"NKF-ASN Task Force: Recommends Increased Use of Cystatin C." *Diagnostic Efficiency*, https://www.gentian.com/news/nkf-asn-task-force-report-release.

Be Duggal, Vishal, et al. "National Estimates of CKD Prevalence and Potential Impact of Estimating Glomerular Filtration Rate without Race." *Journal of the American Society of Nephrology*, vol. 32, no. 6, 2021, pp. 1454–1463., https://doi.org/10.1681/asn.2020121780.

Bichell, Rae Ellen, and Cara Anthony. "For Black Kidney Patients, an Algorithm May Help Perpetuate Harmful Racial Disparities." *The Washington Post*, WP Company, 6 June 2021, https://www.washingtonpost.com/health/black-kidney-patients-racial-health-disparities/2021/06/04/7752b492-c3a7-11eb-9a8d-f95d7724967c_story.html.

Boulware, L. Ebony, et al. "Systemic Kidney Transplant Inequities for Black Individuals: Examining the Contribution of Racialized Kidney Function Estimating Equations." *JAMA Network Open*, vol. 4, no. 1, 2021, https://doi.org/10.1001/jamanetworkopen.2020.34630.

Cockcroft-Gault Formula." *National Kidney Foundation*, https://www.kidney.org/professionals/kdoqi/gfr_calculatorcoc.

Delgado, Cynthia, et al. "Reassessing the Inclusion of Race in Diagnosing Kidney Diseases: An Interim Report from the NKF-ASN Task Force." *American Society of Nephrology*, American Society of Nephrology, 1 June 2021, https://jasn.asnjournals.org/content/32/6/1305.

Diao, James A., et al. "Clinical Implications of Removing Race from Estimates of Kidney Function." *JAMA*, 2020, https://doi.org/10.1001/jama.2020.22124.

Frequently Asked Questions about GFR Estimates. National Kidney Foundation, https://www.kidney.org/sites/default/files/docs/12-10-4004_abe_faqs_aboutgfrrev1b_singleb.pdf.

Grubb, Anders. "Non-Invasive Estimation of Glomerular Filtration Rate (GFR). The Lund Model: Simultaneous Use of Cystatin C- and Creatinine-Based GFR-Prediction Equations, Clinical Data and an Internal Quality Check." *Scandinavian Journal of Clinical and Laboratory Investigation*, vol. 70, no. 2, 2010, pp. 65–70., https://doi.org/10.3109/00365511003642535.

Hsu, Chi-yuan, et al. "Race, Genetic Ancestry, and Estimating Kidney Function in CKD." *New England Journal of Medicine*, vol. 385, no. 19, 2021, pp. 1750–1760., https://doi.org/10.1056/nejmoa2103753.

Hsu, Joy, et al. "Higher Serum Creatinine Concentrations in Black Patients with Chronic Kidney Disease: Beyond Nutritional Status and Body Composition."

Clinical Journal of the American Society of Nephrology, vol. 3, no. 4, 2008, pp. 992–997., https://doi.org/10.2215/cjn.00090108.

Inker, Lesley A., et al. "New Creatinine- and Cystatin C–Based Equations to Estimate GFR without Race." *New England Journal of Medicine*, vol. 385, no. 19, 2021, pp. 1737–1749., https://doi.org/10.1056/nejmoa2102953.

Levey, Andrew S. "A More Accurate Method to Estimate Glomerular Filtration Rate from Serum Creatinine: A New Prediction Equation." *Annals of Internal Medicine*, vol. 130, no. 6, 1999, p. 461., https://doi.org/10.7326/0003-4819-130-6-199903160-00002.

Miller, G. & Vassalotti, J. A. (2020). Kidney biomarkers: the kidney profile order, urine albumin creatinine ratio (uACR), and estimated glomerular filtration rate (eGFR), College of American Pathologists. https://documents.cap.org/documents/2020-a-kidney- biomarkers.pdf

Mitchel L. Zoler, PhD. "Dropping Race-Based EGFR Adjustment Gains Traction in US." *Medscape*, Medscape, 10 July 2020, https://www.medscape.com/viewarticle/933418.

