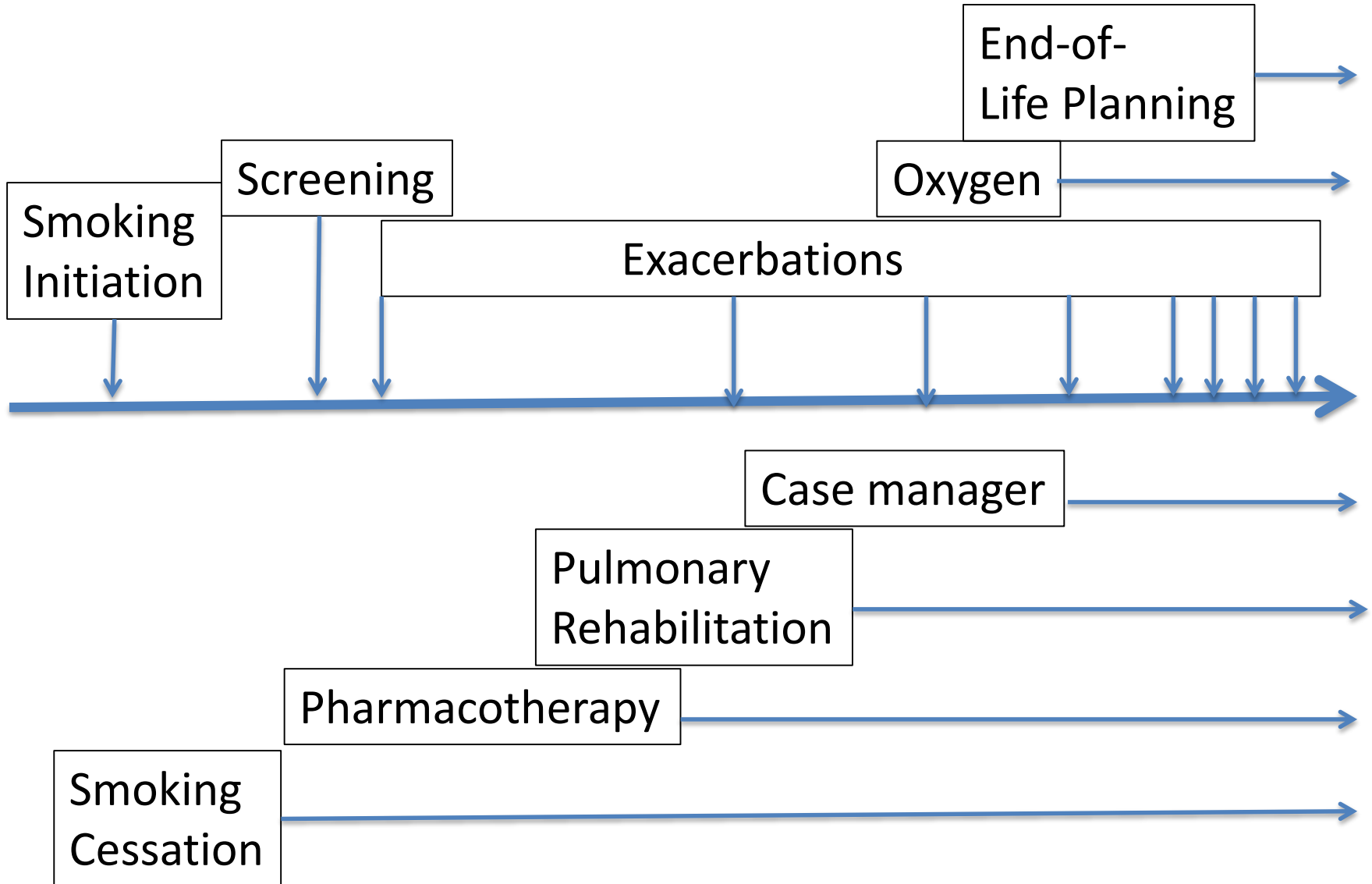


COPD

Scope of Problem

Continuum of Management



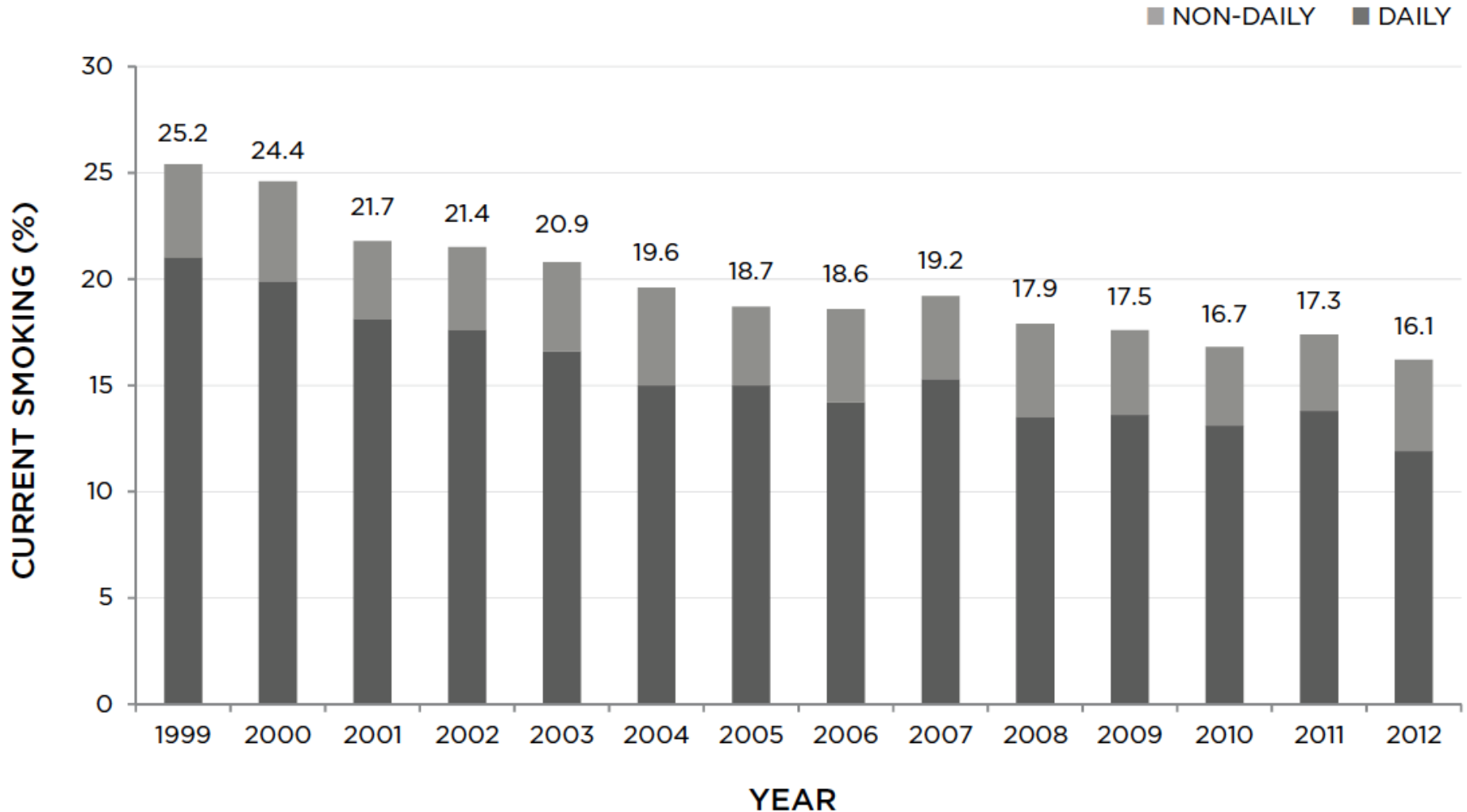
Smoking

Smoking Status in USA

- Cancer Prevention Study I (CPS I), initiated by the American Cancer Society (ACS) in 1959
- Cancer Prevention Study (CPS II) 1982
 - Included nearly 1.2 million men and women
- Contemporary pooled data from five US cohort studies

