

Marijuana Use and Respiratory Health (1)—APPROVED STATEMENTS

	Evidence Reviews				APPROVED STATEMENTS
	Colorado Report Review Article, 2014 (pg.125-134)	RAND report Evidence review, 2015 (pg.57)	Institute of Medicine Review Article, 1999 (pg. 111-115)	Oregon: Washington county report, 2014 (pg. 8; 32-34)	Oregon Public Health Division Approved Statements
Carcinogens	SUBSTANTIAL evidence that marijuana smoke, both mainstream and sidestream contains many of the same cancer-causing chemicals as tobacco smoke. ^{1,2,3,4}	Marijuana smoke contains many of the same carcinogens as tobacco smoke. ¹	<p>The gas and tar phases of marijuana and tobacco smoke contain many of the same compounds.</p> <p>The tar phase of marijuana smoke contains higher concentrations of polycyclic aromatic hydrocarbons (PAHs), such as the carcinogen benzopyrene.</p>	<p>Marijuana smoke contains levels of ammonia, hydrogen cyanide, nitric oxide and aromatic amines at concentrations three to five times those found in tobacco smoke.</p> <p>In 2009, marijuana smoke was placed on California’s Proposition 65 list of chemicals known to the state to cause cancer.⁵</p> <p>Independent of THC content, cannabis smokers are typically exposed to more carbon monoxide and tar than cigarette smokers.⁶</p>	Marijuana smoke, both firsthand and secondhand, contains many of the same cancer-causing chemicals as tobacco smoke.

Marijuana Use and Respiratory Health (2)—APPROVED STATEMENTS

				In a study of the chemical composition of marijuana smoke, ammonia was found in mainstream marijuana smoke at levels up to twenty-fold greater than found in tobacco. ¹	
Airflow Obstruction	MODERATE evidence that heavy marijuana smoking is associated with mild airflow obstruction. ^{7,8,9,10}		There is conflicting evidence on whether regular marijuana use harms the small airways of the lungs.	Lung function is significantly poorer and there are significantly greater abnormalities in the large airways of marijuana smokers than in non-smokers. ¹¹	Regular marijuana smoking is associated with mild decreased airflow in the lungs.
Particulate matter	LIMITED evidence that smoking marijuana deposits more particulate matter per puff in the lungs compared to tobacco smoke. ¹²		Given a cigarette of comparable weight, as much as four times the amount of tar can be deposited in the lungs of marijuana smokers as in the lungs of tobacco smokers. ¹³ Marijuana cigarettes usually do not have filters, and marijuana smokers typically develop a larger puff	Methods of cannabis smoking may place more cannabis particulate matter into the lungs than noted with typical cigarette smoking. ¹⁵ Marijuana smoking is characterized by about two-thirds larger inhalation or “puff” volume, 40% deeper inhalation, and four times longer retention of hotter and unfiltered smoke	Marijuana smoke may deposit more particulate matter in the lungs per puff compared to tobacco smoke.

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (3)—APPROVED STATEMENTS

			<p>volume, inhale more deeply, and hold their breath several times longer than tobacco smokers.¹⁴</p>	<p>in comparison to tobacco cigarettes.¹⁶</p>	
Emphysema	<p>INSUFFICIENT evidence to suggest that marijuana smoking alone is associated with emphysema.^{17,18}</p>			<p>There is no evidence to date that chronic cannabis smoking increases the risk of emphysema.¹⁹</p>	<p>There is currently not enough evidence to indicate that chronic marijuana smoking increases the risk of emphysema.</p>
Chronic Obstructive Pulmonary Disease (COPD)	<p>MIXED evidence for whether or not smoking marijuana is associated with chronic obstructive pulmonary disease (COPD).^{20,21,22,23,24,25,26}</p>		<p>In the absence of epidemiological data, indirect evidence, such as nonspecific airway hyperresponsiveness and measures of lung function, offers an indicator of the vulnerability of marijuana smokers to COPD.²⁷</p> <p>It has not been established whether chronic marijuana smoking causes COPD, but there is probably an association.</p>		<p>There is conflicting research for whether or not regular marijuana smoking is associated with chronic obstructive pulmonary disease (COPD).</p>

