



Markets or Monopolies? Considerations for Addressing Health Care Consolidation in California

Over the past three decades, markets for health insurers and providers have gone through waves of consolidation.¹ As of 2018, 95% of metropolitan areas in the United States had highly concentrated hospital markets.² Markets for health insurers are also highly concentrated — between 2006 and 2014, the combined market share of the top four insurers climbed from 74% to 83%.³ The coronavirus pandemic appears to be fueling another round of consolidation — especially acquisition of providers by private equity firms.⁴ While past consolidation typically resulted from mergers and acquisitions, consolidation now also occurs through other types of transactions including joint ventures, strategic alliances, affiliations, and other agreements between companies.⁵ Because it is clearly increasing throughout market segments and across the state, it is important to understand different forms of health care consolidation, common measurements of market concentration, the evidence on the effects of past consolidation, the current sources and types of regulatory oversight in California, and potential considerations for future policymaking.

an HHI, the market share of each firm in the relevant market is squared and the squares are summed. For example, if there are three hospitals in a market, each with 20%, 30%, and 50% market shares, the HHI for that hospital market is 3,800 (or $20^2 + 30^2 + 50^2$). HHI measurements range from 0 (an infinite number of firms) to 10,000 (a monopoly). Antitrust enforcers consider a market with an HHI of less than 1,500 as a competitive marketplace, one with an HHI between 1,500 to 2,500 as moderately concentrated, and one with an HHI of greater than 2,500 as highly concentrated. Researchers from the Petris Center at the University of California, Berkeley calculated that the average HHI level for counties in California in 2018 exceeded the “highly concentrated” threshold for hospitals (average HHI = 5,695), specialists (4,191), and insurers (3,121), and was “moderately concentrated” for primary care physicians (1,540).⁶ Furthermore, if they removed counties with populations over 500,000 from the analysis, the average hospital HHI in California was over 7,000,⁷ demonstrating that hospital markets in most California counties are approaching monopoly levels of concentration, especially in rural areas. Other studies show that these trends are not limited to California.⁸

Types of Consolidation: Definitions and Measures

Horizontal Concentration

Horizontal concentration refers to how many direct competitors are in a market and how much market share each competitor has. A market can become horizontally concentrated through mergers and acquisitions (e.g., if two hospitals in a market merge) or if companies gain substantial market share through expansion or by outcompeting their rivals. One commonly used measure of market concentration is the Herfindahl–Hirschman Index (HHI). When calculating

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Vertical Concentration

Vertical consolidation occurs when firms at different levels of the supply chain merge. In health care, vertical consolidation often refers to hospitals acquiring physician practices or clinics, but vertical consolidation also applies to insurers purchasing physician practices

or pharmacy benefit managers. To measure vertical consolidation, researchers typically report the percentage of companies in the market owned by a firm higher up in the supply chain (e.g., the percentage of physicians or clinics owned by a hospital or health system). Unlike HHI levels in horizontal merger guidelines, antitrust enforcers have not issued thresholds for percentage ownership that warrant increased scrutiny of vertical mergers. Nonetheless, the percentage of ownership measures demonstrate that physicians in California are increasingly vertically consolidated — as of 2018, 52% of specialists and 42% of primary care physicians in California were in practices owned by a health system.⁹ Another study reported similar findings nationwide.¹⁰ Of note, this vertical consolidation has increased dramatically over the past decade. For example, researchers found that the percentage of specialists in California that were in practices affiliated with a health system increased from 25% in 2010 to 52% in 2018 — an increase of 108%.¹¹

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Cross-Market Concentration

Cross-market consolidation occurs when two companies that operate in different geographic markets merge. For example, a cross-market merger occurs when a hospital in one city merges with a hospital in another city. While there is no widely accepted methodology for measuring the extent of cross-market consolidation — like HHI for horizontal consolidation — researchers have used “willingness-to-pay” calculations and “common customers” to try to estimate the impact of a particular cross-market merger.¹²

Impacts of Consolidation on Consumers

When assessing the potential impacts of a health care merger,¹³ it is important to ask whether the patient or the public will benefit. For instance, will the merger result in decreased administrative costs that result in lower prices for consumers? Will the merger allow investment in technologies that increase quality or efficiency of care that patients receive? Or will the merger reduce competition and allow companies to raise prices or decrease quality without losing market share?

