California's Digital Divide: Clinical Information Systems For The Haves And Have-Nots

Strong barriers exist to financing clinical information systems for providers serving disadvantaged California patients—and new policy interventions are needed to close the gap.

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ABSTRACT: Strong barriers prevent the financing of clinical information systems (CIS) in health care delivery system organizations in market segments serving disadvantaged patients. These segments include community health centers, public hospitals, unaffiliated rural hospitals, and some Medicaid-oriented solo and small-group medical practices. Policy interventions such as loans, grants, pay-for-performance and other reimbursement changes, and support services assistance will help lower these barriers. Without intervention, progress will be slow and worsen health care disparities between the advantaged and disadvantaged populations. [*Health Affairs* 28, no. 2 (2009): 505–516; 10.1377/hlthaff.28.2.505]

CONCERNED ABOUT SLOW RATES OF health information technology (IT) adoption, the California Governor's Health Information Technology Financing Advisory Commission (HITFAC) was formed in May 2007 to recommend policies to reduce barriers to financing clinical information systems (CIS) in health care delivery system organizations in the state. Examples of CIS include ambulatory care electronic health records (EHRs) and inpatient computerized physician order entry (CPOE).

The commission focused mainly on health care market segments that lagged in CIS adoption, experienced barriers to financing CIS, and provided care to disadvantaged or underserved populations. HITFAC was especially concerned with whether CIS financing barriers were creating a digital divide (a gap in CIS use, especially for quality improvement) between providers in market segments primarily serving disadvantaged/underserved patients and other providers. To address

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these problems, HITFAC asked us to describe and analyze financing and other challenges to CIS adoption in key market segments and outline potential policies that could accelerate adoption. This paper reports the results of that analysis and draws some broader lessons for health IT adoption nationwide.

Study Data And Methods

To analyze barriers to financing CIS, we needed information on multiple topics for organizations in multiple market segments. Topics included CIS adoption rates, the business case for CIS, financial health, and access to capital markets; market segments included Kaiser Permanente, other large health systems (such as Sutter Health and Catholic Healthcare West), public hospitals, unaffiliated urban and rural hospitals, large capitated medical groups, solo/small practices, and community health centers (CHCs). The availability and quality of California-specific administrative and survey data varied greatly by topic and market segment—for example, publicly available financial and health care utilization administrative data were extensive for hospitals, limited for large medical groups, and absent for solo/small practices. The sheer size, complexity, and diversity of California's health care sector added to the challenges.

Given budget and time constraints (nine months), the project aimed to provide a broad overview of key topics and policy options for each market segment; an exhaustive, resource- and time-intensive definitive analysis was not feasible. HITFAC adopted criteria to prioritize market segments for research and potential policy intervention. Segments had to (1) face barriers to financing CIS—that is, they had to lag in CIS adoption (and have substantial CIS financing needs); lack financial health or creditworthiness, and face an unfavorable CIS business case; and (2) serve disadvantaged/underserved patients who were uninsured, rural, or insured by Medi-Cal (California's Medicaid program). Based on our initial research, we placed the highest research priority on four market segments: CHCs, public hospitals, unaffiliated rural hospitals, and solo/small practices oriented to Medi-Cal.

For each topic in each segment, we used a combination of available administrative and survey data on health care organizations in California, findings from peer-reviewed literature and reports on organizations nationally, and interview data. We used national-level data or findings where extrapolations to California seemed appropriate. The project used data from more than 100 interviews of California health care leaders, twenty-five interviews of managers of CIS programs in twenty states and two cities, and more than twenty interviews with eleven financial experts in eight organizations participating in tax-exempt health care capital financing. Finally, we proposed to HITFAC potential policy options to reduce CIS financing barriers. Exhibit 1 contains definitions of some key terms; we describe methods and findings in more detail elsewhere.[1]

EXHIBIT 1
Definitions Of Key Terms For Clinical Information Systems (CIS)

