Tobacco Harm Reduction: Key Strategic Themes

Prof. Riccardo Polosa MD PhD
CoEHAR Founder
Università di Catania – ITALY

WORKSHOP ON THE ECONOMICS OF TOBACCO AND REDUCED RISK NICOTINE PRODUCTS
17.10.2024, Ankara, Turkey

What is Harm reduction?

LAISSEZ-FAIRE

from tar-emitting to tar-free products

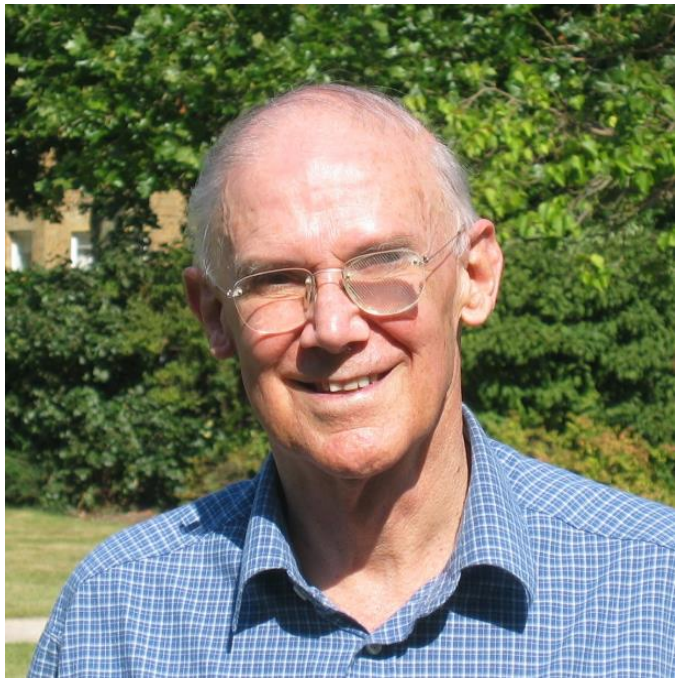
Combustion-free
nicotine delivery devices

HARM REDUCTION

PROHBITIONIST APPROACH

NICOTINE AND HARM REDUCTION

Professor Michael Russell 1932-2009



"People smoke for the nicotine but die from the tar".

CANCER

Nicotine is not cancerogenic

COPD

Nicotine does not cause respiratory disease

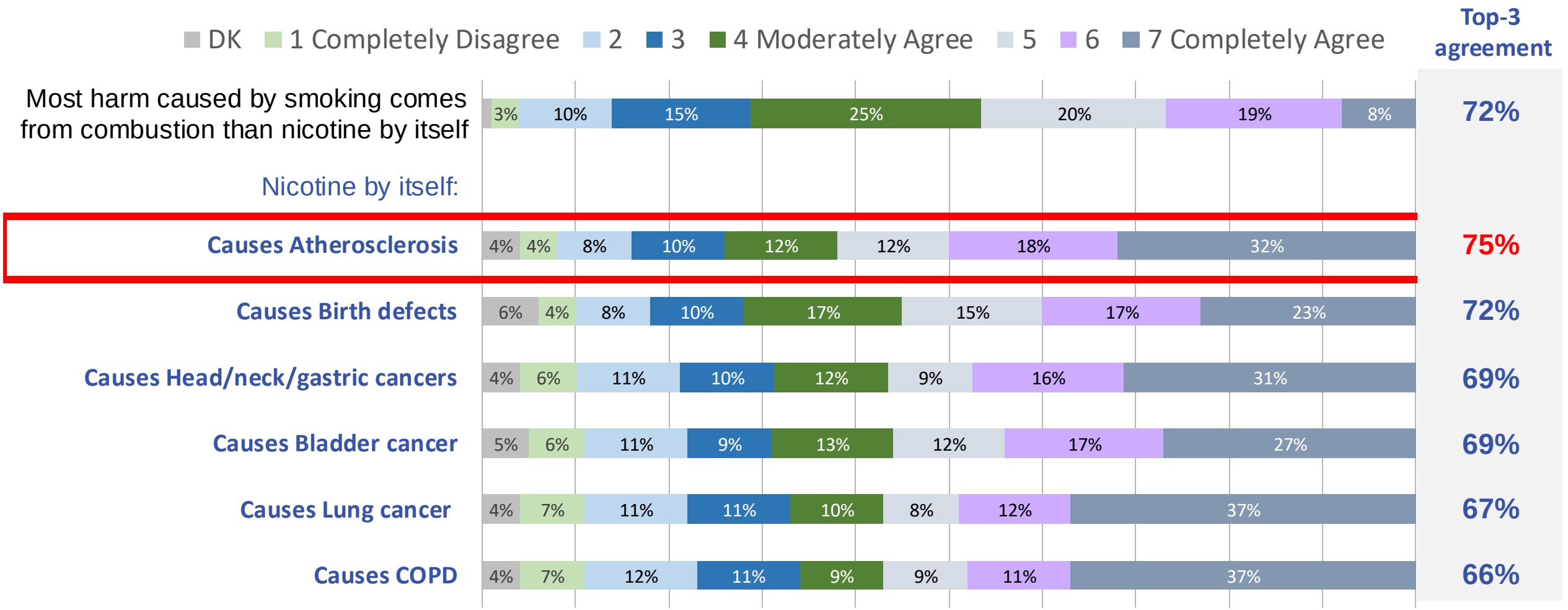
CARDIOVASCULAR DISEASES

Potential health risk for patients with unstable coronary artery disease (e.g. early after surviving MI)

Tobacco Smoke and Involuntary Smoking 2004. Geneva: WHO International Agency for Research on Cancer; 2004.
The Biology and Behavioral Basis for Smoking-Attributable Disease: A Report of the Surgeon General. 2010. Atlanta, GA: U.S.
Royal College of Physicians. Smoking and health 2021: a coming of age for tobacco control? London: RCP, 2021.

Agreement with statements about nicotine

USA physicians, n = 3.628



FOUNDATION FOR A SMOKE-FREE WORLD

SOURCE: Global Smoking Cessation Research Interview 2022, conducted by sermo

Theme #1

Smoking cessation and e-cigarettes

e-cigarettes help smoker quit: the evidence

Systematic Reviews

Cochrane Library

Cochrane Database of Systematic Reviews

Electronic cigarettes for smoking cessation (Review)

Hartmann-Boyce J, McRobbie H, Butler AR, Lindson N, Bullen C, Begh R, Theodoulou A, Notley C, Rigotti NA, Turner T, Fanshawe TR, Hajek P

RCTs

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy

Peter Hajek, Ph.D., Anna Phillips-Waller, B.Sc., Dunja Przulj, Ph.D., Francesca Pesola, Ph.D., Katie Myers Smith, D.Psych., Natalie Bisal, M.Sc., Jinshuo Li, M.Phil., Steve Parrott, M.Sc., Peter Sasieni, Ph.D., Lynne Dawkins, Ph.D., Louise Ross, Maciej Goniewicz, Ph.D., Pharm.D., Qi Wu, M.Sc., and Hayden J. McRobbie, Ph.D.

Population studies

RESEARCH

OPEN ACCESS

BMJ

E-cigarette use and associated changes in population smoking cessation: evidence from US current population surveys

Shu-Hong Zhu,[1,2] Yue-Lin Zhuang,[2] Shiushing Wong,[2] Sharon E Cummins,[1,2] Gary J Tedeschi[2]

[1]Department of Family Medicine and Public Health, University

ABSTRACT

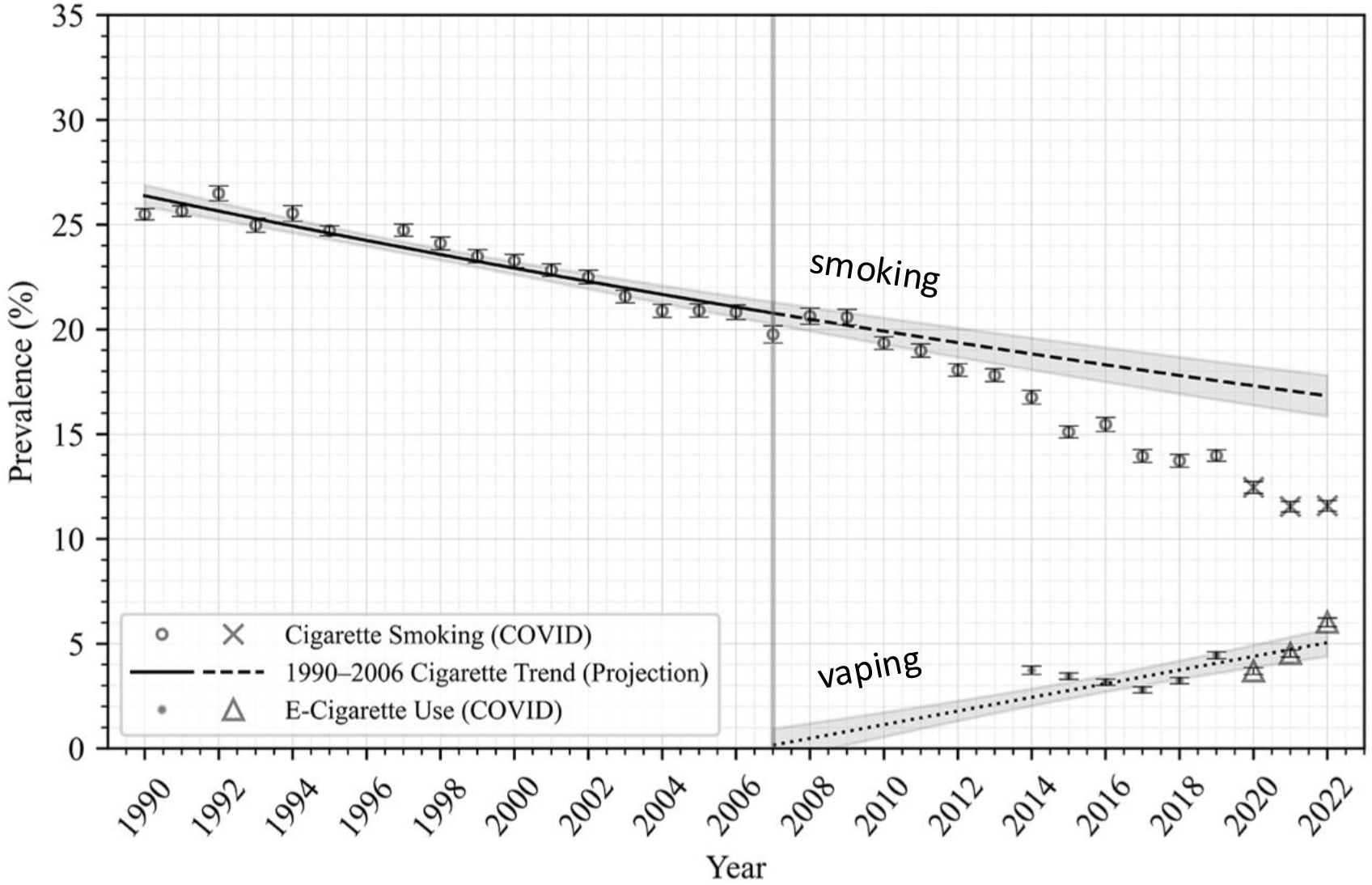
OBJECTIVE

cessation rate for 2014-15 was significantly higher than that for 2010-11, 5.6% vs 4.5% (1.1%, 0.6% to

Trends in smoking and e-cigarette use prevalence

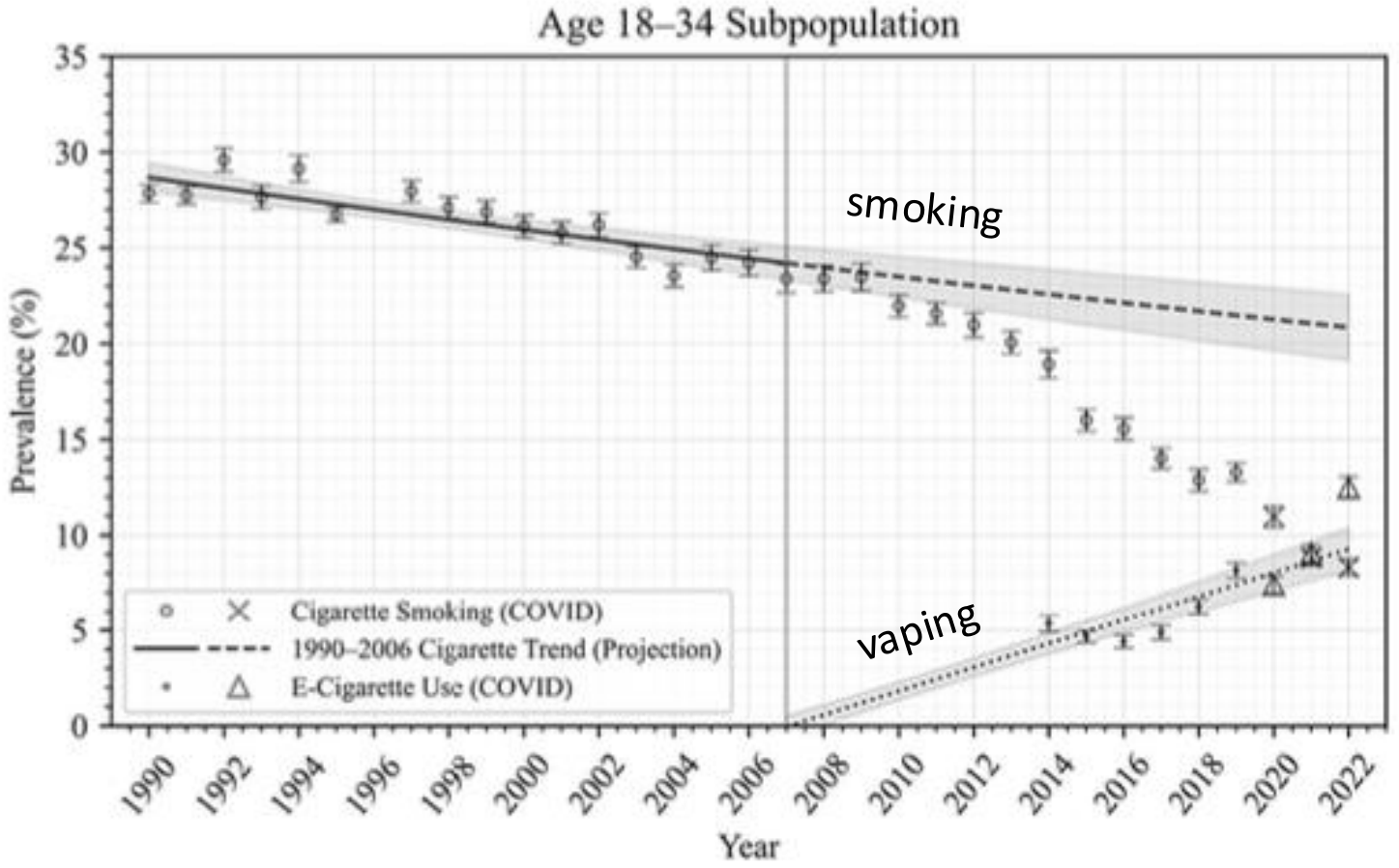
National Health Interview Survey (NHIS); N = 870,652