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (4)—APPROVED STATEMENTS

<p>Chronic bronchitis with cough/wheeze/sputum</p>	<p>SUBSTANTIAL evidence that heavy marijuana smoking is associated with chronic bronchitis, including chronic cough, sputum production, and wheezing.^{28,29,30,31,32,33,34}</p>		<p>Chronic marijuana smoking might lead to acute and chronic bronchitis.</p> <p>When marijuana smokers were compared with nonsmokers and tobacco smokers in a group of 446 volunteers, the difference in the percentages of tobacco smokers and marijuana smokers experiencing symptoms of chronic bronchitis was statistically insignificant.³⁵</p>	<p>In a nationally representative US survey, after controlling for age, gender and current asthma, marijuana use was significantly associated with respiratory symptoms of chronic bronchitis, coughing on most days, phlegm production, wheezing, and chest sounds without a cold.³⁶</p>	<p>Heavy marijuana smoking is associated with chronic bronchitis, including chronic cough, sputum production and wheezing.</p>
<p>Bullous lung disease</p>	<p>LIMITED evidence that heavy marijuana smoking is associated with bullous lung disease.^{37,38,39}</p>				<p>Heavy marijuana smoking may be associated with a specific type of lung tissue destruction called bullous lung disease.</p>
<p>Respiratory Infections</p>	<p>INSUFFICIENT evidence to determine if smoking marijuana is associated with</p>		<p>In a large sample of volunteers, habitual marijuana smokers had twice as many alveolar macrophages as</p>	<p>Regular or heavy cannabis consumption can result in generalized airway inflammation with evidence of respiratory epithelial cell</p>	<p>There is conflicting research for whether or not marijuana smoking is associated with lung cancer.</p>

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (5)—APPROVED STATEMENTS

	increased risk of respiratory infections. ^{40, 41}		nonsmokers, and smokers of both marijuana and tobacco had twice as many again. ⁴²	injury and damage to alveolar macrophages, which can lead to pulmonary infection. ⁴³ The immunological competence of regular cannabis smokers is impaired, increasing rates of respiratory infections and pneumonia and their use of health services for these infections. ^{44,45}	
Lung cancer	MIXED evidence for whether or not marijuana smoking is associated with lung cancer. ^{46,47,48,49,50, 51}		There is no conclusive evidence that marijuana causes cancer in humans, including cancers usually related to tobacco use. Although cellular, genetic, and human studies all suggest that marijuana smoke is an important risk factor for the development of respiratory cancer, proof that habitual marijuana smoking does or does not cause cancer awaits	Chronic cannabis smokers show many of the pathological changes in lung cells that precede the development of cancer in tobacco smokers. ⁵² Studies that examined lung cancer risk factors found an association of marijuana smoking with increased tar exposure, alveolar macrophage tumoricidal dysfunction, increased oxidative stress, and bronchial mucosal histopathologic abnormalities as compared to tobacco	

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (6)—APPROVED STATEMENTS

			the results of well-designed studies.	<p>smokers or nonsmoking controls.⁵³</p> <p>In a case-control study, the risk of lung cancer increased by about 8% for each joint-year of cannabis smoking, after adjusting for confounding variables.⁵⁴</p> <p>A population based case-control study showed no significant risk of lung cancer with even long-term or heavy use of marijuana.⁵⁵</p> <p>Heavy cannabis smoking was significantly associated with more than a twofold risk of developing lung cancer over the 40-year follow-up period in a large cohort study.⁵⁶</p>	
Pre-malignant lesions in airways	SUBSTANTIAL evidence that heavy marijuana smoking is associated with pre-malignant			Chronic inflammatory and precancerous changes in the airways have been identified in cannabis smokers and the most recent case-control study shows an	Heavy marijuana smoking is strongly associated with pre-malignant lesions in your lungs.

