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Guidelines for Public Health and Safety Metrics to Evaluate the Potential Harms and Benefits of Cannabis Regulation in Canada

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BRITISH COLUMBIA
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in HIV/AIDS



Disclosure Statement

- I have no affiliation (financial or otherwise) with a pharmaceutical, medical device or communications organization.

Background

OPEN LETTER: _____

A Call for A Reprioritization of Metrics to Evaluate Illicit Drug Policy _____

TO: _____

UN Member States Delegations
Mr. Ban Ki-Moon, Secretary-General, United Nations
Mr. Mogens Lykketoft, President of the UN General Assembly
Mr. Arthayudh Srisamoot, Chair of the Commission on Narcotic Drugs
Mr. Yury Fedotov, Executive Director, United Nations Office on Drugs and Crime
Dr. Margaret Chan, Director-General, World Health Organization
Dr. Michel Sidibé, Executive Director, Joint United Nations Programme on HIV/AIDS
Mr. Anthony Lake, Executive Director, UNICEF
Ms. Helen Clark, Administrator, UN Development Program
Mr. Dainius Pūras, UN Special Rapporteur on the Right to Health

JANUARY 21, 2016



Objectives

1) Recommend a set of population indicators that could be used to assess the public health and safety impacts of cannabis regulation in Canada

2) Summarize preliminary evidence of short-term impacts in nearby jurisdictions that have regulated cannabis



Methods

What are current public health and safety issues relevant to cannabis use or cannabis policy?

Searched 5 academic databases using broad terms (e.g., “cannabis”, “public health”)

Articles screened and sorted into topic categories (e.g., road safety)

Indicators generated from topic categories (e.g., number and rate of motor vehicle crash fatalities)



What do we know about the impact of legal cannabis on each indicator?

Academic/non-academic database search, snowball search methods (e.g., hand searching reference lists of articles from indicator selection)

What data sources can be used to evaluate indicator shift?

- Consultation with health science librarian

Metrics

Public Safety

- Cannabis-impaired driving
- Cannabis use and road traffic fatalities
- All-cause fatal injuries
- Alcohol-impaired driving
- Alcohol-impaired driving and road traffic fatalities
- Dating violence
- Cannabis use and violence
- Violent crime

Cannabis Use

Trends

- Cannabis use initiation among youth
- Cannabis use prevalence among youth
- Cannabis use prevalence among adults
- Unintentional cannabis poisoning
- Cannabis use and mental health
- Cannabis use and cardiovascular health
- Cannabis use and respiratory health
- Cannabis use and cognitive functioning
- Cannabis use and educational achievement
- Cannabis use and violence

Other Substance

Use Trends

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Cardiovascular & Respiratory Health

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-
-
-

Mental Health & Cognition

- Psychosis and psychotic disorders
- Depression and anxiety
- Attempted and completed suicide
- Cognitive functioning and educational achievement among youth

Metrics: Public Safety

Public Safety

- Cannabis-impaired driving
- Cannabis-related motor vehicle injuries and fatalities
- All-cause motor vehicle injuries and fatalities
- Alcohol-impaired driving
- Alcohol-related motor vehicle injuries and fatalities
- Dating and intimate partner violence
- Cannabis-related workplace injuries overall and across work sectors
- Violent and property crime

Cardiovascular & Respiratory Health

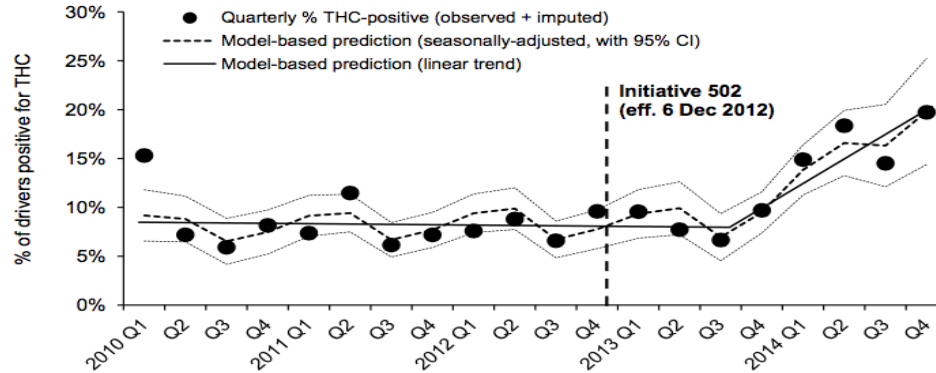
Mental Health & Cognition

- Psychosis and psychotic disorders
- Depression and anxiety
- Attempted and completed suicide
- Cognitive functioning and educational achievement among youth