Unfortunately, a large and growing body of evidence demonstrates that mergers of health care companies have consistently resulted in increased prices for health care services with little to no improvement in quality.

Effects of Horizontal Mergers

A diverse set of research studies clearly demonstrate that hospital prices increase following a horizontal merger with another hospital in the same market and that those price increases happen for both nonprofit and for-profit hospitals.¹⁴ The demonstrated price increases can be quite large, ranging from 20% to 40% post-merger. In 2020, the Medicare Payment Advisory Commission (MedPAC) reviewed the published research on hospital consolidation and concluded that the “preponderance of evidence suggests that hospital consolidation leads to higher prices.”¹⁵ While there are fewer studies about horizontal concentration of physician practices, studies found that physicians in consolidated markets are paid higher prices for their services¹⁶ and that prices increased 10% to 20% following a merger of two specialty practices in the same market.¹⁷ Importantly, the effects of these higher prices are not limited to the patients at these hospitals because insurers pass on these increased prices to all enrollees and their employers through increased premiums.¹⁸ Furthermore, workers bear the burden of these increased premiums as employers depress wages to pay more for health insurance coverage.¹⁹

When analyzing mergers of insurers, the effect is a bit more complex because insurers with market power may be able to negotiate lower prices from providers, but that market power may also enable them to retain higher profits without passing those savings to employers or individuals through lower premiums.²⁰ For example, one study looking at the impact of health plan concentration on hospital prices found that hospital prices in the most concentrated health insurer markets were approximately 12% lower than in more competitive health plan markets.²¹ Other studies, however, documented that lower provider prices only translate into lower premiums if the insurance market is sufficiently competitive,²² as insurers who do not face competitive pressure may not have the incentive to pass any savings on to consumers.²³ Nonetheless, the medical loss ratio requirements in the Affordable Care Act (ACA) essentially cap profits of all commercial insurance plans.²⁴ Furthermore, because insurers with market power may be able to demand rates that are below competitive prices, providers may respond by reducing services or quality or exiting the market entirely. Accordingly, the effect of insurance mergers on costs for consumers depends on whether the newly merged insurer can negotiate lower rates, whether regulations or market forces require the insurer to pass on any savings generated from decreased provider prices, and whether those rates negatively affect providers in the area.

Horizontal consolidation affects more than prices. Antitrust theory and empirical research both reveal the mixed to negative impact that horizontal consolidation can have on health care quality and the negative impact it can have on the labor market for health care workers. A report sponsored by the American Hospital Association found that mergers increased the standardization of clinical protocols, increased investments and access to medical staff at acquired hospitals, and improved outcomes from complex services because of an increase in volume at the acquiring hospital.²⁵ The bulk of the research evidence, however, finds that these efficiencies are not consistently borne out and that quality suffers in highly concentrated markets, and multiple studies find higher patient mortality for

some conditions.²⁶ Beyond impacts on prices and quality, evidence suggests that consolidation can also decrease wage growth for hospital employees. Prager and Schmitt found that among the mergers resulting in the highest increases in concentration, wage growth for nurses and pharmacists was about two-thirds of what it would have been without the merger.²⁷

Effects of Vertical Mergers

A number of studies find increased prices and little improvement in quality following vertical mergers.²⁸ For example, Capps, Dranove, and Ody found that physician prices increased, on average, by 14% for medical groups acquired by hospital systems.²⁹ Further, researchers found that in California, an increase in the share of physicians in practices owned by a hospital was associated with an increase in premiums for private plans sold on Covered California, the state's marketplace.³⁰

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Proponents of vertical mergers have frequently claimed that the merger will help improve continuity of care, reduce duplicative care, or increase quality.³¹ A few studies have found improvements in specific areas, like increased number of patients getting cancer screening and increased care utilization, while other studies found no statistically significant effects on mortality or patient satisfaction.³² More recent studies have found that physicians change their referral and prescribing patterns after they are acquired by a hospital in ways that lead to wasteful spending.³³ For example, Young and colleagues found that the odds of a patient receiving an inappropriate MRI referral increased by more than 20% after a physician transitioned from independent practice to hospital employment.³⁴ Overall, studies on quality improvements following a vertical merger remain ambiguous.³⁵

