Impact of adding an MCED blood test to current cancer screening

Summary of "Estimating the population health impact of a multi-cancer early detection genomic blood test to complement existing screening in the US and UK"
– Data published in *BJC*, 2021 –

Cancer is a common and costly global disease. In the United States (US), 1.8 million cases are expected in 2020.[1] In the United Kingdom (UK), 367,000 cancer cases were diagnosed each year from 2015-2017. About half of those were diagnosed after the cancer had spread from the original tumor site.[2] The costs associated with cancer care were $201 billion in the US in 2020[3] and £21 billion in the UK in 2018.[4]

The purpose of screening for cancer is to find it early, when it is easier to cure. There are four recommended single-cancer screenings in the US (United States Preventive Services Taskforce [USPSTF] Grade A/B) and three in the UK (National Health Service [NHS]). These are breast, lung (US only), colorectal, and cervical cancer screening.[5,6] These four cancers only represent 29% of total cases and 24% of cancer deaths in the US. Other types of cancer do not have recommended screenings yet.

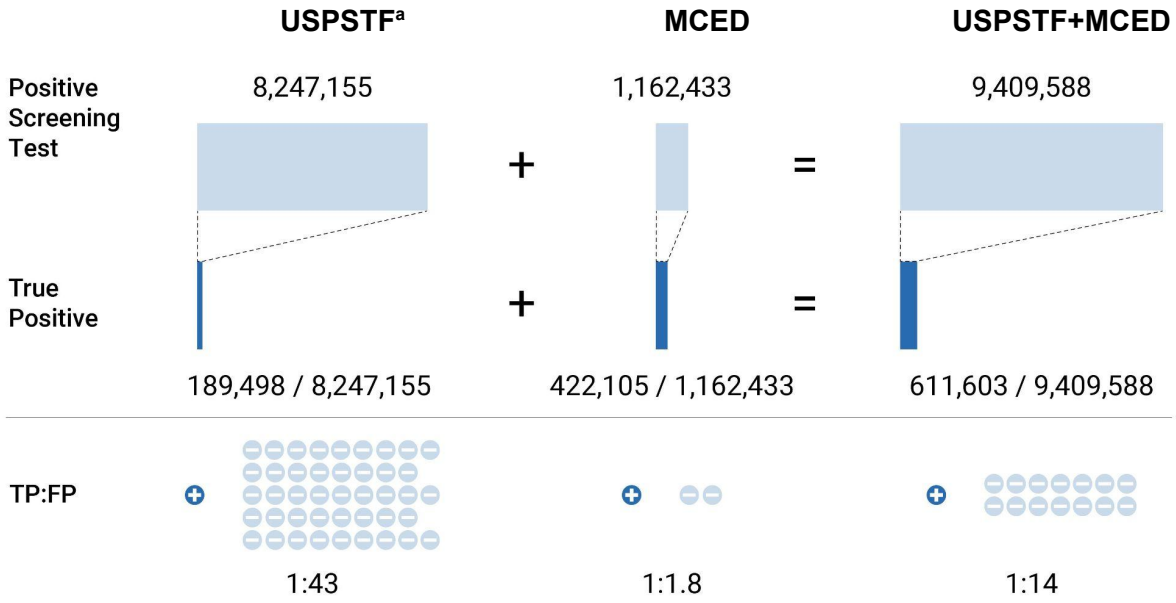
A multi-cancer early detection (MCED) test is a new kind of screening that can look for a shared cancer signal across multiple cancers with one blood sample. This means an MCED test can detect many cancers that cannot be found with the screening tests currently recommended by the United USPSTF.[5] Because it is a blood test, it is also easier to check for cancer in people who may not be able to get complicated screening tests that only detect one cancer.

This study looks at how well current screening and an MCED test could work together in two different healthcare systems. For the current screening tests, information from national cancer sources for the US and UK were used. This included 107 million adults aged 50–79 years old in the US[7] and almost 22 million adults 45–74 years old in the UK.[8] For the MCED test, information from a clinical study was used.[9] The results in this study are not from current medical practice because MCED tests are not widely available yet. Instead, these results are calculations of what might happen if an MCED test was added to current screening.

