Welcome

Please stand by. We will begin shortly.

Tobacco Cessation Education – A Training Program for Faculty

SESSION 1

Wednesday, August 20, 2014 · 1pm ET (120 minutes)

Rx for Change

University of California San Francisco
UCSF
School of Pharmacy
Department of Clinical Pharmacy

PURDUE UNIVERSITY

Smoking Cessation Leadership Center

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- Robin L. Corelli, PharmD, Professor of Clinical Pharmacy, Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco – Has nothing to disclose.

- Lisa A. Kroon, PharmD, CDE, Professor of Clinical Pharmacy and Chair, Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco – Has nothing to disclose.

Moderator

Jennifer Matekuare

- Operations Manager, Smoking Cessation Leadership Center, University of California, San Francisco
- **jmatekuare@medicine.ucsf.edu**

Tobacco Cessation Education – A Training Program for Faculty, Session 1

Learning objectives

- Discuss epidemiology, pharmacology, drug interaction and forms of tobacco along with the consequences/risks of tobacco use and benefits of cessation
- Discuss strategies to assist patients with smoking cessation
- Discuss aids for smoking cessation

Housekeeping

- All participants will be in **listen only mode.**
- Please **make sure your speakers are on** and adjust the volume accordingly.
- If you do not have speakers, please request the dial-in via the chat box.
- **This webinar is being recorded** and will be available on SCLC's website, along with the slides.
- **Use the chat box to send questions** at any time for the presenters.

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Required for Completion - To receive credit, you must attend and participate in ALL three webinars scheduled for 08/20/2014, 08/26/2014, 08/28/2014. Attendance will be verified by completion of an evaluation form at the end of each webinar. Credits will be uploaded to CPE Monitor within 60 days of the final webinar on 08/28/2014.

Today's Speaker

University of California
San Francisco
UCSF
School of Pharmacy
Department of Clinical Pharmacy

Lisa A. Kroon, PharmD, CDE

- Professor of Clinical Pharmacy and Chair, Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco

Today's Speaker

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Robin L. Corelli, PharmD

- Professor of Clinical Pharmacy, Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco

Rx for CHANGE

Clinician-Assisted Tobacco Cessation

TRAINING OVERVIEW

- Epidemiology of Tobacco Use
- Forms of Tobacco
- Nicotine Pharmacology & Principles of Addiction
- Drug Interactions with Smoking
- Assisting Patients with Quitting
- Aids for Cessation
- Tobacco Trigger Tapes
- Role Playing with Case Scenarios and Video Counseling Sessions

EPIDEMIOLOGY of TOBACCO USE

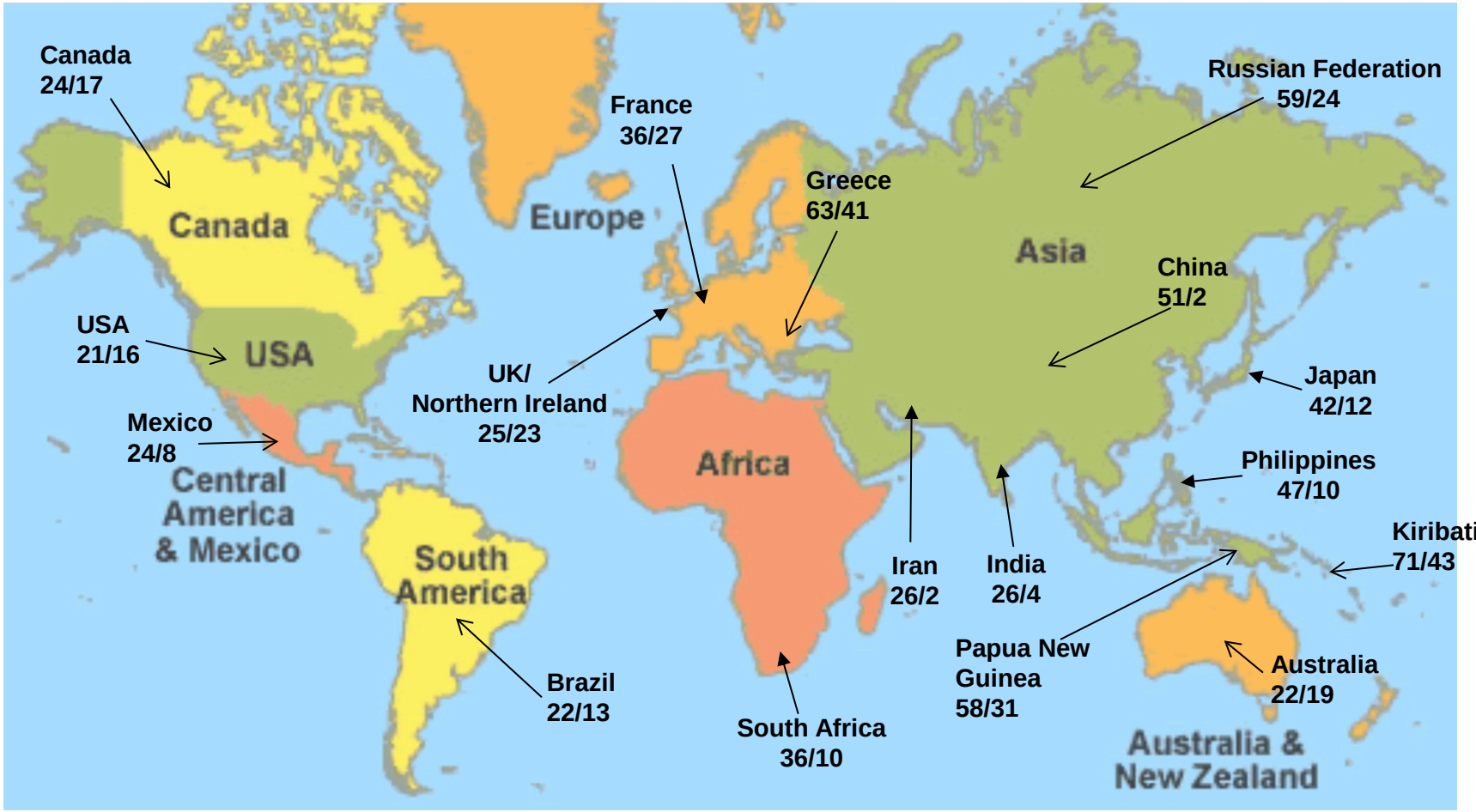
“CIGARETTE SMOKING…

is the chief, single, avoidable cause of death in our society and the most important public health issue of our time.”

C. Everett Koop, M.D., former U.S. Surgeon General

All forms of tobacco are harmful.

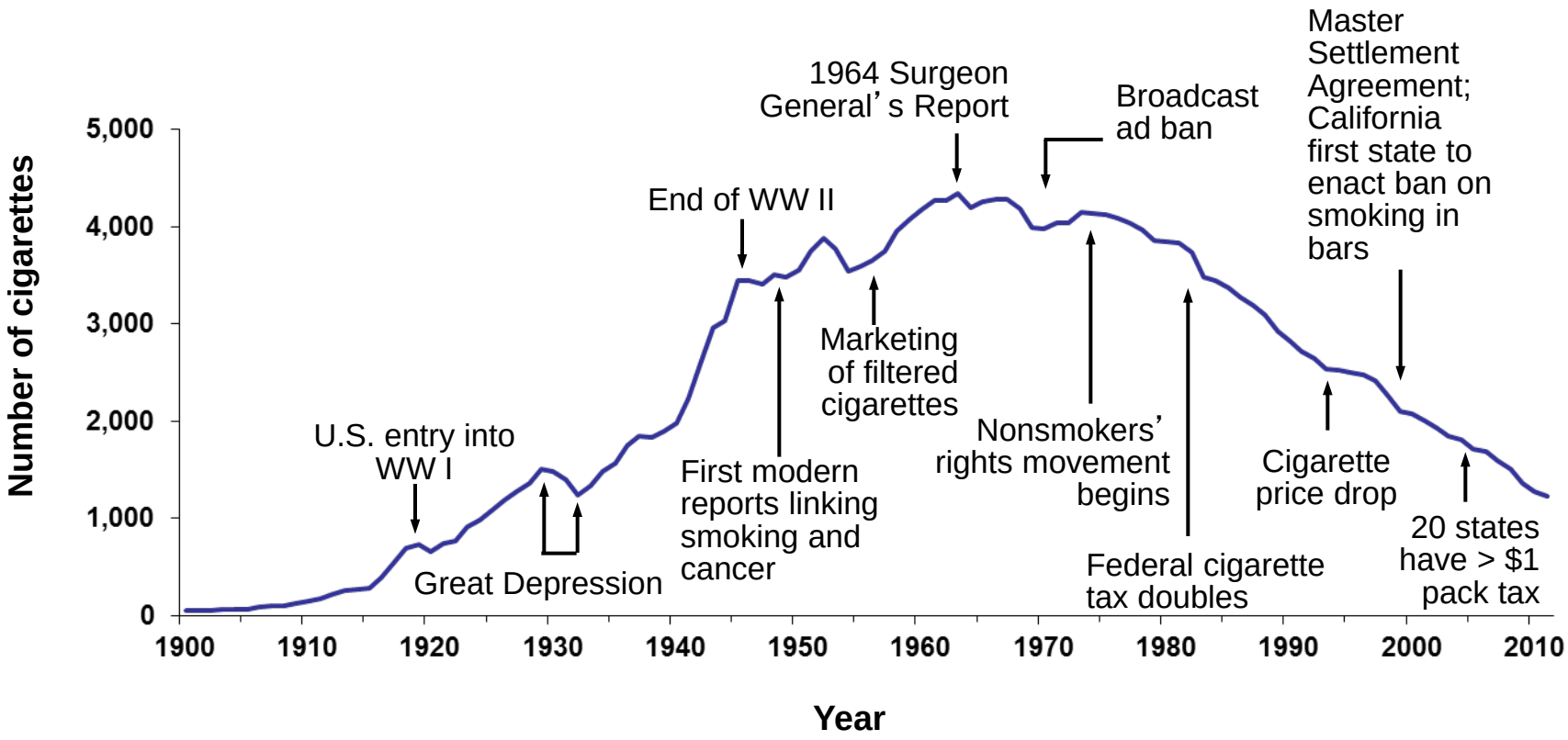
WORLDWIDE ADULT TOBACCO USE PREVALENCE (Men/Women)



World Health Organization Report on the Global Tobacco Epidemic (2011).
U.S. updates from: Centers for Disease Control and Prevention (CDC). (2014). *MMWR* 63:29–34.

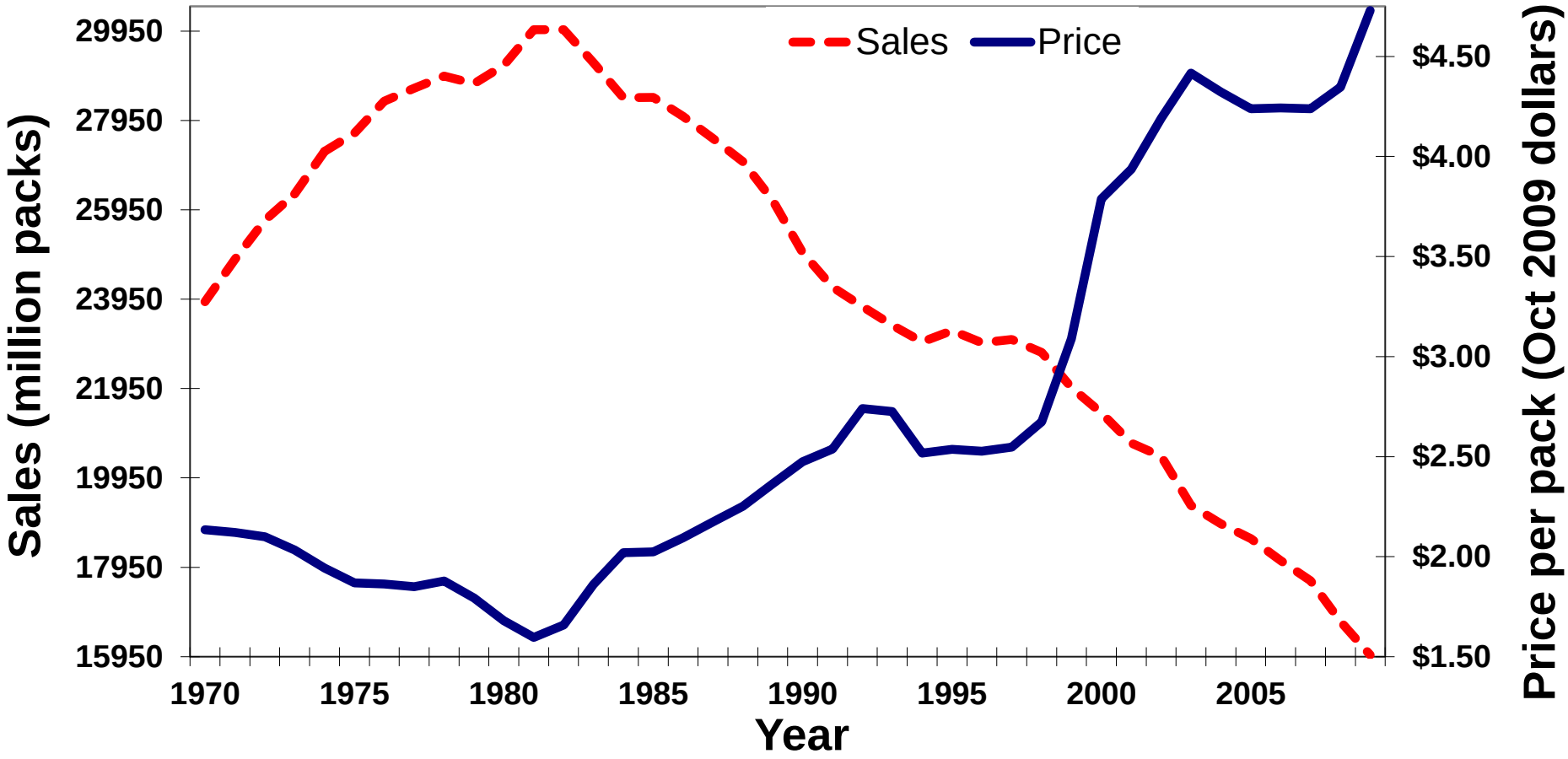
TRENDS in ADULT CIGARETTE CONSUMPTION—U.S., 1900–2011

Annual adult per capita cigarette consumption and major smoking and health events



Centers for Disease Control and Prevention (CDC). (1999). *MMWR* 48:986–993.
Per-capita updates from U.S. Department of Agriculture and (since 2000) Centers for Disease Control and Prevention (CDC). (2012). *MMWR* 61:565–569.

