

Two-decade prefecture-wide trends in prostate biopsy volume and cancer detection alongside institutional adoption of pre-biopsy MRI in Yamanashi, Japan

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Abstract

Prostate biopsy practice has evolved substantially with the introduction of pre-biopsy magnetic resonance imaging (MRI), but long-term regional changes remain incompletely characterized. We analyzed annual prefecture-wide aggregate data from Yamanashi, Japan, for fiscal years 2004–2024 and 2,929 institutional biopsy procedures performed at the University of Yamanashi Hospital during fiscal years 2011–2024. Temporal trends were assessed using linear and grouped quasibinomial regression, and policy-period associations were evaluated after adjustment for fiscal year. Across Yamanashi Prefecture, 20,192 biopsy procedures were reported, with 10,365 cancers detected. Annual biopsy volume decreased by 21.1 procedures per fiscal year (95% confidence interval [CI], – 29.5 to – 12.8; $P < 0.001$), whereas the cancer detection rate increased from 39.4% to 69.5% (odds ratio [OR] per fiscal year, 1.069; 95% CI, 1.061–1.077; $P < 0.001$). Institutionally, pre-biopsy MRI utilization increased from 10.2% to 97.7%, while overall and clinically significant prostate cancer detection increased significantly; Grade Group 1 detection did not. After temporal-trend adjustment, a significant post-policy level difference was observed only for MRI utilization (OR, 9.295; 95% CI, 3.562–24.257; $P < 0.001$). These findings suggest increasingly selective biopsy practice, while improvements in cancer detection likely reflect multiple evolving diagnostic factors rather than MRI policy alone.

Introduction

Prostate-specific antigen (PSA) testing has profoundly changed the early detection of prostate cancer by identifying disease at an earlier stage and increasing the number of men referred for prostate biopsy. However, randomized screening trials have yielded differing estimates of mortality benefit, while widespread PSA-based evaluation has also raised concerns regarding unnecessary biopsy, overdiagnosis, and treatment of indolent tumors^{1–3}. Because prostate biopsy is invasive and may detect cancers unlikely to affect survival, contemporary diagnostic pathways increasingly aim to distinguish men at risk of clinically significant prostate cancer from those who can safely avoid biopsy. Improving the selectivity and diagnostic yield of prostate biopsy has therefore become a central objective of modern prostate cancer detection.

Multiparametric magnetic resonance imaging (mpMRI) has emerged as an important triage tool before prostate biopsy. The PROMIS study demonstrated that mpMRI had high sensitivity for clinically significant prostate cancer and could potentially allow a proportion of men with negative imaging findings to avoid immediate biopsy⁴. The PRECISION trial subsequently showed that an MRI-based diagnostic pathway with targeted biopsy improved the detection of clinically significant prostate cancer while reducing the detection of clinically insignificant disease compared with standard systematic biopsy⁵. These findings, together with subsequent systematic reviews, supported the incorporation of pre-biopsy MRI and MRI-targeted sampling into contemporary diagnostic pathways and clinical guidelines⁶. Nevertheless, MRI is not infallible, and the optimal balance between targeted and systematic sampling remains an area of ongoing investigation.

Despite the growing evidence supporting pre-biopsy MRI, its adoption in routine clinical practice has been gradual and heterogeneous. Previous real-world studies have described increasing MRI utilization and higher prostate cancer detection rates after the introduction of MRI-based or MRI-targeted biopsy pathways^{7–9}. However, most studies have been limited to single institutions, relatively short observation periods, or comparisons of MRI-guided and conventional biopsy within selected patient populations. Consequently, long-term changes in biopsy volume and cancer detection at the regional level remain incompletely characterized. Furthermore, few studies have distinguished changes associated with a formal MRI policy from underlying secular trends in diagnostic practice or have simultaneously evaluated clinically significant and Grade Group 1 cancer detection.

Therefore, this study aimed to characterize two-decade prefecture-wide trends in prostate biopsy volume and cancer detection in Yamanashi, Japan, and to examine institutional changes in pre-biopsy MRI utilization and grade-specific cancer detection. We further assessed whether the formal institutional MRI policy was associated with level changes in MRI utilization, overall prostate cancer detection, clinically significant prostate cancer detection, and Grade Group 1 cancer detection after accounting for the underlying temporal trend.

Methods

Study design and data sources

This retrospective longitudinal study evaluated temporal changes in prostate biopsy practice and prostate cancer detection in Yamanashi Prefecture, Japan. Two complementary datasets were analyzed: annual institution-level aggregate data collected across Yamanashi Prefecture and biopsy data from the University of Yamanashi Hospital.

