SPECIAL SERIES: COVID-19 AND CANCER CARE

original reports abstract

# Patterns of Prostate-Specific Antigen Testing and Prostate Biopsies During the COVID-19 Pandemic

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**PURPOSE** This study examined changes in prostate disease screening (prostatic-specific antigen [PSA] testing), prostate biopsy testing, and prostate cancer diagnoses during the COVID-19 pandemic through December 2020.

**MATERIALS AND METHODS** This analysis included test results from men ≥ 40 years, without prior International Classification of Diseases-10 record of prostate cancer since January 2016, who received PSA or prostate biopsy testing at Quest Diagnostics during January 2018-December 2020. Monthly trends were evaluated for three periods: prepandemic (January 2018-February 2020), early-pandemic (March-May 2020), and late-pandemic (June-December 2020).

**RESULTS** Meeting inclusion criteria were 16,365,833 PSA and 48,819 prostate biopsy results. The average monthly number of PSA tests declined from 465,187 prepandemic to 295,786 early-pandemic (36.4% decrease; $P = .01$) before rebounding to 483,374 (3.9% increase; $P = .23$) late-pandemic. The monthly average number of PSA results ≥ 50 ng/mL (23,356; 0.14% of all PSA results) dipped from 659 prepandemic to 506 early-pandemic (23.2% decrease; $P = .02$) and rebounded to 674 late-pandemic (2.3% increase; $P = .65$). The average monthly number of prostate biopsy results decreased from 1,453 prepandemic to 903 early-pandemic (37.9% decrease; $P = .01$) before rebounding to 1,190 late-pandemic (18.1% decrease; $P = .01$). The average monthly number for Gleason score ≥ 8 (6,241; 12.8% of all prostate biopsies) declined from 182 prepandemic to 130 early-pandemic (28.6% decrease; $P = .02$) and decreased to 161 late-pandemic (11.5% decrease; $P = .02$).

**CONCLUSION** The findings suggest that a substantial number of prostate screening opportunities and cancer diagnoses have been missed. Efforts are needed to bring such patients back for screening and diagnostic testing and to restore appropriate care for non–COVID-19–related medical conditions.

JCO Clin Cancer Inform 5:1028-1033. 

## INTRODUCTION

The early months of the COVID-19 pandemic were associated with marked decreases in new cancer diagnoses.[1] Given that cancer does not pause, resulting delays could lead to more patients having advanced disease at diagnosis, requiring aggressive therapy, and succumbing to cancer.[2-4] This study examined changes in prostate disease screening (prostatic-specific antigen [PSA] testing), prostate biopsy testing, and prostate cancer diagnoses during the pandemic through December 2020.

The American Cancer Society recommends men make an informed decision with consultation of their personal physicians regarding PSA screening for cancer.[5] Men are considered at risk starting at age 50 years (with life expectancy of at least 10 years), higher risk includes Black non-Hispanics and men with a first-degree relative (father or brother) diagnosed with prostate cancer at an early age (younger than 65 years), and highest risk with more than one first-degree relative who had prostate cancer at an early age. The American Urological Association strongly recommends shared decision making for men age 55-69 years who are considering PSA screening and proceeding on the basis of each man's values and preferences while recognizing some younger men may be at high risk and older men could have life expectancies exceeding 10 or 15 years.[6] The United States Preventive Services Task Force recommends men age 55-69 years should have an opportunity to discuss the potential benefits and harms of screening with their personal physician and to incorporate their values and preferences in the decision; testing of men 70 years and older is not recommended.[7]

During 2020, the COVID-19 pandemic has affected the practice of medicine.[8,9] The Centers for Disease Control and Prevention released guidance on delaying nonessential procedures and postponing routine

Author affiliations and support information (if applicable) appear at the end of this article.

Accepted on September 15, 2021 and published at ascopubs.org/journal/cci on October 14, 2021: DOI https://doi.org/10.1200/CCI.21.00074

## CONTEXT

**Key Objective**

How has the COVID-19 pandemic affected prostate disease screening (prostatic-specific antigen testing), prostate biopsy testing, and prostate cancer diagnoses?

