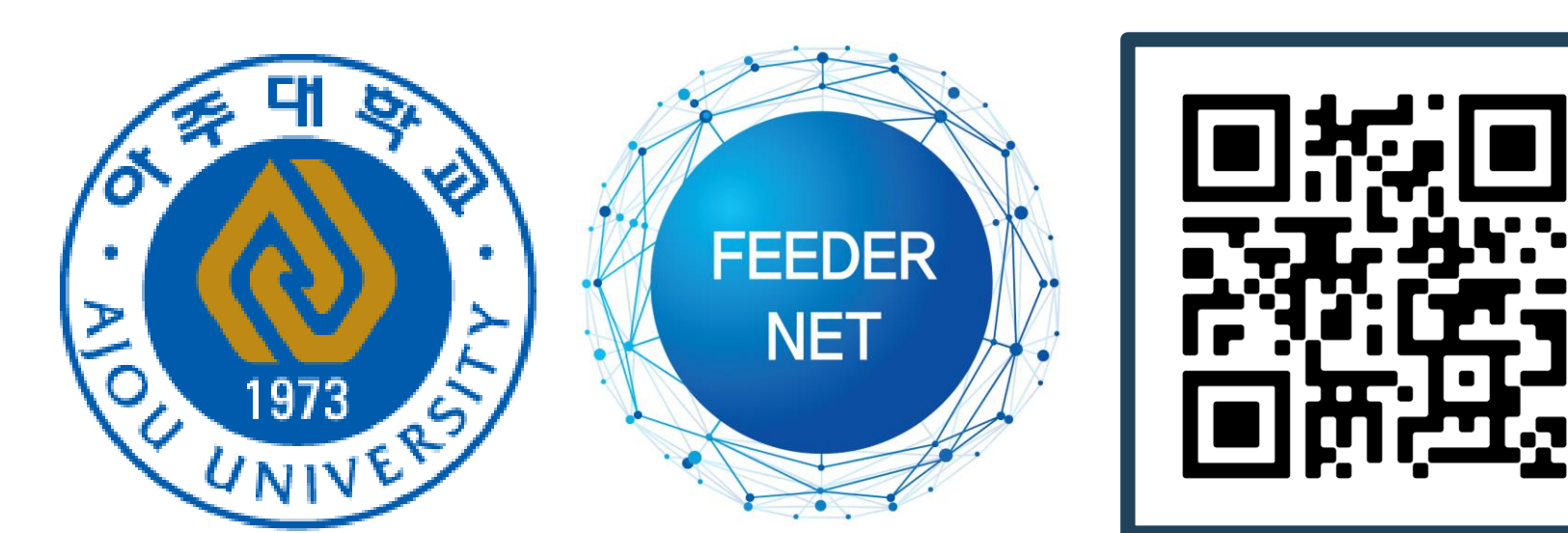




# New phenotyping of asthmatics using long-term followed measurement data

## Trajectory clustering of lung function data over 15 years



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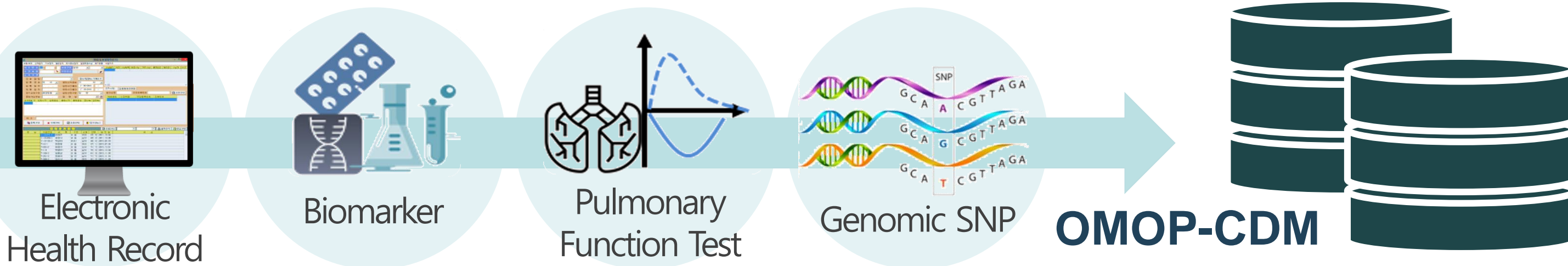
### Why "trajectory clustering" is needed?

