Office of the Principal Scientific Adviser to the Government of India

A Cluster Approach to Public Health

PUNE KNOWLEDGE CLUSTER

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PUNE KNOWLEDGE CLUSTER
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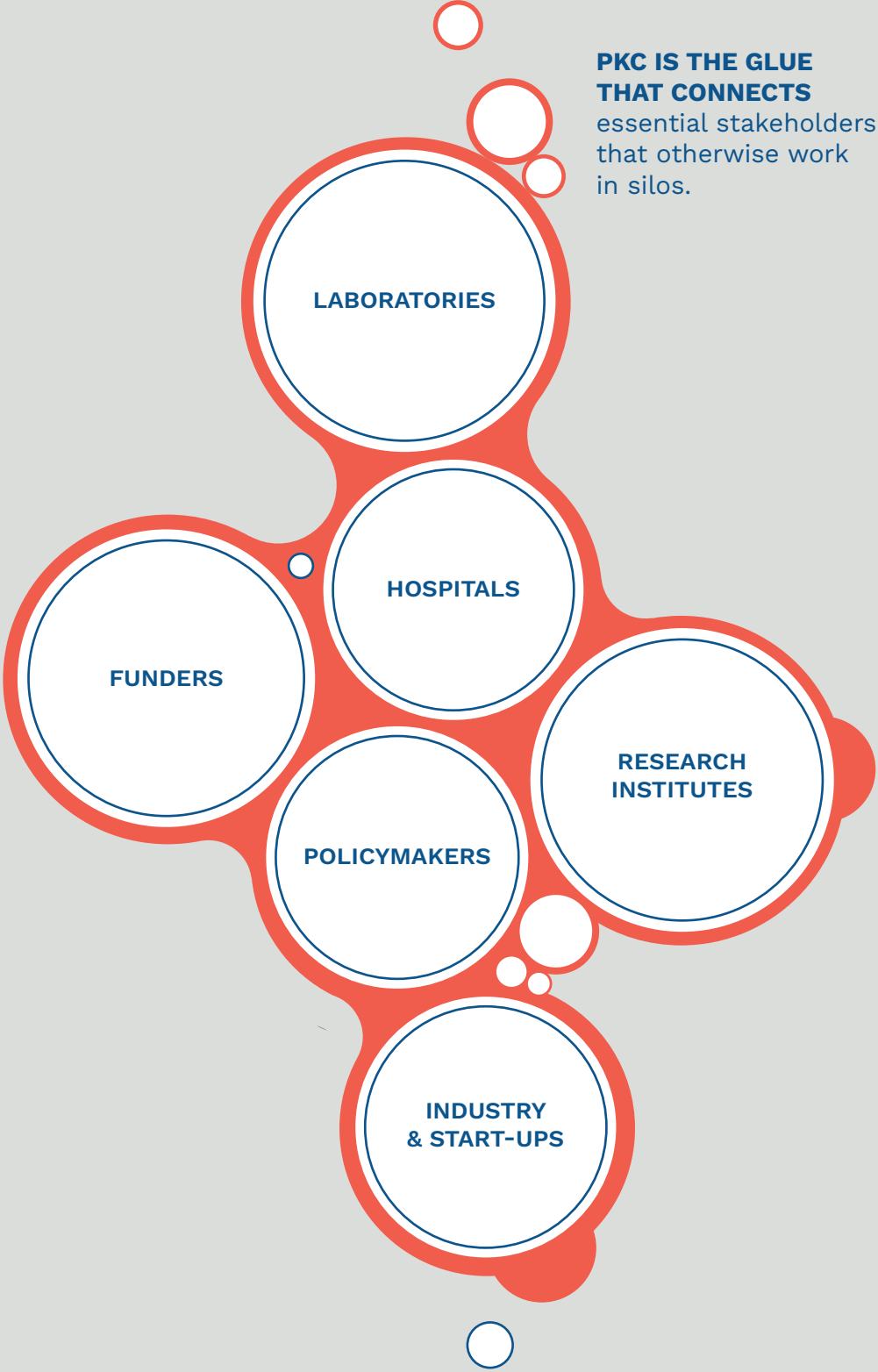
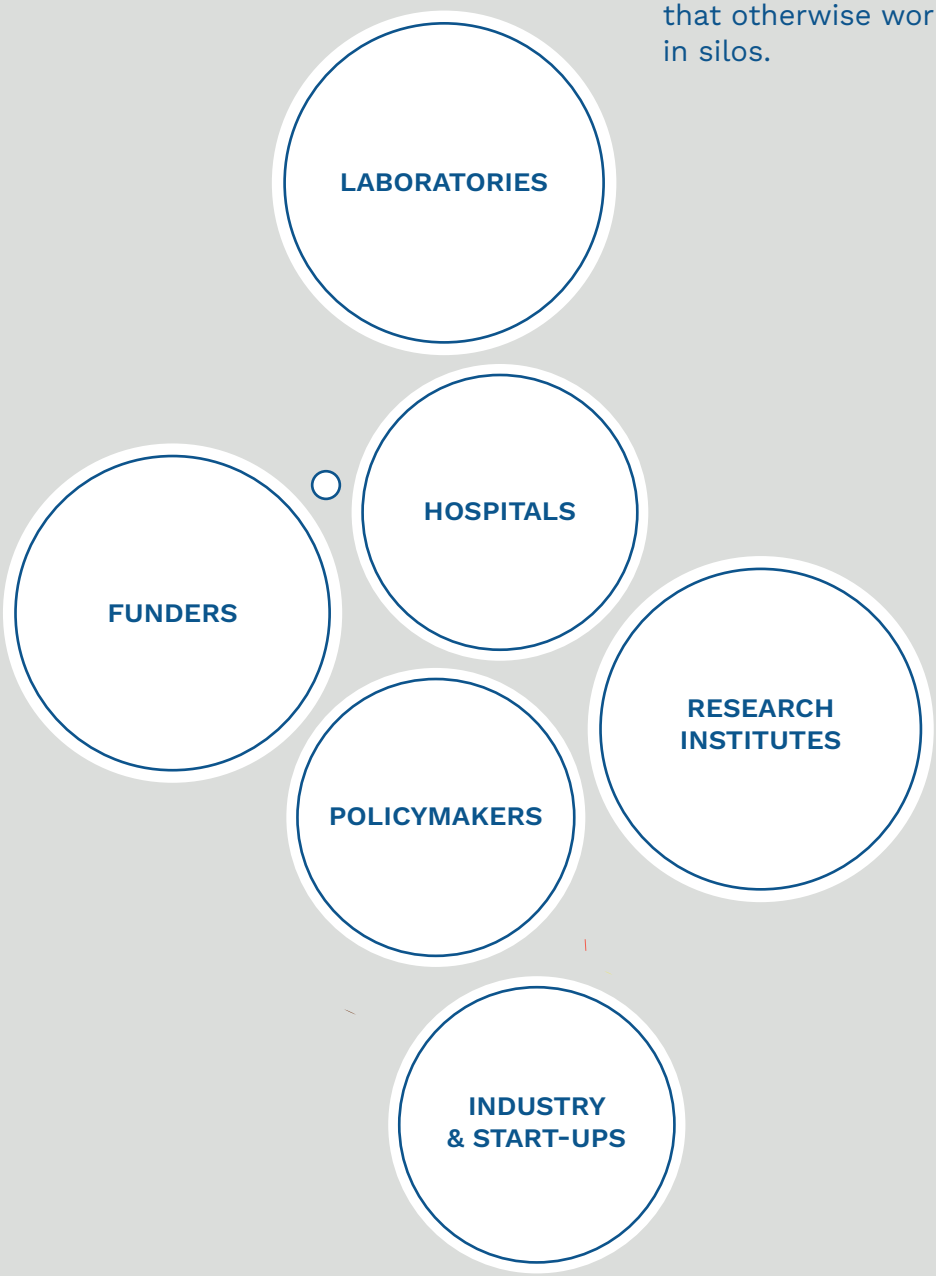
PKC IS THE GLUE THAT CONNECTS essential stakeholders that otherwise work in silos.