The prefecture-wide dataset covered fiscal years 2004 through 2024. The Yamanashi Prostate Cancer Screening Forum, established in 2005 to promote regional collaboration in prostate cancer screening and diagnostic evaluation, compiled annual data from hospitals and urological clinics providing secondary prostate cancer screening and diagnostic services in Yamanashi Prefecture. A fiscal year was defined as the period from April of the indicated year through March of the following year.

The number and composition of participating institutions varied during the study period. From fiscal year 2016 onward, all seven regional hospitals participated in the annual surveys, although not all participating institutions performed prostate biopsy in every year.

Prefecture-wide data collection

Participating institutions completed annual questionnaires regarding prostate biopsy practice. The variables used in the present study were the total number of prostate biopsy procedures and the number of procedures resulting in a histological diagnosis of prostate cancer. The unit of aggregation was the

biopsy procedure rather than the individual patient. Repeat biopsies performed in the same patient were counted as separate biopsy procedures.

Institution-level data were collated to calculate annual aggregate totals for Yamanashi Prefecture. The annual overall prostate cancer detection rate was calculated as the number of cancer-positive biopsy procedures divided by the total number of biopsy procedures performed during the corresponding fiscal year.

The analytical dataset was validated by comparing institution-level source spreadsheets with annual Forum presentation materials. When discrepancies were identified, institution-level source data that were internally consistent among the total, cancer-positive, and cancer-negative biopsy counts were prioritized. The final annual data are presented in Supplementary Table S1.

Institutional cohort and pre-biopsy MRI policy

The institutional dataset included prostate biopsy procedures performed at the University of Yamanashi Hospital from fiscal year 2011 through fiscal year 2024. The unit of data aggregation was the biopsy procedure rather than the individual patient, and repeat biopsies performed in the same patient were counted as separate procedures.

Institutional data were used to evaluate overall prostate cancer, clinically significant prostate cancer, Grade Group 1 cancer, and pre-biopsy magnetic resonance imaging utilization. Cancer-detection data were available from fiscal year 2011 through fiscal year 2024. During source-data reconciliation, three biopsy procedures—one from fiscal year 2011 and two from fiscal year 2022—were excluded because discrepancies in the corresponding source data could not be resolved.

Pre-biopsy MRI utilization was evaluated from fiscal year 2012 through fiscal year 2024 because MRI information for fiscal year 2011 was incomplete. No imputation was performed for missing MRI data. Annual MRI counts were reconstructed from the archived annual MRI utilization rates and the corresponding biopsy denominators. For each fiscal year, the reported rate yielded a unique integer numerator that was consistent with the annual biopsy total.

Beginning in January 2018, the University of Yamanashi Hospital adopted a policy of performing pre-biopsy MRI in principle for patients scheduled to undergo prostate biopsy, except when MRI was contraindicated or clinically impractical. Because the data were organized by Japanese fiscal year, fiscal year 2017 contained a three-month period after policy implementation and was therefore treated as a transition year.

For the principal policy-period analysis, fiscal years 2012–2016 were classified as the pre-policy period, fiscal year 2017 was excluded as a transition year, and fiscal years 2018–2024 were classified as the post-policy period. Annual institutional data are presented in Supplementary Table S2.

Outcomes and definitions

The prefecture-wide outcomes were:

the annual number of prostate biopsy procedures; and

the annual overall prostate cancer detection rate.

The institutional outcomes were:

the annual pre-biopsy MRI utilization rate;

the annual overall prostate cancer detection rate;

the annual clinically significant prostate cancer detection rate; and

the annual Grade Group 1 prostate cancer detection rate.

Overall prostate cancer was defined as histologically confirmed prostate cancer detected by prostate biopsy. Clinically significant prostate cancer was defined as International Society of Urological Pathology Grade Group 2 or higher.

Grade Group 1 cancer was calculated as the difference between overall prostate cancer and clinically significant prostate cancer. All institutional detection rates used the total number of biopsy procedures performed during the corresponding fiscal year as the denominator.

Statistical analysis

Annual counts and proportions were summarized descriptively. Temporal changes in the annual number of prostate biopsy procedures in Yamanashi Prefecture were evaluated using linear regression, with fiscal year entered as a continuous variable. The estimated annual change was reported as a regression coefficient with a 95% confidence interval.