How well screening programs worked in the US and UK was measured in three main ways:

1) How many possible cancers the tests flag (positive screening test result).
2) How many people with a positive screening test result really do have cancer (known as a true positive signal) versus how many do not have cancer (known as a false positive signal). Having fewer false positives for each true positive is better.
3) The cost of diagnosing cancer after a positive screening test. This includes the cost of checking false positive signals.

Figure 1. How many cancers does each screening test flag in the US and how many were actually cancer?

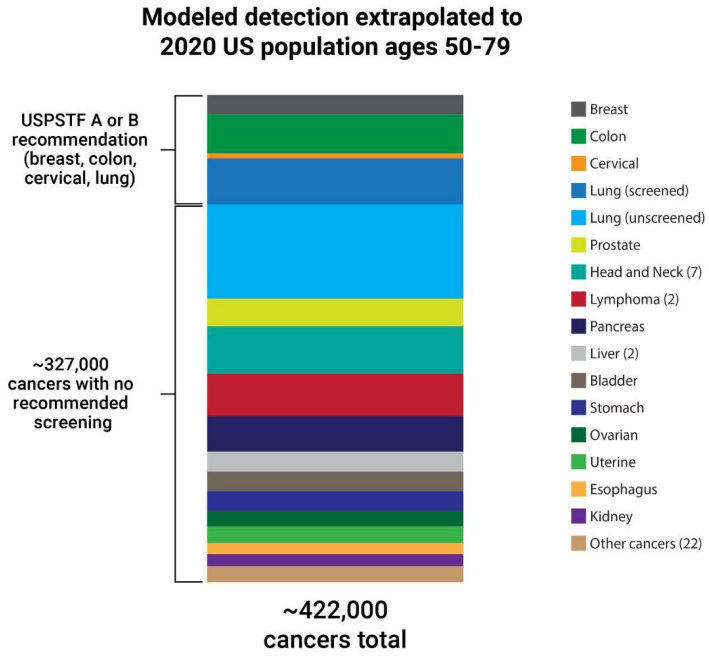


The left column on the top row of this figure shows how many people were flagged as having cancer every year with current USPSTF screening. The next column is the additional cancer signals found with MCED testing. The last column is the number of cancer signals found with USPSTF plus MCED screening. The second row shows the number of people confirmed to have cancer after they have positive screening test results (true positive). Everyone who is not a true positive is a false positive. The bottom row shows how many false positive test results there were for every 1 true positive.
[a]Current screening in the US for breast, colon, cervical, and lung cancers.
FP, false positive; MCED, multi-cancer early detection; TP, true positive; US, United States; USPSTF, United States Preventive Services Task Force.

In the US, current screenings (USPSTF, Grade A/B) flag more than 8 million people as possibly having cancer each year (Positive Screening Test; **Figure 1**). About 190,000 of them end up having cancer (True Positives; **Figure 1**). If an MCED test was added, about 1 million more people could be flagged as possibly having cancer (Positive Screening Test; **Figure 1**). About

422,000 of these MCED signals would be confirmed as cancer (True Positives; **Figure 1).** These confirmed signals can come from many different types of cancer (**Figure 2**). By adding an MCED test to current screenings, almost 612,000 confirmed cancers could be found by screening in the US each year (True Positives; **Figure 1**). For context, about 1.2 million total cancers are diagnosed in the US each year. This would mean that with addition of an MCED test, about one half of all cancers diagnosed per year in people 50-79 years old would be through screening.

Figure 2. Additional Cancers Found with an MCED Test in the US



At the top of the figure are the number of additional cancers that could be detected with an MCED test for the 4 cancers with current screening tests recommended by USPSTF. The bottom bracket of the figure shows the number and types of cancers detected with an MCED test that do not have current screening options.The numbers in parentheses next to some cancers are how many subtypes are included in that main cancer type.
MCED, multi-cancer early detection; US, United States; USPSTF, United States Preventive Services Task Force.