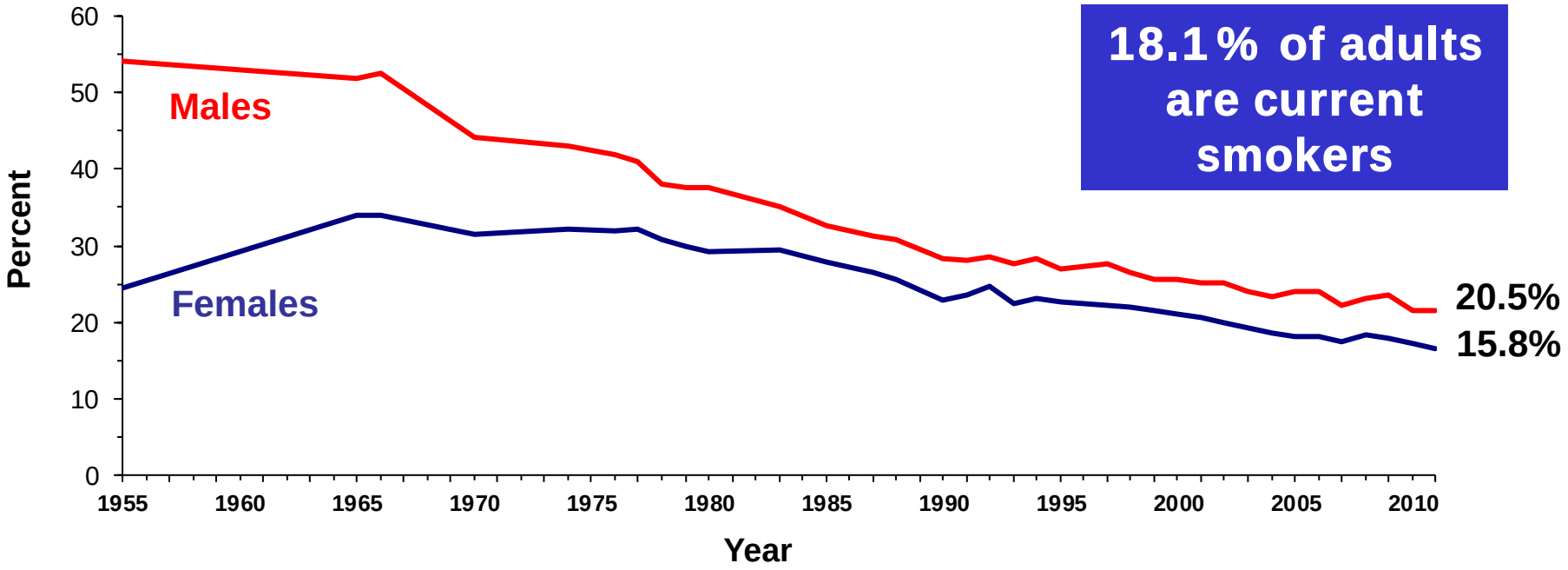
CIGARETTE PRICES and CIGARETTE SALES, 1970–2009



Chaloupka FJ. (2010). The economics of tobacco taxation. Chicago, IL: ImpacTEEN, University of Illinois at Chicago.

TRENDS in ADULT SMOKING, by SEX—U.S., 1955–2012

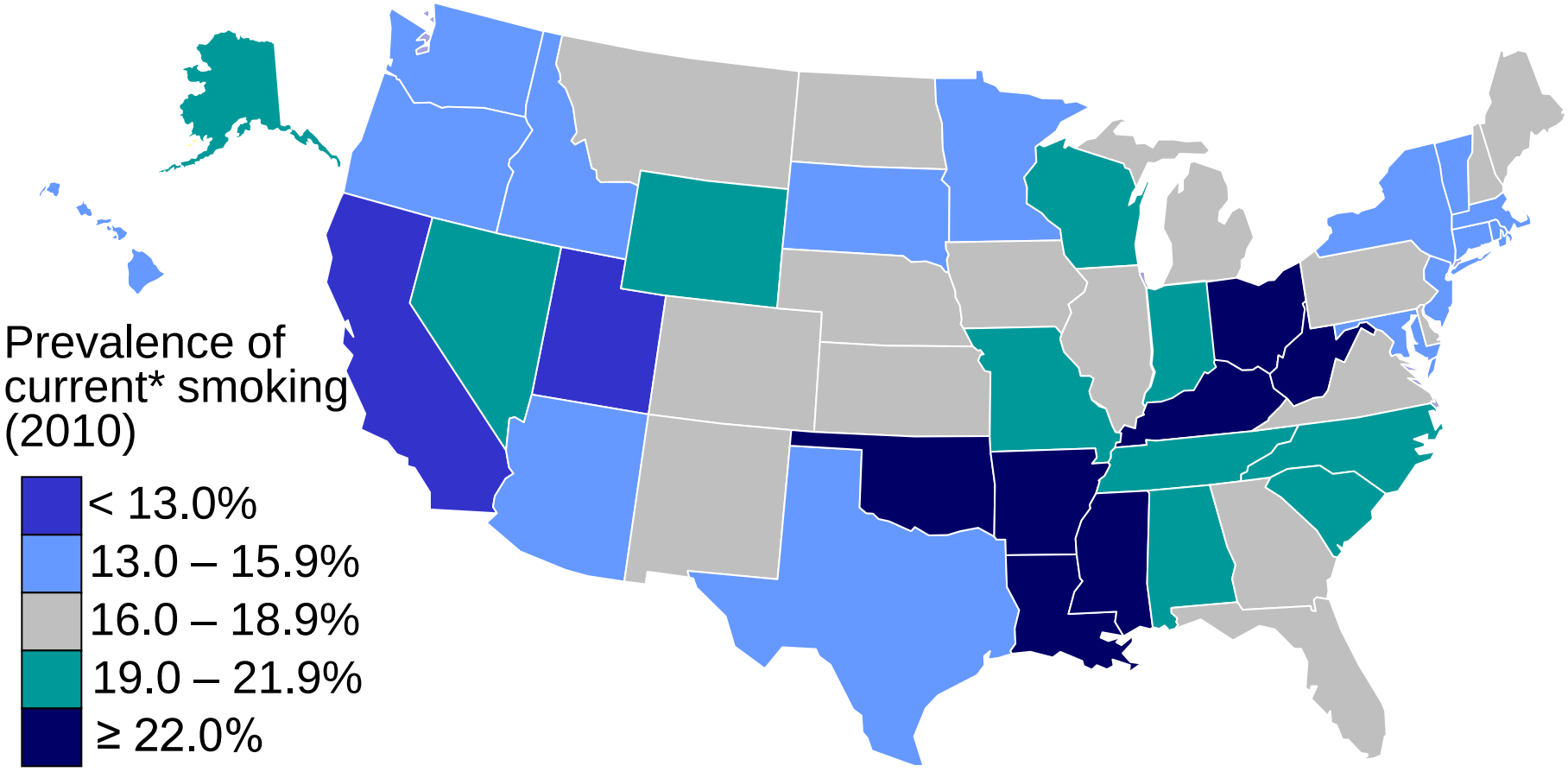
Trends in cigarette current smoking among persons aged 18 or older



68.8% want to quit
52.9% tried to quit in the past year

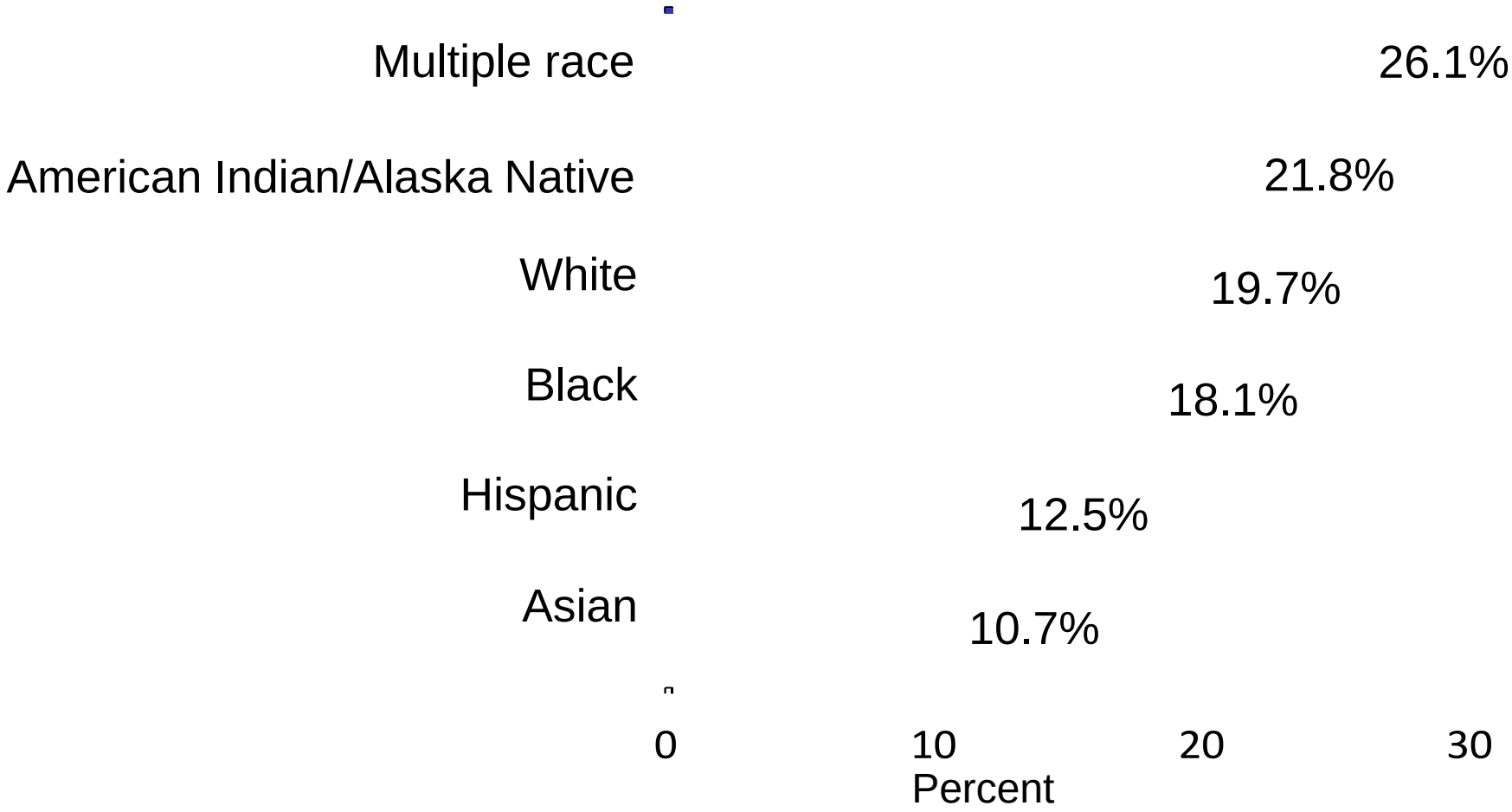
Graph provided by the Centers for Disease Control and Prevention. 1955 Current Population Survey; 1965–2012 NHIS. Estimates since 1992 include some-day smoking.

STATE-SPECIFIC PREVALENCE of SMOKING among ADULTS, 2010



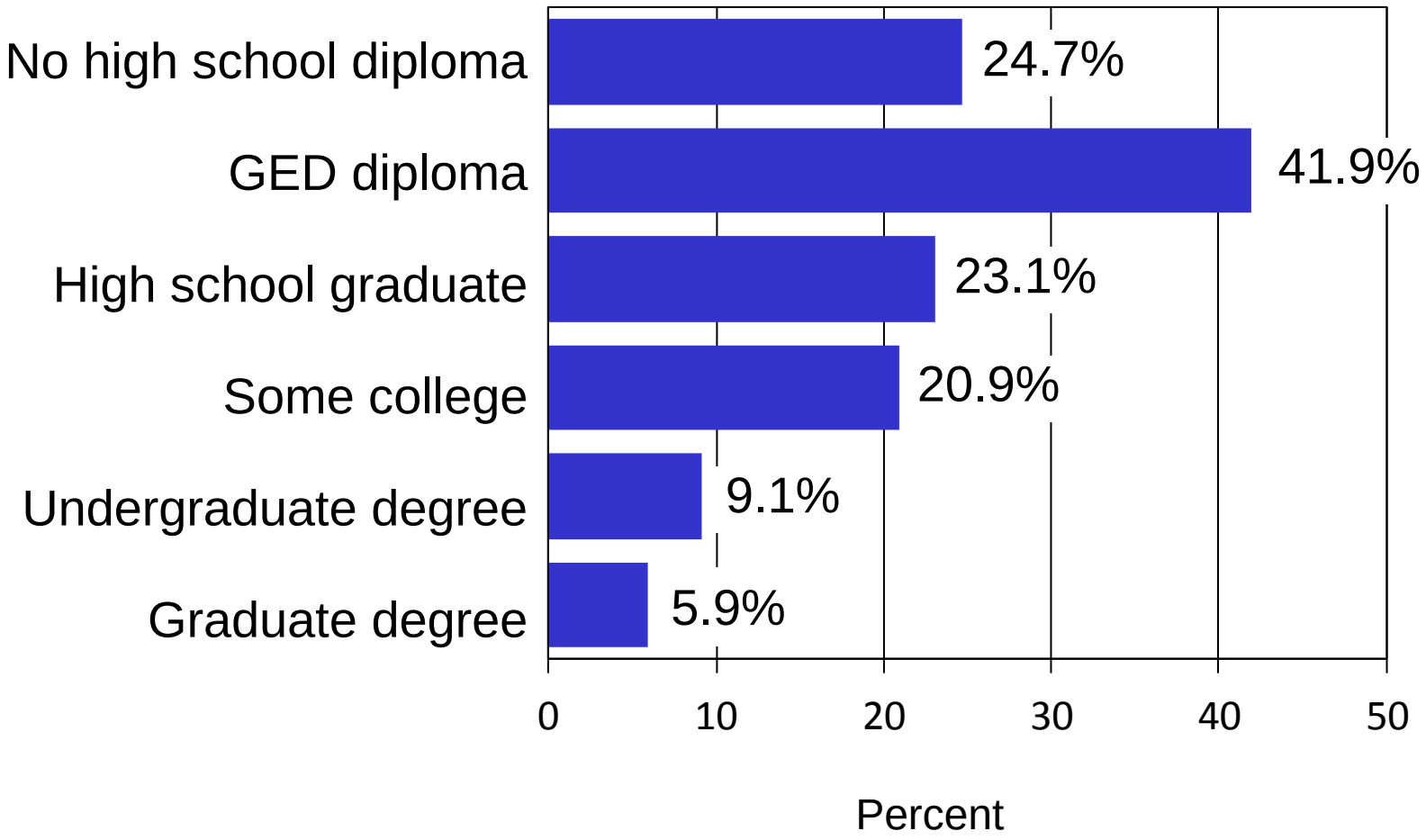
* Has smoked ≥ 100 cigarettes during lifetime and currently smokes either every day or some days.

