

# Pre-existing allergic diseases as risk factors for Long-COVID symptoms: Systematic Review and Meta-Analysis

A. Ulrich<sup>1</sup> | K.P. Drewitz<sup>1</sup> | D. Wolff<sup>1</sup> |  
D. Siegels<sup>2</sup> | S. Deckert<sup>2</sup> | A. Sprenger<sup>1</sup> |  
P. Kuper<sup>1</sup> | J. Schmitt<sup>2</sup> | D. Munblit<sup>3</sup> |  
C. Apfelbacher<sup>1,4</sup>

<sup>1</sup> Institute of Social Medicine and Health Systems Research, University of Magdeburg

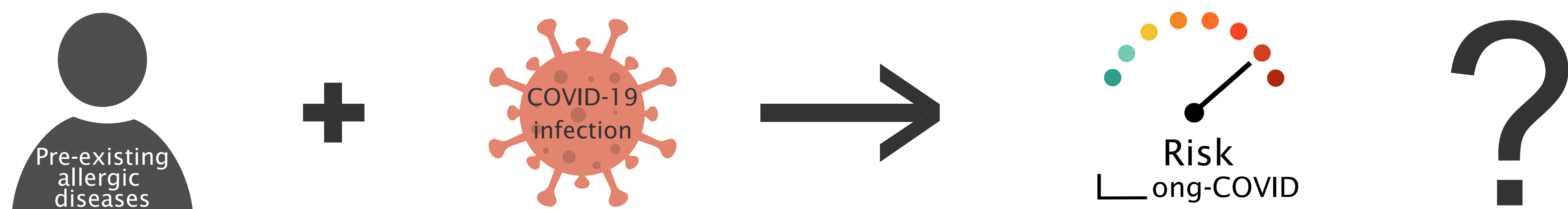
<sup>2</sup> University Hospital and Medical Faculty Carl Gustav Carus, Technical University Dresden, Germany

<sup>3</sup> Kings' College London, United Kingdom

<sup>4</sup> Nanyang Technological University, Singapore

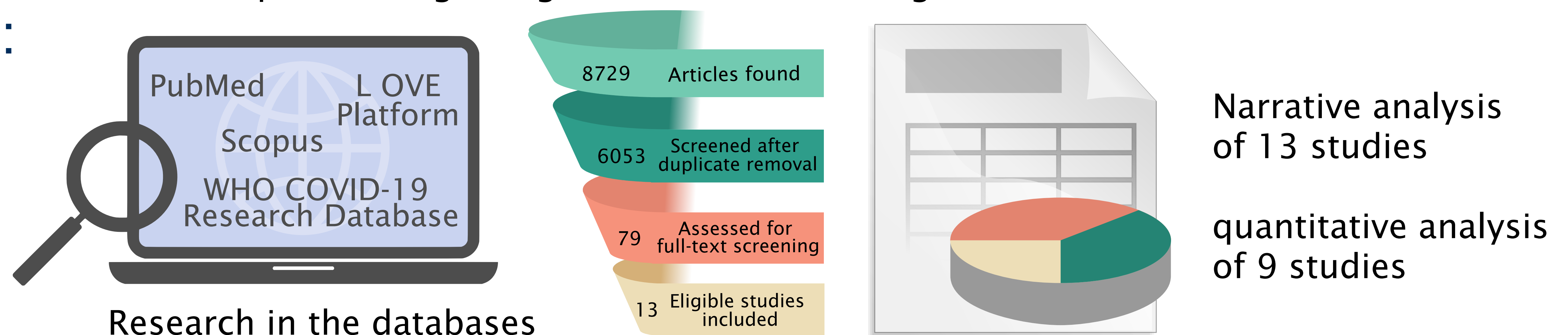
**Background:** Long-COVID (LC) is a significant and concerning consequence of COVID-19. Underlying mechanisms of LC are not yet fully understood. Studies suggest increased risk between pre-existing allergic diseases and Long-COVID.

