Cannabis and Psychosis: A Comprehensive Review of Epidemiological, Biological, and Clinical Interactions

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INTRODUCTION

The interaction between marijuana uses and psychosis has been a contentious and highly researched topic, driven by both the rising prevalence of cannabis consumption and its evolving legal landscape. Marijuana, derived from the Cannabis sativa plant, is one of the most widely used psychoactive substances globally. According to the United Nations Office on Drugs and
Crime (2021), millions of people use cannabis each year, with an increasing number of
jurisdictions legalizing its use for recreational and medicinal purposes. Despite its therapeutic potential, marijuana is also associated with various adverse health effects, particularly on mental health.

One of the most concerning associations is the potential link between marijuana use and psychosis. Psychosis, a condition characterized by impaired reality testing and symptoms such as hallucinations, delusions, and disorganized thinking, can occur in a variety of psychiatric disorders, including schizophrenia. The potential for cannabis to trigger or exacerbate psychotic disorders has prompted growing concern among healthcare providers, researchers, and policymakers. This association is particularly alarming given the rising potency of cannabis products, which often contain higher concentrations of delta-9-tetrahydrocannabinol (THC), the psychoactive component linked to adverse mental health outcomes.

The relationship between marijuana use and psychosis is not straightforward. While some individuals develop psychotic symptoms following cannabis use, others may use cannabis without experiencing such effects. This variability has led to questions about genetic predispositions, environmental factors, and the role of other cannabis compounds, such as
cannabidiol (CBD), in modulating these outcomes. Additionally, debates persist over whether marijuana use is a causal factor, a contributory element, or merely a correlate of underlying
vulnerabilities to psychosis.

This review aims to provide a comprehensive analysis of the interaction between marijuana and psychosis. It examines epidemiological evidence, biological mechanisms, risk factors, and
controversies surrounding causality. By understanding these dynamics, we can better inform public health strategies, clinical practices, and policy decisions regarding cannabis use and mental health.

II. EPIDEMIOLOGICAL EVIDENCE

The relationship between marijuana use and psychosis has been extensively studied through epidemiological research, providing significant insights into the prevalence, patterns, and risk
factors associated with this interaction. Multiple longitudinal, cross-sectional, and meta-analytic studies have highlighted a positive correlation between cannabis use and an increased risk of
psychotic disorders.

One of the earliest and most influential longitudinal studies was conducted by Arseneault et al. (2002), who used data from the Dunedin birth cohort in New Zealand. This study demonstrated that individuals who reported frequent cannabis use during adolescence were at an elevated risk of developing schizophrenia and other psychotic disorders in adulthood. The study revealed that early initiation of cannabis use, particularly before the age of 15, was strongly associated with
this increased risk. These findings were critical in establishing a temporal relationship, suggesting that cannabis use might precede the onset of psychotic symptoms.

A landmark study by van Os et al. (2002) further supported these findings through a population-based cohort in the Netherlands. This study found that cannabis use not only increased the risk of psychosis in the general population but also exacerbated symptoms in
individuals with subclinical psychotic experiences. These results highlighted the dose-response relationship, where more frequent cannabis use was associated with a higher likelihood of
psychotic outcomes.

Meta-analyses have provided additional evidence, strengthening the link between cannabis use and psychosis. Marconi et al. (2016) conducted a comprehensive review of studies, concluding that individuals who used cannabis frequently were approximately four times more likely to develop a psychotic disorder compared to non-users. This meta-analysis also accounted for potential confounding variables, such as age, socioeconomic status, and family history of mental illness, reinforcing the robustness of the findings. Similarly, Gage et al. (2016) identified a consistent association across various study designs and populations, emphasizing the global
relevance of this relationship.

The type and potency of cannabis products have also emerged as significant factors influencing the risk of psychosis. Di Forti et al. (2019) conducted a multicenter case-control study across
Europe and found that individuals who used high-potency cannabis (strains with THC
concentrations exceeding 10%) had a significantly higher risk of developing psychotic disorders than those who used low-potency cannabis or abstained. This study suggested that the growing availability of high-THC products may partly explain the rising incidence of psychosis in certain regions.

