

Epidemiology and Burden of Chronic Cough

Dongguk University Gyeongju Hospital

Sang Hyuk Kim

Contents

Prevalence of chronic cough

Burden of chronic cough

Future perspectives

Contents

Prevalence of chronic cough

Burden of chronic cough

Future perspectives

Prevalence of CC in World

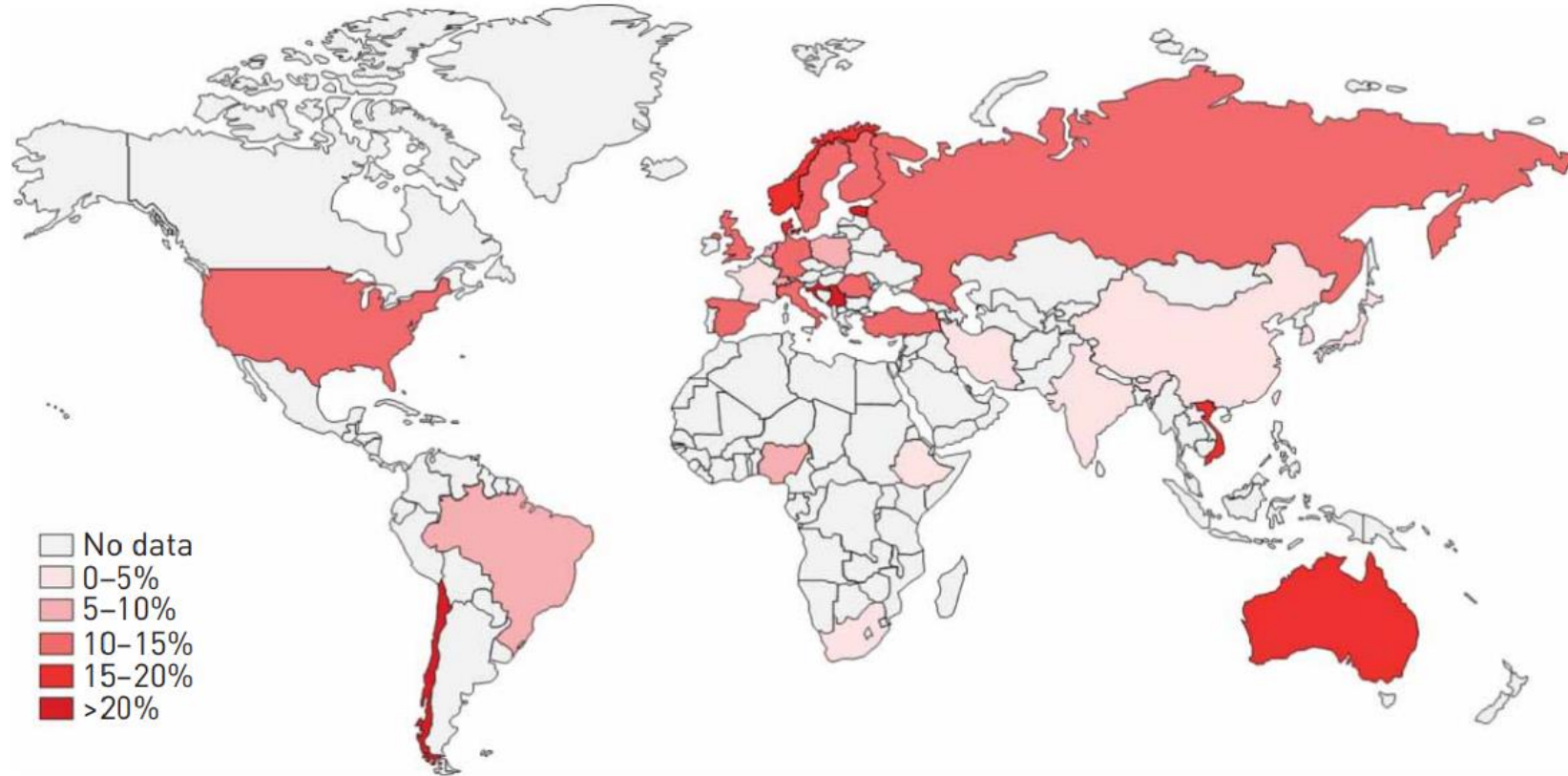
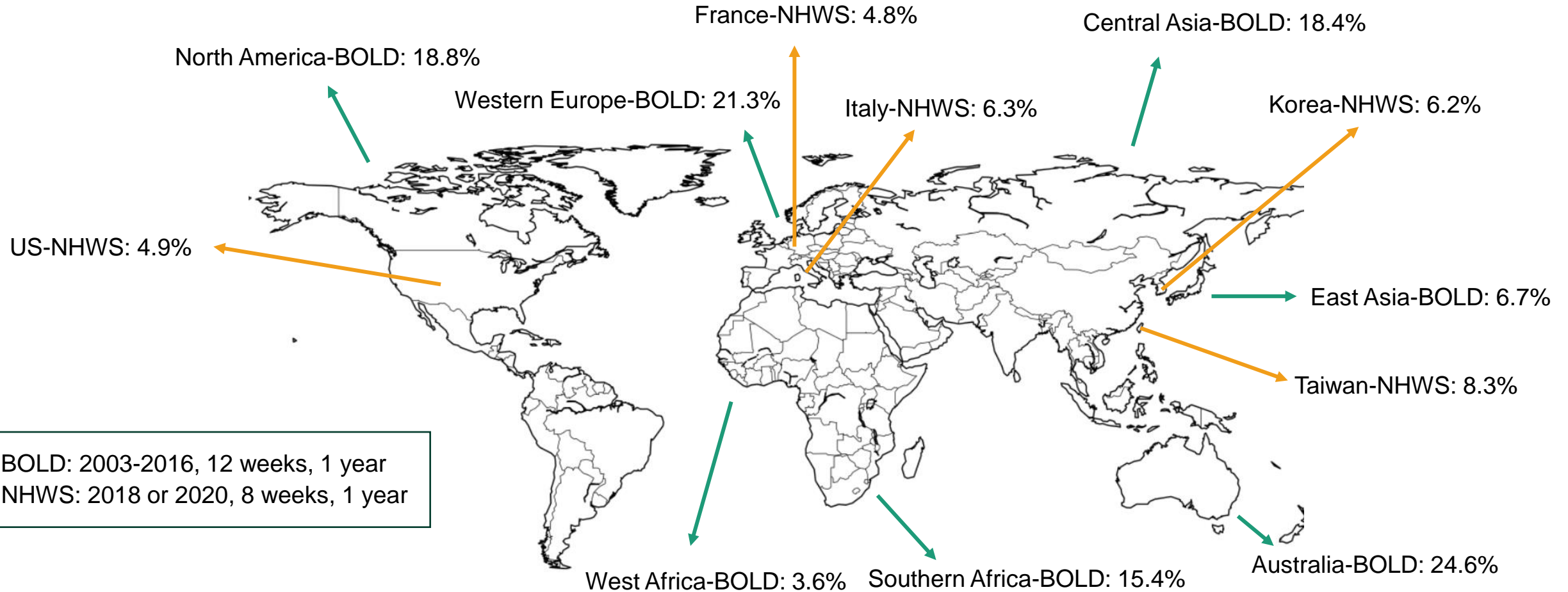


FIGURE 1 Map showing the pooled prevalence of chronic cough by country.

Prevalence of CC in World



Prevalence of CC in Korea

Table 1 Prevalence of chronic cough in Korean community populations

Study	Study population	Survey year	Definition of chronic cough	Cough duration	Prevalence of chronic cough
Shin <i>et al.</i> , 2004, (26)	Participants of the KHG study; aged 40–69 years	2000	Period prevalence of chronic bronchitis (cough and phlegm on most days for a minimum of three months a year and for at least two successive years)	NA	3.5%
Song <i>et al.</i> , 2013, (27)	Participants of the KLoSHA study; aged ≥65 years	2005–2006	Period prevalence of chronic cough (cough on most days for three consecutive months or more during the year)	NA	4.6%
Kang <i>et al.</i> , 2017, (25)	Participants of the KNHANES; aged ≥18 years	2010–2012	Point prevalence of chronic cough (current cough lasting more than eight weeks)	1.6% had cough lasting for more than one year.	2.6%
Won <i>et al.</i> , 2020, (24)	Participants of the KNHANES; aged ≥40 years	2010–2016	Period prevalence of chronic cough (cough on most days for three months or more in the past year)	Mean duration of chronic cough; 7.8 years	3.5%

KHG, Korean Health and Genome; KLoSHA, Korean Longitudinal Study on Health and Aging; KNHANES, Korean National Health and Nutrition Examination Survey; NA, not available.

South
Korea

		Self-reported			Physician diagnosis		
All respondents		2,699,149	43,525,439	6.20%	805,399	43,525,439	1.85%
Gender	Male	1,168,960	21,694,290	5.39%	320,031	21,694,290	1.48%
	Female	1,530,189	21,831,149	7.01%	485,368	21,831,149	2.22%
Age group	18-29	419,408	8,126,032	5.16%	136,784	8,126,032	1.68%
	30-39	518,128	7,461,814	6.94%	144,907	7,461,814	1.94%
	40-49	427,757	8,103,835	5.28%	109,961	8,103,835	1.36%
	50-64	534,578	12,013,068	4.45%	167,949	12,013,068	1.40%
	65+	799,278	7,820,690	10.22%	245,798	7,820,690	3.14%
Smoking status	Never	1,552,470	27,333,551	5.68%	487,175	27,333,551	1.78%
	Former	363,692	6,630,833	5.48%	106,170	6,630,833	1.60%
	Current	782,987	9,561,055	8.19%	212,054	9,561,055	2.22%

KNHANES 2010-2016

Table 1. Weighted characteristics of the study subjects (aged ≥ 40 years) in the KNHANES 2010–2016