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (7)—APPROVED STATEMENTS

	lesions in the airway. ^{57,58,59}			increased risk of airways cancer that is proportional to the amount of cannabis use. ⁶⁰	
Smoke from water pipes or bongs contain more cancer-causing chemicals	LIMITED evidence from simulated smoking studies that smoke from water pipes or bongs contains more cancer-causing chemicals per milligram of THC compared to smoke from unfiltered joints ^{61,62}				Smoke from water pipes or bongs may contain more cancer-causing chemicals per milligram of THC compared to smoke from unfiltered joints.
Acute use improves airflow	SUBSTANTIAL evidence that marijuana use (inhaled or oral) results in an immediate short-term improvement of lung airflow. ^{63,64,65}				One-time marijuana use (edible or smoked) is strongly associated with immediate, short-term (1 to 6 hours) improved airflow in the lungs of healthy marijuana users and asthmatics.
Respiratory health effects from aerosolizing	INSUFFICIENT evidence to determine if vaporizing				There is currently not enough evidence to determine if aerosolizing or vaporizing marijuana is associated with effects on lung health.

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (8)—APPROVED STATEMENTS

/vaporizing	marijuana is associated with respiratory health effects. ⁶⁶				
--------------------	--	--	--	--	--

REFERENCES

- ¹ Moir, D., et al., *A comparison of mainstream and sidestream marijuana and tobacco cigarette smoke produced under two machine smoking conditions*. Chem Res Toxicol, 2008. **21**(2): p. 494-502.
- ² Lee, M.L., M. Novotny, and K.D. Bartle, *Gas chromatography/mass spectrometric and nuclear magnetic resonance spectrometric studies of carcinogenic polynuclear aromatic hydrocarbons in tobacco and marijuana smoke condensates*. Anal Chem, 1976. **48**(2): p. 405-16.
- ³ Sparacino, C.M., P.A. Hyldborg, and T.J. Hughes, *Chemical and Biological Analysis of Marijuana Smoke Condensate*, U.S.D.o.H.a.H. Services, Editor. 1990.
- ⁴ Gieringer, D., J. St. Laurent, and S. Goodrich, *Cannabis Vaporizer Combines Efficient Delivery of THC with Effective Suppression of Pyrolytic Compounds*. Journal of Cannabis Therapeutics, 2004. **4**(1).
- ⁵ Tomar, R.S., J. Beaumont, and J.C.Y. Hsieh, *Evidence on the Carcinogenicity of Marijuana Smoke*. Aug. 2009, California Environmental Protection Agency, Reproductive and Cancer Hazard Assessment Branch, Office of Environmental Health Hazard Assessment.
- ⁶ Greydanus, D.E., et al., *Marijuana: current concepts*. Front Public Health, 2013. **1**: p. 42.
- ⁷ Tashkin, D.P., et al., *Respiratory symptoms and lung function in habitual heavy smokers of marijuana alone, smokers of marijuana and tobacco, smokers of tobacco alone, and nonsmokers*. Am Rev Respir Dis, 1987. **135**(1): p. 209-16.
- ⁸ Tashkin, D.P., et al., *Subacute effects of heavy marihuana smoking on pulmonary function in healthy men*. N Engl J Med, 1976. **294**(3): p. 125-9.
- ⁹ Aldington, S., et al., *Effects of cannabis on pulmonary structure, function and symptoms*. Thorax, 2007. **62**(12): p. 1058-63.
- ¹⁰ Hancox, R.J., et al., *Effects of cannabis on lung function: a population-based cohort study*. Eur Respir J, 2010. **35**(1): p. 42-7.
- ¹¹ Hall, W. and N. Solowij, *Adverse effects of cannabis*. Lancet, 1998. **352**(9140): p. 1611-6.
- ¹² Wu, T.C., et al., *Pulmonary hazards of smoking marijuana as compared with tobacco*. N Engl J Med, 1988. **318**(6): p. 347-51.
- ¹³ SAMHSA (Substance Abuse and Mental Health Services Administration). 1998. *National Household Survey on Drug Abuse: Population Estimates 1997*. DHHS Pub. No. (SMA) 98-3250. Rockville, MD: SAMHSA, Office of Applied Studies.
- ¹⁴ Peterson RC. 1979. Importance of inhalation patterns in determining effects of marijuana use. *Lancet* 1:727—728.
- ¹⁵ Greydanus, D.E., et al., *Marijuana: current concepts*. Front Public Health, 2013. **1**: p. 42.
- ¹⁶ Mégarbane, B. and L. Chevillard, *The large spectrum of pulmonary complications following illicit drug use: features and mechanisms*. Chem Biol Interact, 2013. **206**(3): p. 444-51.
- ¹⁷ Tashkin, D.P., et al., *Subacute effects of heavy marihuana smoking on pulmonary function in healthy men*. N Engl J Med, 1976. **294**(3): p. 125-9.
- ¹⁸ Aldington, S., et al., *Effects of cannabis on pulmonary structure, function and symptoms*. Thorax, 2007. **62**(12): p. 1058-63.
- ¹⁹ Hall, W., *The adverse health effects of cannabis use: what are they, and what are their implications for policy?* Int J Drug Policy, 2009. **20**(6): p. 458-66.