Monaco, Kristen. "Nix Race from EGFR, Says Joint Task Force." *Medical News*, MedpageToday, 23 Sept. 2021, https://www.medpagetoday.com/nephrology/generalnephrology/94673?fbclid=IwAR3ly0Xoybw6pmhCBI7psxkLNWbT2TX6v9Qn_QVHquanHjDVaGDeO6nXZ4k.

Shlipak, Michael G., et al. "Update on Cystatin C: Incorporation into Clinical Practice." *American Journal of Kidney Diseases*, vol. 62, no. 3, 2013, pp. 595–603., https://doi.org/10.1053/j.ajkd.2013.03.027.

Smith, Jacque, and Cassie Spodak. "Black or 'Other'? Doctors May Be Relying on Race to Make Decisions about Your Health." *CNN*, Cable News Network, 7 June 2021, https://www.cnn.com/2021/04/25/health/race-correction-in-medicine-history-refocused/index.html.

Stevens, Lesley A., et al. "Evaluation of the Chronic Kidney Disease Epidemiology Collaboration Equation for Estimating the Glomerular Filtration Rate in Multiple Ethnicities." Kidney International, vol. 79, no. 5, 2011, pp. 555–562., https://doi.org/10.1038/ki.2010.462.

Utt, Leah E., "Race-Based Adjustment in eGFR Algorithms: An Integrative Literature Review" (2021). Honors Undergraduate Theses. 1037.

Zelnick, Leila R., et al. "Association of the Estimated Glomerular Filtration Rate with vs without a Coefficient for Race with Time to Eligibility for Kidney Transplant." *JAMA Network Open*, vol. 4, no. 1, 2021, https://doi.org/10.1001/jamanetworkopen.2020.34004.

A Review of Peer Navigation Services and the Potential for HPV Focused Programs

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A peer navigator (PN) is an individual who is part of the community and is capable of helping other community members navigate a disease that the PN has experience with. They are trained in cultural competence and basic medical education, and they can help guide patients through complex health systems (Karwa et al., 2017). For example, an individual who is infected with human immunodeficiency virus (HIV) and adheres to their treatment can help community members who test positive for HIV navigate their care, attend their follow-ups, and stay on top of their medication. This individual providing the support would be labeled as a PN. PNs guide health conditions and they serve to bridge the gap between clinical and social communities (Krulic et al., 2022).

Peer navigation programs are used to increase prevention methods, such as surveillance testing and healthy practices, as well as to improve treatment adherence. Peer navigation has been instilled for a variety of chronic diseases that affect individuals around the world such as HIV, diabetes, substance use disorders, and mental health disorders (McBrien et al., 2018). There is limited research on the feasibility of implementing peer navigation programs for other diseases, such as human papillomavirus (HPV). However, there is the potential for peer-based strategies to be implemented similarly. The goal of a PN is to help a patient that may be struggling with their new diagnosis or have limited education and health literacy connect better with the provider in the inpatient setting and develop confidentiality and rapport in the outpatient setting (Karwa et al., 2017).

Prior literature shows that peer navigation is a feasible approach to enhance engagement with HIV testing and care. Individuals infected with HIV claim that they appreciate working with the PNs and receiving help to navigate the medical environment to take part in prevention, treatment, and follow-up appointments (Steward et al., 2018). Programs that implement peer navigation have been seen to improve HIV treatment and care outcomes, specifically with starting and adhering to antiretroviral therapy (ART) (Shah et al., 2019). Steward et al. concluded that the implementation of a peer navigation program helped patients feel more comfortable seeking out preventative measures and accepting their HIV serostatus by sharing their status with at least one other individual, which made it easier for the clients to adhere to their care (Steward et al., 2018). Through the support of the PNs, the patients infected with HIV felt safer sharing their diagnosis and trusting their close family and friends to help them manage their illness. The PNs not only helped HIV patients confide in their trusted acquaintances, but they also helped them navigate a new diagnosis by learning about their disease and what options are available for care (Steward et al., 2018).

In terms of treatment, PNs are essential in helping clients go to their appointments with healthcare providers, access their medication, and stay in contact with the clinics. Steward et al. found that some clients relied on PNs for encouragement for treatment, while others relied on them for consistent reminders to attend their appointments (Steward et al., 2018). Along the encouragement track, the researchers found that their program provided interpersonal support, which complements the structural interventions in HIV care that look to overcome individual barriers to treatment (Steward et al., 2018). One of the reasons researchers found that peer navigation services are well suited for support is due to the PN's ability to respond to stigma (Steward et al., 2018). Steward et al. found that PNs helped patients overcome feelings of shame and prevent them from being isolated by stigma (Steward et al., 2018).