Term	Definition
Ambulatory care CIS	
Electronic health records (EHRs)	Enables providers to electronically view clinical data, document visits, order tests/prescriptions, receive reminders/alerts, communicate with other providers/staff and with patients; most have population management capabilities and replace paper records
Hospital CIS	
Basic ancillary CIS	Laboratory, pharmacy, and radiology systems that process orders
Advanced CIS	Clinical data repositories (that integrate data from multiple sources, enabling viewing and reporting), electronic medication administration records (eMAR) (to manage prescription administration), picture archiving and communication systems (PACS) (digital imaging), electronic order entry by patient care staff, documenting of nursing and physician notes, and computerized physician order entry (CPOE)
CIS return on investment (ROI) and business case	
ROI	The profitability of the investment, often expressed as the ratio of measurable net financial benefits to the amount invested; the fewer the years needed to pay for the investment, the more favorable the return on investment
Business case	An organization's measured return on investment plus unmeasured strategic benefits/costs, such as maintaining or increasing market share

SOURCE: Authors' definitions.

Background: Capital Markets And CIS Financing

Health care organizations can pay for CIS investments by self-funding (from reserves, reduced operating margins, grants, and so on) or borrowing in capital markets. Not-for-profit organizations are eligible to borrow in tax-exempt municipal bond markets and thus can pay interest rates that are lower than those for regular loans, since investor interest income is exempt from federal and some state taxes. Bonds enable borrowers to spread repayment of investment costs over years, reducing pressure on financial margins during the initial investment period.[2]

■ **Borrowing process.** In seeking borrowers who will repay funds, investors evaluate potential borrowers' financial metrics, such as operating and net margins, and qualitative factors, such as management quality and ability to maintain or increase market share. According to interviewees, investors especially prefer borrowing organizations with (1) solid financial health, (2) investment projects that are quickly profitable and create collateral that is resaleable in case of default, and (3) sufficient size to have diversified revenue streams and operations and the need to borrow the minimum $5 million or more that would justify high fixed bond transaction fees.

■ **Unique challenges of CIS financing.** CIS investments are more challenging

to finance than buildings or equipment because many are not predictably profitable (see below). Moreover, loans for CIS may be smaller and repayment periods shorter than borrowers need because CIS hardware provides the only tangible collateral for loans, and that collateral depreciates relatively quickly (typically over five years), even though software, training, technical staff (to implement, support, and improve the system), and other costs combined exceed hardware costs, and achieving profitability can take many years.[3]

Community Health Centers

■ **Background.** California's nonprofit "licensed primary care provider" organizations (referred to here as CHCs) served about 3.7 million mostly low-income uninsured and Medi-Cal patients (about 10 percent of California's population) in 2006.[4] Federally qualified health centers (FQHCs) or FQHC "look-alikes" accounted for almost three-quarters of the segment's $1.6 billion in revenues; because they must serve uninsured patients, these CHCs received enhanced Medi-Cal reimbursement rates, while FQHCs also received lump-sum Health Resources and Services Administration (HRSA) payments. Most CHCs were small: median revenues were $2.3 million in 2006, and just 12 percent of clinics accounted for half of the revenues.

■ **CIS adoption.** Only 4 percent of California's FQHCs used EHRs in 2006; however, many CHCs used chronic disease management systems (registries).[5]

■ **Business case.** Past research suggests an unfavorable EHR return on investment (ROI) to CHCs—the net cost (loss) may be $60,000–$100,000 per full-time-equivalent (FTE) billing provider over five years, after including an estimated $20,000 per provider from recent changes in Medi-Cal's FQHC reimbursement rate calculations that pay CHCs for some EHR capital costs for Medi-Cal patients.[6] In addition to high initial EHR costs, ongoing costs are high, in part because CHCs invest in CIS technical and clinical staff that make numerous software and workflow changes needed to generate benefits from EHRs. Ongoing financial gains might not cover ongoing EHR costs, let alone initial costs, because CHCs receive few financial benefits from EHR-enabled higher coding levels (and reimbursement) and from more quality improvement.[7]

