



## **INTRODUCTION**

This research attempts to understand social determinants of health as they relate to health inequities. We know that socio-economic standing effects health inequities and the abilities of

that health inequity is solely a social justice issue. While the social justice aspect of health inequity is cause for concern on its own, health inequity also hinders socioeconomic development as ill and



education, and household income affected people's ability to find relevant and credible information (Clarke et al., 2016). This lack of information could impact the capabilities of people who might already be affected by other social justice issues.

These researchers all point to different aspects of health equity as a multidimensional concept (Braveman & Gruskin, 2003; Sen, 2010; Marmot, 2007; Khan et al., 2010). They also point to the fact that health inequities limit development. In *Uganda Development of Freedom*, it was discussed how all freedoms impact one another. Indeed, if there is an unfreedom in economic facilities, this will impact health equity (Sen, 2010). We saw the effects of this most recently as more and more people from wealthy backgrounds encourage those of perhaps not so wealthy backgrounds to not get vaccinations and not take precautions in order to end the current pandemic. When the health of these two groups were impacted by the virus, the wealthier received hardcore treatment plans. Whereas many people who were not as well off did not receive similar treatment plans. In order to understand health inequities, we use the United Nations Human Development Index. It is defined as follows:

“The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living. The HDI is the geometric mean of normalized indices for each of the three dimensions.

The health dimension is assessed by life expectancy at birth, the education dimension is measured by mean of years of schooling for adults aged 25 years and more and expected years of schooling for children of school entering age. The standard of living dimension is measured by gross national income per capita.” (UNDP p.1, 2021)





Kr0 gGS8 gs0 G.6 #GSI 72.466e 72 )2u466u72.466(JIE 74QW\*#B 9 #I 0 0 1 72.024 747.6 #GS7 gs011gs2S8 gs0 GGS8.6 #Qu)4fe6(h)3(JIE 74QW\*







The hypotheses tested by this model are as follows:

H1.1: Inequality Index is positively related to HDI

H2.1: The Gender Index is negatively related to HDI

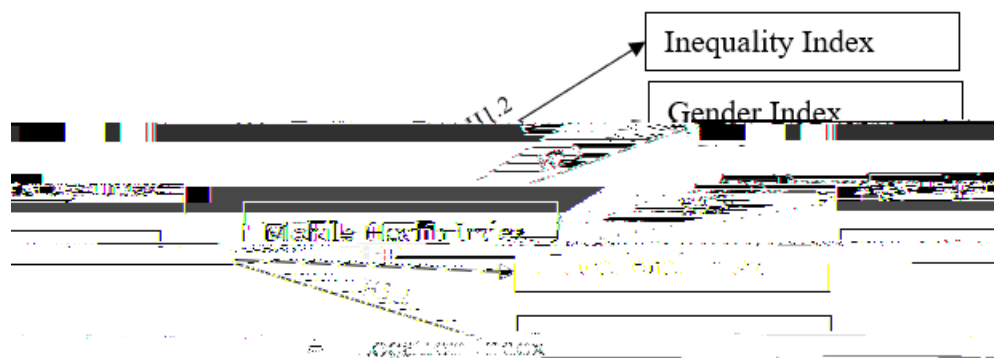
H3.1: The Age Dependency Index is negatively related to HDI.

H4.1: The Educational Index is positively related to HDI.

H5.1: The Location Index is positively related to HDI.

To address the second research question (is there a correlation between mHealth and addressing the unequal health outcomes?) we will take the same indexes and compare them to a Mobile Health Index. The Mobile Health Index is made by combining the percent of the total population using the internet, mobile subscriptions per 100 people, and life expectancy. The model for this research question is illustrated in figure 2 below:

**Figure 2: Model of Mobile Health to Social Determinants of Health**



In order to find out if the use of mobile phones to access health information can help overcome limitations brought about by the above social determinants, we investigate the following hypotheses as follows:

H1.2: The Mobile Health Index is positively related to the Inequality Index.

H2.2: The Mobile Health Index is negatively related to the Gender Index.

H3.2: The Mobile Health Index is negatively related to the Age Dependency Index.

H4.2: The Mobile Health Index is positively related to the Educational Index.

H5.2: The Mobile Health Index is positively related to the Location Index.

## **METHODOLOGY**

Demographic information was a difficult category. No matter where you go there will be biases. But they might not always be the same biases. Since our data was limited, we decided to use two demographic indices: age and gender. As we could see from Clarke et al (2016), age is a variable that impacts ICTs usefulness (Clarke et al., 2016). Therefore, an age index was needed. Gender inequality is a concern that is impacted by health inequity and use of ICT (UNDP, 2019; Alder & Ostrove, 1999; Taylor, 2017; Baker, 2014; Castañeda et al., 2015, Kaba & Meso, 2021). Women in many parts of the world are not as equal to their male counterpart (UNDP, 2019). Education of women is especially low in some countries (UNDP, 2019). Development as Freedom, this is an unfreedom of social opportunities. Unfreedoms in social opportunities tend to effect other freedoms. According to the UN, this could affect health care and mortality rates (UNDP, 2019; Sen, 2001). Thus, a Gender inequality index will also be utilized when considering addressing health inequities with mhealth. The environmental factors were organized into infrastructure and potential future infrastructure. Infrastructure is operationalized by the location index which groups together many impacts to health. Future infrastructure is operationalized by education index. Those countries that have a more educated population will have more innovations. It contributes to the number of doctors a population has, the number of engineers a population has, and so on.