PREVALENCE of ADULT SMOKING, by RACE/ETHNICITY—U.S., 2012



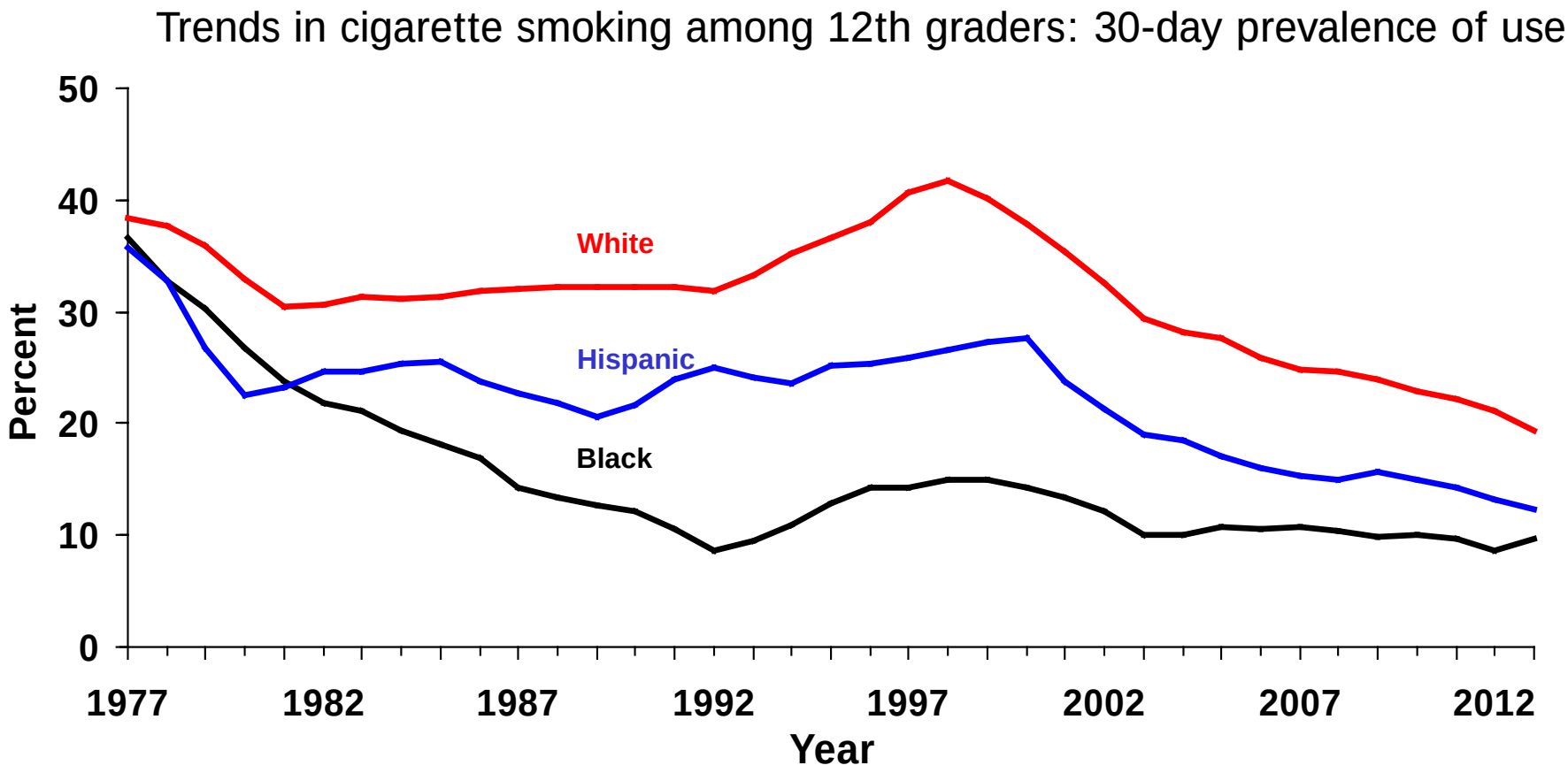
Centers for Disease Control and Prevention (CDC). (2014). *MMWR* 63:29–34.

PREVALENCE of ADULT SMOKING, by EDUCATION—U.S., 2012



Centers for Disease Control and Prevention (CDC). (2014). *MMWR* 63:29–34.

TRENDS in TEEN SMOKING, by ETHNICITY—U.S., 1977–2013



Institute for Social Research, University of Michigan, Monitoring the Future Project
www.monitoringthefuture.org

PUBLIC HEALTH versus "BIG TOBACCO"

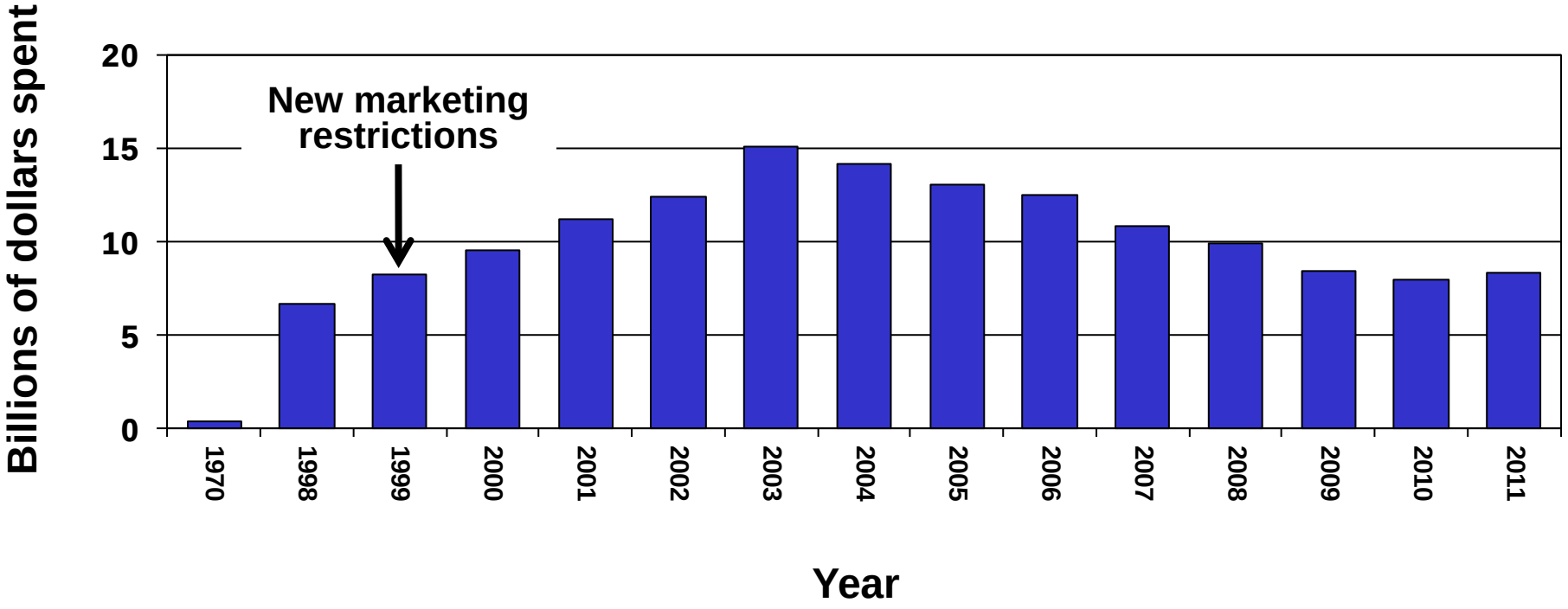
The biggest opponent to tobacco control efforts is the tobacco industry itself.

Nationally, the tobacco industry is outspending our state tobacco control funding.

For every $1 spent by the states, the tobacco industry spends $23 to market its products.

TOBACCO INDUSTRY MARKETING

- $8.37 billion spent in the U.S. in 2011
  - $23.0 million a day



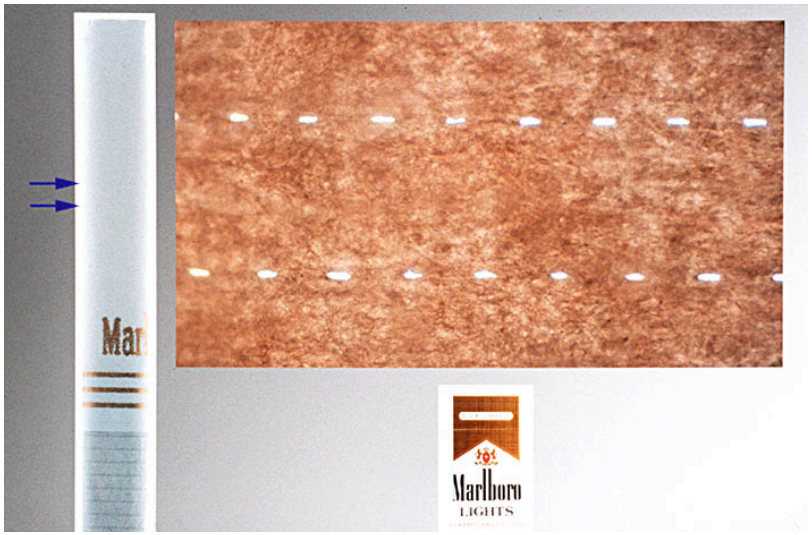
Federal Trade Commission (FTC). (2013). *Cigarette Report for 2011.*

The TOBACCO INDUSTRY

- For decades, the tobacco industry publicly denied the addictive nature of nicotine and the negative health effects of tobacco.
- **April 14, 1994:** Seven top executives of major tobacco companies state, under oath, that they believe nicotine is not addictive: http://www.jeffreywigand.com/7ceos.php
  - Tobacco industry documents indicate otherwise
  - Documents available at http://legacy.library.ucsf.edu
- The cigarette is a heavily engineered product.
  - Designed and marketed to maximize bioavailability of nicotine and addictive potential
  - **Profits over people**

An EFFECTIVE MARKETING STRATEGY: "LIGHT" CIGARETTES

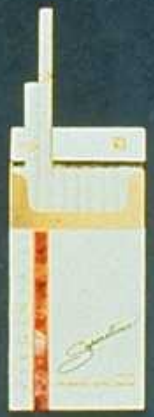
The difference between Marlboro and Marlboro Lights...



an extra row of ventilation holes

Image courtesy of Mayo Clinic Nicotine Dependence Center - Research Program / Dr. Richard D. Hurt

This Is
Superslims
From Virginia Slims



Low Smoke™
70% Less Smoke From The Lit End.

Gives off 70% less smoke from the lit end than leading 100mm cigarettes and 60% less than the other ultra thin as tested under laboratory conditions. Available in Regular or Menthol.

The Ultra Light With
More Taste Than Meets The Eye.

Fashions by Vicky Tiel

6 mg "tar," 0.4 mg nicotine av. per cigarette by FTC method.

SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

"You like them FRESH? So do I!"

1932

You don't have to tell the woman who has switched to Camels the benefits of a *fresh* cigarette.

She knows all about it — that's the reason she stays switched.

She has learned that the fine, fragrant, sun-ripened choice tobaccos in Camels have a perfectly preserved delicate mildness all their own.

She knows by a grateful throat's testimony what a relief this smooth, cool, slow-burning *fresh* cigarette means to sensitive membrane.

Camels are fresh in the Camel Humidor Pack because they are *made* fresh, fresh with natural moisture and natural flavors — they are never parched or toasted.

If you don't know what the Reynolds method of scientifically applying heat so as to avoid parching or toasting means to the smoker — switch to Camels for just one day — then leave them — if you can.

R. J. REYNOLDS TOBACCO COMPANY, *Winston-Salem, N.C.*

"Are you Listenin'?"

R. J. REYNOLDS TOBACCO COMPANY'S COAST-TO-COAST RADIO PROGRAMS—SEE RADIO PAGE OF LOCAL NEWSPAPER FOR TIME

CAMEL QUARTER HOUR, Morton Downey, Tony Wons, and Camel Orchestra, direction Jacques Renard, every night except Sunday, Columbia Broadcasting System

PRINCE ALBERT QUARTER HOUR, Alice Joy, "Old Hunch," and Prince Albert Orchestra, every night except Sunday, National Broadcasting Company Red Network

● *Don't remove the moisture-proof wrapping from your package of Camels after you open it. The Camel Humidor Pack is protection against perfume and powder odors, dust and germs. In offices and homes, even in the dry atmosphere of artificial heat, the Camel Humidor Pack can be depended upon to deliver fresh Camels every time*

CAMELS

Made FRESH — *Kept* FRESH

It's Wise TO SMOKE EXTRA-MILD FATIMA

"I agree..."

says NURSE Shirley Gellman
Los Angeles, California

Sept. 23, 1936

"...sound as a bell"

Wise doctor.

Wise mother.

Fortunate youngster.

Regular physical examinations plus all the methods developed to prevent or inhibit even the once-casual diseases are now routine in American life.

The magnificent advance made in *guarding* health by fighting illness *before* it strikes is still another proud chapter in the history of the medical profession.

