

Approximate or accurate? Efficacy of daily use of weather and air quality mobile applications for pollen allergy sufferers?

Alessandro Travaglini¹ | Maria Antonia Brighetti¹ | Auro Della Giustina² | Stefano Pattini³ | Ifigenia Sfika⁴ | Velia Malizia⁵  | Salvatore Tripodi⁶ | Alessandro Di Menno di Bucchianico⁷ 

¹Department of Biology, University of Rome "Tor Vergata", Rome, Italy

²Private Practice, Parma, Italy

³Pediatric Unit, Department of Medical and Surgical Sciences of the Mother, Children and Adults, University of Modena and Reggio Emilia, Modena, Italy

⁴Private Practice, Rome, Italy

⁵Institute for Biomedical Research and Innovation (IRIB), National Research Council (CNR), Palermo, Italy

⁶Allergy Service, Policlinico Casilino, Rome, Italy

⁷Italian National Institute for Environmental Protection and Research (ISPRA), Rome, Italy

Correspondence

Alessandro Travaglini, Department of Biology, University of Rome "Tor Vergata", Rome, Italy.

Email: alessandro.travaglini@uniroma2.it

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Abstract

Nowadays, technology permeates every aspect of human activity, from the professional to the recreational side, and the recent pandemic crisis has only amplified a clearly defined trend.

Through portable devices, people play, work, and get information. The immediacy of information and of many aspects of our life is a condition that, once acquired, is difficult to give up. However, immediate information must also be correct, and not all issues can easily be simplified to the point of being understandable in the absence of basic theoretical notions to a large audience. This aspect is particularly relevant when dealing with issues related to human health and the communication problems encountered in recent months concerning the spread of SARS-CoV-2, and the vaccination campaign is there to prove it. With the intent of clarifying the advantages and disadvantages of fast and accessible information, in this article, some of the most widespread applications for mobile devices, dedicated to pollen allergens, air quality, parks, gardens, and green areas, were examined.

A widespread lack of clarity on the sources of the data and on the criteria used to formulate synthetic judgments—that often confuse the final users—was noted.

KEYWORDS

air quality, allergenic pollen, apps, real-time information, urban green

1 | INTRODUCTION

The health emergency constituted by the coronavirus disease 2019 (COVID-19) pandemic has determined and still causes many changes in our lives, by spreading smart working, distance learning, virtual conferences, teleconferences, and telemedicine.^{1–3} In this context, we asked ourselves: what technological tools do we have at our disposal to help allergy sufferers deal with spring and the critical seasons? What kind of information is presented on air quality, in its

various components, and on any synergistic effects between allergenic pollens and pollutants of anthropogenic origin?^{4–7}

1.1 | Official aerobiological networks

There are three aerobiological monitoring networks in Italy: AIA-RIMA (www.ilpolline.it), POLLnet, the aerobiological monitoring network of the National System for the Protection of the Environment,

SNPA (www.pollnet.it), finally AAIITO (pollinieallergia.net). They are characterized by a not fully and homogeneously covering of the national territory but operate according to official rule.⁸ So, both allergists and allergic people can check what the data coverage is in their city or region, using the first two networks.

1.2 | The apps

The situation is different for the apps that deal with weather forecasts. Some are present by default among those pre-installed on the phone. The different weather forecast sites offer a wide range of 3, 5, 7, and 15-day weather forecasts, air quality data, and pollen forecasts. Looking for some of the most "clicked" apps in Italy, 3Bmeteo, Meteo.it., AccuWeather, it is possible to note the inability to understand which the source of the data is presented. Moreover, the forecast of 3Bmeteo is presented by province, even where there are no active monitoring centers. Often it is not clear which pollen is present, nor which is the source of the pollen data; in other cases, data are wrong.

Among the most common apps for the smartphones, AccuWeather offers data on air quality, reworked by Plumelabs (<https://air.plumelabs.com/en/>), and data regarding pollen, strangely assembled. They are captivating, with soothing graphics and soft pastel colors. They are initially designed for other countries and then only translated for Italy. The proposed subdivision, trees, grasses, and ragweed trees reveal the Anglo-Saxon derivation of these apps. Generally, these apps require geolocation, and people can customize their profile by indicating which species are allergic.

Pollen Wise (<https://www.pollensense.com/pages/automated-particle-sensors>) is based on a network of sensors capable of measuring in real time the concentration of pollen, spores, and dust in real time, but too far from Italy. Furthermore, the list of species/*genera* does not include the cypress but juniper and cedar.

