

IMPACT REPORT

JUNE 2024

www.kinstitute.org.il

Ki The Israeli Institute for Applied
Research in Computational Health

OUR VISION AND **IMPACT GOALS**

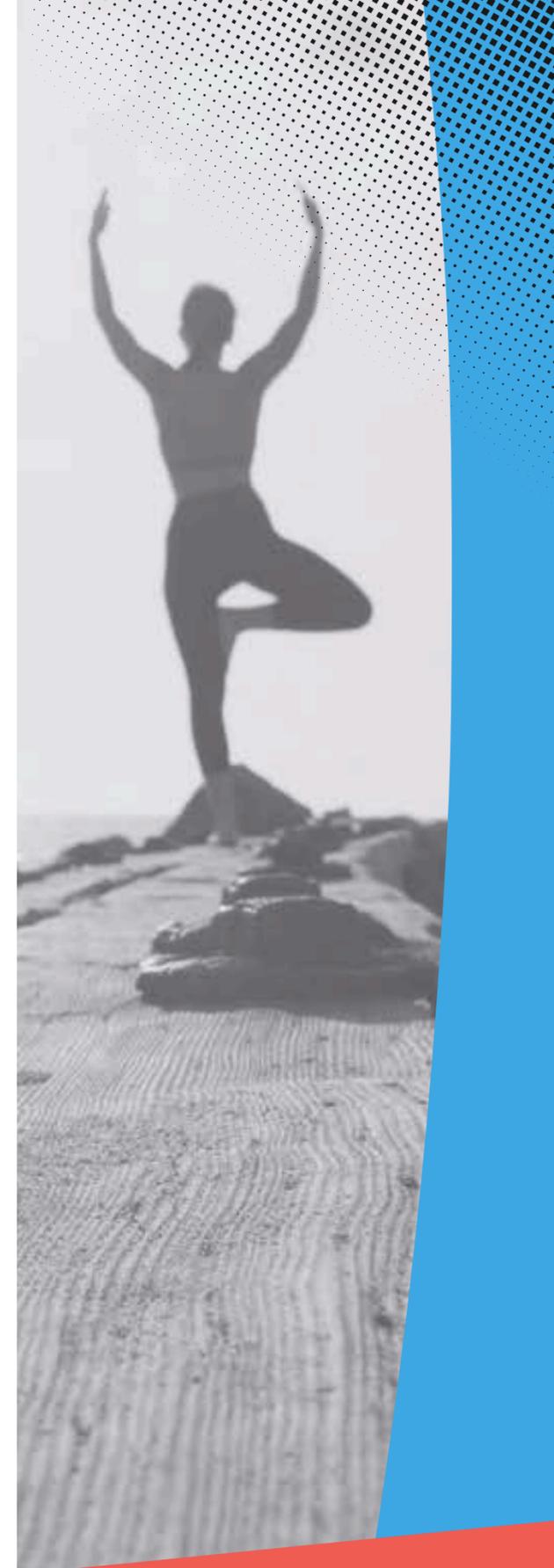
We are excited to release our first impact report!

KI Research Institute launched in 2019 as a non-profit institution leading state-of-the-art computational health research with the core mission of making a significant impact on human health. Founded by Nir Kalkstein, an accomplished entrepreneur and a machine-learning expert, **the institute set its vision of making a broad impact on healthcare by accelerating the discovery of new insights from medical data and making them accessible to all.** The future we see is one in which health and well-being decisions are not a wild guess or a “gut feeling”, but are data-driven.

Computational health research could profoundly impact healthcare, revolutionizing the way we understand, diagnose, and treat medical conditions.

By harnessing the power of advanced computing, data analytics, and artificial intelligence, researchers can process vast amounts of patient data, uncover hidden patterns, and develop more efficient treatment plans. **Computational health research has improved the efficiency of healthcare systems, reducing costs and enhancing patient outcomes.** It has empowered healthcare professionals with tools to make data-informed decisions and has the potential to transform healthcare from a reactive model to a proactive, preventative, and patient-centric one, ultimately leading to better overall health and well-being for individuals and populations.

The impact of computational health research on public health is substantial and multifaceted.