Because the outcomes were available as annual grouped counts and evidence of overdispersion was observed, temporal trends in proportional outcomes were evaluated using grouped quasibinomial regression models. The annual numbers of positive and negative procedures were entered as the grouped response, and fiscal year was included as a continuous variable. Results were expressed as odds ratios per one-fiscal-year increase with 95% confidence intervals.

Separate temporal-trend models were constructed for prefecture-wide overall cancer detection and for institutional pre-biopsy MRI utilization, overall prostate cancer, clinically significant prostate cancer, and Grade Group 1 cancer.

Associations with the institutional MRI policy were evaluated using models that included fiscal year as a continuous variable and post-policy period as a binary variable. Fiscal year was centered at fiscal year 2018. The post-policy coefficient therefore represented an adjusted level difference between the pre-

policy and post-policy periods after accounting for the underlying temporal trend. These estimates were interpreted as temporal associations rather than causal effects of MRI implementation.

Sensitivity analyses included Poisson and negative binomial models for annual biopsy volume, an alternative quasibinomial policy-period analysis in which fiscal year 2017 was classified as part of the pre-policy period, and exploratory quasibinomial segmented regression models incorporating both a post-policy level change and a post-policy slope change. Sensitivity analyses are presented in Supplementary Table S3.

All tests were two-sided, and a P value of less than 0.05 was considered statistically significant. Statistical analyses were performed using R version 4.5.1 (R Foundation for Statistical Computing, Vienna, Austria).

Use of generative artificial intelligence

During the preparation of this manuscript, the authors used ChatGPT (OpenAI) to assist with English-language editing and manuscript organization. All scientific content, analyses, interpretations, and final wording were critically reviewed and approved by the authors, who take full responsibility for the manuscript.

Ethical approval

The study was approved by the Institutional Review Board of the University of Yamanashi (approval no. 2616) and was conducted in accordance with the principles of the Declaration of Helsinki. The requirement for written informed consent was waived by the Institutional Review Board because of the retrospective nature of the study. Information regarding the study was made available to eligible patients, who were provided with the opportunity to decline participation through an opt-out procedure.

Results

Prefecture-wide trends in prostate biopsy volume and cancer detection

From fiscal year 2004 through fiscal year 2024, 20,192 prostate biopsy procedures were reported across participating institutions in Yamanashi Prefecture, of which 10,365 resulted in a diagnosis of prostate cancer (Table 1 and Supplementary Table S1).

The annual number of prostate biopsy procedures decreased from 1,270 in fiscal year 2004 to 783 in fiscal year 2024. Linear regression demonstrated a significant decrease of 21.1 biopsy procedures per fiscal year (95% confidence interval [CI], -29.5 to -12.8; $P < 0.001$; $R^2 = 0.595$; Fig. 1a and Table 2).

In contrast, the overall prostate cancer detection rate increased from 39.4% in fiscal year 2004 to 69.5% in fiscal year 2024. In the quasibinomial regression model, the odds of detecting prostate cancer

increased significantly with each successive fiscal year (odds ratio [OR], 1.069; 95% CI, 1.061–1.077; $P<0.001$; Fig. 1b and Table 2).

Thus, the decrease in annual biopsy volume was accompanied by an increase in the proportion of biopsy procedures resulting in a diagnosis of prostate cancer.

Institutional trends in prostate cancer detection

At the University of Yamanashi Hospital, 2,929 prostate biopsy procedures were included from fiscal year 2011 through fiscal year 2024. Overall prostate cancer was detected in 1,803 procedures (61.6%), including 1,626 clinically significant prostate cancers (55.5% of all biopsies) and 177 Grade Group 1 cancers (6.0%; Table 1 and Supplementary Table S2).

The overall prostate cancer detection rate increased from 44.1% in fiscal year 2011 to 69.3% in fiscal year 2024. The clinically significant prostate cancer detection rate increased from 38.4% to 66.5%, whereas the Grade Group 1 detection rate changed from 5.7% to 2.8% during the same period (Fig. 2b).

The odds of detecting overall prostate cancer increased significantly over time (OR, 1.134 per fiscal year; 95% CI, 1.095–1.175; $P<0.001$). A similar temporal increase was observed for clinically significant prostate cancer (OR, 1.134; 95% CI, 1.097–1.173; $P<0.001$).

In contrast, no statistically significant temporal change was observed in Grade Group 1 cancer detection (OR, 0.975; 95% CI, 0.927–1.026; $P=0.297$; Table 2).

Temporal changes in pre-biopsy MRI utilization

The institutional MRI analysis included 2,718 biopsy procedures performed from fiscal year 2012 through fiscal year 2024. Pre-biopsy MRI was performed in 1,616 procedures (59.5%).