■ **CIS financing requirements.** Given the number of FTE billing providers, CHCs needed $170–$270 million to pay the net cost for EHRs.[8]

■ **Financial health and access to capital.** Current California CHC statistics on financial health are scarce and contradictory—for example, median margins of 4 percent or so from 2003 and 2004 from audited financial statements compare with median margins of 1 percent from 2006 administrative data. However, the unfavorable CIS ROI makes self-funding CIS difficult or impossible for most CHCs in either case, since such investment would reduce operating margins by approximately 2 percent per year, averaged over five years—unsustainably low levels for most CHCs.[9] Not surprisingly, interviewees reported that CHC managers often gave higher capital financing priority to new buildings and medical equipment for ex-

panded services, which generate revenue quickly while increasing access to care for the disadvantaged—the primary CHC mission.

Meanwhile, CHCs' access to low-cost borrowing for CIS also was difficult or impossible because of a mismatch between bond market expectations and CHCs' financial health, size, and CIS ROI. Weak financial health disqualifies some CHCs from borrowing; small size and limited project collateral disqualify many others, since CHCs typically would seek EHR loans too small for tax-exempt bond markets. Moreover, EHR investments often create initial operating losses (not quick profits that investors desire), and revenue streams offsetting those losses (including future grants and Medicaid reimbursement changes) are uncertain.

Although financing barriers are a "binding" constraint on CIS adoption only for CHCs that are organizationally ready for EHR implementation—possibly a small minority currently—this financing constraint will increase as more CHCs improve their readiness for EHRs.[10]

Public Hospitals

■ **Background.** California's fifteen acute care public hospitals, owned by thirteen counties, had $5.2 billion in revenues, or 10 percent of the California hospital total in 2006; they primarily served uninsured and Medi-Cal patients.[11] Most public hospitals were large and operated as departments within counties or divisions within county health departments.[12]

■ **CIS adoption.** Although all public hospitals had basic CIS capabilities, advanced CIS implementation varied greatly—for example, hospitals in nine counties had electronic order entry used by support staff, eight had some form of clinical data repositories that enabled reporting, and seven had picture archiving and communication capabilities for digital imaging. Despite considerable CIS progress in some hospitals, none had implemented CPOE, considered to be among the most advanced CIS capabilities. Public hospitals in a few counties focused on implementing EHRs in their ambulatory care clinics, although none had fully done so. In many cases, information systems staff responded to lack of funding for new systems by creatively pushing older software beyond its originally intended uses.

■ **Business case.** Public hospital executives interviewed perceived an unfavorable business case for most advanced inpatient CIS. They saw little prospect of a favorable, measurable return on CIS investment in the foreseeable future—a finding similar to that for large health systems. However, unlike those large systems, they typically did not see advanced inpatient CIS as a "cost of doing business" needed to maintain market position, because their patient base had few other care alternatives—although advanced CIS did help meet regulatory reporting requirements, teaching/training objectives, and longer-term efficiency and quality improvement goals. According to several interviewees, EHRs in public hospital primary care clinics might have a favorable ROI, since EHR-enabled quality improvement in primary care can decrease the cost of emergency department (ED) or inpatient care for unin-

sured and Medi-Cal capitated patients.

■ **CIS financing requirements.** Interviewees estimated that remaining advanced CIS financing needs totaled $300–$450 million.

■ **Financial health and access to capital.** Although the quality of administrative financial data for the public hospital segment was worse than for other hospitals, and hospitals' financial health varied greatly, public hospitals clearly faced a much more resource-scarce environment than did not-for-profit systems, as care for Medi-Cal and uninsured patients has not been well funded.[13] Many interviewees reported limited capital investment funds available for any purpose, not just CIS—and similar to CHCs, capital spending priority went mainly to buildings and medical equipment investments that increased access to care, were self-funded and quickly profitable, or met urgent public safety or regulatory requirements. Meanwhile, county hospitals' CIS capital spending proposals had to compete against all other county capital projects, including roads, levees, and jails.