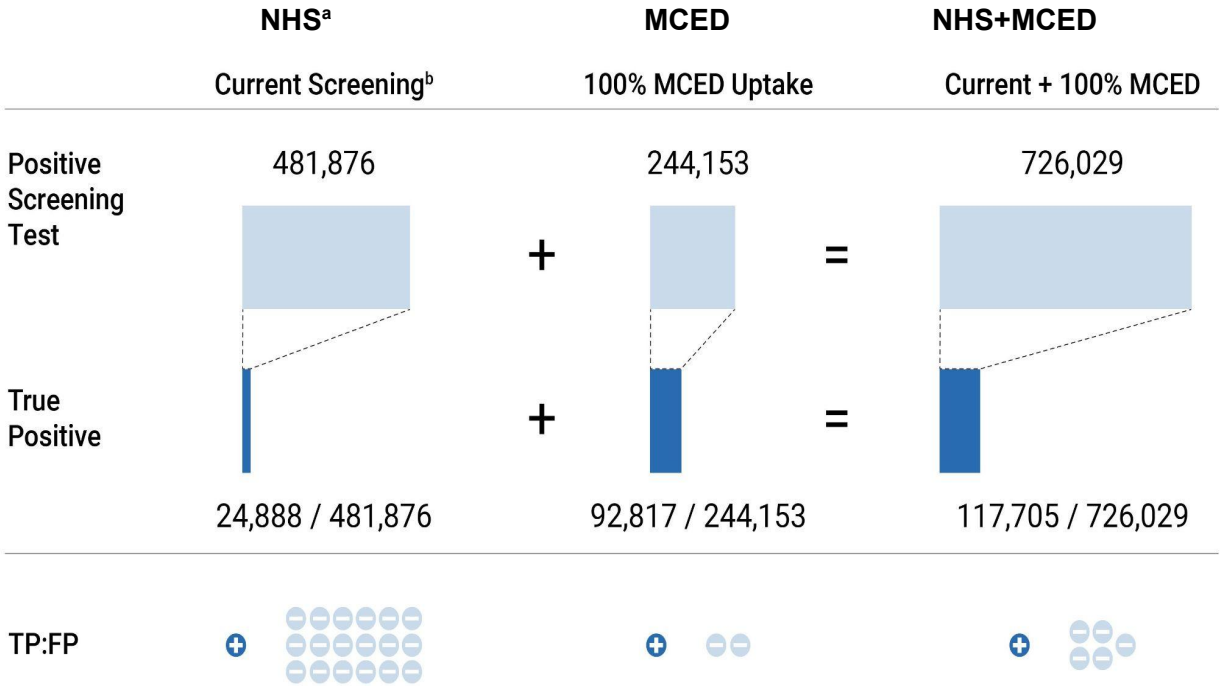
Types of cancer signals that were detected by an MCED test and how many people would have each cancer are shown in **Figure 2**. The thicker a bar, the more of that kind of cancer was detected. The top four cancers (breast, colorectal, cervical, and lung) have USPSTF screening recommended for specific groups of people, but some people who do not fall into those current screening boundaries can be screened with an MCED test. The remaining cancers in this figure do not have recommended screening tests. About one quarter of the confirmed cancers were

those with screening options and the remaining three quarters were those without screening options.

One important way to measure how well a test works is to see how many possible cancers are found with the test and then look at how many people actually had cancer versus how many did not. With current US screenings, for every 1 true positive signal there were 43 false positive signals (TP:FP; **Figure 1**). With the MCED test, for every 1 true positive there were 1.8 false positives (TP:FP; **Figure 1**).[10] If you combine current screenings and the MCED test, for every 1 true positive there were 14 false positives (TP:FP; **Figure 1**).

If an MCED test were added to current screening, would there be an impact on cost too? According to this estimate, there could be substantial cost savings. The cost to confirm each cancer diagnosed with current screening tests was $89,042. The cost to confirm each cancer diagnosed with an MCED screening test was $7,060. When current and MCED testing were combined, the cost was $32,461.