The annual pre-biopsy MRI utilization rate increased from 10.2% in fiscal year 2012 to 97.7% in fiscal year 2024 (Fig. 2a). The odds of undergoing pre-biopsy MRI increased significantly with each successive fiscal year (OR, 1.793; 95% CI, 1.523–2.111; $P<0.001$; Table 2).

Descriptive comparison of MRI-policy periods

During the pre-policy period, 270 of 1,168 biopsy procedures were preceded by MRI (23.1%). Overall prostate cancer was detected in 599 procedures (51.3%), clinically significant prostate cancer in 525 procedures (44.9%), and Grade Group 1 cancer in 74 procedures (6.3%; Table 1).

During the transition fiscal year, MRI was performed before 93 of 232 biopsy procedures (40.1%). The corresponding detection rates were 60.8% for overall prostate cancer, 50.4% for clinically significant prostate cancer, and 10.3% for Grade Group 1 cancer.

During the post-policy period, MRI was performed before 1,253 of 1,318 biopsy procedures (95.1%). Overall prostate cancer was detected in 970 procedures (73.6%), clinically significant prostate cancer in 903 procedures (68.5%), and Grade Group 1 cancer in 67 procedures (5.1%).

Associations with the institutional MRI policy

After adjustment for the underlying temporal trend, the post-policy period remained strongly associated with increased pre-biopsy MRI utilization (OR, 9.295; 95% CI, 3.562–24.257; $P<0.001$; Fig. 3 and Table 2).

No statistically significant additional level change was observed for overall prostate cancer detection (OR, 1.529; 95% CI, 0.725–3.224; $P=0.230$), clinically significant prostate cancer detection (OR, 1.520; 95% CI, 0.790–2.927; $P=0.182$), or Grade Group 1 cancer detection (OR, 0.965; 95% CI, 0.394–2.366; $P=0.930$).

Sensitivity analyses

The decrease in annual biopsy volume remained significant in both Poisson and negative binomial models. The estimated rate ratio per fiscal year was 0.978 in both models ($P<0.001$; Supplementary Table S3).

When fiscal year 2017 was classified as part of the pre-policy period, the post-policy association remained statistically significant only for pre-biopsy MRI utilization, whereas no statistically significant post-policy level differences were observed for the cancer-detection outcomes.

In exploratory segmented regression analyses, a significant post-policy level increase was observed for MRI utilization, whereas no statistically significant post-policy level or slope changes were observed for overall prostate cancer, clinically significant prostate cancer, or Grade Group 1 cancer detection.

Discussion

In this two-decade regional study, the annual number of prostate biopsy procedures decreased substantially, whereas the overall prostate cancer detection rate increased. At the institutional level, pre-biopsy MRI utilization increased markedly and coincided with higher detection rates of overall and clinically significant prostate cancer, while Grade Group 1 cancer detection did not increase significantly over time. However, after adjustment for the underlying temporal trend, the post-policy period was associated with a significant level difference only in pre-biopsy MRI utilization. These findings suggest that prostate biopsy practice in Yamanashi shifted toward more selective diagnostic evaluation over time, although the observed improvements in cancer detection cannot be attributed solely to the institutional MRI policy.

The inverse trends in biopsy volume and cancer detection rate may reflect a transition from biopsy decisions based primarily on PSA elevation toward risk-based evaluation. Historically, PSA-based diagnostic pathways increased prostate cancer detection but also raised concerns regarding

unnecessary biopsies and the overdiagnosis of indolent disease ¹⁻³. The increasing incorporation of clinical risk assessment, PSA density, and pre-biopsy MRI into diagnostic pathways has supported more selective biopsy decision-making among men with a higher likelihood of harboring clinically significant cancer ^{6,10,11}. In the present prefecture-wide dataset, the cancer detection rate increased from 39.4% to 69.5% despite a substantial reduction in the annual number of biopsy procedures. This pattern is compatible with improved selection of biopsy candidates; however, the absence of patient-level data on PSA, prostate volume, MRI findings, and biopsy indications prevents direct determination of the mechanisms underlying this change.