essential stakeholders that otherwise work in silos.



Introduction

The Pune Knowledge Cluster was established in July 2020 by the Office of the Principal Scientific Adviser to the Government of India, as the first Science & Technology (S&T) cluster in the country with a mandate of addressing challenging regional problems through an ecosystem driven approach, leveraging science, technology and innovation.

Pune was one of the worst hit cities in India during the COVID-19 pandemic. At the time of PKC's inception, the public health system in Pune was struggling with infrastructural and clinical challenges, hindering the effective monitoring and management of the pandemic. Being the need of the hour, PKC stepped up to play the role of an enabler, by bringing together over 20 government and private multidisciplinary stakeholders, including R&D organizations, hospitals, pathology labs and startups to drive as well as manage a multi-stakeholder collaboration for crisis management, complementing the efforts of the government.

PKC enabled the building of a robust and scalable disease surveillance system at the city level which began with COVID-19 but later expanded to other infectious diseases. This involved development and validation of protocols, kits, sampling methods, data collection and integration and strengthening capacity of on-ground multi-purpose health workers.

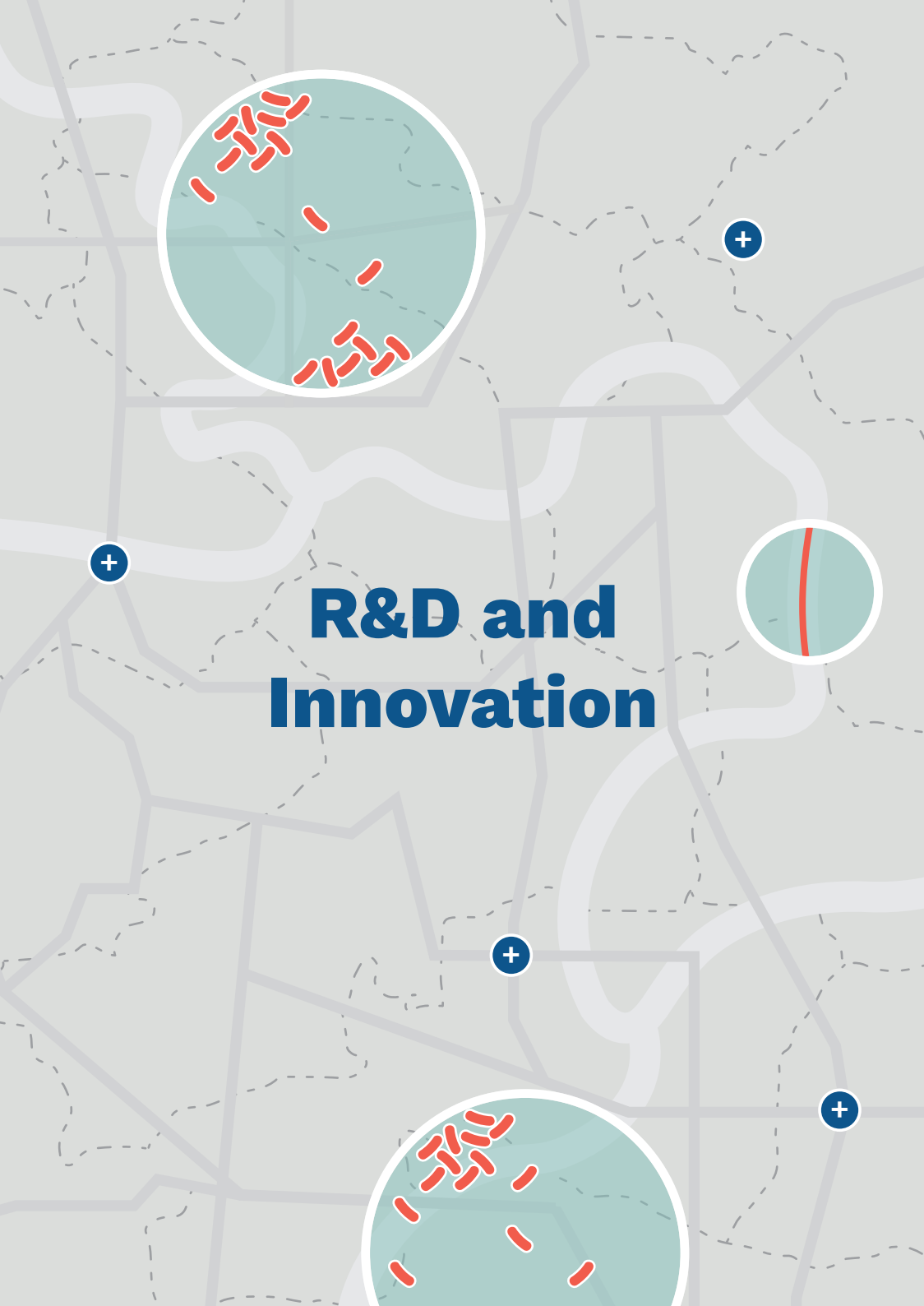
This is a first-of-its-kind initiative that demonstrated how a city's R&D, medical and civic

communities can collectively augment the public health system through science, technology, and innovation. It demonstrates that science and innovation integrated with coordination and collaborations has the ability to foster systemic change and how Clusters serve as ideal platforms for such initiatives.

