

Public Release

# *Health Effects of Cannabis and Cannabinoids*

*Current State of  
Evidence and  
Recommendations for  
Research*

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## Today's Presenters

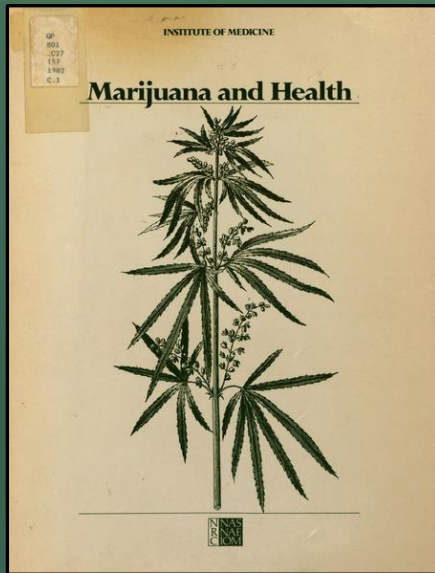
- **Rose Marie Martinez**, Senior Board Director, Board on Population Health and Public Health Practice
- **Leigh Miles Jackson**, Study Director, Board on Population Health and Public Health Practice
- **Marie C. McCormick** (chair), Harvard School of Public Health, MA
- **Ziva D. Cooper**, Columbia University Medical Center, NY
- **Sean Hennessy**, University of Pennsylvania, PA
- **Sachin Patel**, Vanderbilt University Medical Center, TN
- **Robert B. Wallace**, University of Iowa College of Public Health, IA

# Outline of Presentation

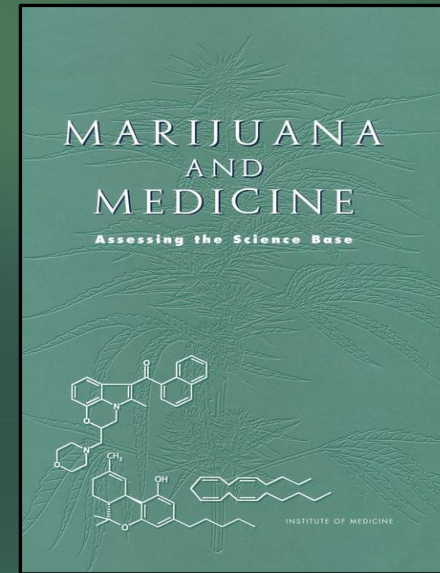
- Brief overview of study context and statement of task
- Overview of study approach
- Report highlights and recommendations
- Report products and upcoming events

# Brief Overview of Study Context and Statement of Task

# Study Context



Marijuana and Health  
(1982)



Marijuana and Medicine:  
Assessing the Science Base  
(1999)

# Summary of Statement of Task

Develop a comprehensive, in-depth review of existing evidence regarding the health effects (both harms and benefits) of cannabis and cannabinoids use

Make short- and long-term recommendations regarding a research agenda to identify the most critical research questions and advance the cannabis and cannabinoid research agenda

# Study Sponsors

- Alaska Mental Health Trust Authority
- Arizona Department of Health Services
- California Department of Public Health
- CDC Foundation
- Centers for Disease Control and Prevention (CDC)
- Food and Drug Administration
- Mat-Su Health Foundation
- National Cancer Institute - National Institutes of Health
- National Highway Traffic Safety Administration
- National Institute on Drug Abuse - National Institutes of Health
- Oregon Health Authority
- Robert W. Woodruff Foundation
- The Colorado Health Foundation
- Truth Initiative
- Washington State Department of Health

# Committee on the Health Effects of Marijuana: An Evidence Review and Research Agenda

**MARIE C. MCCORMICK** (*chair*), Harvard T.H. Chan School of Public Health, MA

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**DONALD I. ABRAMS**, Zuckerberg San Francisco General Hospital

**ADRE J. DU PLESSIS**, Children National Health System, D.C.

**MARGARITA ALEGRÍA**, Massachusetts General Hospital

**SARAH FELDSTEIN EWING**, Oregon Health and Science University

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**SEAN HENNESSY**, University of Pennsylvania

**R. LORRAINE COLLINS**, University at Buffalo-SUNY, Buffalo, NY

**KENT HUTCHISON**, University of Colorado Boulder



# Committee on the Health Effects of Marijuana: An Evidence Review and Research Agenda

**NORBERT E. KAMINSKI**, Michigan State University

**SACHIN PATEL**, Vanderbilt University Medical Center,  
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**DANIELE PIOMELLI**, University of California, Irvine

**STEPHEN SIDNEY**, Kaiser Permanente Northern  
California

**ROBERT B. WALLACE**, University Of Iowa College of  
Public Health

**JOHN WILLIAMS**, Duke University Medical Center, NC

# Overview of Study Approach

# Study Approach

## Committee member expertise included:

- substance abuse
- cardiovascular health
- general epidemiology
- immunology
- pharmacology
- pulmonary health
- neurodevelopment
- oncology
- pediatrics
- public health
- systematic review methodology
- and others...