**Objective:**

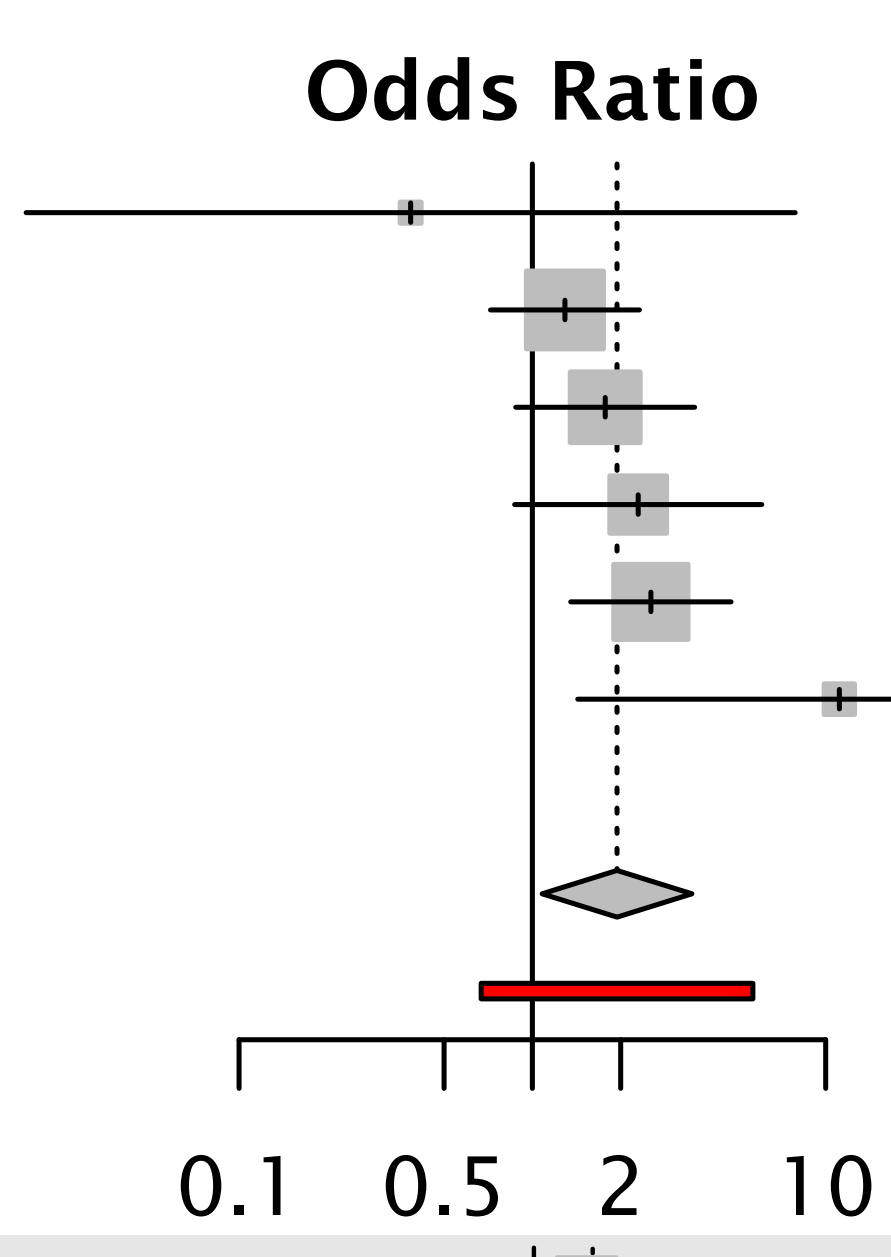