- Trajectory** means the course of measured variable over age or time
- Even though started at **same condition** and treated with **same treatment**, trajectory after the start point can be **different**.
- Recently, the need of new phenotype decided by long-term patterns were emerged
- Latent class linear mixed model (LCMM)** is an innovative statistical method used to identify subgroups of participants with **heterogeneous trajectories**

### Methods

#### ICARUS Database

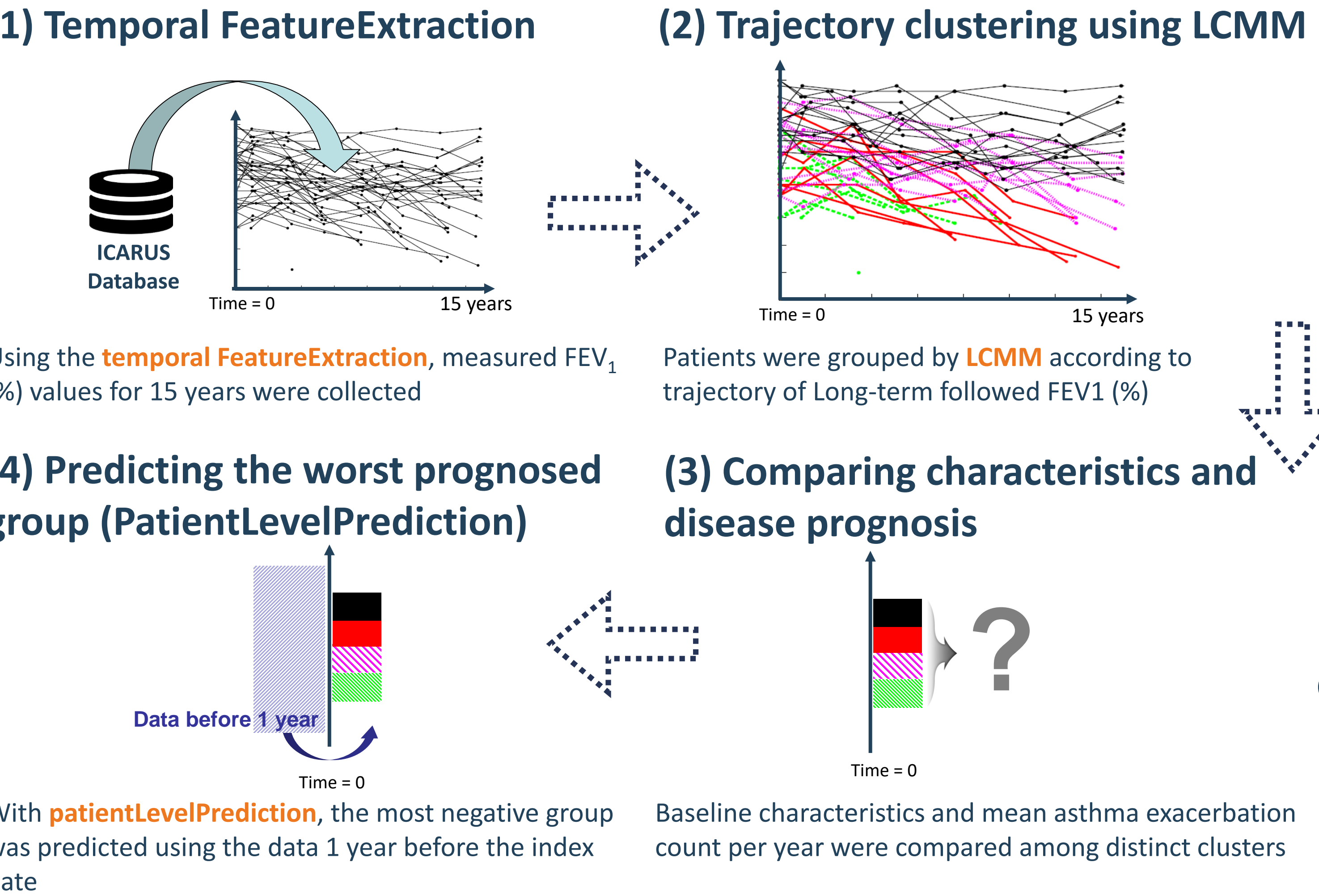
- Immune/Inflammatory Disease Common Data Model Augmentation for Research Union System (ICARUS) database**
- patients who visited department of allergy and clinical immunology base on the EHR of Ajou University medical center from 1995 to 2017