All adults

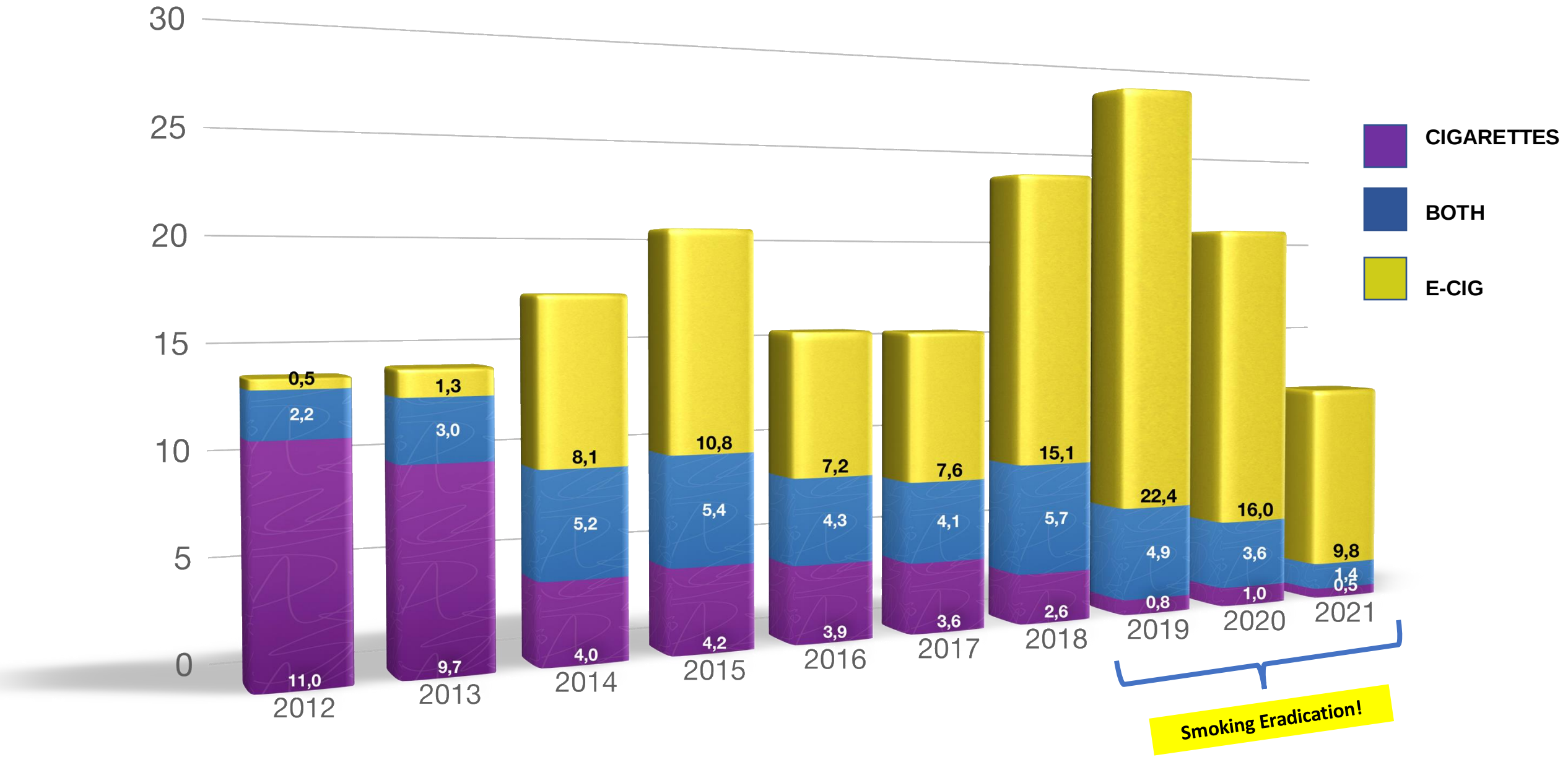


Trends in smoking and e-cigarette use prevalence by age

National Health Interview Survey (NHIS); N = 870,652

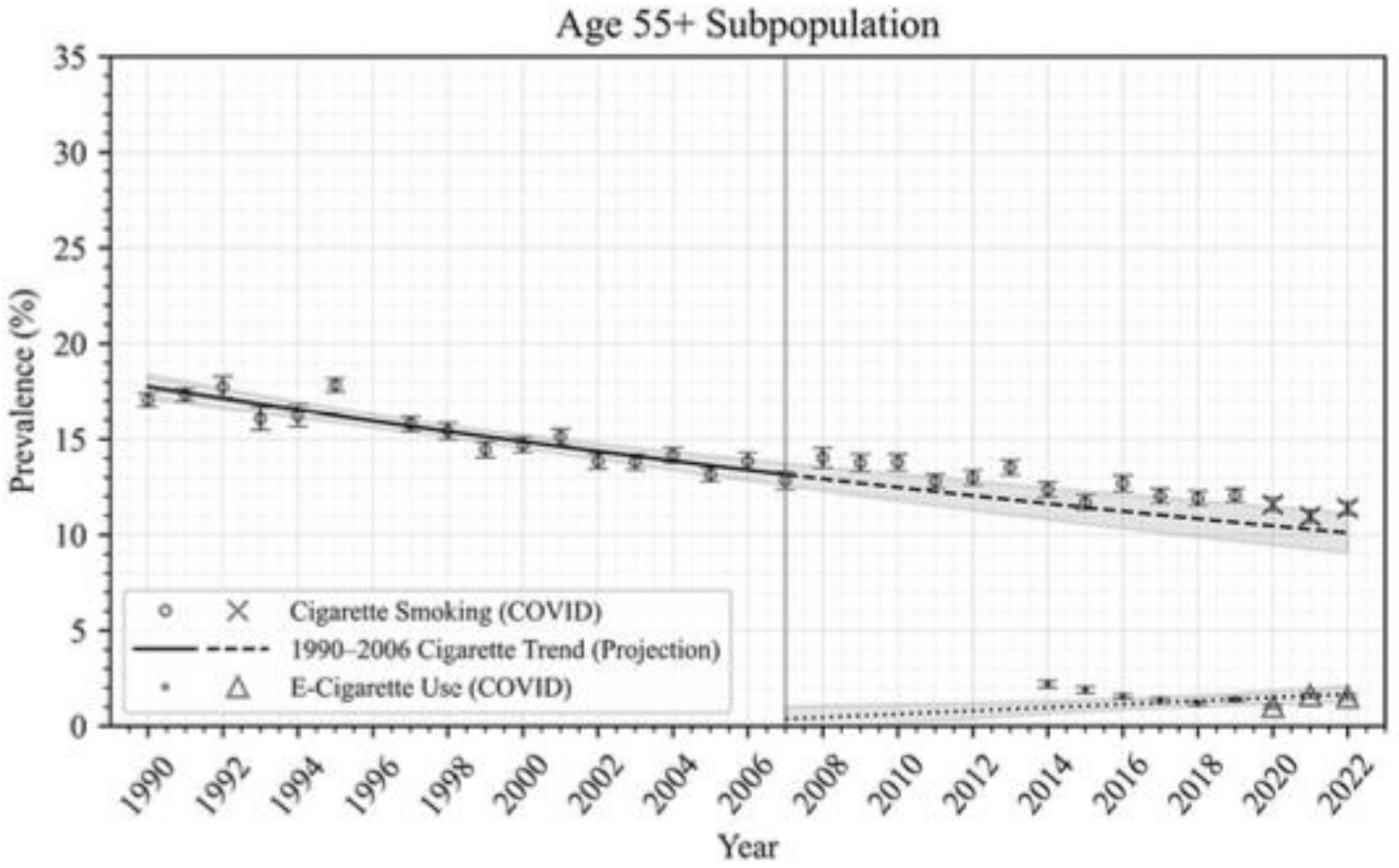


Current (Past 30 Days) e-cigarettes and tobacco cigarettes use in the U.S.among youth NYTS 2012-2021



Trends in smoking and e-cigarette use prevalence by age

National Health Interview Survey (NHIS); N = 870,652



Decline in smoking prevalence
(WHO data - adults)

	2014	2017	2020	Δ %
	27%	27%	25%	-2%
	18%	15%	14%	-4%

WHO report on the global tobacco epidemic 2021: addressing new and emerging products. Annex 11.2: Adult tobacco surveys-smokeless tobacco or e-cigarettes. Available online: https://www.who.int/teams/health-promotion/tobacco-control/global-tobacco-report-2021

The New Zealand experience

- Has embraced ECIGS as tobacco harm reduction.
- Regulation was intended to reflect *relative risk* – tobacco cigarettes have higher taxes and stricter regulation.
- Mass media campaign by government: ***Vape to Quit Strong***
- Government fact-based website: www.vapingfacts.health.nz.
- Aimed to *complement* strong tobacco control (the push away from smoking)
  - Gives smokers an appealing product to switch *to*.
  - Gets away from the "quit or die" approach of traditional tobacco control.

The New Zealand experience - Results

Sharp increase in the rate of smoking decline when ECIGS were introduced:

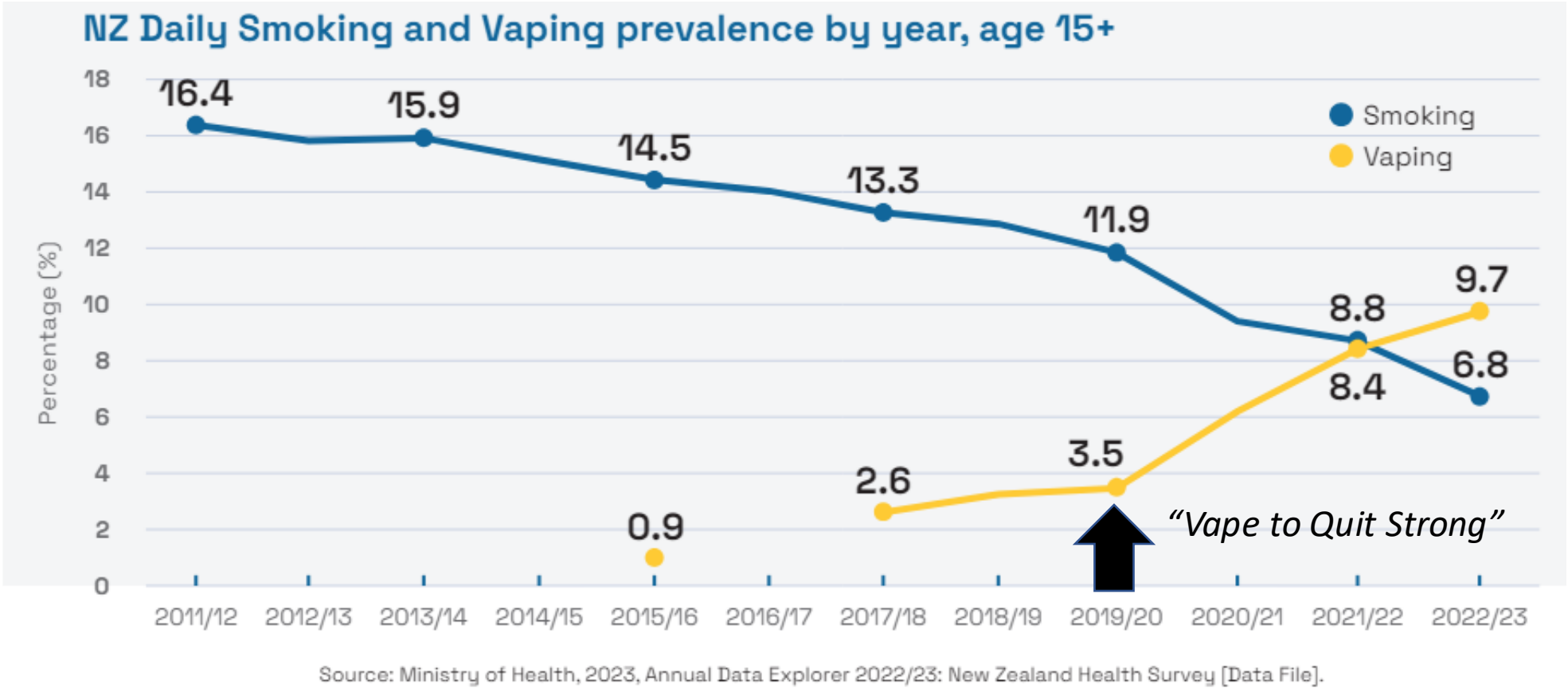


Figure taken from SmokeFree New Zealand, *Quitting Strong* report.

Do e-cigarettes help people with schizophrenia spectrum disorders quit smoking?

Schizophrenia and smoking factsheet

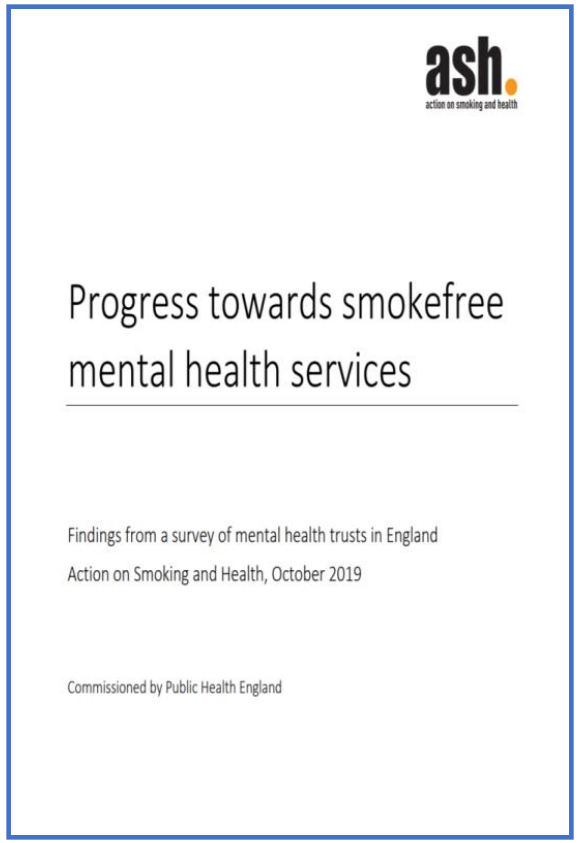
- Smoking rates remain high in people with schizophrenia
- High morbidity and mortality for smoking-related diseases among smokers with schizophrenia
- FDA-approved smoking cessation products (i.e. NRT, varenicline, bupropion) are largely ineffective in people with schizophrenia
- Schizophrenic smokers have little or no interest in quitting

What strategy for schizophrenic smokers?