By helping to combat stigma, PNs establish comfort and trust for patients within the medical field and as a result, increase participation in medical services. Shah et al. examined the importance of PNs in encouraging treatment services and found that PNs provided a necessary link between clients and providers (Shah et al., 2019). The researchers found that the PNs often brought patients into the care facilities and referred them to HIV services, leading to more follow-up appointments and a more consistent supply of their ART (Ibid, 2019). The clients in the PN program had a say in how the PNs could best help them, and it improved their adherence to preventive methods and treatment because their services were personalized. Personalized medical care is not always possible when only working with medical professionals because these professionals can easily be overworked and see too many patients. PNs provide the opportunity to bridge the gap between medical staff and patients by helping overcome logistical difficulties and non-medical responsibilities. Shah et al. found that the shared lived experiences between the PNs and the infected patients promote a relationship that provides support, education, and an established connection to adequate medical care (Ibid, 2019). The Steward et al. study concluded that it is essential to work with newly diagnosed clients, especially clients that participated in preventive methods like HIV testing for the first time because they have not yet established a routine for care, and it can be difficult to ensure follow-up (Steward et al., 2018). The range of research on the implementation of peer navigation for HIV provides insight into the potential success of peer navigation services for HPV.

HPV, like HIV, relies on both preventive measures as well as treatment for the infection before it develops into a disease with greater mortality: cervical cancer for HPV and acquired immunodeficiency syndrome (AIDs) for HIV. Similar to what Karwa et al. described in their research on leveraging peer support for HIV care in Kenya, HPV care can be improved by relying on PNs to connect the inpatient setting with medical professionals, the outpatient setting with the community, and the patients (Karwa et al., 2017). The researchers found that PNs could offer responsibilities to the patient and healthcare providers in these settings, helping to provide outpatient follow-up, facilitate clinic flow navigation, maintain confidentiality, encourage partner testing, and provide continuity of prevention and treatment (Ibid, 2017). All of these responsibilities overlap with ones that PNs could provide for HPV due to the similar nature of the two viruses.

Wong et al. suggested that there is a need for women with HIV to have increased screening for HPV as studies have confirmed that the prevalence of high-risk HPV infection is greater and more prevalent in women with HIV (Wong et al. 2018). Since PNs are already working with patients infected with HIV, it would make sense to connect these PNs with HPV services so that they could recommend that their female clients participate in routine HPV screening. In their research among women living with HIV in Tanzania, Wong et al. found clear barriers to cervical cancer screening and treatment amongst the women that could be relieved by PNs (Ibid, 2018). They discovered that women living with HIV saw the PNs as acceptable roles that they can work within the clinical setting (Ibid, 2018). Koneru et al. found that among the 399 participants in their study, there were only 36 that had previously been screened for cervical cancer, which made it clear that prevention methods needed to be improved (2017). The study found that there is a lack of awareness of the relationship between HIV, HPV, and cervical cancer among women as approximately half of the participants did not know that HIV infection increased the risk of HPV infection (Koneru et al., 2017). While this research proved that there was a need for increased awareness and preventative methods for HPV and cervical cancer, the study also suggested that peer navigation services would be an effective method to improve prevention and care (Ibid, 2017). By implementing a peer navigation program, women infected with HIV could be educated about their risk of HPV and cervical cancer, and gain access to necessary screening and treatment. The researchers concluded that the use of PNs is highly accepted

by women, and it represents a novel approach to addressing the barriers to cervical cancer screening and treatment (Ibid, 2017).