At the institutional level, the marked increase in pre-biopsy MRI utilization coincided with increasing detection rates of overall and clinically significant prostate cancer, whereas Grade Group 1 cancer detection did not increase significantly. Similar changes have been reported in real-world studies, in which increasing use or systematic implementation of pre-biopsy MRI and MRI-targeted biopsy was associated with improved detection of overall and clinically significant prostate cancer without a corresponding increase in clinically insignificant disease ^{7,9}. A recent systematic review and meta-analysis of randomized controlled trials in biopsy-naïve men also found that the combination of MRI-targeted and systematic biopsy improved the detection of overall and clinically significant prostate cancer compared with systematic biopsy alone, without a significant increase in the detection of clinically insignificant cancer ¹². These findings support the potential of MRI-directed diagnostic pathways to concentrate cancer detection toward clinically significant disease. Nevertheless, MRI-based selection does not completely eliminate the detection of low-grade cancer, and its apparent diagnostic benefits may also reflect concurrent changes in biopsy indications, imaging quality, targeting techniques, and systematic sampling.

An important finding was that the formal MRI policy was associated with a clear post-policy level difference in MRI utilization but not with statistically significant level differences in overall prostate cancer, clinically significant prostate cancer, or Grade Group 1 cancer detection after accounting for the underlying temporal trend. This apparent discrepancy may reflect the gradual adoption of MRI before formal policy implementation rather than an abrupt transition at a single time point. Previous real-world studies have likewise documented progressive increases in pre-biopsy MRI use over time and substantial variation in its uptake across clinical settings ^{8,9}. Although a short-term before-and-after study reported increased detection of overall and clinically significant prostate cancer after systematic implementation of MRI-targeted biopsy ⁷, such comparisons may be influenced by secular changes occurring concurrently. In our longer time series, the institutional policy may have helped consolidate and standardize pre-biopsy MRI use, whereas changes in cancer detection may have reflected the cumulative effects of evolving patient selection, MRI interpretation, biopsy targeting, and systematic sampling. Accordingly, these findings should be interpreted as temporal associations rather than evidence of a causal effect of the MRI policy on cancer detection.

This study has several strengths. First, it combined a long-term regional dataset spanning 21 fiscal years and 20,192 biopsy procedures with a detailed institutional dataset that included pre-biopsy MRI utilization and grade-specific cancer detection. This complementary two-level design enabled us to describe broad changes in prostate biopsy practice across Yamanashi Prefecture while examining institutional changes surrounding a clearly defined MRI policy. Second, the study period encompassed the transition from predominantly PSA-based biopsy decision-making to widespread use of pre-biopsy MRI. Third, the policy-period analysis accounted for the underlying temporal trend, treated fiscal year 2017 as a transition year, and was supported by multiple sensitivity analyses. Finally, the separate evaluation of overall prostate cancer, clinically significant prostate cancer, and Grade Group 1 cancer provided insight into changes in the selectivity of contemporary biopsy practice.

This study has several limitations. First, its retrospective observational design precludes causal inference regarding the effect of the institutional MRI policy on prostate cancer detection. Second, the prefecture-wide data consisted of annual institution-level aggregates and did not include patient-level characteristics such as age, PSA level, prostate volume, PSA density, prior biopsy status, MRI findings, or indications for biopsy. Changes in these factors may have contributed to the observed temporal trends. Third, both the prefecture-wide and institutional datasets were procedure based rather than patient based; repeat biopsies in the same patient were counted as separate procedures, and patient-level longitudinal trajectories and within-patient correlations could not be evaluated. Fourth, the number and composition of participating institutions varied during the early part of the study period, although participation became more consistent in later years. Fifth, detailed information on biopsy approach, the use of targeted and systematic sampling, MRI quality, radiologist experience, and pathological assessment was unavailable. Finally, the detailed MRI and grade-specific analyses were derived from a single tertiary institution, which may limit their generalizability to other settings.

Conclusion

In conclusion, prostate biopsy practice in Yamanashi changed substantially over the past two decades, with a decline in annual biopsy volume and a concurrent increase in overall cancer detection. At the institutional level, pre-biopsy MRI utilization increased to near-universal levels, while overall and clinically significant prostate cancer detection increased without a significant temporal increase in Grade Group 1 cancer detection. However, after adjustment for the underlying temporal trend, a statistically significant post-policy level difference was observed only for pre-biopsy MRI utilization. These findings suggest that contemporary prostate biopsy practice has become more selective, but that improvements in cancer detection likely reflect multiple evolving components of the diagnostic pathway rather than the institutional MRI policy alone.

Declarations

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Author contributions

TM conceived the study, performed the analysis, and drafted the manuscript. HS contributed to data collection and interpretation. All authors contributed to data acquisition, critically revised the manuscript, and approved the final manuscript.

Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Competing interests

The authors declare that they have no competing interests related to this study.

