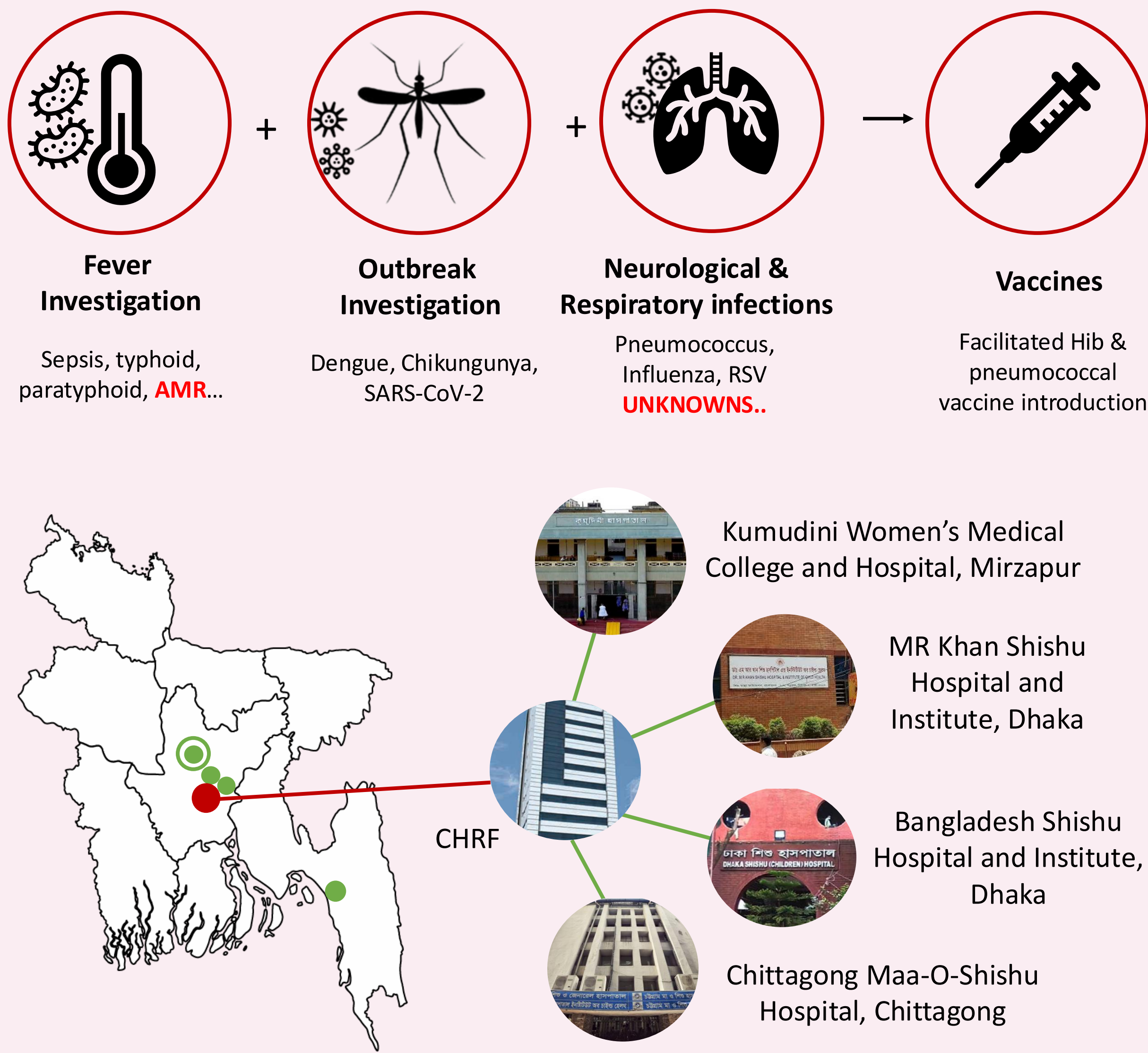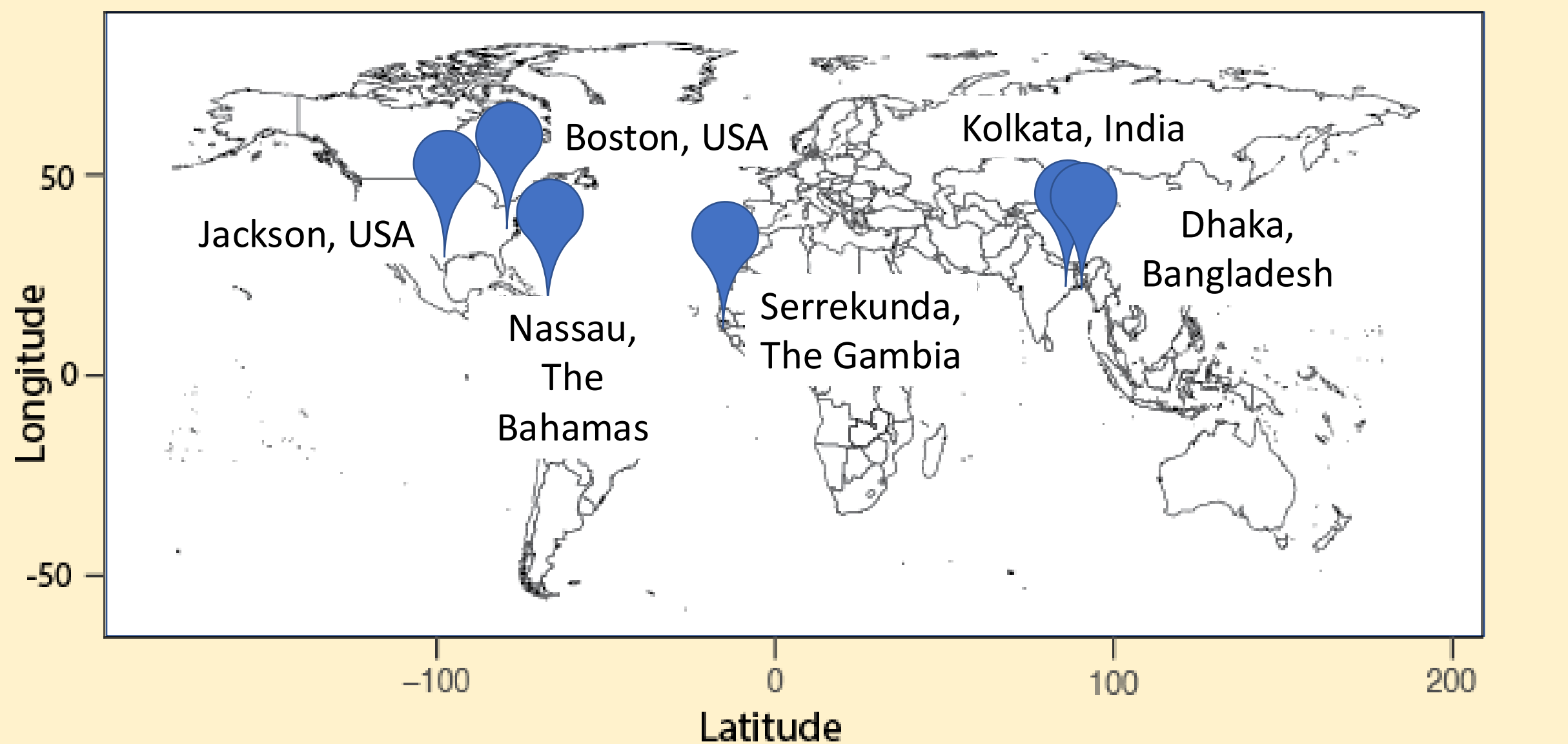# Building a Single-cell Atlas of the Nasopharyngeal Mucosa to Investigate SARS-CoV-2 Infection