Beyond connecting HPV to peer navigation for HIV, there is a need for peer-based services to be directly applied to HPV prevention and treatment to increase the general understanding of the virus and explain the risks and susceptibility to cervical cancer. Madrigal et al. found that in Chicago there was a need for peer health educators, who could serve as navigators of the health system, connecting individuals to HPV prevention and treatment services (Madrigal et al., 2020). The study utilized PNs to perform community surveillance of HPV vaccination status and compared the data from women who met with PNs and those who simply received an educational brochure on HPV services (Madrigal et al., 2020). While the percentage of women from both groups who got the first vaccine for HPV after the intervention was the same, the women who had seen a PN were more likely to return for their second vaccine (Ibid, 2020). This shows that PNs could help increase HPV prevention through complete vaccination. Finley et al. conducted a similar study looking at the use of peers in support of an HPV vaccine intervention, finding that peer-based strategies help to overcome HPV vaccination inequities in rural communities (Finley et al., 2021). By addressing these inequities with the support of peers, HPV vaccination rates increase and the overall burden of HPV-related cancers reduces (Ibid, 2021). Based on these two studies, there is potential for peer navigation to be applied to HPV vaccination and other preventive measures, such as HPV self-sampling.

For a PN program to be successful for HPV, the women participating in the program must appreciate and trust the PNs. Koneru et al. conducted a study looking at women's attitudes toward cervical cancer and PNs to determine this feasibility (Koneru et al., 2017). The researchers found that 88.2% of the women surveyed relayed that they would appreciate having a PN accompany them for cervical cancer screenings (Ibid, 2017). This suggests that PNs have the opportunity to have a positive influence not just on vaccination rates, but also on HPV and cervical cancer services. s. If PNs can help reduce the stigma associated with HPV and cervical cancer, then they can increase participation in preventive measures and treatment by supporting women and navigating them through medical services. Additionally, Koneru et al. found that a majority of the women agreed that a PN who was a cervical cancer survivor would be more helpful than one who had not experienced cervical cancer (Ibid, 2017). This supports the purpose of peer navigation being to connect new patients with individuals who have experience with their diagnosis, treatment, and prolonged care. Based on the literature, there is evidence for the implementation of peer navigation programs focusing on HPV. The PN services can be effective for HPV prevention and care, reduce stigma barriers, and increase education in many different communities.

References

Finley, C., Dugan, M. J., Carney, J. K., Davis, W. S., Delaney, T. V., Hart, V. C., Holmes, B. W., Stein, G. S., Katrick, R., Morehouse, H., Cole, B., Bradford, L. S., Boardman, M. B., Considine, H., Kaplan, N. C., Plumpton, M., Schadler, L., Smith, J. J., & McAllister, K. (2021). A Peer-Based Strategy to Overcome HPV Vaccination Inequities in Rural Communities: A Physical Distancing-Compliant Approach. *Critical reviews in eukaryotic gene expression*, *31*(1), 61–69. https://doi.org/10.1615/CritRevEukaryotGeneExpr.2021036945

Karwa R, Maina M, Mercer T, Njuguna B, Wachira J, Ngetich C, et al. (2017) Leveraging peer-based support to facilitate HIV care in Kenya. PLoS Med 14(7): e1002355. https://doi.org/10.1371/journal.pmed.1002355

Krulic, T., Brown, G. & Bourne, A. A Scoping Review of Peer Navigation Programs for People Living with HIV: Form, Function and Effects. *AIDS Behav* 26, 4034–4054 (2022). https://doi.org/10.1007/s10461-022-03729-y

McBrien, K. A., Ivers, N., Barnieh, L., Bailey, J. J., Lorenzetti, D. L., Nicholas, D., Tonelli, M., Hemmelgarn, B., Lewanczuk, R., Edwards, A., Braun, T., & Manns, B. (2018). Patient navigators for people with chronic disease: A systematic review. *PLOS ONE, 13*(2), e0191980. https://doi.org/10.1371/journal.pone.0191980

Shah, P., Kibel, M., Ayuku, D. et al. A Pilot Study of "Peer Navigators" to Promote Uptake of HIV Testing, Care and Treatment Among Street-Connected Children and Youth in Eldoret, Kenya. AIDS Behav 23, 908–919 (2019). https://doi.org/10.1007/s10461-018-2276-1

Wayne T. Steward, Jeri Sumitani, Mary E. Moran, Mary-Jane Ratlhagana, Jessica L. Morris, Lebogang Isidoro, Jennifer M. Gilvydis, John Tumbo, Jessica Grignon, Scott Barnhart & Sheri A. Lippman (2018) Engaging HIV-positive clients in care: acceptability and mechanisms of action of a peer navigation program in South Africa, AIDS Care, 30:3, 330-337, DOI: 10.1080/09540121.2017.1363362