PKC is part of the Alliance for Pathogen Surveillance Consortium (APSI), which aims to strengthen the country's disease surveillance systems through an ecosystem driven approach. Through this platform, PKC connects and integrates the work done in the Pune region to other cities in India. The surveillance system is currently active for COVID-19, H1N1, H3N2, and RSV and AMR, which continues to support the government in disease prediction and management.

OUR OFFERINGS

- TECHNICAL PROGRAM MANAGEMENT
- FUND MOBILIZATION AND MANAGEMENT
- STAKEHOLDER MAPPING AND ENGAGEMENT
- LOCAL, STATE AND CENTRAL GOVERNMENT RELATIONS
- STRATEGIC INDUSTRY & ACADEMIA PARTNERSHIPS
- RISK ASSESSMENT AND MITIGATION COMMUNICATION, VISIBILITY, OUTREACH
- POLICY ADVOCACY
- CAPACITY BUILDING
- COLLECTION & DISSEMINATION OF DATA (DASHBOARDS, DATABASES, MODELS)


R&D and
Innovation

Through PKC enabled initiatives, significant advances have been made in genomic sequencing, sample collection methods and data analytics, enhancing the sensitivity, speed, and scalability of surveillance systems. These innovations support real-time decision-making and strengthen epidemic preparedness, especially in resource-constrained settings.

IDENTIFYING DISEASE VARIANT STRAINS

RESEARCH PUBLICATIONS

SURVEILLANCE KITS

WASTEWATER SURVEILLANCE (WWS) IS NOT JUST ABOUT TRACKING CONTAMINANTS; IT'S A POWERFUL TOOL FOR EARLY DETECTION, PROVIDING INSIGHTS THAT ALLOW US TO ANTICIPATE, RESPOND, AND PROTECT AGAINST THE UNSEEN THREATS OF INFECTIOUS DISEASES. WWS UNCOVERS A STREAM OF INVALUABLE DATA, A SILENT WITNESS TO THE HEALTH OF OUR COMMUNITIES.

Dr Suryakant Deokar, Assistant Medical Officer of Health, Pune Municipal Corporation (PMC)

IDENTIFYING DISEASE VARIANT STRAINS

A critical aspect of disease surveillance is the identification of new variants that can determine the severity of disease and spread. It also helps in assessing the effectiveness of existing diagnostics, therapies and vaccines against the pathogen, as validated during the pandemic. By tracking variants of the SARS-CoV-2 virus, public health systems across the world could anticipate surges, adapt vaccination strategies and update clinical guidelines. Without variant surveillance, they would be “fighting blind.”

15,000+ HUMAN CLINICAL SAMPLES were sequenced for detecting variants of COVID-19. This data contributed to 4.6% of total sequences uploaded to INSACOG* making it one of the largest contributions of sequencing data from one city.

4000 WASTEWATER SAMPLES WERE SEQUENCED FROM 40+ SITES IN PUNE to detect variants of COVID-19 in wastewater, largely from open drains and STPs. WWS serves as an early indicator of COVID-19, giving a lead time of 2-3 weeks before the disease peaks in the human population.

SEE THE FULL LIST OF PUBLICATIONS ON PAGE 29

RESEARCH PUBLICATIONS

Over 14 scientific publications in international and national journals involving R&D organizations, diagnostic companies, hospitals were enabled through this initiative.

SURVEILLANCE KITS

Collecting wastewater samples can be a hazardous task but the technology used by Fluid Robotics removes the need for direct contact

The CoViQuant kit by GenePath Dx Private Limited used for the detection and quantification of viral RNA of SARS-CoV-2 viruses

WITH THE WORK ENABLED BY PKC, THE OMICRON VARIANT OF COVID-19 WAS IDENTIFIED IN PUNE'S WASTEWATER BEFORE THE FIRST CLINICAL CASE WAS REPORTED IN THE CITY, AND GLOBALLY (BOTSWANA).

THE R&D INITIATIVES PROVED THAT WWS CAN SERVE AS AN EARLY INDICATOR OF DISEASES AND PLAY A SIGNIFICANT ROLE IN MAKING TIMELY PUBLIC HEALTH DECISIONS. THE RESEARCH FINDINGS HAVE BEEN RECOGNIZED BY THE GLOBAL R&D COMMUNITY AND PUBLISHED IN PEER-REVIEWED JOURNALS.


Data
Stewardship

Data stewardship is critical in ensuring responsible collection, management, and use of sensitive health data. It involves maintaining data quality, privacy, and interoperability while enabling timely access for decision-makers. PKC built strong data governance frameworks to support ethical, equitable use of surveillance insights to inform public health action.

