Onsite
WOMEN'S HEALTH

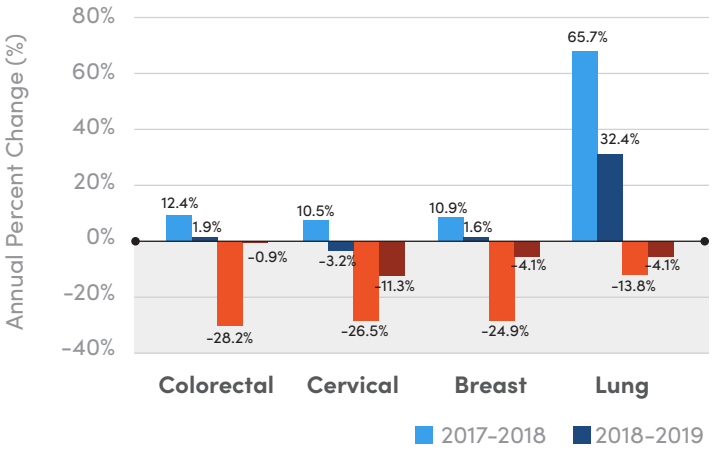
# ADVANCES IN ARTIFICIAL INTELLIGENCE CAN LEAD TO BETTER BREAST CANCER PREVENTION AND DETECTION

The upheavals of the last few years have included profound disruptions in healthcare, one manifestation of which had been delayed screenings for breast cancer. In fact, between 2019 and 2020 – pre-pandemic – the number of breast cancer screenings declined by 25%, and the downward trajectory continued into 2021, with a 4% decline annually. Unsurprisingly, the number of breast cancer diagnoses dropped by 14% between 2019 and 2020, and almost 9% from 2020 to 2021. Declines in screening, diagnosis and, most crucially, treatment, were also observed in other cancers, too, including colorectal, cervical, and lung, with as much as double-digit decreases since 2020.[1]

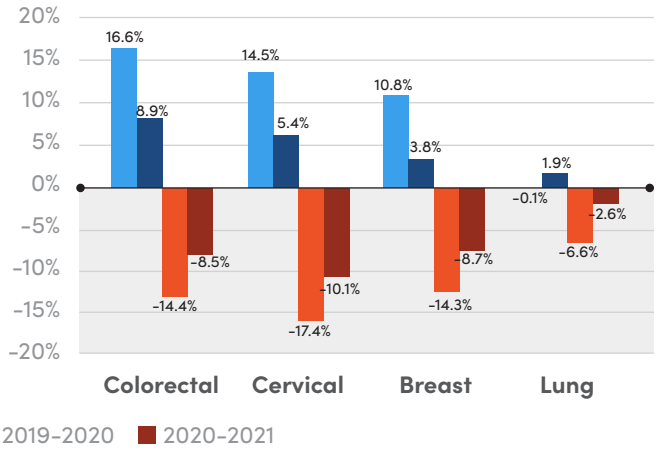
## Fewer Cancer Screenings May Signal Increased Disease Acuity

Across cancer types, preventive screenings have declined since 2017. If the decline in incidence of associated cancer diagnoses over the same period results from underdiagnosis, then it is likely that patients will increasingly receive an initial diagnosis of a more advanced stage cancer.

YEAR-OVER-YEAR PERCENT CHANGE IN **CANCER SCREENINGS**, 2017-2021




YEAR-OVER-YEAR PERCENT CHANGE IN **CANCER DIAGNOSES**, 2017-2021




2017-2018 2018-2019 2019-2020 2020-2021

Note: Analysis is limited to adult patients (18+) without a personal history of cancer with at least three years of continuous insurance coverage; coverage sources include commercial, Medicaid, Traditional Medicare, Medicare Advantage. Cancer screening rates are calculated at the unique patient level, rather than the episode level. Rates for breast and cervical cancers are limited to the adult female population, while rates for colorectal and lung cancers are inclusive of the entire adult population. Multiple screening methods (e.g. colonoscopy, blood-based, stool-based, screenings for colorectal cancer) were included for each cancer type, identified through both CPT and HCPCS codes indicating screening for these cancers. Soure: Trilliant Health national all-payer claims database.

1 https://thehill-com.cdn.ampproject.org/c/s/thehill.com/opinion/healthcare/3765189-undiagnosed-cancer-could-be-the-next-health-crisis-and-we-arent-ready/amp/

These delays are jeopardizing adequate treatment for any number of issues, including breast health, making early detection even more vital. However, despite advances on many fronts there remains something of a "one-size-fits-all" approach in most of the market that is outdated and requires the incorporation of new advances and technologies. The fact of the matter is that every woman's breast cancer journey is her own. Fortunately, one of today's most innovative, exciting, and rapidly developing technologies is becoming another tool in making the detection and treatment of breast cancer more personalized, and more importantly more effective.

## Smarter, better, faster

**"Artificial intelligence (AI) continues to revolutionize various spheres of our lives with its numerous applications," reports the *Cureus Journal of Medical Science*. "Faster, more accurate results are some of the benefits of AI methods in breast cancer screening."**

Given the diminished effectiveness of treatment in late-stage breast cancer it follows that timelier diagnosis and treatment driven by AI can improve prognosis and reduce mortality.[2]

Human intelligence is characterized by its already extraordinary ability to take existing knowledge and process new information to elevate learnings, then use this even higher level of intelligence to adapt to new challenges, identify patterns and assign them meaning. AI possesses these same abilities; it learns and improves at blindingly fast rates.