According to a recent Nationwide survey:

More Doctors Smoke Camels *than any other Cigarette*

The "T-Zone"...T for Taste and Throat

Your "T-Zone" is a critical "laboratory" when it comes to cigarettes. Try Camel's flavor on *your* taste. See how *your* throat reacts to Camel's cool mildness. Like millions of other smokers, you too may say, "Camels suit my 'T-Zone' to a 'T'!"

• The makers of Camels take an understandable pride in the results of a nationwide survey among 113,597 doctors by three leading independent research organizations.

When queried about the cigarette they themselves smoked, the cigarette named most by the doctors was . . . Camel. Every branch of medicine was represented—physicians, surgeons, diagnosticians, specialists.

Like you, doctors smoke for pleasure. The rich, full flavor and cool mildness of Camel's costlier tobaccos are just as appealing to them as to you. Compare Camels—in your own "T-Zone."

CAMELS *Costlier Tobaccos*

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

1936


CAMEL
CAMEL
FILTERS
SMOOTH
TURKISH & DOMESTIC
BLEND
SURGEON GENERAL'S WARNING: Smoking
Causes Lung Cancer, Heart Disease,
Emphysema, And May Complicate Pregnancy.

1990

SMOKING in MOVIES

- Cigarette smoking is pervasive in movies
  - Evident in at least ¾ of box-office hits
  - Average, 10.9 smoking incidents per hour

    Charlesworth and Glantz. (2005). *Pediatrics* 116:1516–1528.

- There is a dose-response, **causal relationship** between exposure to smoking in movies and youth smoking initiation

  National Cancer Institute. (2008). *The Role of the Media in Promoting and Reducing Tobacco Use*.

Superman II (1980)

70% of adults support assigning an "R" rating to movies with smoking.

For more information on smoking in movies, go to http://smokefreemovies.ucsf.edu

FDA REGULATION of TOBACCO PRODUCTS

Currently, the FDA Center for Tobacco Control Products is responsible for regulation of:

- Cigarettes
- Cigarette tobacco
- Roll-your-own tobacco
- Smokeless tobacco
- E-cigarettes that are marketed for therapeutic purposes*

*Currently regulated by the FDA Center for Drug Evaluation and Research. It is anticipated that the FDA Center for Tobacco Control Products will regulate other nicotine-containing products , including electronic cigarette products that do not make a therapeutic claim, in the future.

COMPOUNDS in TOBACCO SMOKE

An estimated 4,800 compounds in tobacco smoke, including 11 proven human carcinogens

Gases	Particles
▪ Carbon monoxide	▪ Nicotine
▪ Hydrogen cyanide	▪ Nitrosamines
▪ Ammonia	▪ Lead
▪ Benzene	▪ Cadmium
▪ Formaldehyde	▪ Polonium-210

Nicotine is the addictive component of tobacco products, but it does NOT cause the ill health effects of tobacco use.

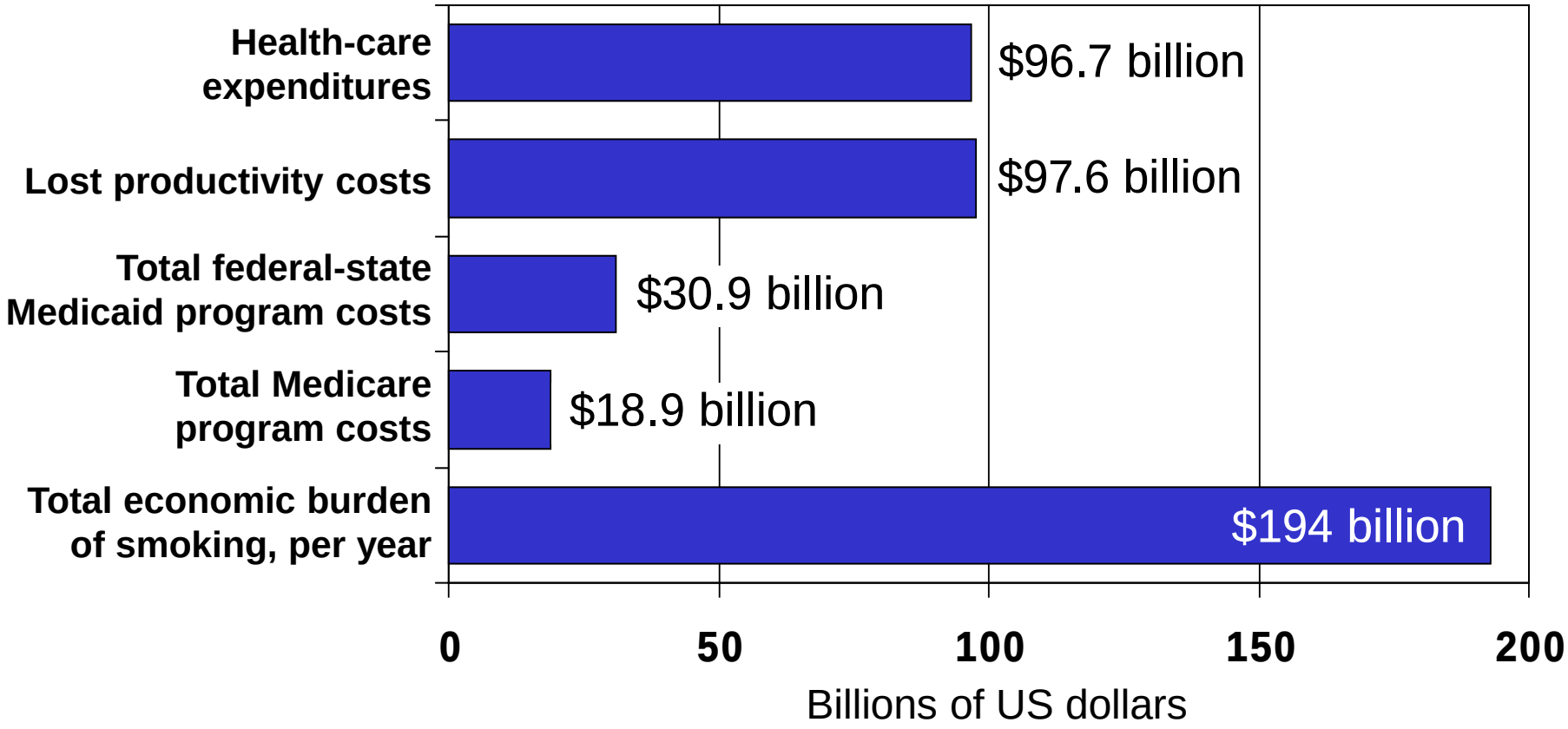
ANNUAL U.S. DEATHS ATTRIBUTABLE to SMOKING, 2000–2004

		Percent of all smoking-attributable deaths
Cardiovascular diseases	128,497	**29%**
Lung cancer	125,522	**28%**
Respiratory diseases	103,338	**23%**
Second-hand smoke	49,400	**11%**
Cancers other than lung	35,326	**8%**
Other	1,512	**<1%**

TOTAL: 443,595 deaths annually

Centers for Disease Control and Prevention (CDC). (2008). *MMWR* 57:1226–1228.

ANNUAL SMOKING-ATTRIBUTABLE ECONOMIC COSTS



Societal costs: $10.47 per pack of cigarettes smoked

Centers for Disease Control and Prevention (CDC). (2008). *MMWR* 57:1226–1228.

2014 REPORT of the SURGEON GENERAL:
HEALTH CONSEQUENCES OF SMOKING

MAJOR DISEASE-RELATED CONCLUSIONS:

- Cigarette smoking is causally linked to diseases of nearly all organs of the body, diminished health status, and harm to the fetus.
  - Additionally, smoking has many adverse effects on the body, such as causing inflammation and impairing immune function.
- Exposure to secondhand smoke is causally linked to cancer, respiratory, and cardiovascular diseases, and to adverse effects on the health of infants and children.
- Disease risks from smoking by women have risen over the last 50 years and for many tobacco-related diseases are now equal to those for men.

U.S. Department of Health and Human Services (USDHHS). (2014). *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*.

HEALTH CONSEQUENCES of SMOKING

- Cancers
  - Acute myeloid leukemia
  - Bladder and kidney
  - Cervical
  - Colorectal
  - Esophageal
  - Gastric
  - Laryngeal
  - Lung
  - Oral cavity and pharyngeal
  - Pancreatic
- Pulmonary diseases
  - Acute (e.g., pneumonia)
  - Chronic (e.g., COPD)
- Cardiovascular diseases
  - Abdominal aortic aneurysm
  - Coronary heart disease
  - Cerebrovascular disease
  - Peripheral arterial disease
- Reproductive effects
  - Reduced fertility in women
  - Poor pregnancy outcomes (e.g., low birth weight, preterm delivery)
  - Infant mortality
- Other: diabetes mellitus, rheumatoid arthritis, cataract, osteoporosis, periodontitis, poor surgical outcomes, impaired immune function

U.S. Department of Health and Human Services (USDHHS). (2014). *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General*.

HEALTH CONSEQUENCES of SMOKELESS TOBACCO USE

Periodontal effects
- Gingival recession
- Bone attachment loss
- Dental caries

Oral leukoplakia

Cancer
- Oral cancer
- Pharyngeal cancer

Oral Leukoplakia
Image courtesy of Dr. Sol Silverman - University of California San Francisco

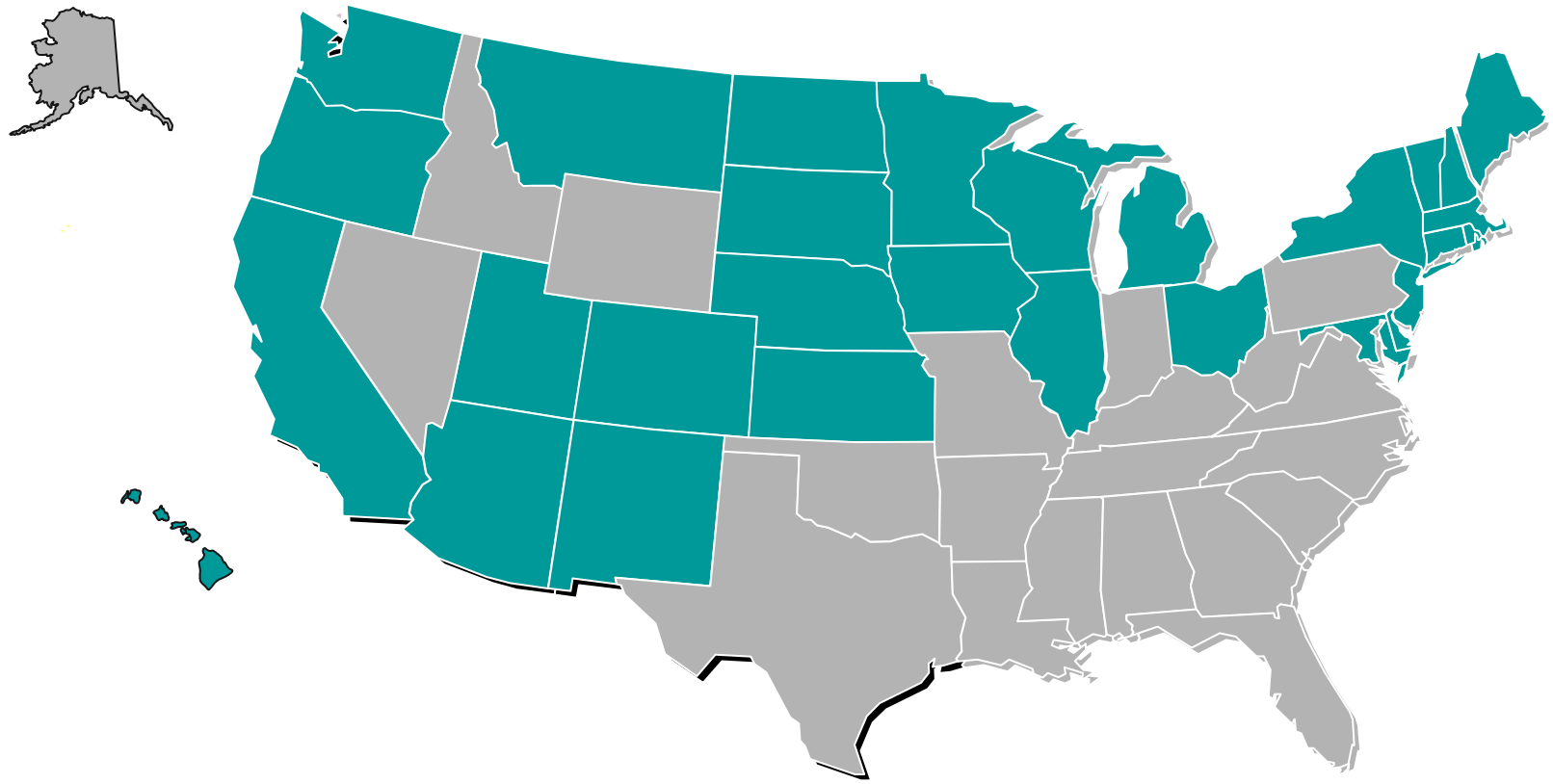
2006 REPORT of the SURGEON GENERAL:
INVOLUNTARY EXPOSURE to TOBACCO SMOKE

- Second-hand smoke causes premature death and disease in nonsmokers (children and adults)
- Children:
  - Increased risk for sudden infant death syndrome (SIDS), acute respiratory infections, ear problems, and more severe asthma
  - Respiratory symptoms and slowed lung growth if parents smoke
- Adults:
  - Immediate adverse effects on cardiovascular system
  - Increased risk for coronary heart disease and lung cancer
- Millions of Americans are exposed to smoke in their homes/workplaces
- Indoor spaces: eliminating smoking fully protects nonsmokers
  - Separating smoking areas, cleaning the air, and ventilation are ineffective

There is no safe level of second-hand smoke.