Characteristics	No chronic cough	Chronic cough	P value
Prevalence (%)	96.52 ± 0.17	3.48 ± 0.17	-
Age (yr)	55.89 ± 0.12	57.27 ± 0.55	0.012
Cough duration (yr)	-	7.76 ± 0.46	-
Men (%)	47.64 ± 0.36	60.80 ± 2.22	< 0.001
Smoking history (%)			< 0.001
Never	56.26 ± 0.40	39.43 ± 2.26	
Former	23.66 ± 0.35	17.56 ± 1.67	
Current	20.08 ± 0.37	43.01 ± 2.40	
BMI category (%)			0.350
< 18.5 kg/m ²	1.62 ± 0.11	1.97 ± 0.51	
18.5–24.9 kg/m ²	60.71 ± 0.42	57.10 ± 2.09	
25.0–29.9 kg/m ²	33.29 ± 0.41	36.40 ± 2.02	
≥ 30 kg/m ²	4.38 ± 0.18	4.52 ± 0.94	
Medical conditions (%)			
Asthma	1.41 ± 0.10	11.74 ± 1.39	< 0.001
COPD*	0.19 ± 0.04	3.04 ± 0.71	< 0.001
Allergic rhinitis†	8.49 ± 0.30	13.16 ± 1.76	0.009
Diabetes mellitus	9.37 ± 0.24	11.94 ± 1.37	0.109
Hypertension	25.66 ± 0.41	26.27 ± 1.96	0.769
Dyslipidemia	12.22 ± 0.28	11.81 ± 1.58	0.771
Angina/MI	2.26 ± 0.12	3.25 ± 0.78	0.132
Stroke	3.48 ± 1.78	2.92 ± 0.97	0.590
Arthritis	13.45 ± 0.31	18.6 ± 1.72	< 0.001
Depression	2.46 ± 0.14	4.85 ± 0.91	0.003

BOLD 2003-2016

	With chronic cough (n = 3444)	Without chronic cough (n = 30,539)	Total (n = 33,983)
Age (years), mean (SD)	57 (13)	56 (11)	55 (11)
Sex, n (%)			
Females	1873 (54.4%)	16,255 (53.2%)	18,128 (53.3%)
Males	1571 (45.6%)	14,284 (46.8%)	15,855 (46.7%)
BMI (kg.m ⁻²), mean (SD)	27.2 (6.2)	26.42 (5.6)	26.5 (5.7)
Smoking status, n (%)			
Current smokers	1068 (31.0%)	5353 (17.5%)	6421 (18.9%)
Ex-smokers	705 (20.5%)	5772 (18.9%)	6477 (19.1%)
Never smokers	1671 (48.5%)	19,414 (66.6%)	21,085 (62.0%)
Passive smoking, n (%)	885 (25.7%)	5595 (18.3%)	6480 (19.2%)
Ever worked in a dusty job, n (%)	1497 (43.5%)	9660 (31.6%)	11,157 (32.8%)
Duration of work in a dusty job (years), mean (SD)	8 (13)	5 (11)	6 (11)
Schooling (years), mean (SD)	8 (5)	9 (5)	9 (5)
History of tuberculosis, n (%)	153 (4.4%)	624 (2.0%)	777 (2.3%)
Hypertension, n (%)	1178 (34.2%)	7429 (24.3%)	8607 (25.3%)
FEV1/FVC (%), mean (SD)	73.7 (12.0)	78.1 (8.2)	77.7 (8.7)

In the clinic?



Discrepancies with Epidemiological Data

Characteristic	Male (n=105)	Female (n=320)	p-value
Age, yr	42.2±14.7	52.1±14.8	<0.001
Cough duration, wk	69.8±200.1	61.3±168.1	0.666
Cough NRS			
Baseline	5.5±1.8	5.3±1.6	0.376
After initial treatment	2.5±1.8	2.6±1.9	0.762
After 4 weeks treatment	1.0±1.0	1.3±1.5	0.116
Initial impression			
UACS	58 (55.2)	164 (51.3)	0.478
CVA	44 (41.9)	174 (54.4)	0.027
EB	7 (6.7)	21 (6.6)	0.970
GERD	15 (14.3)	41 (12.8)	0.699
Final diagnosis			
UACS	61 (58.1)	167 (52.2)	0.292
CVA	35 (33.3)	165 (51.6)	0.001
EB	11 (10.5)	22 (6.9)	0.232
GERD	15 (14.3)	48 (15.0)	0.858

Discrepancies with Epidemiological Data

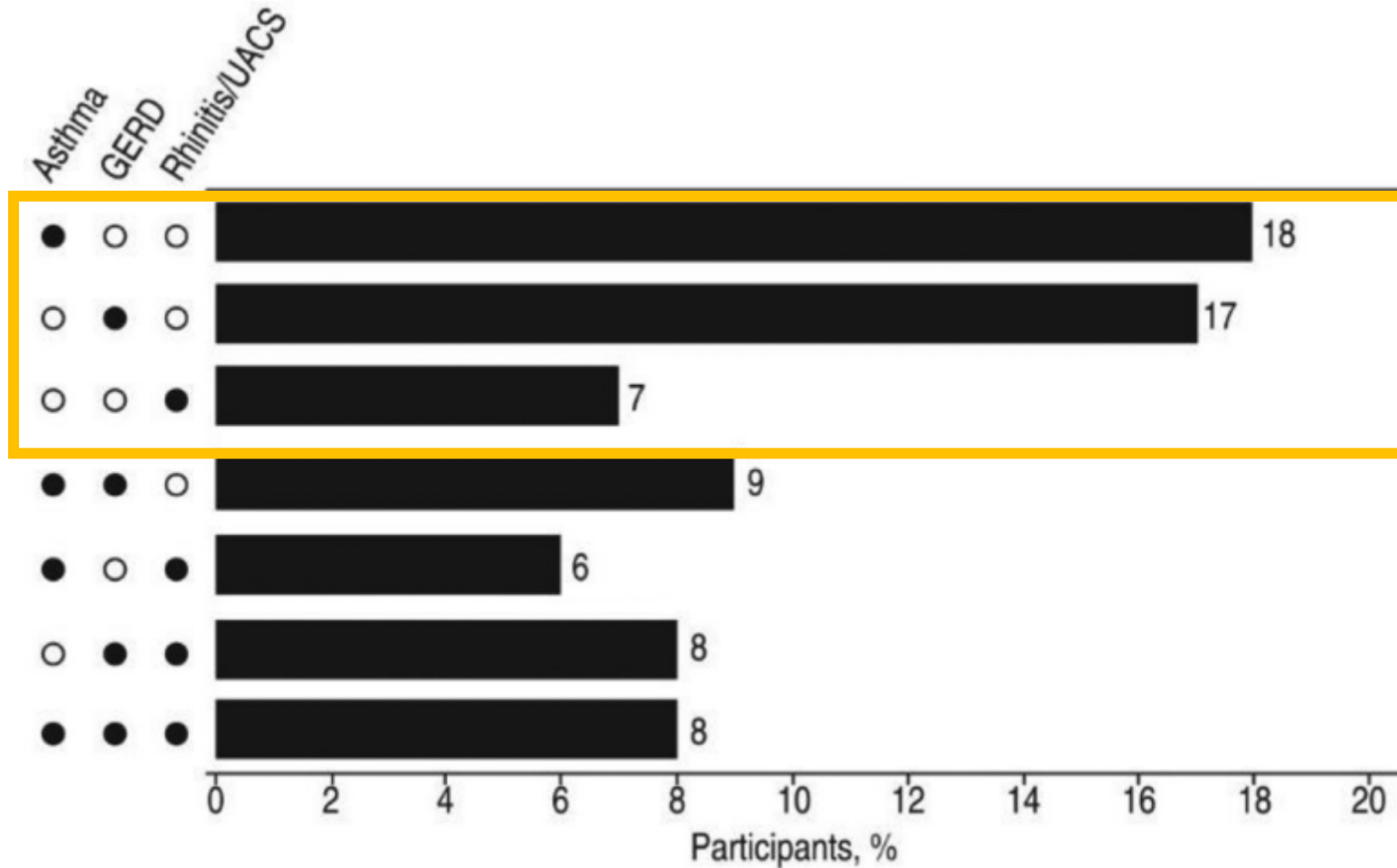
Table 2 Baseline characteristics of subjects with newly referred CC and RUCC

	Total (n=610)	Newly referred CC (n=434)	RUCC (n=176)	<i>P</i> value*
Females, %	66.9%	65.4%	70.5%	0.233
Age, years	59.0 (IQR 43.8–67.0)	58.0 (IQR 41.8–65.0)	62.0 (IQR 49.5–69.0)	0.001
Age at cough onset, years	50.1 (IQR 34.0–61.0)	49.0 (IQR 34.0–60.6)	51.0 (IQR 33.0–62.0)	0.530
Cough duration, years	4.0 (IQR 1.0–10.0)	3.0 (IQR 1.0–10.0)	6.0 (IQR 3.0–10.0)	<0.001
Family history of chronic cough	31.0%	30.0%	33.3%	0.424
BMI, kg/m ²	24.6 ± 4.4	24.7 ± 4.6	24.5 ± 3.8	0.814
Smoking status, %				
Non-smoker	75.7%	75.1%	77.3%	0.573
Ex-smoker	19.7%	19.4%	20.5%	0.757
Current smoker	4.6%	5.5%	2.3%	0.090
Recent ACE inhibitor use, %	0.7%	1.0%	0%	0.327
Comorbidity, %				
Hypertension	26.5%	23.9%	32.8%	0.026
GERD	20.0%	20.8%	17.9%	0.424
Diabetes mellitus	10.4%	10.2%	11.0%	0.767
Asthma	9.1%	7.1%	13.9%	0.009
Thyroid diseases	5.9%	6.2%	5.2%	0.647
Post-tuberculosis lung sequelae	5.2%	5.7%	4.0%	0.417
Arrhythmia	2.4%	2.4%	2.3%	1.000
Heart failure	1.2%	1.2%	1.2%	1.000
Autoimmune diseases	0.7%	0.5%	1.2%	0.584

Discrepancies with Epidemiological Data

Parameter	Primary diagnosis RCC (n = 1258)	Primary diagnosis UCC (n = 786)	Total patient population (N = 2044)
Sex, n (%)			
Female	950 (76)	576 (73)	1526 (75)
Male	308 (24)	210 (27)	518 (25)
Age, y			
Mean (SD)	59 (12)	58 (12)	58 (12)
Median (range)	61 (19-88)	60 (19-89)	60 (19-89)
Age, n (%)			
< 65 y	801 (64)	526 (67)	1327 (65)
≥ 65 y	457 (36)	260 (33)	717 (35)
Geographic region, n (%)			
Asia Pacific	111 (9)	73 (9)	184 (9)
Europe	633 (50)	447 (57)	1080 (53)
North America	282 (22)	179 (23)	461 (23)
Latin America	232 (18)	87 (11)	319 (16)
Race, n (%)			
American Indian or Alaskan Native	59 (5)	34 (4)	93 (4)
Asian	86 (7)	62 (8)	148 (7)
Black or African American	23 (2)	16 (2)	39 (2)
Multiple	87 (7)	41 (5)	128 (6)
Native Hawaiian or other Pacific Islander	4 (<1)	5 (1)	9 (<1)
White	999 (79)	628 (80)	1627 (80)
Ethnicity, n (%)			
Hispanic or Latino	269 (21)	99 (13)	368 (18)
Not Hispanic or Latino	976 (78)	675 (86)	1651 (81)
Not reported	7 (1)	10 (1)	17 (1)
Not known	6 (<1)	2 (<1)	8 (<1)
BMI, mean (SD), kg/m ²	28.8 (5.8) ^a	28.3 (5.7)	28.6 (5.8) ^b