The Impact of Minimum Wage on Child Development

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Ensuring that people can afford a reasonable standard of living is important not just for themselves, but also for their children. Children born into poverty face limited resources and opportunities, and without adequate access to shelter, food, and healthcare, their development can be significantly hindered. The International Labour Organization defines minimum wage as the "minimum amount of remuneration that an employer is required to pay wage earners for the work performed during a given period, which cannot be reduced by collective agreement or an individual contract." Over the years, there have been many debates about whether minimum wage laws are beneficial or detrimental to economic growth. The United Nations Global Compact advocates for all companies to "promote and provide a living wage as an essential aspect of decent work to ensure all workers, families, and communities can live in dignity." Despite inflation and the rising cost of living, the federal minimum wage has remained at $7.25 per hour for the past decade, leaving states to regulate yearly increases. As many as 20 states still opt for the federal minimum wage.

Previous research has shown that improving the minimum wage can impact children's development in numerous ways. In 2021 the Economic Policy Institute found that a $15 minimum wage would lift over 3.7 million people out of poverty, including 1.3 million children. Higher family incomes provide direct and indirect benefits, leading to increased access to resources such as food, housing, and healthcare, as well as improvements in parental stress and quality of care, which are crucial to improving child development. A paper published in the American Journal of Health Economics, "Effects of the Minimum Wage on Child Health," analyzed data from the National Survey of Children's Health on different minimum wages over different periods of childhood. It found that raising the minimum wage during childhood was positively correlated with improvements in child health and outcomes. Higher salaries allow families to devote time and resources they would not otherwise have to investments that could prevent or mitigate physical health issues, mental health issues, trauma, and other drivers. For example, higher wages can help expecting mothers afford nutritious food and dietary supplements to ensure a smooth pregnancy. Higher salaries can also reduce financial burdens and stress on the household, contributing to improved parent-child bonding time, stronger relationships, and a supportive environment for healthy child development.

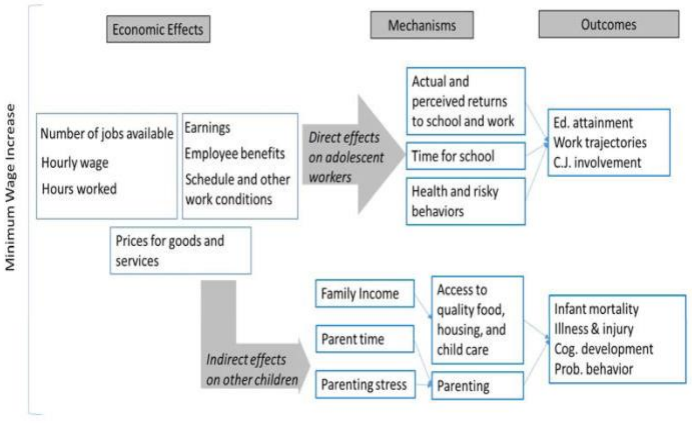

Figure 1. Flow chart summarizing the potential effects of minimum wage on family life and child development (Hill & Romich, 2018)

Despite the benefits of raising the minimum wage, arguments against it persist. Some studies suggest that it could lead to a reduction in employment opportunities, particularly for low-skilled workers. Employers may choose to cut jobs or reduce work hours to compensate for the increased labor costs, which could lead to job losses for parents and caregivers. However, it could also be argued that providing a livable wage could reduce the need for people to work multiple jobs to afford basic necessities like housing and food. This, in turn, could provide more routine and financial stability for parents to spend time with their children, even though fewer jobs may become available.

The impact of minimum wage on childhood development is complex and multifaceted. More research needs to be done to fully understand the extent of costs and benefits to increasing the minimum wage at the federal level. However, there is overwhelming evidence that shows that increasing minimum wage can significantly improve family health and child outcomes. We should redirect or prioritize government funding for low-income families to ensure that these families are provided a livable salary to promote healthy living and allow children to reach their full potential. Policymakers should consider these factors when making decisions about minimum wage policies to ensure that they benefit all workers and families, especially those with children.