**Knowledge Generated**

On the basis of 16,365,833 prostate-specific antigen and 48,819 prostate biopsy results, this Quest Diagnostics Health Trends study found deep declines in screening and biopsies during the early pandemic months with a rebound in the second half of 2020, but still below prepandemic baseline. The declines were more marked for men age 40-59 years than for older men.

**Relevance**

A substantial number of prostate screening opportunities and cancer diagnoses have been missed, especially for younger men and those with less than high-grade prostate cancer whose symptoms may not prompt urologic evaluation. Men may benefit from multidisciplinary management to avoid diagnostic and therapeutic delays. Efforts are needed to bring such patients back for screening and diagnostic testing and, in general, to restore appropriate care for non–COVID-19–related medical conditions.

clinical visits as part of initial mitigation strategies for the COVID-19 pandemic.[10] This delay was supported by other organizations including the National Comprehensive Cancer Network, which provided specific guidance to avoid and defer care regarding prostate cancer screening and diagnoses including patients with elevated PSA or abnormal digital rectal examination findings.[11] As part of this guidance, patients have been advised to use telemedicine, patient portals, phone, and e-mail for communication with their health care providers and to limit in-person visits.[12] Deferral of health care services during the pandemic likely led to delays in prostate screening and diagnosis, the subject of this analysis.

## MATERIALS AND METHODS

From January 2018 through December 2020, there were 16,365,833 PSA testing results and 48,819 prostate biopsy results from men 40 years and older in the Quest Diagnostics database. This database reflects a highly diverse, heterogeneous population across the United States, including patients from all US states and District of Columbia. This study only included PSA testing results from those men who had no records of International Statistical Classification of Diseases and Related Health Problems Tenth Revision codes associated with prostate cancer since January 2016. Each patient was counted once within each month, using the most severe result of PSA or prostate biopsy testing.

The total PSA testing was performed using the Siemens chemiluminescent method, and its result value (ng/mL) was standardized against the WHO standard. In this analysis, PSA level was categorized into four groups: $<$ 4.0 ng/mL, 4.0-10.0 ng/mL, 10.1-49.9 ng/mL, and $\geq$ 50.0 ng/mL. Prostate biopsy results were reported with a Gleason score (6 to 10) on the basis of Gleason primary and secondary grades assigned to biopsy tissues. Gleason scores were used in this study to indicate prostate biopsy results and reported for a dichotomous grouping: Gleason score 6-7 and Gleason score $\geq$ 8. Monthly trends in testing volume were evaluated for three periods: prepandemic (January 2018-February 2020), early-pandemic (March-May 2020), and late-pandemic (June-December 2020). The early-pandemic period was selected as the months with the greatest impact on PSA testing. The average monthly numbers were compared between prepandemic and early-pandemic or late-pandemic using Wilcoxon rank-sum test. Data analyses were performed using SAS Studio 3.6 on SAS version 9.4 (SAS Institute). This study was deemed exempt by the Western Institutional Review Board (Puyallup, WA).

## RESULTS

### PSA Testing Results

Of 16,365,833 PSA testing results that met study inclusion criteria, 14,578,442 (89.1%) had a level of $<$ 4.0 ng/mL, 1,504,152 (9.2%) a level of 4.0-10.0 ng/mL, 259,883 (1.6%) a level of 10.1-49.9 ng/mL, and 23,356 (0.14%) a level of $\geq$ 50.0 ng/mL (a level often associated with advanced cancer). The mean (standard deviation) age was 62.4 (10.4) years.

The average monthly number of PSA tests declined from 465,187 prepandemic to 295,786 early-pandemic (36.4% decrease; $P$ = .01), reaching a nadir of 187,653 tests (59.7% decrease) in April before rebounding to 483,374 (3.9% increase; $P$ = .23) late-pandemic (Fig 1A).

