# Multi-cancer early detection tests for cancer screening: a behavioural science perspective

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Identifying circulating cell-free tumour DNA in blood offers the potential for multi-cancer early detection tests (MCEDs) in cancer screening. Several trials assessing the impact of MCEDs on early asymptomatic cancer detection are underway. MCEDs differ significantly from existing cancer screening tests (see Figure 1). If shown to improve cancer outcomes, careful consideration of other benefits and harms is vital before population-level use.[1] Many of these are psychological or behavioural in nature, making theory-driven behavioural science research essential to successful implementation.

Acceptability and informed decision-making are vital for population-based screening. Supporting informed decision-making about MCED screening will be more challenging than for single-cancer screening programmes because results could reflect one of many cancers, each with different profiles (e.g., risk, severity). Uptake will be influenced by multiple determinants, including delivery (e.g., invitation, appointment, location, accessibility, familiarity), community-level (e.g., cultural norms), and individual factors (e.g., socio-demographics, attitudes, beliefs). Although blood tests are familiar and less invasive than other screening tests, the ability of a blood test to detect multiple cancers may not be intuitive and needle phobia may deter some people. Recommended screening frequency will likely influence attitudes and repeated uptake over time.

Low uptake has implications for cost-effectiveness and can contribute to discontinuation of screening programmes. Barriers vary across existing screening programmes, and inequalities in uptake are well-documented.[2] Uptake is therefore far from universal, and it is vital to understand and address barriers and facilitators specific to MCED screening ahead of any future roll-out.

Delivering MCED screening results to clearly communicate their meaning (e.g., estimated cancer risk) and recommended diagnostic work-up will be essential. Behavioural science can inform optimal results communication and the development of educational resources. Training for health professionals communicating results, and shared decision-making resources, will also be important, particularly where multiple possible tissues of origin are identified, and clinical pathways are complex or unclear. The communication and delivery of results is likely to influence patient understanding and psychological responses to MCED screening.

Psychological impact of MCED screening, including generalised and cancer-specific anxiety and distress, must be assessed.[3] The unexpectedness of a screen-detected cancer can increase distress compared with symptomatic diagnosis but can also provoke relief when early detection improves prognosis.[4] Unlike single-cancer screening, MCEDs can sometimes identify more than one tissue of origin, bringing further complexity. Since adverse emotional reactions are more likely if positive

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screening results are misinterpreted as cancer diagnoses, accessible information at the time of invitation, consent, and results delivery is crucial to support comprehension. For people receiving false-positive results in single-cancer screening, generalised anxiety is typically replaced by reassurance when cancer is not found, but cancer-specific worry can linger, especially without a differential diagnosis.[3] This may be exacerbated with MCED screening if no cancer is found and an alternative explanation for the positive screening result is not provided. False-positive results could increase cancer risk perceptions and anxiety, and the invasiveness of unnecessary follow-up tests might reduce future screening uptake.[3,5] Conversely, residual worry associated with false-positive results may prompt increased self-checking behaviours[6] and healthcare utilisation.[7]

Behavioural impact, including attendance at follow-up and the influence MCED screening results have on health-related behaviours should be assessed and optimised. Critically, individuals with positive results need to be motivated and enabled to attend for follow-up, since early cancer detection only leads to better health outcomes if results are acted upon. Negative results from MCEDs may offer greater reassurance and reduced risk perceptions compared with other cancer screening. The potential for false reassurance,[5] reinforcing 'healthy self' perceptions,[3] and subsequent reductions in symptomatic presentation or attendance at other screening programmes are important considerations. Furthermore, false-negative results may reduce trust in screening where cancers are missed.[6]

The psychological and behavioural impact of MCED screening results on individuals will likely vary with pre-existing representations of cancer,[8] personal factors (e.g., age, cancer experience, social support), and previous experiences (e.g., of diagnostic work-up).

In conclusion, MCEDs offer promise for accelerating early cancer diagnosis and improving patient outcomes. Behavioural science research will help address critical questions related to acceptability and uptake, communication of results, and psychological and behavioural impact. Drawing on relevant behavioural science theories when designing research will strengthen the quality and implications of findings.[8-10] Marginalised and vulnerable groups who are often under-represented in research must be considered. Monitoring the social gradient in uptake and outcomes is essential. MCED tests in cancer screening may revolutionise the way cancer is detected; however, successful implementation requires a shift in communication and public understanding which must be strongly informed by behavioural science. The importance and complexity of this challenge should not be underestimated.

**Contribution:**

JW, LM and NSB conceptualised this piece. The original draft was written by authors JW, LM and NSB and all authors contributed to reviewing and editing. All authors have reviewed the manuscript and approved it for submission.

**Declaration of interests:**

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**Figure 1: Key features of MCEDs in a screening context that have implications for behavioural science research**



**Key features of MCEDs**

**Uses a simple blood test**

The procedure is a standard blood draw, familiar to most people and not specific to cancer screening

**Screens for multiple cancer types**

MCEDs can detect circulating tumour DNA from multiple tissues of origin and may detect rare as well as more common cancers

**Complex and varied follow-up after a positive screening result**

When a potential cancer signal is detected the pathways for diagnostic work-up are varied and complex, especially where more than one possible tissue of origin is identified

**High test specificity and positive predictive value**

A large proportion of positive screening results will lead to a cancer diagnosis

**Possible lack of diagnostic resolution**

If follow-up tests do not find a cancer, an alternative explanation for the positive screening result is unlikely

**Behavioural Science contribution**

**Acceptability and uptake**

Understand barriers and facilitators to engagement including capability, opportunity & motivational factors

Identify information needs for informed decision-making

Identify and address socio-demographic inequalities

**Delivery of results**

Develop and test optimal communication of results

Inform training and resources to assist professionals communicating results

**Psychological and behavioural impact of results**

Understand and mitigate adverse emotional impact of positive and negative results

Assess and optimise attendance at follow-up and future health-related behaviours

Intervention development and evaluation