Discrepancies with Epidemiological Data



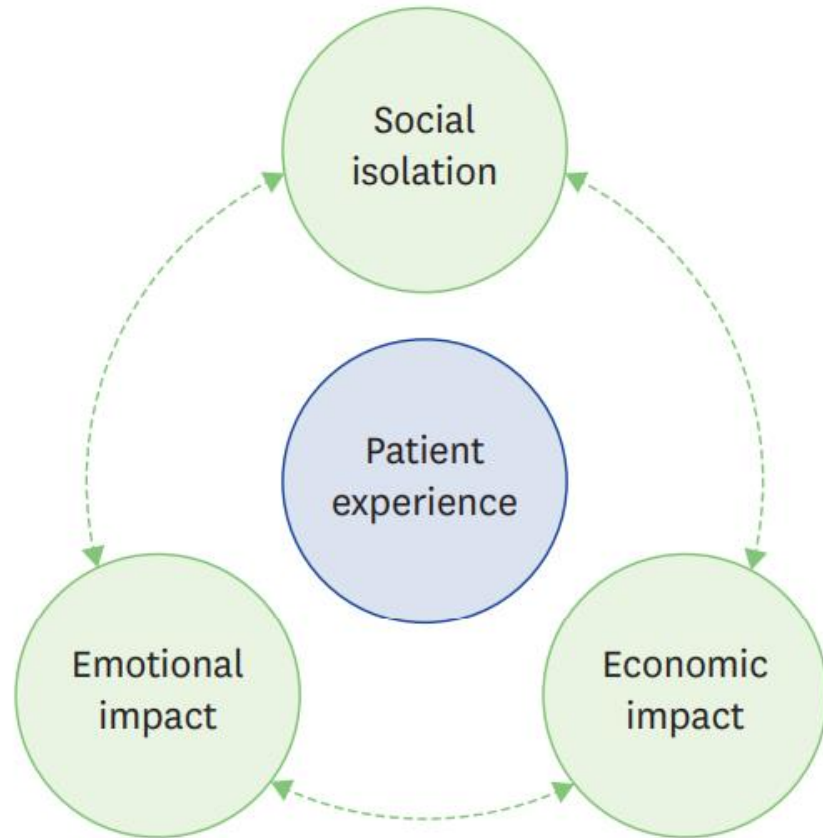
Contents

Prevalence of chronic cough

Burden of chronic cough

Future perspectives

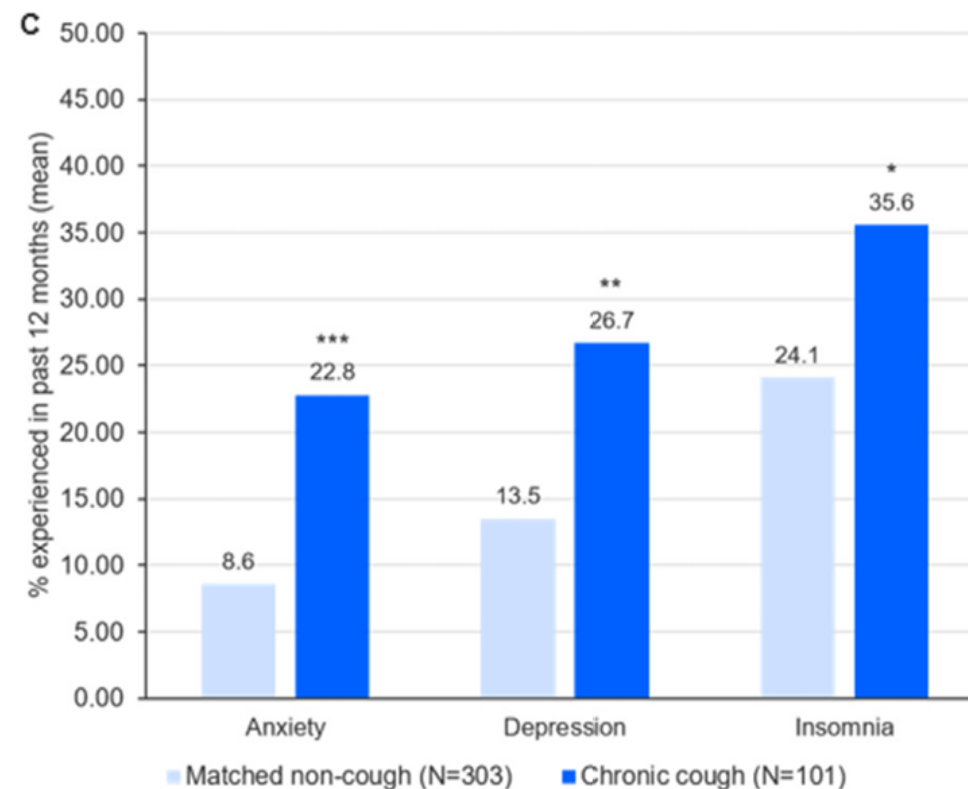
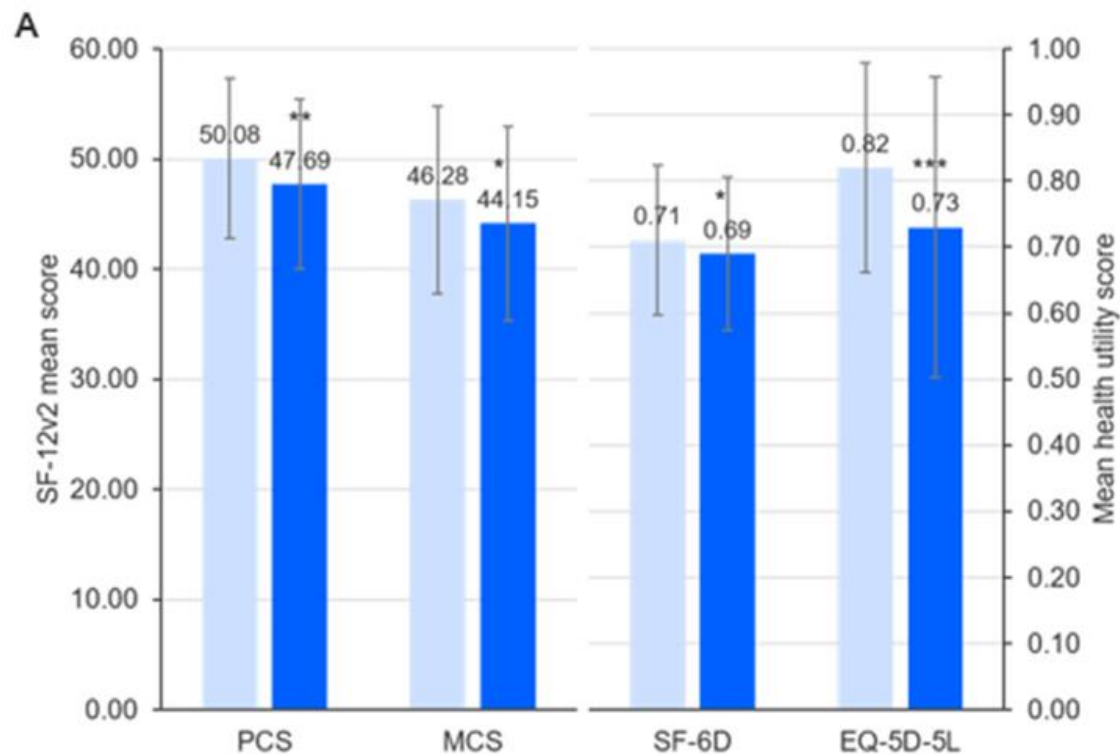
Impact of CC