U.S. Department of Health and Human Services (USDHHS). (2006). *The Health Consequences of Involuntary Exposure to Tobacco Smoke: Report of the Surgeon General.*

SMOKING BANS in the UNITED STATES

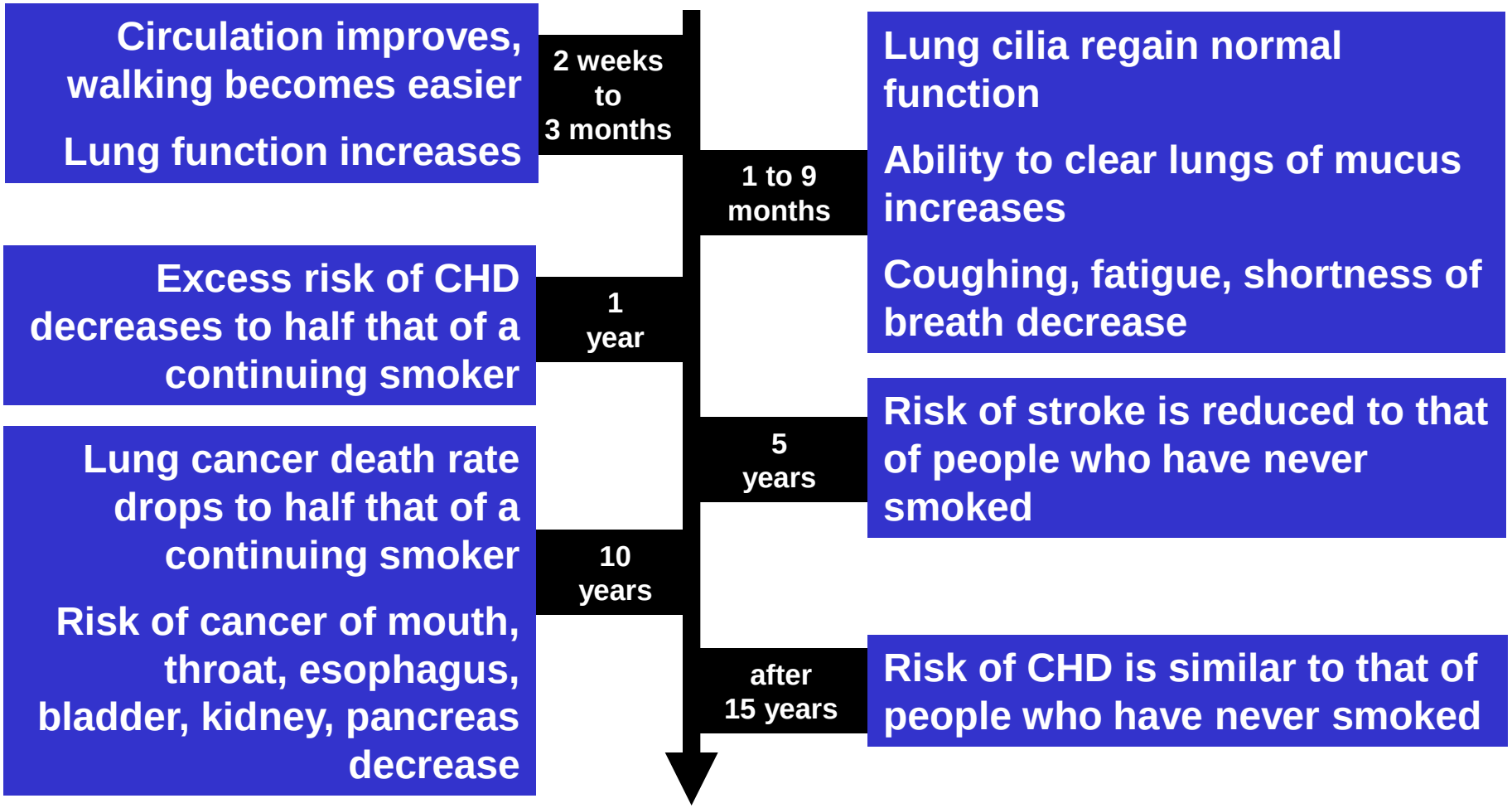


Smoke-free offices, restaurants, and bars

Data current as of December 2012.

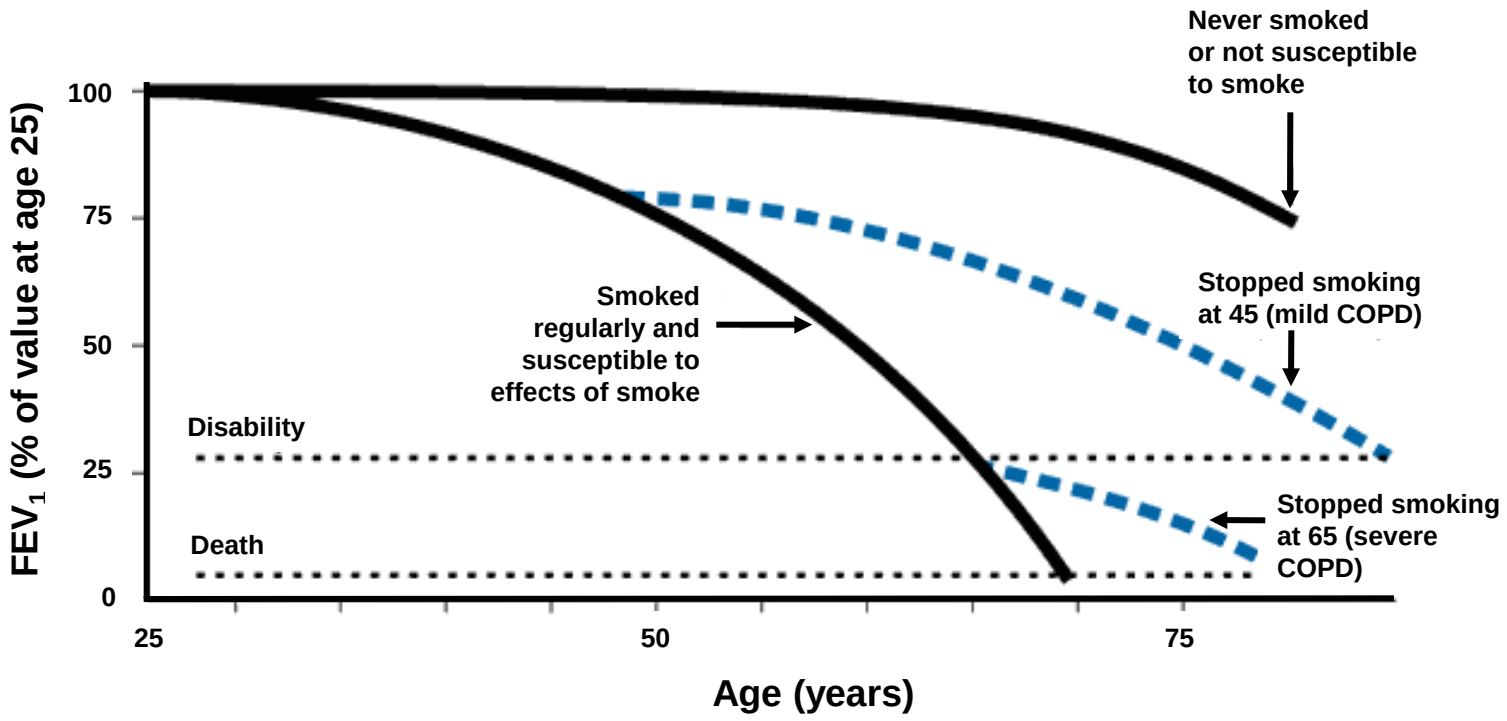
QUITTING: HEALTH BENEFITS

Time Since Quit Date



BENEFICIAL EFFECTS of QUITTING: PULMONARY EFFECTS

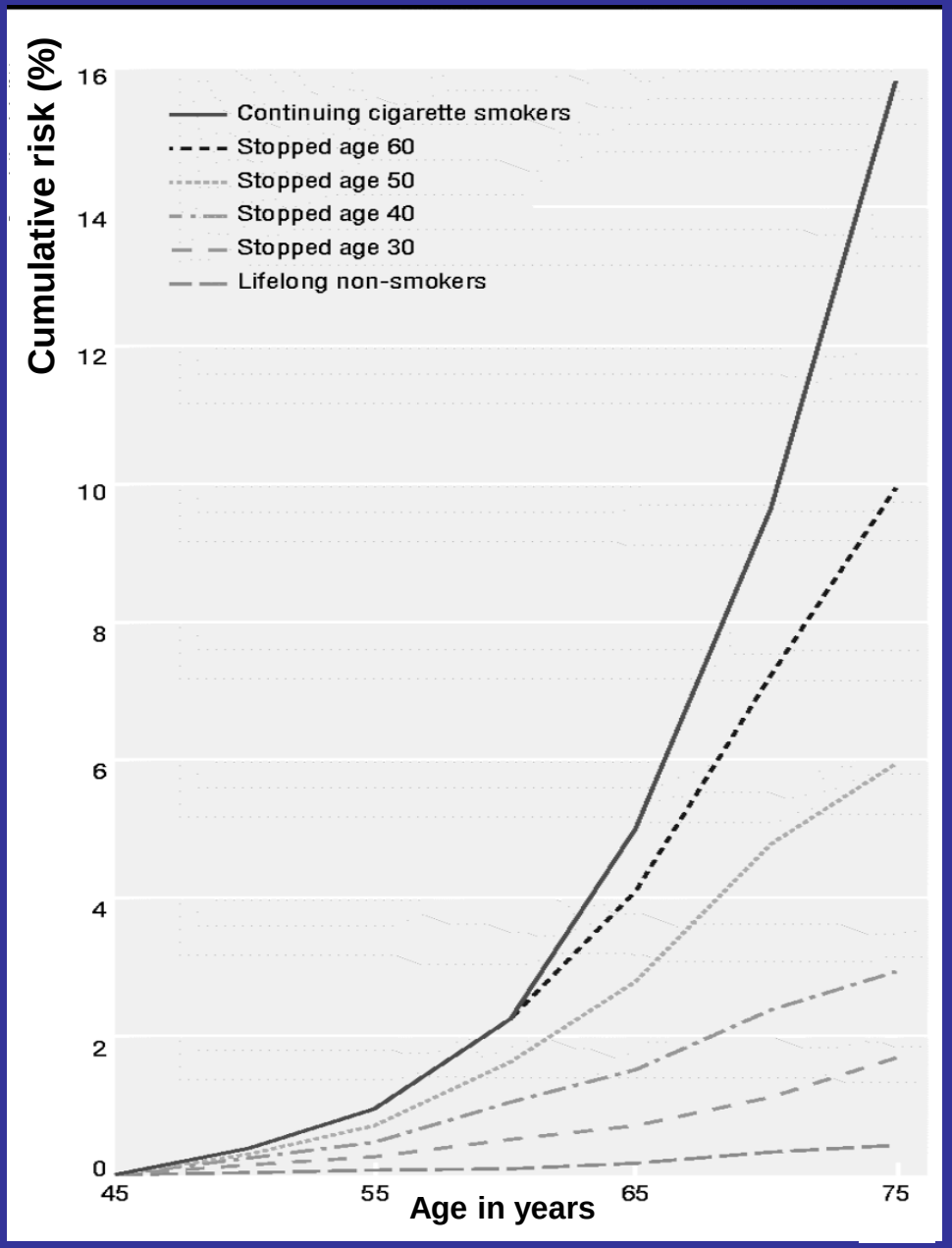
AT ANY AGE, there are benefits of quitting.



COPD = chronic obstructive pulmonary disease

Reprinted with permission. Fletcher & Peto. (1977). *BMJ* 1(6077):1645–1648.

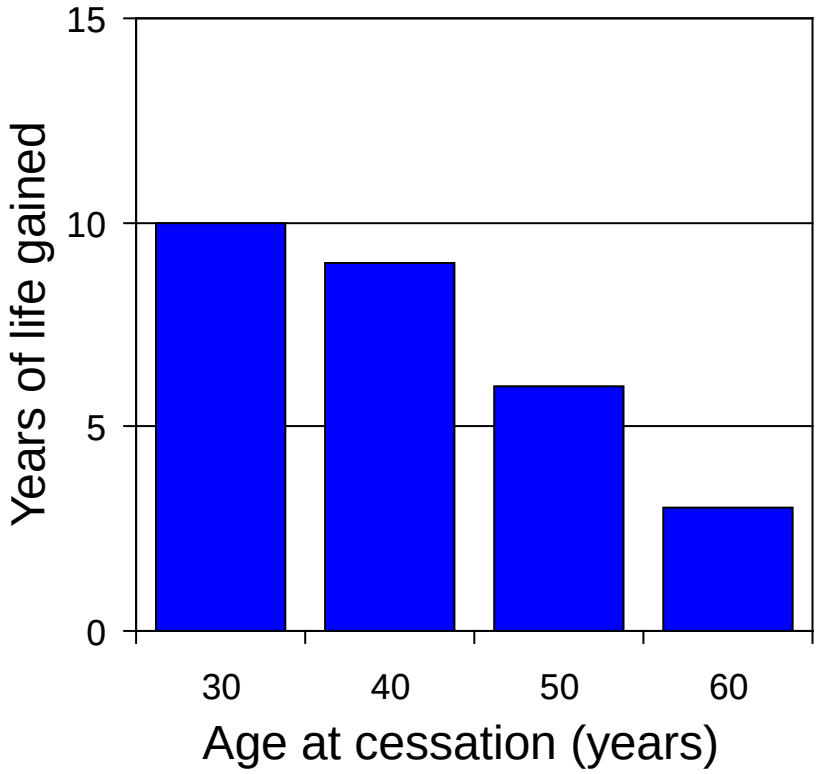
Reduction in cumulative risk of death from lung cancer in men



Reprinted with permission. Peto et al. (2000). *BMJ* 321(7257):323–329.

