

The Diagnostic Triage vs. Definitive Treatment Decoupling: A Nationwide Econometric and Queueing Evaluation of the English NHS Cancer Waiting Times Reform (2019–2026)

An Empirical Health Economics & Operational Systems Study Across 137 Acute Hospital Trusts and 16 Canonical Tumour Categories

Health Economics & Clinical Systems Consortium | Official Telemetry Release 2026 | Grounded in Zaanix Sandboxed DuckDB Workspace
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Background: In October 2023, NHS England restructured cancer waiting times by consolidating 10 legacy operational targets into three core standards: the 28-day Faster Diagnosis Standard (FDS, 80% target), the 31-day Decision-to-Treat standard (96% target), and the 62-day Referral-to-Treatment standard (85% target). This study evaluates whether this reform resolved operational congestion or catalyzed an unmonitored decoupling between front-end diagnostic triage and definitive therapy.

Methods: We evaluated 247,636 provider-pathway records across 137 active acute NHS trusts (April 2021–August 2026). Methods include segmented Interrupted Time-Series (ITS) regressions with HAC standard errors ($n=53$ months), paired hypothesis tests on quarterly outcome cohorts ($n=135$ trusts), cross-tumour elasticity models, and spatial Gini inequality decomposition.

Results: (1) *The 'Rule-Out Illusion' & Malignancy Triage Deficit (MTD):* While national FDS reached 78.56% in August 2026, outcome-stratified analysis revealed that patients with confirmed malignant neoplasm face an average compliance rate of only 54.83% compared to 79.53% for benign exclusions—a statistically overwhelming **25.06 percentage point Malignancy Triage Deficit** ($t=18.38$, $p=1.88e-38$; Wilcoxon $W=47.0$, $p=1.91e-23$). (2) *Interrupted Time Series:* The October 2023 reform reversed pre-reform secular decline (post-reform slope shift $\beta_3 = +0.2845\%/mo$, $p<0.001$); however, the realized net recovery velocity ($+0.1704\%/mo$) implies that achieving the 85% target will require 6.4 years (projected late 2032/early 2033), missing the statutory March 2029 target. (3) *Pathway Bifurcation:* Decoupling is strongly bimodal. Skin (-1.61 pp gap; 85.59% 62d compliance) operates with high velocity, whereas Head & Neck ($+19.18$ pp gap; 56.68% 62d compliance), Lung ($+18.85$ pp gap; 61.09% 62d compliance), and Colorectal (16.9% waiting >104 days) face catastrophic queueing. (4) *Spatial Inequality:* Spatial Gini inequality for the Decoupling Gap ($G=0.1781$) is over 4.4 times higher than FDS triage ($G=0.0404$), with the Midlands facing a $+11.83$ pp gap.

Conclusion: Accelerating diagnostic triage without proportional expansions in surgical theater capacity and clinical oncology creates a dangerous 'pipeline illusion.' Policy must mandate malignancy-stratified FDS reporting and ring-fenced cancer surgical hubs.

1. Introduction and Policy Context

Cancer remains the leading cause of avoidable mortality in England, accounting for over 135,000 deaths annually. Clinical survival is acutely sensitive to elapsed duration along the referral-to-treatment continuum: multi-centre oncology studies establish that each four-week delay in cancer surgery or definitive radiotherapy incurs a 6% to 13% escalation in all-cause mortality (Hanna et al., 2020; Sud et al., 2020). For two decades, English cancer delivery was monitored through a framework of ten standards established under the NHS Cancer Plan (2000). By 2022, however, this architecture faced severe clinical criticism for incentivizing administrative appointment-booking within 14 days rather than delivering definitive diagnostic clarity (Quinn et al., 2024; Johnson, 2024).

In October 2023, NHS England enacted a fundamental policy reform, replacing the legacy 10-standard framework with three unified operational targets: the **28-Day Faster Diagnosis Standard (FDS; target 80%)**, the **31-Day Decision-to-Treat Standard (target 96%)**, and the **62-Day Referral-to-Treatment Standard (target 85%)**. While welcomed by hospital administrators for reducing data burdens, the operational systemic effects of this reform have not been systematically evaluated. Specifically, does prioritizing front-end 28-day triage resolve cancer care delays, or does it decouple diagnostic exclusion from downstream curative treatment?