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Tables

Table 1. Summary of study datasets and institutional MRI-policy periods.

a. Study datasets

Dataset	Study period	Biopsy procedures, n	Overall PCa, n (%)	csPCa, n (%)	Grade Group 1, n (%)	Pre-biopsy MRI, n (%)
Yamanashi Prefecture	FY2004–2024	20,192	10,365 (51.3%)	—	—	—
University of Yamanashi	FY2011–2024	2,929	1,803 (61.6%)	1,626 (55.5%)	177 (6.0%)	—
University MRI analysis cohort	FY2012–2024	2,718	1,710 (62.9%)	1,545 (56.8%)	165 (6.1%)	1,616 (59.5%)

b. Descriptive comparison of institutional MRI-policy periods

Policy period	Fiscal years	Biopsy procedures, n	Pre-biopsy MRI, n (%)	Overall PCa, n (%)	csPCa, n (%)	Grade Group 1, n (%)
Pre-policy	FY2012–2016	1,168	270 (23.1%)	599 (51.3%)	525 (44.9%)	74 (6.3%)
Transition	FY2017	232	93 (40.1%)	141 (60.8%)	117 (50.4%)	24 (10.3%)
Post-policy	FY2018–2024	1,318	1,253 (95.1%)	970 (73.6%)	903 (68.5%)	67 (5.1%)

Values are n (%) unless otherwise indicated. PCa, prostate cancer; csPCa, clinically significant prostate cancer; MRI, magnetic resonance imaging; FY, fiscal year. csPCa was defined as International Society of Urological Pathology Grade Group 2 or higher. Percentages were calculated using all biopsy procedures in the corresponding dataset or policy period as the denominator. Fiscal year 2017 was excluded from the principal pre-policy versus post-policy comparison.

Table 2. Temporal trends and MRI-policy-period associations.

a. Temporal trends

Outcome	Model	Effect	Estimate	95% CI	P value
Annual prostate biopsy procedures	Linear regression	Change per fiscal year	-21.1	-29.5 to -12.8	<0.001
Prefecture-wide overall PCa detection	Quasibinomial regression	OR per fiscal year	1.069	1.061–1.077	<0.001
University overall PCa detection	Quasibinomial regression	OR per fiscal year	1.134	1.095–1.175	<0.001
University csPCa detection	Quasibinomial regression	OR per fiscal year	1.134	1.097–1.173	<0.001
University Grade Group 1 detection	Quasibinomial regression	OR per fiscal year	0.975	0.927–1.026	0.297
Pre-biopsy MRI utilization	Quasibinomial regression	OR per fiscal year	1.793	1.523–2.111	<0.001

b. MRI-policy-period associations adjusted for fiscal year

Outcome	Model	Effect	Estimate	95% CI	P value
Pre-biopsy MRI utilization	Quasibinomial regression	Post-policy OR	9.295	3.562–24.257	<0.001
Overall PCa detection	Quasibinomial regression	Post-policy OR	1.529	0.725–3.224	0.230
csPCa detection	Quasibinomial regression	Post-policy OR	1.520	0.790–2.927	0.182
Grade Group 1 detection	Quasibinomial regression	Post-policy OR	0.965	0.394–2.366	0.930

CI, confidence interval; MRI, magnetic resonance imaging; OR, odds ratio; PCa, prostate cancer; csPCa, clinically significant prostate cancer; FY, fiscal year. Temporal trends in proportional outcomes and policy-period associations were estimated using grouped quasibinomial regression models to account for overdispersion. The annual change in prostate biopsy volume was estimated using linear regression. For the policy-period analyses, fiscal years 2012–2016 were classified as the pre-policy period, fiscal year 2017 was excluded as a transition year, and fiscal years 2018–2024 were classified as the post-policy period. Post-policy odds ratios were adjusted for the underlying fiscal-year trend. All confidence intervals are 95% confidence intervals, and all P values are two-sided. The estimate for annual prostate biopsy procedures represents the regression coefficient expressed as the change in the number of procedures per fiscal year; all other estimates are odds ratios.