Serious harm from heavy smoking + Difficulty in cessation = Strong ethical case for e-cigarettes

Emerging evidence: e-cigs can help this group quit or reduce cigarette consumption

ASH survey of mental health NHS organisations in England (2019)


ash
action on smoking and health

Progress towards smokefree mental health services

Findings from a survey of mental health trusts in England

Action on Smoking and Health, October 2019

Commissioned by Public Health England

- 83% (45/54) Mental Health NHS Trusts responded to an online survey
- 82% (37/45) had a comprehensive smokefree policy *(no smoking allowed in hospital grounds and buildings and tobacco dependence treatment)*
- 100% offered smokers NRT
- 49% offered smokers varenicline
- 91% allowed the use of e-cigarettes

ASH (2019) Progress towards smokefree mental health services

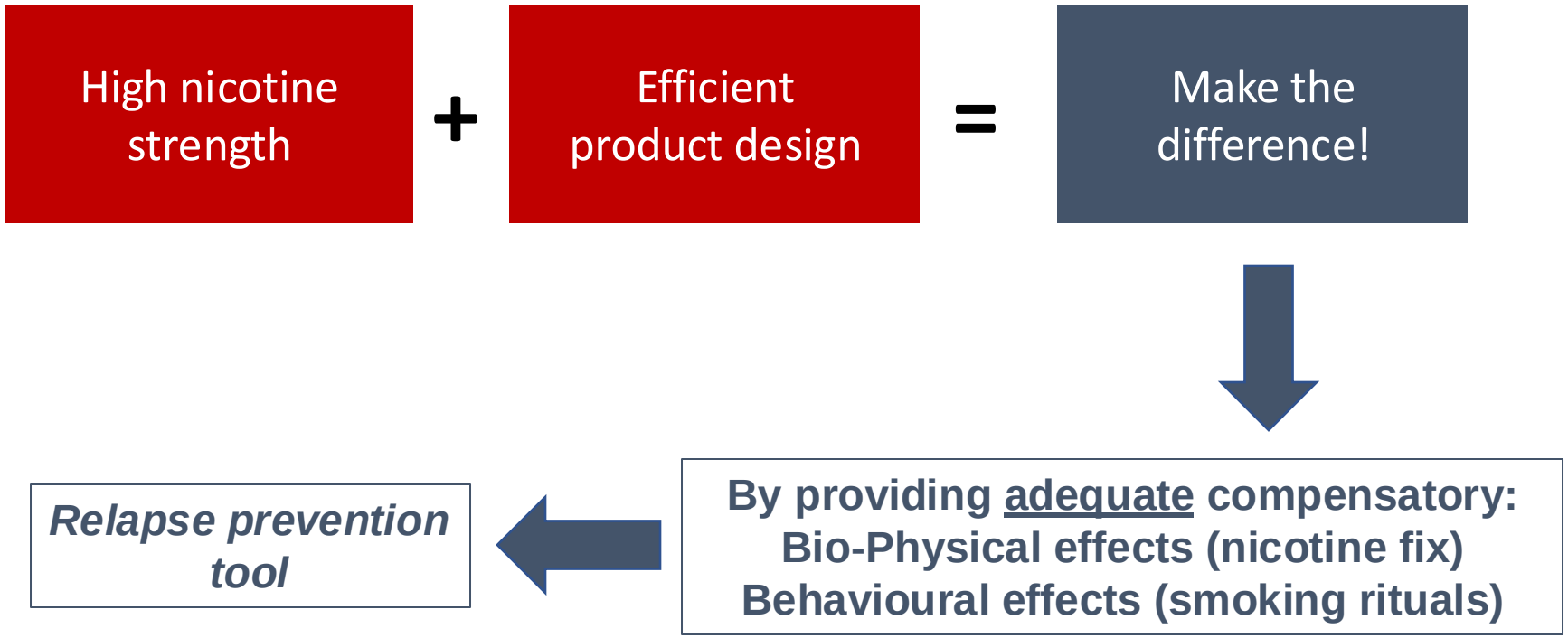
E-cigarettes for smoking cessation in smokers with SSD

	Caponnetto 2013 Italy	Pratt 2014 USA	Hickling 2019 England	Caponnetto 2021 Italy	Pratt 2022 USA	
Diagnosis	Schizophr.	Schizophr. bipolar	Psychosis	Schizophr.	Schizophr. bipolar	
Sample size	14	19	50	40	240	
Vaping product	4 week supply Rechargeable, prefilled, disposable Nic -7.5mg/ml	4 week supply Prefilled tank	6 week supply Disposable Nic- 45mg/ml	12 week supply Pod device Nic- 50mg/ml	8 week supply Prefilled tank	
Quit rate	14% (1yr)	10% (1 month)	2% (6 months)	40% (3 months)	22% (2 months)	

Lesson learned - 1

High nicotine strength + Efficient product design = Make the difference!

Lesson learned -2



GENESIS TRIAL

A 12-month randomised, double-blind, controlled, multicentre trial comparing changes in Cigarette consumption after switchinG to high or low nicotine strENght E-cigaretteS In smokers with Schizophrenia spectrum disorders: Protocol for the GENESIS Trial

Pasquale Caponnetto, Bulat Idrisov, Maria Salvina Signorelli, Evgeny Krupitsky, Tetiana Kiriazova, Ramin Nilforooshan, Fabio Cibella, Marilena Maglia, Daniela Saitta, Francesca Benfatto, Eugenio Aguglia, Roberto Cavallaro, Lucio Inguscio, Giuseppe Minutolo, Roberta Auditore, Riccardo Polosa, GENESIS study investigators

doi: https://doi.org/10.1101/2020.10.15.20141457

Posted October 26, 2020.

UNIVERSITÀ degli STUDI di CATANIA

Research paper

OPEN ACCESS

Potential deaths averted in USA by replacing cigarettes with e-cigarettes

David T Levy,[1] Ron Borland,[2] Eric N Lindblom,[3] Maciej L Goniewicz,[4] Rafael Meza,[5] Theodore R Holford,[6] Zhe Yuan,[7] Yuying Luo,[7] Richard J O'Connor,[4] Raymond Niaura,[8] David B Abrams[1,8]

Archives of Toxicology (2022) 96:167–176
https://doi.org/10.1007/s00204-021-03180-3

Findings

Compared with the Status Quo, replacement of cigarette by E-cig use over a 10-year period yields:

6.6 million fewer premature deaths

Levy DT, et al. Tob Control. 2018 Jan;27(1):18-25.

BIOINFORMATICS AND STATISTICS

Check for updates

Estimating the reduction in US mortality if cigarettes were largely replaced by e-cigarettes

Peter N. Lee[1] · John S. Fry[2] · Stanley Gilliland III[3] · Preston Campbell[3] · Andrew R. Joyce[3]

Received: 9 August 2021 / Accepted: 6 October 2021 / Published online: 22 October 2021

Abstract

Background Recent estimates indicated substantially replacing cigarettes by e-cigarettes would, during 2016–2100, reduce U… provide ad… ted dis- ea… garettes ve… vaping, re… **M**… imistic **Sc**… nd I 0.5 to… garettes to… **Re**… uctions w… triction to… F, 2.74 (F… **Co**… s. Esti- mates varied most for X and Y. These findings supplement literature indicating e-cigarettes can importantly impact health challenges from smoking.

Conclusions

Substantial reductions in deaths and life-years lost were observed even under pessimistic assumptions.

E-cigs can importantly impact health challenges from smoking.

British Journal of Healthcare Management

Does switching from tobacco to reduced-risk products free up hospital resources?

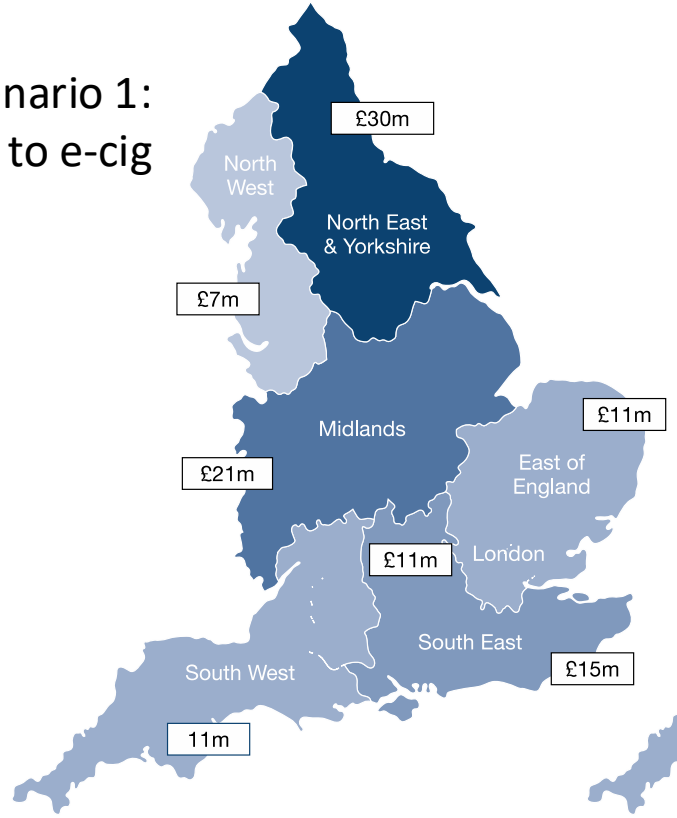
Francesco Moscone[1,2]

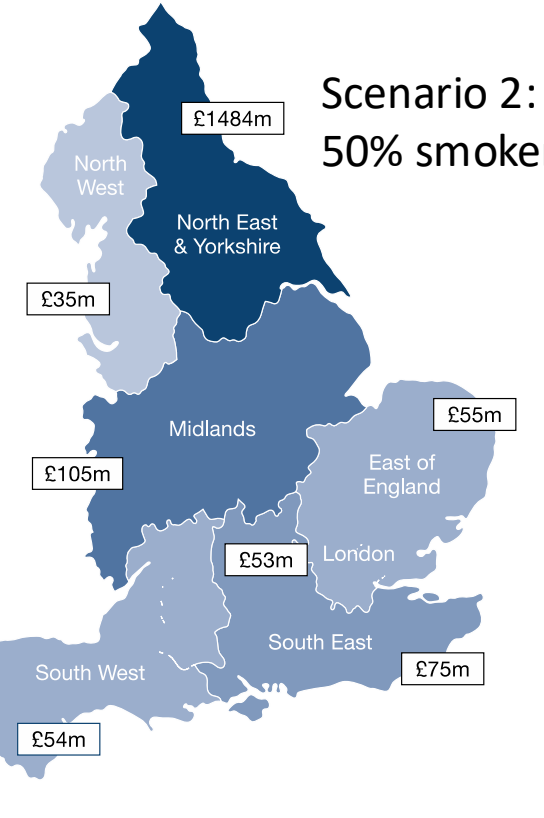
Author details can be found at the end of this article

Abstract

Promoting a shift from smoking tobacco to reduced-risk products—such as vapes and

Scenario 1:
10% smokers switch to e-cig





Scenario 2:
50% smokers switch to e-cig

World Health Organization (WHO):
<<Vape kills>>

World Health Organization (W...
@WHO

Q: What looks cute, smells good, but is designed to kill?
A: A vape!

The tobacco industry spends tons of money designing their products to look appealing, but it's time we expose the truth and protect young people from the harmful effects of tobacco. 🚭🚭🚭

#TobaccoExposed

11 June 2024

Polosa (CoEHAR):

<<Vape never killed anybody>>

Riccardo Polosa
@RiccardoPolosa

The WHO tweet perpetuates blatant misinformation. Easy to prove them wrong: 1. Vape is not tobacco. 2. Vaping hasn't been proven to cause a single death.
Most importantly, the evidence is now clear that vaping is a powerful smoking cessation and harm reduction tool for millions. Let's focus on facts and support safer alternatives! #HarmReduction #VapingSavesLives #TruthMatters

Traduci post

World Health Organiza... · 11/06/24
Q: What looks cute, smells good, but is designed to kill?
A: A vape!

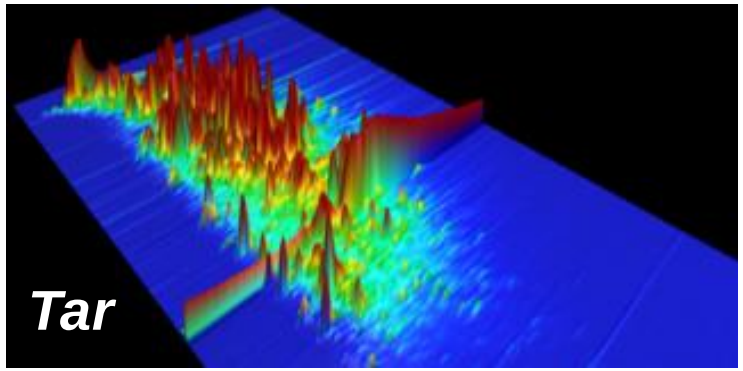
The tobacco industry spends tons of

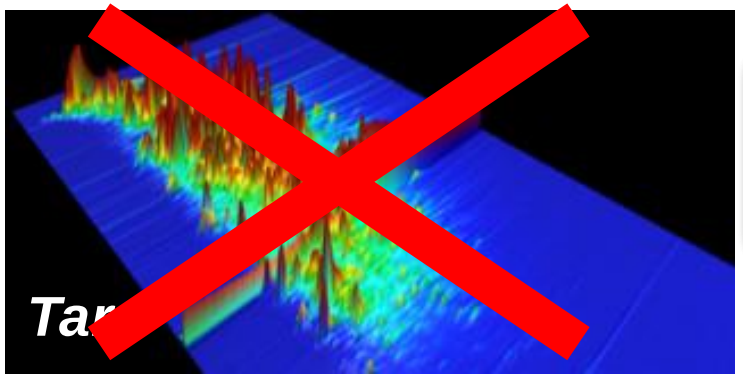
Theme #2

Health effects of e-cigarettes

Smoking related diseases

Smoking related diseases





> 8000 chemicals in tobacco smoke

COMBUSTION

Reduced Harm ?

NO Exposure ✔

NO Emission ✔

Smoking Cessation

Health improvements are expected when stopping smoking

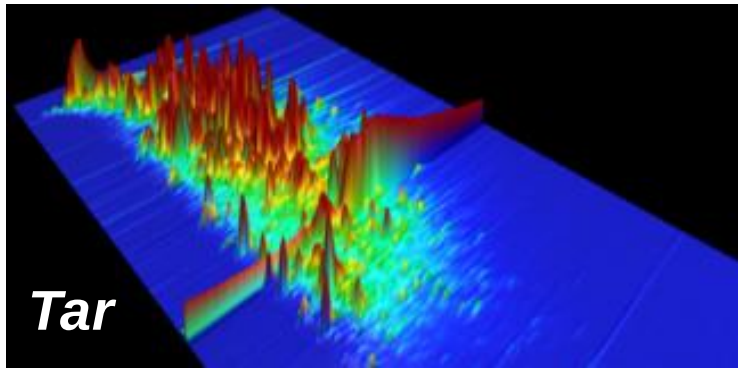
Smoking related diseases

?