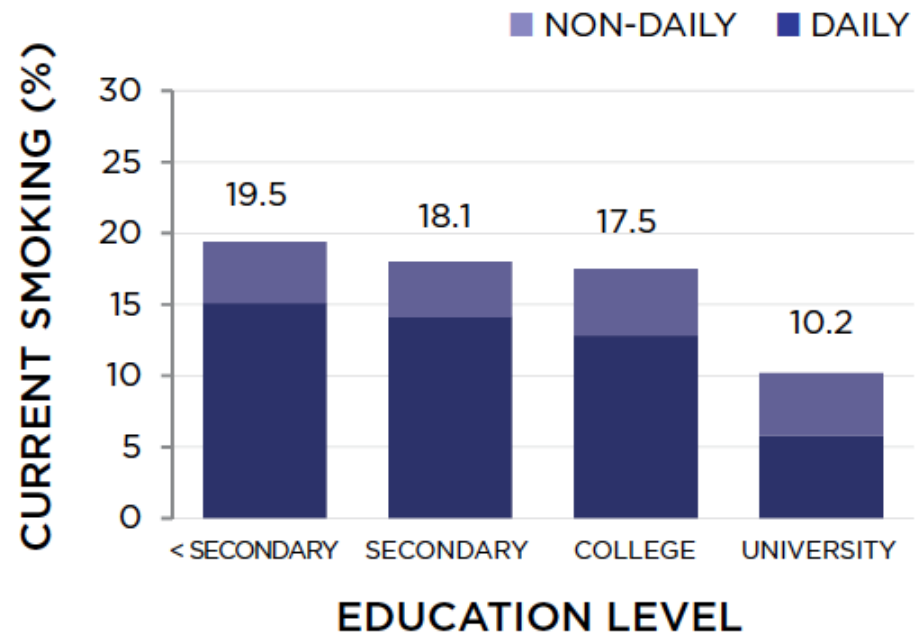
Characteristic	CPS I Cohort (1959–1965) [†]		CPS II Cohort (1982–1988) [†]		Contemporary Cohort (2000–2010) [‡]	
	Men	Women	Men	Women	Men	Women
Participants included in analysis (no.)	183,060	335,922	293,592	452,893	421,702	535,054
Smoking status (%) ^{††}						
Never smoked	43.5	81.0	33.6	61.2	36.2	49.3
Current smoker	39.5	15.2	23.5	18.0	9.3	9.7
Former smoker	17.0	3.8	42.9	20.8	54.5	41.0