OUR VISION AND **IMPACT GOALS**

Through the analysis of large-scale health data, predictive modeling, and the identification of risk factors, computational health research enables a more proactive and targeted approach to public health interventions. This can range from predicting disease early and optimizing resource allocation to tailoring preventive strategies for specific patient populations. The impact should be measured not only in terms of traditional health indicators like mortality rates or disease prevalence but also by assessing the efficiency of interventions, the reduction in healthcare costs, and improvements in overall community well-being. Additionally, measuring the accessibility and equity of healthcare services resulting from computational health initiatives is crucial to ensure that advancements benefit diverse populations.

Regular evaluations, feedback loops, and continuous refinement of the computational models are essential for maximizing the positive impact on public health outcomes.

This year has been a pivotal year in defining and promoting our main impact verticals and in this report we present a few of them. We believe that while our research is conducted at the highest academic level with state-of-the-art computational methodologies and results in impressive publications, the real challenge is synchronizing the research products with the needs of our healthcare partners. **We strive to create a sustainable long-lasting impact with our partners so that together we will improve people's health and well-being.**

OUR IMPACT CHANNELS



Discovery

We perform state-of-the-art computational health research and publish all our insights in a variety of outlets



Tools

We build computational tools that are shared with all stakeholders that want to advance their healthcare services and improve patients' care



Implementation

Our projects are designed and executed with healthcare partners that are able to take the research outcomes and translate them to implementation within their organizations



Policy

We strive to promote data-driven policy by working closely with regulatory bodies within healthcare organizations and support data-driven policy formation.



Mentoring

We mentor physicians, data scientists, healthcare professionals and all those who want to learn closely how to perform computational health research and use it to advance data-driven healthcare.

OUR MAIN RESEARCH AREAS



We have over 40 projects at different research stages, some of them are already implemented and creating impact in different channels. In this report we highlight some of them.

IMPROVING MONITORING OF CHILD DEVELOPMENT AND **EARLY DETECTION OF DEVELOPMENTAL DELAYS**

One of our main research focuses is child development. The first years of a child's life are a critical period of rapid growth and development, forming the foundation for future learning, behavior, and health. During this time, monitoring the attainment of significant developmental milestones that encompass cognitive, motor, social, and emotional domains is crucial for early detection of potential developmental delays. US statistics show that as many as 25% of children from birth to 5 years of age are at moderate to high risk for some developmental delay.

Regular observation and assessment allow parents and healthcare professionals to identify any deviations from typical developmental trajectories, providing an opportunity for early intervention. Untreated developmental delays in early childhood can lead

to long-term societal costs, including increased educational support, higher healthcare expenses, and potential challenges in employment and social integration later in life. Therefore, **early detection and intervention can significantly enhance a child's chances of reaching their full potential, as they are most adaptable during these formative years.**

There are multiple developmental surveillance tools in use worldwide, however, they lack strong normative data which renders them inconsistent and restricts their ability to assess normative attainment age of commonly evaluated milestones. To address this challenge, we partnered with the Ministry of Health and the Timna initiative (the ministry's big data platform).



IMPROVING MONITORING OF CHILD DEVELOPMENT AND **EARLY DETECTION OF DEVELOPMENTAL DELAYS**

Using Israel's unique dataset of maternal child health clinics, we analyzed developmental milestone attainment in routine visits of 70% of the Israeli children between 2014-2020 and established new population norms and a corresponding developmental scale.

The new data-driven developmental scale was embraced by the ministry of health and embedded in its revised guidelines. This made Israel the first country in the world with an evidence-based developmental surveillance scale, tailored to its heterogeneous, multicultural population. The new scale is now implemented in all maternal child health clinics around the country and used for routine developmental surveillance. We have made the scale accessible to all and support its continuous implementation in healthcare and educational settings.

Maximizing knowledge with this unique data, **we further analyzed the child development trajectories and created a national child development report.** The report provides, for the first time, a comprehensive overview of the national child development status. It describes national trends in the gross motor, fine motor, language, and social domains and highlights those subgroups in need of intervention. It may also assist in the evaluation of intervention programs' efficiency. **The report is designed to be used as a planning and surveillance tool, providing valuable information for decision makers and professionals from the health, education, welfare and municipal services.**



IMPROVING MONITORING OF CHILD DEVELOPMENT AND EARLY DETECTION OF DEVELOPMENTAL DELAYS

To promote easy access and use of the important insights provided by the report, and together with the Ministry of Health and the MAOZ leadership program we have created interactive dashboards that can be freely accessed and researched (currently in Hebrew).