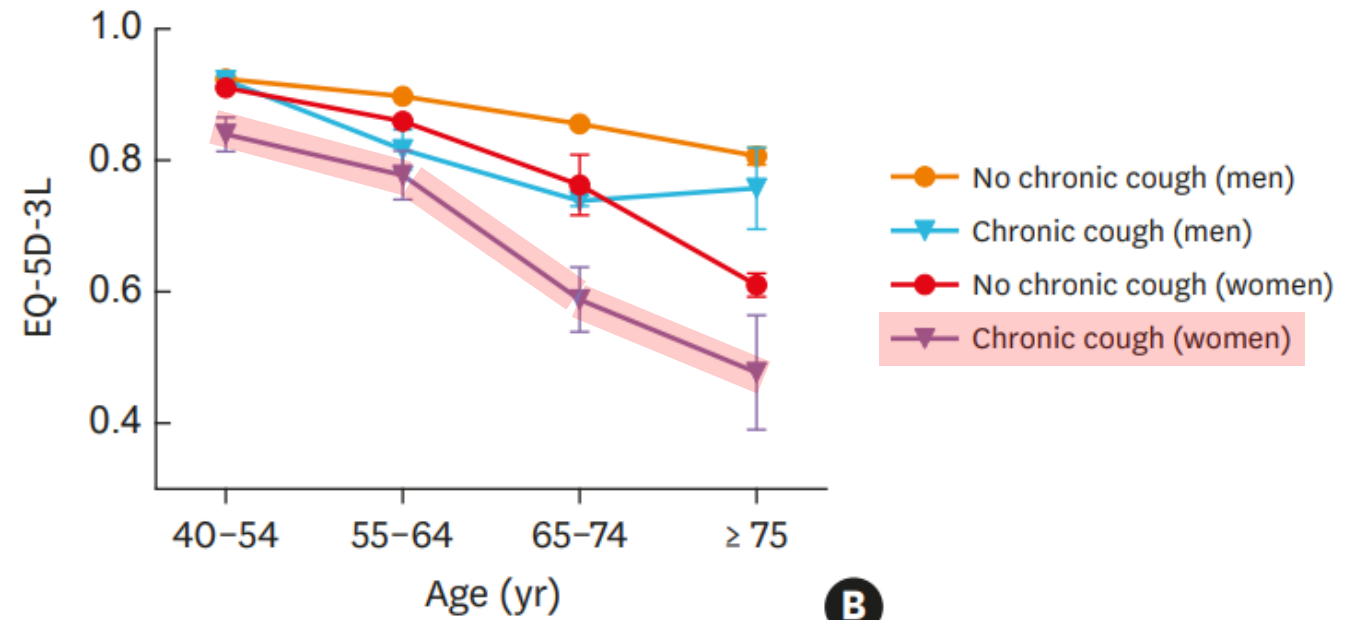
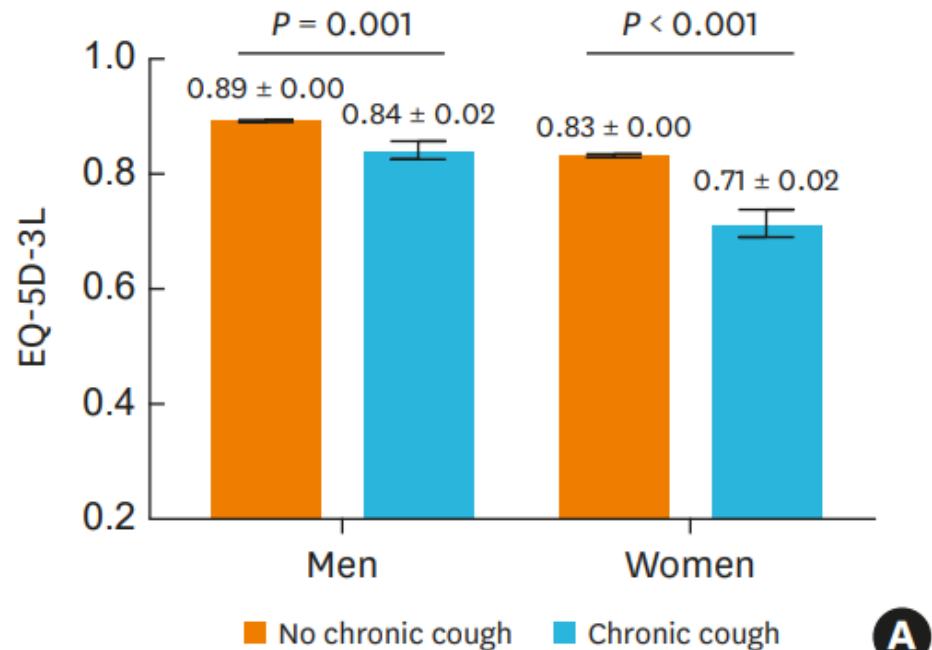
Unmet clinical needs

- 1) Clear information
- 2) Treatment
- 3) Specialists

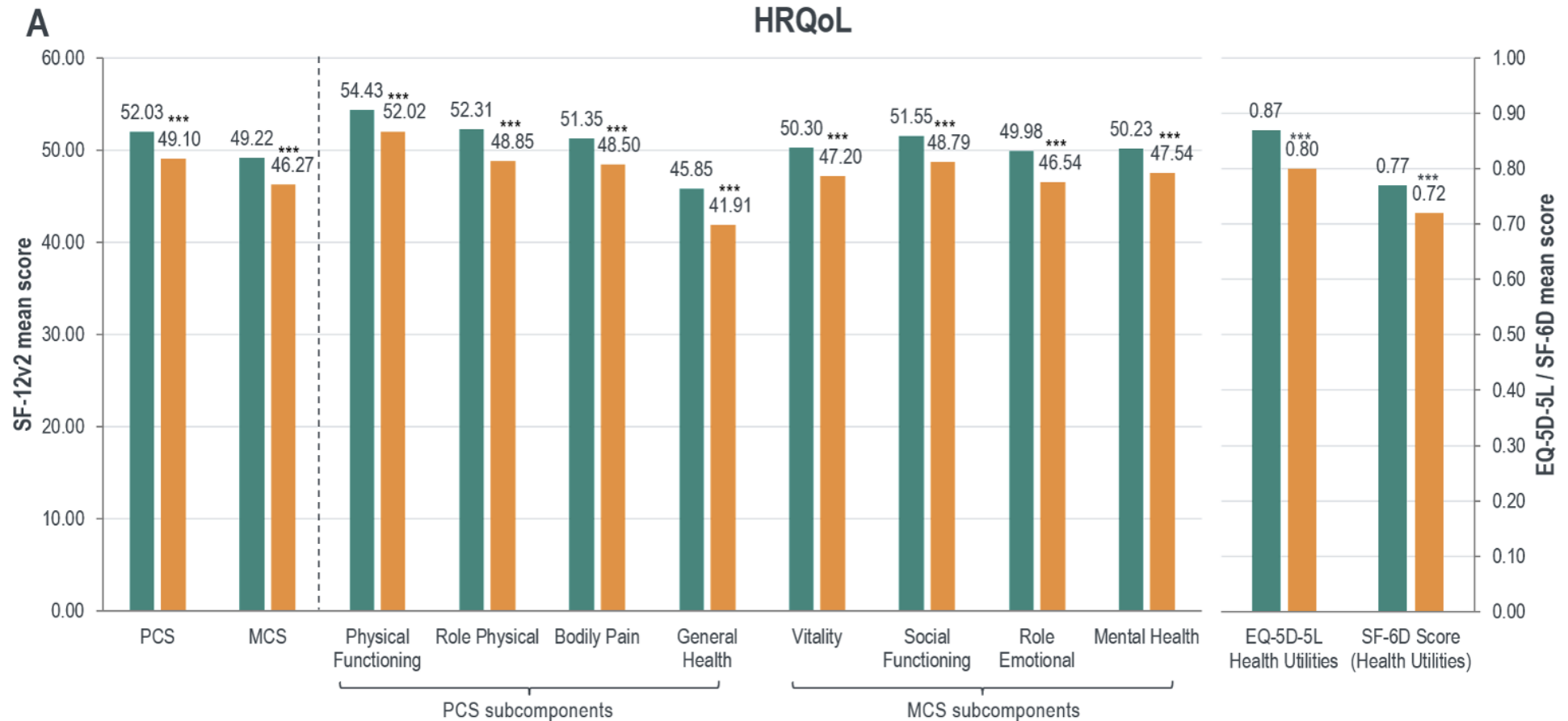
Impact of CC on QoL from National study: South Korea



Impact of CC on QoL from National study: South Korea



Impact of CC on QoL from National study: Japan



Narrowing inclusion criteria

Age \geq 18

Experienced a cough on most days for the past 8 weeks or longer despite taking treatment for the cough

Not currently smoking cigarettes or must have quit at least 1 year ago

Former smokers must not have smoked \geq 20 pack

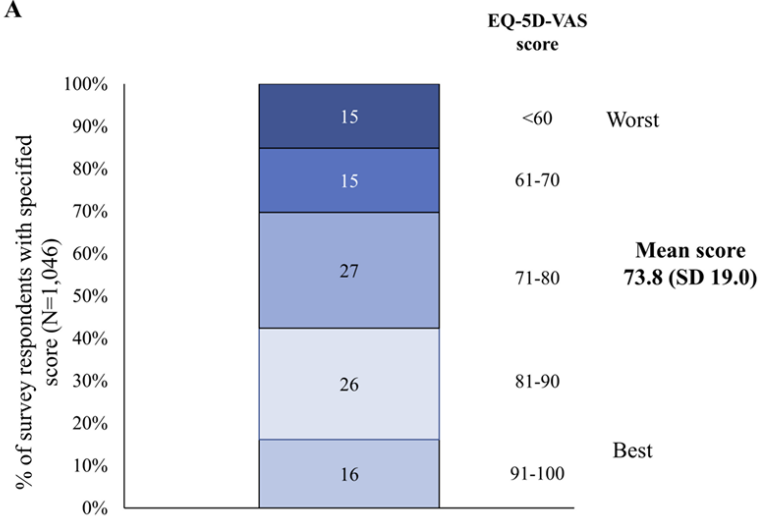
No prior diagnosis of IPF, COPD, or lung cancer

Not currently taking ACE inhibitors

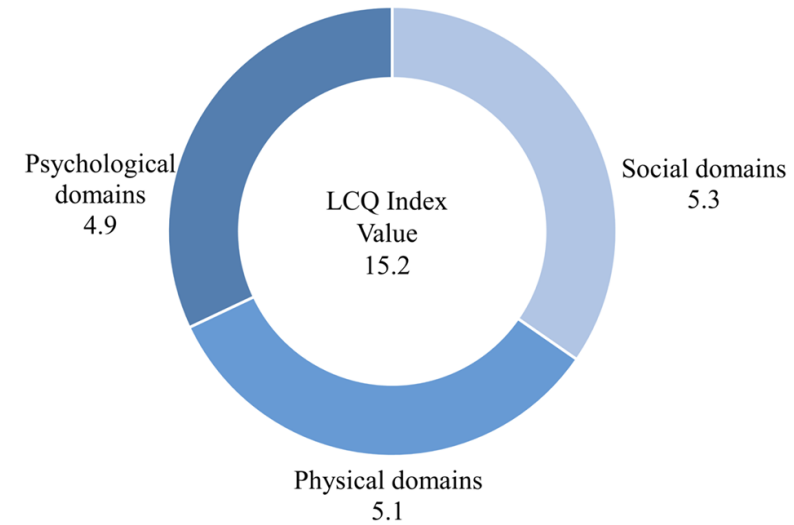
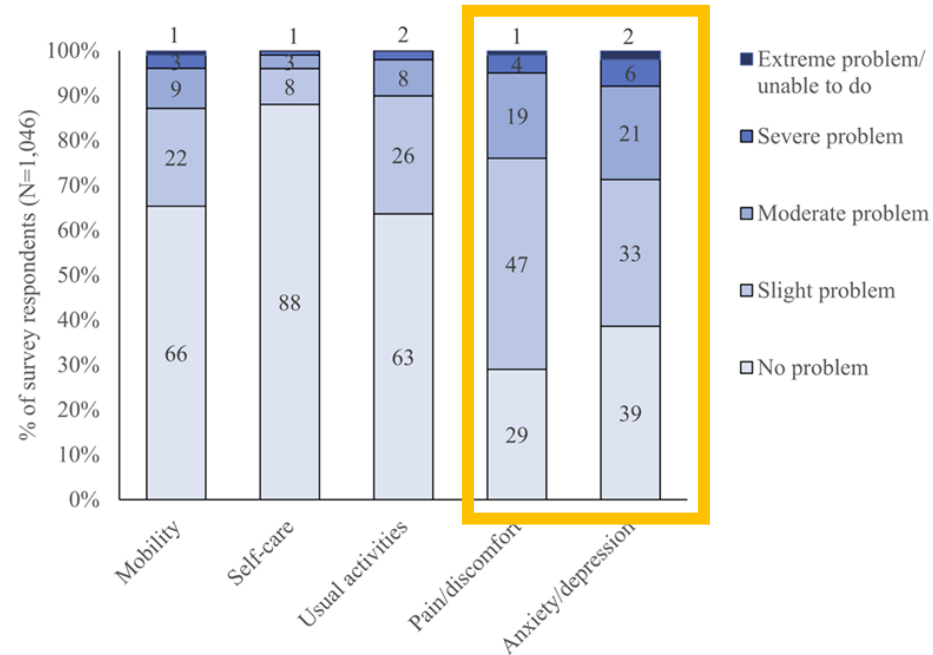
Not diagnosed with COVID-19 within the past 6 months