California public hospitals had no direct access to capital markets because they depended on counties to borrow funds. Although almost all counties had investment-grade credit ratings, most were cash-strapped and unwilling to borrow for public hospital CIS without a rapid ROI.

In contrast to the relatively well-funded, orderly, and predictable CIS implementation characteristic of large health systems, interviewees from almost all California public hospitals reported that capital financing barriers greatly slowed CIS progress and that they sometimes had to opportunistically implement systems to fit whatever capital funds became available.

Unaffiliated Rural Hospitals

■ **Background.** California had 2–4.1 million rural residents (depending on the definition of "rural") in 2006, many of whom are considered "underserved" because they have few provider choices (typically one or a few physicians and one acute care hospital) and may have to travel relatively far to receive services.[14] The fifty-nine rural hospitals that served these residents had $2 billion in revenues in 2006, or less than 4 percent of the total for California hospitals. Some thirty-one unaffiliated district hospitals and nine not-for-profit hospitals accounted for 40 percent and 12 percent of those revenues, respectively; the seventeen system-owned rural hospitals accounted for almost all of the rest.[15]

■ **CIS adoption.** These hospitals in California appeared similar to their counterparts nationally in having less advanced CIS than system-affiliated rural hospitals.[16]

■ **Business case.** Interviewees saw an unfavorable business case for advanced CIS investment—the measurable ROI was unfavorable, and implementing advanced CIS was not yet seen as a "cost of doing business."

■ **CIS financing requirements.** Smaller hospital size enables the use of simpler, less costly systems. Our rough estimates suggest that unaffiliated rural hospitals needed up to $75 million to pay for advanced CIS investment, and half of that was

needed by hospitals with negative operating or net margins.

■ **Financial health and access to capital.** Many small rural hospitals face special financial challenges (including personnel shortages), uncertain demand (reliance on only a few admitting physicians), and diseconomies of small scale. Many faced more financial challenges than system-affiliated hospitals faced, because they had half those hospitals' median revenue size and could not benefit from a parent system's access to capital or provision of common services, including CIS.[17]

Twenty-six of thirty California rural hospitals with negative operating margins were rural unaffiliated hospitals, and some fifteen of forty such hospitals had negative net margins, limiting their ability to self-finance CIS capital projects that often ranked lower than more lucrative investment alternatives in capital budgeting priority.[18] Most unaffiliated rural hospitals theoretically could access the tax-exempt bond market, but smaller and financially weaker hospitals had difficulty borrowing for CIS, for reasons similar to those stated for CHCs. Overall, financing barriers likely were a primary constraint on progress toward CIS for financially weaker unaffiliated rural hospitals.

Medi-Cal-Oriented Solo And Small Practices

Although it was prioritized for investigation, we were able to obtain few California-specific quantitative data for this market segment, so we provide only a brief synopsis of findings. We estimated that about 3,500 primary care physicians (PCPs) and 7,500 specialists in California were Medi-Cal oriented—that is, they derived 30 percent or more of their practice revenue from Medi-Cal—and we conservatively assumed that only 12 percent used EHRs in 2007.[19] Given that, estimated CIS capital requirements for this segment ranged from $125 million (for PCPs only) to $400 million (for PCPs and specialists). Although income data suggested that many California solo/small practices could self-fund EHRs or obtain commercial bank loans, Medi-Cal-oriented solo/small practices might have less income than other practices, reducing these financing possibilities. Interview data suggested that selected large independent practice associations' (IPAs') and hospitals' EHR subsidies/services to affiliated physicians might eventually become an important source of CIS financing and technical support for many solo/small practices; however, Medi-Cal-oriented physicians may benefit less than others, since Medi-Cal-oriented IPAs tended to be smaller than others (and thus less likely to provide EHR services) and hospitals might favor subsidies for physicians who admit better-insured patients.[20]

Main Market Segments Not Prioritized For Policy Intervention

Most organizations in market segments that HITFAC did not prioritize had some combination of substantial CIS implementation and progress, clear plans and funding for further CIS, sufficient financial health or access to capital markets to pay for CIS, and little primary focus on disadvantaged/underserved patients.[21]

Kaiser Permanente was nearing completion of its systemwide EHR implementation. Large not-for-profit health systems were systematically implementing CIS that was seen as a "cost of doing business"—that is, despite its unfavorable measurable ROI, CIS use enabled systems to protect or improve their quality reputation and market share, meet increasing regulatory reporting requirements, make incremental process improvements over time, and offer new patient services.