WWS DASHBOARD

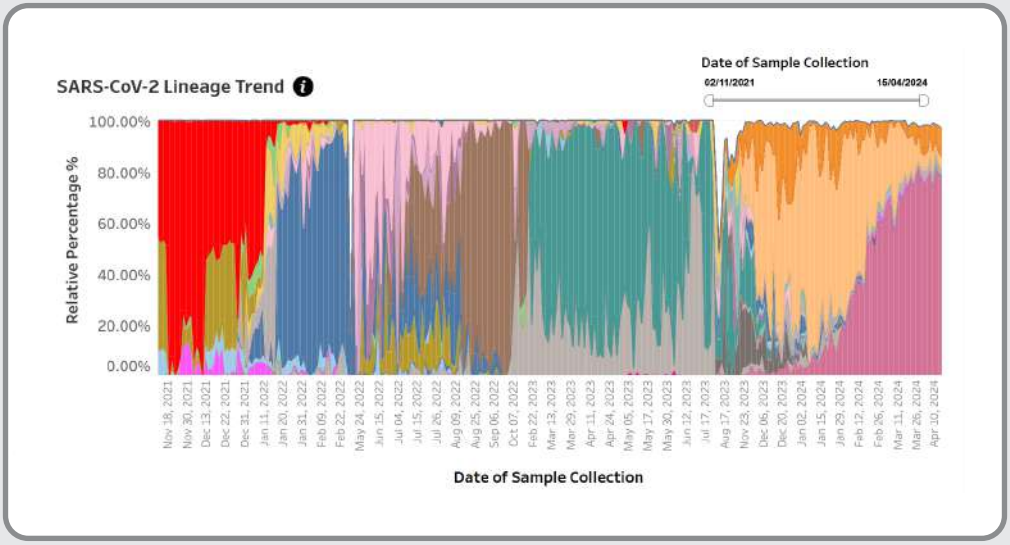
COVID-19 CLINICAL DATABASE

AMR DASHBOARD

WWS DASHBOARD

The Pune Wastewater Surveillance Dashboard is an open access, user-friendly, dashboard presenting the status of viral loads in the city's wastewater surveillance for four pathogens – COVID-19, H1N1, H3N2, and Influenza-A. These samples were collected from various locations across the Pune Metropolitan Region from Sewage Treatment Plants (STP). The mapping of WWS results provides a pictorial and graphical representation of the viral load, making it simple for various stakeholders to interpret the data.

VISIT PKC.ORG.IN/COVID19-WWS-DASHBOARD



A snapshot of PKC's Wastewater Surveillance Dashboard showing the trend of SARS-CoV-2 lineage prevalence over time

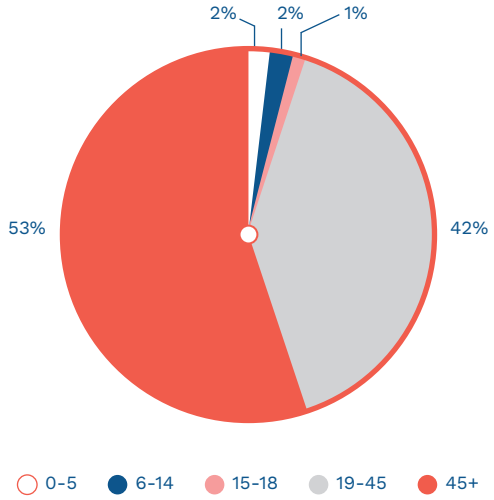
VISIT
COVICORE.PKC.ORG.IN

COVID-19 CLINICAL DATABASE

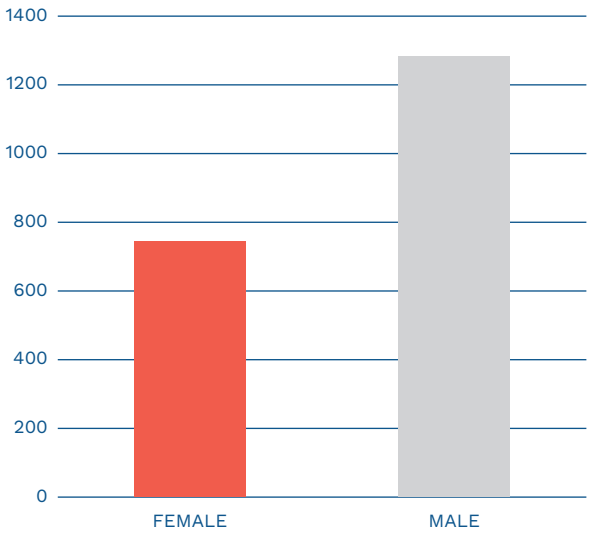
COVI-CORE is a first-of-its kind open access, searchable database that hosts digitized clinical and lab data of 2000 COVID-19 patients from three hospitals in Pune. The database captures over 100 clinical parameters from the day of admission of a patient to the day of their discharge/death.

*COVI-CORE has data on various clinical parameters for **2000 patients** who were hospitalised for **an average duration of 5.72 days. 106 of the total were admitted to the ICU.***

AGE-WISE DISTRIBUTION OF THE PATIENT DATA ON COVI-CORE



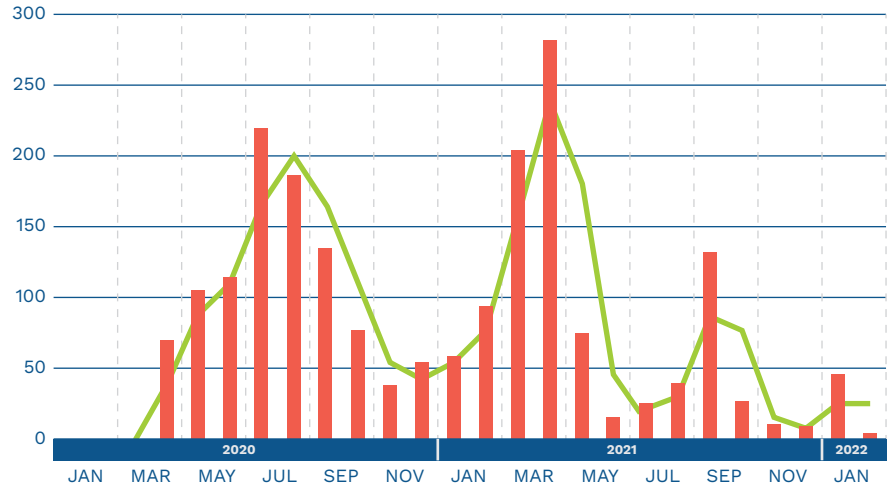
GENDER-WISE DISTRIBUTION OF THE PATIENT DATA ON COVI-CORE



DURING THE COVID-19 PANDEMIC, WASTEWATER SURVEILLANCE BECAME A CRITICAL PART OF THE FIGHT AGAINST THE VIRUS AS AN INDICATOR NOT JUST AT MACRO SCALE BUT ALSO TO UNDERSTAND MICRO NEIGHBOURHOOD PATTERNS. THE STUDY AND DASHBOARD DEVELOPED BY PKC BUILD ONTO THAT STRENGTH NOT JUST FOR THE COVID VIRUS BUT ALSO AGAINST OTHER INDICATORS INCLUDING ANTIBIOTIC RESISTANT BACTERIA ETC WHICH CAN GO A LONG WAY IN A CITY'S MONITORING AND PREPAREDNESS.

