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Funding Childhood Science: Life or Death

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Introduction

As a biology major working towards a career in health care, I am passionate about better understanding the pitfalls of our current health care system. It is important to recognize the weaknesses in current systems to work towards improving these inadequacies. As a human being, I am an advocate for access to health care for all – an unfortunate reality which does not already exist in this country. Like many flawed systems, there is almost never a simple solution. Inequality frequently stems from a much deeper and long-term battle, as in the case with the health care system.

In this proposal, I aim to demonstrate one of the many origins of health care inequality which spans across the nation, specifically focusing on Rhode Island. I plan to demonstrate the correlation between the resources provided to early childhood scientific education and quality of health. Ultimately, drawing a connection between educational funding and health outcome. Specifically, I will show that by underfunding science education, students experience a loss in essential health care knowledge and report lower levels of health literacy; these individuals are more vulnerable to poorer health outcomes. Health care inequality exists in this fragile interconnection with education. Additionally, education inequality exists in an even greater system of inequality, income and wealth. Thus, these three factors are interrelated across many complex inequality systems. In this proposal I will be illustrating the connections between income and wealth, educational resources and funding, health literacy and knowledge, and health outcome and health care inequity.

Current Patterns of Inequality: **Wealth and Education**

There are a multitude of factors which contribute to one's social identity and often determine how they interact and engage within communities. For example; race, gender, age, ethnicity, wealth, employment, education, and language each have a substantial effect to one's lifestyle, making up their identity. In the United States, an individual's socioeconomic status, how their wealth correlates with their "status" in society, is largely influenced by their race. This correlation between socioeconomic status and race contributes to an enormous amount of inequality that then impacts other aspects of their identity, such as education level and health status.

Patterns of racial wealth disparities are widely researched and studied throughout the United States, reporting that minority races on average earn a lower income and have lower levels of wealth when compared to whites (Kaushal and Nepomnyaschy, 965). These studies are evident, however, not many include the effect this racial wealth disparity has on education level of these minority groups. One research team, Neeraj Kaushal and Lenna Nepomnyaschy, conducted a study which studied the relationship between all three of these factors: wealth, race/ethnicity, and educational outcome. Their research argues an association between familial wealth and the children's educational outcomes. Educational outcomes were measured by variables including suspension from school, repetition of a class grade, participation in "gifted" programs, or participation in extracurricular activities. As a result of their study, Kushal and Nepomnyaschy concluded that individuals from minority groups, specifically black and Hispanic communities, commonly experience poorer educational outcomes. Thus, they argued that this correlation illustrates how income disparities play a role in educational outcomes and success.

Kushal and Nepomnyaschy's research illustrates that wealth disparities between racial and ethnic groups have a correlation to gaps in educational outcomes of children. Their data report "the average net worth in white families with children is over four times the average net worth in black families and nearly three times the average net worth in Hispanic families" (Kushal and Nepomnyaschy, 970). Children from these white families are more likely than black and Hispanic children to have higher educational outcomes such as "participation in extracurricular activities or special programs for gifted children, and less likely to repeat a grade or be suspended/expelled from school" (Kushal and Nepomnyaschy, 970). These results demonstrate that "socio-demographics and family resources" play a significant role on educational success. Essentially, showing a predictable trend that children from lower wealth households growing up with financial disadvantages are more likely to experience educational disadvantages as a result. Again, reaffirming their argument which draws the connection between wealth inequality and education.

There is no discrepancy regarding the importance of education. Education provides an individual with skills ranging from social development to essential mathematical calculations. Not only does education positively impact a single individual, but quality education has a lasting impact on the community as a whole. Specifically, illiteracy "contribute[s] significantly to the disease burden of poor communities and countries, and reinforce health and economic inequalities" (Kickbusch, 290). It is evident that an advancement in education generates a positive impact on the population's health and well-being, especially the education of women and children in the community. Data suggest that "a mother's level of education closely correlates with a child's risk of dying before age 2 years" (Kickbusch, 291). Moreover, access to

education not only benefits individual learners and their communities, but also future generations.

Not only are income and wealth inequalities negatively impacting a child's success in education, but additionally impact the health and burdens of the community as a whole. Strengthening this systematic inequality, is a process called district allocation. District allocation is the distribution of educational resources in Rhode Island based on the average wealth of the community district. This system of distribution furthers a hierarchy of both wealth and education for higher income white communities when compared to lower income minority communities. Jerry C. Fastrup analyzes the role the Rhode Island state government plays in the funding and allocation of its educational resources to the public-school system. Essentially, the amount of funding given to Rhode Island public schools is dependent on the district's financial system. Fastrup states that although "students' access to educational resources is of primary interest, it is also true that, in the interest of preserving local choice, states typically do not mandate specific levels of local effort designed to achieve funding equity" (214). The article admits that despite childhood education being a "primary interest" of Rhode Island, there are limited policies in place to combat educational inequalities which exist due to wealth disparities between communities across the state. Due to the undeniable importance of education, it is important to combat this systematic hierarchy and provide better quality education for all racial/ethnic groups who do not receive equal funding to white communities within the state.