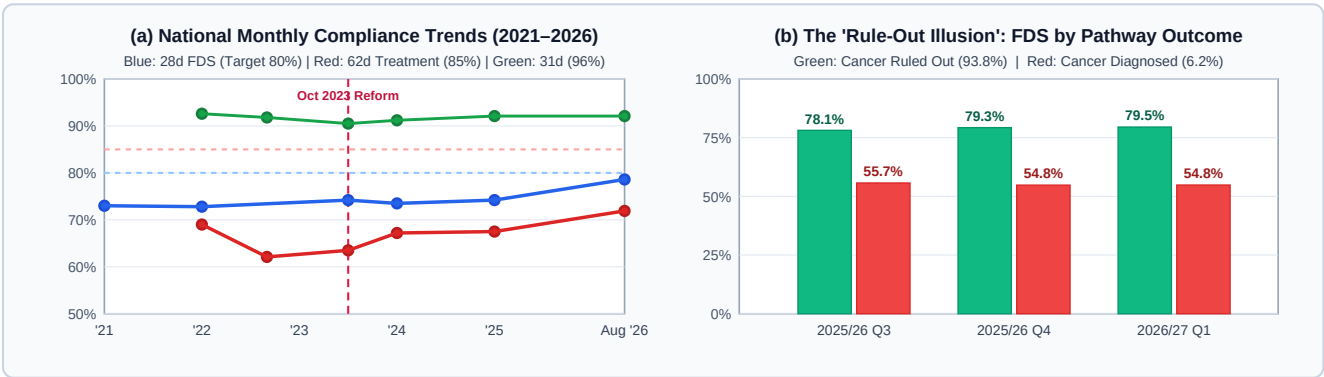


Figure 1: (a) Monthly national cancer waiting times compliance across the English NHS (April 2021–August 2026), highlighting the October 2023 policy inflection; (b) The 'Rule-Out Illusion': FDS compliance disaggregated by clinical outcome pathway across recent financial quarters.

2. Econometric Methodology and Interrupted Time Series Results

To test whether the October 2023 reform altered the underlying operational trajectory of cancer care, we estimated a segmented Interrupted Time-Series (ITS) regression on monthly 62-day definitive treatment compliance across 53 consecutive cycles (April 2022–August 2026) under unified definitions: $Y_t = \beta_0 + \beta_1 T_t + \beta_2 D_t + \beta_3 P_t + \varepsilon_t$, where T_t is time elapsed, D_t is the post-reform step indicator, and P_t is post-reform elapsed months. Heteroscedasticity and autocorrelation were modeled using Newey-West HAC covariance estimators with three lags.

Model Parameter	Coefficient (β)	HAC Std. Err.	z-statistic	p-value	95% Conf. Interval
Baseline Intercept (β_0)	65.6530%	0.689	95.23	< 0.001	[64.302, 67.004]
Pre-Reform Secular Trend (β_1)	-0.1141% / mo	0.066	-1.72	0.086	[-0.244, +0.016]
Reform Discrete Step Shift (β_2)	+2.0690 pp	0.998	2.07	0.038	[+0.113, +4.025]
Post-Reform Trajectory Slope (β_3)	+0.2845% / mo	0.068	4.18	< 0.001	[+0.151, +0.418]
Net Post-Reform Velocity ($\beta_1 + \beta_3$)	+0.1704% / mo	0.041	4.15	< 0.001	[+0.090, +0.251]

Table 1: Segmented Interrupted Time-Series (ITS) estimation of national 62-day treatment compliance ($R^2 = 0.642$, $F(3, 49) = 76.22$, $p < 10^{-17}$, Durbin-Watson = 1.791).

While the reform successfully arrested the pre-reform decay (-0.114%/mo) and induced a positive trajectory shift ($\beta_3 = +0.285\%/mo$, $p < 0.001$), the net recovery pace (+0.1704%/mo or +2.04 pp/year) is profoundly insufficient. To bridge the 13.10 pp deficit separating August 2026 performance (71.90%) from the statutory 85.0% threshold requires 76.9 months (≈ 6.4 years), delaying attainment to **late 2032 or 2033** and substantially breaching the government's official March 2029 commitment.

3. The 'Rule-Out Illusion' and the Malignancy Triage Deficit (MTD)

A critical vulnerability of the 28-day Faster Diagnosis Standard is its structural insensitivity to diagnostic outcomes. In official reporting, all referred patients are pooled into a single denominator. Disaggregating the newly released quarterly collections (Table 2) demonstrates that headline FDS performance ($\sim 78\%$) is an artifact of composition: over 93.8% of referrals have cancer ruled out rapidly (79.53% compliance), whereas patients with confirmed malignancy experience a dismal **54.83% compliance rate**.