Preliminary Evidence – Road Safety

Washington state

Figure 1. Quarterly average proportion of drivers involved in fatal crashes who were positive for THC and modeled seasonally-adjusted linear trend before and after Washington Initiative 502 took effect on 6 December 2012 legalizing recreational use of marijuana for adults aged 21 years and older, Washington, 2010 – 2014.



Data: Washington Traffic Safety Commission, 2010 – 2014.

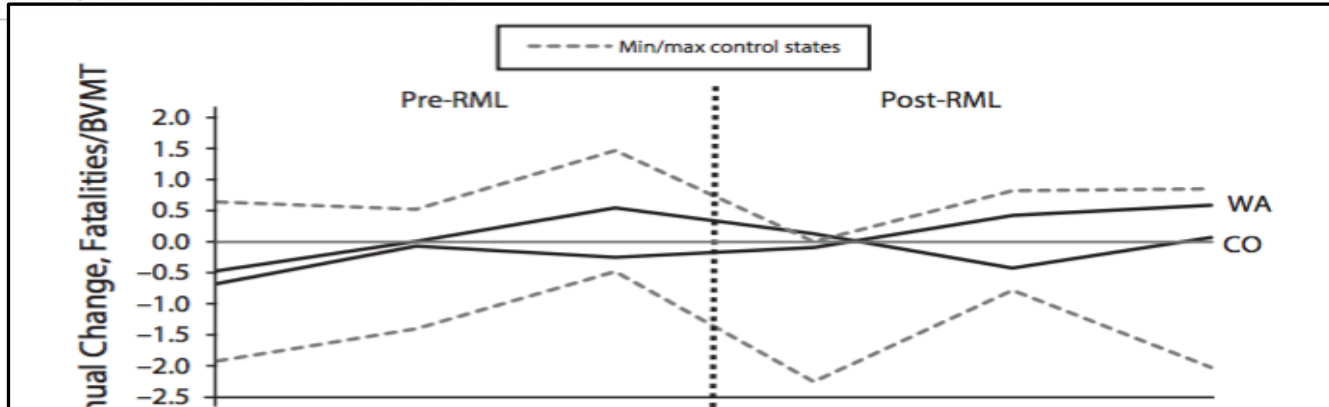
Drivers positive for THC based on results of blood toxicological tests. Results imputed 10 times when driver was not tested or test results were unknown; results reflect averages from 10 imputed values for each driver. Model-based predictions are from binomial regression model with identity link function, indicator variables for seasons, and a linear spline with change in slope on 5 September 2013 (39 weeks after effective date of Initiative 502).

Preliminary Evidence – Road Safety

AJPH RESEARCH

Crash Fatality Rates After Recreational Marijuana Legalization in Washington and Colorado

Jayson D. Aydelotte, MD, Laurence H. Brown, PhD, Kevin M. Lofman, MD, Alexandra L. Mardock, BA, Pedro G. R. Teixeira, MD, Ben Coopwood, MD, and Carlos V. R. Brown, MD



Conclusions. Three years after recreational marijuana legalization, changes in motor vehicle crash fatality rates for Washington and Colorado were not statistically different from those in similar states without recreational marijuana legalization. Future studies over a longer time remain warranted. (*Am J Public Health.* 2017;107:1329–1331. doi: 10.2105/AJPH.2017.303848)

Preliminary Evidence – Road Safety

Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption

D. Mark Anderson *Montana State University*
 Benjamin Hansen *University of Oregon*
 Daniel I. Rees *University of Colorado Denver*

Table 10
Medical Marijuana Laws and Traffic Fatalities by Sex

	Fatalities Males	Fatalities Females
MML	-.114 ⁺ (.065)	-.072 (.073)
R ²	.974	.960

Note. The dependent variable is equal to the natural log of fatalities per 100,000 people, weighted using the relevant state-by-age populations. Standard errors, corrected for clustering at the state level, are in parentheses. Year fixed effects, state fixed effects, state covariates, and state-specific trends are included in all specifications. *N* = 1,071.