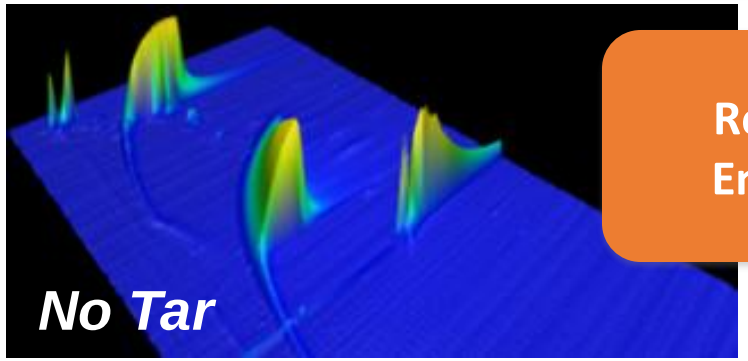
Reduced Harm ?

Reduced Exposure ✔

Reduced Emission ✔



> 8000 chemicals in tobacco smoke



≈ 200 chemicals in EC/HTP aerosol

COMBUSTION

COMBUSTION-FREE

Health improvements are expected when switching to C-F nicotine products

Substantiation of health improvements after switching

Reduced Harm

This can be proven by:

- In vitro cytotoxicity and mutagenicity studies
- Epidemiology and In Silico Science
- Clinical studies (health effects indicators, biomarkers of potential harm)

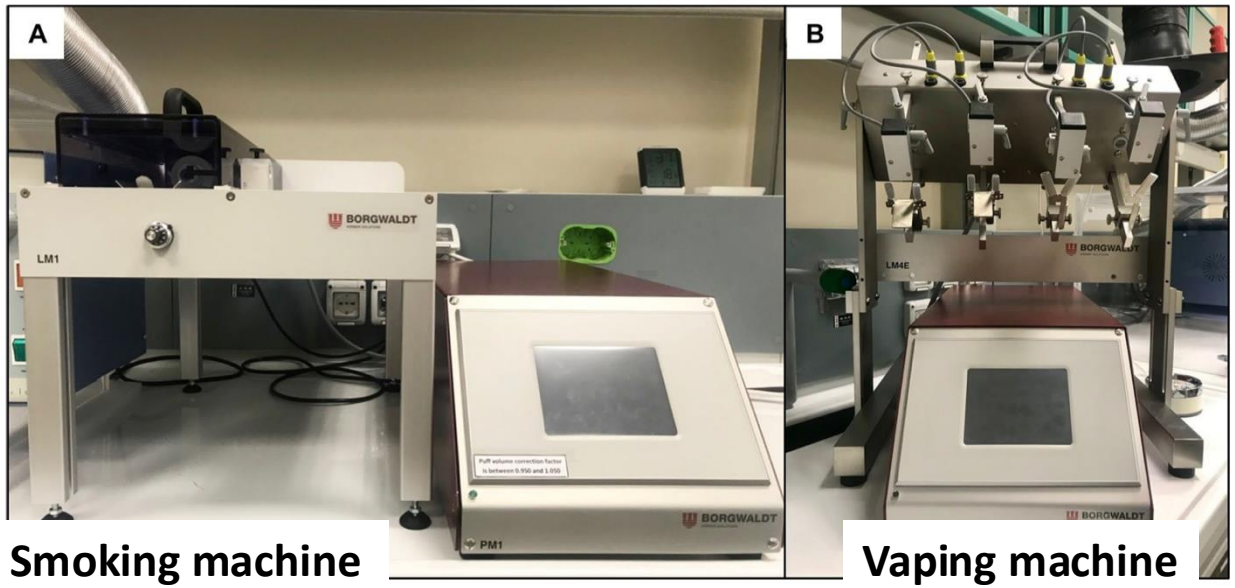
scientific reports

Check for updates

OPEN

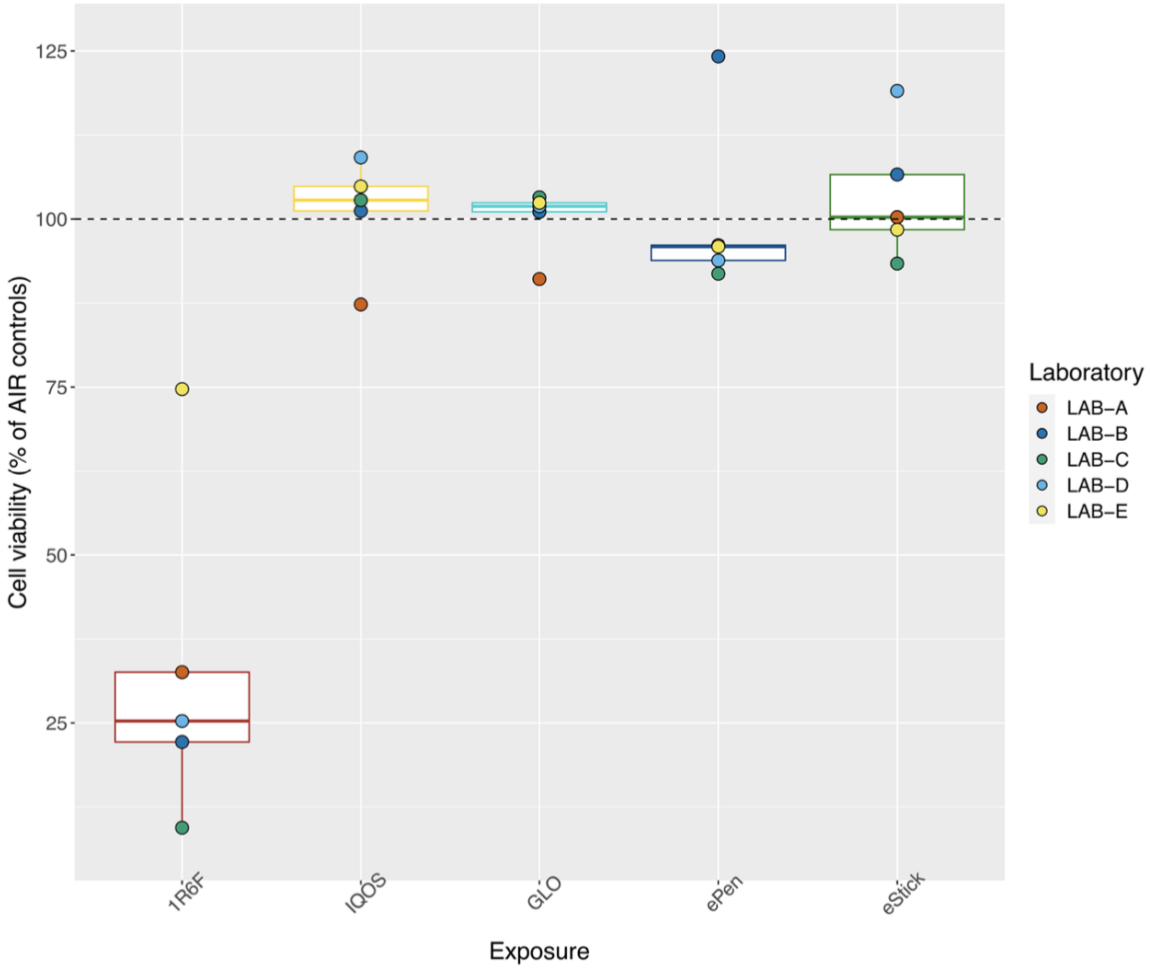
Electronic nicotine delivery systems exhibit reduced bronchial epithelial cells toxicity compared to cigarette: the Replica Project

Massimo Caruso[1,2,11], Rosalia Emma[1,2,11], Alfio Distefano[1], Sonja Rust[3], Konstantinos Poulas[4,5], Fahad Zadjali[6], Antonio Giordano[7], Vladislav Volarevic[8], Konstantinos Mesiakaris[4,5], Mohammed Al Tobi[6], Silvia Boffo[7], Aleksandar Arsenijevic[8], Pietro Zuccarello[9], Cesarina Giallongo[9], Margherita Ferrante[9], Riccardo Polosa[2,3,10], Giovanni Li Volti[1,2]✉ & the Replica Project Group*



Smoking machine

Vaping machine



ECIG AEROSOL DOES NOT INDUCE CYTOTOXICITY

Cytotoxicity, Mutagenicity and Genotoxicity of Electronic Cigarettes Emission Aerosols Compared to Cigarette Smoke: the REPLICA project

Rosalia Emma, Virginia Fuochi, Alfio Distefano, Sonja Rust, Fahad Zadjali, Mohammed Al Tobi, Razan Zadjali, Zaina Alharthi, Roberta Pulvirenti, Pio Maria Furneri, Riccardo Polosa, Massimo Caruso, Giovanni Li Volti

doi: https://doi.org/10.1101/2022.10.28.514205

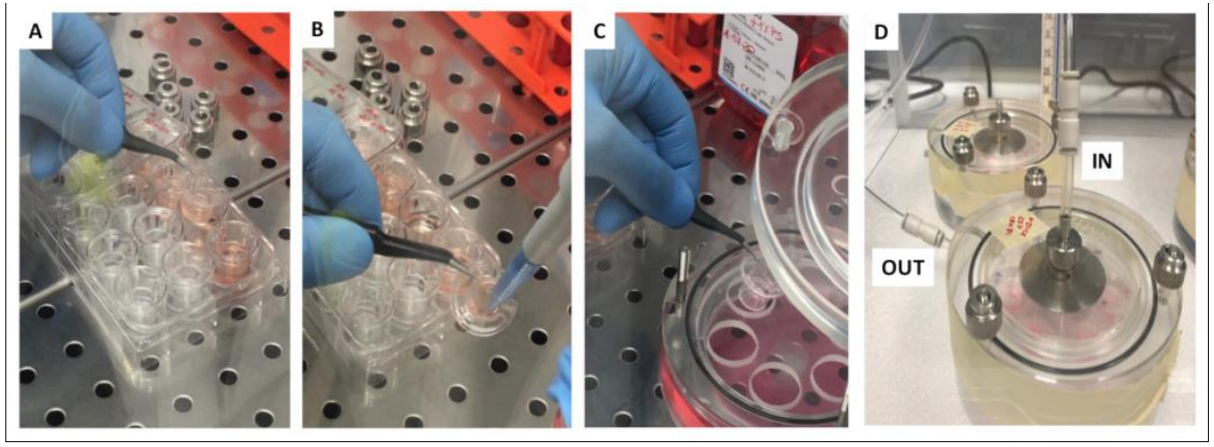
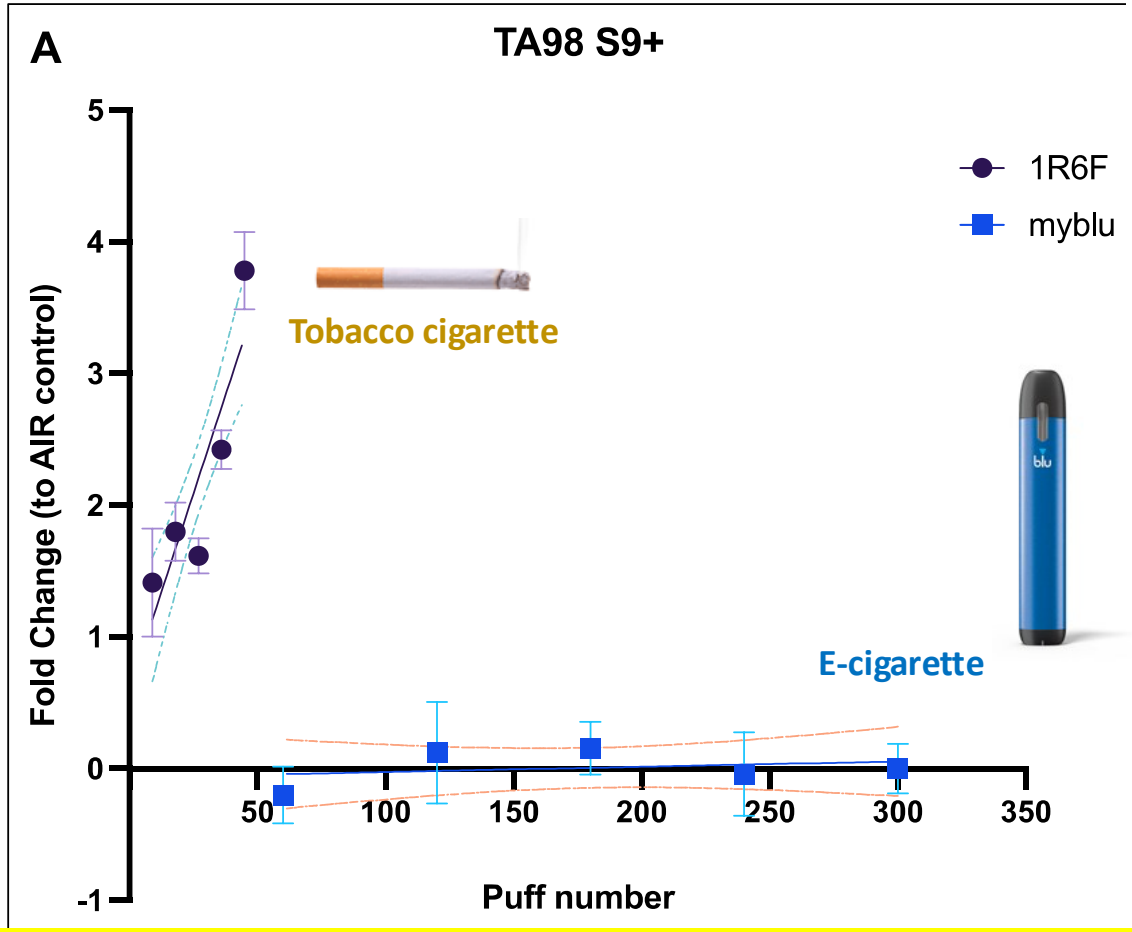


