

Generation, Harmonization, and Use of Real-World Data from Asthma and COPD Patients

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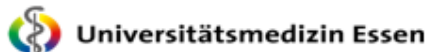
Visiting Professor, Tongji University School of Medicine, Shanghai, China

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Coordination team:

- Christian Kreisel
- Saide Polat
- Julia Dietermann

From Real-World-Data to outcome prediction of Asthma and COPD



- 4 years
- 12 Mio € funding
- 2023-2027

Local data



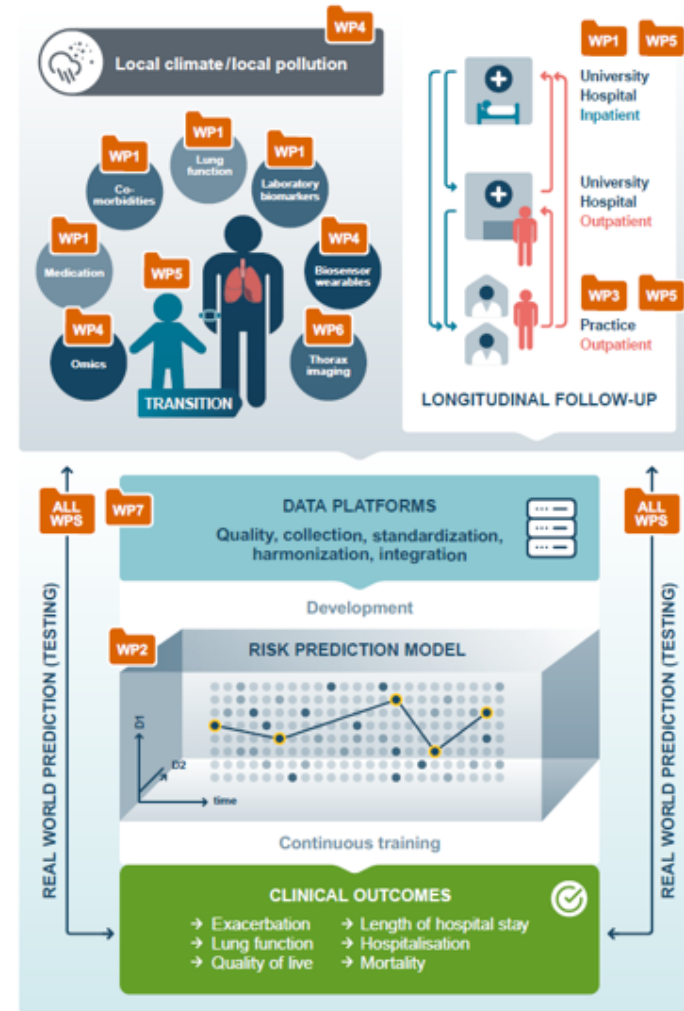
Quality/
harmonization



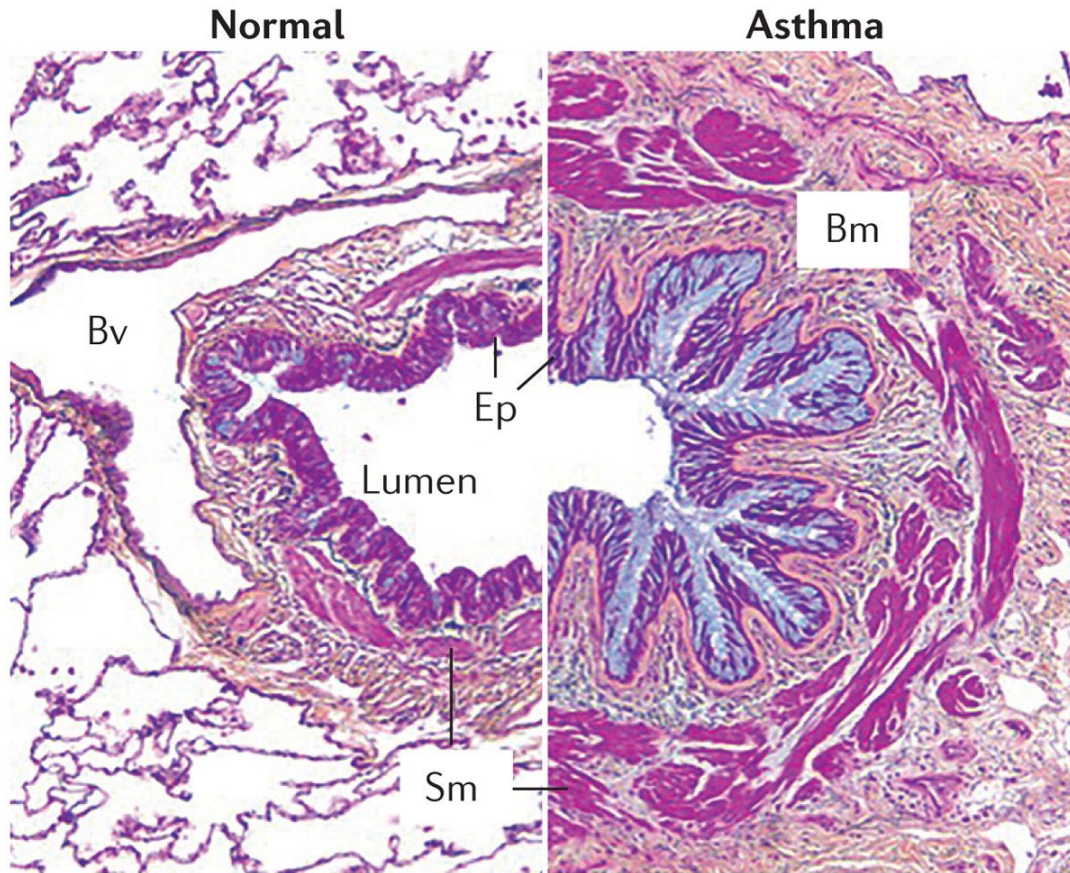
Modelling



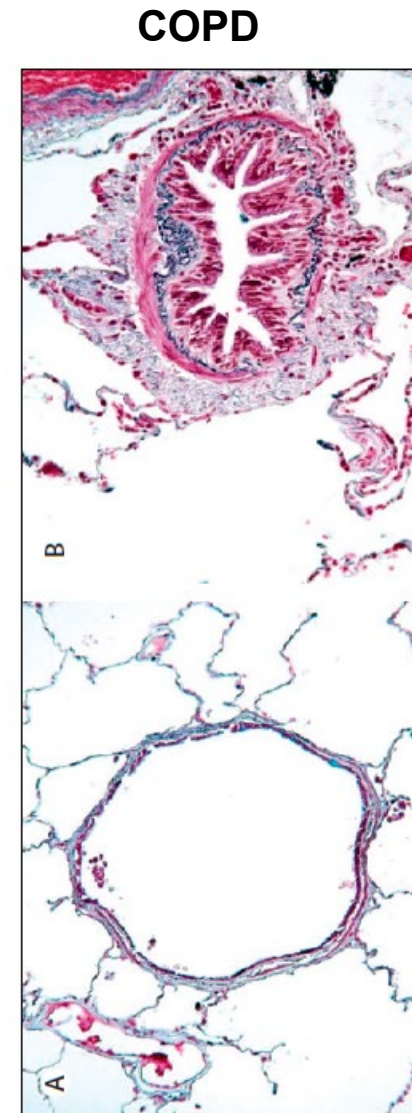
Outcome prediction



Histopathology of Asthma and COPD

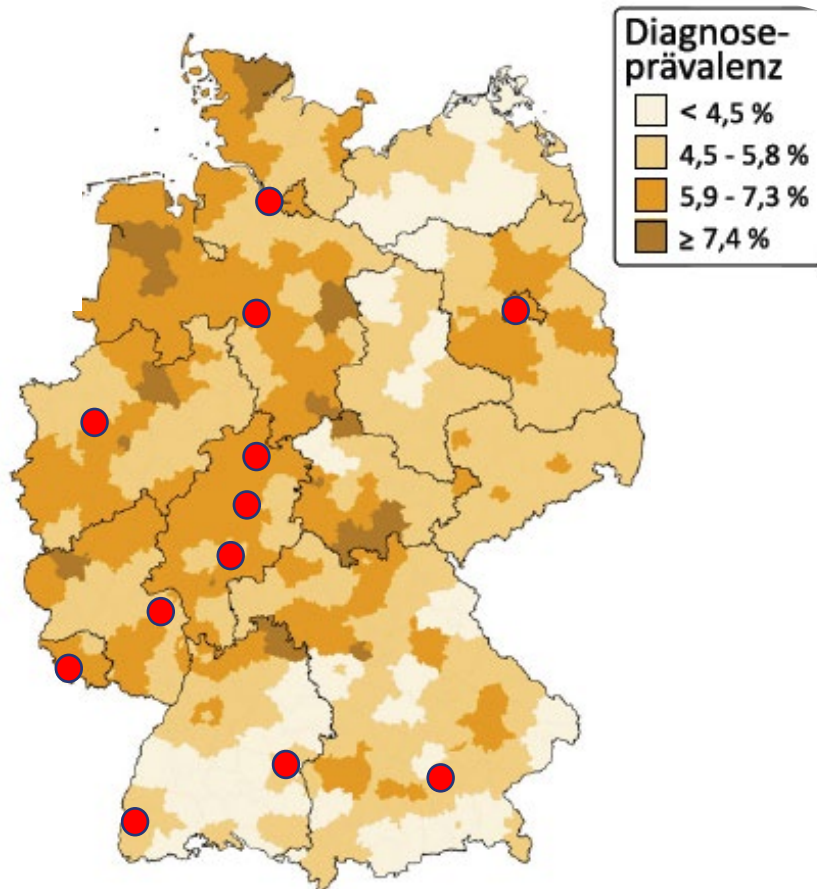


Nature Reviews | **Disease Primers**

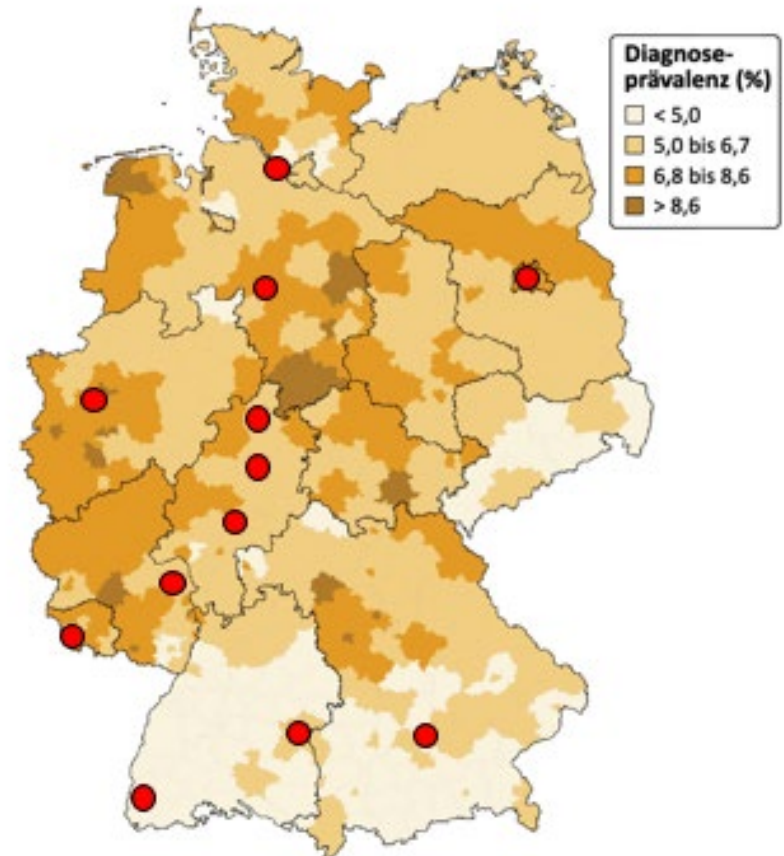


Prevalance of Asthma and COPD and CALM-QE study sites

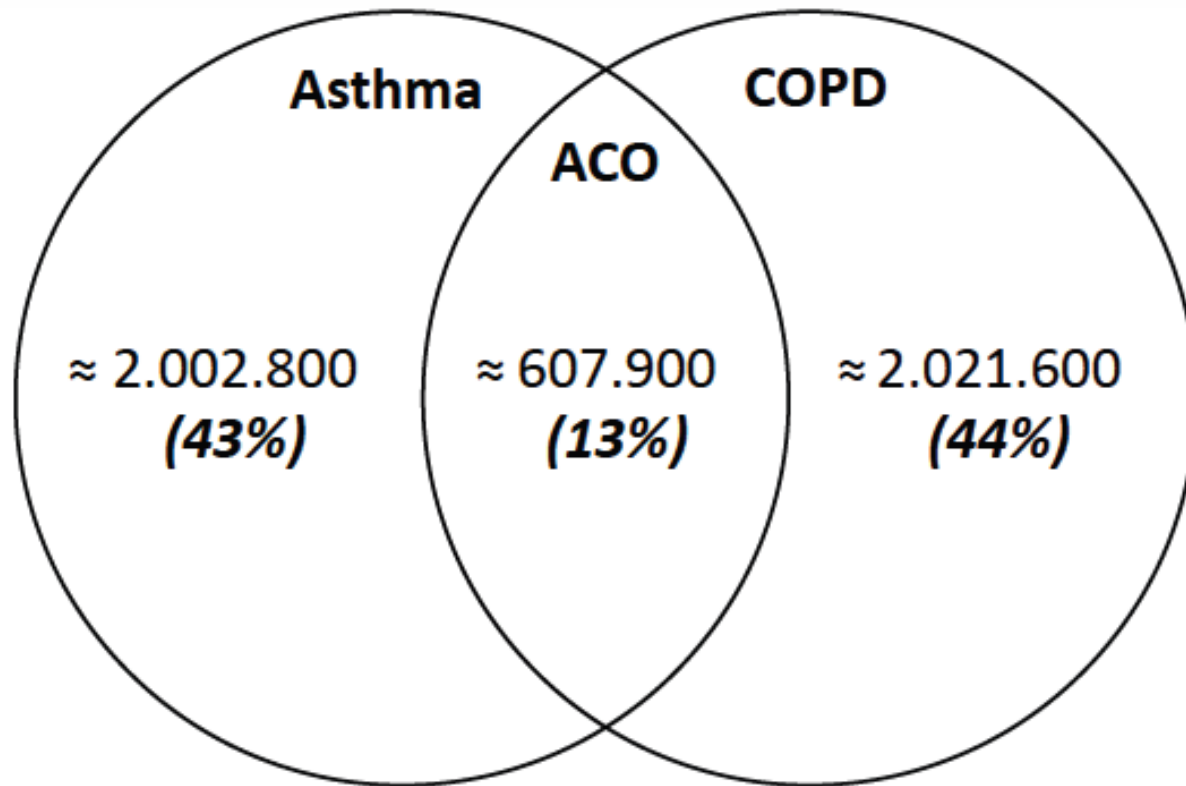
Asthma



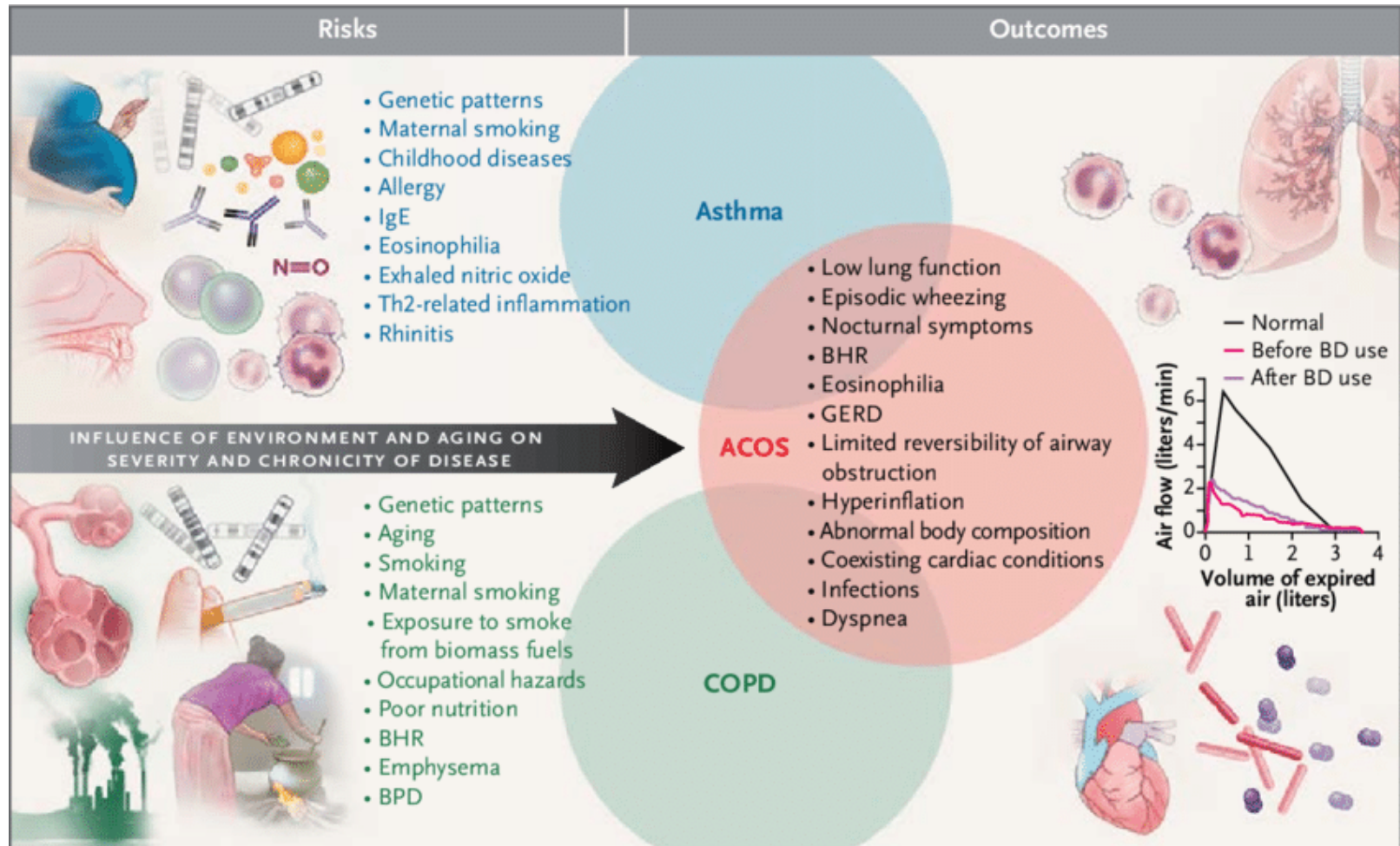
COPD



