telemedicine for the new
majority in california
A report to the California Program on Access to Care

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Acknowledgements

Telemedicine is by nature a nebulous concept. It incorporates everything from electronic records, to the use of video and telephonic technologies, to development of new products from companies not immediately associated with the health care industry. And though it is something not easily understood, there is one thing undeniably true about it; it produces positive health outcomes. We hope this report contributes to the growing body of work that helps make the case for why telemedicine use should be expanded, particularly into underserved communities.

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Executive Summary

With healthcare reform dominating the national political debate, telemedicine has emerged as a viable option to improve the quality of care, increase health access, and reduce costs for underserved communities. Telemedicine is the use of technology to connect patients with primary care providers and specialists when distance and time serve as barriers to healthcare. This report examines the scope of investment in telemedicine infrastructure and workforce development, and the replicability of its historical use and success in rural settings to urban populations. Last, given the racial/ethnic and linguistic diversity of California’s population, this report explores explicit efforts being made to ensure telemedicine is linguistically and culturally appropriate.

This report’s findings identify important issues for further research and policy discussions. Adapting telemedicine to California’s low-income communities of color will require community-based input in the planning, development, and evaluation stages of policies, further research on funding mechanisms to sustain urban telemedicine, a clear and consistent reimbursement policy for both private and public insurers, investment in infrastructure and workforce development that is culturally and linguistically competent, and the integration of cultural and linguistic competency standards for telemedicine.

Policymakers may want to consider ways to improve access, quality, and fiscal efficiency through telemedicine to reduce the current gaps in health access among California’s medically underserved.

Definition
A clear consensus of what telemedicine fully encapsulates within current literature on the subject does not exist. The Institute of Medicine describes telemedicine as the use of electronic information and communication when distance is prohibitive of traditional forms of healthcare. There is consensus that telemedicine applications are a mix of real time, where patients interactively connect with remote clinicians, and store-and-forward methods, where diagnostic patient information is transmitted to a remote provider for review at a later time. [1] The California Telemedicine and eHealth Center describes telehealth and telemedicine as two separate entities. [2] For the purposes of this report, telemedicine is synonymous with telehealth and e-medicine.
History of Telemedicine

United States
Telemedicine started in the U.S. in the 1960’s with the National Aeronautics and Space Administration. The initial telemedicine project identified the need to remotely monitor astronauts’ health during the onset of space exploration. Other Federal-level agencies, such as, the Department of Veterans Affairs (VA), Department of Defense (DoD), Department of Justice (DoJ), and Department of Health and Human Services (DHHS), have subsequently provided significant funding towards the establishment of telemedicine programs for veterans, military personnel, prisoners, and the rural underserved.

Recently, under President Obama’s Administration, $19 billion from the American Recovery and Reinvestment Act of 2009 (ARRA) was allocated for health IT, including telemedicine. [1] Historically, funding and development of telemedicine services has been conducted through a need basis and most are facilitated by government agencies.

California
Telemedicine emerged in California in the early 1990’s to address health disparities, the needs of a growing aging population, and a shortage of health care professionals. [2] The first major breakthrough in telemedicine occurred in 1992 when the University of California, Davis launched a telemedicine program focused on fetal monitoring within California’s rural communities. Later, Kaiser Permanente launched a home telemedicine program and Blue Cross of California and California’s Department of Corrections developed similar programs.

In 1997 the state legislature passed the Telemedicine Development Act of 1996, requiring reimbursement for healthcare providers that supplied services using telemedicine; the first legislation of its kind nationally. Since these early phases of telemedicine produced positive health outcomes, there has been further expansion and commitment through increased funding and public policy in California; including tools to expand telemedicine projects with an emphasis on underserved communities.

However, questions about the availability of resources to support telemedicine programs, demographic and geographical breakdown of funding recipients, and the propensity to ensure that the expansion of telemedicine bridges the current gaps in healthcare access and health outcomes remain unanswered.
Methodology and Analysis

This project utilizes qualitative research methods to analyze four major structural elements of telemedicine: funding mechanisms, telemedicine infrastructure, telemedicine workforce, and current California telemedicine legislation. Data collection includes public document analysis, compilation of a literature review, and interviews with five telemedicine stakeholders representing four different entities or organizations. The report aims to answer the following research questions through a qualitative analysis of four structural components of telemedicine as it pertains to California’s underserved:

Research Questions:
1. What is the current state of telemedicine in addressing health issues facing California’s underserved?
2. Given the racial/ethnic and linguistic diversity of California’s demographics, what explicit efforts are being made to ensure telemedicine is accessible for all Californians?