Smoking rates in Canada Over Age 15

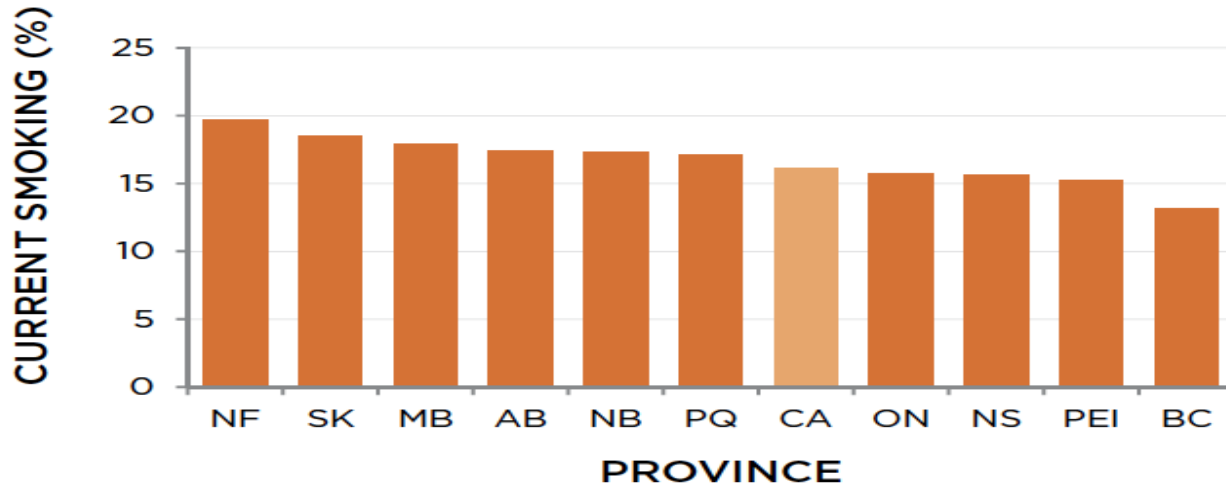


Smoking by Education

- Those completed university have shown ongoing decline since 1999
- Those with less than secondary education decline from 1999 to 2004
 - Since 2004 have reached stable plateau
- At any educational level smokers consume similar daily numbers of cigarettes
 - 14 to 15 per day