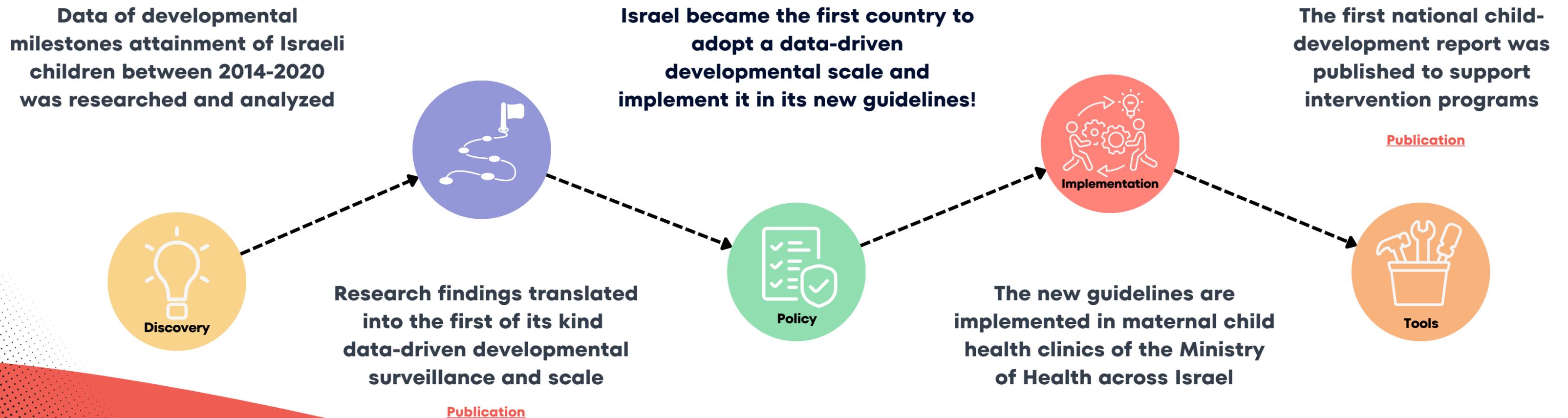
Our goal is to further translate these efforts and methodologies to be used worldwide, create evidence-based developmental surveillance scales that are costumed to every country and maximize the developmental potential of children everywhere.

[The MOH dashboard of child development in Israel](#)