⁺ Statistically significant at the 10% level.

-10.8% (p<0.1)

Table 9
Medical Marijuana Laws and Traffic Fatalities by Age

	Fatalities, 15–19	Fatalities, 20–29	Fatalities, 30–39	Fatalities, 40–49	Fatalities, 50–59	Fatalities, 60+
MML	-.022 (.083)	-.183* (.073)	-.175 ⁺ (.096)	-.094 (.070)	-.038 (.056)	-.048 (.048)
R ²	.915	.940	.943	.939	.874	.921

Note. The dependent variable is equal to the natural log of fatalities per 100,000 people. Regressions are weighted using the relevant state-by-age populations. Standard errors, corrected for clustering at the state level, are in parentheses. Year fixed effects, state fixed effects, state covariates, and state-specific trends are included in all specifications.

⁺ Statistically significant at the 10% level.

* Statistically significant at the 5% level.

-16.7% (p<0.05)

-16.1% (p<0.1)

Table 7
Medical Marijuana Laws and Traffic Fatalities: The Role of Alcohol

	Fatalities (No Alcohol)		Fatalities (BAC > 0)		Fatalities (BAC ≥ .10)	
	(1)	(2)	(3)	(4)	(5)	(6)
MML	-.075 (.062)		-.141 ⁺ (.077)		-.168* (.082)	
Year of law change		-.026 (.031)		-.011 (.040)		-.041 (.051)
1 Year after MML		-.071 (.047)		-.103 (.068)		-.124 (.086)
2 Years after MML						-.132* (.068)
3 Years after MML						-.155* (.073)
4 Years after MML						-.132* (.068)
5+ Years after MML		-.024 (.062)		-.138 ⁺ (.081)		-.197* (.090)
Joint significance of lags (<i>p</i> -value)		.244		.002**		.082 ⁺
R ²	.964	.964	.905	.906	.906	.906

Note. The dependent variable is equal to the natural log of fatalities per 100,000 people. Regressions are weighted using state populations. Standard errors, corrected for clustering at the state level, are in parentheses. Year fixed effects, state fixed effects, state covariates, and state-specific trends are included in all specifications. MML = medical marijuana law. *N* = 1,071.

⁺ Statistically significant at the 10% level.

* Statistically significant at the 5% level.

** Statistically significant at the 1% level.

-13.2% (p<0.1)

-15.5% (p<0.05)

Metrics: Cannabis Use Trends

Public Safety

- Cannabis-impaired driving
- Cannabis and...
- All-c...
- fatal...
- Alco...
- Alco...
- and...
- Datin...
- Cann...
- over...
- Viole...

Cannabis Use Trends

- Cannabis use initiation among youth
- Cannabis use rates among youth
- Cannabis use disorder
- Unregulated cannabis product use
- Cannabis use among expectant and breastfeeding mothers
- Trends in cannabis use products and practices
- Cannabis-related health care utilization
- Cannabis-related poison center calls
- Cannabis-attributable burden of disease

Carcinoma Respiration

Mental Health & Cognition

- Psychosis and psychotic disorders
- Depression and anxiety
- Attempted and completed suicide
- Cognitive functioning and educational achievement among youth