### Subjects



### Process



### Results

#### Results of trajectory clustering

Severe asthmatics were clustered into 3 classes according to lung function using LCMM

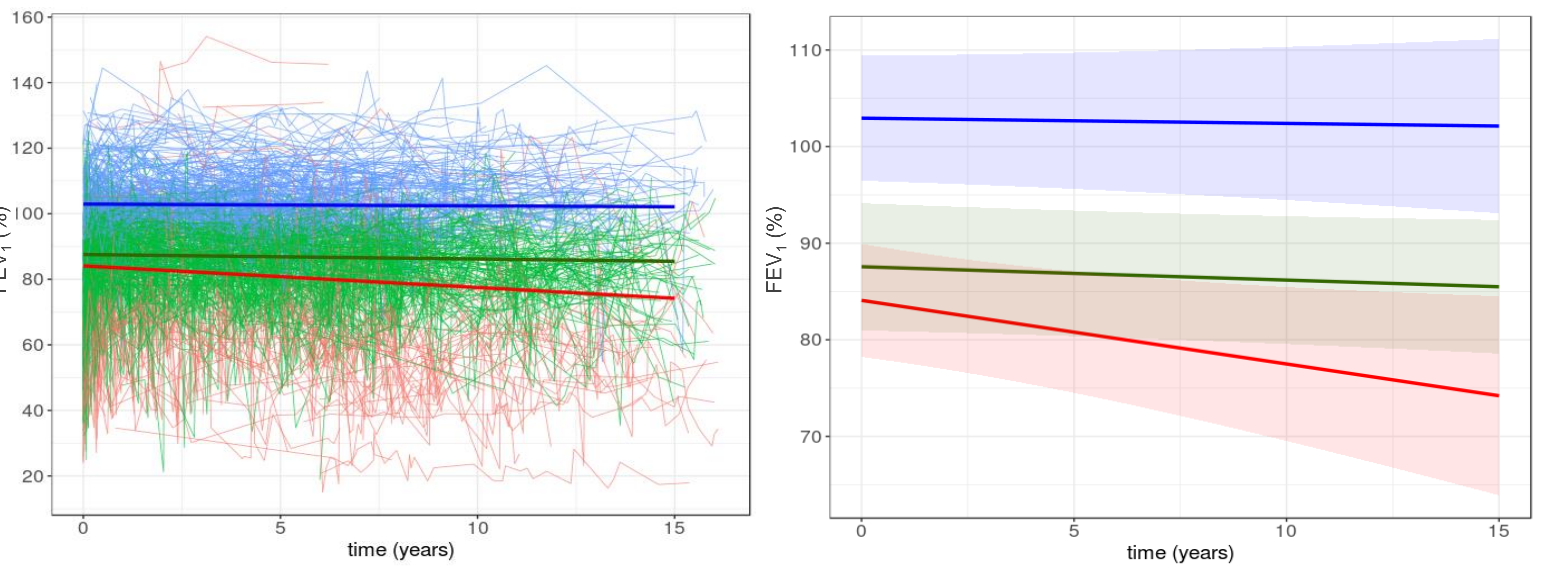


Figure 1-a. Observation individual lung function trajectories and three estimated representative trajectories. Figure 1-b. Three estimated representative trajectories. The shaded areas indicate estimated 95% confidential intervals