CREATING UNIQUE IMPACT IN CHILD DEVELOPMENT

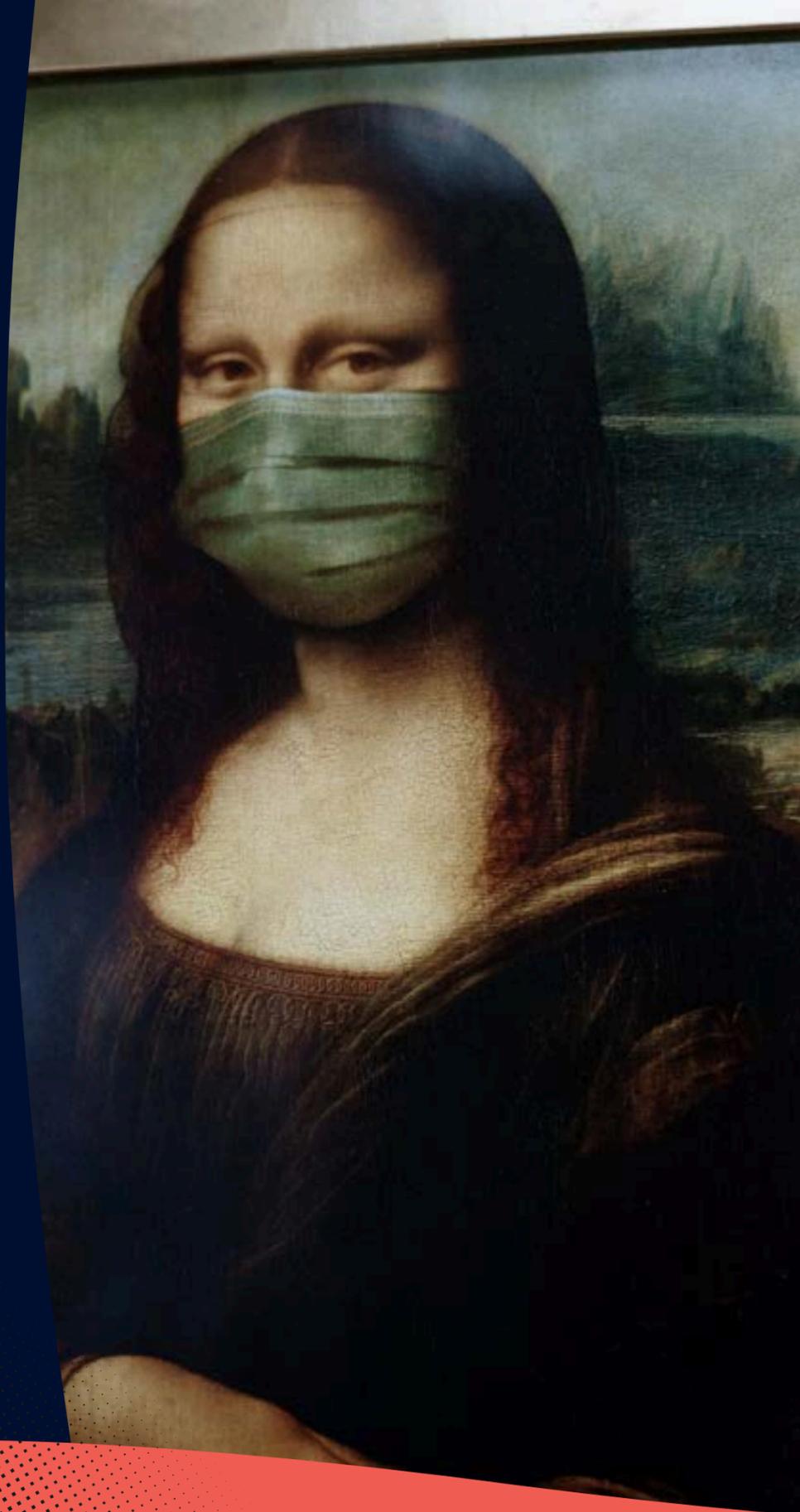
Supporting Israel in becoming the first country in the world to have a data-driven developmental scale and an adapted surveillance program that is widely implemented



INVESTIGATING AN EPIDEMIC **FROM BEGINNING TO END**

The covid-19 pandemic, which emerged in late 2019, claimed millions of lives and has had a profound global impact. The novel coronavirus, SARS-CoV-2, rapidly spread around the globe leading to unprecedented challenges in combating the virus and mitigating its impact on public health. Governments implemented various measures, ranging from strict lockdowns and social distancing protocols to mass vaccination campaigns, in an effort to curb the transmission of the virus. The international scientific community collaborated heavily as researchers raced to develop vaccines and treatments. As nations continue to navigate the ongoing effects of the pandemic, it emphasizes the need for a coordinated and resilient approach to address both current and future global challenges.

From the early days of the pandemic, KI Research Institute has dedicated its resources to actively participate in the global efforts to characterize transmission, symptoms and resolution of the infection. **We initiated and executed computational research studies with the most updated data sources of the Israeli healthcare system. The availability of longitudinal data, the unlimited PCR testing of the Israeli population and the quick adoption of the SARS-CoV-2 vaccines allowed us to perform our unique research and share it with the global scientific community.**



INVESTIGATING AN EPIDEMIC

FROM BEGINNING TO END

During the early stages of the covid-19 pandemic, researchers focused on understanding the novel coronavirus, mainly, deciphering the virus's genetic code, investigating transmission dynamics, and developing diagnostic tools, laying the foundation for subsequent vaccine development and public health strategies. **We analyzed data from Maccabi Healthcare Services, which included EMRs of over 2M Israelis, and discovered the factors that increased risk for covid-19 complications.**

Together with the Weizmann Institute **we also mapped longitudinal symptoms dynamics of the infection from EMRs and surveys, discovering the course of symptoms in infected patients.**

Covid-19 vaccines were developed at an unprecedented pace and became available to the global population.