The monthly average number of PSA results $\geq$ 50 ng/mL dipped from 659 prepandemic to 506 early-pandemic (23.2% decrease; $P$ = .02), with a nadir of 384 (41.7% decrease) in April, and rebounded to 674 late-pandemic (2.3% increase; $P$ = .65; Table 1). For PSA levels of 4.0-49.9 ng/mL, the average monthly number declined even further, from 50,260 prepandemic to 33,846 early-pandemic (32.7% decrease; $P$ = .01), reaching a nadir of 23,007 tests (54.2% decrease) in April, before it rebounded to 50,820 (1.1% increase; $P$ = .78) late-pandemic.

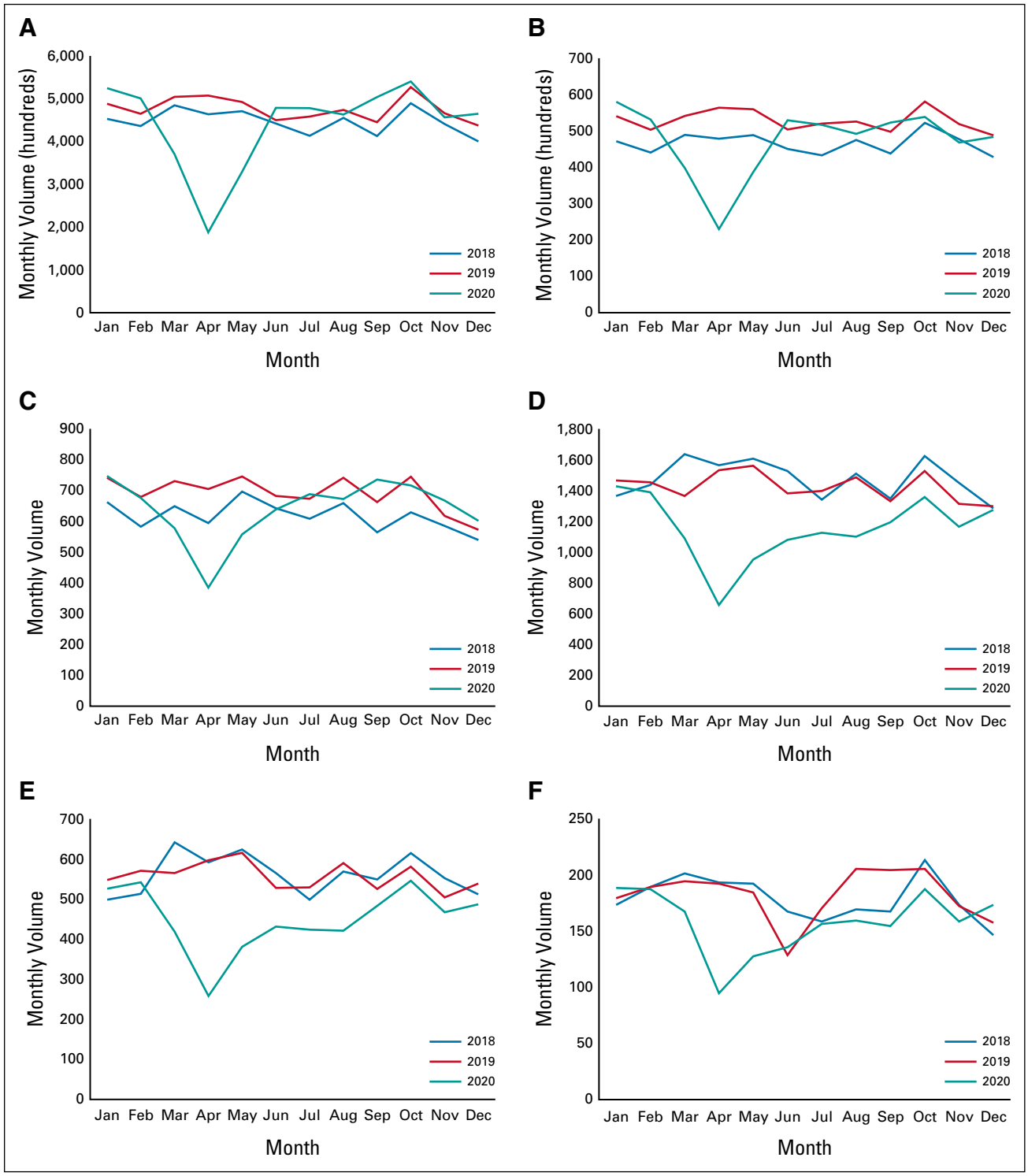


**FIG 1.** Monthly numbers of prostate-specific antigen tests: (A) all, (B) 4.0-49.9 ng/mL, and (C) ≥ 50.0 ng/mL, January 2018-December 2020. Monthly numbers of prostate biopsies: (D) all, (E) Gleason score 6-7, and (F) Gleason score ≥ 8, January 2018-December 2020.

In older patients (age ≥ 60 years), the decline in PSA results from prepandemic to early-pandemic was 34.2% (267,679 to 176,038; $P = .01$); in younger patients (age 40-59 years), a slightly deeper decline, 39.4% (197,508 to 119,748; $P = .01$), was observed during the same periods (Table 1). The number of older patients rebounded to 283,562 (5.9% increase; $P = .08$), and the number of younger patients rebounded to 199,812 (1.2% increase; $P = .91$).

 

**TABLE 1.** Monthly Averages for PSA and Prostate Biopsies With Percent Changes From Prepandemic (January 2018-February 2020) to Early-Pandemic (March-May 2020) or Late-Pandemic (June-December 2020)

| | Prepandemic (January 2018-February 2020) | Early-Pandemic (March-May 2020) | | | Late-Pandemic (June-December 2020) | | |