It is also important to consider demographic factors, such as age and gender, in the epidemiological context. Adolescents and young adults appear to be particularly vulnerable to
the adverse effects of cannabis on mental health. Studies by Fergusson et al. (2003) and Rubino and Parolaro (2008) have shown that cannabis use during adolescence, a critical period for brain development, is associated with long-term changes in brain structure and function that may
predispose individuals to psychosis. Gender differences have also been noted, with some evidence suggesting that males may have a higher risk of cannabis-related psychosis than females, possibly due to differences in cannabis use patterns and biological susceptibility (Radhakrishnan et al., 2014).

Although these studies provide compelling evidence for an association between cannabis use and psychosis, they are not without limitations. Many studies rely on self-reported data, which can
introduce recall bias or underreporting. Additionally, the presence of confounding factors, such as socioeconomic status, childhood trauma, and co-occurring substance use, complicates the
interpretation of causal relationships. However, the consistency of findings across diverse study designs and populations underscores the public health significance of this interaction.

In summary, epidemiological evidence strongly supports a link between marijuana use and an increased risk of psychosis. This relationship is influenced by factors such as the frequency and potency of use, age of initiation, and individual susceptibility. These findings have critical
implications for public health, particularly in the context of increasing cannabis legalization and the proliferation of high-THC products.

III. BIOLOGICAL MECHANISMS

The biological mechanisms underlying the interaction between marijuana use and psychosis are complex and multifaceted, involving the endocannabinoid system, genetic factors, and neurodevelopmental processes. The primary psychoactive compound in marijuana,
delta-9-tetrahydrocannabinol (THC), is known to have psychotomimetic effects, while cannabidiol (CBD), another major component, may counteract these effects. The interplay between these compounds, neural pathways, and individual susceptibility factors provides a framework for understanding how marijuana use can contribute to psychotic symptoms or disorders.

1. The Role of THC and the Endocannabinoid System

The endocannabinoid system is a critical regulator of brain function, influencing processes such as mood, cognition, memory, and perception. It consists of cannabinoid receptors (CB1 and CB2), endogenous

cannabinoids (such as anandamide), and enzymes that synthesize and degrade these molecules. THC exerts its effects primarily through activation of CB1 receptors, which are abundantly expressed in brain regions associated with psychosis, including the prefrontal cortex, hippocampus, and striatum (Volkow et al., 2014).

Acute exposure to THC can disrupt normal endocannabinoid signaling, leading to altered neurotransmitter release and activity. For example, THC has been shown to increase dopamine release in the striatum, a neurochemical change implicated in the pathophysiology of psychosis (Bossong et al., 2009). Dopaminergic dysregulation is a hallmark of schizophrenia and other
psychotic disorders, and THC-induced increases in dopamine levels may mimic or exacerbate these abnormalities.

Furthermore, chronic THC use may lead to desensitization and downregulation of CB1 receptors, resulting in long-term changes to brain structure and function. Imaging studies have revealed that heavy cannabis users often exhibit structural abnormalities in the hippocampus and prefrontal cortex, regions critical for cognitive and emotional regulation (Lorenzetti et al., 2016). These
changes may contribute to the development or persistence of psychotic symptoms.

2. The Protective Role of CBD

In contrast to THC, CBD appears to have antipsychotic properties and may mitigate some of the adverse effects of THC. CBD does not activate CB1 receptors but modulates the endocannabinoid system in other ways, including increasing anandamide levels by inhibiting its degradation (Leweke et al., 2012). Anandamide is thought to have protective effects against psychosis, and higher levels may counterbalance the disruptive effects of THC.