Israel's covid-19 vaccine campaign gained international acclaim for its efficiency and rapidity. It achieved one of the world's highest vaccination rates, significantly reducing severe illness and providing a model for effective mass vaccination campaigns. This allowed us to perform studies that supported decision makers around the world in defining their own vaccination campaigns and pandemic policies. **We investigated the vaccine's effectiveness by a novel research approach through household infections, analyzed the antibody response in immunosuppressed individuals following the booster dose and were one of the first in the world to demonstrate and publish the vaccine's waning effect.** Importantly, we participated in the pivotal study of the Israeli Ministry of Health demonstrating that the BNT162b2 vaccine booster protected participants **over 60 yrs from infection and severe illness and supported organizations such as the FDA in mitigating the pandemic.**



INVESTIGATING AN EPIDEMIC

FROM BEGINNING TO END

While the main focus was on mitigating the effect of the pandemic, lockdowns and social distancing took their toll and the deteriorating mental health of the population came to light. We investigated the mental health of adolescents during the pandemic from real-world data and demonstrated increased incidence of depression, anxiety, stress, eating disorders and the use of psychiatric medications. **This was the first data-supported evidence of adolescents' deteriorating mental health in Israel and presented pivotal information for policy decision makers that was adopted by the Israeli ministries of health, education and welfare.**

The latest and one of our most significant works investigated the long-term symptoms that persisted in the mildly infected population worldwide. **This nationwide study was one of the most significant research studies in the world that investigated the long-term effects of covid-19 infection and suggested that mild disease does not lead to serious or chronic long-term morbidity in most patients and adds a small continuous burden on healthcare providers.** This study received local and worldwide attention, cited widely in scientific publications and was covered by renowned media outlets such as CNN, Time magazine and The Washington post.

THE GLOBAL IMPACT OF OUR COVID-19 RESEARCH

UNDERSTANDING THE PANDEMIC

- Identifying risk factors for severe covid-19
- Mapping longitudinal symptoms dynamics

[Publication 1](#) [Publication 2](#)

Mar 2020

Insights were addressed by the CDC and WHO



ASSESSING VACCINE EFFICIENCY

- Revealing the vaccine's waning effect
- Assessing protection of the booster vaccine

[Publication 1](#) [Publication 2](#)

Dec 2020

Insights were addressed by the FDA



ASSESSING ADOLESCENTS' MENTAL HEALTH

- Quantifying the incidence of mental health diagnoses and psychiatric drug dispensations

[Publication](#)

Jan 2022

Insights were addressed by the Israeli MOH, MOE and MOW



Insights were addressed by the FDA



IDENTIFYING RISK OF SEVERE COVID-19

- Detecting patients at high risk for severe illness early

[Publication](#)

MONITORING LASTING IMMUNITY

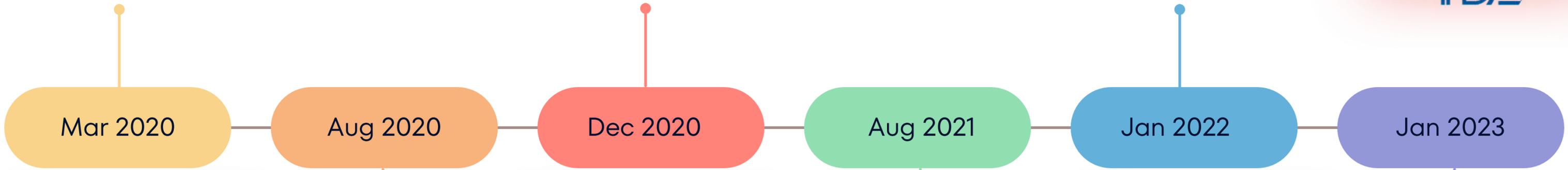
- Evaluating post-booster antibody responses

[Publication](#)

STUDYING LONG-TERM PANDEMIC OUTCOMES

- Mapping long covid outcomes

[Publication](#)



CREATING NEW METHODOLOGIES FOR **COLLABORATIVE DATA RESEARCH**

Prediction models in healthcare play a pivotal role in harnessing the power of data to personalize and optimize patient care. These models utilize advanced statistical and machine learning techniques and analyze individual patient health-related data to forecast diverse outcomes, such as disease progression, hospitalizations, or death. By considering each patient's attributes, these models allow healthcare professionals to make more informed and tailored decisions, leading to personalized treatment plans and improved clinical outcomes. These models may contribute to better efficiency and effectiveness of healthcare delivery, supporting a new era of data-driven and patient-centric healthcare.

Predictive model robustness is the ability to provide accurate prediction over time and across data sets that vary in their population characteristics, clinical settings, and policies. Often, predictive models are not robust and their performance across data sources may deteriorate significantly. Access to multiple data sources during development and testing of patient-level prediction models may alleviate performance decline and promote their implementation in clinical settings.