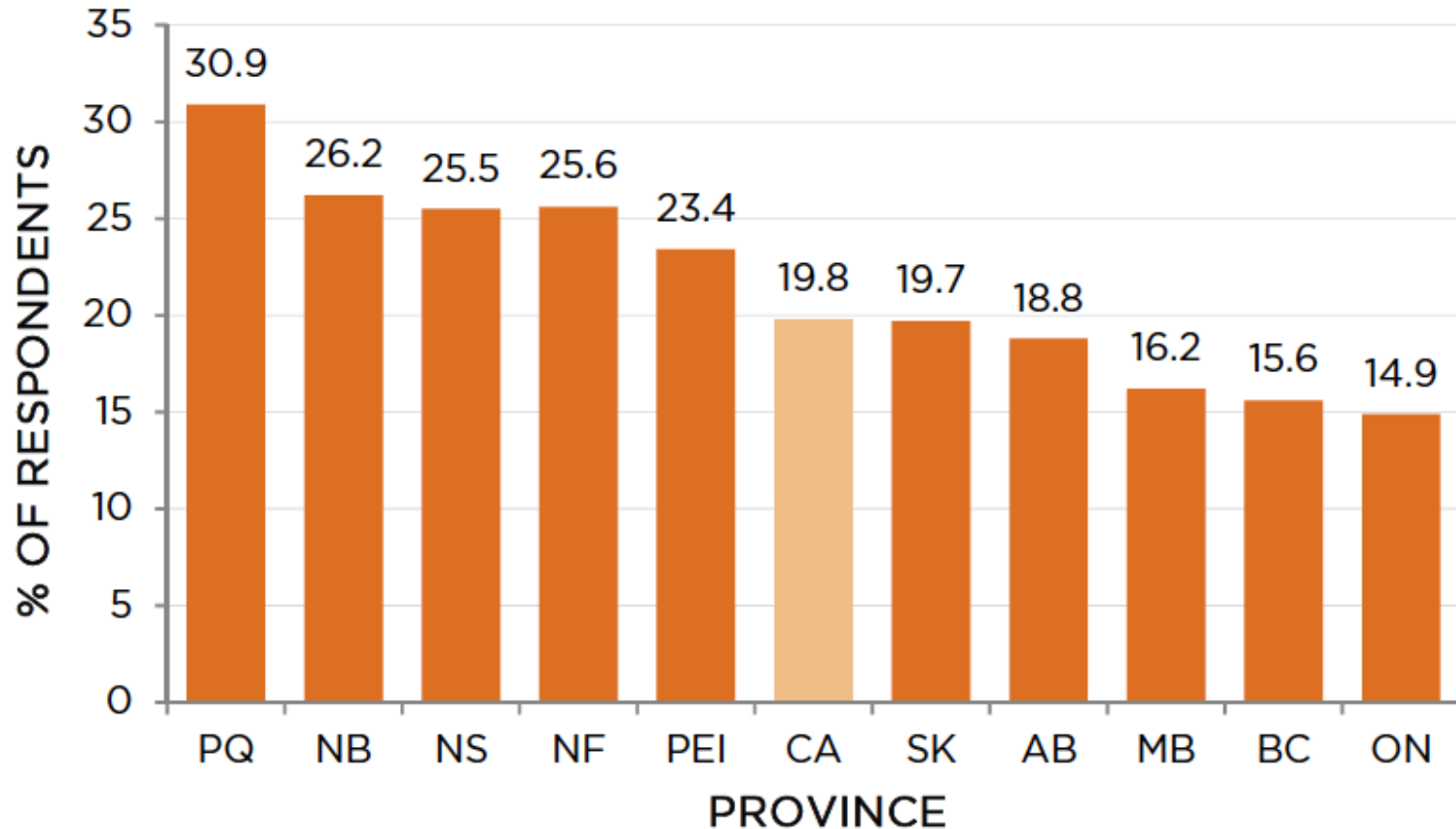


Smoking by Province



- Alberta rates are in the middle of the provinces
- Decreased from 26% in 1999 to 17.4% by 2012
- The majority of youth who tried tobacco used flavored tobacco
- These data were collated before e-cigarette use started