Shri Shekhar Singh, IAS – PCMC Commissioner

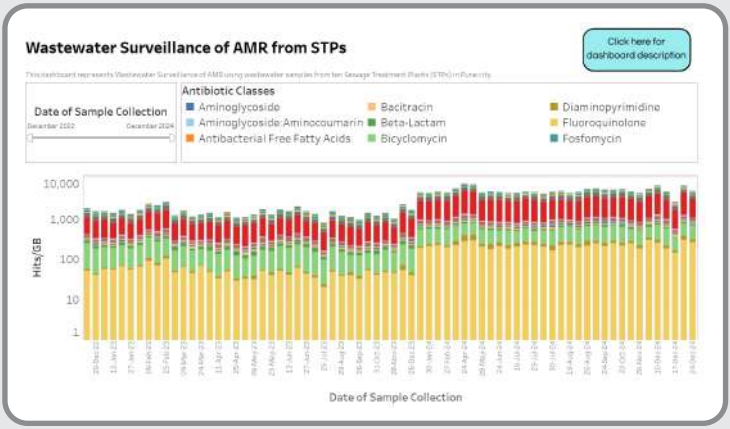
MONTH-WISE DISTRIBUTION OF THE PATIENT DATA ON COVI-CORE

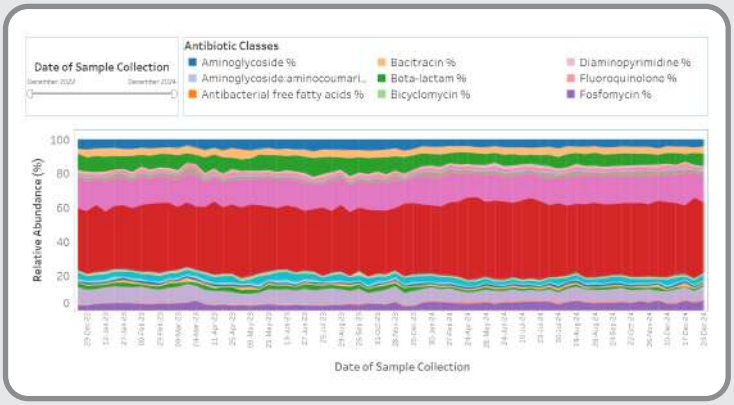


AMR DASHBOARD

The Wastewater Surveillance Dashboard for AMR in Pune (PMC) provides insights into how AMR exists and evolves in the environment, specifically in wastewater. It has been designed to help understand AMR trends in the community and create awareness for the issue. The dashboard currently has about 380 views across six countries.

VISIT PKC.ORG.IN/
WWS-AMR-DASHBOARD

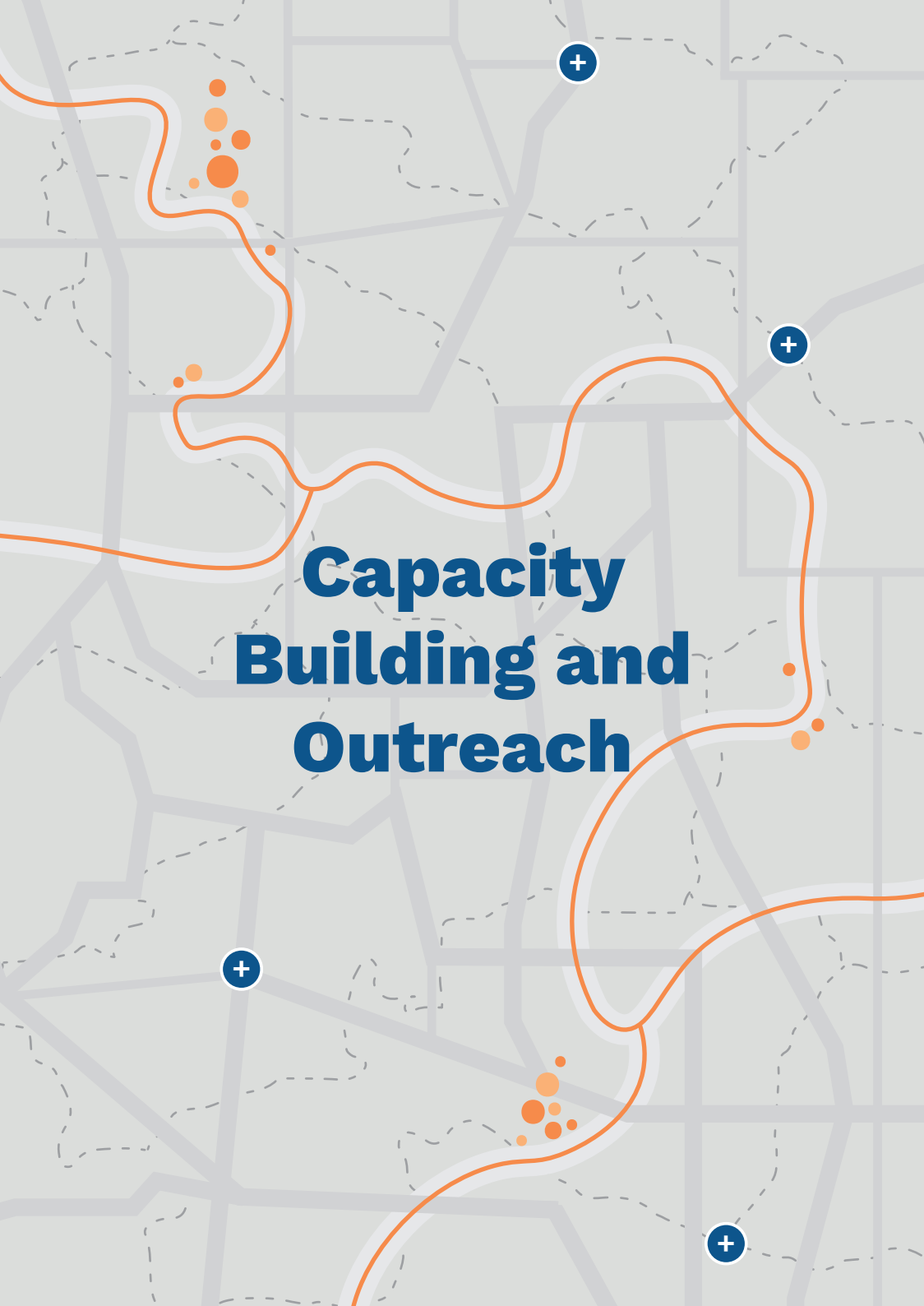




A snapshot of PKC's AMR dashboard showing the trend of antibiotic classes in the waste waters of Pune city

THE PKC ENABLED COVID-19 WWS DASHBOARD IS ONE OF TWO DASHBOARDS FROM INDIA RECOGNIZED BY THE WORLD HEALTH ORGANIZATION (WHO) AS A PUBLICLY AVAILABLE DATABASE FOR WASTEWATER SURVEILLANCE OUTPUTS.