Many large and midsize risk-bearing medical groups also were making good progress toward implementing CIS, because of a favorable ROI for some (especially for heavily capitated medical groups) and sufficient financial health to self-fund or borrow for CIS.[22] Despite apparently slow CIS adoption, solo/small practices that were not Medi-Cal oriented also were not prioritized because they did not focus on disadvantaged/underserved patients, some faced a favorable EHR ROI, and many could self-fund or borrow for CIS.[23] Unaffiliated urban hospitals, a final nonprioritized group, had varied characteristics, making generalizations difficult; however, hospitals with a majority of that segment's expenditures had solid financial health and likely had adequate access to capital to finance CIS.

Discussion And Policy Options

Our findings indicate that many CHCs, public hospitals, and unaffiliated rural hospitals have large CIS capital requirements—from roughly $700 million to $1.2 billion, in a state with 11 percent of U.S. health care expenditures. These requirements would have been difficult to finance even before financial market turmoil erupted in mid-2007 and intensified in 2008. Even after capital markets return to something resembling "normal" functioning, financing difficulties likely will increase as borrowers likely will confront stricter loan terms, higher interest rates, and scarcer credit insurance, with smaller and financially weaker borrowers most affected.[24] Moreover, cutbacks in state Medicaid spending as a result of an economic downturn would further weaken financing for CIS.

■ **Likelihood of digital divide widening.** Absent new policy interventions, a widening digital divide (gap in CIS use for quality improvement) is likely between organizations in at least three market segments caring for the underserved/disadvantaged compared to organizations serving other patients (Exhibit 2). Compared to midsize medical groups, CHCs' adoption of EHRs likely is slower and the ROI is much worse. Compared to hospital systems, public hospitals' advanced CIS adoption is slower, their ability to self-fund or borrow for CIS is much worse, and the overall business case is worse. Compared to system-affiliated rural hospitals, unaffiliated rural hospitals' advanced CIS adoption likely is worse, as is their ability to self-fund or borrow for CIS. We lacked sufficient information to compare small Medi-Cal-oriented practices to other small practices.

■ **Policy options to narrow the gap.** A coordinated combination of four policy interventions—loans, grants, pay-for-performance (P4P)/other reimbursement changes, and support services—could diminish the emergence of an increasing digi-

EXHIBIT 2
Summary Of Barriers To Financing Clinical Information Systems (CIS) In Health Care Market Segments Serving Disadvantaged And Underserved Patients In California, 2008

Priority segment	CIS capital requirements (millions)	Difficulty accessing tax-exempt loans	Difficulty self-funding CIS	Negative CIS business case	Insufficient Medi-Cal P4P	Shortage of technical support
CHCs	$170–$280	HIgh	High	High	Med. to high	High without networks
Public hospitals	$300–$450	High	High	High[a]	HIgh	Low
Unaffiliated rural hospitals	$75	Varies	Varies	HIgh	High	Varies
Solo/small practices, Medi-Cal oriented	$125–$400	Not applicable	Varies	Med.[b]	Med. to high	High[b]

SOURCE: Authors' data.

NOTE: P4P is pay-for-performance.

[a] Especially for inpatient.

[b] Lower with independent practice association (IPA)/hospital support.

tal divide. The new government programs would augment current federal/state funding policies that affect organizations serving disadvantaged or underserved patients, such as higher Medicaid reimbursement rates for FQHCs, Medicare disproportionate-share hospital (DSH) payments for safety-net hospitals, HRSA annual lump-sum payments to FQHCs, and special Medicare reimbursement status for clinics and small hospitals in rural areas.

