

Supplementary Table 1. International classification of Diseases 10th revision (ICD-10) codes used.

Comorbidity	ICD-10 codes
Main outcome	
Hospitalisation due to pneumonia	J12-18
Comorbidities used for exclusion	
Malignancy	C00-C43, C45-C99, D00-D03, D05-D09
Immune deficiency	D80-84, D86, D89
Comorbidities presented in Baseline	
Asthma	J45
Bronchiectasis	J47
Myocardial infarction	I21-I24
Congestive heart failure	I110, I30, I32, I42, I50, J81
Atrial fibrillation	I48
Hypertension	I10-I15
Renal failure	I120, I131, I132; E102, E112, E132, E142 N02-N08, N11, N14, N158-N165, N168, N18, N19, N26 Z992
Cerebrovascular disease	I60-I64, G45, G46
Diabetes Mellitus	E10-14

Supplementary Table 2. The Anatomical Therapeutic Chemical (ATC) codes used.

Medication	ATC
Disease-modifying anti-rheumatics drugs	A07EC01, L01AA01, L04AA06, L04AA13, L04AD01, L04AX01, L04AX03, P01BA02
Inhaled corticosteroids	R03AK06, R03AK07, R03AK08, R03AK10, R03AK11, R03AK14, R03AL08, R03AL09, R03AL11, R03AL12
Oral corticosteroids	H02AB06
Antibiotics	J01AA02, J01AA07, J01CA01, J01CA02, J01CA04, J01CA05, J01CA08, J01CA11, J01CE01, J01CE02, J01CF01, J01CR02, J01DB01, J01EB01, J01EB02, J01FA01, J01FA06, J01FA09, J01FA10, J01FF01, J01MA02, J01MA14, J01XC01, P01AB01
Long-Acting Beta-Agonist or Long-Acting Muscarinic Antagonist	R03AC12, R03AC13, R03AC18, R03AC19, R03AL03, R03AL04, R03AL05, R03AL06, R03AL07, R03AL08, R03AL09, R03AL10, R03AL11, R03BB04, R03BB05, R03BB06, R03BB07,
Theophylline	R03DA04
Leukotrine receptor antagonist	R03DC

Supplementary Table 3. ICS dosage equivalence conversion ratios.

ICS type	Factor
Budesonide	1:1
Mometasone	1:1
Beclomethasone	1:1
Beclomethasone HFA	1:2
Fluticasone propionate	1:2
Fluticasone furoate	1:10
Ciclesonide	1:2.5

Abbreviations: ICS: Inhaled Corticosteroids. HFA: Hydrofluoroalkane inhaler.

Supplementary Table 4. Unadjusted Cox hazard ratios for the unmatched population.

	HR (95% CI)	P-Value
Extra-fine particles ICS *	0.74 (0.62-0.88)	0.0006
ICS exposure group †		
Low (<420 µg/day)	ref	ref
Moderate (420-986 µg/day)	1.34 (1.23-1.45)	<.0001
High (>986 µg/day)	1.82 (1.69-1.97)	<.0001
Male	1.11 (1.04-1.17)	0.001
Age group		
<62	ref	ref
62-69	1.44 (1.30-1.60)	<.0001
70-77	1.92 (1.74-2.12)	<.0001
>77	2.82 (2.56-3.11)	<.0001
BMI class, kg/m ²		
<18.5	1.4 (1.27-1.54)	<.0001
18.5-24.9	ref	ref
25-29.9	0.83 (0.77-0.89)	<.0001
30-34.9	0.71 (0.64-0.79)	<.0001
≥35	0.80 (0.71-0.91)	0.0007
Gold stage according to FEV1(%)		
≥ 80	ref	ref
79-50	1.39 (1.13-1.70)	0.002
49-30	2.20 (1.8-2.68)	<.0001
<30	3.0 (2.45-3.67)	<.0001
Smoking status		
Active	0.8 (0.6-0.96)	0.02
Former	ref	Ref
Never	0.90 (0.84-0.96)	0.002
Number of OCS treatments		
0	Ref	ref
1	1.38 (1.25-1.53)	<.0001
2	1.93 (1.81-2.06)	<.0001
Asthma	0.92 (0.86-0.98)	0.016

* Spray devices containing beclomethason HFA solutions or ciclesonide are categorized as extra-fine particles, all other ICS devices are categorized as standard particle size.

† Based on ICS accumulated budesonide equivalent dose one year prior to cohort entry. Budesonide equivalent dose was calculated using ratios summarized in table 5.

Abbreviations: HR: Hazard ratio. ICS: Inhaled Corticosteroids. BMI: Body Mass Index. FEV1: Forced Expiratory Volume in the first second. OCS: Oral corticosteroids.

Supplementary Table 5. Additional baseline characteristics. main findings are presented in Table 1.

	Entire cohort (n=35,691)		Propensity-matched population* (n=7,986)	
	Standard particles ICS [†] (n=34,220)	Extra-fine particles ICS [†] (n=1,471)	Standard particle size ICS [†] (n=6,654)	Extra-fine particles ICS [†] (n=1,332)
<i>Comorbidities[‡], n (%)</i>				
Asthma	9,184 (26.8)	555 (37.7)	2,449 (36.8)	492 (36.9)
Bronchiectasis	1,160 (3.4)	99 (6.7)	295 (4.4)	84 (6.3)
Myocardial infarction	4,543 (13.3)	153 (10.4)	860 (12.9)	139 (10.4)
Congestive heart failure	8,793 (25.7)	279 (19.0)	1,641 (24.7)	252 (18.9)
Atrial fibrillation	4,663 (13.6)	156 (10.6)	898 (13.5)	141 (10.6)
Hypertension	8,670 (25.3)	353 (24.0)	1,664 (25.0)	325 (24.4)
Renal failure	3,178 (9.3)	113 (7.7)	613 (9.2)	108 (8.1)
Cerebrovascular disease	5,631 (16.5)	206 (14.0)	1,068 (16.1)	183 (13.7)
Diabetes	5,674 (16.6)	207 (14.1)	1,163 (17.5)	191 (14.3)
<i>Medication based on redeemed prescriptions 365 days prior to cohort entry</i>				
LABA or LAMA users, n (%)	27,394 (80.1)	1,246 (84.7)	5,364 (80.6)	1,150 (86.3)
Leukotrine receptor antagonist user, n (%)	1,376 (4.0)	130 (8.8)	341 (5.1)	110 (8.3)
Theophylline user, n (%)	1,164 (3.4)	50 (3.4)	255 (3.8)	46 (3.5)
Any use of antibiotic, n (%)	26,065 (76.2)	1,143 (77.7)	5,205 (78.2)	1,039 (78.0)

* Propensity matched cohort. Propensity matching was done using a greedy match algorithm matching up to five controls receiving standard particle size ICS per case receiving extra-fine particles. Matching was done on the following variables: age, sex, smoking status, forced expiratory volume in the first second, body mass index, daily use of inhaled corticosteroids in budesonide equivalent dose, number of oral corticosteroids treatments, and overlapping asthma.

[†] Devices containing beclomethason hydrofluoroalkane solutions or ciclesonide sprays were categorized as extra-fine particles, all other ICS devices were categorized as standard particle size.

[‡] Based on registered comorbidities 5 years prior to first outpatient visit. ICD-10 codes used are summarized in supplementary table 1.

Abbreviations: ICS: Inhaled Corticosteroids. IQR: Interquartile Range. LABA: Long-Acting Beta-Agonist. LAMA: Long-Acting Muscarinic Antagonist.