Figures

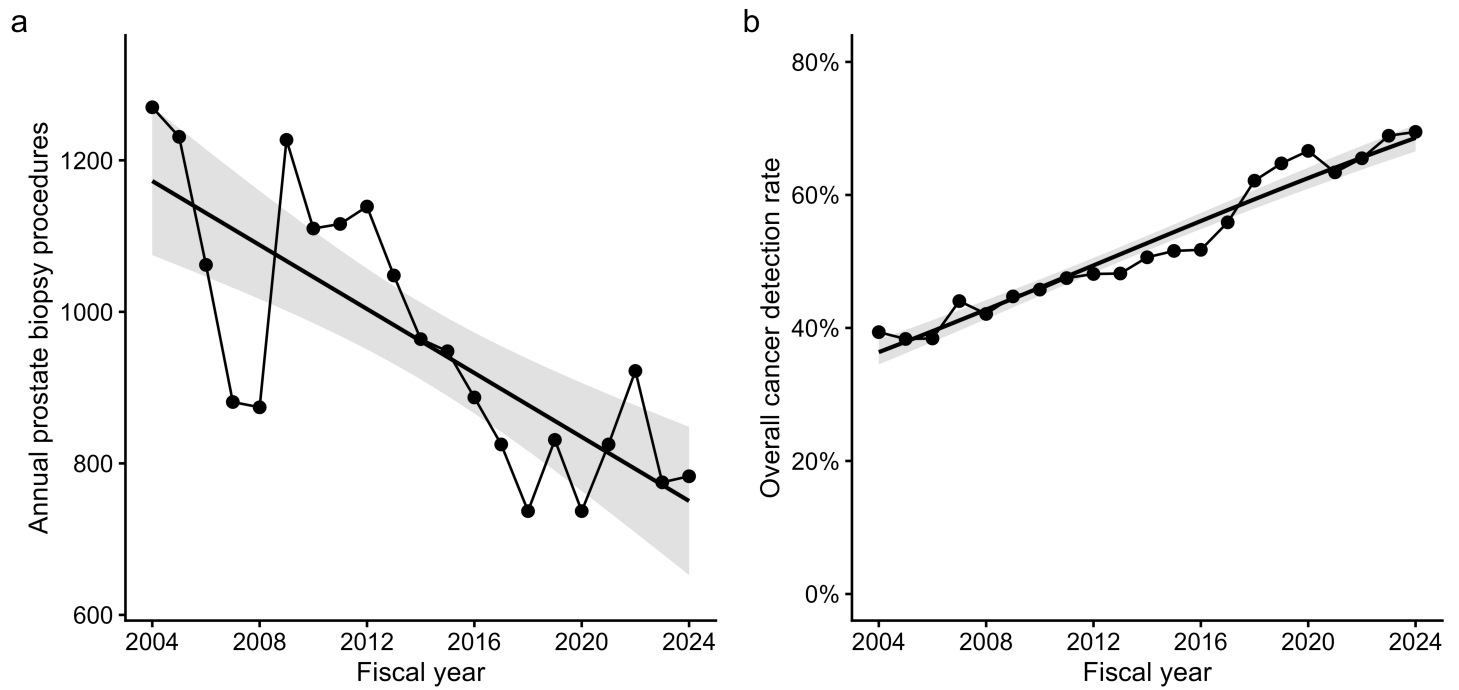


Figure 1

Prefecture-wide temporal trends in prostate biopsy volume and prostate cancer detection in Yamanashi Prefecture.