Impact of CC on QoL from regional survey: Canada

A



B



Psychological impact of CC

Symptoms experienced	Cough origin		
	RCC (N=15)	UCC (N=15)	Total (N=30)
Impacts on daily function			
Communicating	10 (67)	7 (47)	17 (57)
Sleep	7 (47)	7 (47)	14 (47)
Socializing	5 (33)	4 (27)	9 (30)
Intimate relationships	5 (33)	3 (20)	8 (27)
Ability to concentrate	3 (20)	4 (27)	7 (23)
Food choices	4 (27)	3 (20)	7 (23)
Participate in sports/exercise/hobbies	4 (27)	3 (20)	7 (23)
Ability to do every day physical activities/ level of exertion	3 (20)	2 (13)	5 (17)
Ability to do household activities	1 (7)	2 (13)	3 (10)
Reduced productivity (amount of work or effort able to put into work/school)	3 (20)	0 (-)	3 (10)
Complete other usual activities	1 (7)	1 (7)	2 (7)
Care for themselves (getting washed/ dressed)	0 (-)	0 (-)	0 (-)
Caring for others	0 (-)	1 (7)	1 (3)
Reduced productivity at home	1 (7)	1 (7)	2 (7)
Missing work/school	1 (7)	0 (-)	1 (3)

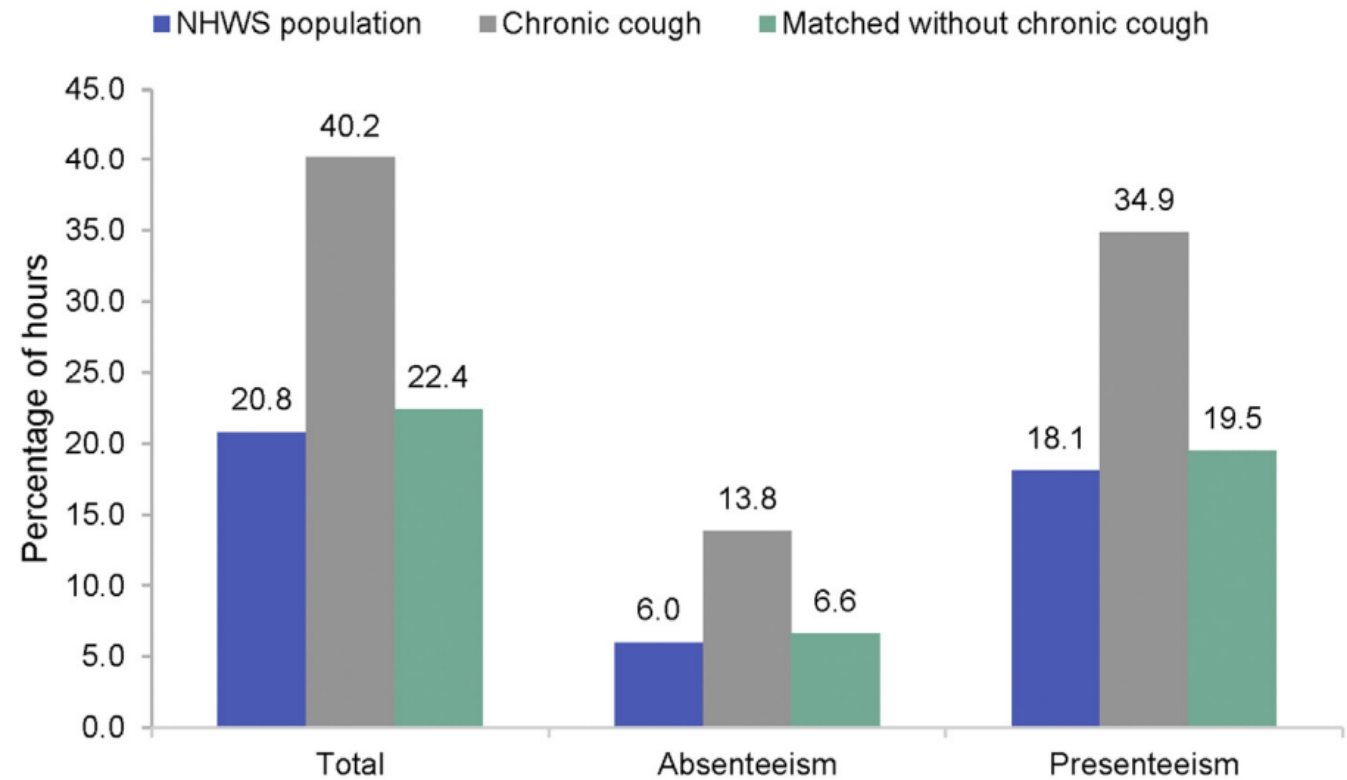
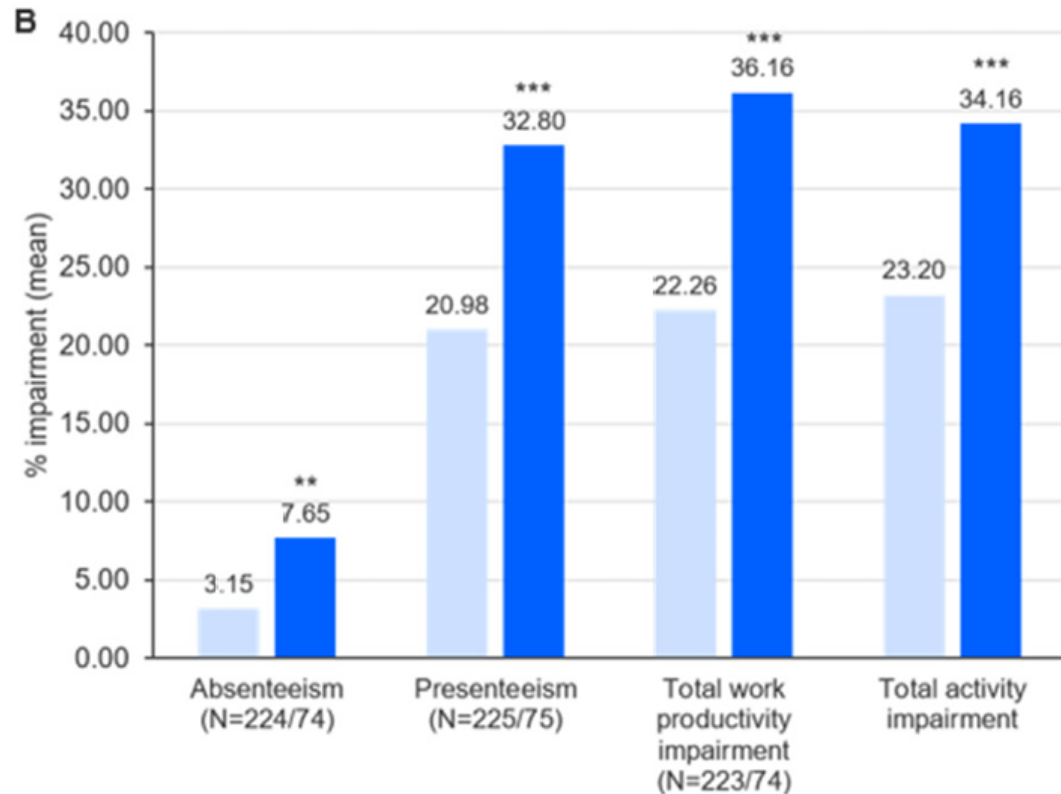
Psychosocial impact

Frustration	9 (60)	12 (80)	21 (70)
Embarrassment	7 (47)	10 (67)	17 (57)
Worried	5 (33)	12 (80)	17 (57)
Overall quality of life (negative impact)	8 (53)	6 (40)	14 (47)
Stigma	4 (27)	4 (27)	8 (27)
Depression	4 (27)	3 (20)	7 (23)
Anxiety	1 (7)	5 (33)	6 (20)
Irritability	2 (13)	3 (20)	5 (17)
Helplessness	2 (13)	0 (-)	2 (7)
Hopelessness	1 (7)	0 (-)	1 (3)