Figure I. List of Telemedicine Stakeholders Interviewed

- California Technology and eHealth Center
- Geographic Outreach Area: California

- Kings View Behavioral Health System
- Geographic Outreach Area: Butte, Del Norte, Fresno, Kings, Lake, Madera, Mariposa, Merced, Plumas, San Benito, San Joaquin, Shasta, Trinity, Tulare, and Tuolumne counties.

- University of California, Davis
- Geographic Outreach Area: California

- Loma Linda University
- Geographic Outreach Area: Rural Hospitals and Clinics in California

Figure II. Assessment Criteria

This report will analyze these four structural components of telemedicine with respect to the policy implications on California’s medically underserved using the following evaluative criterion for each section:

- Assessment of funding mechanism: This section provides an analysis of contemporary public and private funding streams in telemedicine with respect to its historical funding context, current funding allocation, and the population demographics of funding recipients.

- Telemedicine infrastructure: This section presents a utilization cost analysis of telemedicine to determine the quantitative feasibility of implementing this service in community-based health organizations. Evaluative factors include the net-savings benefit of telemedicine from a provider’s perspective through such factors as a decrease in emergency room use and hospital stay.

- Telemedicine workforce: Provides a historical context of the medical workforce and an analysis of future workforce projects as it pertains to current training in telemedicine. Evaluative factors include efforts to increase physician buy-in, cultural and linguistic competency measures, and racial composition of the workforce.

- Current California telemedicine legislation: This section synthesizes past and current California telemedicine legislation that focuses on telemedicine and evaluates these proposals’ propensity to provide care to California’s underserved through an analysis of linguistic and cultural competency in the training and delivery of electronic medicine.
Literature Review

This literature review assesses the viability of telemedicine as a tangible option to cut costs and increase access to care amidst ethnic health disparities that persist in California. Though current literature on telemedicine is limited to privately funded reports and a small selection of scholarly journal articles, this review does analyze the main tenets of telemedicine: broadband internet access, barriers to implementation, patient-provider interaction, cultural competency in the workforce, and costs.

Health Disparities
While health in the U.S. has improved over the years, widespread health disparities that disproportionately affect communities of color still exist. In analyzing the politics of health inequities, research suggests that the social determinants of health are distributed inequitably among individuals. These social determinants include socio economic status, availability of transportation, educational attainment, crime rates, social services, racism, poverty, and environmental surroundings.

Further, health disparities vary by race/ethnicity with African Americans and other ethnic groups, including Native Americans and Latinos, experiencing a higher proportion of illness and mortality in comparison to their white peers. Race/ethnicity has effects on health that are independent of socioeconomic differences between groups.

African Americans, for example, exhibit poorer health outcomes in comparison to their socio-economic white peers and have a mortality rate 33 percent higher than whites with an infant mortality 2.4 times higher. Likewise, Latinos have higher mortality rates than whites for tuberculosis, septicemia, HIV/AIDS, chronic liver disease and cirrhosis, diabetes, and homicide. Similarly, mortality rates of Native Americans are higher than the national average for tuberculosis, alcoholism, diabetes, and pneumonia. Conversely, Asian Americans, Native Hawaiians, and Pacific Islander adults are less likely than whites to have a chronic condition, except Filipinos.

With respect to telemedicine, California’s underserved lack the ability to take advantage of amenities, technologies, and conditions that are available to their higher income peers, further marginalizing the underserved.

California’s Health Landscape: Emergency Care, Physician Visits, Hospitalization and Costs
Issues of healthcare access and improved health outcomes are directly correlated with emergency room visits, hospitalization, and physician visits, with different groups disproportionately reliant on emergency care. Specifically, low-income individuals and those who utilize Medi-Cal and Medicare have the highest visit rates in the state.

In terms of race and ethnicity, U.S. born Blacks and both foreign born and U.S. born Whites were the most likely of all groups to visit an emergency room. The high volume of emergency visits is not driven by uninsured Californians but by
those with Medi-Cal or Medicare, given the high costs of out-of-pocket emergency care. Thus, the historically low insurance rate of both Asian and Latinos supports findings that Asians and Latinos are less likely than Whites to visit emergency departments.

Further, almost half of recent emergency room users felt their medical problem could have been addressed in a primary care setting. However, these users, which include a disproportionate amount of Medi-Cal patients, report difficulties in accessing primary care; a large proportion of emergency room users would have preferred to see a primary care provider if they could have obtained an appointment within 24 hours.

California’s decreasing number of primary care physicians will impact the well-being of the states underserved and reinforce the need for telemedicine as a critical component of the healthcare crisis solution. California overall has fewer primary care doctors than needed; the state’s 59 primary care doctors per 100,000 patients is below thresholds that mandate upwards of eighty physicians per this population. Shortages in primary care physicians are most profound in rural areas, such as the Central Valley and Inland Empire, where there are barriers in recruiting new physicians to replace aging primary care physicians.