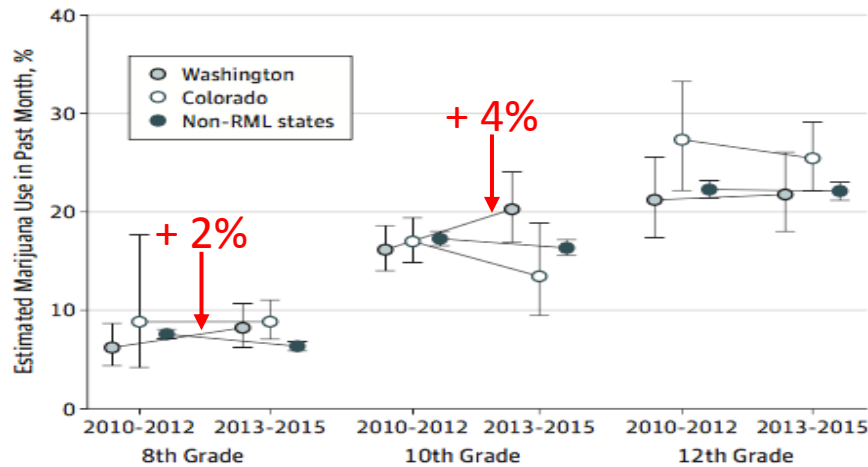
Preliminary Evidence – Youth usage trends

JAMA Pediatrics
Association
With A

Magdalena Cerdá,
Aaron Sarvet, MPI
Sandro Galea, MD

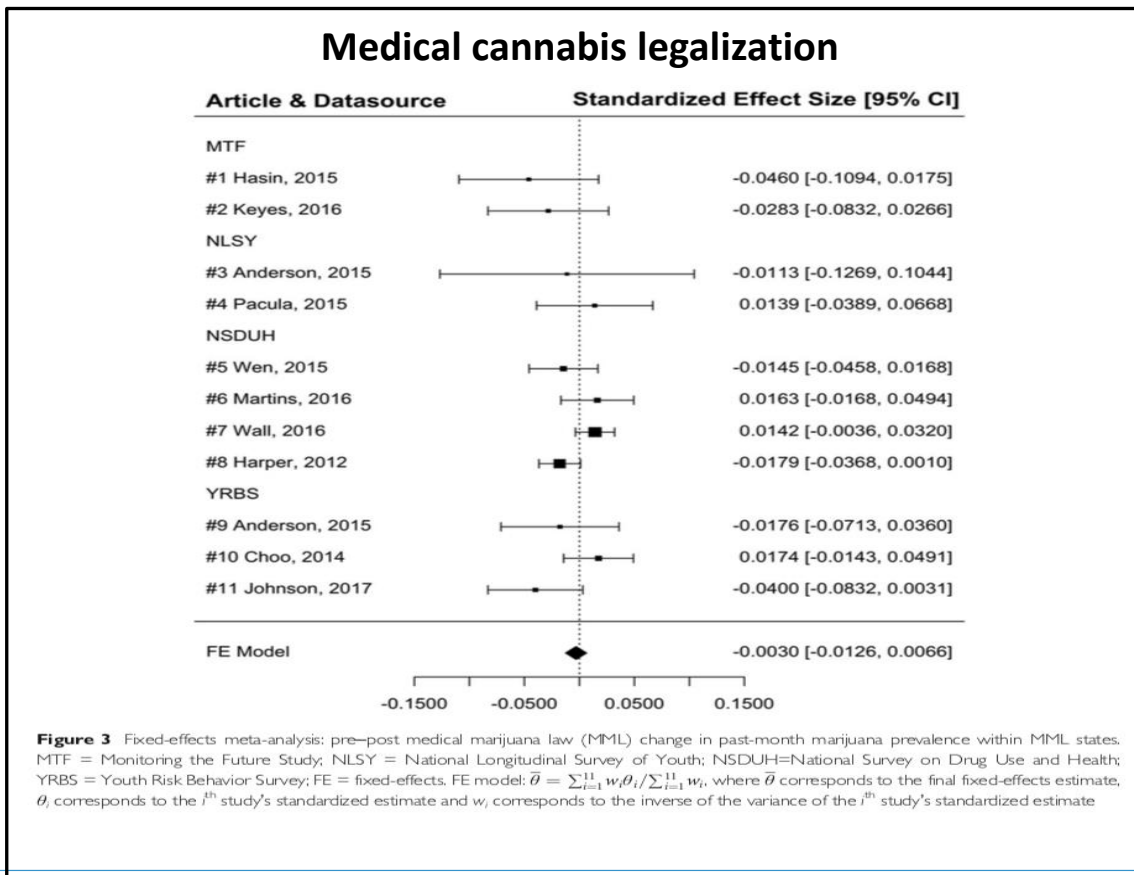
na Laws

Figure 2. Marijuana Use Before and After Legalization in Colorado, Washington, and States Without Recreational Marijuana Laws (RML)



The solid lines indicate the adjusted prevalence of past-month marijuana use before and after RML in Colorado, Washington, and non-RML states by grade. Error bars indicate 95% CIs.

