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# 2022

# IATI Israel's Life Science Annual Industry Report

*Connecting Israel's Tech Ecosystem*

# AI for Healthcare

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**IATI is the umbrella organization of Israel's tech ecosystem with the mission of generating impact across all value chains of the Israeli economy and society**


Connecting Israel's tech ecosystem

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# Executive summary

**IATI Israel's Life Science Annual Industry Report** provides the broadest, deepest view of this thriving industry. The continuity, the annual comparison and the long-term view, all make the Report the most comprehensive take on the Israeli Life Science Industry. As the Israel's Umbrella Organization of the High-Tech & Life Science industries, IATI continuously acts to connect and promote the country's massive resources of academic and technological prowess towards creating a fertile ecosystem which will nourish growth in the coming years as well.

The Israeli life science industry kept growing in 2021 despite the COVID-19 pandemic. Continuance increase in the number of companies, stable maturity levels and innovation in new and developing sectors, all contribute to the industry's success and its significant role in the Israeli economy. 2021 was a record year in capital raising from VCs, public offerings and other investors with a challenging H1 of 2022 in these aspects.

After putting a spotlight on the industry's rising sub-sectors in our prior report, we focus this time on some new promising sub-sectors and following up on those we have identified in the past. This is in addition to the traditional sub-sectors discussed in our prior reports. The spotlight is put on those sectors not only because they are fast populated by new companies and attract more investments, but mainly as being leaders in innovation and multidisciplinary abilities, demonstrating the industry's ability to take advantage of the excellence in academic research, deep government support and the innovative ecosystem in Israel.

The healthtech industry has been experiencing dramatic changes due to the COVID-19 pandemic. From unique collaborations with players coming outside of the life sciences industry through fast paced adoption of digital health and remote health solutions, the pandemic had a huge impact on the industry. This also led to a record year when it comes to funding, as aforementioned.

The healthcare landscape is continuing to shift towards a more integrated ecosystem, converging biopharma, medtech, digital health and healthcare into a single bioconvergent industry. This emerging bio-convergent healthtech space holds great potential to make a transformative impact on health and healthcare practices. When it comes to holding a leading position in this emerging bio-convergent field, Israel has substantial strengths and capabilities. The new shifts and trends in the Israeli Health Tech space were all demonstrated for the first time in a conference driven by IATI by the industry and for the industry in continuation of the legacy of the MIXIII conference.

A broader discussion on Israel's value proposition in the bio-convergance sphere can be found in the "Bio-Convergence Revolution" chapter of this report.

The healthcare system is confronting skyrocketing costs, while the biopharma industry is coming up against aggressive pricing pressures. In an effort to meet these challenges, the healthtech industry is seeking new innovation growth engines.

Israeli life science companies can play, and in many ways already are playing, a leading role in facing the coming challenges. Fostering digital health innovation to address actual needs and not perceived ones, for example, can lead to significant improvements in integrating technological solutions, even from sources outside of traditional healthcare. We invite you to read insights from the field in the "How Can the Israeli Health-Tech Industry Reduce the Cost Burden" chapter and throughout the report.

We would like to warmly thank Omer Gavish, Partner, Pharmaceuticals & Life Sciences Leader at PwC Israel, for all the support in preparing this Report; Dr. Ami Appelbaum Chairman and Dror Bin, CEO of The Israeli Innovation Authority for supporting our Report and for partnering with us on promoting the industry throughout the year; Prof. Yossi Matias, Vice President, Engineering & Research, Google; Dr. Yair Schindel, Co-Founder & Managing Partner and the team of aMoon Fund; Oded Har-Even, Co-Managing Partner, Sullivan & Worcester Tel-Aviv; and Dr. Ruth Dagan, Partner, Head of Environment & Climate Change, Herzog Fox & Neeman.

Here's to another year of Israeli Health- Tech pride!

**Karin Mayer Rubinstein**

**CEO & President**

**IATI**

**Yaacov Michlin**

**Chairman**

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## AI for Healthcare[33]

The advancement of AI is already transforming health and wellness, and in the years to come, we can expect to see further breakthroughs and developments that will improve healthcare for billions of people globally. Machine learning is opening the door for advances across multiple medical fields, from the use of genomics for personalized healthcare to the use of imaging and diagnostics for the early detection of diseases such as breast cancer and diabetic retinopathy. Research teams and technology companies such as Google on one hand, and traditional pharmaceutical and life sciences on the other hand, are investing in the development of these types of AI technologies and applications that can help medical professionals deliver better care and can help make care more accessible for patients around the world.

**Applying artificial intelligence to applications in endoscopy and minimally invasive surgery - a case study from Verily, an Alphabet precision health company and its Israel R&D Center**

Verily is a subsidiary of Alphabet that is using a data-driven, people-first approach to change the way people manage their health and the way healthcare is delivered. Launched from Google X in 2015, Verily's purpose is to bring the promise of precision health to everyone, every day.

In August 2021, Verily opened a new R&D Center in Israel. It was established after successful early research conducted by Google Health and Jerusalem's Shaare Zedek Medical Center on the application of AI in detection of colonic polyps. The Verily Israel team is focused on applying artificial intelligence (AI) techniques to important biomedical problems, including applications in endoscopy, minimally invasive surgery and other imaging modalities. A key focus of the team is using AI to assist in identifying potentially cancerous growths that traditional colonoscopies sometimes miss. In addition, the team aims to develop a suite that supports surgeons and gastroenterologists in their daily activities before, during and after procedures. The Verily Israel team is led by Ehud Rivlin, Professor of Computer Science at the Technion, who worked with Google Health and joined Verily to establish and lead Verily Israel. Verily continues to collaborate closely with Google Health and Google's global Health AI Research team led by Yossi Matias, VP Engineering & Research at Google and managing director of Google Center in Israel.