Applying the policies to CHCs. For some larger, financially healthy CHCs, a new federal-, state-, or private foundation–sponsored CIS financing organization could increase access to low-cost tax-exempt bond market financing, by standardizing, reducing, and subsidizing bond market transaction fees; by subsidizing bond insurance; and by financing reserves that borrowers must set aside to assure repayment.[25] However, this policy would pay for only part of EHR investment costs and might help few CHCs, especially as borrowing becomes more difficult.

In a more costly alternative, the financing organization could establish a revolving loan pool that lends to CHCs of all sizes at the same low tax-exempt rates at which it borrows funds; although it could increase lending capacity by reselling larger loans with investment-grade credit ratings, most loans could not be resold, which would increase the risk and cost to the financing organization.

Obviously, an even more costly option—full grant financing for CHCs—could eliminate barriers to financing CIS for most organizations serving the disadvantaged. Short of full financing of CIS for CHCs, grants could reduce the amount of self-funding or borrowing needed, increasing the affordability of an EHR.

Reimbursement policies that increase CIS profitability could help CHCs pay for EHRs. Although Medi-Cal has agreed to pay for some initial EHR capital costs

for Medi-Cal patients, CHCs also must pay for ongoing EHR-related losses and EHR costs for uninsured and other patients; moreover, policies should encourage CHCs to use EHRs to improve quality. California's Medicaid health maintenance organizations (HMOs) could expand P4P incentives for selected EHR-enabled chronic/preventive care activities, while Medi-Cal—like Medicaid agencies elsewhere—could offer P4P incentives for EHR-enabled "medical home" activities for non-HMO Medi-Cal patients.[26] Grant-making agencies could emulate P4P incentives by making portions of CIS grant payments conditional on performance targets. Moreover, HRSA could transform part of its lump-sum payments to FQHCs into incentive payments for EHR-enabled quality improvement. Government/foundation funding for support-service programs also could help CHCs repay EHR investment expenses. CHC networks providing EHR services thus could offer more technical and quality improvement services that could help CHCs reduce EHR costs, and use EHRs to increase revenues, efficiency, and quality.

For public hospitals. For California public hospitals, CIS grant programs with performance targets and Medi-Cal inpatient P4P reimbursement incentives might become the major policy intervention by default, as even with subsidized CIS loan programs, counties might not borrow on behalf of their public hospitals, absent a positive CIS ROI, and CIS support-service programs are less relevant to large public hospitals with substantial CIS staffing and managerial expertise.

For unaffiliated rural hospitals. Grants with performance targets would help the many unaffiliated rural hospitals that are in poor financial health. Improved access to low-cost, tax-exempt loans could help some, while P4P incentives could benefit all. Policies increasing CIS support services also could help California's unaffiliated rural hospitals, since many have limited CIS expertise.

For small practices with Medi-Cal patients. For Medi-Cal-oriented small practices, policy interventions should focus on improving the EHR ROI, since many practices could finance EHRs but lack incentives to do so. Any grant-making program would benefit society most if accompanied by requirements to report on quality improvement and by Medi-Cal/Medicare P4P incentives.

■ **National comparisons.** Although the generalizability of California findings to other states varies, many CIS financing challenges elsewhere appear to be similar. CHCs nationally and in California appear to have roughly similar financial health, CIS adoption rates, and business cases.[27] Many public hospitals elsewhere also have had difficulty accessing capital financing for any purpose because of poor financial health, and they face the same unfavorable CIS business case that public hospitals in California face.[28] Unaffiliated rural hospitals and solo/small practices in other states also are lagging in CIS adoption, face a similar business case, and may have similar financial health as their California peers.[29] However, there are relatively fewer large IPAs outside California to provide EHR services/subsidies to members.