The barriers to access for the underserved have given way to new telemedicine based strategies, such as, providing patient-to-provider telephone hotlines and broadband communication for email to physicians. It is important to connect the impact of health access and care to California’s underserved who disproportionately are uninsured and live in both rural and urban areas that lack health options due to financial and geographic barriers.

**Internet Access**

Literature on broadband access and the digital divide are integral to the propensity of telemedicine to service California’s low income communities of color. Telemedicine requires patients to use and access the appropriate technology. Nearly half of Californians have high speed broadband internet access with major gaps between rural and urban areas and variations amongst racial and ethnic groups. The digital divide, the gap separating individuals with access to information technology from those that do not, contributes to disparities in access, adoption, and literacy between the rich and poor.

Further, broadband, internet, and computer ownership differ by income among California households, 68 percent of those with incomes over $100,000 have broadband, compared to 49 percent with incomes between $50,000 and $75,000 and only 24 percent for households with incomes below $25,000 annually. Even in instances of computer ownership, there still is a digital divide in broadband adoption. With respect to race and ethnicity, 46 percent of whites and English-proficient Latinos have broadband, compared to 63 percent of Asians and 36 percent of African Americans.

Lastly, rural communities have significantly smaller broadband adoptions than large urban regions like Los Angeles and San Francisco. Although there are definite variations across income and race/ethnicity for Californians’ broadband access, the limitations of English only surveying severely understates California’s growing immigrant population. Nevertheless, California’s broadband access and presence of the digital divide are important considerations in understanding the propensity for telemedicine adoption for racial/ethnic and low income groups throughout the state.

The digital divide, the gap separating individuals with access to information technology from those that do not, contributes to disparities in access, adoption, and literacy between the rich and poor.

The Pew Internet and American Life Project estimates that 61 percent of American adults look online for health information but maintain that Americans continue to turn to traditional sources of health information such as doctors, family, books, and insurance providers. More revealing are the demographics of e-patients, adults who look online for information about health issues; 65 percent of non-Hispanic whites, 51 percent of African Americans, and 44 percent of Latinos use the internet for health information.

These findings suggest that highly educated and wealthier Americans use the internet for health information at rates much larger than their lesser educated and lower income peers, providing valuable information about the ways in which technology is used to communicate health and wellness information, and
the disparities between race/ethnicity, social class, and educational attainment.

**Telemedicine**

Studies on the distribution of other telemedicine resources are equally important because California’s medical resources and medical experts are poorly distributed across the state, especially in urban and rural economically disadvantaged regions. Challenges in accessing care are faced by isolated elderly, ethnic groups with language and cultural norms not comprehended by traditional health settings, and low-income communities. Investments in telecommunication infrastructure described above will strengthen the state’s capacity to implement new telemedicine polices.

Further, many California telemedicine programs have improved health access but widespread barriers to adoption remain. The primary challenges to telemedicine implementation include the use and accessibility of technology and the economic returns that will increase use among physicians, patients and insurers. Similarly, the technological complexity and large amount of data associated with telemedicine are more than those required of traditional doctor-patient sessions, which pose a barrier to both patients and physicians. Finally, telemedicine applications remain limited due to reimbursement issues, and despite growth in rural settings, telemedicine has not reached anticipated service levels due to the lack of availability of technology.

With respect to patient-provider interaction, telemedicine has proven useful to some specialists and burdensome to other medical specialties. The best evidence for telemedicine effectiveness is situated in medical specialties that require verbal interactions for patient assessment, including psychiatry and neurology; diagnostic skills are not compromised when using telemedicine methods instead of in-person methods when providing patient care. Both findings counteract concerns that diagnosis relies on in-person interaction and using telemedicine compromises the effectiveness of care. However, technological barriers exist for patient-provider interaction, with only 19 percent of California physicians communicating with patients often or sometimes using e-mail, as one example.

Little literature exists about the level of cultural and linguistic training for physicians. The Institute of Medicine identifies cultural competency as the understanding of the cultural, nutritional and belief systems of patients and communities that may assist or hinder effective healthcare delivery. Moreover, in their qualitative study of the diversity of UC medical schools, the Greenlining Institute found that increased diversity in the faculty and student body of these schools may provide the appropriate level of interaction with diversity to create a culturally competent health workforce.

Studies of provider behavior in medical encounters shows that ethnic minority patients received less information, less positive or reinforcing speech, and less communication overall than their White peers.