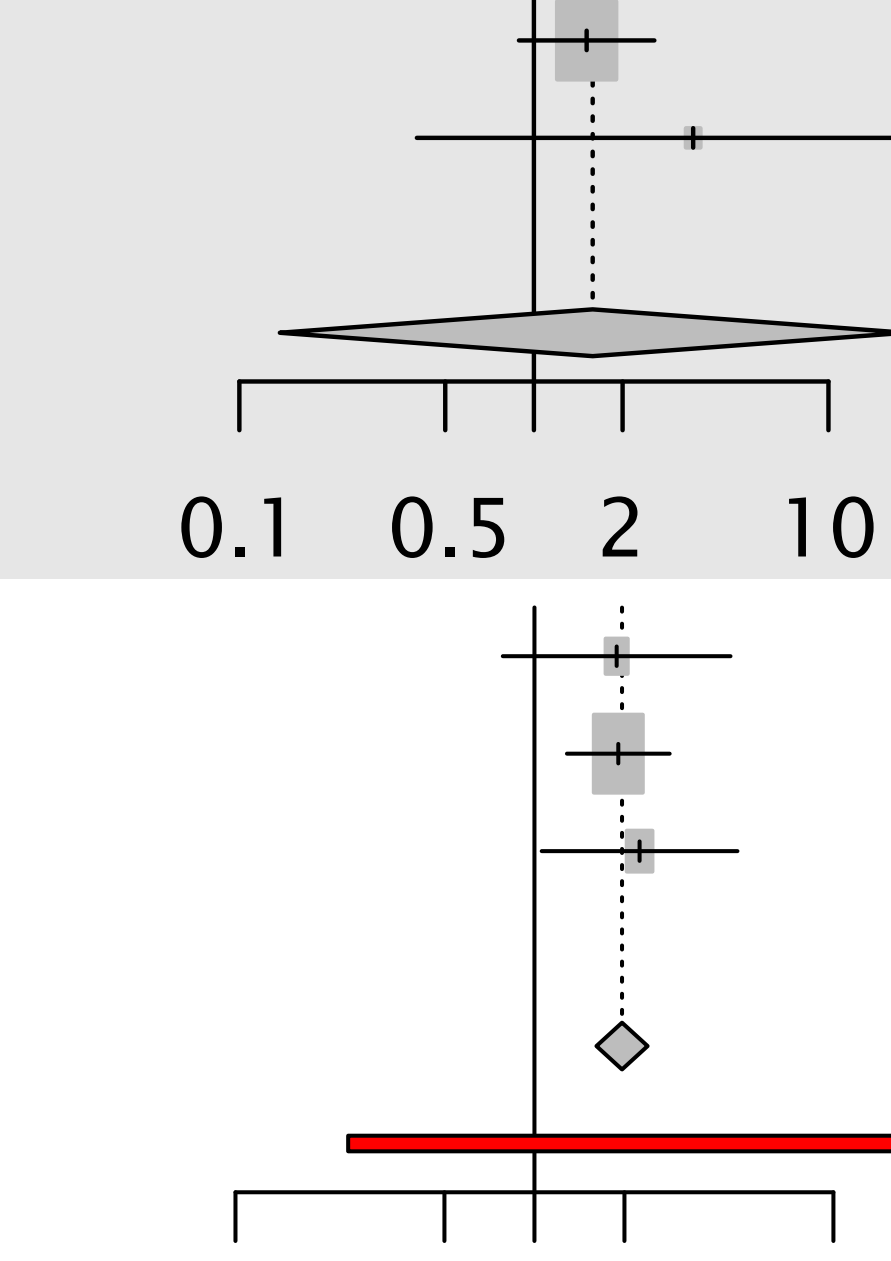
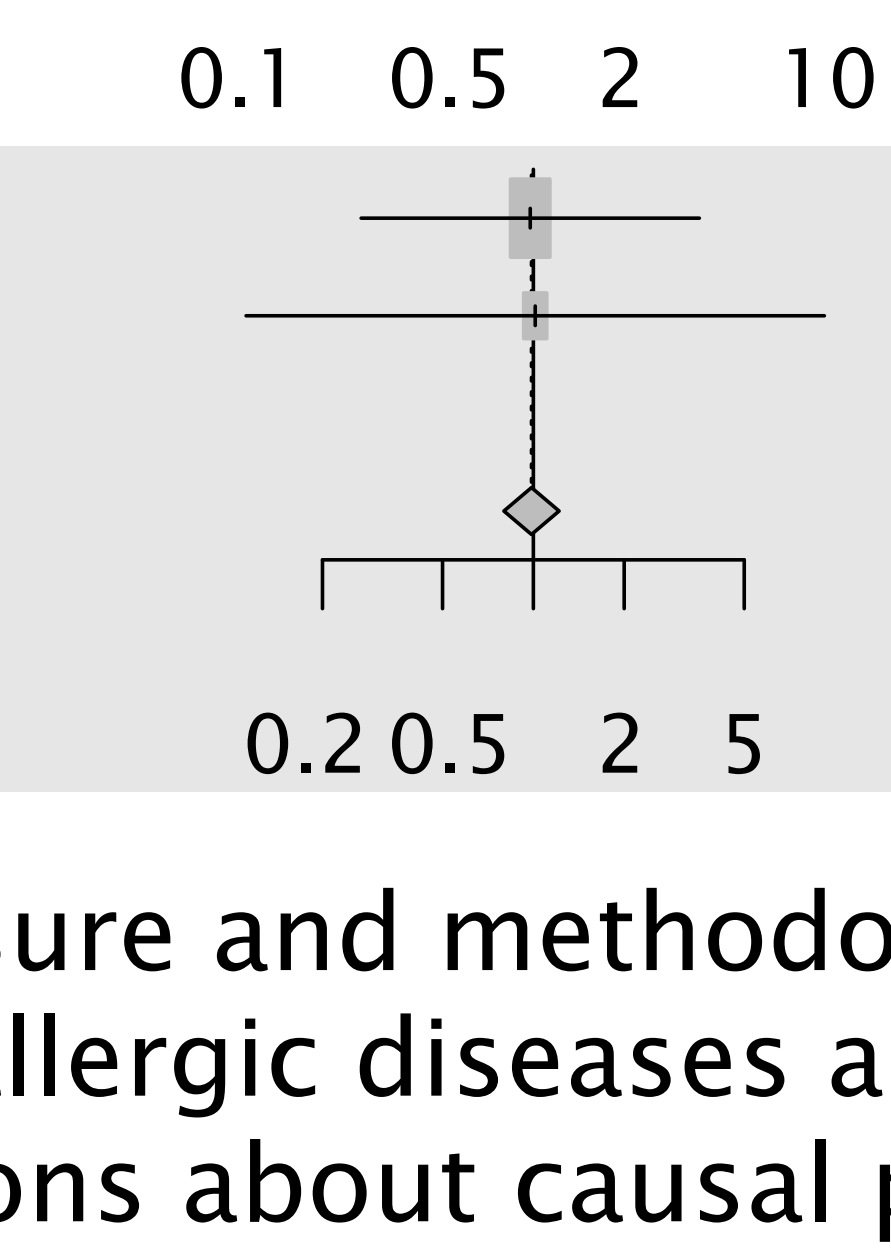