References

Effects of the Minimum Wage on Child Health
https://www.nber.org/system/files/working_papers/w26691/w26691.pdf

How will Higher Minimum Wages Affect Family Life and Children's Well-Being?
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5966045/

https://www.epi.org/publication/raising-the-federal-minimum-wage-to-15-by-2025-would-lift-the-pay-of-32-million-workers/

Alan Manning, "Why Increasing the Minimum Wage Does Not Necessarily Reduce Employment," *Social Europe*, Jan. 27, 2014

"May The Opposite Be My Fate" – For Modern Doctors, That May Be Their New Reality

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"So long as I maintain this Oath faithfully and without corruption, may it be granted to me to partake of life fully and the practice of my art, gaining the respect of all men for all time. However, should I transgress this Oath and violate it, may the opposite be my fate."

~

The above excerpt is the final lines from the renowned Hippocratic Oath - its namesake comes from the legendary Greek doctor Hippocrates, who pioneered multiple academic concepts that form the core of modern medicine. The very values of service, respect, and quality inscribed into the Hippocratic Oath are said to have been first taught by Hippocrates himself to his pupils under the cooling shade of a sycamore tree located in Kos, Greece.

Thousands of years and hundreds of doctors later, the Hippocratic Oath remains the foundation of ethical beliefs surrounding medical care – the Oath itself acts as a gateway to usher newly minted doctors into the professional world, marking the end of many demanding years of medical education and even more piles of financial debt. For students studying in America, the associated (and aptly titled) "white coat ceremonies" in medical schools across the country is a treasured symbolic event, signifying the beginning of a fulfilling career in providing lifesaving healthcare for over eight billion people on this planet.

Yet, anyone who may walk into a hospital, outpatient office, or an urgent care clinic at any moment in time has their own background and beliefs - and the "one-size-fits-all" approach popularly taught to new doctors will ultimately fall flat.

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An average American medical student's schedule often fills up with countless hours of studying, so much so that it can neglect other parts of their lives.[1] Much of that time is often spent reviewing solely S.T.E.M. course concepts, including (but not limited to) biology, chemistry, anatomy, physiology, physics, psychology, sociology, and biochemistry. This can manifest into a lack of culturally sensitive communication skills and general cultural competency, as rigid biological perceptions of patients become the normalized belief versus the actual complex individuality that makes up the average patient. Often, the first week of many MD programs in American medical schools involve grotesque dissections, invasive examination practices, and lots of bodily fluids - all to train students in viewing patients not as people, but rather as bodies. And when it comes to serving as the final line of defense between life and death, a lack of cultural and social awareness among medical students can have terrible consequences.

One prominent example is illustrated in the 1997 novel *The Spirit Catches You* by Anne Fadiman, chronicling the life of Lia Lee, a Hmong child with severe epilepsy who had several interactions with the American healthcare system.[2] Throughout her childhood, Lia was unable to receive the proper care she needed due to language and cultural barriers with her doctors in Merced, California. At one point, Lia's mother and father believed that her multiple prescribed medicines were making her seizures more severe, so much so that they opted to change her strict medication schedule. They also believed that her seizures were a result of spiritual imbalance and preferred to consult with a local Hmong shaman than with American doctors. Conversely, Lia's doctors strictly believed in the biological causes of her seizures

but had no understanding or skills to begin communicating such with her family.

As the United States' population continues to diversify,[3] medical professionals are increasingly interacting with different languages and cultural beliefs but lack the skills to do so properly. This has dire consequences, often with communicating important medications, procedures, and post-operative regimens.[4]

The reasoning behind such gaps can be traced back to medical school. A 2020 Washington Post article brings up the lack of diverse curriculum in education.[5] The article focuses on Malone Mukwende, a medical student in the UK who published a clinical handbook detailing physiological conditions on different skin tones after noticing many of his educational materials utilized only white skin in photographs and diagnostic criteria.

These exact educational materials are the ones teaching our future doctors. If the curriculum is not reflective of the population students will be serving, how can we expect future doctors to provide the best quality care to *everyone*?

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And it isn't just in books. Social constructs (such race and gender) are often considered diagnostic tools in medical school, which can distort ways of thinking. A key example is a study which showed how some students were taught that black patients' blood coagulates quicker compared to other patients, causing neglect in treatment plans.[6] As globalization continues, it will be difficult to find someone who matches the exact characteristics of what medical students are being taught, so why teach in such a cookie-cutter way in the first place?