Pollen alert (<https://www.alertepollens.org/pollinarium-sentinel>) is released by a French company in collaboration with the French aerobiological monitoring network. An interesting aspect is that the app is associated with a network of mini phenological gardens, called *pollinarium sentinel*.

POLLEN results from a collaboration between institutions from different countries, Austria, Finland, France, Germany, Great Britain, Sweden, Switzerland, and South Tyrol. An hourly risk is therefore proposed.

Breezometer (<https://breezometer.com/products/pollen-api>) the information is provided synthetically through a synthetic judgment based on the European EAQI Index (European Air Quality Index, <https://airindex.eea.europa.eu/Map/AQI/Viewer/>) using different data sources including national monitoring stations, real-time traffic information, weather conditions, and CAMS (Copernicus Atmosphere Monitoring Service) data, combined with self-learning technology and big data analytics. The application does not provide data relating to a single pollutant, but only an

Key Message

It is preferable to consult the institutional sites of the bodies responsible for environmental protection and research. Even if less directly, these websites consistently report data collected according to standard methods, certified and verified by the technicians in charge in compliance with the regulations in force.

overall judgment on the air quality (which can be "bad," "moderate," "good," and so on).

Moving on to applications dedicated explicitly to air quality, we found over 200 applications on this topic available in the Android store. Generally, no details are provided on the available sites, which in any case do not correspond to fixed monitoring stations of the Italian air quality network, although the position detected by the GPS is requested. Some apps present data only for concentrations of PM₁, PM_{2.5}, PM₄, and PM₁₀; other ones also for gaseous pollutants, such as nitrogen oxides or ozone.

Plume Air (<https://plumelabs.com/en/>). The air quality data are expressed through an air quality index called AQI based on the levels of PM₁₀, PM_{2.5}, nitrogen dioxide, and ozone detected by portable sensors connected to the project. The algorithm used for calculating the AQI index is not revealed but, from the data presented, it is clear that it is a typical index with a dominant pollutant.

Wiseair (<https://www.wiseair.vision/>) is an application that provides real-time information on air pollution. The information is expressed through a synthetic index from 0 to 100, calculated based on data collected by a portable analyzer assigned to a community of citizens interested in environmental issues.

In the stores, people can find many applications, but none of them can suggest what is really in that place and at that moment. Allergic people rarely know the pollen-producing plant that causes their allergy.

PlantNet analyzes the pictures of the parts of the plant, leaves, flowers, trunk. The app recognizes both herbaceous and arboreal plants and is developed on plants typical of wild flora; in fact, it often does not recognize ornamental and horticultural species. This app is straightforward to use but does not report information on the allergenicity of the species.

2 | CONCLUSIONS

Overall, the apps examined show some critical issues, the most important is undoubtedly the unclear (or even missing) indication of the source of the data used, the lack of transparency on the methods of collection and data processing criteria. In general, the apps dedicated to pollen and air quality are mostly imported products and have been designed for other countries. Moreover, when they

apply clear criteria and use public databases, the results will inevitably be affected by the different designs and spatial coverage of the national networks. The information provided is always pre-interpreted, making it easy to read. However, a simple comparison between similar apps will frequently show different judgments (and consequent behavior suggestions) for the same time and place, leaving the non-expert user without any rational criteria that choose the most reliable evaluation.

Finally, the direct consult of the institutional sites for the environmental protection and research is preferable. Even if less immediately, websites consistently report data collected according to standard methods, certified and verified by the technicians in compliance with the regulations.

CONFLICT OF INTEREST

Authors declared they have no conflict of interests.

AUTHOR CONTRIBUTIONS

Alessandro Travaglini: Writing—review and editing (equal). **Maria Antonia Brighetti:** Writing—review and editing (equal). **Auro Della Giustina:** Writing—review and editing (equal). **Stefano Pattini:** Writing—review and editing (equal). **Ifigenia Sfika:** Writing—review and editing (equal). **Velia Malizia:** Writing—review and editing (equal). **Salvatore Tripodi:** Supervision (lead); Writing—review and editing (equal). **Alessandro Di Menno di Bucchianico:** Conceptualization (equal); Supervision (lead); Writing—review and editing (equal).

ORCID

Velia Malizia  <https://orcid.org/0000-0002-1754-9353>

Alessandro Di Menno di Bucchianico  <https://orcid.org/0000-0001-9139-935X>

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