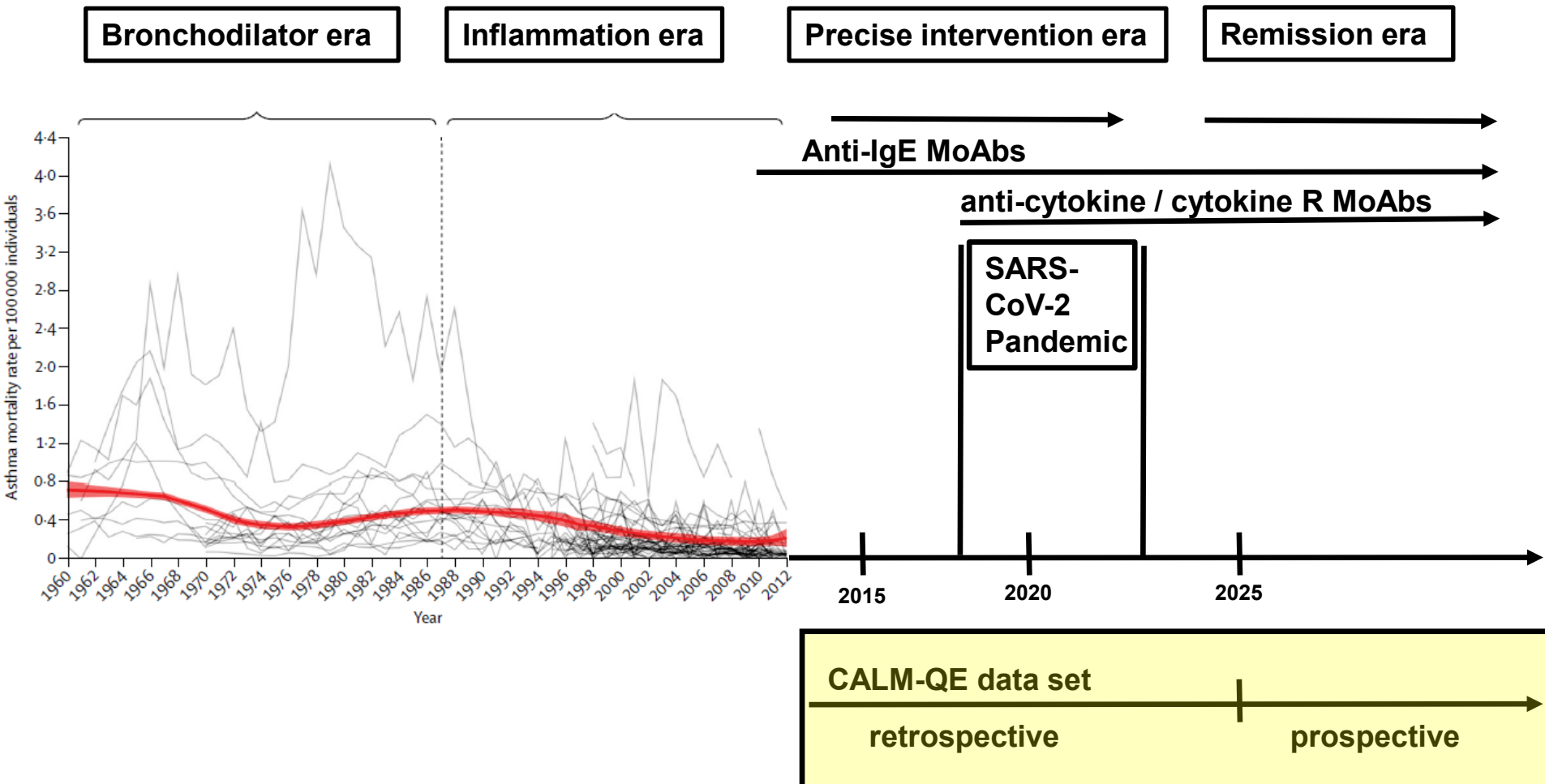
M2Q diagnoses of asthma and COPD based on nationwide contract physician billing data in 2017



Asthma–COPD Continuum and Overlap (ACO): From Risks to Outcomes

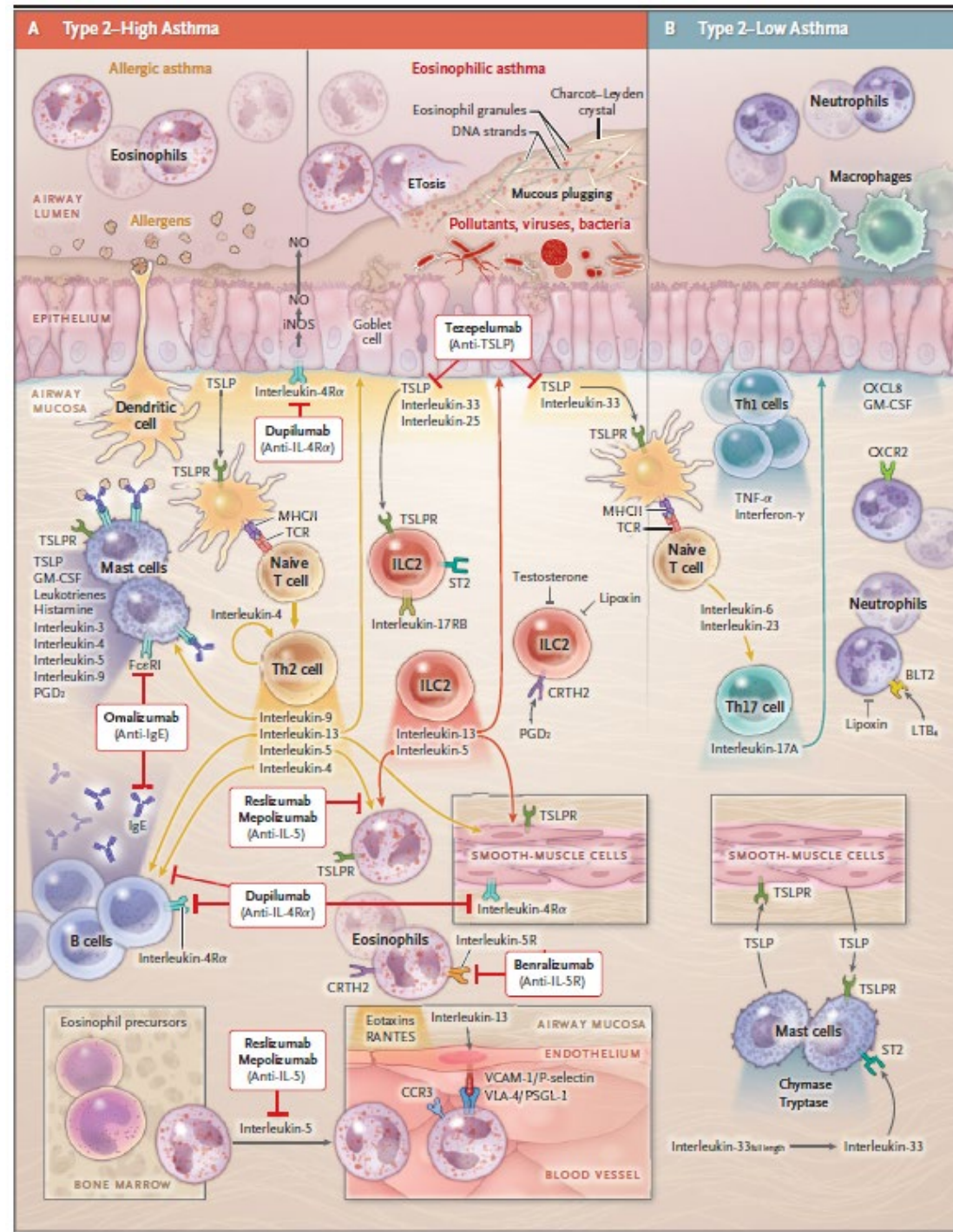


Progress in asthma therapy and conceptual developments



Adapted from Pavord et al., Lancet, 2018

Airway inflammation in Severe Asthma and Targets of Biologic Therapies



*Brusselle and Koppelman,
NEJM 2022*

Real World Data (RWD) vs Clinical data

➤ RWD

Source:

- Routine clinical practice
- Electronic health records
- Insurance claims
- Patient registries and wearable devices

Data Quality:

Variable and less controlled, with potential gaps and inconsistencies

➤ Clinical data

Source:

- Structured research studies
- clinical trials
- observational cohort studies

Data Quality:

Higher quality and more consistent, with strict data collection methods and protocols to minimize variability

The Challenges:

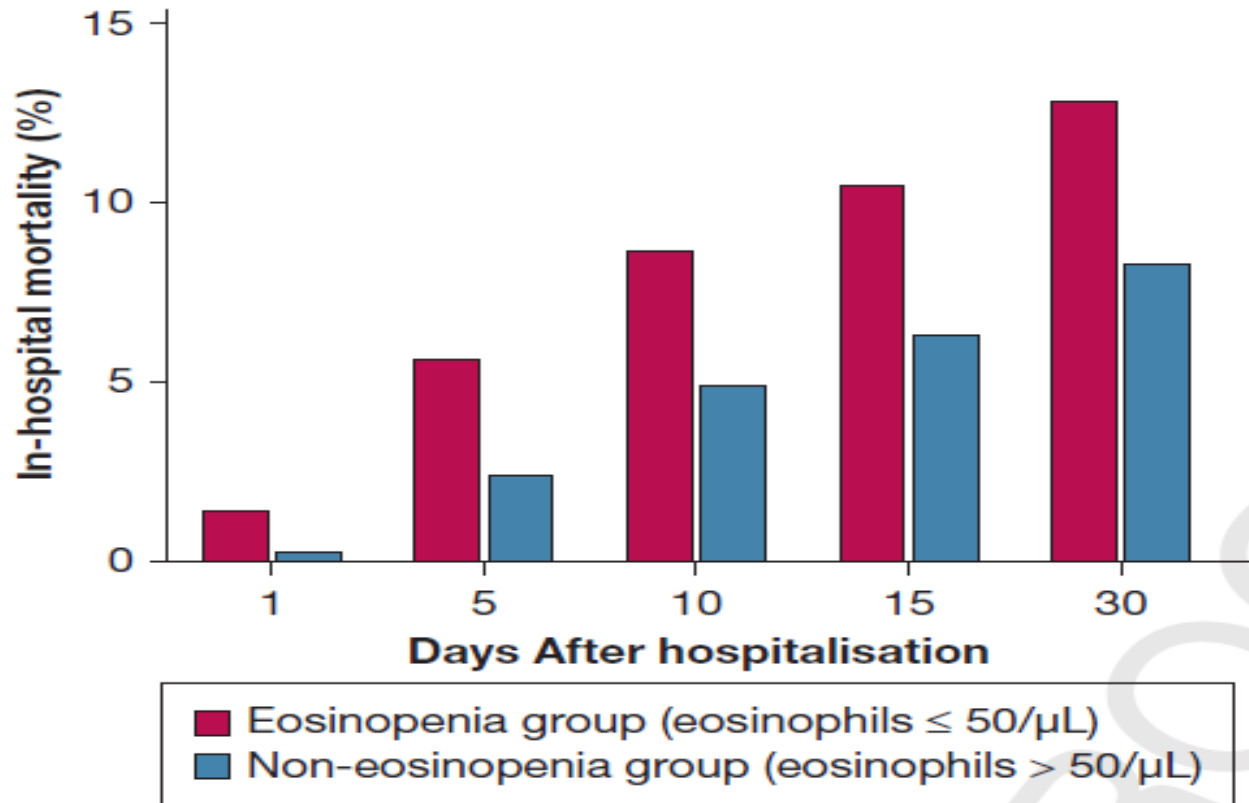
Regulation

- Each university hospital with its own ethics, with different requirements
- Each university hospital with its own data protection office with local requirements
- Some sites even have different data protection offices at the University and the Hospital
- Different ethics / data protection agencies for outpatient practices (regulated by each German state)

Data quality and harmonization (2005-2025 and prospective)

- Clinical data in different systems, not all sites can provide all data packages
- Technical format of data (e.g. units)
- Switches of technical formats over time (new methods, new units,...)
- Data plausibility (e.g. diagnosis at entry, discharge, reimbursement)

Eosinopenia as Predictor of Disease Severity in Patients With Community-Acquired Pneumonia: An Observational Study



Eosinopenia correlates with:

- Higher in-hospital mortality
- Increased risk of mechanical ventilation
- Greater risk of developing sepsis
- Longer hospital stays for survivors

Weckler BC, Pott H, Race A, Jugkaeo N, Karki K, Ringshandl S, et al. (2024)

Can AI improve to distinguish asthma, COPD and overlap syndrome using clinical data?

Pulmonology:

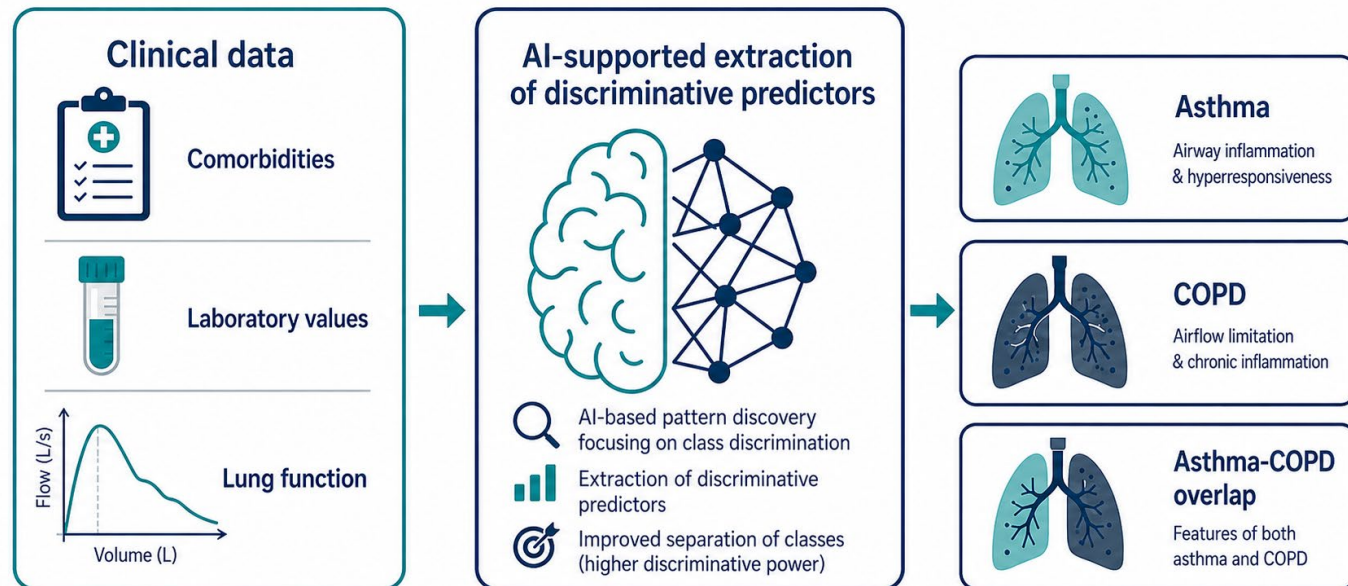
- Bernd Schmeck
- Gernot Rohde
- Barbara Weckler

DIC:

- Stephan Ringshandl
- Christian Seidemann

Bioinformatics:

- Harald Binder
- Maria Weymann

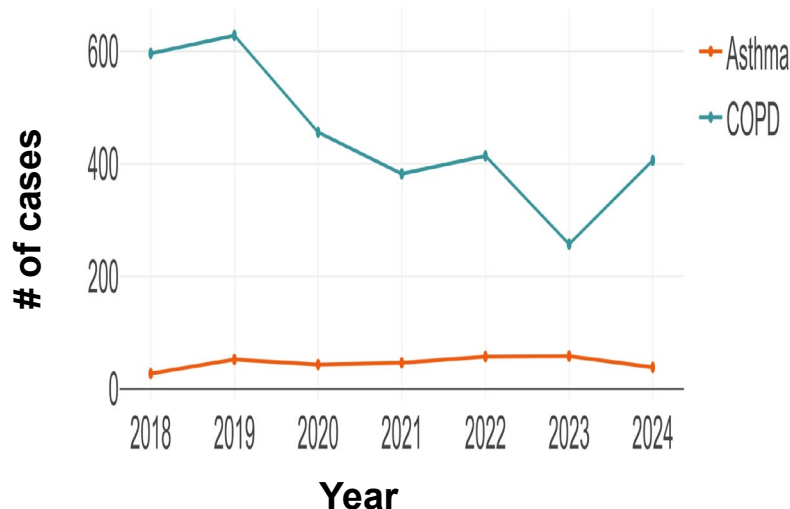


Blood Eosinophils in COPD: A Real-World Observation and Comparison with Asthma

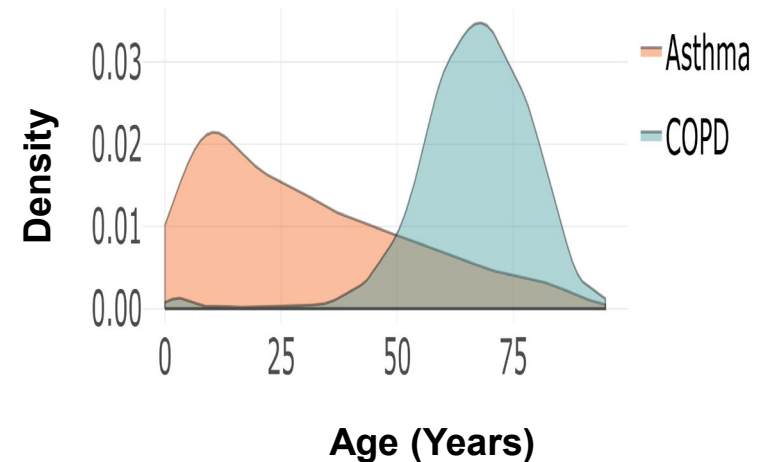
How big is the Proportion of eosinophilic COPD (e COPD) eligible for treatment with biological (benchmark = asthma)?

Preliminary data:

Asthma and COPD diagnoses per year:



Age distribution Asthma vs. COPD:



Pulmonology:

- Natascha Sommer
- Stefan Kuhnert

DIC:

- Romina Blasini

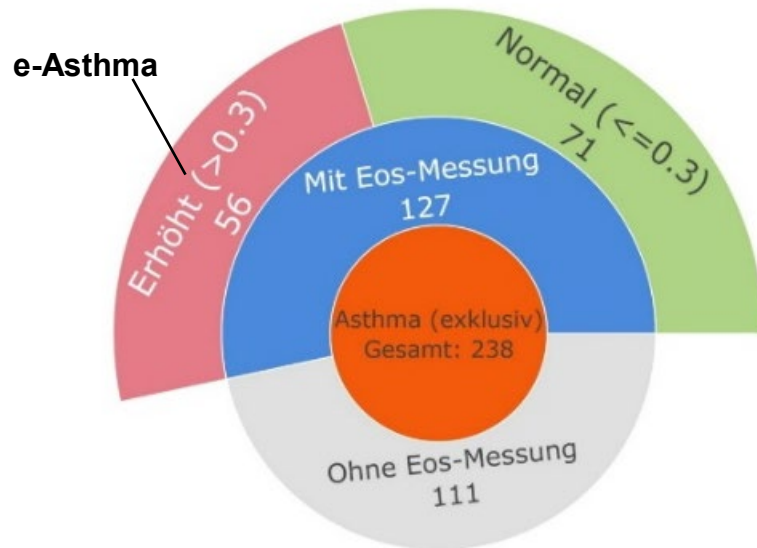
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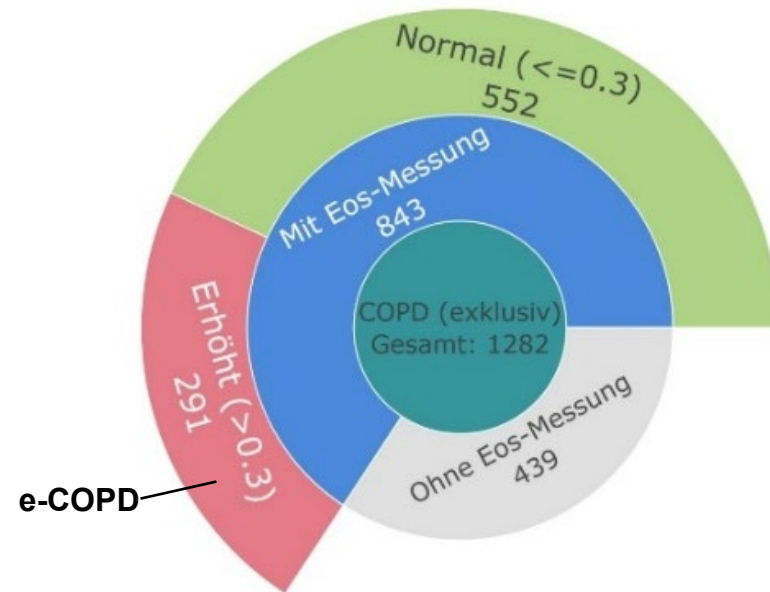
Surprise: unexpected high portion of e-COPD patients!

Eos and Asthma



- Asthma patients have higher IgE levels than COPD patients
- Eosinophil counts were measured in approximately **50%** of asthma cases
- Of these, **44%** had elevated eosinophil levels >0.3 giga/l

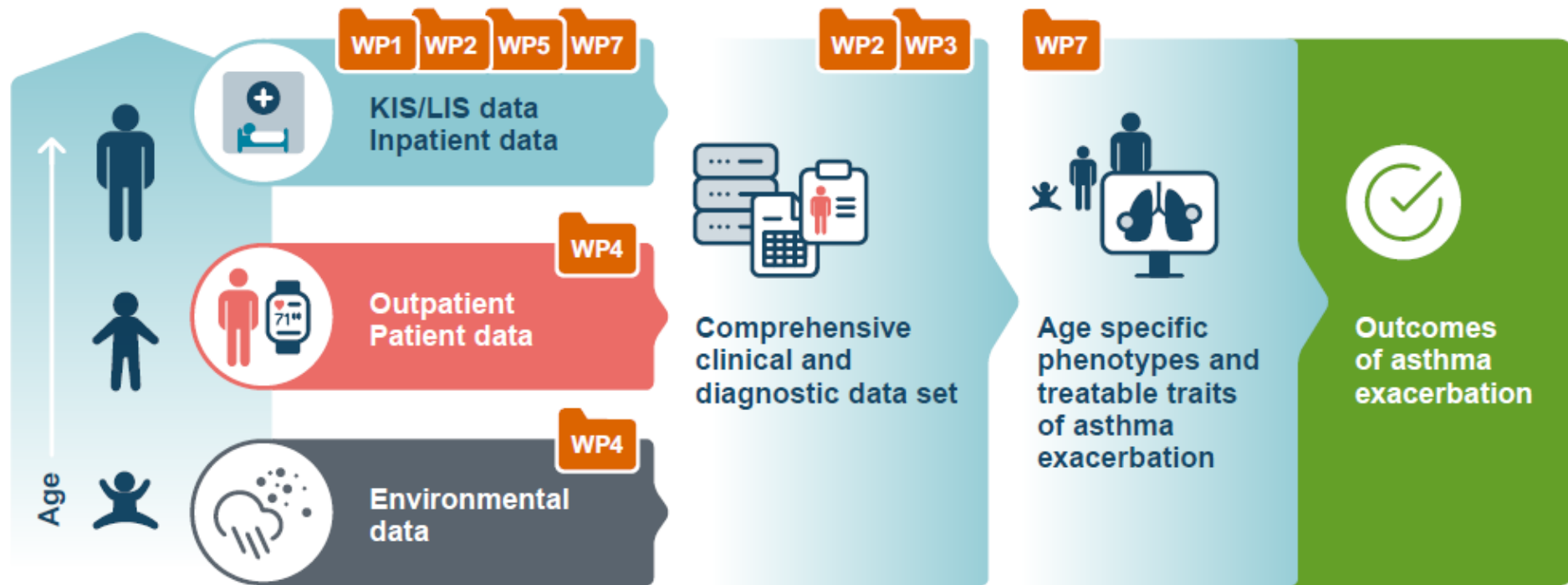
Eos and COPD



- COPD patients have higher CRP levels than asthma patients
- Eosinophil counts were measured in approximately **60%** of COPD cases
- Of these, **35%** had elevated eosinophil levels >0.3 giga/l

