The Role of Public Health School Nutrition in Ending the HIV Epidemic, (EtHE): A Commentary

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Introduction

Health promotion, beginning early in the lifecycle, has lifespan implications. Youth is a critical period in the lifecycle. It marks the consolidation of lifestyle habits that predate “…nutrition-related diseases… (NRDs), [1] such as “…obesity, diabetes, cardiovascular disease…, cancer, osteoporosis, and dental disease.” [2] In the U.S., the pervasiveness of NRDs prompted “the American Cancer Society, the American Diabetes Association, and the American Heart Association… [to advocate a joint position]. …Quality health education programs delivered in the nation’s schools can improve… well-being and health…. [The justification was] promoting and establishing healthy behaviors… [at an early age] are more effective, and often easier than… in adult populations” [3].

The nation’s educational institutions have a captive audience for “…school-based nutrition education.” [4] Among U.S. youth 7 – 17 years old, 96.8% attended school in 2017, for almost six months of the year, on average, six hours per day [5]. And “…coordinated school health programs, [CSHP],” [6] grounded in ecological and social-cognitive approaches to healthy eating, have changed both school and home environments [7]. Nutrition science marks territory for reducing non-communicable chronic diseases, but will it work with infectious diseases like HIV?

HIV epidemiology includes school-aged youth. Among new HIV diagnoses in the U.S., in 2017, one in five (21%) were persons 13 to 24 years old [8]. The Jacksonville metropolitan statistical area had 348 new HIV diagnoses in 2017 [9]. If the national proportion is generalizable, there should be 73 infected youth in local HIV cases. All is not lost, for science is delivering solutions to stymie the epidemic. “…PrEP, pre-exposure prophylaxis, [is a prevention tool for ending HIV] … as a… public health phenomenon. …Emtricitabine and tenofovir disoproxil fumarate… [is] a single pill daily [regimen and] are [approximately] 95% effective for preventing HIV acquisition” [10]. Everyone wants PrEP to be successful, except for the virus. They employ immune evasion mechanisms such as class I Major Histocompatibility Complex molecules to evade detection [11]. This commentary describes a role for Nutrition as an adjunct for PrEP. If the maxim, two heads are better than one, has currency, then nutrition and pharmacology, together, may do more for HIV prevention than apart.

Discussion

The efficacy of PrEP for HIV prevention may rest on a robust immune system (RIS). RIS may mean “…the presence of high levels of anti-HIV-1-specific CTLm, (memory cytotoxic T lymphocytes) …[in vivo for] control of virus replication [at] initial… HIV-1 infection…”[12] If the assumption of RIS has merit, what are the chances that persons in food-insecure households will have robust immunity to support the metabolism of PrEP? Food shortages among the disadvantaged contribute to “health and nutrition problems during childhood…”[13] Might that be the case in the U.S., or Duval County, Jacksonville, Florida? In 2018, Jacksonville poverty rate was 16% [14] however, Census Tract 3, on the Eastside of Duval County, had 40.5% of families below 100% of poverty and 41.6% of families under 100% of poverty with children less than 18 years [15]. “HIV prevalence rates in urban poverty areas [are] inversely related to annual household income—the lower the income, the greater the HIV prevalence rate” [16]. What does this mean for low-income families? Pena and Bacallao (2002), [17] shared this response.

Poor people are not only more exposed to health-impairing factors but are less
resistant... to comparable levels of those factors [than non-poor peers].... Poverty’s... broad-spectrum... manifestations... [includes] increased propensity to... diseases, both infectious and non-communicable...

The ties between poverty, food insecurity, place, and HIV for school attending youth with social determinants of health (SDH), risk factors make them eligible for Protein-Energy Malnutrition (PEM)—an umbrella term for "...undernutrition and deficiency of multiple nutrients and energy" [18].

PEM adversely affects immunological factors. These include suppressor cytotoxic CD8 cells...[19]...cytokines... and interferon-gamma. A decrease in these factors reduces the ability of T lymphocytes to follow the instructions of cytokines—chemical signaling molecules [20]. Here is Kedzierska and Crowe’s (2001) [21] discussion of immunology.

Interferons, (IFN-α, -β and -γ), have... antiviral, antiproliferative, and immunomodulatory effects... [can inhibit] viral replication in a non-specific manner. [And]... cytokines exert both stimulatory and inhibitory effects on HIV-1 infection and replication...

PEM can impair the immune system response [22] through "...IFN-α/β [which] is crucial for protective immunity to viruses..." [23] An imperative exists to leverage multiple strategies to optimize EtHE efforts.

Local planners should ramp up efforts to support immune-compliance in uninfected, school-aged youth. School nutrition services focusing on estimation of protein nutritional status [24] can yield indices for designing interventions that promote immunity. We know that PEM... decreases resistance to infection and... [compromise] anatomical barriers... [like] mucus... [membranes].... [25] The connection exists because PEM causes low immunoglobulin A, (IgA), production, which works to deny toxins, viruses, and bacteria access to mucosal surfaces [26]. Strengthening the immune system to defend the host against antigens requires a joint focus on SDH and PrEP’s metabolism. Medications are necessary for disease interdiction, and they are even more useful with nutritional support.

Conclusions

Public health research should have a more formative role in HIV prevention planning. Formative, as used here, implies serving as a guide to help planners...[1]...identify potential... influence[r]s... [of] implementation efforts." [27] "PrEP is a new HIV prevention approach, where HIV-negative individuals use anti-HIV medications to reduce their risk of becoming infected... exposed to the virus." [28] Nutrition is a legacy approach for boosting "... total antioxidant capacity... [for neutralizing] oxidative stress... [and decreasing] reactive oxygen species... [to limit] apoptosis... [and]... decrease of CD4+ T cell[s]..." [29] Addressing nutritional deficiencies... [30] may serve as adjunctive therapy for PrEP’s rollout and long-term efficacy in disadvantaged populations [31] More than a decade ago, Williams and colleagues [32] provided a health promotion rationale that remains apropos today.

Much of the policy focus [on] reducing health disparities has... concentrated on improving access, coverage, quality, and the intensity of healthcare. However, health is more a function of lifestyles linked to living and working conditions than of healthcare. Accordingly, [practical] efforts to improve health and reduce gaps in health need to pay [more considerable] attention to addressing the social determinants of health within and outside of the healthcare system.

EtHE, is a policy proposal. It... will require a heightened emphasis on... interventions... that will reach all people, irrespective of social class, or racial and ethnic background" [33].

References