Furthermore, studies of provider behavior in medical encounters shows that ethnic minority patients received less information, less positive or reinforcing speech, and less communication overall than their white peers. These findings allude to potential barriers for California’s underserved communities to engage fully in telemedicine, given the emphasis on communication via phone, the internet, and through digital images.

The cost of new equipment, fiscal sustainability, and reimbursement issues are barriers to implementation. Moreover, telemedicine programs that establish economical connections between patients and providers despite geographic and time barriers warrant funding and may induce market demand.

However, many of the telemedicine ventures that are successful may also fail to expand and are in jeopardy of termination. Current reimbursement methods, contracts, and payments are most practical when government sponsored insurance covers low-income patient services, or in cases where telemedicine is facilitated by large integrated delivery systems.

Finally, the lack of information about aggregate savings may stifle telemedicine implementation in California, although it is estimated that the U.S. can potentially save $3.61 billion annually with telemedicine by reducing or eliminating costs associated with travel expenses.
Funding

The majority of telemedicine systems are funded by federal, state, and private demonstration grants that do not provide stable sources of revenue. From this perspective, telemedicine programs are dependent on grant monies, which challenge their ability to operate in a sustainable manner.

**Federal Funding of Telemedicine**

Federal funding is made available through twenty-four major cabinet-level departments, independent agencies, and commissions (See Appendix I). These entities oversee telemedicine projects, including providing healthcare for government personnel and fiscal support for rural based telemedicine programs that expand service to non-government personnel. Early federal funding for telemedicine aimed to increase access to primary and specialty care in rural communities.

Federal level spending for telemedicine falls into three main categories: grants and contracts, direct services, and Medicare; in 2003, about $270 million in federal grants and contracts were issued for six to eight programs, a third of which were research contracts for the Department of Defense. Other federal providers of direct services include the Veterans Health Administration, the Department of Defense, Indian Health Service and Bureau of Prisons in the Department of Justice. The total amount spent on direct services and Medicare expenditures using telemedicine and the rate of Medicare reimbursements for services are not tracked, making it difficult to track exactly how much Federal funding is allocated towards telemedicine.

In 2007, several changes in federal funding occurred. The Federal Communications Commission (FCC) granted $22 million to expand broadband services to over three-hundred rural telemedicine sites in California, including 81 rural hospitals. Also, the FCC awarded a total of $417 million to support sixty-nine telehealth network projects in forty-two states, representing the largest government effort to expand access to telehealth across the U.S., with California’s award the second highest in the country. The intent of the telehealth network is to improve access to care in underserved communities, as well as to provide a resource for emergency services and disaster preparedness.

**Department of Veterans Affairs (VA)**

The VA provides medical care to over 7.6 million veterans and remains the largest provider of telemedicine in the U.S. Currently, the VA conducts 243,000 telemedicine consultations a year. To move forward with telemedicine based programs, the VA created the Steering Committee on Telehealth and Healthcare Informatics to inform interested members of Congress and their staffers about issues related to telemedicine and telehealth. With the advent of telemedicine, the VA is able to provide specialty and primary care services to veterans in geographically isolated areas, where distance and time had previously served as a barrier to access.
The VA has consistently provided major financial support for the use and expansion of telemedicine to serve the health needs of rural veterans. While the VA has largely funded telemedicine deployment in rural areas, it has also showed its support of telemedicine expansion in urban areas through Veterans Integrated Service Networks in San Francisco, CA and Boston, MA, which received $1 million.

**Department of Health and Human Services (DHHS)**

The DHHS has been a leader in telemedicine funding. Between 1988 and 2005, DHHS has awarded at least $250 million in telemedicine projects in every state, most of which serve rural communities. This report focuses on the telemedicine funding facilitated by the Centers for Medicare and Medicaid Services (CMS), the Office for the Advancement of Telehealth (OAT), and Indian Health Service (IHS).

The establishment of OAT in 1998 represents a microcosm of DHHS’s leadership on telemedicine efforts targeted at establishing collaboration with other federal departments that finance and provide telemedicine services. OAT grants can be used to cover operating costs of the telemedicine system, rural staff salaries and compensation for consulting and referring practitioners, equipment purchase, lease, installation, and maintenance, and transmissions costs, such as the use of phone lines.

IHS’ interest in telemedicine has been rooted primarily in the lack of health care professionals on Indian reservations. Historically, IHS’ support for telemedicine focused on primary care and serving rural populations but has since expanded its telemedicine efforts to include teleradiology, telemammography, teleoptometry, telepediatrics, and telepsychiatry, which have been successful in improving health care access to specialty care in these areas in a cost-effective manner.

**Funding for Telemedicine in California**

States are playing greater roles in the funding and oversight of telemedicine expansion. Funding for telemedicine in California is reflective of the funding mechanisms on the national level, with resources initially poured into state-funded academic institutions.