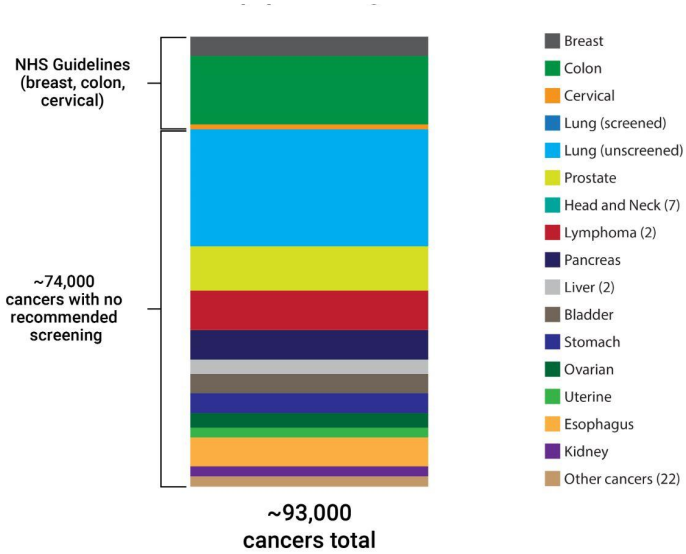
Figure 3. How many cancers does each screening test catch in the UK and how many were actually cancer?



The left column on the top row of this figure shows how many people were flagged as having cancer every year with current National Health Service (NHS) screening. The next column is the additional cancer signals found with MCED testing. The last column is the number of cancer signals found with NHS plus MCED screening. The second row shows the number of people confirmed to have cancer after they have positive screening test results (true positive). Everyone who is not a true positive is a false positive. The bottom row shows how many false positive test results there were for every 1 true positive.
[a]Current screening in the UK for all cancer types.
FP, false positive; MCED, multi-cancer early detection; NHS, National Health Service; TP, true positive; UK, United Kingdom.

In the UK, the 3 recommended screening tests (breast, colorectal, cervical) flag about half a million people as possibly having cancer (Positive Screening Test; **Figure 3**). About 25,000 of those were actual cancer (True Positive; **Figure 3**). An MCED test could detect another ~245,000 people with possible cancer (Positive Screening Test; **Figure 3**). About 93,000 of them would actually have cancer (True Positive; **Figure 3)**. These confirmed signals can come from many different types of cancer (**Figure 4**). By adding current screening and an MCED test together, almost 118,000 confirmed cancers could be found by screening in the UK each year (True Positive; **Figure 3**). For context, about 200,000 total cancers are diagnosed every year in the UK. This would mean that with addition of an MCED test, about one half of all cancers diagnosed per year in people 50-79 years old would be through screening.

Figure 4. Additional Cancers Found with an MCED Test in the UK



At the top of the figure are the number of additional cancers that could be detected with an MCED test for the 3 cancers with current screening tests recommended by the NHS. The bottom bracket of the figure shows the number and types of cancers detected with an MCED test that do not have any current screening options. The numbers in parentheses next to some cancers are how many subtypes are included in that main cancer type.
MCED, multi-cancer early detection; NHS, National Health Service; UK, United Kingdom.

With current UK screenings (breast, colorectal, cervical), for every 1 true positive there were 18 false positives (TP:FP; **Figure 3**). For the MCED test, for every 1 true positive there were 1.6 false positives (TP:FP; **Figure 3**). If you combine current screening and the MCED test, for every 1 true positive there were 5 false positives (TP:FP; **Figure 3**).

According to this study, there could be substantial cost savings by adding an MCED test in the UK too. The cost to confirm each cancer detected with current cancer screenings was £10,452. The cost to confirm each cancer detected with an MCED screening test was £2,175. When current screening and MCED screening was combined, the cost to confirm each diagnosis was £3,925.

Current cancer screening saves many lives in both the US and the UK each year. However, there are many types of cancer that do not have any screening tests and it is hard for some people to get current tests. By adding a new multi-cancer blood-based screening test to regular screening, doctors might be able to test more people for more kinds of cancer and potentially save lives more efficiently. This was true for both of these very different health care systems.

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