**Between June and December 2016, the committee held 5 in-person meetings and 1 virtual meeting**

**The committee held 2 open session meetings**

## Study Approach

(further detailed in the full report)

- Adopted key features of a systematic review process
- Conducted an extensive search of relevant databases (e.g., Medline, Embase, the Cochrane Database of Systematic Reviews, PsycINFO)
  - Initial search resulted in more than 24, 000 articles
  - Committee considered more than 10,000 abstracts to determine relevance for the report
- Primacy given to recently published systematic reviews and high-quality primary research that studied one or more of the committee's 11 prioritized health endpoints

## Study Approach– 11 prioritized health endpoints

- Therapeutic effects
- Cancer incidence
- Cardiometabolic risk
- Respiratory disease
- Immune function
- Injury and death
- Prenatal, perinatal, and postnatal outcomes
- Psychosocial outcomes
- Mental health
- Problem cannabis use
- Cannabis use and abuse of other substance

## Study approach

(further detailed in the full report)

- Standardized language to categorize the weight of evidence
- 5 levels of evidence
  - CONCLUSIVE
  - SUBSTANTIAL
  - MODERATE
  - LIMITED
  - NO or INSUFFICIENT

# Study Process— Special Considerations

- *Biological Plausibility*
- *Considerations of Observational Studies*
- *Comparing Harms and Benefits of Cannabis Use*

# Review of Select Chapter Highlights



# Therapeutics

- In adults with chemotherapy induced nausea and vomiting, oral cannabinoids are effective antiemetics.
- In adults with chronic pain, patients who were treated with cannabis or cannabinoids are more likely to experience a clinically significant reduction in pain symptoms
- In adults with multiple sclerosis (MS) related spasticity, short-term use of oral cannabinoids improves patient-reported spasticity symptoms.
- For these conditions the effects of cannabinoids are modest; for all other conditions evaluated there is inadequate information to assess their effects.

# Respiratory Disease

- There is substantial evidence of a statistical association between long-term cannabis smoking and worse respiratory symptoms and more frequent chronic bronchitis episodes.
- There is moderate evidence of a statistical association between cannabis smoking and improved airway dynamics with acute use, but not with chronic use.
- There is moderate evidence of a statistical association between cannabis smoking and higher forced vital capacity (FVC).
- There is moderate evidence of a statistical association between *cessation* of cannabis smoking and improvements in respiratory symptoms.

# Respiratory Disease

- There is limited evidence of a statistical association between occasional cannabis smoking and an increased risk of developing chronic obstructive pulmonary disease (COPD) when controlled for tobacco use.
- There is insufficient evidence to support or refute a statistical association between cannabis smoking and hospital admissions for COPD.
- There is insufficient evidence to support or refute a statistical association between cannabis smoking and asthma development or asthma exacerbation.

## Injury and Death

- Cannabis use prior to driving increases the risk of being involved in a motor vehicle accident.
- In states where cannabis use is legal, there is increased risk of unintentional cannabis overdose injuries among children.
- It is unclear whether and how cannabis use is associated with all-cause mortality or with occupational injury.

# Cancer

- There is moderate evidence of *no* statistical association between cannabis smoking and the incidence of lung cancer.
- There is moderate evidence of *no* statistical association between cannabis use and the incidence of head and neck cancers.
- There is limited evidence of a statistical association between current, frequent, or chronic cannabis smoking and non-seminoma-type testicular germ cell tumors.

# Cancer

- There is insufficient evidence to support or refute a statistical association between cannabis smoking and the incidence of esophageal cancer.
- There is insufficient evidence to support or refute a statistical association between cannabis use and the incidence of prostate cancer, cervical cancer, malignant gliomas, non-Hodgkin lymphoma, penile cancer, anal cancer, Kaposi's sarcoma, or bladder cancer.
- There is insufficient evidence to support or refute a statistical association between parental cannabis use and a subsequent risk of developing acute myeloid leukemia/acute non-lymphoblastic leukemia, acute lymphoblastic leukemia, rhabdomyosarcoma, astrocytoma, or neuroblastoma in offspring.

## Cardiometabolic Risk

- The evidence is unclear as to whether and how cannabis use is associated with heart attack, stroke, and diabetes.

# Immunity

- There exists a paucity of data on the effects of cannabis or cannabinoid-based therapeutics on the human immune system.
- There is insufficient data to draw overarching conclusions concerning the effects of cannabis smoke or cannabinoids on immune competence.
- There is limited evidence to suggest that regular exposure to cannabis smoke may have anti-inflammatory activity.
- There is insufficient evidence to support or refute a statistical association between cannabis or cannabinoid use and adverse effects on immune status in individuals with HIV.