Two of the major public agencies involved in the expansion of telemedicine in California are the FCC and the California Public Utilities Commission (CPUC). In 2005, the CPUC approved the mergers of SBC-AT&T and Verizon-MCI under the condition that AT&T and Verizon contribute a total of $60 million over 5 years to the California Emerging Technology Fund (CETF), which was established by the CPUC to increase broadband deployment in the State. At least $5 million from the agreement is earmarked to fund telemedicine programs that serve California’s underserved populations, particularly those in rural areas.

Since 1997, California prisons have facilitated more than 70,000 telemedicine consults almost half of which were for mental health problems.

In May 2008, $3.8 million in match-funding was allocated to support FCC’s efforts to fund rural telemedicine expansion in California. State spending on telemedicine has paved the way for the development of telemedicine in California.

**California Dept. of Corrections and Rehabilitation**

The California Department of Corrections and Rehabilitation’s (CDCR’s) financial investment in telemedicine, supported by the state, mirrors the structure of 25 other state correctional systems nationwide. Since 1997, California prisons have facilitated more than 70,000 telemedicine consults almost half of which were for mental health problems. Funding for telemedicine was partly influenced by a 2002 settlement agreement that requires the CDCR to significantly improve access and quality of medical care in state prisons.

The total annual cost of upgrading twenty-two prisons with telemedicine specific technology was approximately $1.8 million for the telemedicine nurse positions and about $1.6 million in one-time costs for telemedicine equipment and lines. An additional $600,000 was allocated from the 2006-2007 Governor’s Budget to provide telemedicine equipment and staff for five additional prisons.

Although CDCR has allocated significant funding to ensure that telemedicine equipment is available at all of the State’s prisons, the Legislative Analyst Office has
expressed concern over CDCR’s policies in making its usage voluntary. For example, in 2004-2005, almost two-thirds of telemedicine consultations were conducted at just five prisons, and one third of prisons with telemedicine equipment that year did not use the system at all.

The usage rates illustrate a shortfall on the part of CDCR implementing telemedicine programs, since financial support for telemedicine equipment did not translate into a mandate for staff to implement the accompanying medical programs. The lack of performance targets and mandates to state prisons to measure the return on investments for telemedicine related funding has resulted in the underutilization of telemedicine within CDCR.

California Telemedicine and eHealth Center
The private sector, particularly foundations, ensures the sustainability of telemedicine programs in California. The private sector’s financial support of The California Telemedicine & eHealth Center (CTEC) is a prime example of the importance of engaging the private sector in efforts to expand telemedicine in California. The CTEC is a not-for-profit organization that aims to improve and expand access to telehealth/telemedicine, programs in California’s underserved areas, and is one of six nationally recognized federally designated Telehealth Resource centers.

These initial investments motivated matching funds from two other foundations, the BlueShield of California Foundation and the California HealthCare Foundation, over $1 million and $0.6 million, respectively.

In addition to its status as a private sector grant recipient, CTEC evolved to become a leading funder of telemedicine in California, particularly in underserved communities. Through the fiscal support of private foundations, CTEC served as a grant-making body that distributes private sector-originated monies to regional based organizations and providers.

CTEC has been able to provide grants to ten California Indian Health Programs, eighteen rural and urban community-based health organizations and healthcare programs, and providers of urban-based medical services. However, CTEC has since ceased its funding capacity and now works with the California Primary Care Association to educate urban-based health providers about telemedicine and funders about urban applications. This targeted urban education initiative resulted from the understanding that urban telemedicine projects are outpaced by the growth of rural programs.

The private sector, particularly foundations, ensures the sustainability of telemedicine programs in California.

Private sector support of CTEC provides information on the impact of private financial support on health access for California’s underserved communities. CTEC was created in 1997 with startup fiscal support from the James Irvine Foundation and grant money from the Sierra Health Foundation. The California Endowment extended an initial $11 million grant to the organization in 2000. In 2003, the California Endowment awarded CTEC a five-year, $9 million grant to develop, expand, and support Regional Rural eHealth Networks, and to provide training and technical support for rural providers.
Infrastructure

The initial and ongoing costs of maintaining telemedicine infrastructure are a significant barrier to implementation. Uncertainty in funding directly impacts the ways in which providers, namely community hospitals and clinics in urban and rural areas, create and maintain the infrastructure necessary to provide care using telemedicine. Although setting up and maintaining a telemedicine program is a major financial investment, there are significant cost savings benefits for the provider, the patient, and the health care system as a whole.

