Idiopathic pulmonary fibrosis (IPF) is a chronic, progressive, and incurable lung disease that affects middle-aged and older adults. Previous studies have reported that air pollution exposure is associated with acute exacerbation, disease progression, and mortality in IPF patients. Ozone (O₃) exposure is associated with increased risk of acute exacerbation of IPF, while mortality risk increases with greater exposure to particulate matter < 2.5 μm. More than four in 10 people (41%) in the United States (U.S.) live in counties that have unhealthy levels of O₃ or particle pollution e.g. particulate matter < 2.5 μm (PM₂.₅). More than 133.9 million people live in the 215 counties that had unhealthy ozone or particle pollution in 2014-2016. The U.S. Environmental Protection Agency (EPA) have recently taken steps that detrimentally affect future air quality for IPF patients. Given the sensitivity of IPF patients to air pollution and recent threats to the Clean Air Act, a database of U.S. based home spirometry recordings and corresponding air quality data may be of value.

The objective of this study was to use a mobile application (patientMpower) to capture longitudinal data on air quality and home spirometry in a group of pulmonary fibrosis patients. The patientMpower mobile application is currently being used by a cohort of IPF patients in the U.S. to objectively measure lung function (e.g. Forced Vital Capacity (FVC) and air quality in real-world settings.

Study participants were recruited via patient support groups and online promotion (Google Adwords, Facebook Advertising). Participants were provided with the patientMpower app for pulmonary fibrosis and portable Bluetooth home spirometers (Spirobank Smart, MIR Srl, Italy). Participants were free to use the patientMpower app/spirometry as often as they wished. For every lung function measurement recorded via the patientMpower app, corresponding historical ground level O₃ and PM₂.₅ data were obtained from the AirNow database.

RESULTS
In a 16-month period (July 2017 - October 2018), 125 U.S. based pulmonary fibrosis patients used the patientMpower app to record location tagged home spirometry. O₃ information was available for 6,646 spirometry readings from 92 patients, while PM₂.₅ information was available for 5,927 spirometry readings from 88 patients (see Table 1).

### Table 1: Descriptive information on the air quality and home spirometry data analyzed

<table>
<thead>
<tr>
<th>Air Pollutant</th>
<th>Number of patients (N)</th>
<th>Total Number of Spirometry Recordings</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>O₃</td>
<td>92</td>
<td>6,646</td>
<td>70 ± 201</td>
<td>12</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>86</td>
<td>5,927</td>
<td>67 ± 194</td>
<td>13</td>
</tr>
</tbody>
</table>

DISCUSSION
This study demonstrated the feasibility of using the patientMpower application as a tool to record longitudinal data on air quality and home spirometry in a group of pulmonary fibrosis patients. The majority of patients in this study were exposed to moderate or unhealthy levels of O₃ and PM₂.₅ at varying time points, increasing the risk of acute exacerbation, disease progression, and mortality.

Over time, a database of home spirometry and air quality data could be built up. Such a database may be of clinical benefit in investigating the impact of air quality on IPF patients’ health and how changes to air quality regulations impact this group.

REFERENCES
5. AirNow API - https://docs.airnowapi.org/

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