# Prenatal, Perinatal, and Neonatal Outcomes

- Smoking cannabis during pregnancy is linked to lower birth weight in the infant
- The relationship between smoking cannabis during pregnancy and other pregnancy and childhood outcomes is unclear.

# Psychosocial

- Recent cannabis use impairs the performance in cognitive domains of learning, memory, and attention. Recent use may be defined as cannabis use within 24 hours of evaluation.
- A limited number of studies suggest that there are impairments in cognitive domains of learning, memory, and attention in individuals who have stopped smoking cannabis.
- Cannabis use during adolescence is related to impairments in subsequent academic achievement and education, employment and income, and social relationships and social roles.

# Mental Health

- There is substantial evidence of a statistical association between cannabis use and the development of schizophrenia or other psychoses, with the highest risk among the most frequent users.
- In individuals with schizophrenia and other psychoses, a history of cannabis use may be linked to better performance on learning and memory tasks.
- Cannabis use does not appear to increase the likelihood of developing depression, anxiety, and posttraumatic stress disorder.
- For individuals diagnosed with bipolar disorders, near daily cannabis use may be linked to greater symptoms of bipolar disorder than non-users.
- Heavy cannabis users are more likely to report thoughts of suicide than non-users.
- Regular cannabis use is likely to increase the risk for developing social anxiety disorder.

## Problem Cannabis Use

- Greater frequency of cannabis use increases the likelihood of developing problem cannabis use.
- Initiating cannabis use at a younger age increases the likelihood of developing problem cannabis use.

## Cannabis Use and Abuse of Other Substances

- There is limited evidence of a statistical association between cannabis use and the initiation of tobacco use.
- There is limited evidence of a statistical association between cannabis use and changes in the rates and use patterns of other licit and illicit substances.
- There is moderate evidence of a statistical association between cannabis use and the development of substance dependence and/or a substance abuse disorder for substances including, alcohol, tobacco, and other illicit drugs.

# Barriers to Cannabis Research

## (Conclusions)

- There are specific regulatory barriers, including the classification of cannabis as a Schedule I substance, that impede the advancement of cannabis and cannabinoid research
- It is often difficult for researchers to gain access to the quantity, quality, and type of cannabis product necessary to address specific research questions on the health effects of cannabis use
- A diverse network of funders is needed to support cannabis and cannabinoid research that explores the beneficial and harmful health effects of cannabis use
- To develop conclusive evidence for the effects of cannabis use on short- and long-term health outcomes, improvements and standardization in research methodology (including those used in controlled trials and observational studies) are needed

# Report Recommendations

## Recommendation 1: Address Research Gaps

To develop a comprehensive evidence base on the short- and long-term health effects of cannabis use (both beneficial and harmful effects), public agencies, philanthropic and professional organizations, private companies, and clinical and public health research groups should provide funding and support for a national cannabis research agenda that addresses key gaps in the evidence base. Prioritized research streams and objectives should include, but need not be limited to:

- Clinical and Observational Research
- Health Policy and Health Economics Research
- Public Health and Public Safety Research



## Recommendation 2: Improve Research Quality

To promote the development of conclusive evidence on the short- and long-term health effects of cannabis use (both beneficial and harmful effects), agencies of the United States Department of Health and Human Services, including the National Institutes of Health and the Centers for Disease Control and Prevention should jointly fund a workshop to develop a set of research standards and benchmarks to guide and ensure the production of high-quality cannabis research.

## Recommendation 3: Improve Surveillance Capacity

To ensure that sufficient data are available to inform research on the short- and long-term health effects of cannabis use (both beneficial and harmful effects), the Centers for Disease Control and Prevention, the Substance Abuse and Mental Health Services Administration, the Association of State and Territorial Health Officials, National Association of County and City Health Officials, the Association of Public Health Laboratories, and state and local public health departments should fund and support improvements to federal public health surveillance systems and state-based public health surveillance efforts.

## Recommendation 4: Address Research Barriers

The Centers for Disease Control and Prevention, National Institutes of Health, Food and Drug Administration, industry groups, and nongovernmental organizations should fund the convening of a committee of experts tasked to produce an objective and evidence-based report that fully characterizes the impacts of regulatory barriers to cannabis research and that proposes strategies for supporting development of the resources and infrastructure necessary to conduct a comprehensive cannabis research agenda.

# Report Products and Upcoming Events

# Report Products and Upcoming Events

- Report highlights (4-page report brief)
- Report conclusions (a consolidated listing)
- Chapter highlights (a consolidated listing)
- 2 Power Point slide sets (professionals; policymakers)
  
- February 2017 Stakeholder Engagement Meeting
  - open to the public; webcasted
  - representative of the committee will discuss the report's findings to a professional audience
  - committee will engage in panel discussions with stakeholders of the report and will field questions from the general public

This report is now available and can be downloaded as a free pdf  
at: [nationalacademies.org/CannabisHealthEffects](https://nationalacademies.org/CannabisHealthEffects)

Thank you for your support of  
this important study.

Questions?