Identification, quality assessment and summary of existing evidence on associations between pre-existing allergic conditions and Long-COVID in cohort studies

**Methods:**



**Results:**

| Study   | Experimental Events | Experimental Total | Control Events | Control Total | Odds Ratio  | OR                   | 95%-CI               | Weight        |
|---|---------------------|--------------------|----------------|---------------|---|----------------------|----------------------|---------------|
| <b>a</b> Marando et al.                                 | 0                   | 5                  | 6              | 33            |  | 0.38                 | [0.02; 7.87]         | 2.1%          |
| Pazukhina et al. (ADT)                                  | 27                  | 48                 | 466            | 934           |   | 1.29                 | [0.72; 2.32]         | 28.4%         |
| Maestre-Muniz et al.                                    | 27                  | 39                 | 282            | 504           |   | 1.77                 | [0.88; 3.58]         | 23.4%         |
| Almutairi et al.  | 6                   | 26                 | 40             | 346           |   | 2.29                 | [0.87; 6.05]         | 15.4%         |
| Fernandez-de-las-Penas et al.                           | 115                 | 126                | 1468           | 1824          |   | 2.54                 | [1.35; 4.76]         | 26.4%         |
| Cervia et al.   | 16                  | 17                 | 69             | 117           |   | 11.13                | [1.43; 86.77]        | 4.4%          |
| <b>Random effects model</b>                             |                     | <b>261</b>         |                | <b>3758</b>   |   | <b>1.94</b>          | <b>[1.08; 3.50]</b>  | <b>100.0%</b> |
| <b>Prediction interval</b>                              |                     |                    |                |               |   | <b>[0.67; 5.65]</b>  |                      |               |
| <b>a</b> asthma measured in a hospital-based population |                     |                    |                |               |   |                      |                      |               |
| <b>b</b> Jacobs et al.                                  | 39                  | 67                 | 166            | 346           |  | 1.51                 | [0.89; 2.56]         | 94.3%         |
| Fischer et al.  | 5                   | 6                  | 167            | 283           |   | 3.47                 | [0.40; 30.12]        | 5.7%          |
| <b>Random effects model</b>                             |                     | <b>73</b>          |                | <b>629</b>    |   | <b>1.58</b>          | <b>[0.14; 18.27]</b> | <b>100.0%</b> |
| <b>b</b> asthma measured in the general population      |                     |                    |                |               |   |                      |                      |               |
| <b>c</b> Pazukhina et al. (CHD)                         | 8                   | 26                 | 63             | 330           |  | 1.88                 | [0.78; 4.53]         | 13.8%         |
| Jacobs et al.   | 103                 | 175                | 102            | 238           |   | 1.91                 | [1.28; 2.83]         | 67.6%         |
| Almutairi et al.  | 11                  | 51                 | 35             | 321           |   | 2.25                 | [1.06; 4.78]         | 18.6%         |
| <b>Random effects model</b>                             |                     | <b>252</b>         |                | <b>889</b>    | <b>1.96</b>   | <b>[1.61; 2.39]</b>  | <b>100.0%</b>        |               |
| <b>Prediction interval</b>                              |                     |                    |                |               |   | <b>[0.24; 16.18]</b> |                      |               |
| <b>c</b> rhinitis measured                              |                     |                    |                |               |   |                      |                      |               |
| <b>d</b> Fumagalli et al.                               | 4                   | 10                 | 99             | 244           |  | 0.98                 | [0.27; 3.55]         | 74.5%         |
| Pazukhina et al. (CHD)                                  | 1                   | 5                  | 70             | 354           |   | 1.01                 | [0.11; 9.22]         | 25.5%         |
| <b>Random effects model</b>                             |                     | <b>15</b>          |                | <b>598</b>    |   | <b>0.99</b>          | <b>[0.80; 1.22]</b>  | <b>100.0%</b> |
| <b>Prediction interval</b>                              |                     |                    |                |               |   |                      |                      |               |
| <b>d</b> allergies measured                             |                     |                    |                |               |   |                      |                      |               |

**Conclusion:** Studies differed regarding objectives, exposure and methodological aspects. Evidence suggests an association between allergic diseases and evolving Long-COVID. The cohort study design allows no conclusions about causal pathways.