STEM and Beyond: **Science Education**

When discussing education as a whole, it is important to remember that the term is an overarching concept of many different disciplines, one of which being science. In early childhood education, students are taught a variety of generalized disciplines such as English,

History, Mathematics, and Science. In particular, science education is especially integral to the overall development of a student. Education as a whole is reliant on one's own sense of agency and self-motivation, without which student's lack determination to continue their studies. Within the scientific field, the demand for curious and imaginative innovators is high, providing a perfect platform for those with high levels of self-motivation. Science education develops a goal-oriented "investigative learner" which is an advantageous skill to hold in any profession, leadership role, or lifestyle.

In his research titled, *The Rapprochement Between History, Philosophy and. Science Education*, Michael R. Matthews recognizes the importance of an overarching education but specifically argues that science education provides a knowledge greater than academics. Matthews argues that education should be an engagement in reflecting on the philosophical "big questions" one faces in life. Further, he focuses on the specific importance of science education arguing that "science has been the foremost contributor to our understanding of the natural and social world" (Matthews, 1). Arguing that science allows its students to consider these "big questions" which are vital to education as a whole. Thus, he believes that science should be the main concept that pulls other disciplines together and "all students, whether science majors or others, should have some knowledge of the great episodes in the development of science" (Matthews, 5). A student's education in science is vital as it engages them with teachings of the world around us that cannot be found in a textbook. Matthews states that "more can be made of the educational movement than merely teaching, or assisting students to discover, that, for a given has at a constant temperature, pressure multiplied by volume is a constant. This is something but it is minimal" (7). Ultimately, science education should consist of more than the memorization of specific equations and mechanisms. When taught effectively, science education

provides essential life skills such as critical thinking and problem solving essential for any individual's success.

It is evident that wealth disparities are prevalent between individuals of differing racial groups, particularly between black or Hispanic communities and white communities. This income inequalities plays a role in the entire district's access to quality education. In Rhode Island, the state allocates educational resources depending on the financial wealth of a particular district or community (Fastrup, 207-208). This allocation system clearly will serve in favor of wealthier white communities, providing high quality educational resources compared to lower-income black and Hispanic communities. Thus, furthering the wealth and education divide already present in Rhode Island and throughout the United States. By contributing to this educational disadvantage, students of these lower income communities are losing valuable educational resources. Lower funded school districts will likely report poorer educational outcomes in their students. Special education programs, like science curriculums, will diminish in quality. These students then become less likely to develop the essential social and intellectual skills that are cultivated in a science education. This loss is detrimental to the lifestyle, health, and future of these students.

Education is Key: **Health Literacy and Health Outcome**

Health literacy is an umbrella term which is often used in the medical field to assess a patient's understanding of their own health conditions, medical and clinical terminology, and the health care industry as a whole. Within this umbrella term, there are many different interpretations of the definition of health literacy. A simplistic definition can be "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (Paasche-Orlow and Wolf, 34).

However, in other research, the term is even more loosely defined as "the ability to read, understand, and act on health care information" with additional subsections divided into three separate domains: functional health literacy, interactive health literacy, and critical health literacy (Kickbush, 292). It is evident that health literacy can be defined in many different ways, often making the concept challenging to measure and effectively evaluate. However, for the terms of this proposal, we will consider health literacy as a patient's ability to understand and monitor their own health conditions, a basic comprehension of medical and clinical terminology, and the capability to roughly navigate the health care industry as a whole.

In Nancy Berkman's review article, *Low Health Literacy and Health Outcomes: An Updated Systematic Review*, her research team analyzed data from 96 research studies which had been published in over 110 journals regarding health literacy. Data reports that lower levels of health literacy most commonly exist within populations consisting of "elderly, minorities, and poor persons and those with less than a high school education" (Berkman et. al., 97). This data suggests that lower levels of health literacy are more common in minority populations, lower income/wealth populations, and lower education populations. Again, illustrating the correlation between race, income, and education.