Figure 1. Air-liquid interface exposure system



ECIG AEROSOL DOES NOT INDUCE GENETIC MUTATIONS

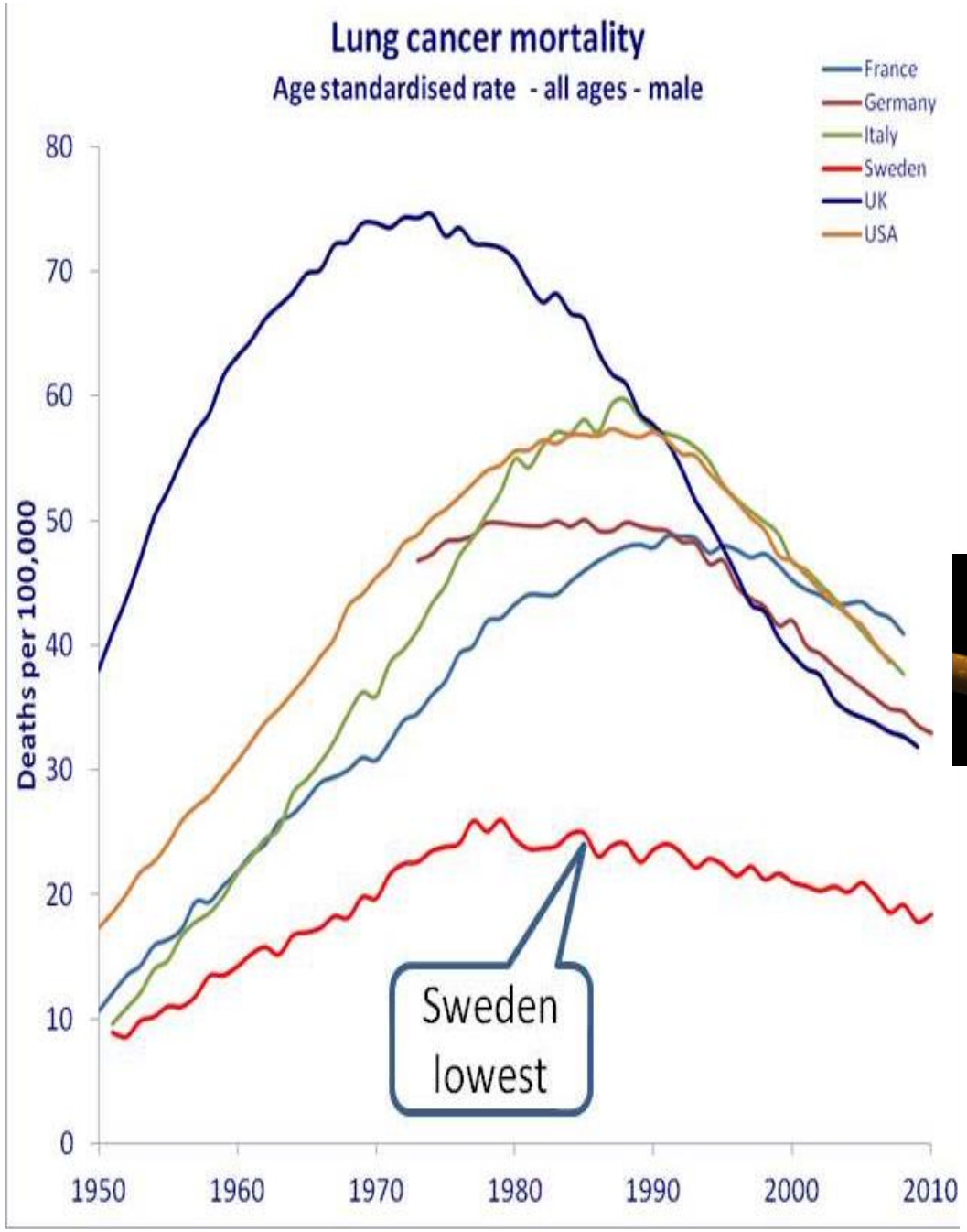
Substantiation of health improvements after switching

Reduced Harm

This can be proven by:

- In vitro cytotoxicity and mutagenicity studies
- Epidemiology and In Silico Science
- Clinical studies (health effects indicators, biomarkers of potential harm)

Epidemiology data on long-term nicotine consumption



High Prevalence of Cigarette Use

COMBUSTION!

High Prevalence of Snus Use

ZERO COMBUSTION!

Internal and Emergency Medicine
https://doi.org/10.1007/s11739-022-03161-z

CE-SYSTEMATIC REVIEWS AND META-ANALYSIS

Clinical testing of the cardiovascular effects of e-cigarette substitution for smoking: a living systematic review

Giusy La Rosa[1] · Robin Vernooij[1,2,3] · Maria Qureshi[1,4] · Riccardo Polosa[1,5] · Renée O'Leary[5]

Received: 30 September 2022 / Accepted: 20 November 2022

KEY FINDINGS

Smokers who choose to switch to e-cig do not have additional CV risk and can benefit from this choice.

Eg., two studies of participants with high BP showed clinically relevant reduction in systolic BP after 1 year of e-cig use.

Summary

Qureshi *et al. Harm Reduction Journal* (2023) 20:143
https://doi.org/10.1186/s12954-023-00877-9

Harm Reduction Journal

RESEARCH Open Access

Respiratory health effects of e-cigarette substitution for tobacco cigarettes: a systematic review

Maria Ahmed Qureshi[1,3], Robin W. M. Vernooij[2], Giusy Rita Maria La Rosa[1], Riccardo Polosa[1,3] and Renee O'Leary[3*]

KEY FINDINGS

Smokers who choose to switch to e-cig do not have additional respiratory risk and can benefit from this choice.

Eg., a few studies of participants with COPD showed clinically relevant improvement in lung function after long term e-cig use.

Substantiation of health improvements after switching

Reduced Harm

This can be proven by:

- In vitro cytotoxicity and mutagenicity studies
- Epidemiology and In Silico Science
- Clinical studies (health effects indicators, biomarkers of potential harm)

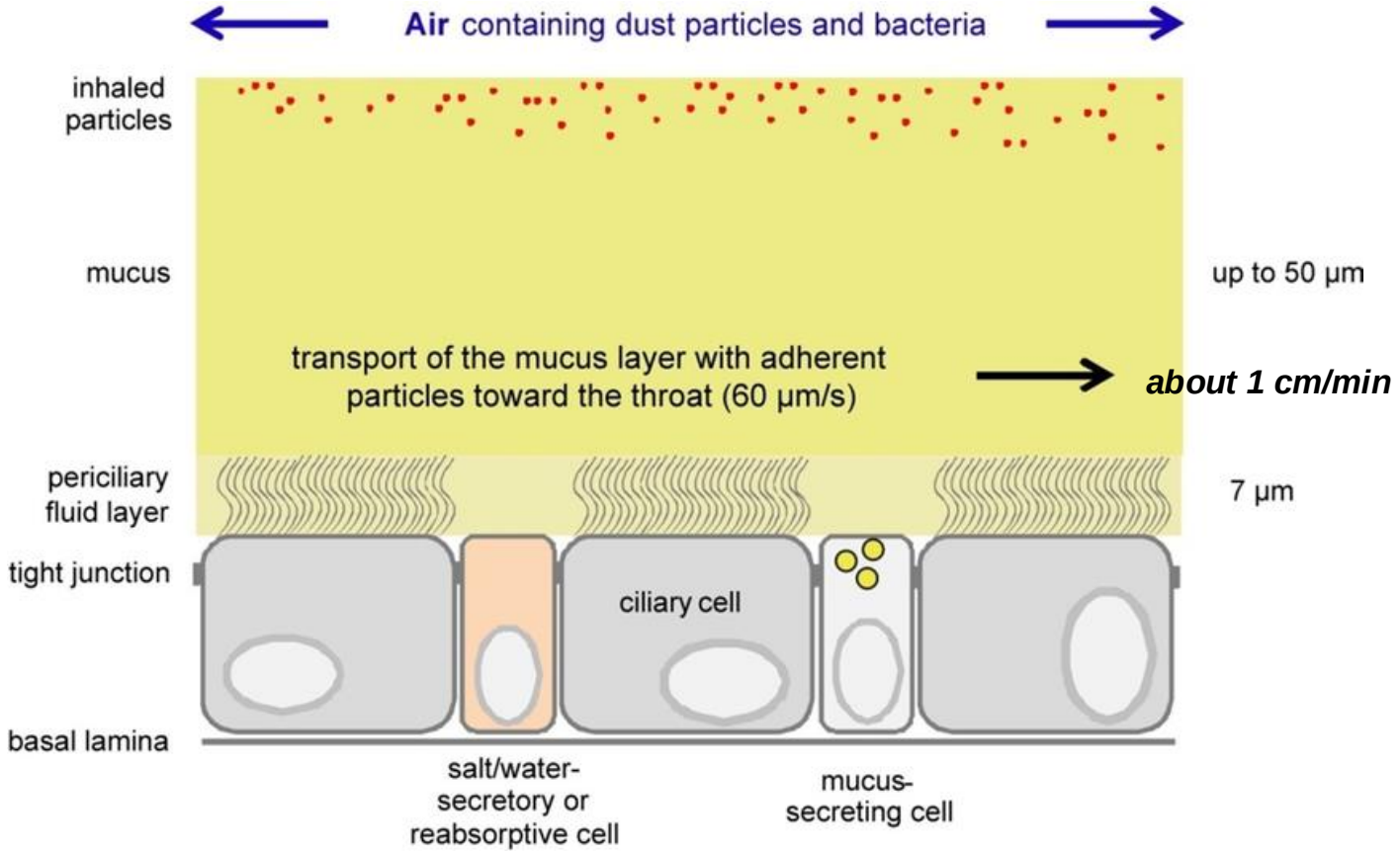
Harm caused by cigarette smoke on respiratory cilia is quickly reversible

Saccharin Test

An innovative approach to the assessment of harm reversal

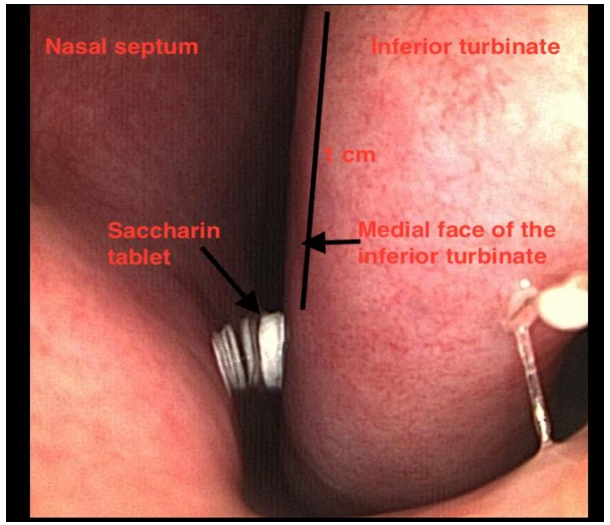
Mucociliary Clearance Transit Time

Nares

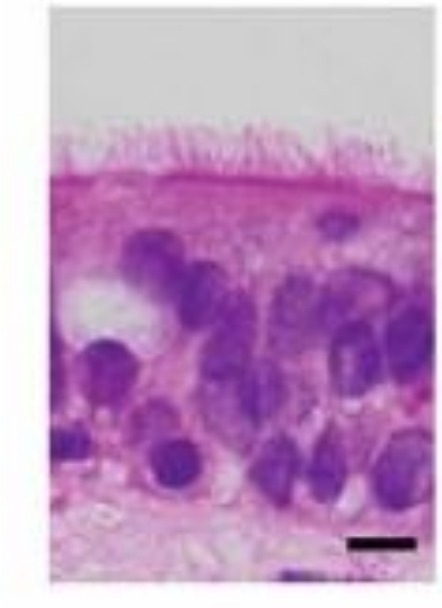


Nasal pharynx

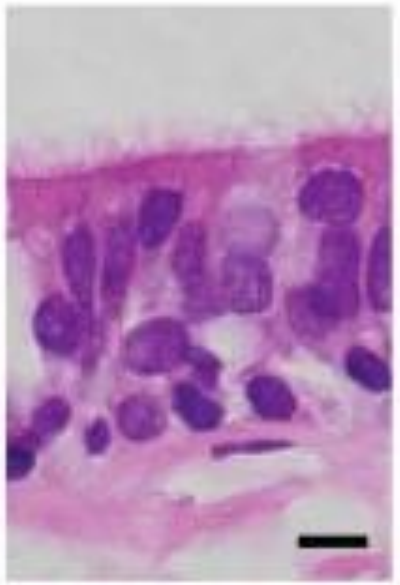
Saccharin tablet is placed in the medial surface of the inferior nasal turbinate.



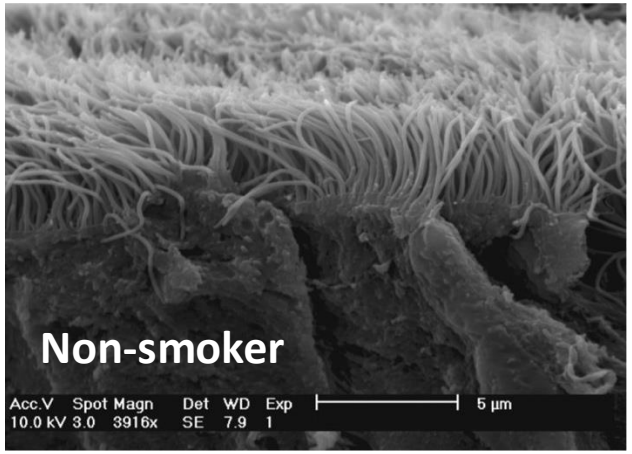
Harm caused by cigarette smoke on respiratory cilia