Meeting date:
October 22, 2015

Marijuana Use and Respiratory Health (9)—APPROVED STATEMENTS

- ²⁰ Hancox, R.J., et al., *Effects of cannabis on lung function: a population-based cohort study*. Eur Respir J, 2010. **35**(1): p. 42-7.
- ²¹ Fligiel, S.E., et al., *Tracheobronchial histopathology in habitual smokers of cocaine, marijuana, and/or tobacco*. Chest, 1997. **112**(2): p. 319-26.
- ²² Pletcher, M.J., et al., *Association between marijuana exposure and pulmonary function over 20 years*. JAMA, 2012. **307**(2): p. 173-81.
- ²³ Tashkin, D.P., et al., *Heavy habitual marijuana smoking does not cause an accelerated decline in FEV1 with age*. Am J Respir Crit Care Med, 1997. **155**(1): p. 141-8.
- ²⁴ Sherrill, D.L., et al., *Respiratory effects of non-tobacco cigarettes: a longitudinal study in general population*. Int J Epidemiol, 1991. **20**(1): p. 132-7.
- ²⁵ Taylor, D.R., et al., *A longitudinal study of the effects of tobacco and cannabis exposure on lung function in young adults*. Addiction, 2002. **97**(8): p. 1055-61.
- ²⁶ Tan, W.C., et al., *Marijuana and chronic obstructive lung disease: a population-based study*. CMAJ, 2009. **180**(8): p. 814-20.
- ²⁷ Van Hoozen BE, Cross CE. 1997. Respiratory tract effects of marijuana. *Clinical Reviews in Allergy and Immunology* 15:243—269.
- ²⁸ Tashkin, D.P., et al., *Respiratory symptoms and lung function in habitual heavy smokers of marijuana alone, smokers of marijuana and tobacco, smokers of tobacco alone, and nonsmokers*. Am Rev Respir Dis, 1987. **135**(1): p. 209-16.
- ²⁹ Aldington, S., et al., *Effects of cannabis on pulmonary structure, function and symptoms*. Thorax, 2007. **62**(12): p. 1058-63.
- ³⁰ Sherrill, D.L., et al., *Respiratory effects of non-tobacco cigarettes: a longitudinal study in general population*. Int J Epidemiol, 1991. **20**(1): p. 132-7.
- ³¹ Bloom, J.W., et al., *Respiratory effects of non-tobacco cigarettes*. Br Med J (Clin Res Ed), 1987. **295**(6612): p. 1516-8.
- ³² Moore, B.A., et al., *Respiratory effects of marijuana and tobacco use in a U.S. sample*. J Gen Intern Med, 2005. **20**(1): p. 33-7.
- ³³ Roth, M.D., et al., *Airway inflammation in young marijuana and tobacco smokers*. Am J Respir Crit Care Med, 1998. **157**(3 Pt 1): p. 928-37.
- ³⁴ Taylor, D.R., et al., *The respiratory effects of cannabis dependence in young adults*. Addiction, 2000. **95**(11): p. 1669-77.