AS OF JUNE 2025, THE PUNE WWS DASHBOARD HAS ABOUT 6870 VISITS FROM 94 COUNTRIES.



Capacity Building and Outreach

Multi-purpose health workers (MPHW) are the grassroot health functionaries responsible for the control of communicable diseases, environmental sanitation and health education. They play a critical role in disease surveillance at the ground level and serve as the first line of disease detection and response in the community. Due to considerable shortage in manpower and limited training, these workers are over-burdened and ill-equipped to handle the growing burden of diseases.

PKC launched a training program called SAKSHAM to strengthen their capacity in data collection, case identification, sample handling, and digital tools. This program was conceptualized and implemented in collaboration with the District Malaria Office under the National Center for Vector Borne Diseases Control (NCVBDC) and the Taluka Health Office, Government of Maharashtra.

SAKSHAM is meant to be informative and interactive keeping in mind the important and serious nature of the workers' daily duties. The training modules are designed and delivered by public health and community medicine experts. This is a regionally demonstrated initiative with the potential to scale nation-wide. PKC has also been able to demonstrate a model for such initiatives to serve as an opportunity for industries and philanthropies to contribute to impact-driven S&T initiatives.

03 DISTRICTS

14 TALUKAS

1327 HEALTH WORKERS TRAINED

Trainers addressing the MPHWs

An interactive game for the MPHWs

IT IS THE FIRST TIME THAT SUCH KIND OF A REFRESHER WORKSHOP HAS BEEN ORGANIZED FOR THE FIELD WORKERS. THEY WERE EXTREMELY HAPPY AND WOULD LOVE TO ATTEND MORE SUCH WORKSHOPS!

Dr Suryakant Deokar, Assistant Medical Officer of Health, PMC

VISIT OUR WEBSITE FOR THE FULL REPORT ON SAKSHAM


Policy
Advocacy

Policy advocacy for disease surveillance is crucial to securing sustained political commitment, funding, and regulatory support. It involves engaging policymakers with evidence on the public health and economic benefits of robust surveillance systems. PKC has enabled several stakeholder meetings, workshops, conferences at the local and national level to advocate for integrating new methods and tools for disease surveillance and management in the public health system.

DENGUE POLICY PAPER

G20 CHIEF SCIENCE ADVISERS ROUNDTABLE

DENGUE POLICY PAPER

In consultation with several stakeholders and experts, PKC prepared a policy paper for Dengue and enabled organizing several policy engagement meetings in Pune and Delhi.

VISIT OUR WEBSITE TO READ THE PAPER

VISIT OUR WEBSITE TO READ THE REPORT

G20 CSAR SIDE EVENT ON “ONE HEALTH, DISEASE SURVEILLANCE AND PANDEMIC PREPAREDNESS”

The G20 Chief Science Advisers Roundtable (G20-CSAR) is a flagship initiative under India’s G20 Presidency and led by the Office of the Principal Scientific Adviser (O/o PSA) to the Government of India. PKC hosted the G20-CSAR side event on “One Health, Disease Surveillance and Pandemic Preparedness” on Monday, 10th July 2023, in Pune. The event was attended by 94 people from 43 organizations including hospitals, R&D, institutions, civic bodies, foundations, start-ups and industries, and was divided into two segments - the inaugural session talks and a panel discussion with the aim of collating insights on Pandemic Preparedness, from an esteemed set of panellists.