EVER USE OF E-CIGARETTES AMONG YOUTH AGED 15-19, BY PROVINCE, 2013

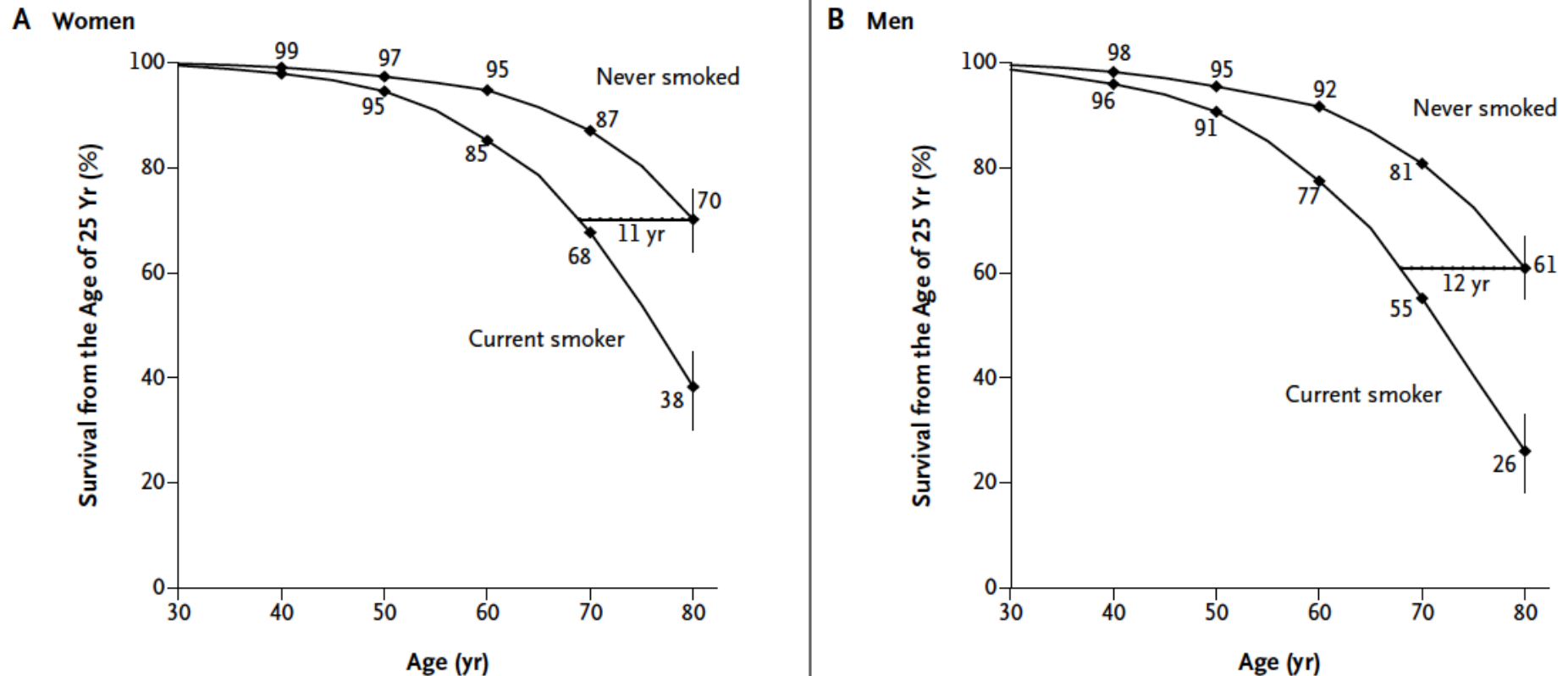


DATA SOURCE: CTADS, 2013

How do Smoking Rates Translate into Health Status

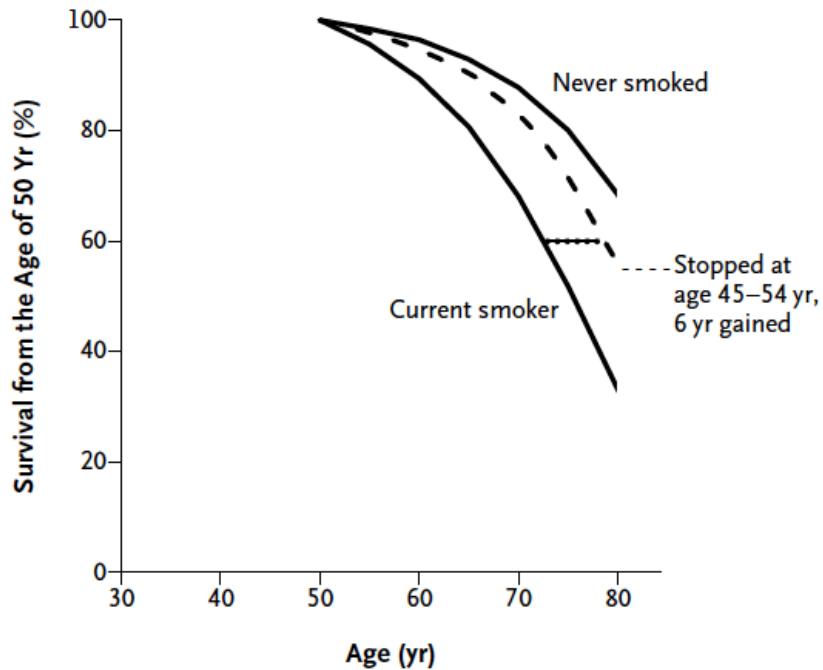
Loss of 11 to 12 years of Life

Double chances of getting to age 80 for men or women

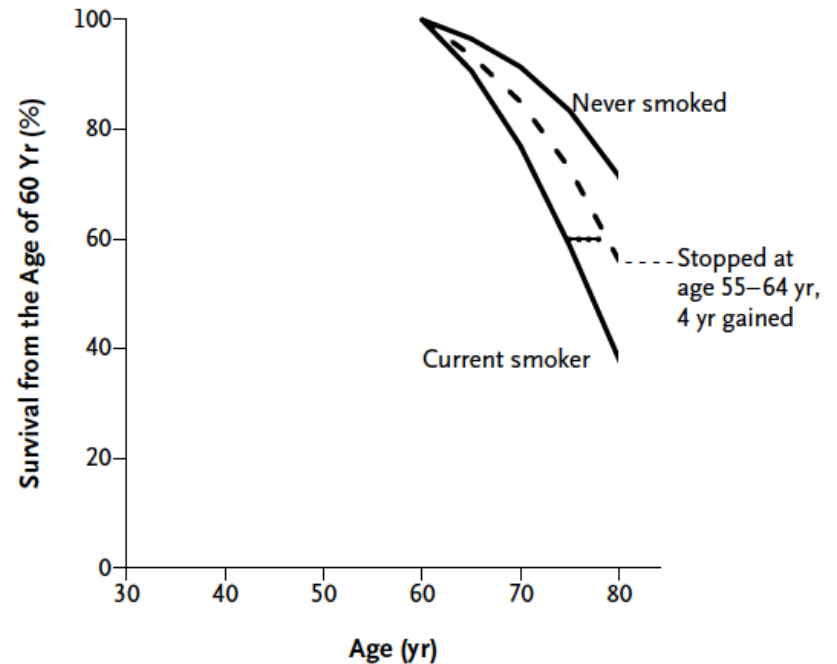


Cigarettes and Mortality

C



D



COPD Prevalence

Screening for COPD

General Prevalence

- Prevalence of COPD directly related to the prevalence of tobacco smoking
- Some countries include other risks
 - Indoor burning biomass fuels
 - Occupational exposure
- Prevalence data shows marked variability
 - Lower estimates based upon physician-diagnosed COPD near 6%

