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# Analyses of the Public Health Impact of Cannabis Must Include the Health Benefits of Moderate Use

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## Commentary

The current discussion of the public health impact of Cannabis use fails to consider the beneficial effects of moderate, adult use, resulting in a misleading perception of harm. Cannabis use counteracts two serious public health crises, the obesity epidemic and the drug overdose epidemic, thereby providing a net improvement in public health.

Of greatest significance from a public health perspective, Cannabis use counteracts the metabolic damage caused by the modern American diet. This diet is obesogenic and pro-inflammatory, and contributes strongly to leading causes of death. Obesity rates are spiking, having increased more than threefold since the early 1960s. The state with the lowest obesity rate, Colorado, now has a rate of obesity (20%) that is double the national average in 1960 (10%) (data from CDC). Diseases associated with obesity include cancer, cardiovascular disease, diabetes mellitus, Alzheimer's disease, mood disorders, liver and kidney disease, and musculoskeletal disorders. These include the leading causes of premature death and disability in the United States. Of particular concern, rates of these diseases are rising in young adults, reducing life expectancy and quality of life for a large proportion of the population. Cannabis users show significantly decreased rates of obesity and improved metabolic profiles [1-4].

A well-supported, comprehensive theory has been established that details how Cannabis use improves metabolic function by reversing the harm caused by the modern industrial diet [1]. Human physiology has not changed since 1960, but our food supply has changed a great deal. One of the most significant of these changes is a shift in the ratio of two essential nutrients, the omega-6 and omega-3 fatty acids. Prior to the emergence of industrial, processed food as a major component of our diet, the dietary ratio of omega-6 to omega-3 fatty acids was approximately 4:1. In the modern diet of processed foods, this ratio has increased to as much as 20:1 [5]. This shift leads to overstimulation of the endocannabinoid system, the internal signaling system acted upon by the active chemicals of Cannabis.

The endocannabinoid system consists of signaling molecules and receptors. The main signals are AEA and 2-AG, and the main receptors are CB1R and CB2R. AEA and 2-AG are synthesized from arachidonic acid, an omega-6 fatty acid. These signals are

elevated in obesity due to an elevated ratio of omega-6 to omega-3 fatty acids in the diet, resulting in chronic overstimulation of the receptors [6,7]. Of especial concern in the obesity epidemic is overstimulation of CB1R. This receptor's primary function is to stimulate weight gain. When stimulated, it increases appetite, palatability of food, absorption of food, and assimilation of energy reserves. At the same time, it promotes conservation of energy by reducing the metabolic rate [8]. In the context of abundant, calorie rich food and a sedentary lifestyle, overstimulation of this system is the perfect recipe for obesity and associated diseases such as DM [9].

The CB1R receptor is also stimulated by THC, the main psychoactive compound in Cannabis. In the short term, this causes the increased appetite, hyperphagia and hypothermia associated with the acute stages of Cannabis use. Despite significant increases in daily caloric intake, however, Cannabis users have clinically significant decreases in obesity rates relative to non-users. A well-supported theoretical explanation for this paradox has recently been established [1]. According to this theory, Cannabis use causes a rapid and long-lasting downregulation of CB1R, reducing the sensitivity of the endocannabinoid system. Because CB1R is overstimulated due to elevated production of AEA and 2-AG, caused by the elevated omega-6 to omega-3 ratio of the diet, downregulation of the receptor acts to bring the system back into homeostasis [1]. Multiple studies have shown lower rates of DM in Cannabis users [2,10], as well as improved metabolic profiles [3]. Cannabinoids provide significant benefits in Alzheimer's disease, potentially reversing the progression of the disease [11]. In addition to reducing obesity rates, and thus rates of cancers associated with obesity, cannabinoids have potent anti-tumor properties, reducing tumor initiation, spread, and survival [12]. Cannabis users therefore appear to have lower rates of cancer than non-users [13]. Cannabis thus acts to reverse or prevent many of the harmful effects of the modern diet, currently the leading cause of premature death and disability in the United States [14].

In addition to the metabolic benefits from Cannabis use, legalization of medical marijuana is followed by decreases in prescriptions for multiple classes of pharmaceuticals, including drugs to treat depression, anxiety, pain, psychosis, spasticity, and insomnia. Reasons given by patients for substitution include improved symptom management, milder adverse side effects

and withdrawal symptoms, and lower cost. Of especial importance is a decrease in use of opioids and benzodiazepines [15,16]. These are the main drugs involved in fatal overdoses [17] and legalization of medical marijuana is therefore followed by a substantial decrease in overdose death [18]. This is not accompanied by increased traffic fatalities [19].

Just as with exercise, we cannot focus on only the harmful effects but must consider also the beneficial effects of Cannabis when evaluating its public health impact. Heavy Cannabis use, or use by susceptible individuals, is associated with negative outcomes, especially in adolescents. However, medical use, and moderate recreational use by adults, appears to be associated with significant health benefits in the context of the modern industrial diet, and can thus contribute to a healthy lifestyle. Cannabis not only improves the quality of life of many people, it also prevents many premature deaths [15,17,18,20]. When these health benefits are considered, it becomes clear that prohibition is a greater threat to public health than Cannabis [13,21].

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