Preonath Chondrow Dev, Apurba Rajib Malaker, Deb Purna Keya, Yogesh Hooda, Senjuti Saha
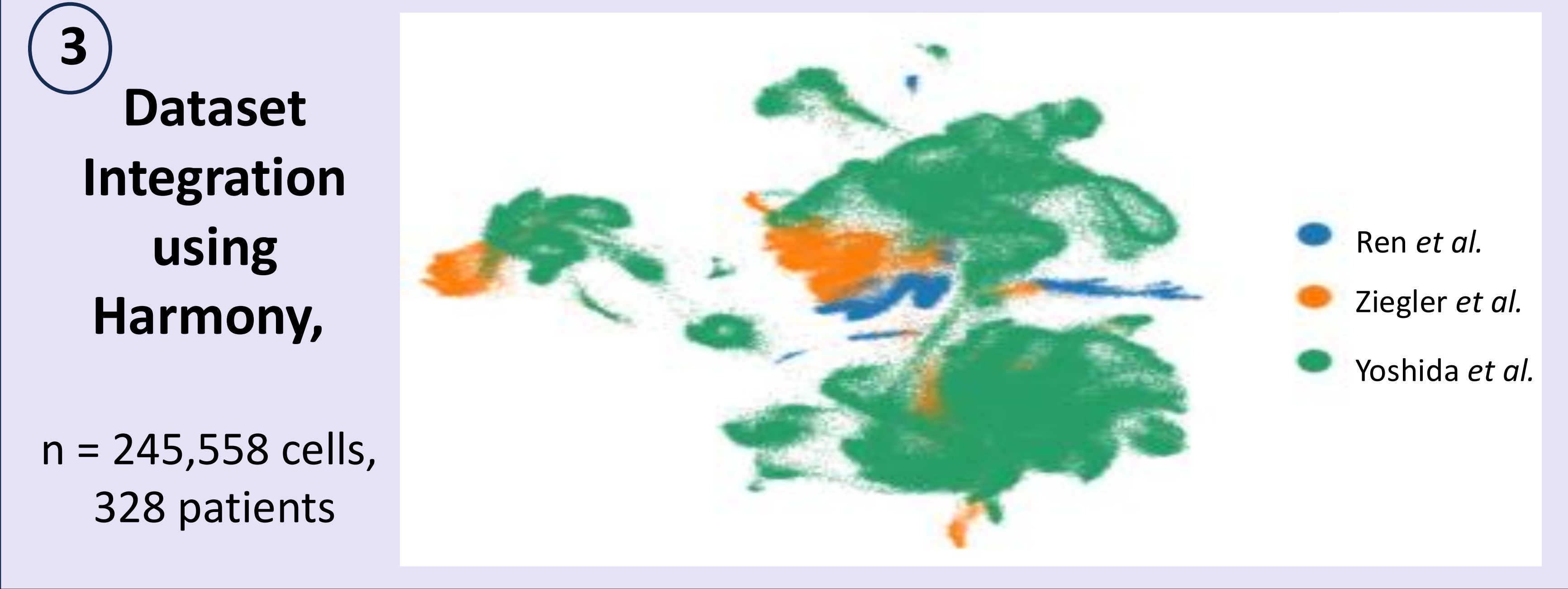