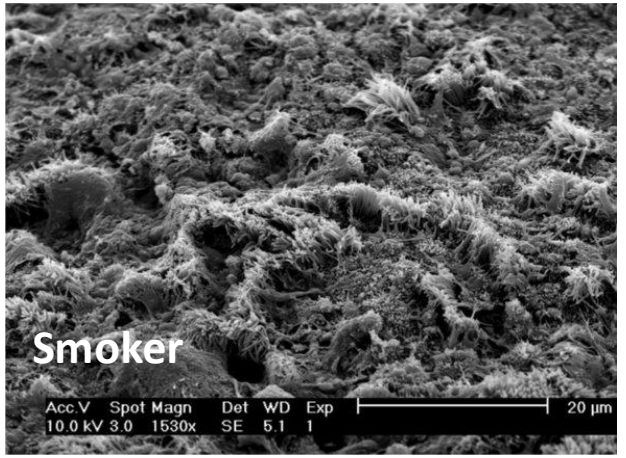


Non-smoker

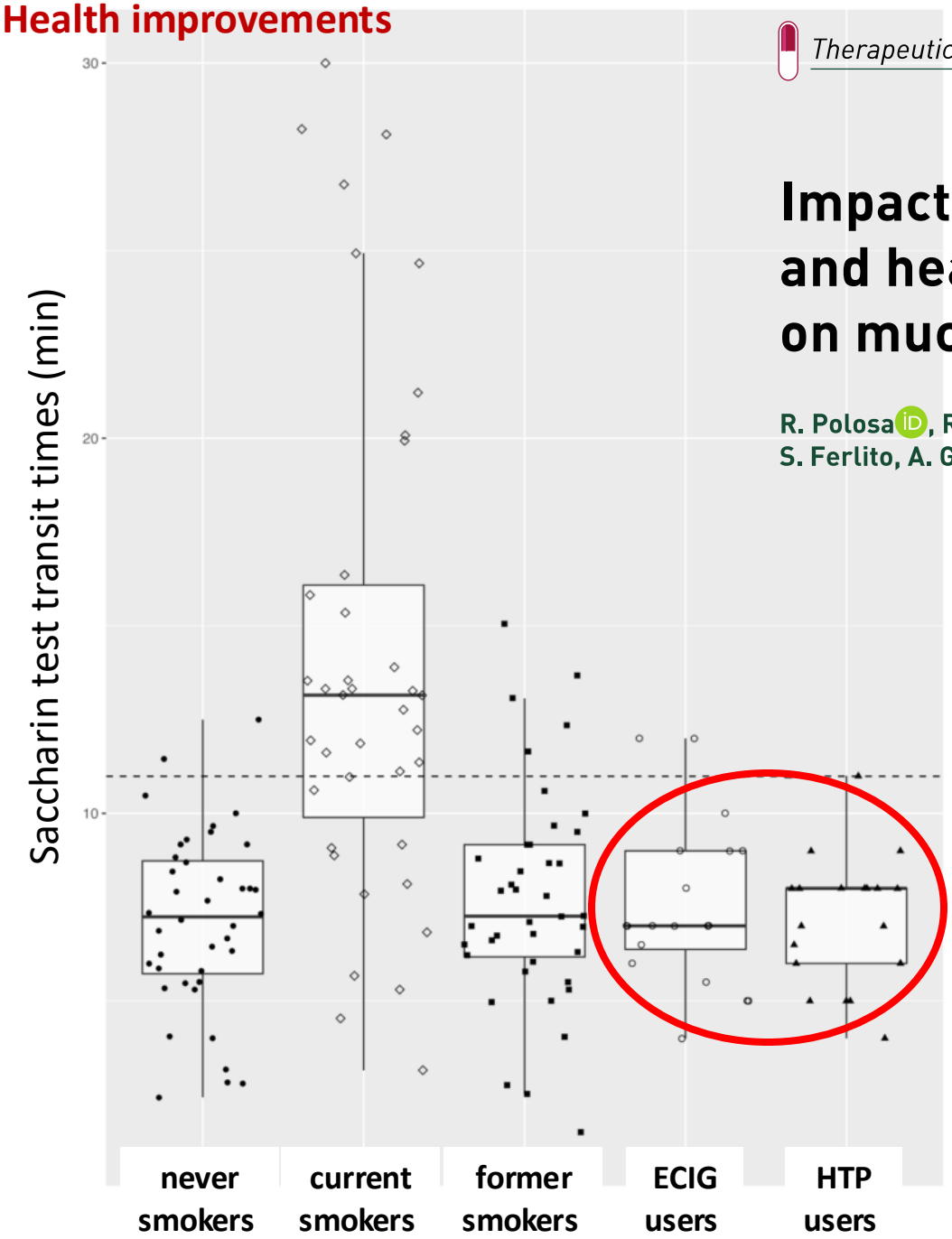


Smoker





Health improvements



Therapeutic Advances in Chronic Disease

Original Research

Impact of exclusive e-cigarettes and heated tobacco products use on muco-ciliary clearance

R. Polosa, R. Emma, F. Cibella, M. Caruso, G. Conte, F. Benfatto, S. Ferlito, A. Gulino, M. Malerba and P. Caponnetto

Ther Adv Chronic Dis

2021, Vol. 12: 1–9

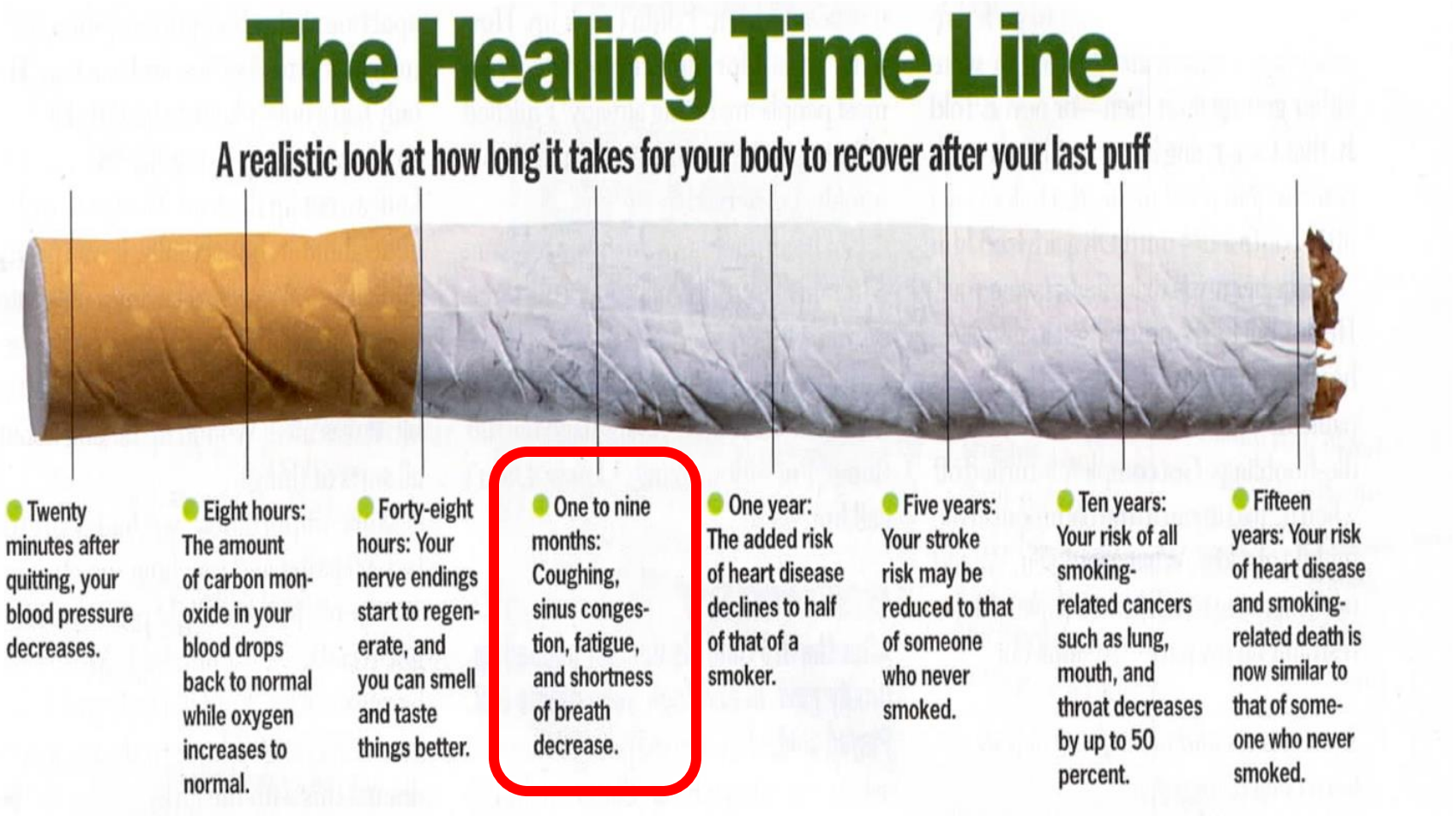
DOI: 10.1177/20406223211035267

Upper Limit of Normality value = 11 min

Switching Can Restore Lung Defence

CoEHAR
Center of Excellence for the Acceleration of HArm Reduction

Impact by cigarette smoke on exercise tolerance is quickly reversible



Exercise Tolerance (VO2max measurements)

Near-Infrared Spectroscopy (NIRS) test

Chester Step test

PNOE test

Exercise Tolerance (VO2max measurements)

Internal and Emergency Medicine
https://doi.org/10.1007/s11739-024-03794-2

HTA-ORIGINAL

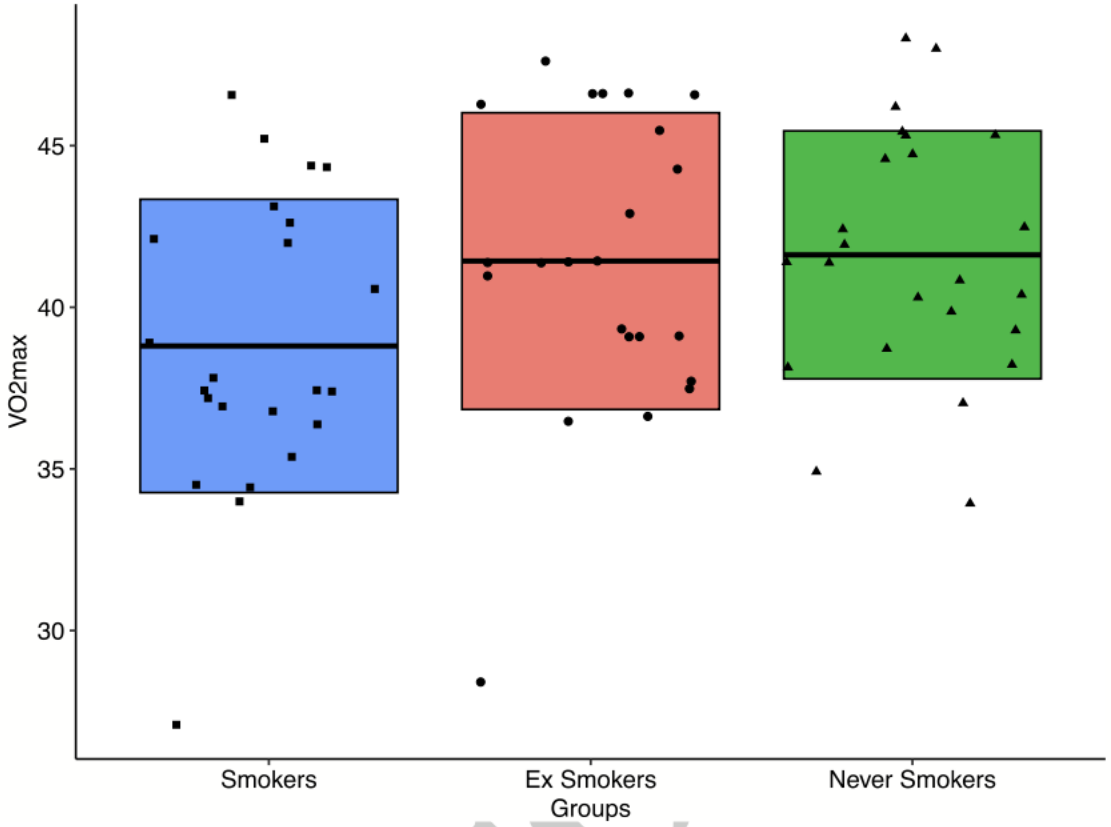
Check for updates

Assessment and repeatability of aerobic capacity using the Chester Step Test among current, former, and never smokers

Grazia Caci[1] · Lucia Spicuzza[2,3,4] · Rosalia Emma[2,3] · Davide Campagna[1,2,5] · Meera Nadir[6] · Erika Anastasi[7] · Francesco Pennisi[3,4] · Stanley Hunter[8] · Shivraj Bhide[6] · Riccardo Polosa[1,2,9]

Received: 27 June 2024 / Accepted: 6 October 2024

Chester Step Test



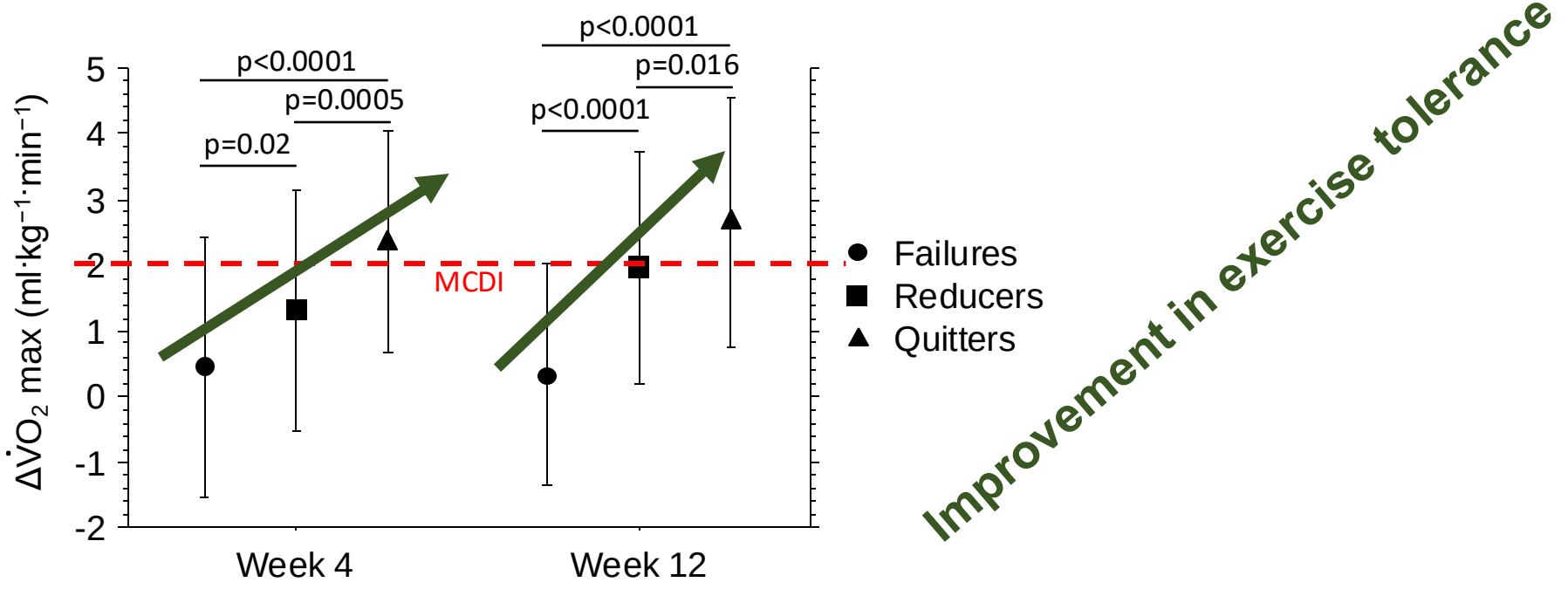
Health improvements

VO2max improvement in smokers who abstained from cigarette smoking after switching

Impact of Smoking Cessation on Aerobic Capacity: Results from a Randomized Controlled Switching Trial with Combustion-Free Nicotine Products