|---|---|---|---|---|---|---|---|
| **Prostate Tests** | **No.** | **No.** | **% Change** | ***P*** | **No.** | **% Change** | ***P*** |
| PSA, all | 465,187 | 295,786 | –36.4 | .01 | 483,374 | 3.9 | .23 |
| PSA, ng/mL | | | | | | | |
| 4.0-49.9 | 50,260 | 33,846 | –32.7 | .01 | 50,820 | 1.1 | .78 |
| ≥ 50.0 | 659 | 506 | –23.2 | .02 | 674 | 2.3 | .65 |
| Age, years | | | | | | | |
| 40-59 | 197,508 | 119,748 | –39.4 | .01 | 199,812 | 1.2 | .91 |
| ≥ 60 | 267,679 | 176,038 | –34.2 | .01 | 283,562 | 5.9 | .08 |
| Prostate biopsy, all | 1,453 | 903 | –37.9 | .01 | 1,190 | –18.1 | .01 |
| Gleason score | | | | | | | |
| 6-7 | 559 | 354 | –36.7 | .01 | 467 | –16.5 | .01 |
| ≥ 8 | 182 | 130 | –28.6 | .02 | 161 | –11.5 | .02 |
| Age, years | | | | | | | |
| 40-59 | 329 | 194 | –41.0 | .01 | 240 | –27.1 | .01 |
| ≥ 60 | 1,124 | 710 | –36.8 | .01 | 950 | –15.5 | .01 |

Abbreviation: PSA, prostate-specific antigen.

### Prostate Biopsy Results

Of 48,819 prostate biopsy results that met study inclusion criteria, 23,703 (48.6%) tissues were benign, 18,875 (38.7%) had a Gleason score of 6-7, and 6,241 (12.8%) had a Gleason score ≥ 8 (considered poorly differentiated or high-grade cancer). The mean (standard deviation) age of patients with biopsy results was 66.4 (8.2) years.

The average monthly number of prostate biopsy results decreased from 1,453 prepandemic to 903 early-pandemic (37.9% decrease; $P = .01$), with a nadir in April (660; 54.6% decrease), before rebounding to 1,190 late-pandemic (18.1% decrease; $P = .01$; Fig 1D).