Getting Started: Capital and Installation Costs
Before offering telemedicine care, a provider must have the necessary funding to invest in capital and installation costs of telemedicine. Costs are determined by the provider’s size and intended use for telemedicine and fall into three categories: equipment needs as it relates to fiscal capacity, maintenance, and personnel. At a minimum, telemedicine providers need computer hardware and software to facilitate basic telemedicine, such as maintaining patient data being collected by home monitoring devices.

While small health organizations and other providers have computer and broadband internet capacities for billing and other purposes, more sophisticated connectivity is necessary for basic telemedicine. Moreover, rural facilities with small patient populations may not support full-time staff necessary to facilitate telemedicine due to capacity limitations. Thus, the ability for these and other providers to use telemedicine may be limited by high upfront fixed costs.

The equipment needs depend on the type of telemedicine to be implemented and the provider’s fiscal capacity. The categories of telemedicine include: store-and-forward, real-time video, or a combination of the two forms. Among these categories exists a wide array of telemedicine equipment; the Center for Information Technology Leadership (CITL) identified thirteen different types of equipment (See Appendix III). There are data limitations for each category of equipment based on the type of telemedicine in use (See Appendix IV).

Providers’ fiscal capacity also impacts their telemedicine infrastructures. Based on the differences in fiscal capacity among telemedicine providers, the CITL categorized telemedicine equipment systems into three categories: low-end, mid-range, and high-end based on cost. CITL conducted cost estimates of telemedicine equipment that relied on market research to establish the price range for telemedicine equipment, finding wide variation in the price of equipment (See Appendix V). In addition to accounting for equipment costs, there are associated technician cost estimates for each installation (See Appendix VI).

Recurring maintenance expenses and personnel provide an additional layer of telemedicine infrastructure expenses. CITL estimates that 20 percent of the recurring costs required to maintain telemedicine systems are attributed to software and hardware upgrades, technical support, replacement parts, technology training, and support staff. Investing in the training of health
personnel who will deliver the care is imperative to telemedicine infrastructure building, with three major personnel needs for telemedicine infrastructures: supportive executive team, program coordinators, and technical support.

**The Cost of a Telemedicine System**
The equipment, maintenance, and personnel expenses required to create a telemedicine infrastructure provide a projection of the total costs to purchase, install, and maintain a telemedicine system. CITL conducted a cost analysis of a holistic telemedicine system by aggregating system costs at four different types of provider facilities (See Appendix VII).

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**Telemedicine may decrease the need for emergency room visits, hospitalizations, and nursing home admissions, and provide significant cost savings through reductions in healthcare resources.**

Taking into account the costs of purchasing, installing, and maintaining a telemedicine system, a telemedicine provider can anticipate spending between at least $1,700 for a low-end store-and-forward system, to a maximum of roughly $32,000 for a high-end hybrid telemedicine system. In addition, given the need for more equipment, investment in real-time video is consistently more expensive than store-and-forward telemedicine.

Similarly, the cost associated with implementing both store-and-forward and real-time video is not significantly higher than the expenditures for real-time video alone.

**Returns on Investment in Telemedicine**
The costs associated with building and maintaining the telemedicine infrastructure are major deterrents for providers, especially those that service California’s underserved communities. However, there are cost-effective benefits associated with implementing telemedicine that may outweigh the capital and installation costs.

Telemedicine may help patients with chronic conditions and diseases better manage their health with more consistent home monitoring, thereby decreasing the need for emergency room visits, hospitalizations, and nursing home admissions, and providing significant cost savings through reductions in healthcare resources. The total net potential annual savings for these chronic diseases and conditions from the use of telemedicine is $12.1 billion (See Appendix XII). Moreover, there are important impacts of telemedicine on providers’ costs and patients’ overall well-being.

The implementation of telemedicine provides cost-savings for providers and improved well-being for patients through increased access to preventative care. Telemedicine affords patients and providers the opportunity to transmit and analyze health information that saves time and money. Moreover, telemedicine increases access to preventative care for insured and uninsured patients, which may result in decreases in the high costs associated with chronic diseases and hospitalization.

For instance, the expanded service hours that telemedicine affords providers allows patients to access care outside of normal office hours, increasing the accessibility of health care. Recent literature has suggested that increased health access resulting from telemedicine may result in increases in physician visits ranging from a 10 percent increase using physiological monitoring for chronic disease patients to upwards of 70 percent using the same technique for heart disease patients (See Appendix VIII).

**Uncertainty in funding is a significant barrier to implementation of telemedicine, and directly impacts the ways in which providers, create and maintain the infrastructure necessary to use the technology.**

These increases in physician visits and use of preventive care services may contribute to the decrease in emergency room visits anywhere from 12 percent to treat chronic conditions to 83 percent using physiological monitoring for diabetes patients (See Appendix IX).