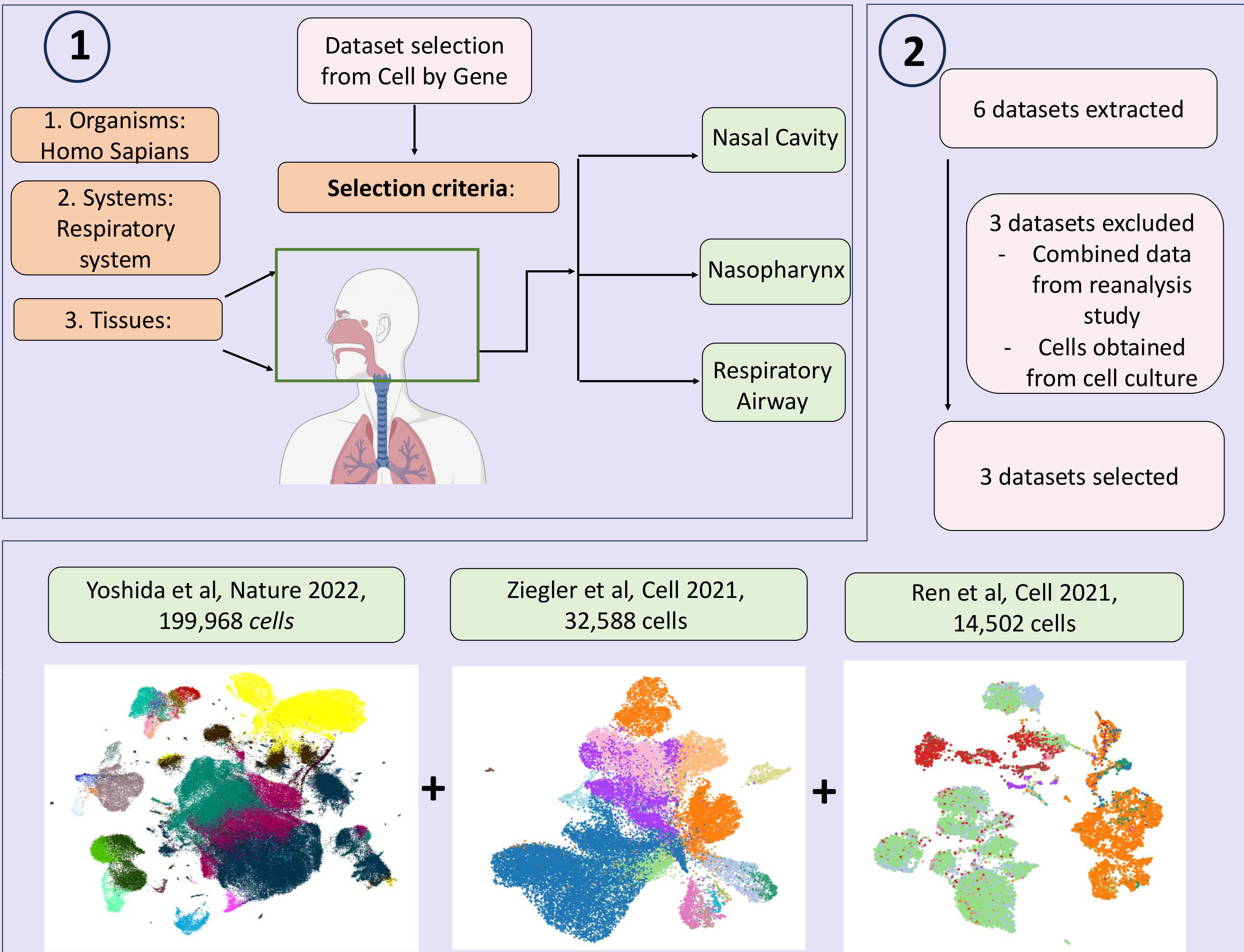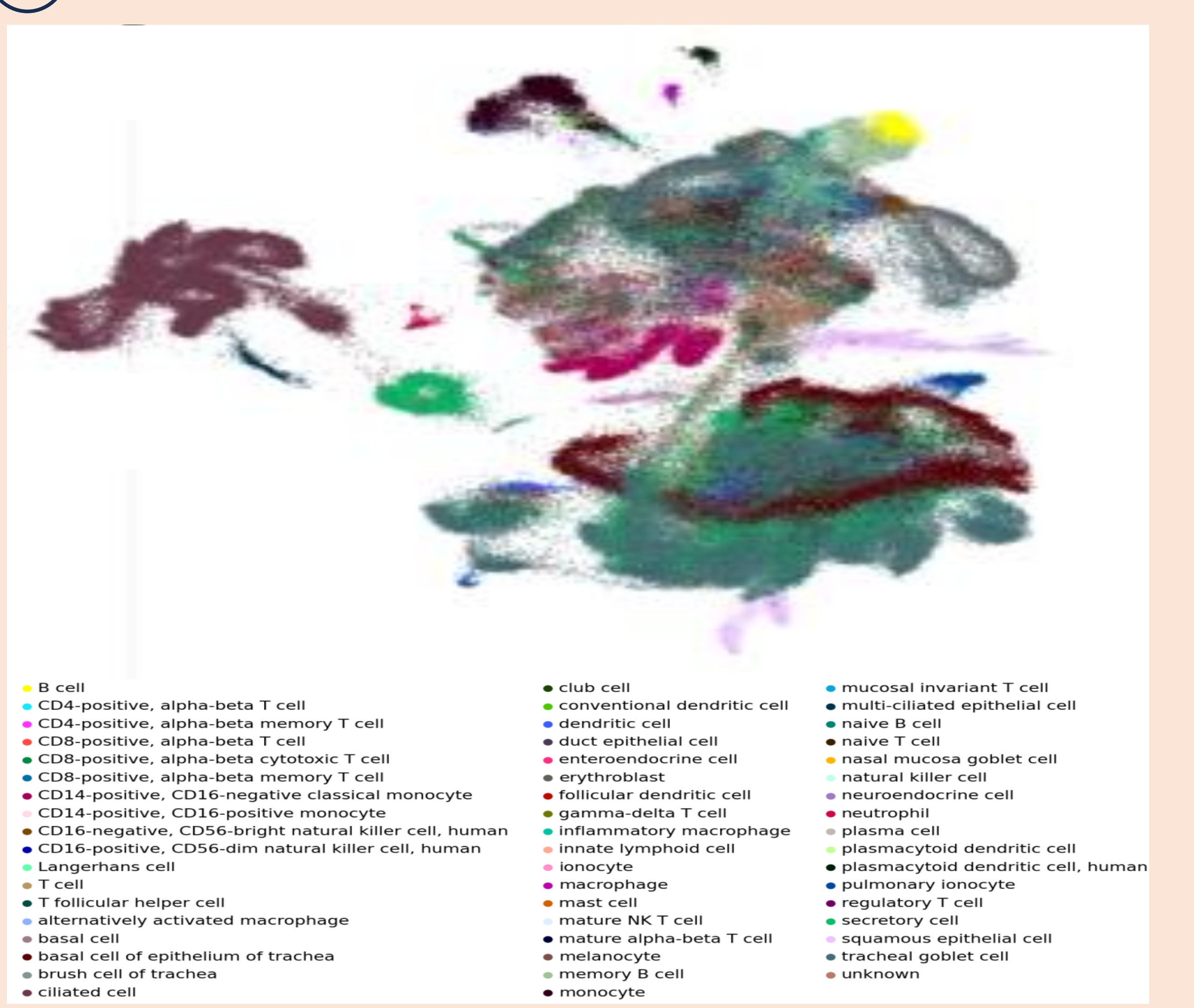
Child Health Research Foundation
CHRF
Prevent Infections, Save Lives