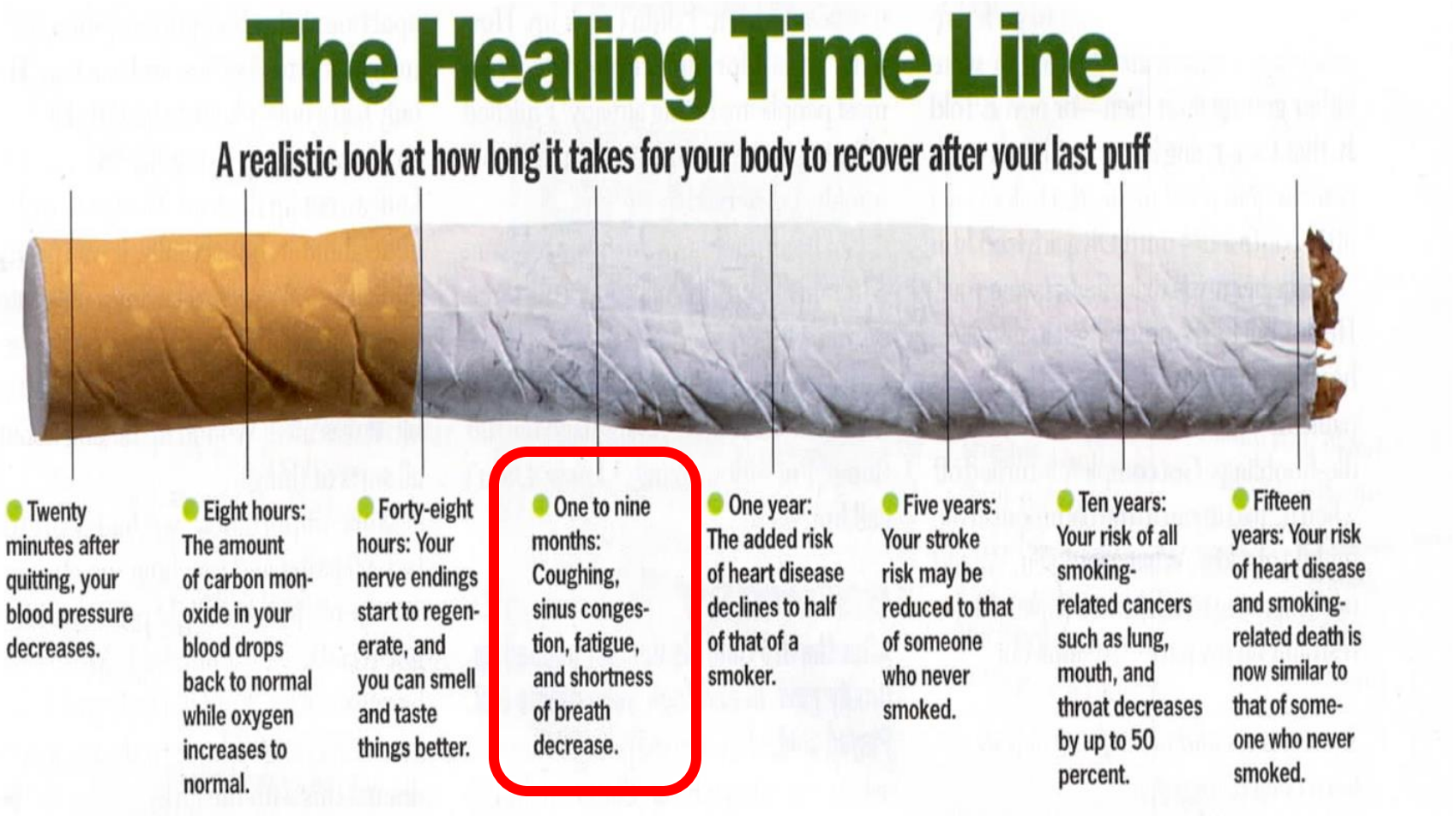
Lucia Spicuzza [a,b,c], Grazia Caci [d], Fabio Cibella [e], Davide Campagna [a,b,f], Claudio Saitta [g], Jacob George [h] , Riccardo Polosa [a,b,i]

MCDI
minimum clinically important difference



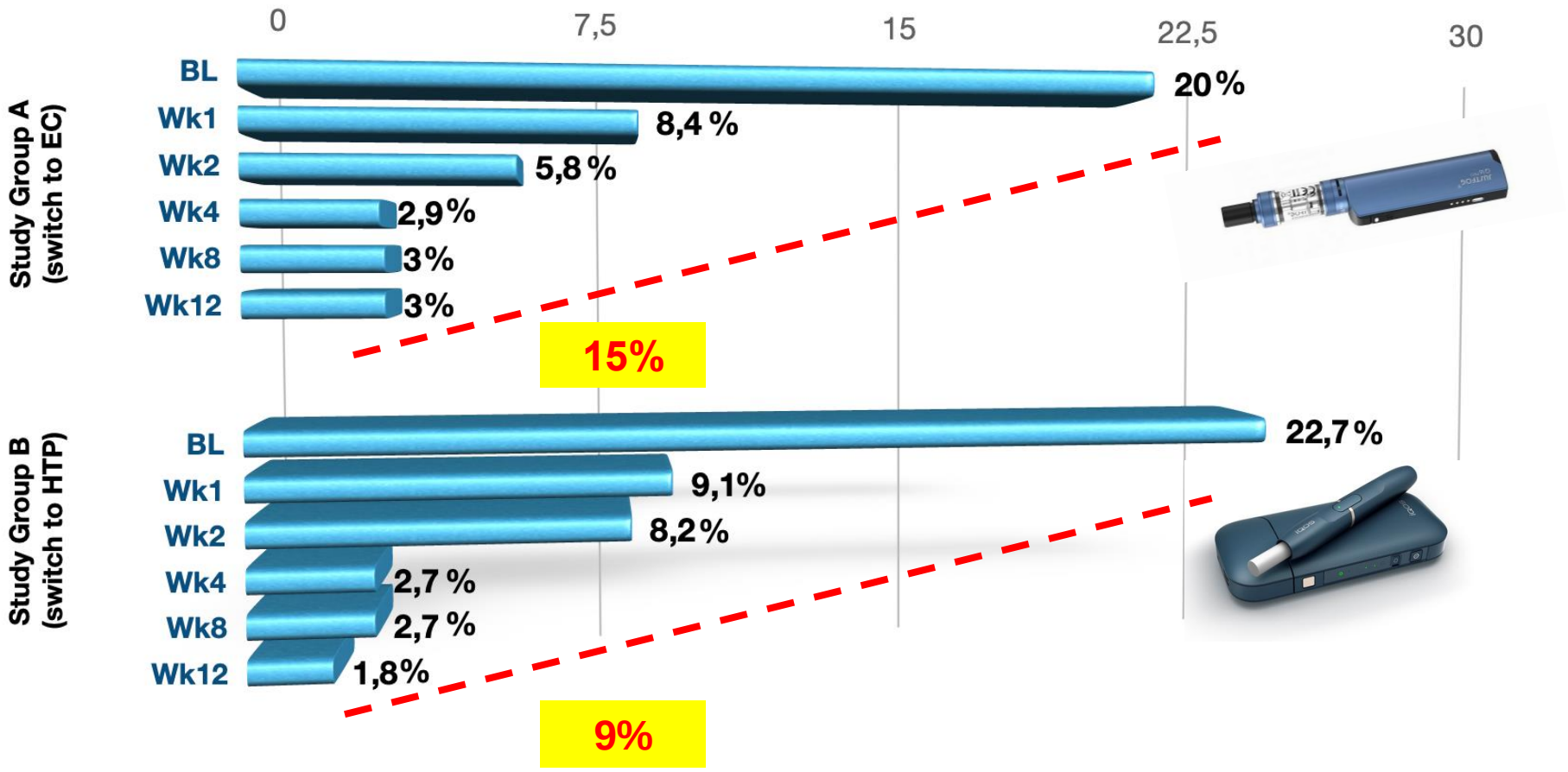
Changes in $\dot{V}O_2$ ($\Delta\dot{V}O_2$) max at week 4 and week 12 separately for phenotype classification.

Impact by cigarette smoke on exercise tolerance is quickly reversible



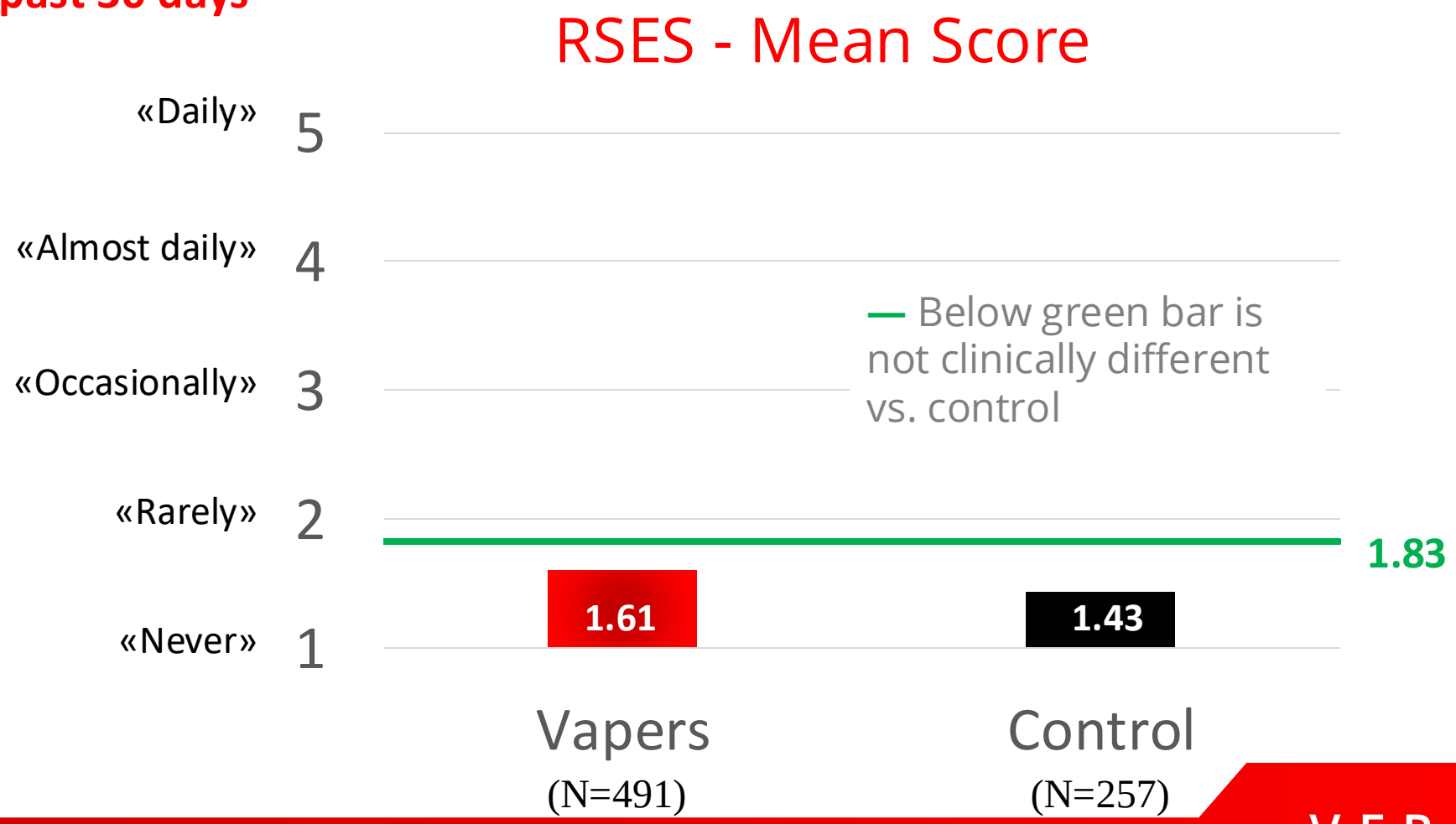
Less coughing after switching to ECs / HTPs

Caponnetto P, et al. Comparing the Effectiveness, Tolerability, and Acceptability of Heated Tobacco Products and Refillable E-Cigarettes for Cigarette Substitution (CEASEFIRE): Randomized Controlled Trial. JMIR Public Health Surveill. 2023 Apr 4;9:e42628.