SMOKING CESSATION: REDUCED RISK of DEATH

- Prospective study of 34,439 male British doctors
- Mortality was monitored for 50 years (1951–2001)



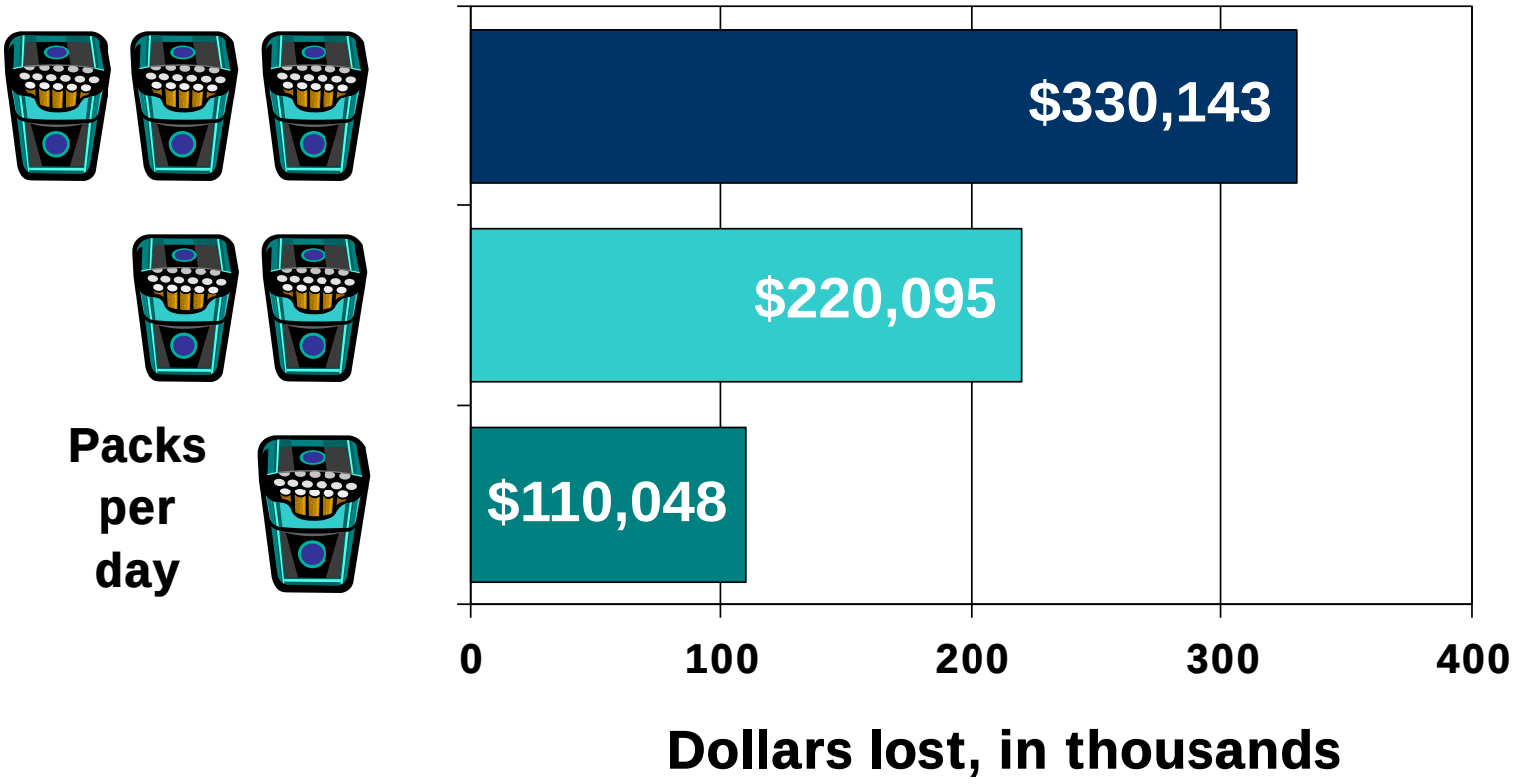
On average, cigarette smokers die approximately 10 years younger than do nonsmokers.

Among those who continue smoking, at least half will die due to a tobacco-related disease.

Doll et al. (2004). *BMJ* 328(7455):1519–1527.

FINANCIAL IMPACT of SMOKING

Buying cigarettes every day for 50 years at $6.03 per pack
(does not include interest)



EPIDEMIOLOGY of TOBACCO USE: SUMMARY

- Nearly one in five adults are current smokers; smoking prevalence varies by sociodemographic characteristics.
- Nearly half a million U.S. deaths are attributable to smoking annually.
- Smoking costs the U.S. $193 billion annually.
- For the individual, a smoking a pack-a-day costs $2,201 annually, plus associated health-care costs.
- At any age, there are benefits to quitting smoking.
- The biggest opponent to tobacco control efforts is the tobacco industry.

Q&A

FORMS of TOBACCO

FORMS of TOBACCO

- Cigarettes
- Smokeless tobacco (chewing tobacco, oral snuff)
- Pipes
- Cigars
- Clove cigarettes
- Bidis
- Hookah (waterpipe smoking)
- Electronic cigarettes (“e-cigarettes”)*

*e-cigarettes are devices that deliver nicotine and are not a form of tobacco.

Image courtesy of the Centers for Disease Control and Prevention / Rick Ward

AMERICAN CIGARETTES

- Most common form of tobacco used in U.S.
- Sold in packs (20 cigarettes/pack)
- Total nicotine content, per cigarette:
  - Average 13.5 mg (range, 11.9 to 14.5 mg)
- Machine-measured nicotine yield:

Type of cigarette	Yield per cigarette
Full-flavor (regular)	1.1 mg
Light	0.8 mg
Ultra-light	0.4 mg
Average (all brands)	0.9 mg

- Smoker's nicotine yield, per cigarette:
  - Approximately 1 to 2 mg

SMOKELESS TOBACCO

Chewing tobacco
- Looseleaf
- Plug
- Twist

Snuff
- Moist
- Dry

SMOKELESS FORMS of TOBACCO

Estimated 9.0 million users in the U.S. in 2012 (3.5%)

- Adult males (6.7%) more likely than adult females (0.4%) to be current users
- Prevalence highest among
  - Young adults aged 18-25 years
  - Residents of the Midwest and Southern U.S.
  - Residents of nonmetropolitan areas

Significant health risks

- Numerous carcinogens
- Nicotine exposure comparable to that of smokers, leading to
  - Physical dependence
  - Withdrawal symptoms after abstinence

NICOTINE CONTENT in SMOKELESS TOBACCO PRODUCTS

Dose	Product	pH	Total free nicotine (mg/g)
Low	Hawken Wintergreen	5.2 – 5.7	0.01 – 0.02
	Skoal Bandits Wintergreen	6.9 – 7.1	0.5 – 1.0
Medium	Skoal Long Cut Straight	7.5 – 7.6	2.4 – 3.7
High	Kodiak Wintergreen	8.2 – 8.4	5.8 – 6.5
	Copenhagen	7.6 – 8.6	3.1 – 9.4

Data from Hatsukami et al. (2007). *Am J Prev Med 33(6S)*:S368–78.

HEALTH CONSEQUENCES of SMOKELESS TOBACCO USE

Periodontal effects
- Gingival recession
- Bone attachment loss
- Dental caries

Oral leukoplakia

Cancer
- Oral cancer
- Pharyngeal cancer

Oral Leukoplakia
Image courtesy of Dr. Sol Silverman - University of California San Francisco

PIPE TOBACCO

- Prevalence of pipe smoking in the U.S. is less than 1%
- Pipe smokers have an increased risk of death due to:
  - Cancer (lung, oral cavity, esophagus, larynx)
  - Chronic obstructive pulmonary disease
- Risk of smoking tobacco-related death:

  cigarettes > pipes ≈ cigars

CIGARS

- Estimated 13.4 million cigar smokers in the U.S. in 2012
- Tobacco content of cigars varies greatly
- One cigar can deliver enough nicotine to establish and maintain dependence
- Cigar smoking is not a safe alternative to cigarette smoking

CLOVE CIGARETTES (also known as KRETEKS)

- Mixture of tobacco and cloves
- Imported from Indonesia
- In 2012, an estimated 3.0% of 12th graders in the U.S. reported smoking kreteks in the past year
- Two times the tar and nicotine content of standard cigarettes

BIDIS

- Imported from India
- Resemble marijuana joints
- Available in candy flavors

- In 2010, an estimated 1.4% of 12th graders in the U.S. reported smoking bidis in the past year
- Deliver 3-fold higher levels of carbon monoxide and nicotine and 5-fold higher levels of tar when compared to standard cigarettes

Image courtesy of the Centers for Disease Control and Prevention / Dr. Clifford H. Watson

HOOKAH (WATERPIPE SMOKING)

- Also known as
  - Shisha, Narghile, Goza, Hubble bubble
- Tobacco flavored with fruit pulp, honey, and molasses
- Increasingly popular among young adults in coffee houses, bars, and lounges
  - In 2012, 18.3% of 12th graders and 25.7% of U.S. college students had smoked hookah in the past year
- Nicotine, tar and carbon monoxide levels comparable to or higher than those in cigarette smoke

Image courtesy of Mr. Sami Romman / www.hookah-shisha.com

ELECTRONIC CIGARETTES

- Generally similar in appearance to cigarettes, cigars, pipes, or pens
- Battery-operated devices that create a vapor for inhalation
  - Simulates smoking but does not involve combustion of tobacco
- Also known as
  - E-cigarette
  - E-hookah, Hookah pen
  - Vapes, Vape pen, Vape pipe
  - Electronic nicotine delivery system (ENDS)

ELECTRONIC CIGARETTES: Components

- Power source
  - Rechargeable or disposable battery
- Cartridge containing liquid solution
  - Propylene glycol
  - Glycerin
  - Flavorings (tobacco, fruit, chocolate, mint, cola, candy, etc.)
  - Nicotine (0-36 mg/mL)
- Electronic atomizer/vaporizer
  - Heating element vaporizes liquid at temperatures 65-120 ° C

ELECTRONIC CIGARETTES: Potential health risks

- Propylene glycol may cause respiratory irritation and increase the risk for asthma
- Glycerin may cause lipoid pneumonia on inhalation
- Nicotine is highly addictive and can be harmful
  - Refill cartridges with high concentrations of nicotine are a poisoning risk, especially in children
- Carcinogenic substances are found in some aerosols
- Use of e-cigarettes leads to emission of propylene glycol, particles, nicotine, and carcinogens into indoor air
  - Long-term safety of second hand exposure to e-cigarette aerosols is unknown

Electronic cigarettes are not proven to be safe.

ELECTRONIC CIGARETTES: Indoor Air Pollution

- E-cigarettes are not emission-free
- During vaping sessions, compounds and particles emitted into the indoor air include
  - Propylene glycol
  - Glycerin
  - Heavy metals
  - Nicotine
  - Flavoring agents
  - Polycyclic aromatic hydrocarbons
- Levels of most substances lower than conventional cigarettes
- Long-term safety of second hand exposure to e-cigarette aerosols is unknown

German Cancer Research Center (Ed). Electronic Cigarettes—An Overview. Heidelberg, 2013.
Schober et al., Int J Hyg Environ Health 2014; 217:628-37.

ELECTRONIC CIGARETTES: Current Trends and Evidence

- Predominantly used by smokers and smokers who are considering quitting
- Used as an alternative to cigarette smoking and as an aid for cessation
  - Perceived as less harmful than conventional cigarettes
- Use is increasing among adolescents and young adults

ELECTRONIC CIGARETTES: Current Trends and Evidence, cont'd

- Can reduce the desire (craving) to smoke cigarettes and alleviate nicotine withdrawal symptoms
- Some smokers reduce the number of cigarettes smoked or quit smoking as a result of using e-cigarettes
- Have not been proven effective as an aid for sustained smoking cessation

Long-term safety and efficacy data are lacking.

FORMS of TOBACCO: SUMMARY

- Cigarettes are, by far, the most common form of tobacco used in the U.S.
- Other forms of tobacco and nicotine delivery devices exist, and some are increasing in popularity.
- All forms of tobacco are harmful.
- The safety/efficacy of e-cigarettes is not established.
- Attention to all forms of tobacco is needed.

Q&A

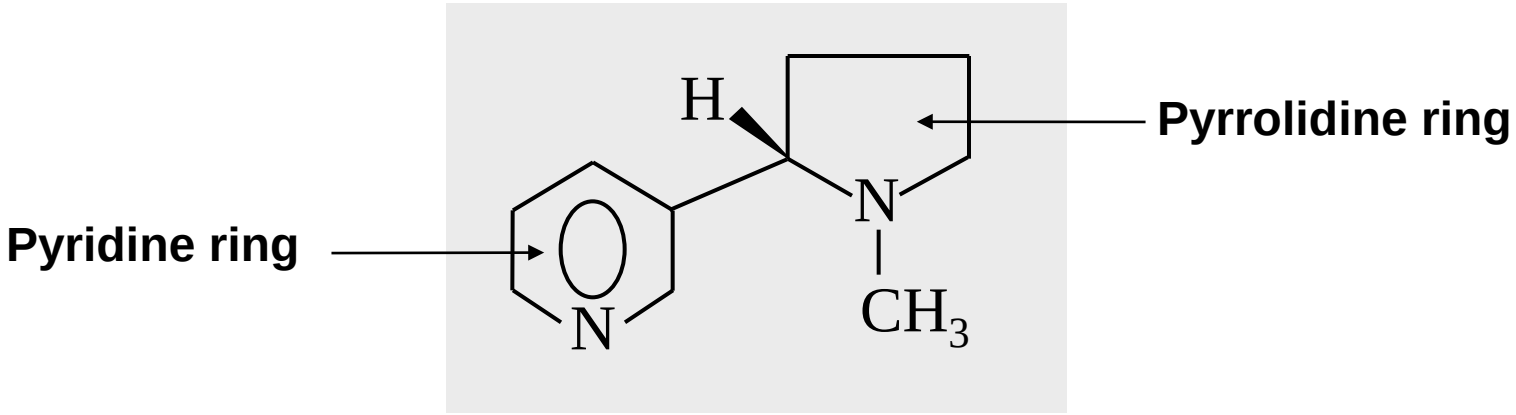
NICOTINE PHARMACOLOGY and PRINCIPLES of ADDICTION

NICOTINE ADDICTION
U.S. Surgeon General's Report

- Cigarettes and other forms of tobacco are addicting.
- Nicotine is the drug in tobacco that causes addiction.
- The pharmacologic and behavioral processes that determine tobacco addiction are similar to those that determine addiction to drugs such as heroin and cocaine.

U.S. Department of Health and Human Services. (1988). *The Health Consequences of Smoking: Nicotine Addiction. A Report of the Surgeon General*.

CHEMISTRY of NICOTINE



Nicotiana tabacum

Natural liquid alkaloid

Colorless, volatile base $pK_a = 8.0$

PHARMACOLOGY

Pharmacokinetics

Effects of the body on the drug

- Absorption
- Distribution
- Metabolism
- Excretion

Pharmacodynamics

Effects of the drug on the body

NICOTINE ABSORPTION

Absorption is pH dependent

- In acidic media
  - Ionized ⇒ poorly absorbed across membranes
- In alkaline media
  - Nonionized ⇒ well absorbed across membranes
  - At physiologic pH (7.4), ~31% of nicotine is nonionized

At physiologic pH, nicotine is readily absorbed.