Another 2000 article also popularized the "flower box allegory" to illustrate how racism is built within medical institutions themselves.[7] The U.S. medical education system has been built on institutionalized racism, as racist attitudes can often influence admissions criteria and committees. In the 2020 medical application cycle alone, only 2,000 black students matriculated into U.S. medical schools, compared to over 9,000 white students.[8]

Psychologically speaking, a patient is more likely to speak more openly with and seek care from a medical professional who looks/speaks/shares the same culture as them due to a sense of shared trust and common background.[9] A lack of diversity in medical school admissions means a lack of diversity in medical professionals, which can impact patients seeking and adhering to care.

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Now, some may question the complicated logistics associated with change – after all, this has the norm for decades. However, thanks to COVID-19, it has become increasingly necessary to ensure that care is available equitably to everyone in order to reduce the severity of communicable diseases and chronic comorbidities. While the process will not be simple, it will be well worth the effort to increase trust between patients and providers, improve the quality of healthcare, and contribute to better quality of life for all.

So, what can be done? Firstly, undergraduate & medical schools should invest more into social science and humanities departments to make such classes more available to their students. Additionally, schools should also give voice to community service organizations on their campuses, allowing for students to be aware of the multitude of opportunities that are available to them in order to get more involved locally and connect on a more personal level with their college-town populations.

Medical schools should also change their requirements for premedical students, adding more emphasis on sociology/health equity courses and expanding credit requirements to include history, anthropology, religious studies, and speech courses. The latter will especially help students enhance their communication skills with patients and with each other as professionals - after all, healthcare has been and will remain a team-oriented field. Schools should also ensure diversity among their student body by reevaluating and omitting biases

among admission policies and committee members.

The journey to become a healthcare professional is not easy. Overhauling previous knowledge and starting from scratch won't be easy either. But it is well worth it – for the kid who gets their first check-up with a doctor who looks just like them to the elderly man who speaks to his caregiver in their native language. Perhaps when medical professionals learn to engage in a culturally sensitive manner will be the moment The Hippocratic Oath becomes genuinely fulfilled.

References

[1] Fares, Jawad et al. "Stress, Burnout and Coping Strategies in Preclinical Medical Students." *North American Journal of Medical Sciences* vol. 8,2 (2016): 75-81. Doi:10.4103/1947-2714.177299

[2] Fadiman, Anne. "Chapter 5 – Take As Directed." *The Spirit Catches You and You Fall Down*, Farrar, Straus, & Giroux, New York City, NY, 1997, pp. 38–59.

[3] Khoury, Amal, et al. "Cultural Competence: Why Surgeons Should Care." *The Bulletin*, American College of Surgeons, 6 June 2016, https://bulletin.facs.org/2012/03/cultural-competence-why-surgeons-should-care/.

[4] "After Surgery: Discomforts and Complications." *Johns Hopkins Medicine*, Johns Hopkins Medicine, 2021, https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/after-surgery-discomforts-and-complications.

[5] Page, Sydney. "A Medical Student Couldn't Find How Symptoms Look on Darker Skin. He Decided to Publish a Book about It." *The Washington Post*, WP Company, 22 July 2020, https://www.washingtonpost.com/lifestyle/2020/07/22/malone-mukwende-medical-handbook/.

[6] Lawrence, Elizabeth. "What Doctors Aren't Always Taught: How to Spot Racism in Health Care." *Kaiser Health News*, Kaiser Family Foundation, 17 Nov. 2020, https://khn.org/news/racism-in-health-care-what-medical-schools-teach/.

[7] Jones, Camara Phyllis. "Levels of Racism: A Theoretic Framework and a Gardener's Tale." American Journal of Public Health, vol. 90, no. 8, Aug. 2000, pp. 1212–1214.

[8] "Table A-9: Matriculants to U.S. MD-Granting Medical Schools by Race, Selected Combinations of Race/Ethnicity and Sex, 2018-2019 through 2021-2022." *AAMC*, Association of American Medical Colleges, 12 Nov. 2021, https://www.aamc.org/media/6031/download?attachment.

[9] Robinson, Carole A. "Trust, Health Care Relationships, and Chronic Illness: A Theoretical Coalescence." *Global qualitative nursing research* vol. 3 2333393616664823. 12 Aug. 2016, doi:10.1177/2333393616664823

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