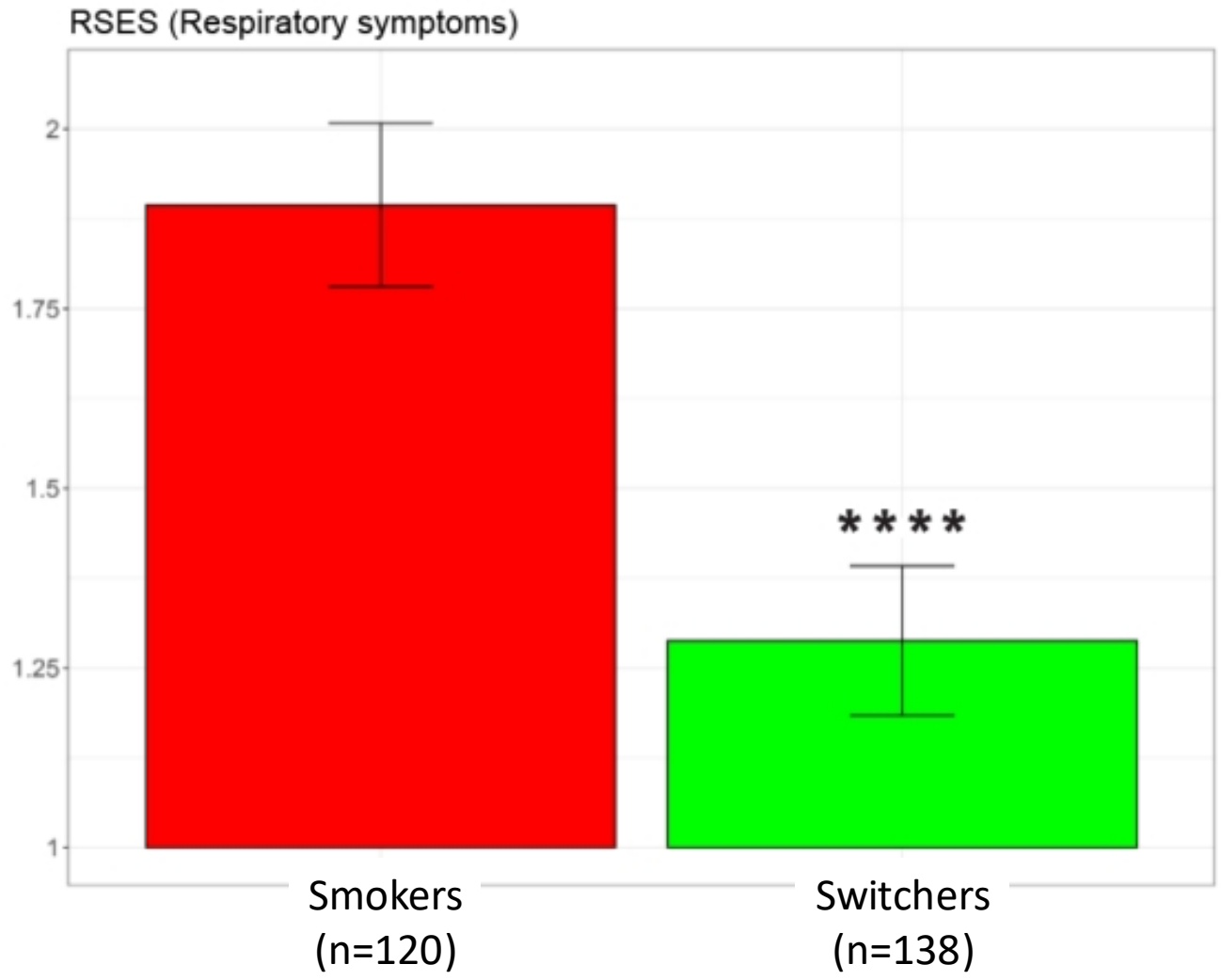


FREQUENCY OF RESPIRATORY SYMPTOMS

Self-reported, past 30 days

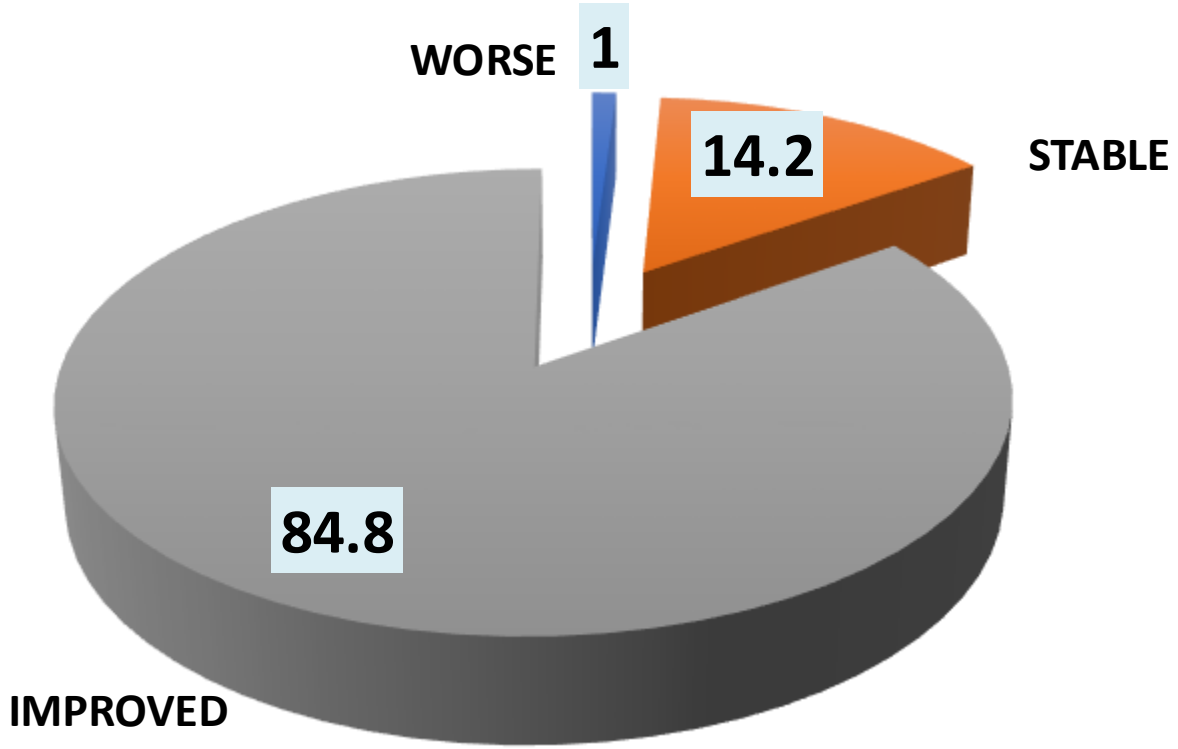


Less respiratory symptoms after switching to ECs



Shiffman et al. Comparing Adult Smokers who Switched to JUUL vs Continuing Smokers: Biomarkers of Exposure and of Potential Harm and Respiratory Symptoms. Nicotine Tob Res 2023 (in press)

CHANGE IN RESPIRATORY SYMPTOMS: EC USERS WITH COPD (n = 1062)



K. Farsalinos et al. Int. J. Environ. Res. Public Health 2014

Therapeutic Advances in Chronic Disease

Original Research

COPD smokers who switched to e-cigarettes: health outcomes at 5-year follow up

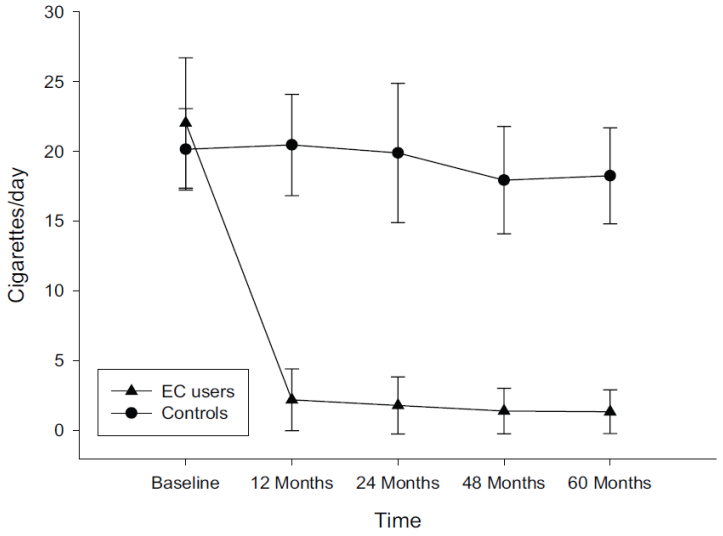
Ricardo Polosa*, Jaymin B Morjaria*, Umberto Prosperini, Barbara Busà, Alfio Pennisi, Mario Malerba, Marilena Maglia and Pasquale Caponnetto

Ther Adv Chronic Dis

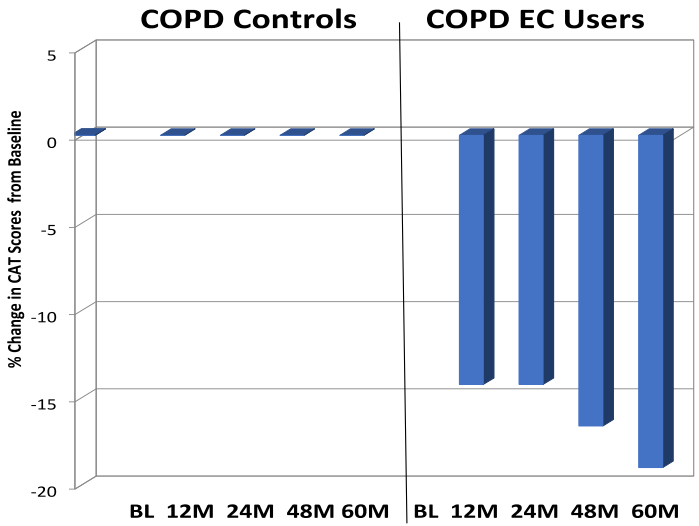
2020, Vol. 11: 1–15

DOI: 10.1177/2040622320961617

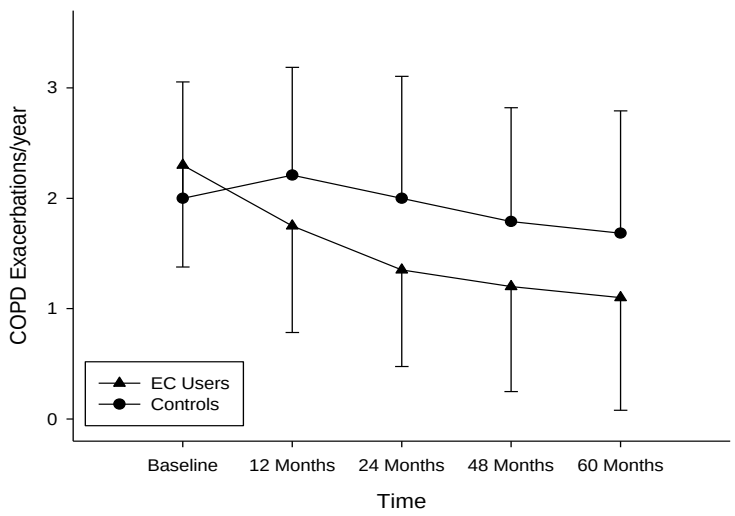
Marked reduction in cigarette consumption



Improved QoL and lung function



Less respiratory exacerbations



Internal and Emergency Medicine
https://doi.org/10.1007/s11739-021-02674-3

IM - ORIGINAL

Health outcomes in COPD smokers using heated tobacco products: a 3-year follow-up

Riccardo Polosa[1,2,3,9] · Jaymin B. Morjaria[4] · Umberto Prosperini[5] · Barbara Busà[6] · Alfio Pennisi[7] · Gualberto Gussoni[8] · Sonja Rust[3] · Marilena Maglia[1,2] · Pasquale Caponnetto[1,2,3]

Marked reduction in cigarette consumption

Improved QoL and lung function

Less respiratory exacerbations

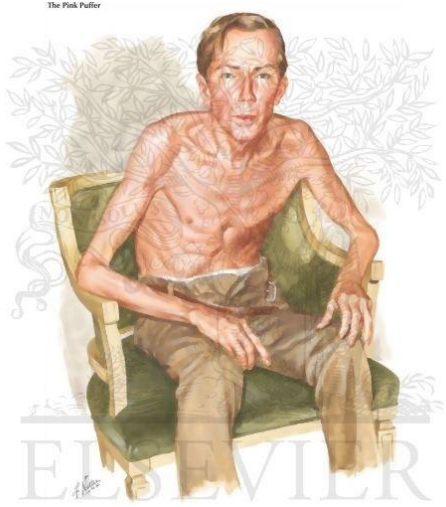
Internal and Emergency Medicine
https://doi.org/10.1007/s11739-021-02674-3

IM - ORIGINAL

Health outcomes in COPD smokers using heated tobacco products: a 3-year follow-up

Riccardo Polosa[1,2,3,9] · Jaymin B. Morjaria[4] · Umberto Prosperini[5] · Barbara Busà[6] · Alfio Pennisi[7] · Gualberto Gussoni[8] · Sonja Rust[3] · Marilena Maglia[1,2] · Pasquale Caponnetto[1,2,3]

Less respiratory exacerbations



Curtailing disease burden and accelerating the COPD endgame?

Approx. 10% less hospitalizations for COPD exacerbation

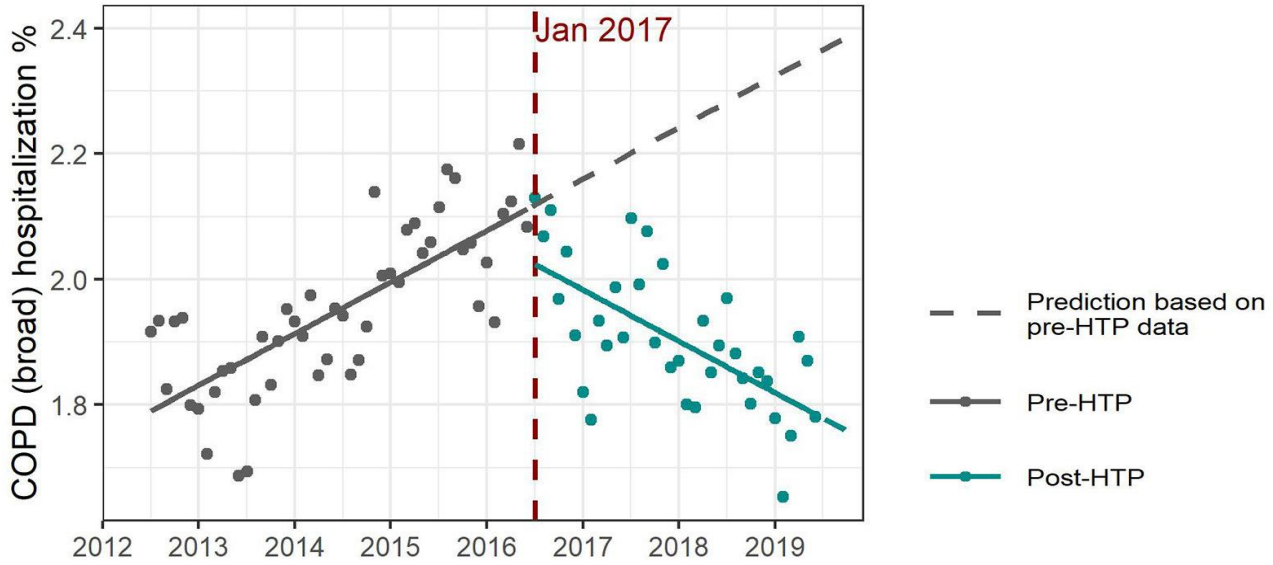
frontiers | Frontiers in Public Health

ORIGINAL RESEARCH
published: 28 June 2022
doi: 10.3389/fpubh.2022.909459

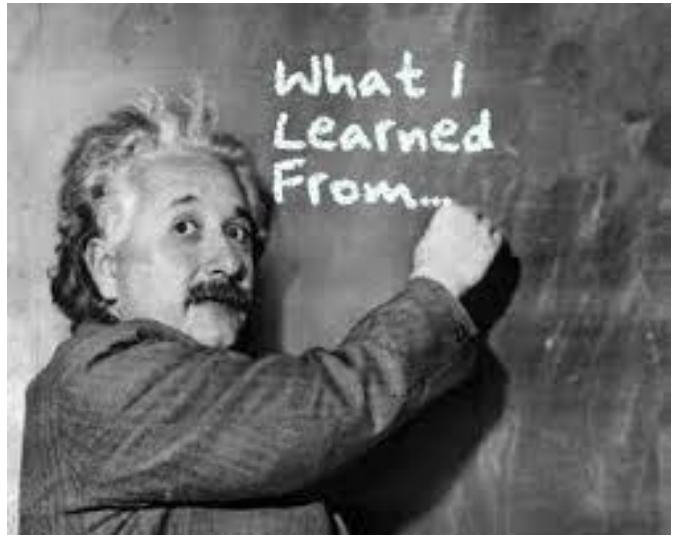
Ischemic Heart Disease and Chronic Obstructive Pulmonary Disease Hospitalizations in Japan Before and After the Introduction of a Heated Tobacco Product

Angela van der Plas, Meagan Antunes, Alba Romero-Kauss, Matthew Hankins and Annie Heremans*

COPD Hospitalization Rate



Take Home Messages



1. Prevalence of smoking remains too high
2. Current tobacco control policies are not enough
3. Switching to ECs/HTPs use helps to abstain from smoking
4. Combustion-free products unlikely to raise significant health concerns under normal condition of use
5. People using or intending to use ECs/HTPs should receive correct information about their risks and benefits