NICOTINE ABSORPTION: BUCCAL (ORAL) MUCOSA

The pH inside the mouth is 7.0.

Acidic media (limited absorption)	**Alkaline media** (significant absorption)
Cigarettes	Pipes, cigars, spit tobacco, oral nicotine products

Beverages can alter pH, affect absorption.

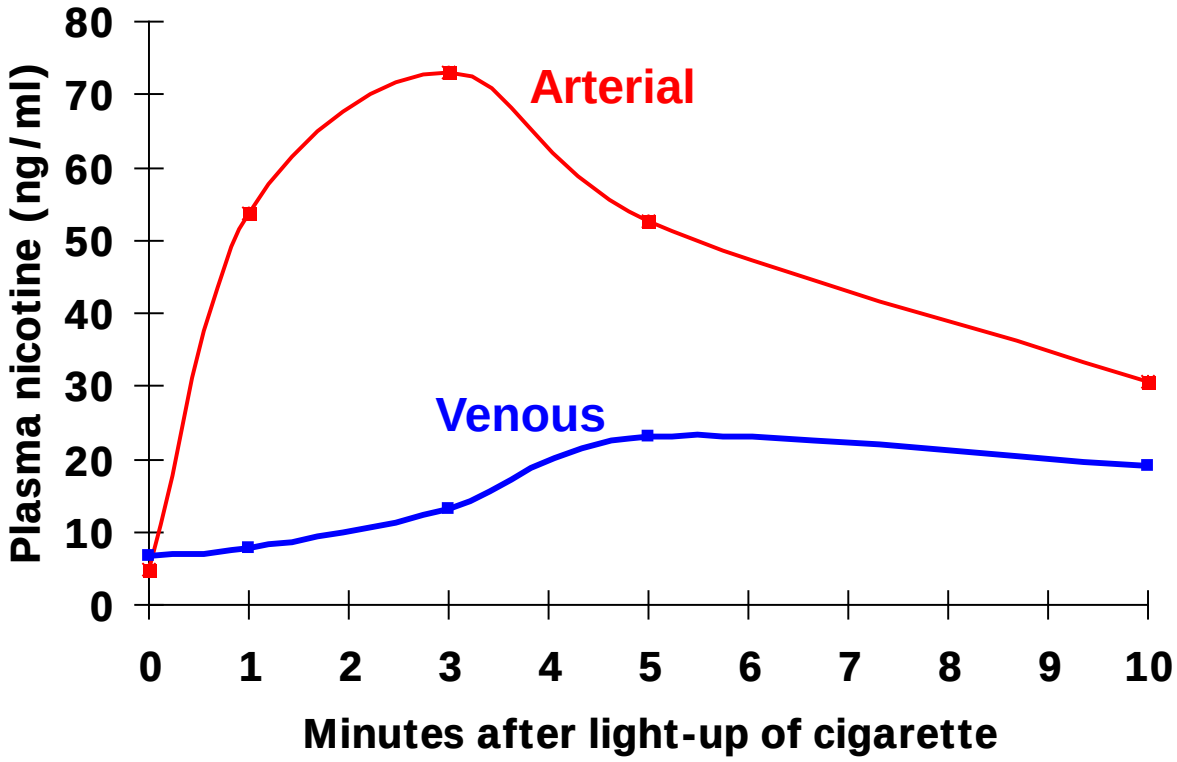
NICOTINE ABSORPTION: SKIN and GASTROINTESTINAL TRACT

- Nicotine is readily absorbed through intact skin.
- Nicotine is well absorbed in the small intestine but has low bioavailability (20-45%) due to first-pass hepatic metabolism.

NICOTINE ABSORPTION: LUNG

- Nicotine is “distilled” from burning tobacco and carried in tar droplets.
- Nicotine is rapidly absorbed across respiratory epithelium.
  - Lung pH = 7.4
  - Large alveolar surface area
  - Extensive capillary system in lung
- Approximately 1 mg of nicotine is absorbed from each cigarette.

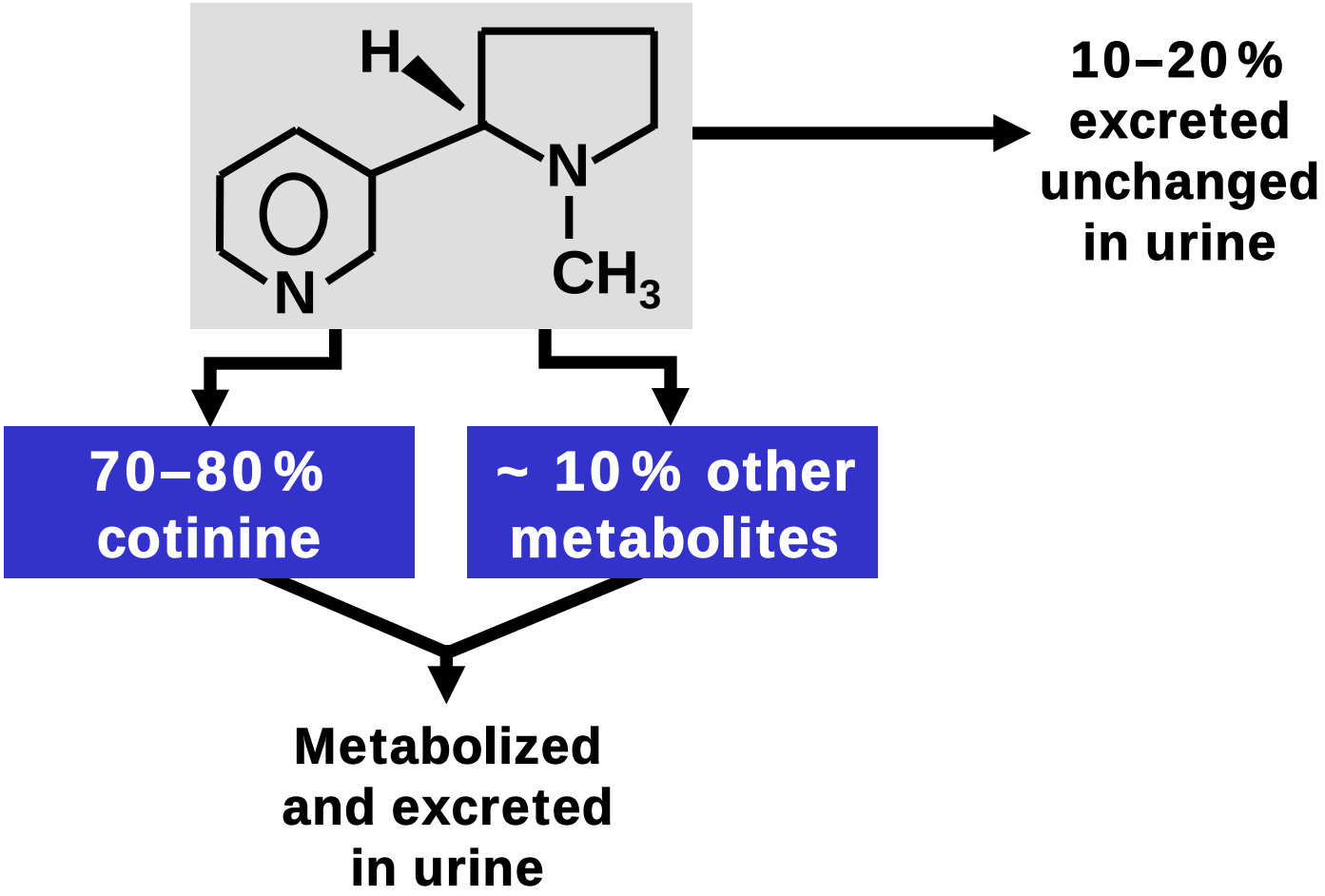
NICOTINE DISTRIBUTION



Nicotine reaches the brain within 10–20 seconds.

Henningfield et al. (1993). *Drug Alcohol Depend* 33:23–29.

NICOTINE METABOLISM



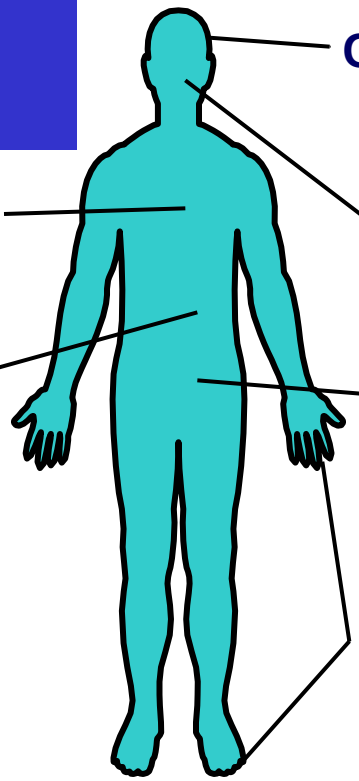
Adapted and reprinted with permission. Benowitz et al. (1994). *J Pharmacol Exp Ther* 268:296–303.

NICOTINE EXCRETION

- Half-life
  - Nicotine $t_{1/2}$ = 2 hr
  - Cotinine $t_{1/2}$ = 16 hr
- Excretion
  - Occurs through kidneys (pH dependent; ↑ with acidic pH)
  - Through breast milk

NICOTINE PHARMACODYNAMICS

Nicotine binds to receptors in the brain and other sites in the body.



Central nervous system

Exocrine glands

Adrenal medulla

Peripheral nervous system

Cardiovascular system

Gastrointestinal system

Other:

- **Neuromuscular junction**
- **Sensory receptors**
- **Other organs**

Nicotine has predominantly stimulatory effects.

NICOTINE PHARMACODYNAMICS (cont'd)

Central nervous system

- Pleasure
- Arousal, enhanced vigilance
- Improved task performance
- Anxiety relief

Other

- Appetite suppression
- Increased metabolic rate
- Skeletal muscle relaxation

Cardiovascular system

- ↑ Heart rate
- ↑ Cardiac output
- ↑ Blood pressure
- Coronary vasoconstriction
- Cutaneous vasoconstriction

NEUROCHEMICAL and RELATED EFFECTS of NICOTINE

N	➔ **Dopamine**	➔	Pleasure, appetite suppression
I	➔ **Norepinephrine**	➔	Arousal, appetite suppression
C	➔ **Acetylcholine**	➔	Arousal, cognitive enhancement
O	➔ **Glutamate**	➔	Learning, memory enhancement
T	➔ **Serotonin**	➔	Mood modulation, appetite suppression
I	➔ **β-Endorphin**	➔	Reduction of anxiety and tension
N	➔ **GABA**	➔	Reduction of anxiety and tension
E			

Benowitz. (2008). *Clin Pharmacol Ther* 83:531–541.

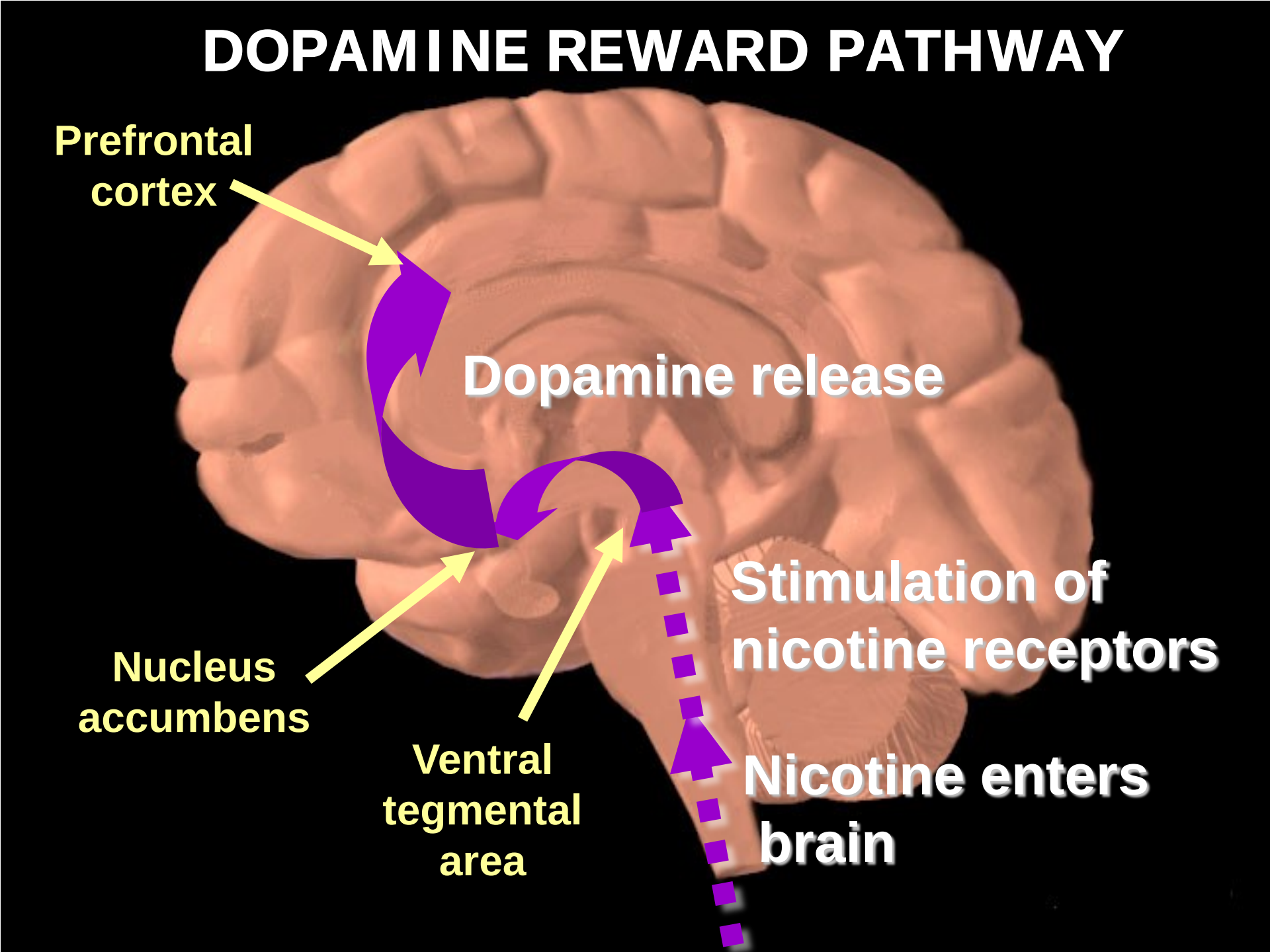
WHAT IS ADDICTION?