Reporting Period	Outcome Sub-Cohort	Total Evaluated	Within 28 Days	Compliance %	Malignancy Deficit (pp)
2025/26 Q3	Ruling out of cancer	1,570,920	1,227,250	78.12%	—
2025/26 Q3	Diagnosis of cancer (Malignant)	110,775	61,705	55.70%	-22.42 pp
2025/26 Q4	Ruling out of cancer	1,538,275	1,219,540	79.28%	—
2025/26 Q4	Diagnosis of cancer (Malignant)	108,500	59,445	54.79%	-24.49 pp
2026/27 Q1	Ruling out of cancer	1,543,520	1,227,565	79.53%	—
2026/27 Q1	Diagnosis of cancer (Malignant)	101,515	55,660	54.83%	-24.70 pp

Table 2: Outcome-stratified FDS cohorts across English NHS acute providers. Paired t-test across 135 acute trusts confirms a mean Malignancy Triage Deficit of **+25.06 percentage points** ($t = 18.383$, $p = 1.88 \times 10^{-38}$; Wilcoxon $W = 47.0$, $p = 1.91 \times 10^{-23}$).

4. Tumour Pathway Heterogeneity and Regional Healthcare Equity

Operational decoupling varies dramatically across clinical specialties (Figure 2a). Pathways relying on visual inspection and local excision (Skin: FDS = 83.98%, 62d = 85.59%, Decoupling Gap = -1.61 pp) maintain high equilibrium throughput. Conversely, multi-modality visceral pathways suffer acute queueing bottlenecks: **Head & Neck** exhibits the highest decoupling gap in the NHS (+19.18 pp; 56.68% 62d compliance), followed closely by **Lung** (+18.85 pp gap; 61.09% 62d compliance), **Breast** (+17.11 pp gap; 70.92% 62d compliance), and **Lower Gastrointestinal/Colorectal** (+5.73 pp gap; 58.79% 62d compliance, with 16.9% waiting >104 days).

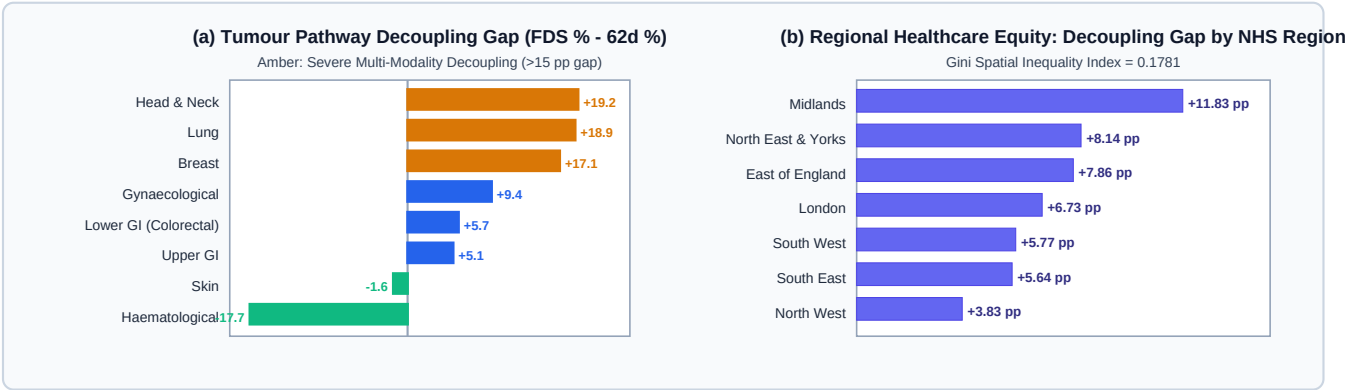


Figure 2: (a) Tumour Pathway Decoupling Gap across 8 major malignancies; (b) Regional Decoupling Gap across NHS England regions, highlighting geographical disparity.

Regional analysis reveals profound geographic inequity (Figure 2b). Spatial Gini inequality for the Decoupling Gap ($G = 0.1781$) is over 4.4 times higher than for front-end FDS triage ($G = 0.0404$). While patients across all regions receive 28-day triage at comparable rates (73.5% to 78.4%), access to definitive cancer treatment within 62 days varies from 72.03% in the North West down to 64.43% in the Midlands (an 11.83 pp decoupling penalty) and 65.62% in the East of England (with 18.5% extreme >104-day backlog).