Effects of Cross-Market Mergers

While the effects of cross-market mergers are less studied than those of horizontal and vertical mergers, economic researchers have found that cross-market mergers can have a significant impact on prices charged by health systems.³⁶ For example, a growing body of research demonstrates a 7% to 17% increase in prices for hospitals purchased by out-of-market systems,³⁷ a 7% to 9% increase in prices at the acquiring hospital after merging with a hospital in a different market in the same state,³⁸ and an 8% increase in prices at nonmerging nearby hospitals that shadow the price increases at the newly merged facility.³⁹

Current Regulatory Oversight of Consolidation in California

Currently, three agencies in California — the Department of Insurance (CDI), the Department of Managed Health Care (DMHC), and the Office of the Attorney General — have the authority to review some mergers involving health care entities. CDI must approve any mergers involving domestic insurers, DMHC must approve mergers involving health care service plans, and the attorney general (AG) must approve most mergers of *nonprofit* hospitals. In addition, the AG can challenge any merger under antitrust laws that would “substantially lessen competition” or “tend to create a monopoly.”⁴⁰

Review of Transactions Involving Insurers or Health Care Service Plans by CDI and DMHC

CDI and DMHC both have the authority to review and block some mergers involving carriers or insurers through an administrative process.⁴¹ For mergers involving a California domestic insurer⁴² or a commercially domiciled insurer,⁴³ which are subject to examination by CDI, parties must obtain written consent or approval of the insurance commissioner before entering into any transaction that transfers substantially all of the business to a new entity⁴⁴ or that changes control of the insurer.⁴⁵ CDI may approve, approve with conditions, or reject the merger. In reviewing a merger, CDI analyzes whether the

transaction may “substantially lessen competition” or “create a monopoly.”⁴⁶ Additionally, CDI may consider other factors including financial solvency, fair and reasonable terms, and adverse effects on policyholders’ interests.⁴⁷

Similarly, mergers involving health care service plans regulated by DMHC must be approved by the director of DMHC.⁴⁸ If the transaction is a “major transaction or agreement” — one that affects a significant number of enrollees, transfers “a material amount of assets,” or adversely affects the “stability of the health care delivery system”⁴⁹ — DMHC must hold a public meeting,⁵⁰ and if a material amount of the assets will be transferred, DMHC must also prepare a statement describing the transaction and make it publicly available before the public meeting.⁵¹ The director then reviews the merger and may approve, conditionally approve, or reject the merger. The standards for rejecting a merger mirror federal antitrust law, and DMHC is authorized to block any transaction that would “substantially lessen competition in health care service plan products or create a monopoly in this state, including, but not limited to, health coverage products for a specific line of business.”⁵²

The Department of Managed Health Care regulates only the plans operating in California (not any parent corporations), and the Department of Insurance does not have the authority to oversee a proposed merger that may affect California residents but does not involve an insurer residing in the state.

CDI and DMHC currently have the authority to oversee mergers involving domestic insurers and health plans regulated by the state. Importantly though, DMHC and CDI cannot block mergers of insurers outside of the state. DMHC regulates only the plans operating in California (not any parent corporations), and CDI does not have the authority to oversee a

proposed merger that may affect California residents but does not involve an insurer residing in the state (e.g., when an insurer sells plans in California but does not meet the definition of a commercially domiciled insurance company).⁵³ Nonetheless, the administrative processes at DMHC and CDI allow the agencies to oppose or condition mergers not easily challenged through litigation under antitrust laws.

The Attorney General Can Sue to Block Any Anticompetitive Transactions

The California AG, on the other hand, can file a lawsuit under state or federal antitrust laws to block any merger or acquisition when the “effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly.”⁵⁴ The AG’s office can file the lawsuit under its law enforcement capacity either on its own behalf as a purchaser of health services or as *parens patriae* on behalf of the interests of the citizens of California.⁵⁵ The AG has authority to sue to block mergers that involve insurers, health care service plans, and health care providers, even if another agency has approved the merger.⁵⁶ Blocking a merger through litigation, however, requires significant resources, may be time-consuming, and has uncertainty associated with judicial decisionmaking. Furthermore, because bringing a case is extremely resource-intensive and time-consuming, the AG is likely to oppose only the largest mergers under antitrust laws.