Telemedicine and usage of preventative care services provide significant cost-savings by mitigating the unnecessary dependency on costly hospitalizations and nursing home stays. Telemedicine allows health providers to monitor patients’ heart rhythm, blood
CASE STUDY: The California Indian Tele-Ophthalmology Program

The California Indian Tele-Ophthalmology Program provides an invaluable case study of the experience of creating a telemedicine infrastructure in California’s underserved communities. An evaluation of the Program found that before telemedicine interventions only 39 percent of the identified Indian diabetics receiving care through the Program completed an annual diabetic eye exam, with the low utilization rate of the annual eye exam attributed to geographic, transportation, cultural, and infrastructure barriers. To overcome these barriers, thirteen Indian health programs created and implemented tele-ophthalmology programs to screen for diabetic retinopathy in their respected communities.

The costs associated with providing retinopathy screening to American Indian diabetics, for the initial infrastructure of these programs, are approximately $31,300 for equipment and training (See Appendix XIII). In addition, the ongoing investment to implement tele-ophthalmology includes expenses for staff time, consulting, and training.

In order to effectively implement a program that would increase utilization rates, several key infrastructure needs must be met. The first necessity is an image capturer on staff that is trained in patient orientation, dark adaptation, image capture, diabetic education, and data entry. Since no full-time personnel on staff within the program exist, different staff members rotate in fulfilling the obligations. It is estimated that in order to reach full compliance with retinopathy screenings among American Indian diabetics, an image capturer would work 14.4 work weeks per year at an average hourly personnel cost of $30.

The second requirement is contracted consulting ophthalmologists for each Indian Health Program to analyze and review the retinopathy images. The costs associated with this position range from $35 to $125 per client, creating a cost scale that disadvantages programs located in rural areas with physician shortages. Lastly, additional costs include on-site refresher staff trainings and technical support to address technology challenges, estimated at $1,580 per year (See Appendix XIV).

pressure, glucose levels, and other vital signs, which has shown to reduce hospital admissions and bed days of care, and their associated expenses.

For example, telemedicine has reduced the number of bed days of care by 20 percent using physiological monitoring for heart disease patients and upwards of 64 percent reductions using video visits for chronic disease patients (See Appendix X). The home monitoring made possible through telemedicine decreases the need for some forms of nursing care, thereby allowing patients to be observed in their own homes rather than moving into a nursing home.

There have been reductions in nursing home admissions ranging from 58 percent using physiological monitoring for chronic disease patients to 68 percent using a combination of physiological monitoring, video visits, and messaging for the same type of patients (See Appendix XI).
Workforce and Education

The demographics of current and future telemedical professionals are integral to telemedicine’s ability to provide access and care to California’s medically underserved. The passage of Proposition 1D in 2006 has initiated and expanded the telemedicine curriculum, facilities, and services of several UC medical schools, some of which specifically target underserved communities.

University of California

The University of California trains the state’s telemedicine workforce at six university campuses: Davis, Irvine, Los Angeles, Merced, San Francisco, and San Diego. Many of the campuses will facilitate the development of this workforce through the Program in Medical Education (PRIME) that aims to address physician shortages in medically underserved communities throughout the state. Unfortunately, the UC has decided to not fund PRIME programs for 2009 and the individual schools have yet to make a decision on the future of the program.

UC Davis School of Medicine initiated the PRIME-Rural California to address physician shortage and expand the availability of specialty services in rural areas through technology. The Rural-PRIME program is the first of its kind to integrate telemedicine training in medical school curriculum. Students are required to complete coursework that emphasizes cultural competency in rural communities. In addition to using telemedicine as a means of providing specialty consultation, Rural-PRIME students leverage telemedicine through clerkships and residencies with rural providers.

UC San Diego School of Medicine is in the planning stages of constructing the Telemedicine Education Building that aims to expand student enrollment in a PRIME-Health Disparities program designed to attract physicians to working with underserved populations, with a telemedicine focus.

UC Los Angeles School of Medicine’s 2007-08 Budget for State Capital Improvements and the Capital Improvement Program includes $19.7 million to fund equipment for Telemedicine and PRIME-Underserved Demographics facilities at affiliated hospitals and clinics, and campus facilities. The project’s primary focus is to improve its Healthcare Delivery and Training, and Medical Education and Distant Learning programs.

Through the new facilities students and physicians will be able to teleconference from remote locations, facilitate real-time interaction between surgeons and observers at hospitals, and expand participation in UCLA conferences and lecturers to remotely located medical students and physicians. Additional investments focus on cultural competency telemedicine trainings as they relate to underserved populations.