"Compulsive drug use, without medical purpose, in the face of negative consequences"

Alan I. Leshner, Ph.D.
Former Director, National Institute on Drug Abuse
National Institutes of Health

Nicotine addiction is a chronic condition with a biological basis.

DOPAMINE REWARD PATHWAY



CHRONIC ADMINISTRATION of NICOTINE: EFFECTS on the BRAIN

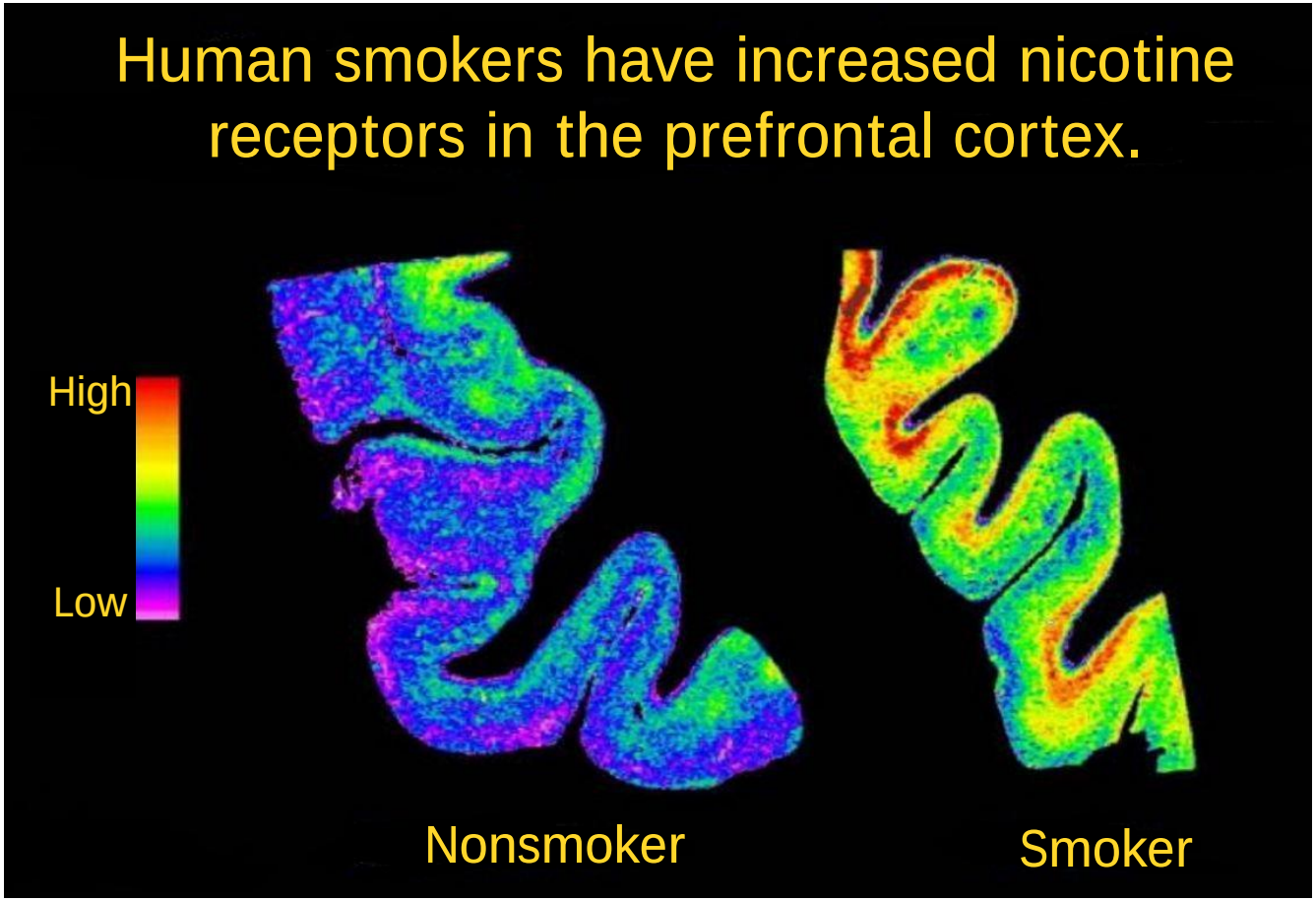


Image courtesy of George Washington University / Dr. David C. Perry

Perry et al. (1999). *J Pharmacol Exp Ther* 289:1545–1552.

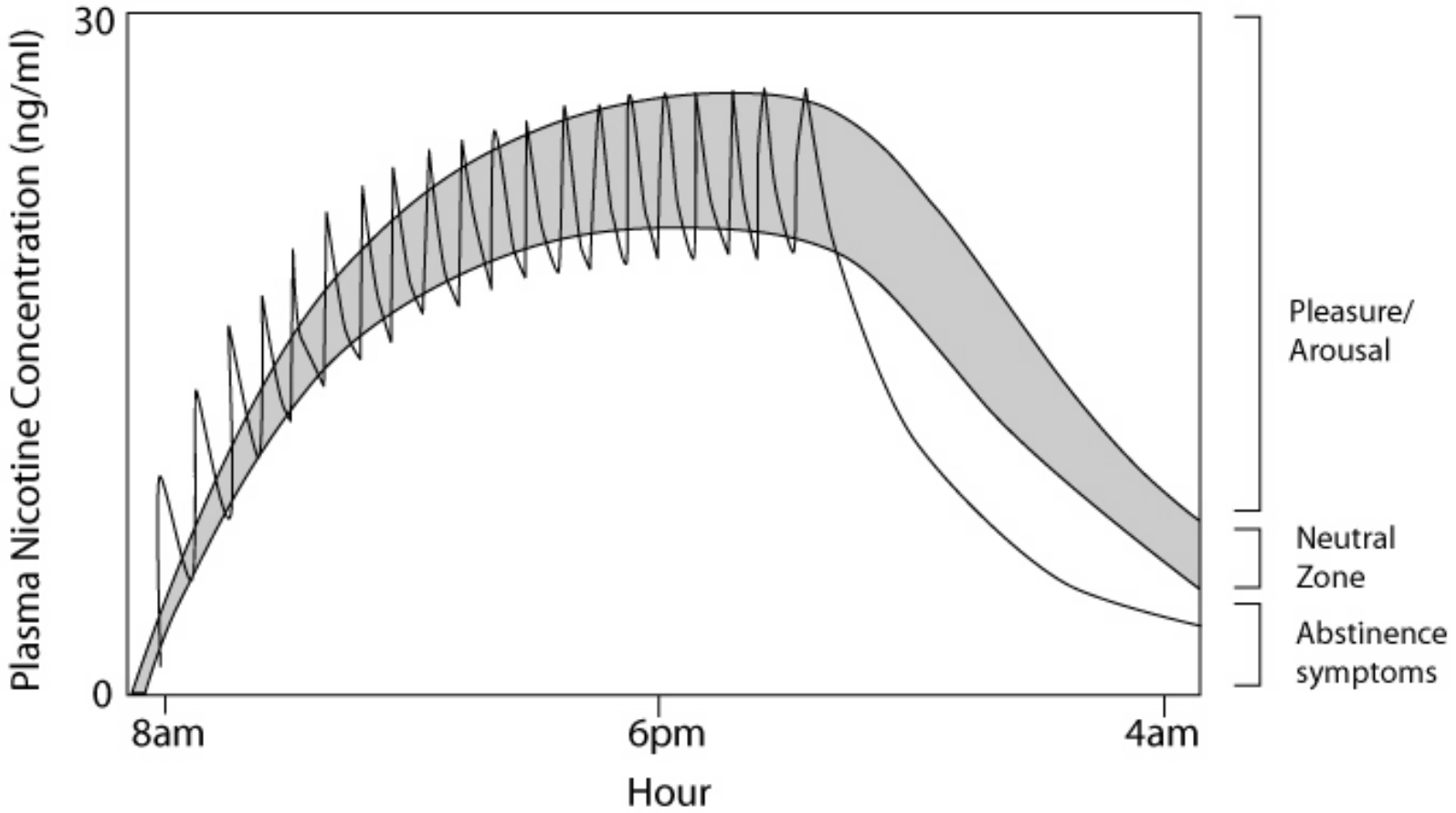
NICOTINE PHARMACODYNAMICS: WITHDRAWAL EFFECTS

- Irritability/frustration/anger
- Anxiety
- Difficulty concentrating
- Restlessness/impatience
- Depressed mood/depression
- Insomnia
- Impaired performance
- Increased appetite/weight gain
- Cravings

Most symptoms manifest within the first 1–2 days, peak within the first week, and subside within 2–4 weeks.

Hughes. (2007). *Nicotine Tob Res* 9:315–327.

NICOTINE ADDICTION CYCLE



Reprinted with permission. Benowitz. (1992). *Med Clin N Am* 2:415–437.

NICOTINE ADDICTION

- Tobacco users maintain a minimum serum nicotine concentration in order to
  - Prevent withdrawal symptoms
  - Maintain pleasure/arousal
  - Modulate mood

- Users self-titrate nicotine intake by
  - Smoking/dipping more frequently
  - Smoking more intensely
  - Obstructing vents on low-nicotine brand cigarettes

Benowitz. (2008). *Clin Pharmacol Ther* 83:531–541.

ASSESSING NICOTINE DEPENDENCE

Fagerström Test for Nicotine Dependence (FTND)

- Developed in 1978 (8 items); revised in 1991 (6 items)
- Most common research measure of nicotine dependence; sometimes used in clinical practice
- Responses coded such that higher scores indicate higher levels of dependence
- Scores range from 0 to 10; score of greater than 5 indicates substantial dependence

Heatherton et al. (1991). *British Journal of Addiction* 86:1119–1127.

FACTORS CONTRIBUTING to TOBACCO USE

Individual

- Sociodemographics
- Genetic predisposition
- Coexisting medical conditions

Pharmacology

- Alleviation of withdrawal symptoms
- Weight control
- Pleasure, mood modulation

Environment

- Tobacco advertising
- Conditioned stimuli
- Social interactions

TOBACCO DEPENDENCE: A 2-PART PROBLEM

Tobacco Dependence

Physiological	Behavioral
The addiction to nicotine	The habit of using tobacco
↓ Treatment	↓ Treatment
Medications for cessation	Behavior change program

Treatment should address the physiological **and** the behavioral aspects of dependence.

NICOTINE PHARMACOLOGY and ADDICTION: SUMMARY

- Tobacco products are effective delivery systems for the drug nicotine.
- Nicotine is a highly addictive drug that induces a constellation of pharmacologic effects, including activation of the dopamine reward pathway in the brain.
- Tobacco use is complex, involving the interplay of a wide range of factors.
- Treatment of tobacco use and dependence requires a multifaceted treatment approach.

Q&A

DRUG INTERACTIONS with SMOKING

PHARMACOKINETIC DRUG INTERACTIONS with SMOKING

Drugs that may have a *decreased effect* due to induction of CYP1A2:

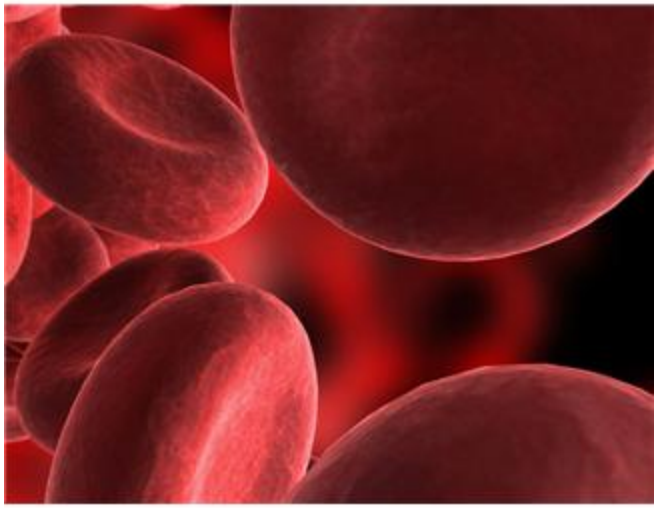
- Bendamustine
- Caffeine
- Clozapine
- Erlotinib
- Fluvoxamine
- Olanzapine
- Ropinirole
- Tacrine
- Theophylline
- Irinotecan (clearance increased and systemic exposure decreased, due to increased glucuronidation of its active metabolite)

Smoking cessation will reverse these effects.

PHARMACOKINETIC DRUG INTERACTIONS with SMOKING, cont'd

Drug that might have an *increased effect* and efficacy due to induction of CYP1A2:

- Clopidogrel



Smoking cessation will reverse these effects.

PHARMACODYNAMIC DRUG INTERACTIONS with SMOKING

Smokers who use combined hormonal contraceptives have an increased risk of serious cardiovascular adverse effects:

- Stroke
- Myocardial infarction
- Thromboembolism

This interaction **does not** decrease the efficacy of hormonal contraceptives.

Women who are 35 years of age or older AND smoke at least 15 cigarettes per day are at significantly elevated risk.

DRUG INTERACTIONS with SMOKING: SUMMARY

Clinicians should be aware of their patients' smoking status:

- Clinically significant interactions result the combustion products of tobacco smoke, not from nicotine.
- Constituents in tobacco smoke (e.g., polycyclic aromatic hydrocarbons; PAHs) may enhance the metabolism of other drugs, resulting in an altered pharmacologic response.
- Changes in smoking status might alter the clinical response to the treatment of a wide variety of conditions.
- Drug interactions with smoking should be considered when patients start smoking, quit smoking, or markedly alter their levels of smoking.

Q&A

Trigger Tapes

Q&A

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Closing remarks

Stay tuned for the post-webinar email containing the webinar recording, information on certificates of attendance and other resources.

"Tobacco Cessation Education -- A Training Program for Faculty: Session #2: Rx for Change module: Assisting Patients with Quitting + trigger tape vignettes," with Dr. Karen Hudmon and Frank Vitale, will be held next week on Tuesday, August 26th at 1pm ET/ 10am PT.

Please complete the post webinar evaluation for CPE credit