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*33 With the support of Verily Israel, a subsidiary of Alphabet, and Google*

## Diving in: Colonoscopy

### Part 1: The need

As the third most common malignancy and the second most deadly type of cancer, colorectal cancer (CRC) was diagnosed in an estimated 1.9 million new cases and resulted in 0.9 million deaths worldwide in 2020[34]. Recommended screening via colonoscopy is well known to be the most effective measure for reducing diagnoses and dramatically mitigating the risk of death[35]. CRC originates in small pre-cancerous lesions in the colon, called polyps. During a colonoscopy, the gastroenterologist or other GI specialist uses a camera-containing probe called a scope to examine the large intestine for pre-cancerous polyps and early signs of cancer. These physicians can also simultaneously remove the tissue, or polyps, that appear worrisome. However, some complicating factors limit the effectiveness of colonoscopies, such as incomplete detection (in which the polyp appears within the field of view, but is missed by the GI, perhaps due to its size or shape) and incomplete exploration (in which the polyp does not appear in the camera's field of view). Both factors can lead to a high fraction of missed polyps. In fact, studies suggest that 22%–28% of polyps are missed during colonoscopies, of which 20%–24% have the potential to become cancerous.[36]

### Part 2: The AI solution in development

Verily is developing a Computer Aided Detection (CAD) solution intended to increase polyp detection rates without interrupting physician workflows. The solution is in active development, pending regulatory registrations and is not available for sale. One can simplistically think of this solution for colonoscopy as another GI expert - a second set of eyes observing the same video in real-time and supporting the overall process to reduce the number of polyps that may be missed. This AI-based system digests the live procedure video in real-time, examines the video for polyps and marks them for further examination by the GI specialist.

Behind the scenes, these functionalities rely on sophisticated video processing by trained deep computational neural networks. As in many other machine learning tasks, gathering sufficient labeled data is of prime importance, and the labeling must be done by domain experts. Verily-developed algorithms are then typically trained on this data while leveraging the most up-to-date self-supervised learning techniques.

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34 *Xi Y, Xu P. Global colorectal cancer burden in 2020 and projections to 2040. Transl Oncol. 2021 Oct;14(10):101174. doi: 10.1016/j.tranon.2021.101174. Epub 2021 Jul 6. PMID: 34243011; PMCID: PMC8273208.*

35 *https://www.cdc.gov/cancer/colorectal/basic_info/prevention.htm*

36 *Leufkens AM, van Oijen MG, Vleggaar FP, Siersema PD. Factors influencing the miss rate of polyps in a back-to-back colonoscopy study. Endoscopy. 2012 May;44(5):470-5. doi: 10.1055/s-0031-1291666. Epub 2012 Mar 22. PMID: 22441756.*

## Part 3: Partnership with Medical Staff and Hospitals

We believe that a development process should be enabled by strong established partnerships with leading hospitals and GI experts in Israel and abroad.

An example of such a partnership, is the research conducted by Verily, Google Health and Jerusalem's Shaare Zedek Medical Center (SZMC), overseen by Shaare Zedek Scientific and the hospital's Innovation Center, on the application of AI in detection of colonic polyps, and was published in Gastrointestinal Endoscopy[37]. The study was approved by SZMC's Institutional Review Board (IRB) and complied with all requirements set by local regulators and the Ministry of Health. Patients who chose to participate in the initial study signed informed consent forms (ICF).

The SZMC study was followed by a larger investigator initiated, randomized controlled trial (RCT) at Elisha Medical Center in 2021. The results of this RCT were presented at UEGW, one of the largest worldwide conferences of GI specialists, held in Vienna, Austria in October 2022. The conclusions of this first Israeli clinical trial demonstrate that the AI system can significantly improve both ADR and APC[38], two important measurements for determining the quality of colonoscopies, while having a low false alert rate.

Partnerships such as these, support a vast and continuous data accumulation and labeling process. For example, Verily Israel has been licensing thousands of videos of colonoscopy procedures along with relevant metadata from partnering hospitals. Gastroenterologist annotators from around the world are labeling large portions of this anonymized data establishing ground truth for training Verily's ML models.

## Part 4: From Colonoscopy to Surgery

Endoscopy is a procedure using a direct imaging system to see inside the body. Colonoscopy is one of several examples of endoscopy. Over the past two decades, numerous innovations and advancements in endoscopic and minimally invasive procedures have been developed across medical and surgical specialities, enabling faster recovery for the patient. AI capabilities have been applied to new domains of minimally invasive surgery, with research that covers both intra-procedural and post-procedural analysis for teaching, training, and quality improvement.

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*37 Dan M. Livovsky, Danny Veikherman, Tomer Golany, Amit Aides, Valentin Dashinsky, Nadav Rabani, David Ben Shimol, Yochai Blau, Liran Katzir, Ilan Shimshoni, Yun Liu, Ori Segol, Eran Goldin, Greg Corrado, Jesse Lachter, Yossi Matias, Ehud Rivlin, Daniel Freedman, Detection of elusive polyps using a large-scale artificial intelligence system (with videos), Gastrointestinal Endoscopy, Volume 94, Issue 6, 2021, Pages 1099-1109.e10, ISSN 0016-5107*

*38 APC - the total number of adenomas detected during screening colonoscopies per total number of procedures. ADR- the number of screening colonoscopies with at least one adenoma per total number of procedures*

## Conclusion

The potential for AI to revolutionize healthcare is significant and we are already seeing the value of applied research in medical domains. As shown above, Verily Israel's unique AI expertise and exceptional engineering and research teams, combined with growing healthcare needs and opportunities, open up new horizons for novel research and development. Their efforts are further enhanced through close collaboration with Google Research in Israel and globally.

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