Research by Bhattacharyya et al. (2018) found that CBD reduced activity in brain regions associated with psychosis, such as the amygdala and midbrain, during tasks that provoke anxiety or psychotic-like experiences. This suggests that CBD can normalize brain function in
individuals at high risk for psychosis. However, many modern cannabis strains are bred to
maximize THC content while minimizing CBD, increasing the likelihood of psychosis-related outcomes (Di Forti et al., 2019).

3. Neurodevelopmental Considerations

Adolescence is a critical period for brain development, characterized by synaptic pruning, myelination, and the maturation of neural circuits. The endocannabinoid system plays an essential role in these processes, and disruption by exogenous cannabinoids such as THC can have lasting effects. Preclinical studies have shown that adolescent exposure to THC can impair the development of prefrontal cortical circuits, leading to deficits in cognition and behavior that persist into adulthood (Rubino & Parolaro, 2008).

Human studies corroborate these findings, showing that individuals who use cannabis heavily during adolescence are more likely to experience structural brain abnormalities and functional
impairments compared to those who initiate use later in life (Batalla et al., 2013). These changes may render individuals more susceptible to developing psychosis, particularly if they have other risk factors, such as genetic predispositions or environmental stressors.

4. Genetic and Molecular Interactions

Genetic susceptibility also plays a significant role in determining how marijuana use affects the brain. Variants in the catechol-O-methyltransferase (COMT) and AKT1 genes have been linked to increased sensitivity to THC and a higher risk of psychosis. For example, Caspi et al. (2005) found that individuals with the COMT Val/Val genotype who used cannabis were significantly more likely to develop psychotic symptoms compared to those with other genotypes. Similarly, AKT1 polymorphisms have been associated with altered dopamine signaling and a greater likelihood of THC-induced psychosis (Colizzi et al., 2015).

Molecular studies have also identified epigenetic changes resulting from cannabis use, such as altered DNA methylation and histone modification in genes associated with brain function and stress response (Freeman et al., 2015). These changes may contribute to the long-term effects of cannabis on mental health, including increased vulnerability to psychosis.

5. THC-Induced Neuroinflammation

Recent research suggests that THC may also promote neuroinflammation, which has been implicated in the pathogenesis of psychosis. THC exposure can activate

microglia, the brain's resident immune cells, leading to the release of pro-inflammatory cytokines (Watson et al., 2020). Chronic neuroinflammation may disrupt synaptic connectivity and plasticity, further increasing the risk of psychosis in vulnerable individuals.

IV. RISK FACTORS AND VULNERABILITY

Not all individuals who use marijuana develop psychosis, suggesting that certain risk factors and vulnerabilities play a critical role in mediating this relationship. These factors include genetic predispositions, early age of cannabis use, environmental influences, and co-occurring mental health conditions. Understanding these vulnerabilities is crucial for identifying at-risk
populations and tailoring prevention and intervention strategies.

1. Genetic Predispositions

Genetic factors significantly influence an individual's susceptibility to cannabis-induced psychosis. Variants in specific genes involved in dopamine signaling and endocannabinoid system regulation have been linked to heightened vulnerability. For example, the
catechol-O-methyltransferase (COMT) gene, which encodes an enzyme involved in the breakdown of dopamine, has been extensively studied. Caspi et al. (2005) found that individuals with the COMT Val/Val genotype who used cannabis during adolescence were at a significantly increased risk of developing psychosis compared to those with the Met/Met genotype. This finding highlights the interaction between genetic predisposition and environmental exposure.

Similarly, the AKT1 gene, which regulates dopamine receptor signaling, has been associated with cannabis-related psychosis. Colizzi et al. (2015) identified that carriers of certain AKT1 polymorphisms were more likely to experience psychotic symptoms after cannabis use,
particularly in high-potency cannabis users. These genetic insights underscore the role of biological susceptibility in shaping the relationship between marijuana use and psychosis.

2. Age of Onset and Developmental Vulnerability

The age at which cannabis use begins is a critical determinant of its impact on mental health.