In contrast to California, several states and cities have robust CIS grant programs that benefit CHCs and physician practices—especially New York State,

New York City, Massachusetts, and Vermont; these programs also provide varying amounts of support services. New York City's Primary Care Information Project is especially relevant, because it targets EHR funding and technical support to CHCs and to private practices serving Medicaid patients, and it requires performance reporting. However, these extensive programs appear to be uncommon, and none fully addresses the CIS needs of all market segments focused on disadvantaged or underserved patients.[30] Meanwhile, exceptionally limited federal government funding for CIS has affected all providers, no matter which state they are in.

ANY ECONOMIC HARD TIMES MAKE new program funding difficult. However, policymakers should consider funding CIS to improve quality as one alternative to other spending options. Where government funding for CIS is possible, funding agencies should carefully prioritize market segments and target organizations, lest they waste scarce resources on subsidizing those that could afford CIS. Only comprehensive, coordinated, and well-financed federal/state government CIS policies for grants, low-cost loans, and support services programs targeting those serving disadvantaged/underserved patients, combined with reimbursement that rewards quality, can help prevent a growing digital divide that can only worsen existing health care disparities.

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NOTES

1. R.H. Miller et al., *Barriers to Financing Clinical Information Systems in California Healthcare Delivery System Organizations: Report to the Governor's Health Information Technology Financing Advisory Commission* (Sacramento: California Council on Science and Technology, forthcoming).
2. Tax-exempt bond market participants include borrowers, investors, and investment bankers that arrange selling and buying of debt obligations (often bonds); bond insurers or banks may guarantee repayments for those lacking investment-grade credit ratings needed to obtain low rates.
3. Some seek tax-exempt leases that only cover CIS hardware, a shrinking minority of total CIS costs.
4. Office of Statewide Health Planning and Development, *The State Utilization Data File of Primary Care Clinics, Calendar Year 2006* (Sacramento: OSHPD, 2007); and Health Resources and Services Administration, *Section 330 Grantees Uniform Data System, Calendar Year 2005 Data, California Rollup Report* (Washington: HRSA, 2006). We obtained information from thirteen managers in twelve CHCs purchasing EHRs, four managers in four clinic networks, and eight financial market experts from five firms.
5. CHCF, *Snapshot: The State of Health Information Technology in California* (Oakland: CHCF, 2008).
6. R.H. Miller and C.E. West, "The Value of Electronic Health Records in Community Health Centers: Policy Implications," *Health Affairs* 26, no. 1 (2007): 206–214.
7. Ibid.
8. For CHC full-time-equivalent billing providers, see OSHPD, *The State Utilization Data File.* We included estimates for county-run and rural health clinics that don't report to OSHPD. For rural health clinic providers, see HRSA, "HRSA Geospatial Data Warehouse-Report Tool," http://datawarehouse.hrsa.gov/HGDWReports/RT_App.aspx?rpt=P8 (accessed 2 December 2008).
9. Data from 2003 and 2004 audited financial statements are from Capital Link and California Primary Care Association, *Linking Financial Capacity, Capital Needs, and Creative Financing for California Clinics* (Sacramento:

CPCA, 2007). Administrative data for 2006 are from OSHPD, *The State Utilization Data File.*