Preliminary Evidence – Youth usage trends



Metrics: Other Substance Use Trends

Public Safety

- Cannabis-impaired driving
- Cannabis and...
- All-c...
- fatal...
- Alco...
- Alco...
- and...
- Datin...
- Cann...
- over...
- Viole...

Cannabis Use

Trends

- Cannabis use initiation among youth
- Can...
- Can...
- Un...
- Can...
- bre...
- Tre...
- pra...
- Can...
- uti...
- Can...
- Can...
- dis...

Other Substance

Use Trends

- Medical and non-medical opioid use and use disorders
- Fatal and non-fatal drug overdoses
- Illicit stimulant use and use disorders
- Alcohol use and use disorders
- Tobacco use and use disorders

C

Re

Me

Co

- Psychosis and psychotic disorders
- Depression and anxiety
- Attempted and completed suicide
- Cognitive functioning and educational achievement among youth

Preliminary Evidence – Opioids

Research

Original Investigation

Medical Cannabis Laws and Opioid Analgesic Overdose Mortality in the United States, 1999-2010

Marcus A. Bachhuber, MD; Brendan Saloner, PhD; Chinazo O. Cunningham, MD, MS; Colleen L. Barry, PhD, MPP



ELSEVIER

Do Medical Marijuana Laws Increase Hard-Drug Use?

Yu-Wei Luke Chu *Victoria University of Wellington*

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcddep



Research

JAMA Internal Medicine | Original Investigation | HEALTH CARE POLICY AND LAW

Association Between US State Medical Cannabis Laws and Opioid Prescribing in the Medicare Part D Population

Ashley C. Bradford, BA; W. David Bradford, PhD; Amanda Abraham, PhD; Grace Bagwell Adams, PhD

Full length article

Medical marijuana policies and hospitalizations related to marijuana and opioid pain reliever

Yuvan Shi*

Contents lists available at ScienceDirect



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Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase



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Journal of Health Economics

journal homepage: www.elsevier.com/locate/econbase



The effect of medical marijuana laws on adolescent and adult use of marijuana, alcohol, and other substances^{☆,☆☆}

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Do medical marijuana laws reduce addictions and death pain killers?[☆]

David Powell^{a,*}, Rosalie Liccardo Pacula^{a,b}, Mireille Jacobson^{b,c}

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^b NBER, Cambridge, MA, United States

^c University of California, Irvine, United States

AJPH RESEARCH

State Medical Marijuana Laws and the Prevalence of Opioids Detected Among Fatally Injured Drivers

June H. Kim, MPhil, MHS, Julian Santaella-Tenorio, DVM, MSc, Christine Mauro, PhD, Julia Wrobel, MS, Magdalena Cerdà, DrPH, Katherine M. Keyes, PhD, Deborah Hasin, PhD, Silvia S. Martins, PhD, and Guohua Li, MD, DrPH

Preliminary Evidence – Opioids

Research

Original Investigation

Medical Cannabis Laws and Opioid Analgesic Overdose Mortality in the United States, 1999-2010

Marcus A. Bachhuber, MD; Brendan Saloner, PhD; Chinazo O. Cunningham, MD, MS; Colleen L. Barry, PhD, MPP

Passage of medical cannabis law associated with significant **decreases** in opioid-related **overdose** fatalities

Preliminary Evidence – Opioids

Passage of medical cannabis law **not associated** with changes in **opioid-related overdose deaths, treatment admissions for OUD, self-reported non-medical use of pharmaceutical opioids, legal distribution of pharmaceutical opioids**