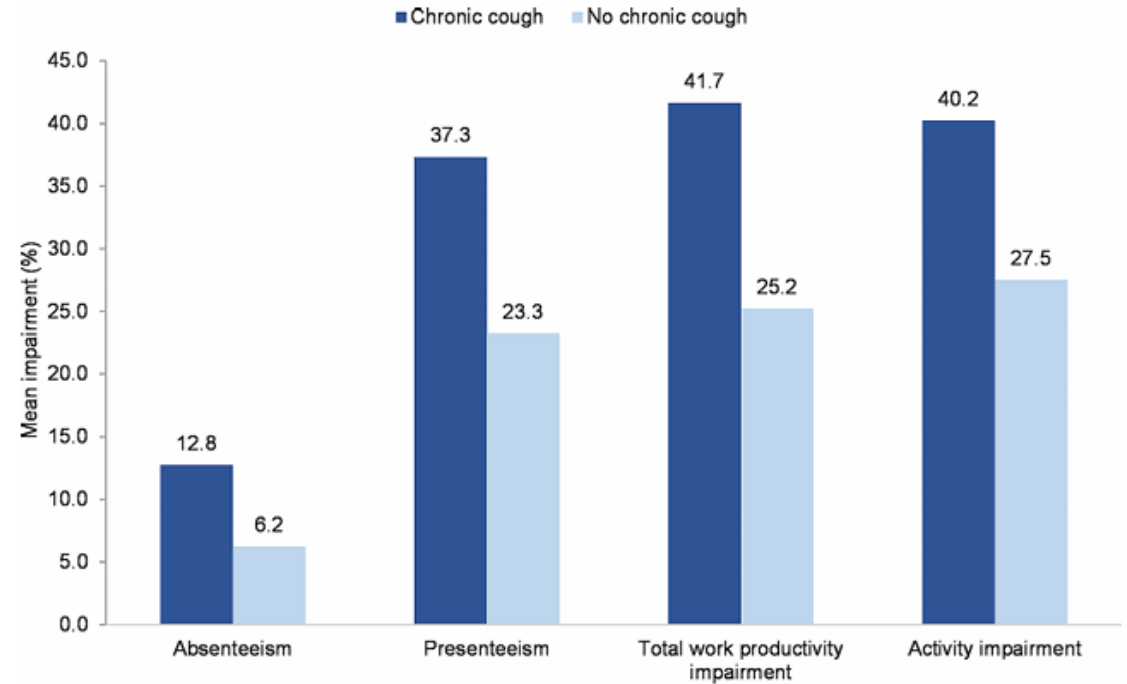
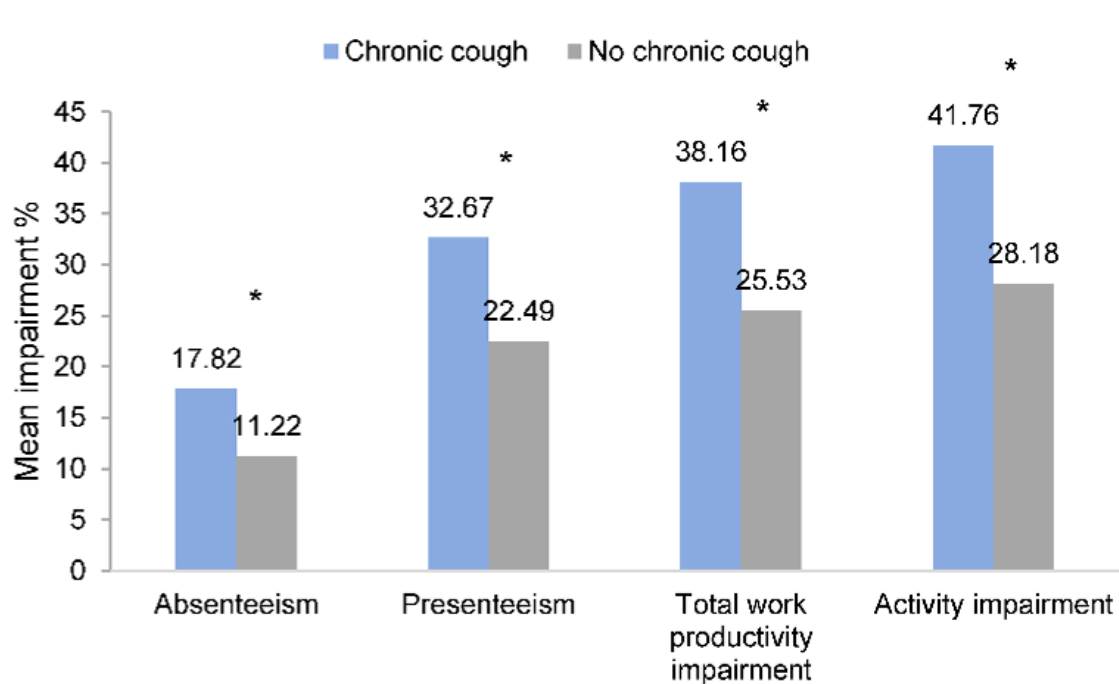
Psychological impact of CC

Symptom/description	Total (N = 30) ^b	Impact on daily life/emotional impacts	
Physical symptoms		Embarrassed/annoyed/nuisance around people; annoying or disturbing others	11 (37)
The cough itself	3 (10)	Disrupts life	6 (20)
Chest pain	2 (7)	Perception of others they are infectious	3 (10)
Mucus	2 (7)	Social isolation	2 (7)
Gagging, cannot breathe	1 (3)	Trying to get back to sleep/lack of sleep	2 (7)
Persistence of cough	1 (3)	Avoiding intimate relationships	1 (3)
Postnasal drip	1 (3)	Cough is irritating	1 (3)
Reflux	1 (3)	Coughing to the point of sounding like they are choking	1 (3)
Shortness of breath	1 (3)	Fear/worry	1 (3)
The cough is terrible, the worst thing in their life	1 (3)	Keeping spouse awake	1 (3)
Throat pain	1 (3)	Not being able to do things normally like others	1 (3)
Unpredictability	1 (3)	Not looking sick on the outside	1 (3)
Urinary incontinence	1 (3)		
Wet weather and postnasal drip cause cough to be at its worst	1 (3)		

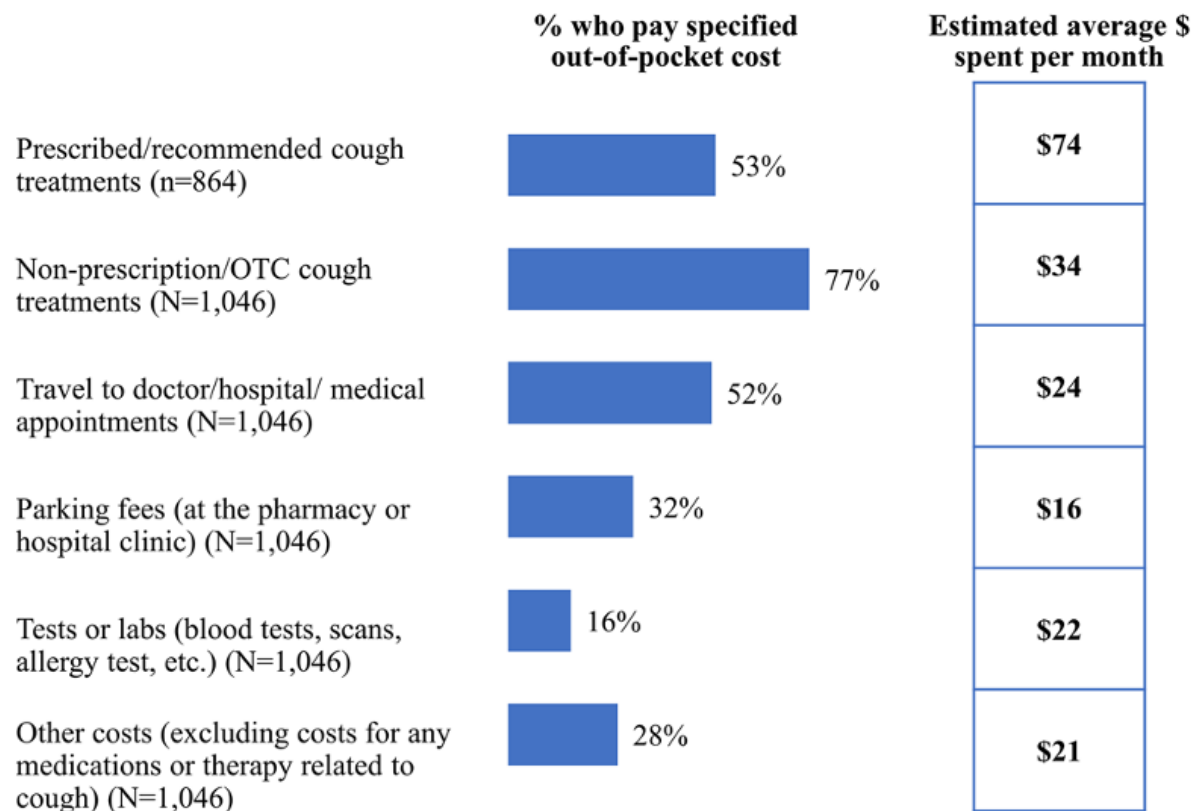
Economic impact of CC :South Korea/US



Economic impact of CC :France/Italy



Economic impact of CC from qualitative study



\$191 = 약 25만원

Economic impact of CC

	No current cough	Any current cough	Acute current cough	Subacute current cough	Chronic current cough
Subjects	2720	976	373	174	421
Subjects with any sick leave day due to cough within 12 months	15.3%	34.0%***	28.9%*	39.1%	36.3%
Subjects with ≥ 7 sick leave days due to cough within 12 months	3.5%	12.1%***	7.0%*	13.8%	16.0%
Subjects with any sick leave day due to any reason within 12 months	76.1%	85.8%***	84.4%	87.7%	87.1%
Subjects with ≥ 7 sick leave days due to any reason within 12 months	32.4%	45.7%***	40.1%**	54.4%**	48.0%

Healthcare utilization of CC

	CC	Matched No Cough	Unadjusted OR (95%CI) ^b	Adjusted ^a OR (95%CI) ^b	p-Value
Pulmonology visits	21,253 (35.8%)	1645 (2.8%)	13.16 (12.72–13.62)	12.05 (11.63–12.48)	<0.001
Allergy visits	5098 (8.6%)	708 (1.2%)	6.41 (6.06–6.78)	5.42 (5.12–5.74)	<0.001
ENT visits	27,655 (46.6%)	10,294 (17.4%)	3.33 (3.27–3.4)	2.73 (2.67–2.78)	<0.001
Sleep visits	1183 (2.0%)	416 (0.7%)	2.98 (2.72–3.26)	2.26 (2.06–2.49)	<0.001
PCP visits	59,111 (99.7%)	47,140 (79.5%)	2.22 (2.2–2.25)	2 (1.98–2.03)	<0.001
ED visits	9160 (15.4%)	4477 (7.6%)	2.38 (2.31–2.46)	1.94 (1.88–2.01)	<0.001
Gastroenterology visits	12,606 (21.3%)	6230 (10.5%)	2.19 (2.14–2.24)	1.76 (1.72–1.81)	<0.001
Hospital length of stay ^c	11,026 (18.6%)	6382 (10.8%)	1.9 (1.87–1.93)	1.77 (1.73–1.8)	<0.001
Hospital admissions ^c	11,026 (18.6%)	6382 (10.8%)	2.04 (1.99–2.1)	1.7 (1.65–1.75)	<0.001
Occupational physician visits	1795 (3.0%)	1009 (1.7%)	1.83 (1.72–1.94)	1.62 (1.53–1.73)	<0.001
Test and procedures	19,313 (32.6%)	3317 (5.6%)	1.42 (1.35–1.49)	1.42 (1.35–1.49)	<0.001