Age-specific treatable traits of asthma exacerbation – pediatric perspective (WP5)

Hannover



Pediatric Asthma: Effect of SARS-CoV-2 on number of hospitalizations and/or severity parameters

Outcomes/ end points

- Number and duration of stays/ admissions
- Type of O₂ requirements
- Medication
- Comorbidities

Pulmonology:

- Anna-Maria Dittrich
- Anna Linnemannstöns

DIC:

- Matthias Gietzelt

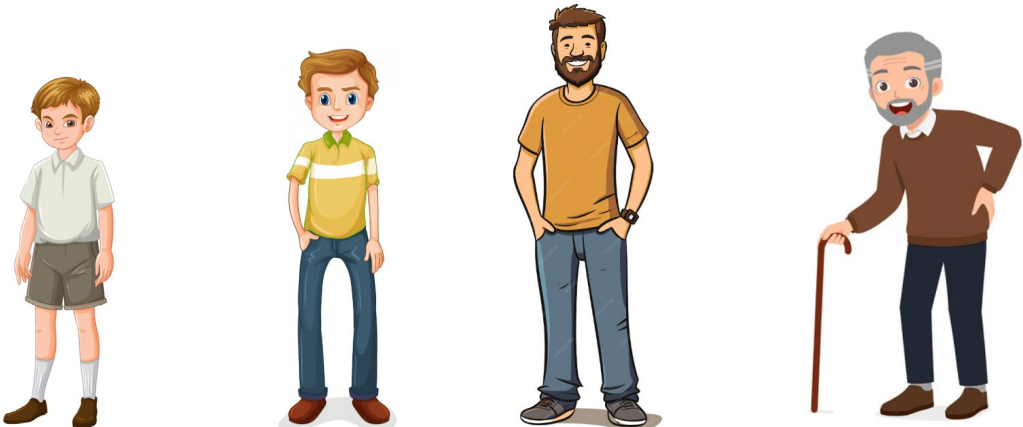
Objective: to integrate data from 500 pediatric patients

- Stratification by biomarkers:
Blood eosinophils, leukocytes,
viral detection, allergic sensitization
(type of inflammation; cause of exacerbation)
- Local and regional differences
- Differences between age groups and
genders

Window of susceptibility
The first 1000 days

Early origin of adult disease

Air pollutants
NO₂, PM_{2.5}, PM₁₀
(indoor; outdoor)
Temp.↑



**Impaired lung development
and immune programming**

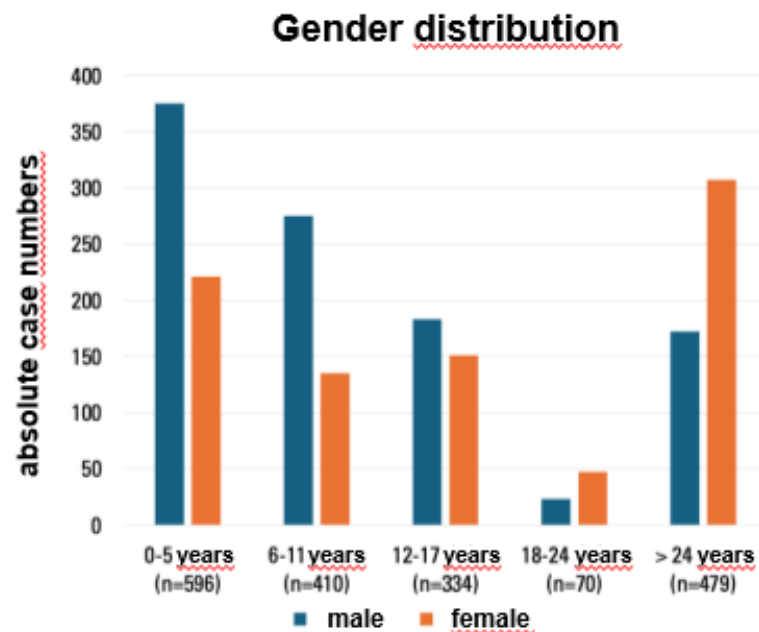
**Lack of tolerance →
inflammation**

**Lung disease: Infections and
chronic inflammation**

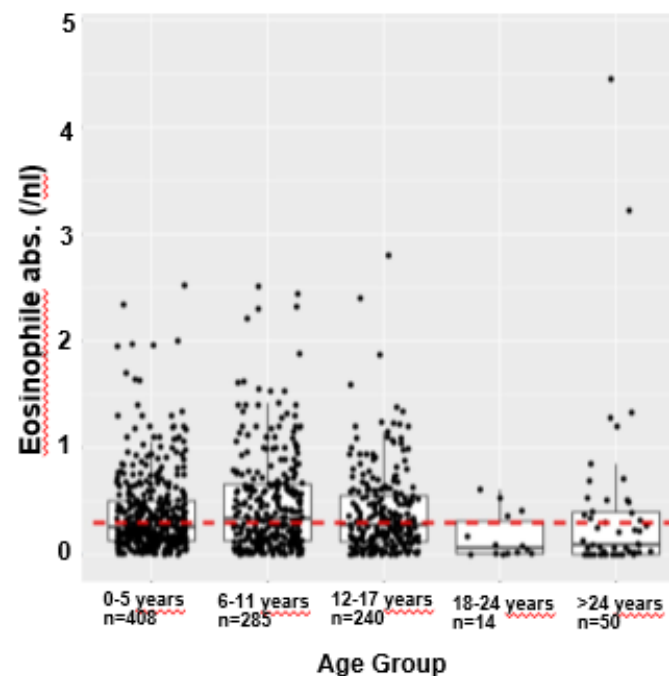
- **disease development**
- **disease progression**
- **disease exacerbation**

Challenge: Transition from childhood to adult asthma

young adults are at increased risk of experiencing both more frequent and more severe asthma exacerbations



Frankfurt 2005-2025



5 participating university hospitals
>10 000 patients anticipated

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Hannover

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MEDIZIN FRANKFURT
GOETHE-UNIVERSITÄT

Pulmonology:

- Anna Linnemannstöns (Hannover)
- Katharina Blümchen (Frankfurt)
- Jordis Trischler (Frankfurt)
- Natascha Sommer (Gießen)

DIC:

- Oliver Vogel (Frankfurt)
- Matthias Gietzelt (Hannover)
- Romina Blasini (Gießen)

Specialist in paediatrics:

- Stephan Müller (Frankfurt)
- Anna-Maria Dittrich (Hannover)

Biostatistics:

- Martin Hutter (Frankfurt)

Quantitative chest CT biomarkers in COPD exacerbations

Pulmonology:

- Daiana Stolz (PI)
- Andreas Hoheisel
- Saskia Kiefer

DIC (WP 7):

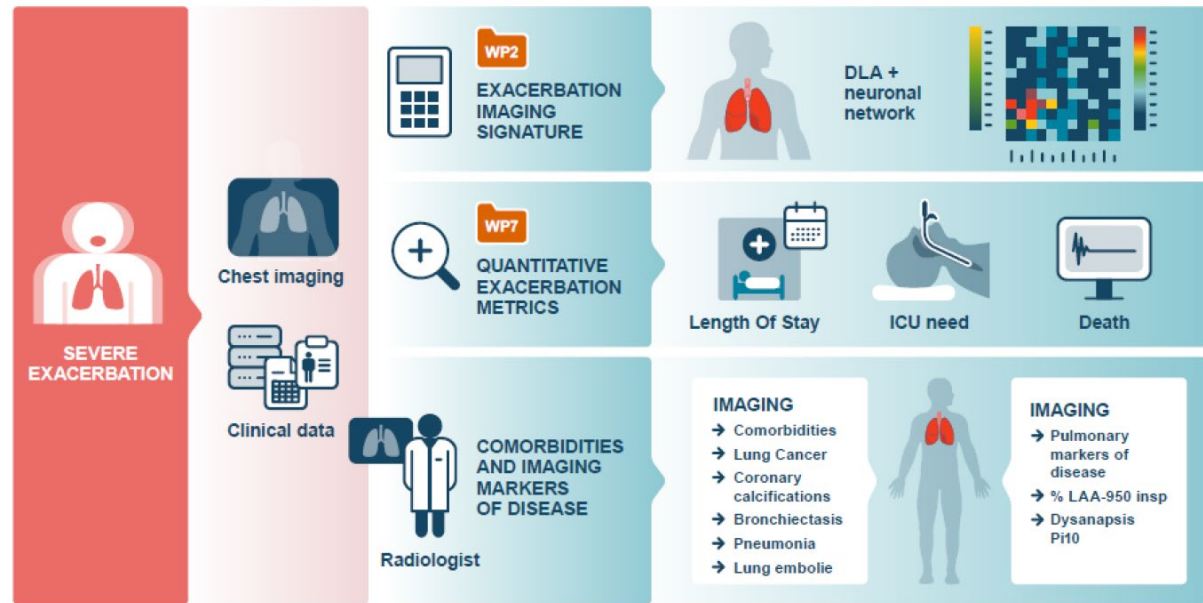
- Julius Wehrle
- Andrea Laukhuf

DIC (WP2):