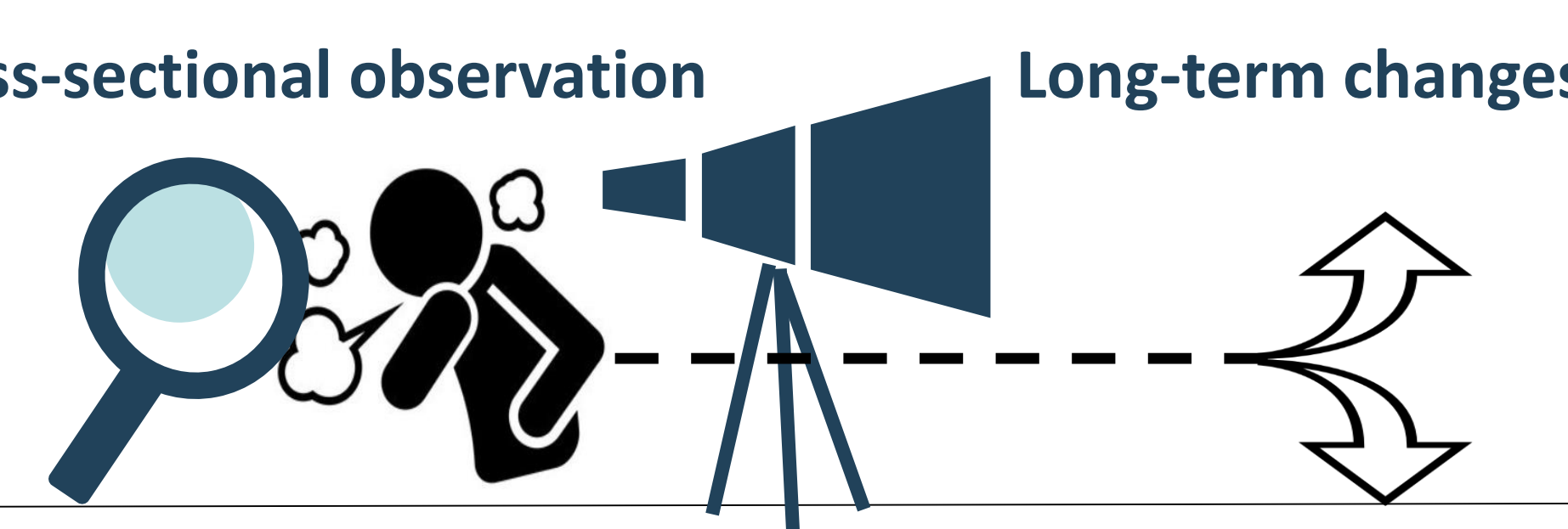
	Persistently high (N = 408, 34.75 %)	Persistently low (N = 618, 52.64 %)	Declining (N = 148, 12.61 %)
Intercept (95% CI)	102.947 (96.47, 109.42)	87.57 (80.98, 94.15)	84.08 (78.23, 89.93)
Slope (95% CI)	-0.05 (-0.38, 0.27)	-0.14 (-0.36, 0.09)	-0.66 (-1.27, -0.05)

#### Comparing characteristics

Declining group had different baseline characteristics

	Persistently high (N = 408)	Persistently low (N = 618)	Declining (N = 148)	p value
Age, years	38.00 ± 15.03	38.82 ± 13.8	46.42 ± 13.55	<0.001
Follow-up duration, years	7.05 (4.15, 10.74)	6.59 (3.37, 10.72)	8.15 (4.11, 11.57)	0.105
Female, n (%)	252 (61.76)	337 (54.53)	89 (60.14)	0.059
BMI, kg/m <sup>2</sup> (N)	24.12 ± 13.17 (167)	25.71 ± 33.78 (373)	24.24 ± 4.81 (110)	0.705
Total IgE (KU/L)	213.5 (79.3, 512.8) (346)	241 (92, 477) (501)	199 (46.5, 535) (103)	0.688
Blood eosinophil (%)	3.7 (1.9, 6.8) (375)	4.2 (1.8, 7.5) (562)	4.4 (2.7, 8.5) (127)	0.034
Blood neutrophil (%)	55.4 (49.4, 61.9) (374)	54.9 (48.4, 62.7) (560)	55.7 (48.8, 62.1) (126)	0.764
Serum EDN (ng/mL)	46.5 (30.5, 63.3) (61)	50.1 (31.3, 83.1) (102)	65.8 (45.9, 100.2) (24)	0.009
Rhinosinusitis, N (%)	284 (69.6)	383 (62.0)	83 (56.1)	0.005
Urticaria/angioedema, N (%)	36 (8.8)	47 (7.6)	2 (1.4)	0.010
Anaphylaxis, N (%)	17 (4.2)	20 (3.2)	3 (2.0)	0.443
Hypertension, N (%)	13 (3.2)	28 (4.5)	9 (6.1)	0.291
Diabetes Mellitus, N (%)	7 (1.7)	12 (1.9)	3 (2.0)	0.956
Osteoporosis, N (%)	10 (2.5)	9 (1.5)	5 (3.4)	0.257
GERD, N (%)	12 (2.9)	21 (3.4)	6 (4.1)	0.802
Ischemic heart disease, N (%)	2 (0.5)	9 (1.5)	7 (4.7)	0.002