Healthcare utilization of CC

	Unadjusted			Adjusted ^a		
	Estimated Mean (95%CI) ^b		<i>p</i> -Value	Estimated Mean (95%CI) ^b		<i>p</i> -Value
	PwCC	Matched No Cough		PwCC	Matched No Cough	
Visits	1327 (1315–1340)	587 (582–592)	<0.001	1992 (1941–2044)	945 (920–970)	<0.001
Hospital and ED ^c	2726 (2660–2794)	2456 (2373–2543)	<0.001	5962 (5597–6351)	4853 (4526–5203)	<0.001
Test and procedures ^c	216 (213–219)	197 (191–204)	<0.001	268 (258–278)	241 (230–253)	<0.001
Medications ^c	85 (84–86)	55 (54–55)	<0.001	277 (269–285)	172 (167–177)	<0.001
Total costs	2095 (2074–2117)	885 (876–894)	<0.001	4038 (3922–4156)	1833 (1780–1888)	<0.001

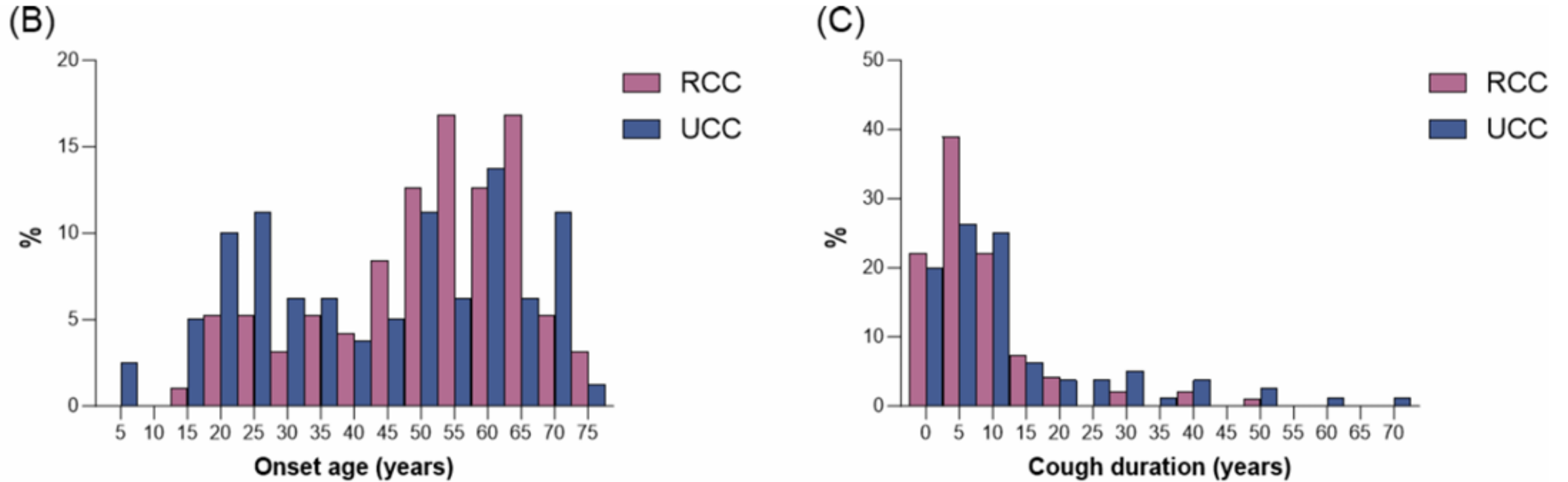
Contents

Prevalence of chronic cough

Burden of chronic cough

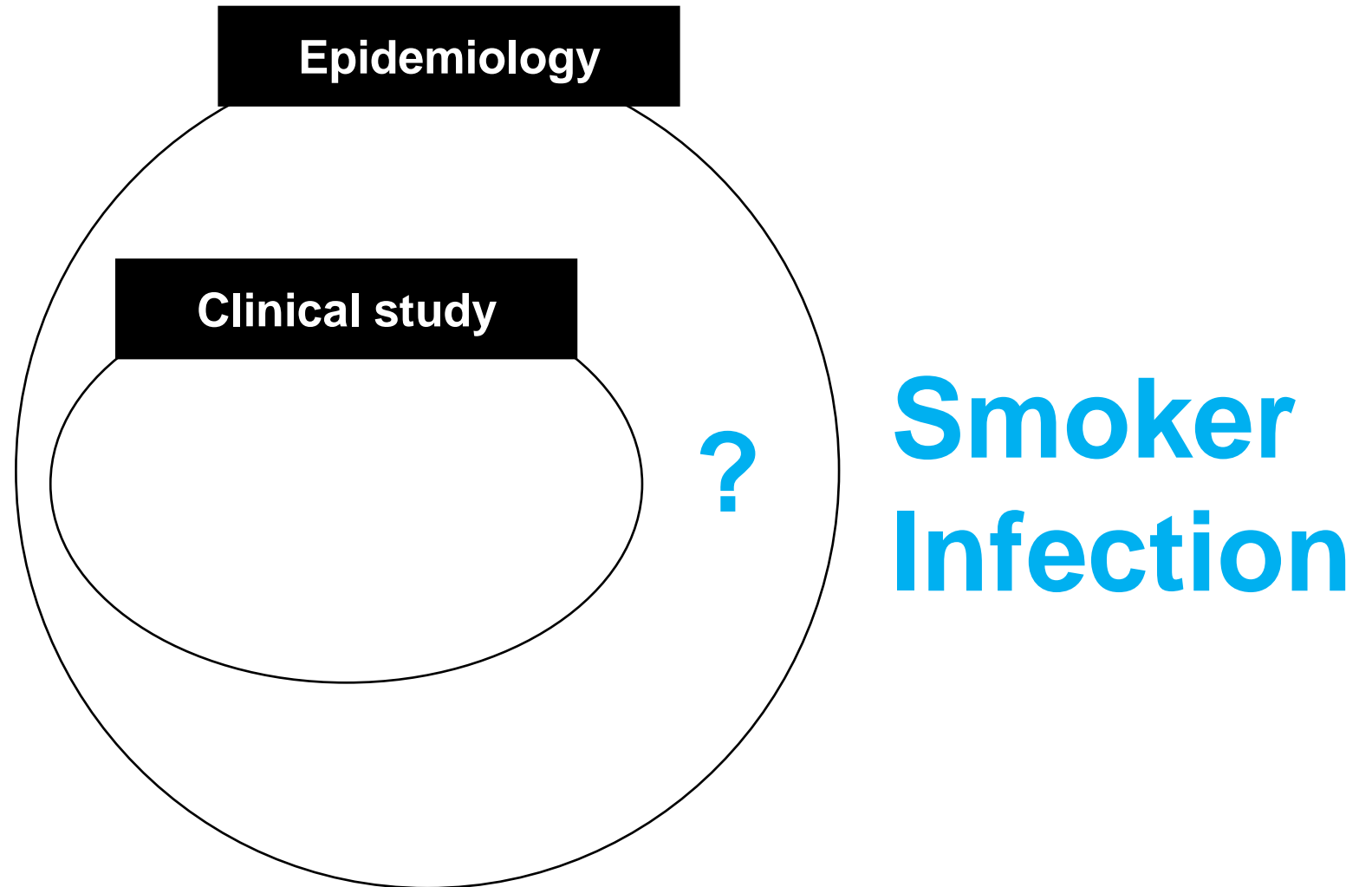
Future perspectives

Longitudinal outcome



Yousaf et al. 2012 [87]	UK	Retrospective cohort, based on a specialist cough clinic	42 Patients with unexplained chronic cough	7 Years	<ul style="list-style-type: none"> • Complete resolution: 14% • Improvement: 26% • No change: 24% • Worsening: 36% 	-
Koskela et al. 2017 [86]	Finland	Prospective cohort, based on a tertiary referral clinic, with newspaper advertisements	68 Patients with chronic cough (>8 weeks)	5 Years	<ul style="list-style-type: none"> • Continuing regular cough (on most days of the week at follow-up): 46% • Continuing impairment in cough-related QoL: 47% 	<p>For continuing regular cough (vs. no)</p> <ul style="list-style-type: none"> • Response-to-dose ratio to histamine at initial assessment (calculated per one %/mg): 0.19 (0.06–0.65) • Coughs-to-dose-ratio to hypertonic saline at initial assessment (calculated per one cough/Osm/kg): 2.4 (1.0–5.6) • Chronic rhinitis or reflux disease: 8.0 (2.2–29) <p>For continuing impairment in cough-related QoL (<1.3 points increase in the LCQ) (vs. no)</p> <ul style="list-style-type: none"> • Body mass index at initial assessment (calculated per one kg/m²): 1.5 (1.2–2.0) • Atopy (vs. no atopy): 0.19 (0.04–0.84)
Koskela et al. 2020 [88]	Finland	Prospective cohort, based on a community-based survey of public service employees	975 Patients with current cough	1 Year	<ul style="list-style-type: none"> • Continuing cough at 12 months (that continued without interruptions): 36% 27% in cluster A 46.1% in cluster B* 	<p>For continuing cough at 12 months (vs. no)</p> <ul style="list-style-type: none"> • Cluster B*: 2.31 (1.52–3.53)
Kang et al. 2020 [85]	Korea	Retrospective cohort, based on a specialist cough clinic	323 Patients with chronic cough (>8 weeks)	4 Years	<ul style="list-style-type: none"> • Chronic persistent cough (troublesome cough that is persistent for longer than 25% of the last 1 year): 20% • Remitted cough (no trouble with cough during the last 1 year): 60% 	<p>For chronic persistent cough (vs. remitted cough)</p> <ul style="list-style-type: none"> • Cough duration (months): 1.003 (1.000–1.006) • Cough with certain foods (0–5; HARQ, Q10[†]): 1.08 (0.89–1.33) • Cough with eating (0–5; HARQ, Q9[†]): 1.22 (1.02–1.45) • Cold air-sensitive cough (vs. no): 2.01 (1.09–3.73) • Family history of chronic cough (vs. no): 4.27 (1.35–9.89)