Limitations of using the courts to mitigate the harmful impacts of consolidation are apparent in the cases against Sutter Health in Northern California. In 1999, the AG filed a lawsuit alleging that the merger of Sutter Health’s Alta Bates Medical Center with Summit Medical Center would have anticompetitive effects and, therefore, violated the federal Clayton Act.⁵⁷ The judge, however, denied the AG’s request for an injunction, saying health plans could “discipline” hospitals by steering patients to lower-cost health providers, and if anticompetitive price increases did occur because of the merger, patients could choose to join Kaiser.⁵⁸ Over a decade later, a retrospective study by the Federal Trade Commission, which helped to revise the economic tools, found that Summit’s

price increases after the merger were among the largest of any comparable hospital in California.⁵⁹ In 2014, a health benefit trust filed a class action lawsuit against Sutter Health alleging that the market power Sutter Health gained through this merger coupled with anticompetitive contract terms led to excessive price increases in Northern California.⁶⁰ In 2018, the California AG joined the lawsuit.⁶¹ The case was finally resolved in 2021, when the court approved a settlement that contained \$575 million in damages and injunctive relief to stop Sutter Health from using specific contracting practices. This case illustrates the harm that can result when antitrust law fails to prevent potentially harmful mergers. Subsequent antitrust lawsuits to curb abuses of market power created by a merger can take years to resolve and, even after resolution, the parties not involved in the lawsuit will not typically receive restitution.

The AG Can Block Transactions of Nonprofit Health Facilities Using an Administrative Review

California’s AG currently has the authority to block transactions that transfer a “material amount of the assets” of a *nonprofit health facility* without going to court. California law defines a health facility as any place or building that “is operated for the diagnosis, care, prevention, and treatment of human illness . . . to which . . . persons are admitted for a 24-hour stay or longer,” and includes acute care hospitals, skilled nursing facilities, psychiatric hospitals, and specialized maternity hospitals. It does not include physician practices or outpatient clinics. Before 2000, this authority only applied to a *conversion* of a nonprofit health facility (i.e., the purchase of a nonprofit health facility by a for-profit entity). Following the AG’s loss in the Sutter-Summit merger challenge (where both Sutter and Summit were nonprofit health systems), the California legislature amended the law to include mergers and acquisitions of nonprofit health facilities, irrespective of the tax status of the purchaser.⁶² Currently, any nonprofit corporation that operates or controls a health care facility must provide written notice to, and obtain approval from, the AG before completing any transaction that sells or transfers a “material amount of the assets” or control of the operations of the nonprofit

corporation.⁶³ In reviewing the transaction, the AG may consider any factors the AG deems relevant, including whether the transaction is in the public interest.⁶⁴

This administrative process has significant benefits relative to antitrust lawsuits, including that it is less resource-intensive than a trial and allows more timely review of proposed mergers. In one of the first challenges to a cross-market merger, the AG issued a conditional approval of the affiliation between Cedars-Sinai Health System and Huntington Memorial Hospital, two nonprofit hospital systems in Southern California,⁶⁵ that included a price cap on the newly affiliated entities and a requirement to maintain separate teams when negotiating prices with payers.⁶⁶ The hospitals filed a lawsuit challenging that conditional approval, alleging that the AG acted in an arbitrary and capricious manner and overstepped the AG's administrative authority.⁶⁷ Before the scheduled trial date, the merging parties and the AG came to a settlement that imposes modified price caps, prohibits the bundling or tying of hospital contracts, and grants insurers the option to request a negotiation firewall.⁶⁸

This case demonstrates that the AG can use nonprofit merger review authority to block or to apply conditions to potentially anticompetitive mergers. The major limitation of this authority is that it applies only to mergers involving nonprofit health care facilities, as defined in the statute. To oppose a merger involving a physician practice, an outpatient clinic, for-profit health systems, or an insurer, the AG must face the uncertainty of a lawsuit and expend the time, effort, and resources required for a trial.