As privacy-preserving regulations and commercial interests limit patient level data access, researchers can typically study only a small number of datasets when training new models.





An alternative approach may leverage population-level information from external datasets, to obtain more robust models. For this purpose, we developed a method that can leverage limited statistical characteristics of external datasets to evaluate models performance. It can also leverage similar shared external information to train various learning algorithms.

We recently partnered with collaborators from the Observational Health Data Sciences and Informatics (OHDSI) community and tested the performance of the external estimation algorithm in real clinical settings using data from five US datasets and prediction models for various outcomes. **We demonstrated impressive accuracy of the models. The method allows executing collaborative research with several data partners, relying on a small number of communication rounds and sharing interpretable aggregated information only. It can be used to rule out poorly performing models and guide model refinement at an early stage, saving valuable time, efforts and money.**

Our continuous efforts will focus on developing more robust models that will be relevant to many different populations, support accurate healthcare decision making and improve public health outcomes worldwide.

CREATING IMPACT WITH **GLOBAL DATA COMMUNITIES**



[To OHDSI Israel website](#)

THE OHDSI ISRAEL NODE

The Observational Health Data Sciences and Informatics (OHDSI) community is a multi-stakeholder, interdisciplinary, open-science collaborative working to bring out the value of health data through large-scale analytics. It includes 2,000 collaborators across 74 countries and health records of nearly 1B unique patients from around the world. The OHDSI community empowers its members to collaboratively generate evidence to promote better health decisions and better care. The data network enables federated analytics to its community members, based on its Observational Medical Outcomes Partnership (OMOP) common data model.

In 2023, we established the local OHDSI research node in Israel. We are active participants in observational research projects of the global OMOP Common Data Model (CDM) data community and initiated studies in the fields of Inflammatory Bowel Disease (IBD), allergy, orthopedics, geriatrics, machine learning model robustness and more. We constantly promote new collaborations to advance studies that could positively impact health worldwide.



Discovery

Initiating collaborative observational research studies that produce global understanding of public health



Tools

Generating new methodologies and tools for analysis of observational data and sharing it among community members



Policy

Using global assets of the community to drive data-driven decision making among policymakers



Mentoring

Training healthcare professionals in observational data research and use of OHDSI tools

OUR INVALUABLE PARTNERS



ACADEMIA

GOVERNMENT AND NGO

MEDICAL CENTERS

HEALTH MAINTENANCE ORGANIZATIONS


 תל אביב אוניברסיטת תל אביב
 UNIVERSITY TEL AVIV


 אוניברסיטת בר-אילן
 Bar-Ilan University of the Negev


 Northeastern University


 אוניברסיטת חיפה
 University of Haifa
 جامعة حيفا


 Bar-Ilan University
 אוניברסיטת בר-אילן


 CORNELL UNIVERSITY


 UCSF
 University of California San Francisco


 The University Of Sheffield.


 WEIZMANN INSTITUTE OF SCIENCE
 מכון ויצמן למדע


 תמנע
 OpenData • AI • Innovation


 משרד הבריאות
 לחיים בריאים יותר


 מעוז
 MAOZ
 מקצועיות ערכים זהות


 המוסד לביטוח לאומי


 ירושלים


 8400
 THE HEALTH NETWORK


 ISRAELI MEDICAL ASSOCIATION
 אגודת הרופאים


 CHARLES AND LYNN SCHUSTERMAN FAMILY PHILANTHROPIES
 קרן שוסטרמן • ישראל (ניו)


 רמב"ם
 הקריה הרפואית לבריאות האדם


 SHEBA
 Tel HaShomer


 המרכז הרפואי שערי צדק
 SHAARE ZEDEK MEDICAL CENTER


 מרכז רפואי צפון
 Tel Aviv Medical Center


 מרכז רפואי מאיר
 איכילוף עם נשמה


 מנבי
 שירותי בריאות


 כללית

OTHER


 R2D2
 Mental Health


 Janssen
 PHARMACEUTICAL COMPANIES OF Johnson & Johnson


 LINK CARING
 Connecting you with your health care providers


 תודעה בריאה


 OHDSI
 OBSERVATIONAL HEALTH DATA SCIENCES AND INFORMATICS


 מרכז טאוב
 לחקר המדיניות החברתית בישראל


 גהה
 המרכז לבריאות הנפש