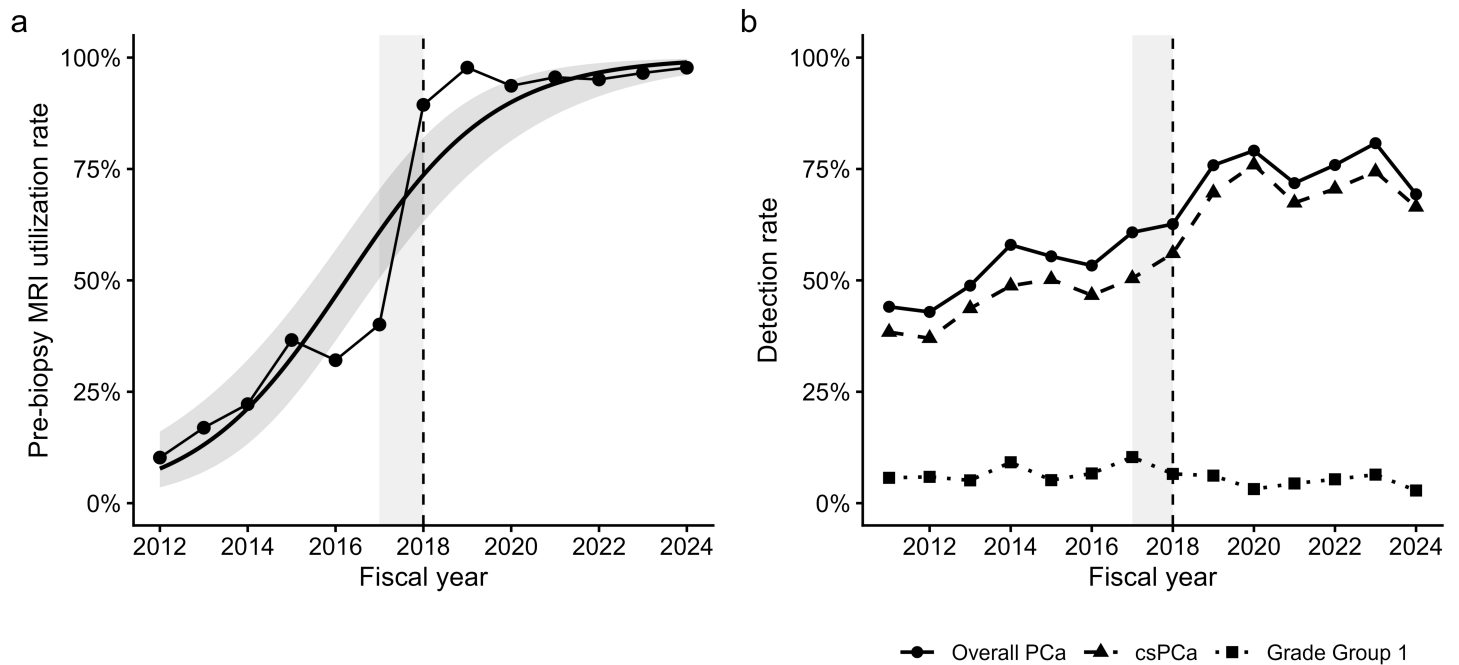


Figure 2

Temporal trends in pre-biopsy magnetic resonance imaging utilization and prostate cancer detection at the University of Yamanashi Hospital.

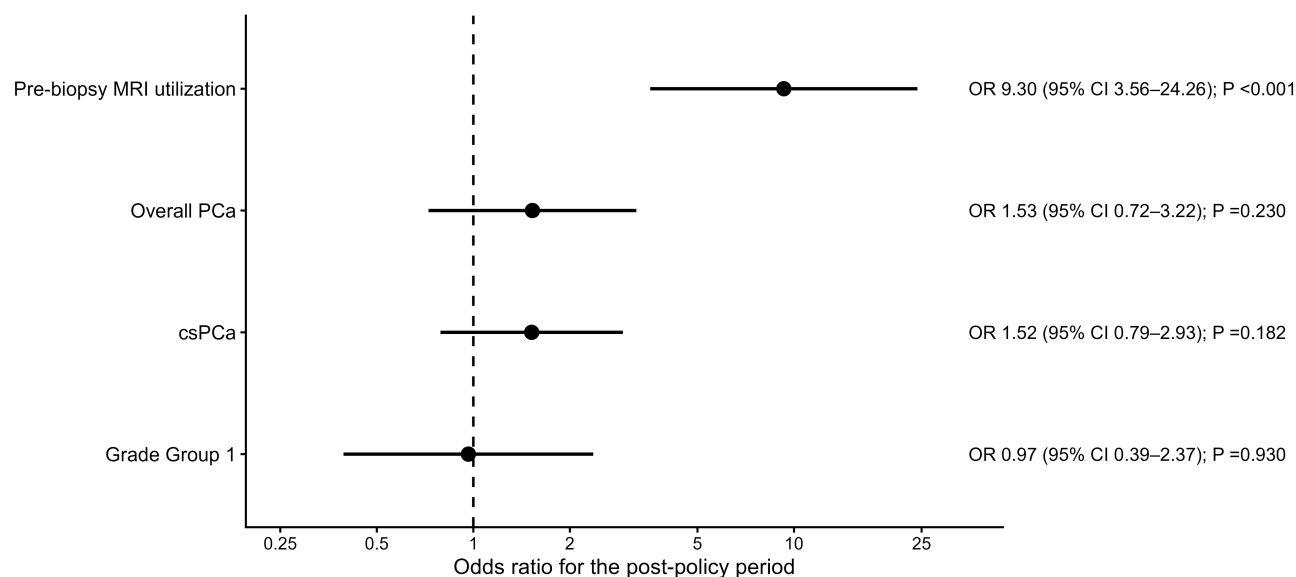


Figure 3

Associations of the institutional pre-biopsy magnetic resonance imaging policy with MRI utilization and prostate cancer detection.

Supplementary Files

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