- ³⁵ Tashkin DP, Coulson AH, Clark VA, Simmons M, Bourque LB, Duann S, Spivey GH, Gong H. 1987. Respiratory symptoms and lung function in habitual, heavy smokers of marijuana alone, smokers of marijuana and tobacco, smokers of tobacco alone, and nonsmokers. *American Review of Respiratory Disease* 135:209—216.
- ³⁶ Moore, B.A., et al., *Respiratory effects of marijuana and tobacco use in a U.S. sample*. J Gen Intern Med, 2005. **20**(1): p. 33-7.
- ³⁷ Beshay, M., et al., *Emphysema and secondary pneumothorax in young adults smoking cannabis*. Eur J Cardiothorac Surg, 2007. **32**(6): p. 834-8.
- ³⁸ Hii, S.W., et al., *Bullous lung disease due to marijuana*. Respirology, 2008. **13**(1): p. 122-7.
- ³⁹ Johnson, M.K., et al., *Large lung bullae in marijuana smokers*. Thorax, 2000. **55**(4): p. 340-2.
- ⁴⁰ Moore, B.A., et al., *Respiratory effects of marijuana and tobacco use in a U.S. sample*. J Gen Intern Med, 2005. **20**(1): p. 33-7.
- ⁴¹ Polen, M.R., et al., *Health care use by frequent marijuana smokers who do not smoke tobacco*. West J Med, 1993. **158**(6): p. 596-601.
- ⁴² Barbers RG, Gong HJ, Tashkin DP, Oishi J, Wallace J M. 1987. Differential examination of bronchoalveolar lavage cells in tobacco cigarette and marijuana smokers. *American Review of Respiratory Disease* 135:1271—1275.
- ⁴³ Greydanus, D.E., et al., *Marijuana: current concepts*. Front Public Health, 2013. **1**: p. 42.
- ⁴⁴ Hall, W., *The adverse health effects of cannabis use: what are they, and what are their implications for policy?* Int J Drug Policy, 2009. **20**(6): p. 458-66.
- ⁴⁵ Volkow, N.D., et al., *Adverse health effects of marijuana use*. N Engl J Med, 2014. **370**(23): p. 2219-27.
- ⁴⁶ Aldington, S., et al., *Cannabis use and risk of lung cancer: a case-control study*. Eur Respir J, 2008. **31**(2): p. 280-6.
- ⁴⁷ Berthiller, J., et al., *Cannabis smoking and risk of lung cancer in men: a pooled analysis of three studies in Maghreb*. J Thorac Oncol, 2008. **3**(12): p. 1398-403.
- ⁴⁸ Callaghan, R.C., P. Allecbeck, and A. Sidorchuk, *Marijuana use and risk of lung cancer: a 40-year cohort study*. Cancer Causes Control, 2013. **24**: p. 1811-1820.
- ⁴⁹ Zhang, Z.F., et al., *Marijuana use and increased risk of squamous cell carcinoma of the head and neck*. Cancer Epidemiol Biomarkers Prev, 1999. **8**(12): p. 1071-8.