In breast cancer research it works by converting images of tissue specimens on glass slides to digital images and storing histologic information. That warehouse of data enables comparison and analysis of other images to detect variations from the normal, disease evaluation and progression.[2] While this presents advantages across the spectrum of detection, it especially enables deeper personalization of treatment.

2 https://www.cureus.com/articles/106594-artificial-intelligence-in-breast-cancer-screening-and-diagnosis

## Accuracy through AI

Studies of how deep learning can be used to standardize and automate subjective assessments that vary across radiologists are addressing breast density, a factor to which AI is being applied to predict cancer risk. The journal *Radiology* reports that researchers from two major institutions have developed a new tool that utilizes AI to predict risk.[3]

> ***"There's much more information in a mammogram than just the four categories of breast density," says study lead author Adam Yala, PhD candidate at the Massachusetts Institute of Technology (MIT) in Cambridge. "By using the deep learning model, we learn subtle cues that are indicative of future cancer."[3]***

Yala and his colleagues, Regina Barzilay, PhD, an AI expert and professor at MIT, and Constance Lehman, MD, PhD, chief of breast imaging at Massachusetts General Hospital (MGH), compared three risk assessment approaches. One relied on traditional risk factors, another on deep learning based solely on mammograms, and another on a hybrid of the two. The researchers accessed almost 90,000 mammograms from approximately 40,000 women to test the deep learning model, and they obtained outcomes from a regional tumor registry.

The deep learning models demonstrated improved risk detection over the standard Tyrer-Cuzick model. The comparison of the hybrid model against breast density indicated that patients with non-dense breasts and model-assessed high-risk had almost four times the rate of cancer of patients with dense breasts and model-assessed low risk. Moreover, those advantages held across different subgroups of women.

As a result of this study AI-assisted breast density measurements are now used for screenings at MGH. The researchers continue to track AI's performance and refine communication processes around delivery of risk information to women and their primary care physicians.[3]

3 https://www.rsna.org/news/2019/may/ai-for-breast-cancer-risk

## Growing data – and study subjects

### Other research underway included an initiative at the University of Hawaii Cancer Center.

Using more than 25,000 digital screening mammograms from almost 6,400 women, the researchers trained the deep learning model to detect signals in mammograms that might indicate increased cancer risk. It underperformed in assessing risk factors for interval cancer risk but outperformed clinical risk factors in determining screening-detected cancer risk.[4]

"The results showed that the extra signal we're getting with AI provides a better risk estimate for screening-detected cancer than other forms of assessment," says UH Cancer Center Researcher John Shepherd. "It helped us accomplish our goal of classifying women into low risk or high risk of screening-detected breast cancer. By ranking mammograms in terms of the probability of seeing cancer in the image, AI is going to be a powerful second reading tool to help categorize mammograms."[4]

Shepherd and his colleagues are planning to replicate the study in Native Hawaiian and Pacific Islander women, two groups that have been underrepresented in breast cancer research. They also want to extend the work beyond cancer risk to look at the risk of different grades of breast cancer, from least to most aggressive.

## Personalization by the numbers

Women with dense breast tissue are at greater risk of breast cancer and that physiology makes it more difficult to detect it mammographically. Given this, automated breast ultrasound as an integral part of breast care delivery must become necessary for this patient population.

Forward-thinking providers, working with innovative tech partners, including Onsite Women's Health, will be empowered to offer breast cancer screening and diagnostic services with clinical expertise, proprietary protocols, and a compassionate concierge approach as part of a truly personalized care plan. Using statistical models that incorporate various elements of a patient's health history, AI-driven assessment will allow the patient and her physician to calibrate a screening paradigm that manages her specific level of risk and, if needed, treatment.

4 https://www.hawaii.edu/news/2021/09/30/ai-can-predect-breast-cancer-risk/

**Personalized experiences based on identifying each women's risk and creating a coordinated breast care plan with ongoing screening compliance reduces cancer mortality by 50%.[5]**

Through high-value, clinical partnerships with specialists in women's health, patients benefit from a personalized, innovative offering that is comprehensive, convenient, compassionate, accurate and profoundly personal.

AI is leading to advancements in a dizzying array of industries, including healthcare in general and breast care in particular. AI can help determine a woman's risk, especially those with dense breasts. The healthcare organizations that are genuinely committed to offering personalized care around breast health will be those that utilize every tool, including AI, for breast cancer screening.

So, the prospect of truly personalized breast cancer diagnosis and treatment that utilizes AI within a "one-stop-shop" delivery model is on the horizon. However, AI works best when women are compliant with their physician's recommendations about mammograms. Only then can it utilize truly meaningful data, based on centralized radiological and genetic expertise, to drive mammography and breast health services that are more than convenient and trusted. They also enhance compliance, offer peace of mind and create a true "win/win" for patients and providers, alike.

## Convenience drives compliance. Compliance saves lives.

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**Dr. Susan Holley, Clinical Director of Research and Development at Onsite Women's Health** recently presented her research findings around AI assisted breast cancer screening to the Radiological Society of North America.

The study utilized approximately 214,000 exams of over 61,000 patients, interpreted by 39 radiologists at 50 different clinics. Density assessments were categorized as constant, bidirectional, ascending, and descending. She incorporated all four categories to compare the resulting density patterns to show that the AI model produced significantly more constant assessments than the radiologists. Variations in comparison data lead to the same results.

**"Moreover, these results held for several subgroups in our dataset, including patients interpreted only by breast fellowship trained radiologists, in women older than 55—presumed to be post menopausal and thus with less hormonal variability—and even in cases interpreted by the same radiologist," says Holley.**

5 https://pubs.rsna.org/doi/10.1148/radiol.2021203935?_ga=2.11287732.1419576820.1637252737-294084905.1637252737