- Harald Binder
- Maria Weymann

Radiology:

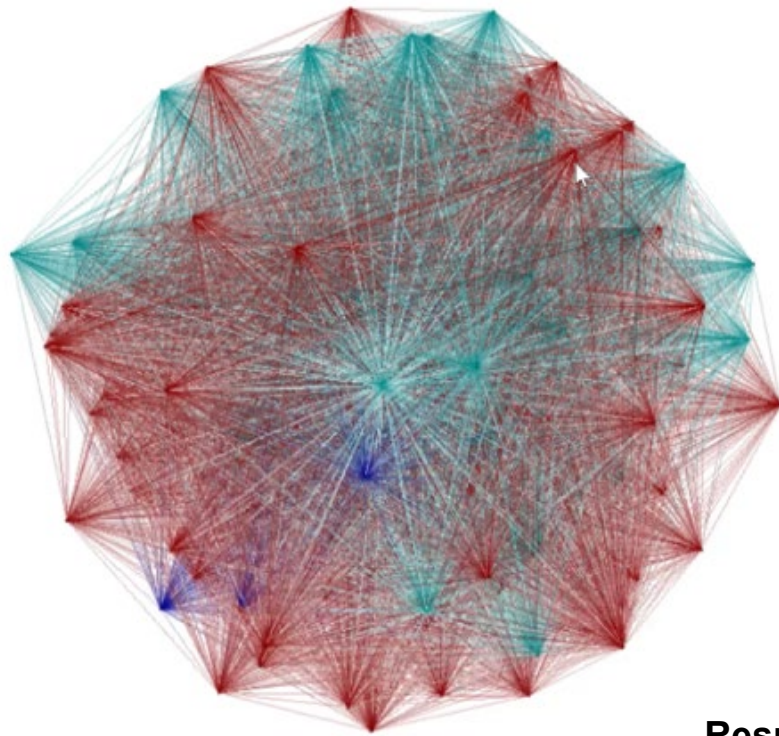
- Christopher Schlett
- Carmen Steinborn



- 8 university hospitals, approximately
- **12,000** exacerbation CT scans across the network **2017–2024**
 - longitudinal observation period
 - AI-supported analysis / quantitative chest CT (qCT)

Objectives: Exacerbation signature / Multimodal prediction models

First 50 Parameters Coreline & EHR



Graphic: M. Weymann

Data integration:

qCT + diagnoses + lab results + pulmonary function (DIZ) + ...

Prediction model:

LOS - ICU - Mortality - ...

Focus on Image Markers



Emphysema: LAA-950 · PRMEmph



Respiratory tract: Pi10 (bronchial wall)



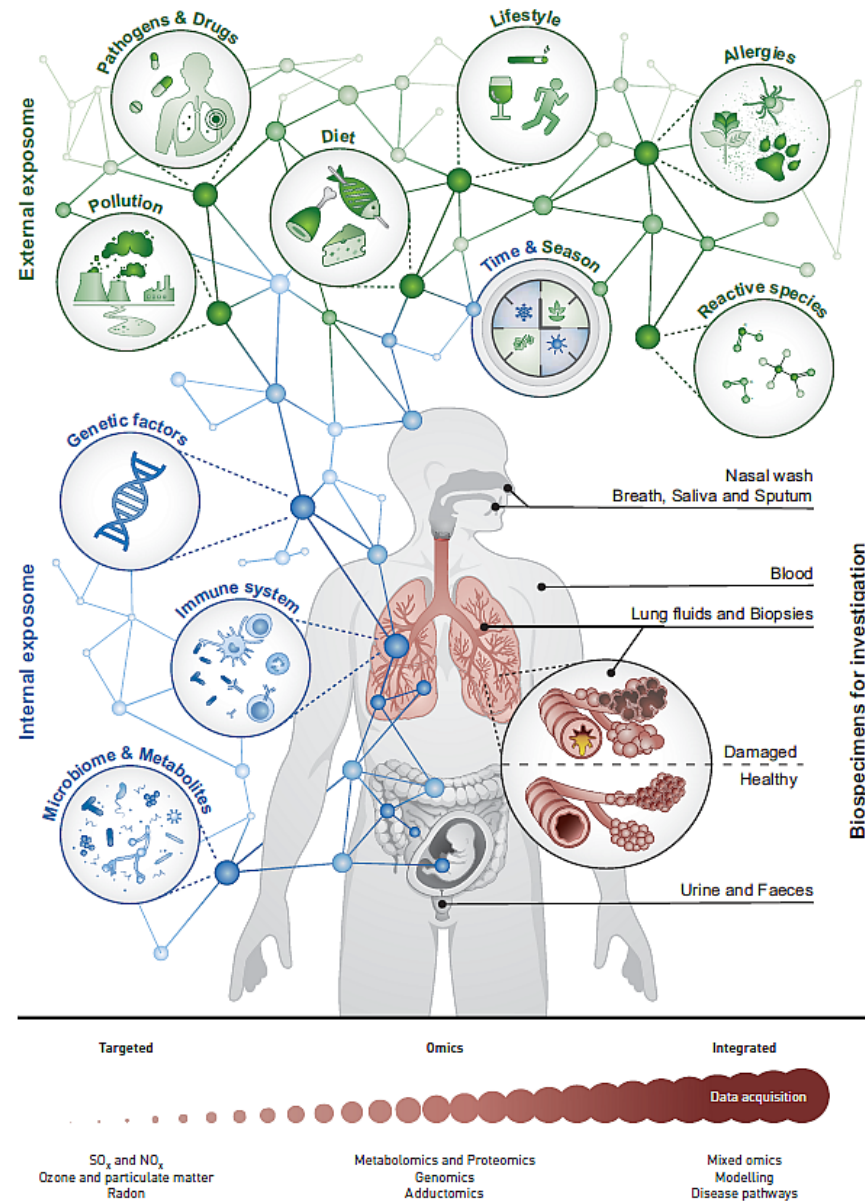
Small Airway Disease: PRMfSAD · Air-trapping

Results to date:

> 5 national and international abstracts (published in the ERJ, among others) with significant results and very positive feedback Parameter review available at:

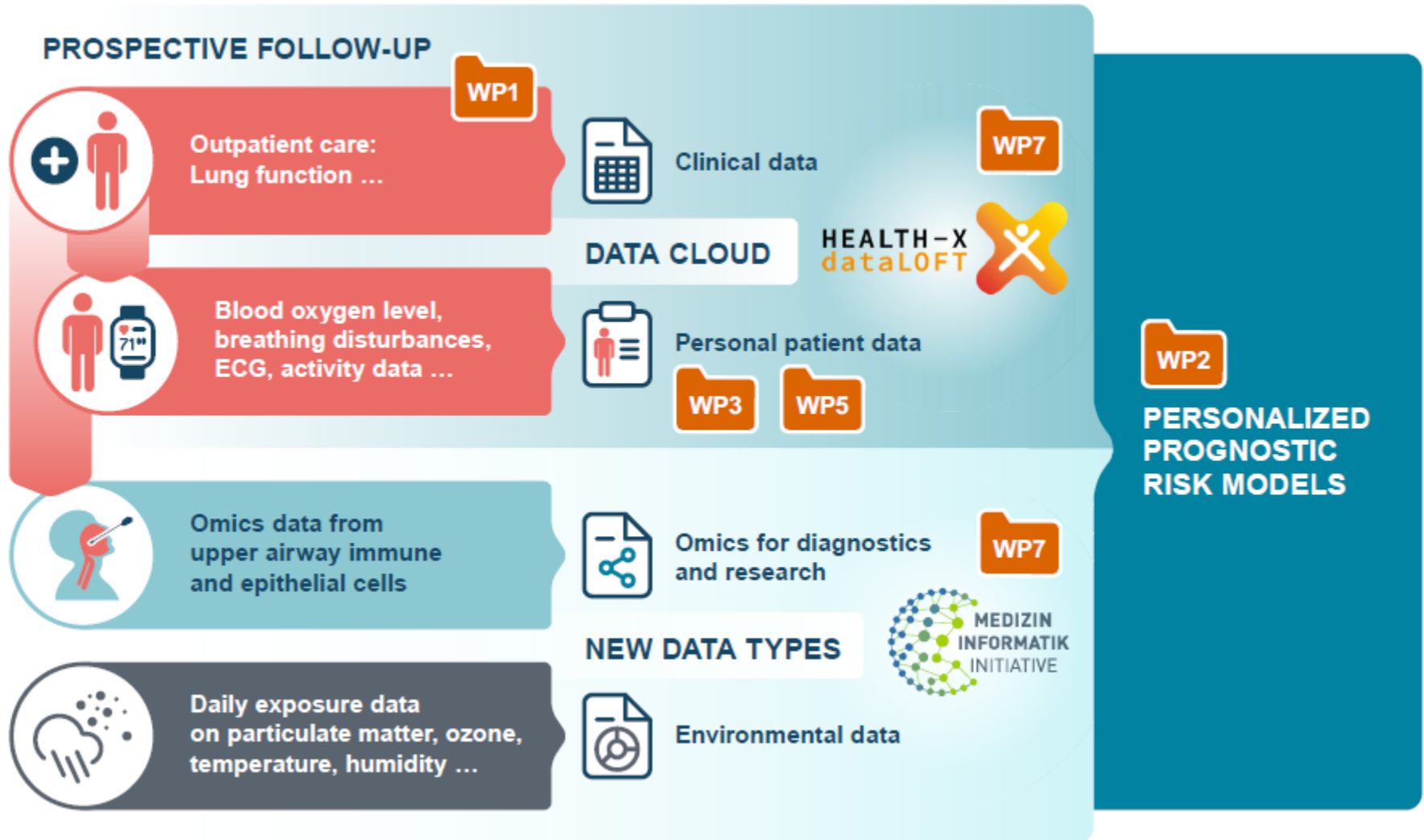
*Etienne S, Hoheisel A, Agarwal P, Kiefer S, Wehrle J, **Renz H, Stolz D**. Quantitative computed tomography and predictive modelling for COPD exacerbations. Eur Respir Rev. 2025 Dec 17;34(178):250097. doi: 10.1183/16000617.0097-2025. PMID: 41407388; PMCID: PMC12709362.*

The role of gene – environment interactions in lung disease: the urgent need for an integrated multi-layer patient view



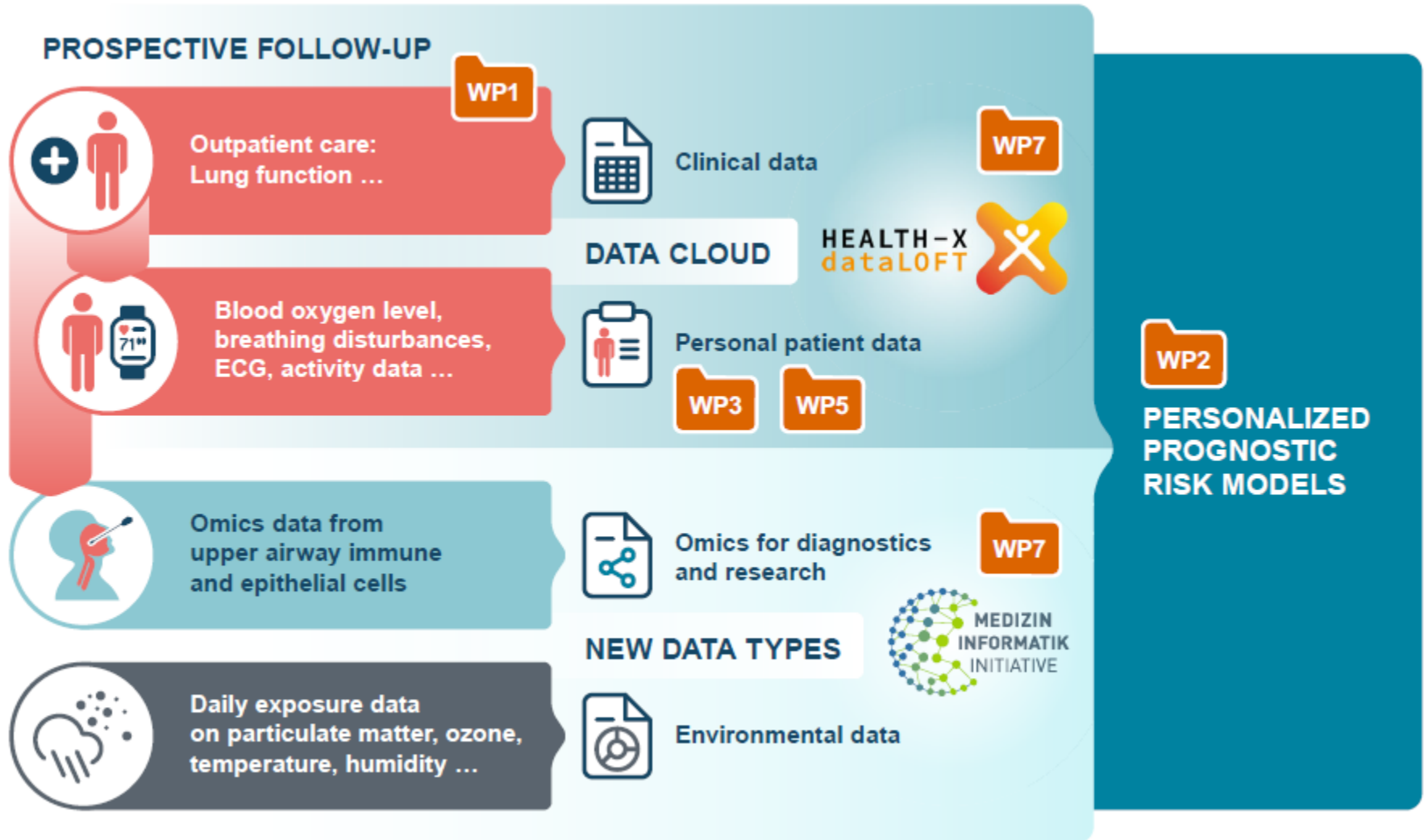
Integrating personal health data with environmental data for secondary prevention (WP4)

Berlin



Integrating personal health data with environmental data for secondary prevention (WP4)

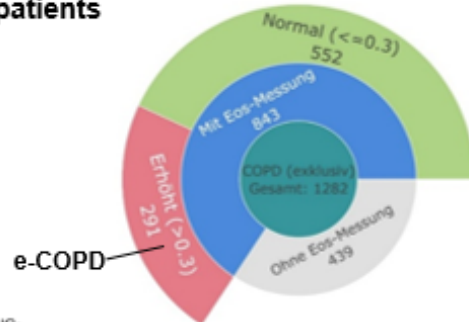
Berlin



Current Flagship Projects

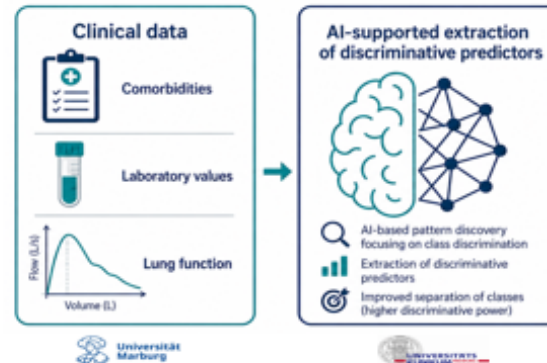
Blood eosinophile in COPD

→ unexpected high portion of e-COPD high patients



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AI-guided distinction of Asthma, COPD and overlap syndrome



Effect of SARS-CoV-2 pandemic on pediatric asthma exacerbation and severity

→ Objective: to integrate data from 500 pediatric patients

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Integration of Personal Health Data (Wearables) with Environmental Data for Secondary Prevention

- Total recruited patients: 351 (04/2026)
 - 9 pediatric patients
 - 342 adult patients

CHARITÉ

Transition from pediatric to adult asthma – prediction models

→ current data feeds to follow

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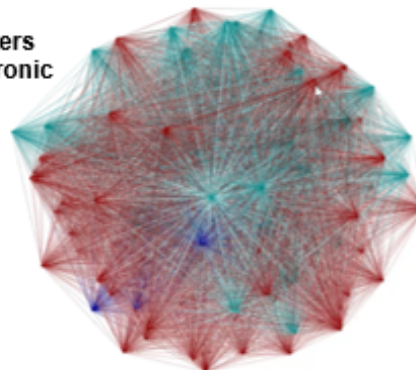
Distinct signatures of COPD exacerbation: Multimodal prediction models

> 12.000 CT; coreline software

Chest CT + diagnosis + lab tests + pulmonary function

First 50 Parameters
Coreline & electronic
health record

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CALM-QE Retreat

28./29.05.2026 Frankfurt