In order to investigate social determinants of health and human development, social determinants of health attributes are Inequality Human Development Index, Gender Inequality





from the (2020) World Development Indicators database. Inequality measures were collected from the World Inequality Database (2020). These are all included in the HDI measures described above.

## **RESULTS AND ANALYSIS**

Regression analysis was carried out to discover any correlations that may exist to test the hypotheses described above to discover a relation between the social determinants of health and HDI. Where there are significant results, there is a relation between social determinants of health. Then we looked at the beta score in order to evaluate whether the hypotheses were correct or not.

### ***Social Determinants of Health relation to Human Development (HDI)***

The hypotheses predicts that the inequality index, the educational index, and the location index have positive beta scores and significant regression analyses when compared to HDI. For education and location, a positive relation would show infrastructure levels effect human development. The reason Inequality Index is predicted to relate positively is due to the way the index was calculated. The UN calculated this index in a way that it would be comparable to HDI. The less inequality there is, the higher the inequality index will be. Our prediction is the higher the index is, the higher the human development will be.

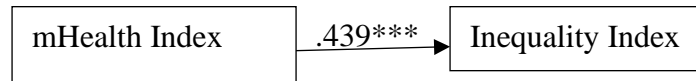
Similarly, when comparing the beta scores, for the gender inequality index and the age dependency index, these should have negative beta scores. For the gender inequality index this is because the more inequality there is, the higher this index will be. Our hypothesis is that when there is less gender inequality in a system, there will be better human development. Our hypothesis for the age dependency index is similar. The less dependency there is in terms of age, the better the human development will be.





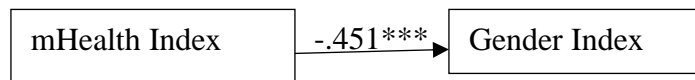
inequality index, educational index, and location index will all have positive beta scores. For gender inequality index and age dependency index, we predicted negative beta scores.

**Figure 4.1: Mhealth Index relation to Inequality Index**



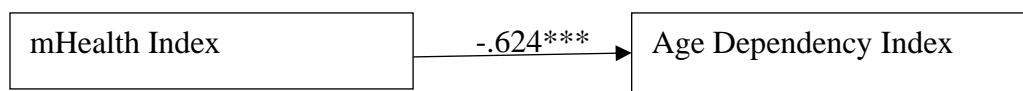
The figure above is the comparison between mHealth and Inequality. The relationship between these two indexes is significant (p-value = 0.000, significant when p-value < 0.005). As it was predicted mHealth is positively related to the Inequality Index. This means that as there is less inequality the life expectancy, use of mobile phones, and the access to mobile phones increases. Qureshi and Najjar (2017) showed this same result that use of information and communication technology (ICT) increased GDP of very small island states (Qureshi & Najjar, 2017). Since IHDI is HDI adjusted by the inequality of the state, we can see the impact of ICT in a worldwide perspective. The more people who have access to ICT, the better the HDI is and the less inequality there is likely to be in a given population.

**Figure 4.2: Mhealth Index relation to Gender Index**



The R-squared value for mHealth and Gender is 0.199. Therefore, the data fits 19.9% of the model and according to the regression table it is a significant relationship (p-value = 0.000, significant when p-value < 0.005). The relation shows a negative relation, as predicted. This means that if there is more mhealth access there is less gender inequality.

**Figure 4.3: Mhealth Index relation to Age Dependency Index**



The figure above shows the relation between mHealth and Age Dependency. The model is a 38.7% fit (r-square value= 0.387, p-



and the beta coefficient were higher than expected. It shows that when mhealth is more accessible, the HDI is higher.

**Figure 5: mHealth Relation to HDI**

As shown in the analysis, mhealth has the ability to impact social determinants of health, which will improve the human development of a country. This offers unique insight into the inequities such as socio-economic, environmental, and demographic that can be overcome through mHealth. People who are unable to obtain basic necessities such as food, shelter, capital, and the capability to acquire the information they need to stay healthy are disadvantaged. These people are at a disadvantage during the COVID-19 pandemic. mHealth has a role to play in the future to making sure that people have access to information and access to resources.

Source: [Illegible text]



**REFERENCES**

- Adler, N. & Ostrove, J. (1999). Socioeconomic Status and Health: What We Know and What We Don't. *Annals of the New York Academy of Sciences*. 896. 3-15. 10.1111/j.1749-6632.1999.tb08101.x.
- Baker, E. H. (2014). Socioeconomic status, definition. *The Wiley Blackwell encyclopedia of health, illness, behavior, and society*, 2210-2214.
- Braveman, P. & Gruskin, S. (2003). Defining equity in health. *J Epidemiol Community Health* 57: 254-258. <https://jech.bmj.com/content/57/4/254>
- Castañeda, H., Holmes, S. M., Madrigal, D. S., Young, M. E. D., Beyeler, N., & Quesada, J. (2015). Immigration as a social determinant of health. *Annual review of public health*, 36, 375-392.
- Clarke, M. A., Moore, J. L., Steege, L. M., Koopman, R. J., Belden, J. L., Canfield, S. M., Meadows, S. E., Elliott, S. G., & Kim, M. S. (2016). Health information needs, sources, and barriers of primary care patients to achieve patient-centered care: A literature review. *Health Informatics Journal*, 22(4), 992-1016. <https://doi.org/10.1177/1460458215602939>

Kahn, J. G., Yang, J. S., & Kahn, J. S. (2010). 'Mobile' health needs and opportunities in developing





Residual	12.908	187	.069		
Total					



**ANOVA**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	63559.227	1	63559.227	521.221	.000
Residual	22803.327	187	121.943		
Total	86362.553	188			