The Sepsis Six: Does Public Data Show Whether It Worked?

Bootstrap CUSUM — ONS Sepsis Mortality England & Wales 2001–2023 — Executive Summary

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Four Key Findings

1 — What the Sepsis Six is

Six bedside actions within one hour: high-flow oxygen, blood cultures, IV antibiotics, IV fluid resuscitation, serum lactate, urine output monitoring. Developed 2005 by Dr Ron Daniels. Now in 96% of NHS trusts and 37 countries.

2 — Bootstrap CUSUM result — no structural change detected

Both public mortality series show one stage and no change point at 90% confidence across 22 years (N=23). Mentioned anywhere series (mean 23,556) and underlying cause series (mean 2,488) both show no structural break consistent with the Sepsis Six timeline.

3 — The smoking gun — the ratio

Bootstrap CUSUM on the ratio between the two series finds a structural change point in 2013 at 95.5% confidence, −19.7%. This dates precisely to the CQUIN financial incentive for sepsis screening. The measurement system changed structurally. The clinical outcome measure did not.

4 — The PDSA failure — wrong measure type

The NHS answered “how will we know a change is an improvement?” (Langley et al.) with process measures (bundle compliance) not outcome measures (mortality rate). Compliance tells you the bundle is being delivered. It does not tell you patients are surviving who would not have survived before.

The Ratio — Stage Summary

Bootstrap CUSUM on the ratio between the two mortality series detects structural change in the **measurement system** — not in clinical outcomes. This is the most important finding in the article.

Stage	Period	Mean ratio	Change	Confidence	Interpretation
1	2001–2013	10.75	Baseline	Baseline	Pre-Think Sepsis. ~11 mentions per 1 primary cause death.
2	2013–2023	8.63	**−19.7%**	**95.5%**	CQUIN coding improvement era. Structural change in measurement, not clinical outcomes.

The Three Measure Types — Langley et al., The Improvement Guide (2009)

Every improvement programme needs all three. The Sepsis Six rollout tracked only process measures and reported them as evidence of outcome improvement.

Type	Examples for the Sepsis Six	Current status
■ **Outcome measure What ultimately matters to the patient**	Age-standardised mortality rate; in-hospital mortality (deaths/admissions); quality of life and functional recovery at 90 days.	■ Not reliably available. ONS series compromised by coding changes. HES rate available (Broad et al. 2025, N=26, 1998–2024) but Bootstrap CUSUM not yet applied. QoL not collected nationally.
■■ **Process measure Whether the change is being implemented**	Bundle compliance %; time-to-antibiotics in minutes; proportion of patients formally screened.	■■ Partially available from NHS England sepsis audit 2018+. The NHS reported improving compliance as proof the Sepsis Six was working. But compliance ≠ outcome.
■ **Balancing measure Unintended consequences**	Post-sepsis syndrome rates in survivors (40–60% affected); antibiotic resistance; fluid overload; unnecessary treatment.	■ Not systematically tracked nationally. Post-sepsis syndrome affects 40–60% of survivors but has never been reported alongside Sepsis Six compliance data.

The evaluation gap in one sentence: The NHS has extensive process measure data, no reliable national outcome measure data, and no balancing measure data. The improvement cycle cannot be completed without all three.

The Question That Matters Most for Patients

This article examines mortality. Broad et al. (2025, Guy's & St Thomas' NHS FT / KCL / UCL) examines admissions and survival. Together they reveal a picture neither provides alone: more patients are surviving — but we do not know what that survival means for their lives.

① **Not to die**	ONS mortality data (this article) — partially addressed, with coding limitations.
② **Leave hospital alive**	HES data (Broad et al. 2025) — addressed. The evidence suggests survival rates have improved.
③ **Return to life before**	Neither paper addresses this. 40–60% of survivors develop post-sepsis syndrome: cognitive impairment, fatigue, recurrent infections, psychological trauma. **Survival is not the same as recovery.**

The key sentence: The 2025 paper shows more patients are surviving sepsis. Our article shows we cannot confirm whether the Sepsis Six is why. Neither paper measures what survival actually means for patients — and that is the most important question of all.

Bright Spots — Where Is It Working and Why?

The national null result conceals variation — some trusts almost certainly outperforming others. Positive deviance research asks: where is it working, and what are those places doing differently? Intellectual lineage: Marian Zeitlin (Tufts, 1990) coined the concept studying why some children thrived in malnourished communities. Jerry and Monique Sternin operationalised it in Vietnam (1991) — 93% of malnourished children rehabilitated, scaled to 5 million families. Pascale, Sternin & Sternin (Harvard Business Press, 2010) brought it to healthcare. Heath & Heath popularised it as “Bright Spots” (‘Switch’, 2010). Bootstrap CUSUM applied at trust level identifies trusts with genuine structural change points in their in-hospital mortality rates — separating real improvement from common cause noise. The improvement opportunity lies in propagating the bright spots, not just pushing the national average.

Key References

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• Full article: stepchangeanalysis.com/sepsis-six-does-public-data-show-whether-it-worked.html