The average monthly number for Gleason score ≥ 8 declined from 182 prepandemic to 130 early-pandemic (28.6% decrease; $P = .02$), with a nadir of 95 (47.7% decrease) in April, and decreased to 161 late-pandemic (11.5% decrease; $P = .02$; Table 1). For the lower Gleason scores (6-7), the average monthly number declined from 559 prepandemic to 354 early-pandemic (36.7% decrease; $P = .01$), with a nadir of 259 (53.7% decrease) in April, and decreased to 467 late-pandemic (16.5% decrease; $P = .01$).

In older patients (age ≥ 60 years), the decline from prepandemic to early-pandemic was 36.8% (1,124 to 710; $P = .01$); in younger patients (age 40-59 years), a slightly deeper decline, 41.0% (329 to 194; $P = .01$), was observed during the same periods (Table 1). For both older and younger patients, the testing volumes in late-pandemic period were still significantly below the prepandemic level, 15.5% decrease and 27.1% decrease (both $P = .01$), respectively.

## DISCUSSION

Quest Diagnostics is the leading provider of clinical laboratory testing in the United States. These data should be interpreted as a very large, but not exhaustive, sample of national data. The study included 16,365,833 PSA and 48,819 prostate biopsy results. The monthly trends in test volumes over the 36-month period reflected in the study demonstrate the validity of the observed dramatic changes during the pandemic (Fig 1). Specifically, we saw sharp declines in early-pandemic PSA testing and prostate biopsies. PSA volumes later rebounded to prepandemic levels, but not enough to account for testing missed early-pandemic. Thus, a considerable number of men may be behind on routine PSA screening and monitoring. In contrast, prostate biopsy volumes leveled out well below the prepandemic levels. For prostate biopsy testing, both early-pandemic and late-pandemic declines were greater for prostate cancer diagnoses with lower Gleason scores compared with higher Gleason scores and greater for younger than older men. For PSA testing, a greater decline in younger men and lower PSA levels was observed only during the early-pandemic period.

Patients with cancer and COVID-19 appear to have a poorer outcome than patients without cancer.[13-15] Another concern for men with prostate cancer is that approximately 18% of such men may have comorbid conditions that can affect the SARS-CoV-2 infection and COVID-19 severity.[16] Although gaps in diagnoses are of great concern, some delay in treatment may have minimal impact.[2,17,18] Specifically, patients with missing PSA testing and biopsy

results tended to be in the lower- to intermediate-risk groups where there may be more time before the patient becomes high-risk or medically incurable. Interestingly, patients with prostate cancer receiving androgen-deprivation therapy have a significantly lower risk (four-fold) of SARS-CoV-2 infection compared with patients not receiving androgen-deprivation therapy or even patients with any other cancer type.[19] Nevertheless, delays in prostate cancer diagnoses can still lead to worse outcomes, with the potential for stage migration toward more advanced disease especially since delays for some men likely greatly exceed 6 months, a time when biochemical disease progression may occur.[20,21]

A limitation of the study is that patients can obtain testing from different laboratories during the pandemic. Reasons for care deferral should be studied, particularly with variable lockdown and other restrictions.

In conclusion, these findings suggest that we are missing a substantial number of prostate screening opportunities and cancer diagnoses, especially for younger men and those with less than high-grade prostate cancer whose symptoms may not prompt urologic evaluation. These men may benefit from multidisciplinary management to avoid diagnostic and therapeutic delays. Efforts are needed to bring such patients back for screening and diagnostic testing and to restore appropriate care for non–COVID-19–related medical conditions. This pandemic is not over, nor is this the final pandemic. Understanding that this gap in care occurred allows policy makers to understand and attempt to address potential critical gaps in care in the future.

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## AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

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**Stock and Other Ownership Interests:** Quest Diagnostics

No other potential conflicts of interest were reported.

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