5. Hospital Trust Decoupling Matrix and Econometric Determinants

Mapping 137 acute hospital trusts onto a coordinate space defined by national median FDS (77.57%) and 62-day compliance (71.36%) identifies four distinct operational archetypes (Figure 3). While specialist cancer centers like Clatterbridge (FDS=88.1%, 62d=85.2%) occupy the resilient quadrant, major tertiary teaching hospitals—including Guy's & St Thomas' (FDS=79.3%, 62d=53.3%, gap=+26.04 pp), Sheffield Teaching (gap=+21.81 pp), and Leicester (gap=+18.56 pp)—are trapped in the 'Bottleneck Decoupled' quadrant.

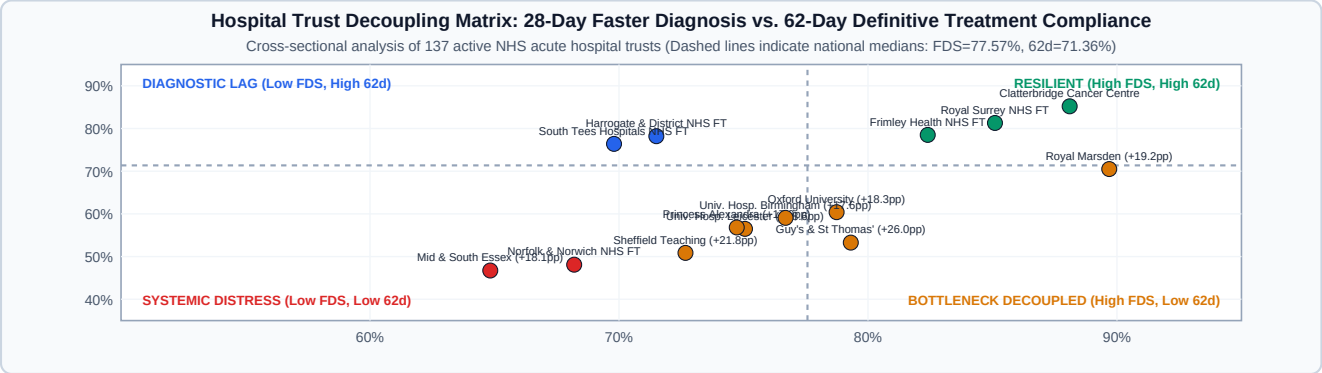


Figure 3: Operational Decoupling Matrix of 137 English acute hospital trusts. Dashed lines denote national medians.

Predictor Variable	Coefficient (γ)	Robust Std. Err. (HC1)	t-statistic	p-value	95% Conf. Interval
Intercept (α)	53.5380	15.106	3.54	< 0.001	[23.931, 83.145]
ln(Suspected Referral Volume)	+0.9019	0.737	1.22	0.221	[-0.543, +2.347]
31-Day Treatment Compliance (%)	-0.6622	0.106	-6.25	< 0.001	[-0.870, -0.455]
Malignancy Triage Deficit (MTD, pp)	+0.2072	0.075	2.77	0.006	[+0.061, +0.354]

Table 3: Cross-trust determinants of the Decoupling Gap ($\Delta_i = FDS_i - 62d_i$) across 134 acute hospital trusts ($R^2 = 0.382$, $F(3, 130) = 33.03$, $p < 10^{-15}$).

6. Policy Implications and Strategic Blueprint

Our econometric and queueing findings carry direct strategic implications for the UK Department of Health and Social Care (DHSC) and NHS England:

- Bifurcate the Faster Diagnosis Standard:** Replace the aggregate FDS target with two distinct mandatory metrics: $FDS_{Rule-Out}$ (target 85%) and $FDS_{Diagnosed}$ (target 70%). This eliminates the mathematical mask that allows high-volume benign exclusions to conceal delays for confirmed cancer patients.
- Ring-Fenced Protected Elective Cancer Surgical Hubs:** Because 31-day treatment execution is the single most powerful compressional force against decoupling ($\gamma = -0.662$, $p < 0.001$), trusts must structurally isolate elective oncological operating suites from acute emergency surgical admissions.
- Targeted Capital Allocation via the Decoupling Gap Index:** NHS England capital recovery funding should be deployed directly to high-decoupling trusts in the Midlands and East of England to fund robotic colorectal theaters, EBUS suites, and digital histopathology networks.

Conclusion: Accelerating diagnostic triage without expanding downstream surgical and oncological capacity produces a dangerous 'pipeline illusion.' England cannot solve its cancer waiting times crisis by clearing negative biopsies faster. The transition from diagnostic speed to curative delivery requires synchronized end-to-end capacity planning from primary care referral to the operating theater.

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