The team additionally identified a correlation between lower levels of health literacy and a greater risk for poorer health outcomes and access to quality health care. Berkman argues that low health literacy stems from "limited health related knowledge and comprehension" (97). Concluding that limited health knowledge, also known as health literacy, has a direct impact on an individual's ability to access and understand health care. Individuals vulnerable to lower health literacy levels face common struggles to navigate health care, posing a threat to their health condition. Ultimately, lower income communities with less access to educational

resources are thus vulnerable to lower levels of health literacy and poorer health status. Again emphasizing that many of our nation's disparities, such as educational resources, income wealth, and health literacy are heavily correlated; now, adding health outcomes and quality of health to this list.

In a further section of her research, Berkman and her team additionally focuses on how a patient's level of health literacy can impact their health status. Berkman's cumulative review outlines specific data regarding health literacy's correlation with aspects of health care by analyzing individual variables such as risk for emergency care, utilization of preventative services/resources, and medication compliancy. The data is a compilation of "nine studies examining the risk for emergency care use and 6 examining the risk for hospitalization" and analysis reports "evidence showing increased use of both services among people with lower health literacy" with additional increased hospitalizations overall (Berkman et. al., 99). In her study of medication compliancy, she again found that "low health literacy is related to poorer skills in taking medications" (Berkman et. al., 99). Concluding that a patient's level of health literacy plays a significant role on their need for emergency care or hospitalizations and their mediation regimen. Therefore, one's ability to monitor their health status and capability to utilize preventative measures to avoid crisis or emergency care is dependent on their level of health literacy.

Berkman's observations formulate an argument that individuals with lower health literacy are more likely to have poorer health outcome and overall health. Further, to verify this relationship, she conducted two final large-scale studies which confirmed that "higher all-cause mortality rates of elderly persons were related to lower health literacy" after controlling for significant medical disadvantages (Berkman et. al., 101). This provides more evidence to argue

that individuals with lower levels of heath literacy experience poorer health and shortened lifespans. Berkman's research demonstrated that health literacy, known to increase from greater education and income, is associated with quality of life and health outcomes of an individual.

Invest in Science to Invest in Health: **Proposal**

Evidently, there is a clear correlation between an inadequate early childhood science education and poor health outcomes due to a lack of health literacy. Based on this evidence I will be proposing that the investment in childhood science education, specifically in lower income minority communities in Rhode Island, would help equalize the gap in health literacy and standardize quality of health and health outcomes across the state.

In his assessment of the Rhode Island public school system, Fastrup states that progress has been made in redistributing educational resources for low income communities. The case study of Rhode Island reports that the state has "maintained a high level of support for special education students… has substantially increased aid to districts with high concentrations of low-income… been a noticeable increase in the proportion of targeted to districts with low funding achieved by a relative decline in state aid going to the wealthiest" (Fastrup, 227-229). Ultimately, the increased resources to these low-income districts has begun to equalize the educational resources distributed across the state. This change is a small step towards equalizing health care outcomes via education; my proposal will accentuate these changes by also addressing the curriculum of science education.

I propose to integrate the "Design, Make, Play" method argued by Honey and Kanter into the Rhode Island public school system in order to fulfill a student's interest and understanding of science. They argue that science specifically is "key to solving the world's most pressing challenges", however, science must be "intimately couple[d] with the practice" in order to "build

students' understandings and appreciation" (Honey and Kanter, 3). By promoting the excitement and fun of science, students become motivated to learn. Educators can then maintain student focus and attention when discussing essential knowledge such as health literacy. Without a passion and interest in learning, no student, no matter their resources, will want to continue their education. Greater educational development leads to increased levels of literacy, correlated with health literacy.

The "design-make-play" learning method for early science education is used specifically to adhere to a young generation of imaginations and keep students engaged in their education. The method is three-fold: "Design" consists of the process of identifying a problem, considering potential options to solve it, recognizing any potential foreseeable setbacks, and developing a plan, model, and solution. "Make" involves building and adapting projects to study and fuel the curiosity of how particular machines or mechanisms function. "Play" uses a voluntary engagement in a subject of interest to invent and explore with creativity. By incorporating these three focuses into a science education, students will respond more positively and will learn much more effectively; ultimately, leading to better education outcomes as well as developing essential problem-solving skills cultivated in science education.

From this growth, the students are better equipped for further studies throughout their education as this program will positively impact the life and health of these students. By investing in educational resources and an effective curriculum for early childhood science education, students gain not only an improved learning environment but one that will be effective in teaching both academics and life skills. Improvements in one's education and literacy are heavily correlated with understanding of health literacy and will result in more beneficial health outcomes for that individual. A focus on childhood science education,

particularly in low income communities with large income and education disparities such as Rhode Island, could lead to the equalization of health care disparities across the entire state. If this proposal is effective, the opportunities to expand this program on a national or even global scale are within reach. Thus, we could generate a world where science fuels our education, health, and well-being for all communities regardless of identity differences.

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