The esteemed panelists of the G20 CSAR Side Event panel discussion

Attendees of the G20 CSAR Side Event

DISTINGUISHED ATTENDEES

DR PARVINDER MAINI, SCIENTIFIC SECRETARY, OFFICE OF THE PRINCIPAL SCIENTIFIC ADVISOR TO THE GOI

DR SHEKHAR MANDE, DISTINGUISHED PROFESSOR, COB, SPPU, FORMER DIRECTOR GENERAL, CSIR

DR SOUMYA SWAMINATHAN, CHAIRWOMAN, MSRF; FORMER CHIEF SCIENTIST, WHO

DR GAGANDEEP KANG, DIRECTOR, GLOBAL HEALTH, BMGF

DR SHEELA GODBOLE, DIRECTOR, ICMR-NARI, PUNE; DIRECTOR-IN-CHARGE, ICMR-NIV, PUNE

DR RAKESH MISHRA, DIRECTOR, TIGS

DR SINDURA GANAPATHI, PSA FELLOW, OFFICE OF PSA

PROF L.S.SHASHIDHARA, CO-FOUNDER-DIRECTOR, PKC; DIRECTOR, TIFR-NCBS BANGALORE

MEDIA COVERAGE

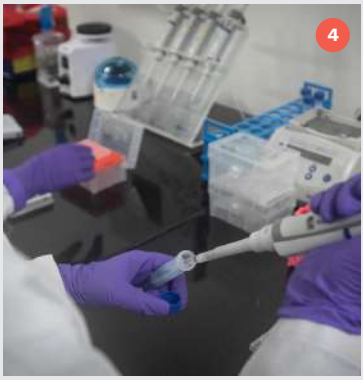
1. CONSORTIUM OF NATIONAL LABS TO UPSCALE GENOME SEQUENCING, THE HINDU, 03 DECEMBER 2021
2. IN JUST OVER A MONTH, OMICRON IN 83% COVID SAMPLES IN PUNE, THE TIMES OF INDIA, 16 JANUARY 2022
3. BA.2 SUB-LINEAGE OF OMICRON NOW DOMINANT IN PUNE: IISER, HINDUSTAN TIMES, 13 FEBRUARY 2022
4. THE HITS AND MISSES OF INDIA'S AMBITIOUS COVID-19 GENOME SEQUENCING PROJECT, THE CARAVAN, 13 MAY 2022
5. OMICRON'S BA.2.38 MAY HAVE CAUSED RECENT SPIKE IN MAHARASHTRA, THE TIMES OF INDIA, 16 JUNE 2022
6. MONKEYPOX VIRUS SHOWS ACCELERATED EVOLUTION, SAYS STUDY, THE TELEGRAPH, 25 JUNE 2022
7. CLOSE EYE ON BA.2.75, SAYS WHO CHIEF SCIENTIST DR SOUMYA SWAMINATHAN, THE TIMES OF INDIA, 10 JULY 2022
8. OMICRON FOUND IN PUNE SEWAGE BEFORE DETECTION IN BOTSWANA, THE TIMES OF INDIA, 26 MARCH 2023
9. PUNE'S SASSOON HOSPITAL TO START WHOLE GENOME SEQUENCING OF DENGUE VIRUS, HINDUSTAN TIMES, 22 JULY 2023
10. BETTER SURVEILLANCE NEEDED TO AVERT PANDEMICS: EXPERTS, THE TIMES OF INDIA, 11 JULY 2023
11. PUNE KNOWLEDGE CLUSTER PLAYS HOST TO G20-CSAR SIDE EVENT ON PANDEMIC PREPAREDNESS, PUNEKAR NEWS, 11 JULY 2023
12. PKC CONDUCTS WORKSHOP FOR HEALTHCARE WORKERS IN PUNE DIST, HINDUSTAN TIMES, 21 FEBRUARY 2024
13. PUNE KNOWLEDGE CLUSTER LAUNCHES SAKSHAM WORKSHOP SERIES TO STRENGTHEN HEALTHCARE WORKERS' CAPABILITIES IN RURAL AREAS, PUNEKAR NEWS, 20 FEBRUARY 2024
14. COVISHIELD OR COVAXIN? A NEW STUDY REVEALS IMMUNE RESPONSE OF BOTH – HERE ARE KEY FINDINGS, FINANCIAL EXPRESS, 8 MARCH 2024
15. FIRST-OF-ITS-KIND COVID DATABASE, BUILT BY PUNE KNOWLEDGE CLUSTER WITH OTHER PARTNERS, LAUNCHED, INDIAN EXPRESS, 31 MAY 2024
16. COVID TRACES IN PUNE SEWAGE, AKIN TO PREVIOUS SURGES, THE TIMES OF INDIA, 06 JUNE 2025
17. DENGUE'S MOST DANGEROUS SEROTYPE, DENV-2, CIRCULATING IN PUNE: STUDY, HINDUSTAN TIMES, 04 JULY 2025

सकाळ

THE HINDU

Consortium of national labs to upscale genome sequencing

03 DECEMBER 2021



लोकमत

THE TIMES OF INDIA

Omicron found in Pune sewage before detection in Botswana

26 MARCH 2023

The Indian EXPRESS

First-of-its-kind Covid database, built by Pune Knowledge Cluster with other partners, launched

31 MAY 2024

Way Forward

What began in Pune and a few other cities during the pandemic has now grown into a movement influencing national health priorities. Cluster enabled initiatives like wastewater surveillance have not only strengthened the city's resilience but also informed the creation of the One Health Mission and the Indian Council of Medical Research (ICMR) to pilot wastewater surveillance in multiple cities across the country. Importantly, the significance of building frameworks for zoonotic disease surveillance is now gaining recognition, highlighting the need for integrated approaches that cut across human, animal, and environmental health.

PKC has shown that collective action works and that regional demonstration is a powerful pathway to national scale-up. By leveraging the strength of academia, research institutions, industry, start-ups, and civic agencies, PKC has validated models that are practical, replicable, and scalable.

Going forward, Pune Knowledge Cluster will continue to serve as a testbed and validation platform for such transformative concepts, supporting their evolution into robust national programs. By anchoring global best practices within regional ecosystems, and by fostering cross-sectoral partnerships, PKC is uniquely positioned to enable systemic change that advances India's preparedness against infectious and zoonotic diseases, and strengthens public health for the future.

PUBLICATIONS

1. COMMUNITY PREVALENCE OF ANTIBODIES TO SARS-COV-2 AND CORRELATES OF PROTECTIVE IMMUNITY IN AN INDIAN METROPOLITAN CITY AURNAB GHOSE, SANKAR BHATTACHARYA, ARUN S. KARTHIKEYAN, ABHAY KUDALE, JOY M. MONTEIRO, APARNA JOSHI, GURUPRASAD MEDIGESHI, GAGANDEEP KANG, VINEETA BAL, SATYAJIT RATH, L. S. SHASHIDHARA, JACOB JOHN, SUSMITA CHAUDHURI, AARTI NAGARKAR. MEDRXIV, NOVEMBER 2020 **HTTPS://DOI.ORG/10.1101/2020.11.17.20228155**

2. INTO THE THIRTEENTH MONTH: A CASE STUDY ON THE OUTBREAK ANALYTICS AND MODELING THE SPREAD OF SARS-COV-2 INFECTION IN PUNE CITY, INDIA. JOY MONTEIRO, BHALCHANDRA PUJARI, SARIKA MAITRA BHATTACHARRYA, ANU RAGHUNATHAN, ASHWINI KESKAR, ARSH SHAIKH, PRASAD BOGAM, SHWETA KADU, NIKITA RAUT, DEVENDRA VAVALE, RUPA MISHRA, AJIT KEMBHAVI, L.S. SHASHIDHARA, VIDYA MAVE. MEDRXIV, JUNE 2021 **HTTPS://DOI.ORG/10.1101/2021.06.22.21259295**

3. TRANSLATING SARS-COV-2 WASTEWATER-BASED EPIDEMIOLOGY FOR PRIORITIZING MASS VACCINATION: A STRATEGIC OVERVIEW. DHARMADHIKARI, T., YADAV, R., DASTAGER, S. ET AL. ENVIRON SCI POLLUTION RES, JULY 2021 **HTTPS://DOI.ORG/10.1007/S11356-021-15169-7**