Child Health Research Foundation

Fever Investigation + **Outbreak Investigation** + **Neurological & Respiratory infections** → **Vaccines**

Sepsis, typhoid, paratyphoid, **AMR**...

Dengue, Chikungunya, SARS-CoV-2

Pneumococcus, Influenza, RSV **UNKNOWNS..**

Facilitated Hib & pneumococcal vaccine introduction

Kumudini Women's Medical College and Hospital, Mirzapur

MR Khan Shishu Hospital and Institute, Dhaka

CHRF

Bangladesh Shishu Hospital and Institute, Dhaka

Chittagong Maa-O-Shishu Hospital, Chittagong

A Global Pediatric Cell Atlas of Nasal and Oral Mucosa

Boston, USA
Jackson, USA
Nassau, The Bahamas
Serrekunda, The Gambia
Kolkata, India
Dhaka, Bangladesh

Building Single-cell Atlas of the Nasopharyngeal Mucosa

1

Dataset selection from Cell by Gene

1. Organisms: Homo Sapians
2. Systems: Respiratory system
3. Tissues:

Selection criteria:

→ Nasal Cavity
→ Nasopharynx
→ Respiratory Airway

2

6 datasets extracted

3 datasets excluded
- Combined data from reanalysis study
- Cells obtained from cell culture

3 datasets selected

Yoshida et al, Nature 2022, 199,968 *cells*

Ziegler et al, Cell 2021, 32,588 cells

Ren et al, Cell 2021, 14,502 cells

3

Dataset Integration using Harmony,

n = 245,558 cells, 328 patients

- Ren *et al.*
- Ziegler *et al.*
- Yoshida *et al.*

Cell-type Clusters of Integrated Dataset

4

- B cell
- CD4-positive, alpha-beta T cell
- CD4-positive, alpha-beta memory T cell
- CD8-positive, alpha-beta T cell
- CD8-positive, alpha-beta cytotoxic cell
- CD8-positive, alpha-beta memory T cell
- CD14-positive, CD16-negative classical monocyte
- CD14-positive, CD16-positive monocyte
- CD16-negative, CD56-bright natural killer cell, human
- CD16-positive, CD56-dim natural killer cell, human
- Langerhans cell
- T cell
- T follicular helper cell
- alternatively activated macrophage
- basal cell
- basal cell of epithelium of trachea
- brush cell of trachea
- ciliated cell
- club cell
- conventional dendritic cell
- dendritic cell
- duct epithelial cell
- enteroendocrine cell
- erythroblast
- follicular dendritic cell
- gamma-delta T cell
- inflammatory macrophage
- innate lymphoid cell
- ionocyte
- macrophage
- mast cell
- mature NK T cell
- mature alpha-beta T cell
- melanocyte
- memory B cell
- monocyte
- mucosal invariant T cell
- multi-ciliated epithelial cell
- naive B cell
- naive T cell
- nasal mucosa goblet cell
- natural killer cell
- neuroendocrine cell
- neutrophil
- plasma cell
- plasmacytoid dendritic cell
- plasmacytoid dendritic cell, human
- pulmonary ionocyte
- regulatory T cell
- secretory cell
- squamous epithelial cell
- tracheal goblet cell
- unknown

Next steps

- Assess expression of SARS-CoV-2 in the nasopharynx.
- Reannotate the cell types to identify novel and other subtypes.
- Analyze data into greater details in terms of demographical characteristics e.g., age specific differences, SARS-CoV-2 status etc.
- Compare findings from Bangladesh with the global integrated dataset.