Diagnosis of COPD

- COPD should be considered in any patient
 - Dyspnea
 - chronic cough or sputum production
 - history of exposure to risk factors for the disease
- If any present and age 40 or above perform spirometry
 - FEV_1/FVC ratio <0.7 post-bronchodilator

COPD Prevalence in Canada

- Prevalence of moderate to very severe COPD in adult Canadians is 8.1%¹
 - About 20% of these are severe to very severe
 - Only ½ have received physician diagnosis
 - At this level of severity therapy is indicated
- COPD common in family practice setting²
 - About 20% of adults in FP practices have COPD by spirometry
- Misdiagnosis common
 - Only about ½ diagnosed

1. Public Health Agency of Canada 2011

2. CMAJ 182:2010;673-678

World Prevalence

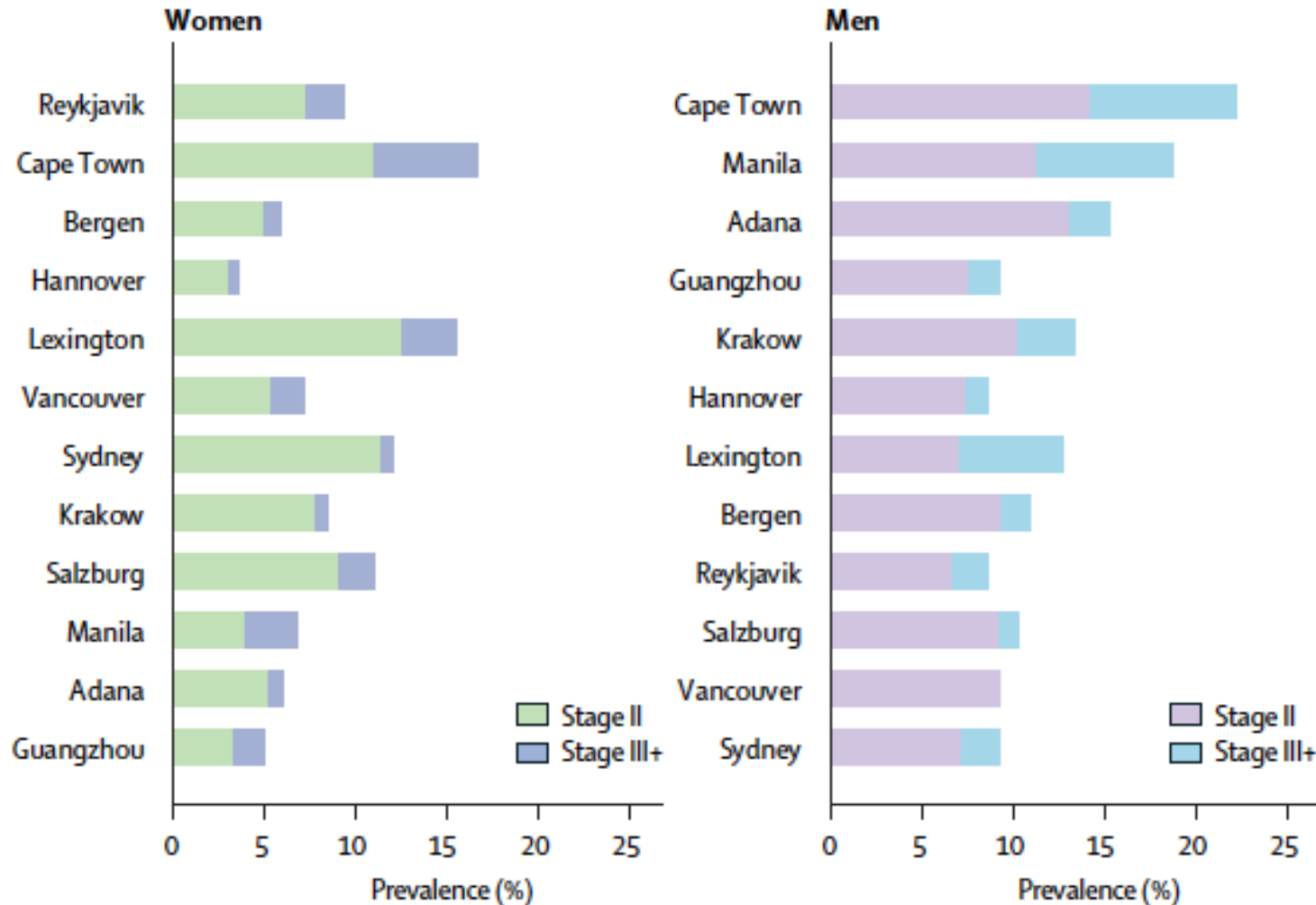
- Five Latin American countries studied
 - Lowest value in Mexico City, Mexico 7.8%
 - Highest value in Montevideo, Uruguay 19.7%
- Cigarette smoking important risk factor but COPD also occurs in non-smokers¹
 - BOLD study surveyed several parts of the world
 - Found COPD in 3-11% among never-smokers

1. Lancet 2007; 370: 741–50

Burden Of Obstructive Lung Disease (BOLD)