Adolescence, a period of rapid brain development, is particularly sensitive to the effects of exogenous cannabinoids like THC. During this time, the prefrontal cortex, responsible for executive functions such as decision-making and impulse control, undergoes significant
maturation. THC can disrupt these processes by interfering with the endocannabinoid system, which plays a key role in neural development (Rubino & Parolaro, 2008).

Research consistently shows that individuals who begin using cannabis in adolescence are at a higher risk of developing psychosis compared to those who initiate use in adulthood. For example, Fergusson et al. (2003) demonstrated that early cannabis use was associated with a higher incidence of psychotic symptoms, independent of other risk factors such as
socioeconomic status or family history. Moreover, heavy cannabis use during adolescence has been linked to long-lasting changes in brain structure, including reduced volume in the
hippocampus and amygdala, which are critical regions for memory and emotional regulation (Batalla et al., 2013).

3. Environmental Factors

Environmental factors, such as childhood trauma, urban living, and socioeconomic status, also contribute to the relationship between cannabis use and psychosis. Childhood trauma, including physical, emotional, or sexual abuse, has been shown to increase the risk of psychotic disorders later in life (Morgan et al., 2010). Cannabis use may exacerbate this vulnerability by amplifying stress-related neural pathways.

Urban living has similarly been associated with a higher risk of psychosis, potentially due to increased exposure to stressors such as social isolation, discrimination, or violence. Research by
Kirkbride et al. (2012) indicates that individuals living in urban environments are more likely to develop psychosis if they use cannabis, compared to those in rural settings. This interaction may be mediated by heightened stress responses and altered social support systems.

Socioeconomic disadvantage is another important factor. Individuals from lower socioeconomic backgrounds may be more likely to use cannabis as a coping mechanism for stress or adversity, thereby increasing their risk of psychosis. Furthermore, limited

access to mental health resources in these populations may delay diagnosis and exacerbate outcomes.

4. Family History of Mental Illness

A family history of psychosis or other severe mental illnesses is a well-established risk factor for cannabis-related psychosis. Individuals with a first-degree relative who has schizophrenia or a related disorder are at significantly higher risk of developing psychosis themselves, even in the absence of cannabis use. When cannabis use is introduced, this risk is further amplified (Gage et al., 2016). This suggests that genetic and environmental factors may interact to increase vulnerability.

5. Co-Occurring Mental Health Conditions

Individuals with pre-existing mental health conditions, such as anxiety or depression, are more susceptible to experiencing adverse effects from cannabis use. Cannabis is often used as a form of self-medication for symptoms of these conditions, but it can paradoxically worsen mental health outcomes. Volkow et al. (2014) note that cannabis use can increase anxiety and depressive symptoms in some individuals, which may compound their risk of developing psychosis.

Substance use disorders involving alcohol, stimulants, or hallucinogens may also heighten the risk of cannabis-related psychosis. Polysubstance use can lead to complex interactions that exacerbate neural dysregulation and stress responses, increasing the likelihood of psychotic episodes.

6. Dose and Frequency of Use

The dose and frequency of cannabis use are critical determinants of psychosis risk. Frequent and heavy use, especially of high-potency cannabis products with elevated THC concentrations, is associated with a significantly higher risk of psychotic disorders. Di Forti et al. (2019) demonstrated that individuals who used high-potency cannabis daily were five times more likely to develop a psychotic disorder than those who abstained or used low-potency products. These findings highlight the importance of understanding patterns of use when assessing individual risk.

V.CONFOUNDING FACTORS AND CONTROVERSIES

The interaction between marijuana uses and psychosis is complex and influenced by a variety of confounding factors, leading to ongoing controversies about causality, directionality, and the interpretation of research findings. These confounders include socioeconomic status, childhood trauma, co-occurring substance use, pre-existing mental health conditions, and reverse causation.

Additionally, debates persist over the role of THC and CBD, the influence of high-potency cannabis products, and the implications for public policy and mental health care.