How to Define CC



How to estimate the burden of CC

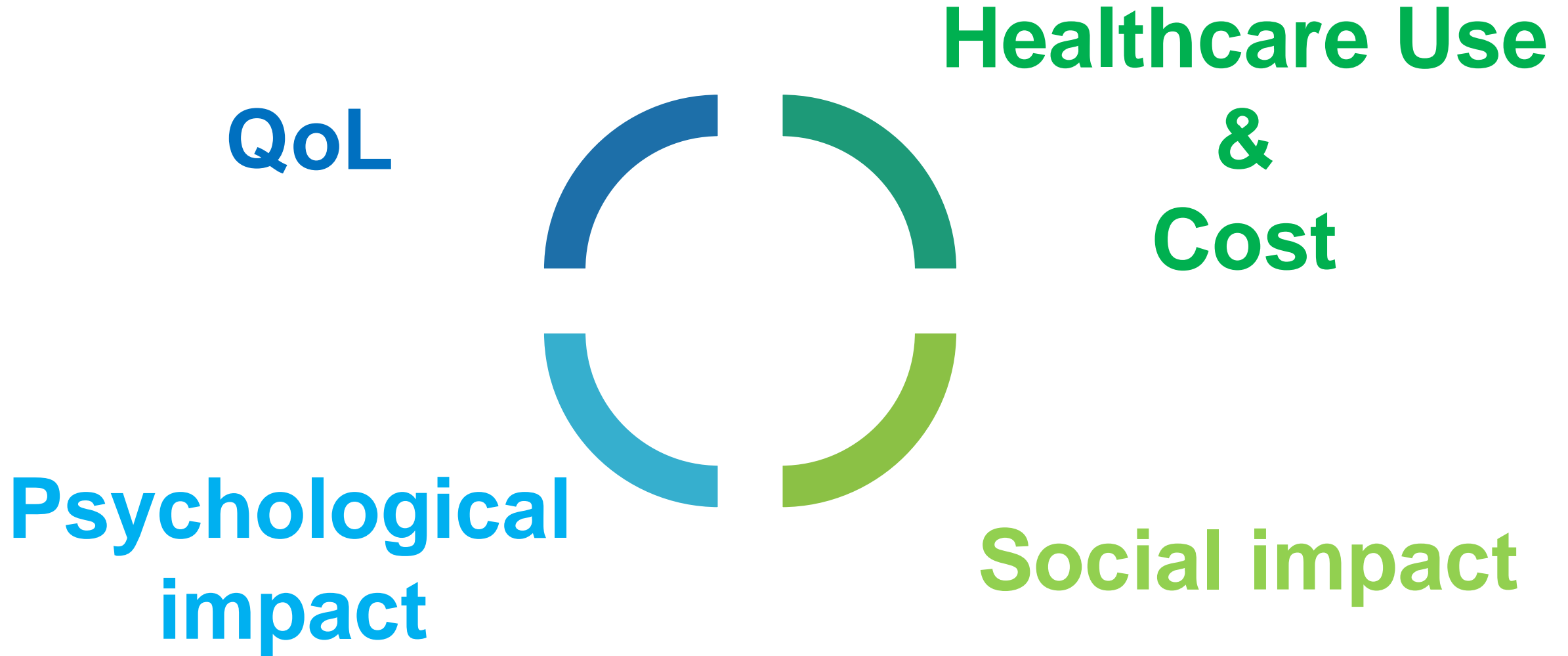


표 10. 레스터 기침 설문(Leicester cough questionnaire, LCQ)

이 설문지는 당신 삶의 다양한 측면에 대한 기침의 영향을 평가하기 위한 것입니다. 각 질문을 주의 깊게 읽고 귀하께 가장 잘 해당되는 답을 표시하시기 바랍니다. 가능한 정직하게 모든 질문에 답해 주시기 바랍니다.

01. 지난 2주 동안, 기침으로 인해 가슴통증이나 복통을 느낀 적이 있습니까?

1. 항상 2. 대부분 시간 3. 상당한 시간 4. 때때로 5. 약간 6. 거의 없음 7. 전혀 없음

02. 지난 2주 동안, 기침할 때 가래 때문에 불편했습니까?

1. 항상 2. 대부분 3. 여러 번 4. 때때로 5. 드물게 6. 거의 없음 7. 전혀 없음

03. 지난 2주 동안, 기침 때문에 피곤을 느꼈습니까?

1. 항상 2. 대부분 시간 3. 상당한 시간 4. 때때로 5. 약간 6. 거의 없음 7. 전혀 없음

04. 지난 2주 동안, 당신이 기침을 조절할 수 있다고 느꼈습니까?

1. 전혀 안됨 2. 거의 안됨 3. 약간 조절 4. 때때로 조절 5. 상당히 조절 6. 대부분 조절 7. 항상 조절됨

05. 지난 2주 동안, 당신은 기침 때문에 얼마나 자주 곤란함을 느끼셨습니까?

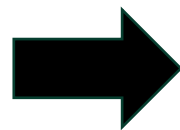
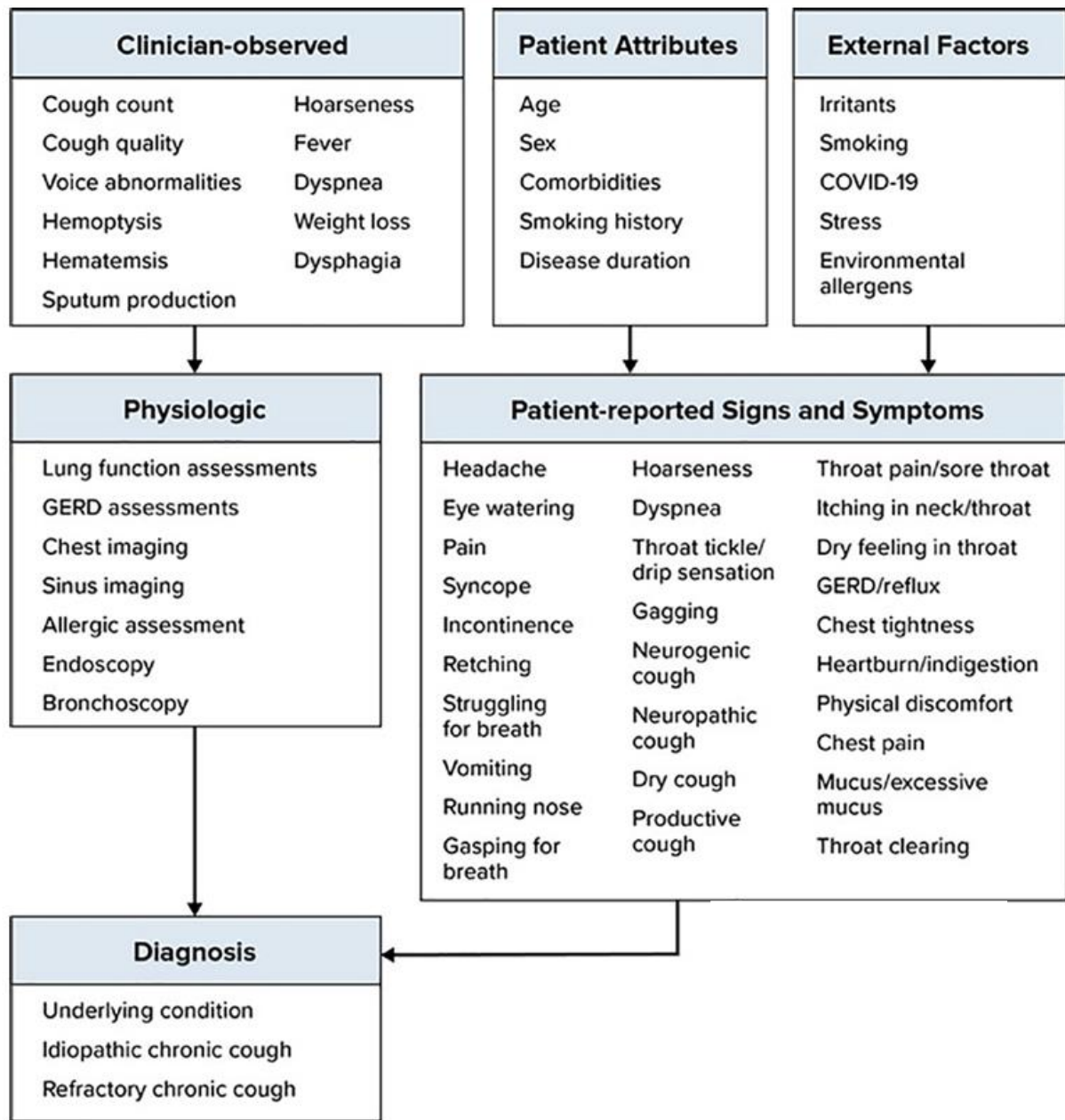
1. 항상 2. 대부분 시간 3. 상당한 시간 4. 때때로 5. 약간 6. 거의 없음 7. 전혀 없음

06. 지난 2주 동안, 나는 기침 때문에 걱정스러웠다.

1. 항상 2. 대부분 시간 3. 상당한 시간 4. 때때로 5. 약간 6. 거의 없음 7. 전혀 없음

07. 지난 2주 동안, 나는 기침 때문에 직장 생활이나 일상 생활을 하는데 지장이 있었다.

1. 항상 2. 대부분 시간 3. 상당한 시간 4. 때때로 5. 약간 6. 거의 없음 7. 전혀 없음



Impacts		
Fatigue/tiredness	Care for themselves	Ability to do everyday physical activities/level of exertion
Emotions (embarrassment, guilty, frustration, anxiety, and sadness)	Caring for others	Participate in hobbies
Communication	Socializing	Frustration
Everyday activities	Intimate relationships	Embarrassment
Self-image	Missing work/school	Stigma
Food choices	Reduced productivity at work/school/home	Anxiety
Sleep	Ability to concentrate	Depression
Negative consequence beliefs	Ability to do household activities	Irritability
Lower illness coherence		Helplessness
Reduced exercise tolerance		Hopelessness
		Worried
		Overall quality of life

Summary

Epidemiology

Around 10%, varied by data source and definition

Burden

Decreased quality of life, economic impact, psychological impact

Perspective

Longitudinal outcome, blind spot, validated tool for evaluating burdens in recent years