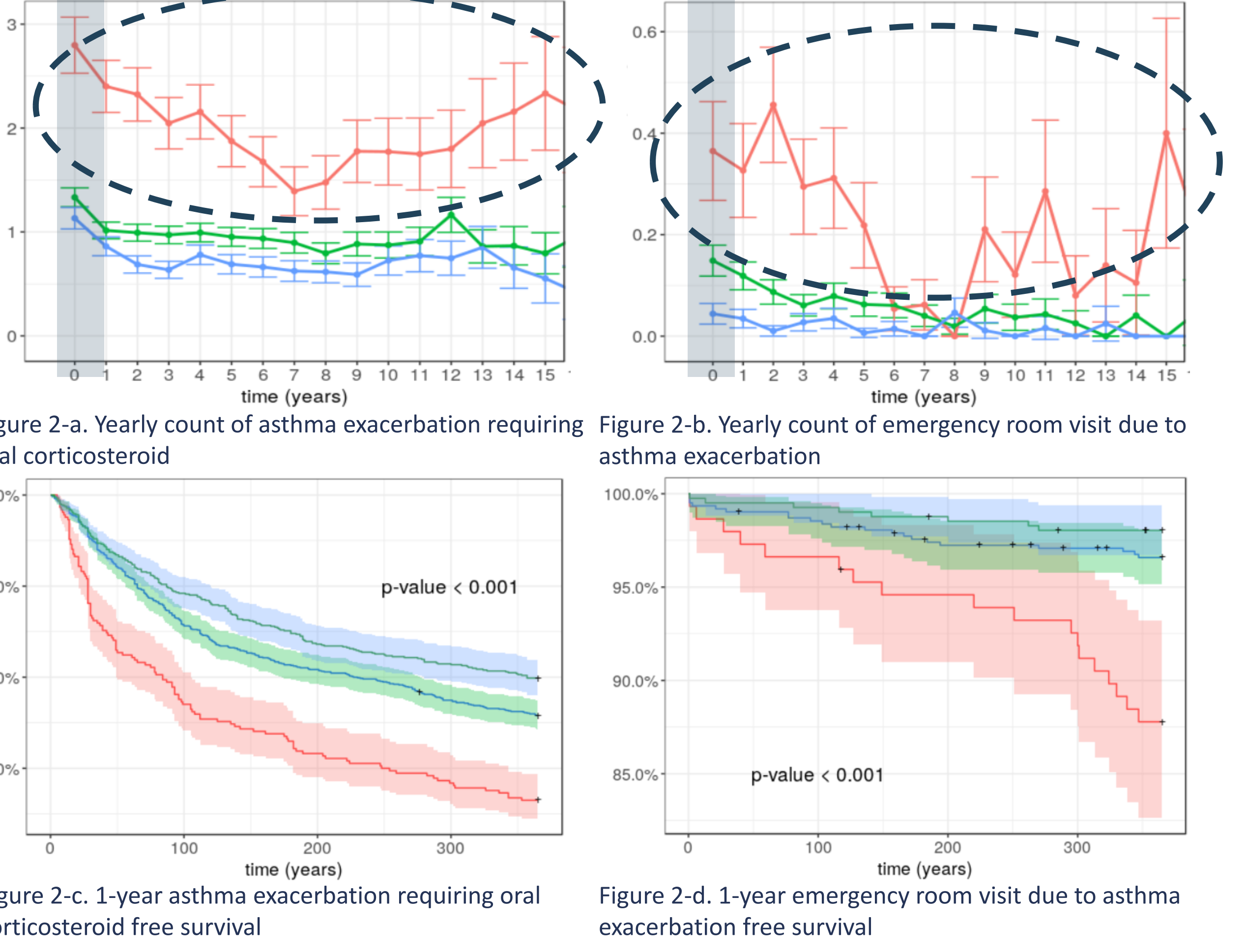
### Conclusions



- Severe asthmatics can be classified according to long-term changes of lung function using the LCMM
- A declining lung function had poor prognosis compared with other trajectories and can be predicted by data before 365 days using the PatientLevelPrediction
- Not only cross-sectional phenotyping, it is also important to define phenotype by long-term changes over time**

#### Comparing disease prognosis

The declining group had the most negative prognosis



#### Results of patient level prediction using PLP package

Declining group can be predicted using the data before 365 days