1. Socioeconomic Status and Environmental Stress

Socioeconomic factors, such as income, education level, and neighborhood conditions, can confound the relationship between cannabis use and psychosis. Individuals from disadvantaged socioeconomic backgrounds may experience higher levels of stress and reduced access to mental health resources, both of which are associated with an increased risk of psychosis. These individuals are also more likely to use cannabis as a coping mechanism for stress, potentially creating a spurious association between cannabis use and psychosis. Studies such as those by Kirkbride et al. (2012) emphasize the need to account for socioeconomic variables when interpreting research findings.

Urban environments further complicate the picture. Living in urban areas has been linked to a higher prevalence of psychosis, independent of cannabis use, possibly due to factors such as social isolation, exposure to violence, and discrimination. Research by Vassos et al. (2012) highlights that urbanicity and cannabis use may interact synergistically, amplifying the risk of psychosis. However, disentangling these overlapping risk factors remains challenging.

2. Childhood Trauma and Life Stress

Childhood trauma, including physical, emotional, and sexual abuse, has been identified as a significant risk factor for psychosis. Individuals who have experienced trauma are also more likely to use cannabis, often as a means of self-medication. Morgan and Fisher (2007) found that cannabis use among

trauma survivors might exacerbate psychotic symptoms by amplifying stress-induced neural dysregulation. This raises the question of whether cannabis use is a causal factor for psychosis or simply a correlate of underlying vulnerabilities, such as a history of trauma.

3. Co-occurring Substance Use

Polysubstance use is another confounding factor that complicates the relationship between cannabis and psychosis. Individuals who use cannabis often engage in the use of other
substances, such as alcohol, tobacco, or stimulants, which are independently associated with an increased risk of psychosis. For example, amphetamine use has well-documented
psychotomimetic effects, and alcohol misuse can exacerbate mental health problems. Determining the specific contribution of cannabis to psychosis in the context of polysubstance use requires careful study design and statistical control for these confounders.

4. Pre-existing Mental Health Conditions

A key controversy is whether cannabis use causes psychosis or whether individuals with
pre-existing mental health vulnerabilities are more likely to use cannabis. People with subclinical psychotic symptoms, anxiety, or depression may turn to cannabis for self-medication, potentially
creating a reverse causation effect. Studies by Henquet et al. (2005) suggest that while cannabis use may exacerbate existing symptoms, it is unclear whether it is the primary driver of psychotic disorders or a secondary factor that accelerates their progression.

5. Role of THC and CBD

The specific roles of THC and CBD in the relationship between cannabis and psychosis have been subjects of intense debate. THC, the primary psychoactive compound in cannabis, has been consistently linked to psychotic symptoms, while CBD may have antipsychotic properties
(Bhattacharyya et al., 2018). Modern cannabis strains often have higher THC concentrations and lower CBD levels, which could increase the risk of psychosis. However, the variability in
THC-to-CBD ratios across different products and populations complicates efforts to draw definitive conclusions.

6. High-Potency Cannabis Products

The proliferation of high-potency cannabis products, with THC concentrations exceeding
15-20%, has raised concerns about their impact on mental health. Di Forti et al. (2019) found that individuals who used high-potency cannabis daily were significantly more likely to develop psychotic disorders than those who used lower-potency products. However, critics argue that the causal relationship between potency and psychosis remains unclear, as high-potency users may differ systematically from other cannabis users in ways that influence their risk of psychosis (e.g., frequency of use, underlying vulnerabilities).

7. Reverse Causation and Bidirectional Relationships

A central controversy in this field is the possibility of reverse causation. While cannabis use is associated with an increased risk of psychosis, it is also possible that individuals with emerging psychotic symptoms are more likely to use cannabis. This bidirectional relationship complicates efforts to establish causality. Longitudinal studies, such as those by Arseneault et al. (2002), have attempted to address this issue by demonstrating that cannabis use often precedes the onset of
psychosis. However, critics argue that pre-existing vulnerabilities may still drive both cannabis use and the development of psychosis.