Opportunities for Additional Oversight of Health Care Transactions in California

While nonprofit health care facilities must notify and get approval from the AG before a sale or transfer of their assets, the AG must rely on news reports and other sources to track consolidation of other health care entities, including for-profit hospitals and physician practices. The AG may be unaware of transactions that do not involve a nonprofit health care facility, and

therefore may be unable to challenge them until after their completion. Furthermore, even if the AG becomes aware of these transactions before they happen, the AG has no authority to impose a waiting period before consummation of the proposed merger to allow the office to review the transaction. While the AG can use antitrust law to challenge any merger, even after it is completed, these legal proceedings may take years, and unwinding the merger (“unscrambling the egg”) is very likely to be ineffective and difficult, so antitrust enforcers almost never attempt it in health care.⁶⁹

To increase scrutiny of provider mergers in California, policymakers could require all health care providers (not just nonprofit ones) to provide written notice to, and obtain the written consent of, the AG before entering into any transaction that transfers a material amount of their assets or changes control or governance of the provider. This notification and approval authority could mirror that currently required for nonprofit health care facilities. Additionally, to expedite review of smaller transactions unlikely to impact competitive factors, policymakers could create a tiered review process.⁷⁰ In Oregon, health entities with revenues over a given threshold must obtain approval from the Oregon Health Authority before merging, including transactions involving a private equity firm.⁷¹ California could adopt a similar approach by establishing a new agency to review health care mergers or to expand the authority of the AG to approve, conditionally approve, or block *all* mergers involving health care providers.⁷²

To increase scrutiny of provider mergers in California, policymakers could require all health care providers (not just nonprofit ones) to provide written notice to, and obtain the written consent of, the attorney general before entering into any transaction that transfers a material amount of their assets or changes control or governance of the provider.

Importantly, granting the AG or another state agency an increased authority to review and block all health care mergers through an administrative process does not address the market power gained through decades of consolidation in California. Consequently, policymakers may choose to consider how to regulate conduct and the harms that may result from previously consummated mergers. For example, while CDI and DMHC have the authority to block or condition mergers of domestic insurers and health care service plans, respectively, policymakers could also consider expanding the authority of these regulatory agencies to include “affordability standards” when they review health plans for sale in California. Currently, DMHC and CDI can review rate changes in the individual and group markets, but neither department has the authority to deny rate increases.⁷³ Policymakers could consider granting DMHC and CDI additional authority to reject rates or rate increases they deem “unaffordable.”⁷⁴ In addition, policymakers could consider prohibiting specific contractual terms likely to be anticompetitive (e.g. all-or-nothing or anti-tiering clauses).⁷⁵ And finally, policymakers could consider directly regulating prices or price increases for high-cost providers. Several states are implementing this policy approach, and the California legislature has explored it in recent years.⁷⁶ While increased oversight of future mergers is critical, increased administrative review alone is unlikely to restore competition to health care markets at a level sufficient to restrain prices and increase quality.

While the Department of Insurance and the Department of Managed Health Care have the authority to block or condition mergers of domestic insurers and health care service plans, respectively, policymakers could also consider expanding the authority of these regulatory agencies to include “affordability standards” when they review health plans for sale in California.

Conclusion

California’s health care provider and insurer markets are highly concentrated, and empirical research has consistently shown that health care consolidation drives increases in health care prices and insurance premiums without commensurate improvements in health care quality. Because health care provider and insurer markets in most regions of California are already highly concentrated, policymakers and state officials could consider additional scrutiny and interventions to promote competition and mitigate consolidation’s most harmful consumer impacts.

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The [Source on Healthcare Price and Competition](#) provides up-to-date and easily accessible research and analysis on health care price and competition in the US.

About the Foundation

The [California Health Care Foundation](#) is dedicated to advancing meaningful, measurable improvements in the way the health care delivery system provides care to the people of California, particularly those with low incomes and those whose needs are not well served by the status quo. We work to ensure that people have access to the care they need, when they need it, at a price they can afford.

CHCF informs policymakers and industry leaders, invests in ideas and innovations, and connects with changemakers to create a more responsive, patient-centered health care system.