Meeting date:

October 22, 2015

Marijuana Use and Respiratory Health (10)—APPROVED STATEMENTS

- ⁵⁰ Hashibe, M., et al., *Marijuana use and the risk of lung and upper aerodigestive tract cancers: results of a population-based case-control study*. *Cancer Epidemiol Biomarkers Prev*, 2006. **15**(10): p. 1829-34.
- ⁵¹ Zhang, L.R., et al., *Cannabis smoking and lung cancer risk: Pooled analysis in the International Lung Cancer Consortium*. *Int J Cancer*, 2014.
- ⁵² Hall, W., *The adverse health effects of cannabis use: what are they, and what are their implications for policy?* *Int J Drug Policy*, 2009. **20**(6): p. 458-66.
- ⁵³ Mehra, R., et al., *The association between marijuana smoking and lung cancer: a systematic review*. *Arch Intern Med*, 2006. **166**(13): p. 1359-67.
- ⁵⁴ Mégarbane, B. and L. Chevillard, *The large spectrum of pulmonary complications following illicit drug use: features and mechanisms*. *Chem Biol Interact*, 2013. **206**(3): p. 444-51.
- ⁵⁵ Hashibe, M., et al., *Marijuana use and the risk of lung and upper aerodigestive tract cancers: results of a population-based case-control study*. *Cancer Epidemiol Biomarkers Prev*, 2006. **15**(10): p. 1829-34.
- ⁵⁶ Callaghan, R.C., P. Allebeck, and A. Sidorchuk, *Marijuana use and risk of lung cancer: a 40-year cohort study*. *Cancer Cause Control*, 2013. **24**: p. 1811-1820.
- ⁵⁷ Fligiel, S.E., et al., *Tracheobronchial histopathology in habitual smokers of cocaine, marijuana, and/or tobacco*. *Chest*, 1997. **112**(2): p. 319-26.
- ⁵⁸ Gong, H., Jr., et al., *Tracheobronchial changes in habitual, heavy smokers of marijuana with and without tobacco*. *Am Rev Respir Dis*, 1987. **136**(1): p. 142-9.
- ⁵⁹ Barsky, S.H., et al., *Histopathologic and molecular alterations in bronchial epithelium in habitual smokers of marijuana, cocaine, and/or tobacco*. *J Natl Cancer Inst*, 1998. **90**(16): p. 1198-205.
- ⁶⁰ Kalant, H., *Adverse effects of cannabis on health: an update of the literature since 1996*. *Prog Neuropsychopharmacol Biol Psychiatry*, 2004. **28**(5): p. 849-63.
- ⁶¹ Gieringer, D., *Multidisciplinary Association for Psychodelic Studies (MAPS) 1996 Newletter, Volume 6, Number 3. Revised Nov. 1999*.
- ⁶² Gowing, L.R., R.L. Ali, and J.M. White, *Respiratory harms of smoked cannabis*, in *DASC Monograph No. 8, Research Series*, D.a.A.S.C.S. Australia, Editor. 2000.
- ⁶³ Tashkin, D.P., B.J. Shapiro, and I.M. Frank, *Acute pulmonary physiologic effects of smoked marijuana and oral 9 -tetrahydrocannabinol in healthy young men*. *N Engl J Med*, 1973. **289**(7): p. 336-41.
- ⁶⁴ Tashkin, D.P., B.J. Shapiro, and I.M. Frank, *Acute effects of smoked marijuana and oral delta9-tetrahydrocannabinol on specific airway conductance in asthmatic subjects*. *Am Rev Respir Dis*, 1974. **109**(4): p. 420-8.
- ⁶⁵ Tashkin, D.P., et al., *Effects of smoked marijuana in experimentally induced asthma*. *Am Rev Respir Dis*, 1975. **112**(3): p. 377-86.
- ⁶⁶ Gieringer, D., *Multidisciplinary Association for Psychodelic Studies (MAPS) 1996 Newletter, Volume 6, Number 3. Revised Nov. 1999*.

Meeting date:
October 22, 2015