4. BURDEN OF COVID-19 AND CASE FATALITY RATE IN PUNE, INDIA: AN ANALYSIS OF THE FIRST AND SECOND WAVE OF THE PANDEMIC. BOGAM P, JOSHI A, NAGARKAR S, JAIN D, GUPTE N, SHASHIDHARA LS, MONTEIRO JM, MAVE V. INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES IJID REGIONS, DECEMBER 2021 **HTTPS://DOI.ORG/10.1016/J.IJREGI.2021.12.006**

5. HIGH THROUGHPUT SEQUENCING BASED DIRECT DETECTION OF SARS-COV-2 FRAGMENTS IN WASTEWATER OF PUNE, WEST INDIA. TANMAY DHARMADHIKARI, VINAY RAJPUT, RAKESHKUMAR YADAV, RADHIKA BOARGAONKAR, DHAWAL PATIL, SAURABH KALE, SANJAY P. KAMBLE, SYED G. DASTAGER, MAHESH S. DHARNE. SCIENCE OF THE TOTAL ENVIRONMENT, DECEMBER 2021 **HTTPS://DOI.ORG/10.1016/J.SCITOTENV.2021.151038**

6. ASSOCIATION OF NATIONAL AND REGIONAL LOCKDOWNS WITH COVID-19 INFECTION RATES IN PUNE. MAVE, V., SHAIKH, A., MONTEIRO, J.M. ET AL. INDIA. SCI REP, JUNE 2022 **HTTPS://DOI.ORG/10.1038/S41598-022-14674-0**

7. INTERIM RESULTS FROM COMPARISON OF IMMUNE RESPONSES ELICITED BY AN INACTIVATED AND A VECTORED SARS-COV-2 VACCINE IN SERONEGATIVE AND SEROPOSITIVE PARTICIPANTS IN INDIA. NIVEDITHA D, KHAN S, KHILARI A, NADKARNI S, BHALERAO U, KADAM P, YADAV R, KANEKAR JB, SHAH N, LIKHITKAR B, SAWANT R, THAKUR S, TUPEKAR M, NAGAR D, RAO AG, JAGTAP R, JOGI S, BELEKAR M, PATHAK M, SHAH P, RANADE S, PHADKE N, DAS R, JOSHI S, KARYAKARTE R, GHOSE A, KADOO N, MANGAIARKARASI ASOKAN, ROSHNI FLORINA JOAN, SUDHIR BABJI, ET. AL. MEDRXIV, JANUARY 2023 **HTTPS://DOI.ORG/10.1101/2023.01.03.22284082**

8. A TALE OF TWO WAVES: DELINEATING DIVERSE GENOMIC AND TRANSMISSION LANDSCAPES DRIVING THE COVID-19 PANDEMIC IN PUNE, INDIA. SHASHIDHARA LS, MONTEIRO JM, SHANMUGAM D, RAGHUNATHAN A, KARMODIYA K. J INFECT PUBLIC HEALTH, JUNE 2023 **HTTPS://DOI.ORG/10.1016/J.JIPH.2023.06.004**

9. GENOMIC SURVEILLANCE REVEALS EARLY DETECTION AND TRANSITION OF DELTA TO OMICRON LINEAGES OF SARS-COV-2

VARIANTS IN WASTEWATER TREATMENT PLANTS OF PUNE, INDIA. RAJPUT, V., PRAMANIK, R., MALIK, V., DHARNE, M. ENVIRON SCI POLLUT RES, NOVEMBER 2023
HTTPS://DOI.ORG/10.1007/S11356-023-30709-Z

10. EARLY DETECTION OF KP.2 SARS-COV-2 VARIANT USING WASTEWATER-BASED GENOMIC SURVEILLANCE IN PUNE, MAHARASHTRA, INDIA. RAJPUT V, DAS R, DHARNE M. JOURNAL OF TRAVEL MEDICINE, JULY 2024
HTTPS://DOI.ORG/10.1093/JTM/TAAE097

11. WASTEWATER SURVEILLANCE OF SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS-2 IN OPEN DRAINS OF TWO INDIAN MEGACITIES CAPTURES EVOLUTIONARY LINEAGE TRANSITIONS: A ZONATION APPROACH. ENVIRONMENTAL SCIENCE AND POLLUTION RESEARCH, JULY 2024
HTTPS://DOI.ORG/10.1007/S11356-024-34448-7

12. MONITORING INFLUENZA A (H1N1, H3N2), RSV, AND SARS-COV-2 USING WASTEWATER-BASED EPIDEMIOLOGY: A 2-YEAR LONGITUDINAL STUDY IN AN INDIAN MEGACITY COVERING OMICRON AND POST-OMICRON PHASES. PRAMANIK, R., NANNAWARE, K., MALIK, V. ET AL. FOOD ENVIRON VIROL, NOVEMBER 2024 **HTTPS://DOI.ORG/10.1007/S12560-024-09618-Y**

13. WASTEWATER SURVEILLANCE IN POST-OMICRON SILENT PHASE UNCOVERS SILENT WAVES AND CRYPTIC TRANSMISSION OF SARS-COV-2 VARIANTS; A YEARLONG STUDY IN WESTERN INDIA. RAJPUT V, PRAMANIK R, NANNAWARE K, MALIK V, ET.AL. SCIENCE OF THE TOTAL ENVIRONMENT, DECEMBER 2024
HTTPS://DOI.ORG/10.1016/J.SCITOTENV.2024.176833

14. LONG-TERM GENOMIC SURVEILLANCE OF SARS-COV-2 IN CAMPUS WASTEWATER DEPICTS LINEAGE TRENDS AND PUBLIC HEALTH IMPLICATIONS DURING AND AFTER OMICRON WAVES. ENVIRONMENT & HEALTH, JUNE 2025
HTTPS://DOI.ORG/10.1021/ENVHEALTH.5C00048

PKC's Integrated Health Ecosystem

DATA & TECHNOLOGY

ARTPARK
AI & Robotics Technology Park, I-Hub @ IISc

ecosan SERVICES FOUNDATION

Epic
Epic Health Information Management
Unleashing the Power of Data

fluid robotics

INSACOG
INDIAN SARS-COV-2 GENOMICS CONSORTIUM

IGIB
INSTITUTE OF GENOMICS & INTEGRATIVE BIOLOGY
Genomics Knowledge Partner

AIQoD
Empowering Enterprises

Oxford NANOPORE Technologies

illumina

FUNDING

BILL & MELINDA GATES foundation

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