8. The Debate Over Causality

The question of causality is perhaps the most contentious issue in the cannabis-psychosis relationship. While numerous studies have identified a strong association, establishing a direct causal link remains challenging due to the presence of confounders and reverse causation. Critics of the causal hypothesis argue that cannabis use may act as a "trigger" for psychosis only in individuals with pre-existing vulnerabilities, such as genetic predispositions or a family history of mental illness. Others propose that cannabis use interacts with other risk factors in a cumulative manner, rather than serving as an independent causal factor.

VI. TREATMENT STRATEGIES FOR CO-OCCURRING PSYCHOSIS AND SUBSTANCE USE

Managing co-occurring psychosis and substance use, particularly cannabis use, presents unique challenges that require an integrated and multidisciplinary approach. The interplay between these conditions often exacerbates symptom severity, complicates treatment adherence, and worsens overall outcomes. Consequently, effective treatment strategies must address both conditions simultaneously, focusing on symptom management, substance use reduction, and relapse prevention.

- Integrated Treatment Approaches

Integrated treatment is widely regarded as the most effective strategy for individuals with co-occurring psychosis and substance use disorders. This approach involves combining mental health and substance use treatments within a unified framework, ensuring that both conditions are addressed concurrently rather than sequentially. Evidence-based integrated models often include psychosocial interventions, pharmacological treatments, and coordinated care services tailored to the individual's needs.

Assertive Community Treatment (ACT) is one such integrated approach that has demonstrated success in treating individuals with severe mental illness and substance use. ACT teams consist of psychiatrists, therapists, and case managers who provide comprehensive and flexible care, including medication management, substance use counseling, and support for housing and employment. Studies have shown that ACT can reduce hospitalizations, improve treatment adherence, and enhance overall quality of life for individuals with dual diagnoses (Drake et al., 2008).

- Psychosocial Interventions

Psychosocial interventions are critical components of treatment for co-occurring psychosis and substance use. These interventions aim to reduce substance use, improve coping skills, and enhance social functioning.

1. Cognitive Behavioral Therapy (CBT)

CBT is effective for addressing both psychosis and substance use. For psychosis, CBT helps individuals challenge and reframe delusional thoughts or hallucinations, while for substance use, it focuses on identifying triggers and developing strategies to avoid relapse. Studies suggest that CBT can reduce cannabis use and psychotic symptoms, particularly when delivered in a structured and individualized format (Addington & Addington, 2001).

2. Motivational Interviewing (MI)

MI is a client-centered approach designed to enhance motivation for change. This technique is particularly useful for individuals ambivalent about reducing their substance use. MI helps individuals explore the consequences of their cannabis use and develop a commitment to change, which can be a critical first step in the recovery process (Miller & Rollnick, 2012).

3. Family-Based Interventions

Involving family members in treatment can provide individuals with a supportive network to aid recovery. Family psychoeducation programs, which teach families about psychosis and substance use, can improve communication, reduce relapse rates, and alleviate caregiver burden (McFarlane et al., 2003).

- Pharmacological Treatments

Pharmacological treatment is often necessary for managing psychotic symptoms and reducing cannabis cravings. However, medication use must be carefully tailored to minimize potential interactions between psychosis medications and the neurochemical effects of cannabis.

1. Antipsychotics:

Antipsychotic medications, such as risperidone or olanzapine, are commonly used to manage symptoms of psychosis. These medications can reduce hallucinations, delusions, and agitation, which are often exacerbated by cannabis use. Recent studies suggest that long-acting injectable antipsychotics may improve adherence in individuals with co-occurring disorders, ensuring more consistent symptom control (Lehman et al., 2018).

2. Cannabidiol (CBD):

Emerging evidence suggests that CBD, a non-psychoactive component of cannabis, may have antipsychotic properties. Research by Leweke et al. (2012) demonstrated that CBD could reduce psychotic

symptoms with fewer side effects than traditional antipsychotics. While not yet a standard treatment, CBD is being investigated as a potential adjunct therapy for individuals with psychosis and cannabis use disorders.