- Participants recruited using population-based sampling plans
- Subjects from 12 cities worldwide (n=9,425) completed post-bronchodilator spirometry
- Vancouver included as one of the sites
 - Contributed 856 subjects

COPD Prevalence



Canadian BOLD Data

- 19.3% of Vancouver sample had spirometric evidence of COPD
 - 8.2% of population had moderate to severe to very severe COPD by spirometry
 - Very Canadian findings
 - Right in middle of pack in terms of prevalence
- This data is serving as basis of Canadian COPD Cohort study (CanCOLD)

Lancet 2007; 370: 741–50

Men	
n	344
No airflow obstruction	78.0% (2.4)
Stage I	12.7% (1.9)
Stage II	9.3% (1.7)
Stage III–IV	0
Women	
n	483
No airflow obstruction	83.2% (1.8)
Stage I	9.5% (1.4)
Stage II	5.5% (1.1)
Stage III–IV	1.8% (0.6)
Overall	
n	827
No airflow obstruction	80.7% (1.5)
Stage I	11.1% (1.2)
Stage II	7.3% (1.0)
Stage III–IV	0.9% (0.3)

Data are % (SE).

Gaps in Knowledge

Therapies

Gaps

- Cost-benefit for many therapies available
 - Very few head-to-head trials of pharmacotherapy for COPD
 - Which components of Pulmonary Rehabilitation are most effective for which patients
 - Where along continuum of care do treatments show best cost-benefit
 - e.g. does Pulmonary Rehabilitation for very mild or very severe show same benefits?

Cost-Benefit of Individual Interventions

Intervention	Incremental Intervention Cost	Incremental Hospital Cost	Incremental Maintenance Cost	Total	Incremental Life Years	Incremental QALYs	Cost per Life Year	Cost per QALY
Smoking cessation programs								
IC vs. UC	\$130	-\$597	-\$1,778	-\$2,245	0.62	0.58	Dominates	Dominates
NRT vs. UC	\$203	-\$285	-\$941	-\$1,023	0.32	0.31	Dominates	Dominates
IC + NRT vs. placebo	\$333	-\$303	-\$874	-\$844	0.31	0.29	Dominates	Dominates
Bupropion vs. placebo	\$38	-\$131	-\$402	-\$495	0.14	0.13	Dominates	Dominates
Multidisciplinary care teams								
MDC vs. UC	\$1,041	-\$464	\$111	\$688	0.12	0.06	\$10,686	\$14,123
MDC, sensitivity analysis	\$3,049	-\$464	\$111	\$2,696	0.12	0.06	\$41,860	\$55,322
Pulmonary rehabilitation								
PR vs. UC	\$1,527	-\$978	\$77	\$626	0.04	0.03	\$14,616	\$17,938
PR, sensitivity analysis	\$2,863	-\$978	\$77	\$1,962	0.04	0.03	\$45,849	\$56,270
Long-term oxygen therapy								
LTOT vs. UC	\$24,668	\$4,218	\$503	\$29,389	1.21	0.75	\$24,347	\$38,993
Ventilation strategies								
NPPV + UMC vs. UMC	-\$3,762	\$583	\$433	-\$2746	0.19	0.13	Dominates	Dominates
Weaning with NPPV vs. weaning with IMV	-\$8,131	\$201	\$146	-\$7784	0.07	0.05	Dominates	Dominates

*Abbreviations: COPD, chronic obstructive pulmonary disease; IC, intensive counselling; IMV, invasive mechanical ventilation; LTOT, long-term oxygen therapy; MDC, multidisciplinary care; NPPV, noninvasive positive pressure ventilation; NRT, nicotine replacement therapy; PR, pulmonary rehabilitation; QALY, quality-adjusted life-year; UC, usual care; UMC, usual medical care.

†All costs are reported in Canadian dollars.

Local and International Costs

Global Cost Estimates

- European Union estimate the total direct costs of respiratory disease about 6% of the total health care budget
 - COPD accounting for 56% of respiratory disease costs
 - 38.6 billion Euros
- USA estimate direct costs are \$29.5 billion
 - Indirect costs \$20.4 billion
- Distribution of costs changes as the disease progresses
 - Increased cost with increased disease severity

Global Morbidity

- Disability-Adjusted Life Year (DALY)
 - Years lost because of premature mortality and years of life lived with disability
 - adjusted for the severity of disability.
- Worldwide COPD was the twelfth leading cause of DALYs in 1990
 - 2.1% of the total.
- Projected to become seventh leading cause of DALYs lost worldwide in 2030

Alberta Costing

- Multiple treatment choices for COPD
 - Smoking cessation
 - Bronchodilators
 - Pulmonary Rehabilitation
 - Supplemental oxygen
 - Lung surgery
- Multiple other costs
 - Physician visits
 - Hospitalizations
 - Testing including lung function tests
 - COPD case managers
 - Pharmacists