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39. Lewis and Pflum, “Diagnosing Bargaining Power.”
40. 15 U.S.C. § 18a.
41. [2020 Annual Report](#) (PDF), Dept. of Managed Health Care (DMHC), June 2021, 11. In California, two departments share oversight of health insurance plans. DMHC regulates all HMOs, all Medicaid managed care plans, and most PPO plans. DMHC regulates plans covering 95% of California residents enrolled in state-regulated commercial health plans. CDI regulates some PPO plans and other insurance products like indemnity plans that cover the remaining 5% of California residents with state-regulated commercial health plans.
42. Cal. Ins. Code § 739(c) defines domestic insurer as “any . . . health insurer . . . organized in this state.”
43. Cal. Ins. Code § 1215.2(d).
44. Cal. Ins. Code § 1011(c).
45. Cal. Ins. Code § 1215.2(d).
46. Cal. Ins. Code § 1215.2(d).
47. Cal. Ins. Code § 1215.2(d).
48. Cal. Health & Safety Code § 1399.65(a)(1).
49. Cal. Health & Safety Code § 1399.65(g).
50. Cal. Health & Safety Code § 1399.65(c).
51. Cal. Health & Safety Code § 1399.65(d).
52. Cal. Health & Safety Code § 1399.65(b).
53. Dave Jones (insurance commissioner, State of California) to Jeff Sessions (US attorney general) and Makan Delrahim (asst. attorney general, Antitrust Div.), “[Proposed Merger of CVS Health Corporation and Aetna, Inc.](#)” (PDF), August 1, 2018. Jones writes, “My department does not have direct approval authority over this proposed acquisition because the transaction does not involve a California domestic or commercially domiciled insurance company.”
54. 15 U.S.C. § 18a.
55. *Hawaii v. Standard Oil Co. of Cal.*, 405 U.S. 251, 258 (1972).
56. The review by the AG under antitrust law is separate and distinct from the review conducted at CDI and DMHC.
57. *California v. Sutter Health Sys.*, 130 F. Supp. 2d 1109.
58. *California v. Sutter Health Sys.*, 130 F. Supp. 2d 1109.
59. Tenn, “Case Study.”
60. Complaint, *UFCW & Employers Benefit Trust, et al. v. Sutter Health, et al.*, No. CGC 14-538451 (Cal. Super. Ct. S.F. City and Cnty. 2019).
61. Complaint, *People of the State of California ex rel Xavier Becerra v. Sutter Health*, No. CGC 18-565398 (Cal. Super. Ct. S.F. City and Cnty. 2019).
62. A.B. 254, 1999–2000, Reg. Sess. (Cal. 1999).
63. Cal. Corp. Code § 5915; and Cal. Corp. Code § 5920.
64. Cal. Corp. Code § 5917; and Cal. Corp. Code § 5923.
65. California Dept. of Justice, “[Attorney General Becerra Conditionally Approves Affiliation Agreement Between Cedars-Sinai and Huntington Memorial Hospital](#),” press release, December 10, 2020.
66. Amy Y. Gu, “[Cedars-Sinai/Huntington Cross-Market Affiliation Settle with Revised Competitive Impact Conditions](#),” *The Source Blog*, August 16, 2021.
67. Complaint, *Pasadena Hospital Ass’n., Ltd. and Cedars-Sinai Health Sys. v. Cal. Dep’t of Justice*, No. 21STCP00978 (Cal. Super. Ct. July 19, 2021).
68. Joint Stipulation and Order to Vacate Trial, *Pasadena Hospital Ass’n., Ltd. and Cedars-Sinai Health Sys. v. Cal. Dep’t of Justice*, No. 21STCP00978 (Cal. Super. Ct. July 19, 2021).
69. “[Mergers](#),” Federal Trade Commission.
70. Samuel M. Chang et al., [Examining the Authority of California’s Attorney General in Health Care Mergers](#), CHCF, April 2020.
71. H.B. 2362, 2021 Reg. Sess. (Or. 2021).
72. Chang et al., [Examining the Authority](#).
73. Cal Health & Safety Code § 1385.03.
74. 230 R.I. Code Reg. 20-30-4.10. In Rhode Island, affordability standards allow the health insurance commissioner to review proposed increases in insurance premium rates and reject plans in which the insurer-hospital negotiated rate increases exceed the US Consumer Price Index (CPI-Urban).
75. [A.B. 1132](#), 2021–22 Leg., Reg. Sess. (Cal. 2021) (as introduced on Feb. 12, 2021). An early version of A.B. 1132 (2021) included bans on specific contracting practices in health care contracts, including anti-tiering, anti-steering, and all-or-nothing clauses.
76. Glenn Melnick and Susan Maerki, [Commissioning Change: How Four States Use Advisory Boards to Contain Health Spending](#), CHCF, January 2020; and A.B. 3087, 2017–18, Reg. Sess. (Cal. 2018).