10. Object Health, *Building Clinic Capacity for Quality in Southern California* (San Francisco: Object Health, 2007).
11. OSHPD, *Hospital Annual Disclosure Report Data 2006* (Sacramento: OSHPD, 2007).
12. In addition to sources cited, we relied on interview data from eighteen executives in twelve counties, three interviewees in two public hospital associations, and three interviewees in two financial firms.
13. OSHPD, *Hospital Annual Disclosure Report Data 2006.*
14. Miller et al., *Barriers to Financing Clinical Information Systems.*
15. In addition to sources cited, we used data from OSHPD, *Hospital Annual Disclosure Report Data 2006,* and from interviews with executives in eight unaffiliated rural hospitals and two rural health care associations.
16. Interviewee data; and J.A. Schoenman, *Small, Stand-Alone, and Struggling: The Adoption of Health Information Technology by Rural Hospitals,* Working Paper no. 2007-02, February 2007, http://www.norc.org/NR/rdonlyres/8A93D7E0-C7E8-4593-96C8-C7E86C641883/0/finalreport_color.pdf (accessed 19 December 2008).
17. Fitch Ratings, *Vital Signs of Critical Access Hospitals* (New York: Fitch Ratings, July 2006).
18. OSHPD, *Hospital Annual Disclosure Report Data, 2006.*
19. See P. Cunningham and J. May, *Medicaid Patients Increasingly Concentrated among Physicians* (Washington: Center for Studying Health System Change, 2006). For numbers of California physicians by practice type, see K. Grumbach et al., *California Physicians 2002: Practice and Perceptions* (San Francisco: Center for the Health Professions, University of California, San Francisco, 2002). Regarding EHR adoption nationally, see C.M. DesRoches et al., "Electronic Health Records in Ambulatory Care—A National Survey of Physicians," *New England Journal of Medicine* 359, no. 1 (2008): 50–60.
20. In addition to sources cited, we used interview information from six executives in six IPAs either providing or close to providing EHRs to member physicians, and four executives in two physician associations.
21. In addition to sources cited, our findings were based on information from thirteen interviewees in eight California delivery system organizations and a hospital association, twelve interviewees in ten medical groups/IPAs and two medical group associations, eight experts in five financial firms, seven other interviewees, and twelve medical group participants in a group discussion. For hospital-sector financial health, see PriceWaterhouseCoopers, *The Financial Health of California Hospitals* (Oakland: CHCF, June 2007).
22. For data on CIS adoption by risk-bearing medical groups, see Active California Medical Groups' Implementation Status of Electronic Medical Records and Chronic Disease Registries, http://www.cattaneostroud.com/medgroup_reports.htm (accessed 21 February 2008); for limited data on financial health of risk-bearing medical groups, see California Department of Managed Health Care, "Summary of Reported RBO Data (FYE 2006)" (table), in *Annual SB260 Report Updated 101507 for web.xls,* http://www.hmohelp.ca.gov/providers/rbo/socad_ye06.pdf (accessed 19 December 2008).
23. R.H. Miller et al., "The Value of Electronic Health Records in Solo or Small Group Practices," *Health Affairs* 24, no. 5 (2005): 1127–1137.
24. For example, see C.J. Bolster, "Planning during Turmoil: Credit Challenges and Healthcare Finance," *Healthcare Financial Management* 62, no. 11 (2008): 54–62.
25. One California program has begun to do this for smaller health care organizations: see UnitedHealth Group/PacifiCare Health Care Investment Program, "Capital Access: Small Issue Program" (Costa Mesa, Calif.: UnitedHealth Group Inc., 2008).
26. National Academy for State Health Policy, "Results of State Medical Home Scan," http://www.nashp.org/_docdisp_page.cfm?LID=980882B8-1085-4B10-B72C136F53C90DFB (accessed 22 January 2009).
27. At least as reflected in operating margins, financial health for California CHCs was similar to that of CHCs nationally: see HRSA, *California Rollup Report*; and HRSA, *Section 330 Grantees Uniform Data System, Calendar Year 2005 Data, National Rollup Report* (Washington: HRSA, 2006). CHCs' EHR adoption rates are also low nationally: see A.E. Shields et al., "Adoption of Health Information Technology in Community Health Centers: Results of a National Survey," *Health Affairs* 26, no. 5 (2007): 1373–1383.
28. C. Moylan et al., *NAPH Health Information Technology Source Book: Findings from the 2004 Electronic Medical Record Survey* (Washington: National Association of Public Hospitals and Health Systems, 2005).
29. Fitch Ratings, *Vital Signs of Critical Access Hospitals.*
30. In addition to interviewee data, we used data from V.K. Smith et al., *State E-Health Activities in 2007: Findings from a State Survey,* Pub. no. 1104 (New York: Commonwealth Fund, 2008).