Significant **decreases** in **opioid overdose deaths** and **OUD treatment admissions** if state allowed for operational **dispensaries**



Do medical marijuana laws reduce addictions and deaths related to pain killers?[☆]

David Powell^{a,*}, Rosalie Liccardo Pacula^{a,b}, Mireille Jacobson^{b,c}

^a RAND, Santa Monica, United States

^b NBER, Cambridge, MA, United States

^c University of California, Irvine, United States

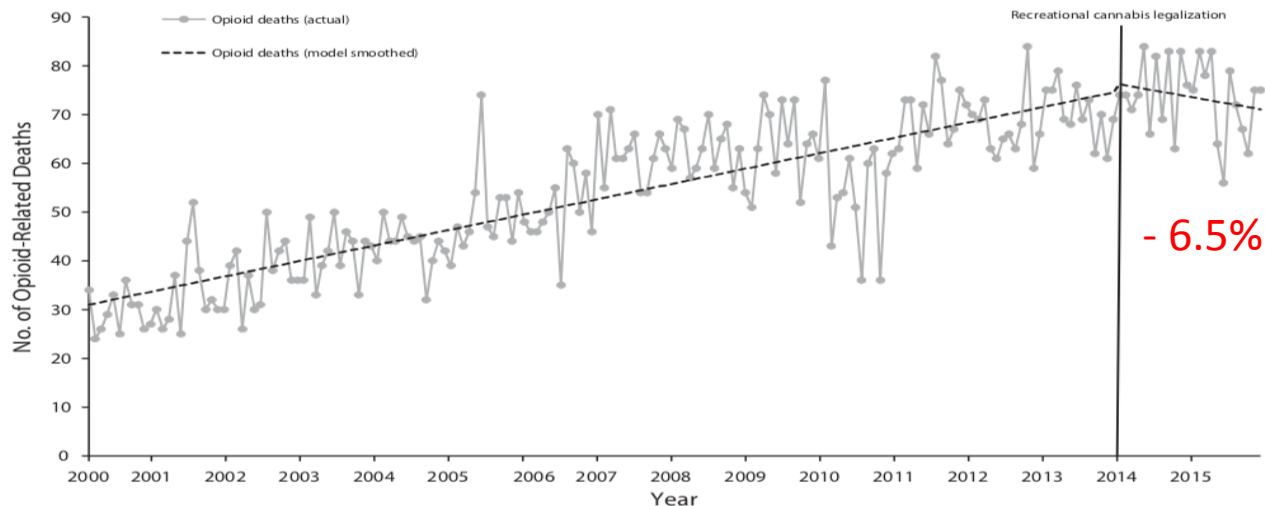


Preliminary Evidence – Opioids

AJPH RESEARCH

Recreational Cannabis Legalization and Opioid-Related Deaths in Colorado, 2000–2015

Melvin D. Livingston, PhD, Tracey E. Barnett, PhD, Chris Delcher, PhD, and Alexander C. Wagenaar, PhD



Note. Change in opioid-related deaths per month following legalization = -0.68 (95% confidence interval = $-1.34, -0.03$; $P = .043$). Change in model-estimated opioid-related deaths was robust to covariate control of opioid-related deaths in all comparison states. Change in model-estimated opioid-related deaths was robust to whether the prescription drug monitoring program (PDMP) covariate was modeled at the beginning of implementation or at full implementation of the 2014 PDMP change.

FIGURE 1—Changes in Monthly Opioid-Related Deaths Following Recreational Cannabis Legalization in Colorado, 2000–2015

Discussion/Conclusions

- The transition from cannabis prohibition to regulation in Canada provides an unmatched opportunity to study the health impacts of cannabis use and cannabis regulation
- We established a set of priority metrics to evaluate the public health and safety impact of legalization in Canada
 - Overall, and between provincial/territorial jurisdictions

Discussion/Conclusions

- Preliminary evidence from US jurisdictions with non-medical and/or medical cannabis reveals potential challenges and possible unintended benefits to public health and safety
 - High degree of heterogeneity between regulatory frameworks
- A comprehensive and evidence-informed public health and safety evaluation will require consideration of both harms and benefits

THANK YOU

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