Supplemental Oxygen

- 2013/2014
 - 8,516 over age 64
 - \$20,459,000
 - Possible 2,769 age 18-64
 - \$6,001,000
- 2014/2015
 - 8,981 over age 64
 - \$21,572,000
 - Possible 2,862 age 18-64
 - \$\$6,281,000
 - Increase 5.12% population
 - Increase 5.75% costs

Summary

- The prevalence of COPD is high worldwide
- The prevalence is underestimated by physicians
- In Canada overall 8.1% COPD moderate, severe and very severe
- The rates of tobacco use | Canada are declining
 - E-cigarette use is rapidly expanding
 - Potential for lung harm is uncertain
- Costs are high and are increasing
 - Population growth of COPD
 - Inflation of prices

Prevalence of COPD

	Guangzhou, China	Adana, Turkey	Salzburg, Austria	Cape Town, South Africa	Reykjavik, Iceland	Hannover, Germany	Krakow, Poland	Bergen, Norway	Vancouver, Canada	Lexington, USA	Manila, Philippines	Sydney, Australia
Men												
n	236	389	685	315	402	349	266	324	344	206	378	265
No airflow obstruction	84.7% (2.3)	71.5% (2.0)	73.4% (1.7)	71.3% (2.7)	81.8% (2.0)	81.9% (2.2)	72.3% (2.4)	77.4% (2.3)	78.0% (2.4)	81.9% (2.7)	80.4% (1.7)	81.1% (2.4)
Stage I	5.9% (1.5)	13.1% (1.7)	16.3% (1.4)	6.5% (1.5)	9.7% (1.5)	9.4% (1.7)	14.4% (2.1)	11.6% (1.7)	12.7% (1.9)	5.4% (1.6)	0.9% (0.4)	9.6% (1.8)
Stage II	7.6% (1.7)	13.1% (1.5)	9.3% (1.1)	14.2% (2.1)	6.7% (1.3)	7.5% (1.5)	10.3% (1.7)	9.4% (1.6)	9.3% (1.7)	7.1% (1.6)	11.3% (1.4)	7.2% (1.6)
Stage III-IV	1.7% (0.8)	2.3% (0.9)	1.0% (0.4)	8.0% (1.6)	1.9% (0.7)	1.1% (0.6)	3.0% (1.0)	1.6% (0.6)	0	5.6% (1.7)	7.4% (1.2)	2.1% (0.9)
Women												
n	237	417	573	532	353	334	260	334	483	302	515	276
No airflow obstruction	92.4% (1.7)	89.7% (1.9)	74.3% (2.0)	80.0% (1.9)	82.5% (2.1)	90.7% (1.6)	83.4% (2.2)	84.6% (1.9)	83.2% (1.8)	79.2% (2.7)	91.4% (1.4)	80.5% (2.5)
Stage I	2.5% (1.0)	4.3% (1.1)	14.7% (1.6)	3.3% (1.0)	8.1% (1.5)	5.6% (1.3)	8.1% (1.7)	9.5% (1.6)	9.5% (1.4)	5.2% (1.5)	1.8% (0.9)	7.3% (1.6)
Stage II	3.4% (1.2)	5.3% (1.1)	9.2% (1.4)	11.0% (1.4)	7.4% (1.4)	3.1% (1.0)	7.8% (1.7)	5.0% (1.1)	5.5% (1.1)	12.6% (2.2)	4.0% (0.8)	11.4% (2.0)
Stage III-IV	1.7% (0.8)	0.7% (0.4)	1.8% (0.7)	5.7% (1.1)	2.0% (0.7)	0.6% (0.5)	0.8% (0.6)	0.9% (0.5)	1.8% (0.6)	3.0% (1.0)	2.8% (0.8)	0.8% (0.6)
Overall												
n	473	806	1258	847	755	683	526	658	827	508	893	541
No airflow obstruction	88.6% (1.5)	80.9% (1.5)	73.9% (1.3)	76.2% (1.6)	82.1% (1.4)	86.7% (1.3)	77.9% (1.6)	81.2% (1.5)	80.7% (1.5)	80.4% (1.9)	86.2% (1.1)	80.8% (1.7)
Stage I	4.2% (0.9)	8.6% (1.0)	15.5% (1.1)	4.7% (0.9)	8.9% (1.1)	7.3% (1.0)	11.2% (2.3)	10.5% (1.2)	11.1% (1.2)	5.3% (1.1)	1.4% (0.6)	8.4% (1.2)
Stage II	5.5% (1.0)	9.1% (0.9)	9.2% (0.9)	12.4% (1.1)	7.0% (0.9)	5.1% (0.9)	9.0% (1.2)	7.1% (1.0)	7.3% (1.0)	10.1% (1.4)	7.5% (0.8)	9.4% (1.2)
Stage III-IV	1.7% (0.6)	1.5% (0.4)	1.4% (0.4)	6.7% (0.9)	1.9% (0.5)	0.8% (3.8)	1.9% (0.6)	1.2% (0.4)	0.9% (0.3)	4.2% (1.0)	5.0% (0.7)	1.4% (0.5)