3. Medications for Substance Use:
While no FDA-approved medications specifically target cannabis use disorders, naltrexone and gabapentin have shown promise in reducing cravings and withdrawal symptoms in some studies. Additionally, medications like bupropion and varenicline, commonly used for nicotine addiction, are being explored for their potential to reduce cannabis dependence.

- Relapse Prevention and Aftercare

Relapse prevention is a critical component of long-term recovery for individuals with
co-occurring psychosis and substance use. Strategies include ongoing therapy, peer support groups, and case management services to ensure continuity of care.

1. Contingency Management (CM):
CM is an evidence-based approach that uses positive reinforcement to encourage abstinence from substances. For example, individuals may receive tangible rewards, such as vouchers, for negative drug tests. CM has been shown to effectively reduce cannabis use, particularly when combined with other psychosocial treatments (Budney et al., 2006).

2. Peer Support and Self-Help Groups:
Participation in peer support groups, such as those modeled after Alcoholics Anonymous (e.g., Marijuana Anonymous or Dual Recovery Anonymous), can provide individuals with a sense of community and accountability. Peer-led programs often emphasize shared experiences and coping strategies, fostering hope and resilience.

3. Lifestyle Interventions:
Encouraging healthy lifestyle changes, such as exercise, mindfulness meditation, and stress management, can reduce relapse risk and improve overall well-being. Exercise, in particular, has been shown to decrease substance cravings and improve mood in individuals with dual diagnoses (Carek et al., 2011).

VII. KEYWORDS

Psychosis, cannabis, marijuana use, THC, cannabidiol (CBD), substance abuse, mental health, epidemiological studies, biological pathways, dopamine regulation, endocannabinoid system, vulnerability, genetic risk, environmental triggers, confounders, early cannabis exposure,
co-occurring disorders, treatment approaches, motivational techniques, integrated therapy, causal links, public health impact, neural development, prevention strategies.

VIII. CONCLUSION

The interaction between marijuana use and psychosis is a multifaceted and deeply complex relationship influenced by a combination of genetic, environmental, and developmental factors. Epidemiological evidence underscores the strong association between cannabis use and an elevated risk of psychosis, particularly among individuals who use high-potency cannabis or start at a young age. Biological mechanisms, including disruptions in the endocannabinoid and
dopamine systems, help explain how THC influences neural pathways related to psychosis. Furthermore, risk factors such as genetic predispositions, early exposure to cannabis, childhood trauma, and socioeconomic disadvantage highlight the role of individual vulnerabilities in shaping this interaction.
Despite these findings, the field remains fraught with controversies. Confounding factors like reverse causation, co-occurring substance use, and environmental stress complicate efforts to
establish causality. Moreover, the contrasting effects of THC and CBD add further complexity to the interpretation of cannabis's role in psychosis. Addressing these confounders through rigorous, longitudinal research is essential for clarifying the causal pathways and informing evidence-based policies and practices.
For individuals with co-occurring psychosis and substance use disorders, treatment strategies must be comprehensive and integrated. Approaches combining psychosocial interventions, such as cognitive behavioral therapy and motivational interviewing, with pharmacological treatments
like antipsychotics and emerging therapies such as

cannabidiol (CBD), hold significant promise. Relapse prevention strategies, peer support, and family-based interventions are also vital for ensuring sustained recovery. However, systemic barriers, including stigma and access to care, must be addressed to improve treatment outcomes and equity in care delivery.

As cannabis legalization expands globally, it is imperative to balance public health concerns with the potential benefits of regulated cannabis use. Future research should focus on identifying
vulnerable populations, refining treatment modalities, and mitigating the risks associated with
cannabis use, particularly for young and at-risk individuals. Ultimately, a nuanced understanding of the interplay between marijuana and psychosis will be essential for developing targeted interventions, shaping policy, and improving outcomes for affected individuals.

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