UC Irvine School of Medicine is in the development stage of constructing a $40.5 million, 65,000-square-foot building to house the school’s telemedicine facility and instructional space for the PRIME-Latino Community program focused on
Latino health; $35 million in funding coming from Proposition 1D funding. The target patient populations are underserved agricultural and rural communities in California. The telemedicine training center includes a 60-seat interactive tele-video center, a clinical simulation lab and clinical skills center. Students will utilize digitally controlled, full-body simulators in operating-room and trauma-room settings, and the tele-video room will allow students to see medicine practiced at distant locations with real-time ability to communicate with clinical instructors.

**UC San Francisco** is in the development stage of constructing the Teaching and Learning Center, funded by the Telemedicine and PRIME-Urban Underserved Education Facilities initiative, a part of Proposition 1D. Paralleling peer institutions, the Center will train physicians to address the needs of the state’s urban underserved and provide telemedicine training in all clinical health professional education programs (e.g. Dentistry, Medicine, Nursing, Pharmacy) to connect patients throughout the Bay Area and Central Valley with health care. In contrast to the other UC medical schools, the telemedicine project at UCSF is unique in its explicit focus on improving health care access for urban underserved populations via high-definition teleconferencing technology.

**UC Merced** is in the exploratory stages of establishing a medical school to train physicians in culturally competent care and to serve the health needs of the San Joaquin Valley. In 2007, UC Merced received a $225,000 seed grant from the California Partnership for the San Joaquin Valley to start a telemedicine network. UC Merced acts as a network hub for its initial telemedicine initiative, the “San Joaquin Valley eHealth Network Project,” which includes eHealth Centers at four different Valley sites. Each eHealth Center provides telemedicine patient services and serves as a training ground for physicians, medical students, and allied health professionals throughout the region. Despite these advances, in 2008 UC Merced reported difficulty in recruiting physicians for the six proposed telemedicine sites in the San Joaquin Valley due to the low reimbursement rate.

**Peer Telemedicine Education and Provider Services**

**Loma Linda University** and UC Davis are the only California-based, academically-affiliated members of the American Telemedicine Association. In the spring of 2006, the university’s president, Dr. Lyn Behrens, designed a Telehealth Coordinating Committee to expand telemedicine to each clinical program. As part of its telemedicine initiative, the university is developing an online educational program that addresses: telemedicine business planning development; case study evidence documenting returns on investment with telemedicine; and billing and coding procedures and techniques.

**Health Care Interpreter Network** is a consortium of California hospitals and healthcare providers that share more than 40 healthcare interpreters via an automated video/voice call center system. Three of its nine members are teaching hospitals, all of which are located in Southern California. These teaching hospitals address cultural and linguistic competency by contracting interpreters for language services employed by one of the consortium member hospitals or referring patients to a contracted telephonic language provider.

**Continuing Medical Education Training Opportunities for Current Health Care Providers**

UC Davis and UC San Diego are the only California academic institutions with medical schools that offer Continuing Medical Education (CME) telemedicine training.

**UC Davis Center for Health and Technology** provides telemedicine education training with an emphasis on health professionals working in underserved communities in California. CHT provides financial assistance to facilities in California that: have been designated as a health professional shortage area (HPSA) or serve a HPSA population or medically underserved population as defined by the Public Health Services Act; been determined by an overseeing federal or state agency as having a significant need for a particular health care service that is not currently being met by the existing resources in the area; and/or serves a medically or financially underserved population not being adequately met by existing resources.

**UC San Diego Southern California Telemedicine Learning Center** aims to increase health care access using technology through partnerships with community clinics, works with school districts to improve health resources, and improve educational opportunities for physicians. The TLC offers regular trainings in the clinical, technical and operational aspects of telemedicine.
Community representation and feedback in health policy is important to achieve cultural and linguistic appropriate care. Existing models provide a framework by incorporating community-based input as a method to advance equitable and accessible health access for California’s underserved. Specifically, the Medi-Cal and State Children’s Health Insurance Program (Medi-Cal Managed Care and Healthy Families) community advisory boards ensure the cultural appropriateness of their services. Several legislative and policy initiatives in California have created telemedicine entities that lack formalized avenues for community-based input (See Appendix XV).

Major Legislation and Executive Orders
Telemedicine legislation in California was spearheaded with the passage of the federal Telemedicine Development Act (TDA) in 1996. TDA became a model for states’ telemedicine laws, and served to advance the California Telemedicine Development Act later that year.

The amended current version of California TDA restricts services to licensed practitioners, adds telemedicine to healthcare service codes, and mandates reimbursement for providers of telemedicine services. Since the enactment of California’s TDA, several additional proposals have been introduced by legislators and the Governor, including some that address reimbursement policies within the Medicaid program.

Despite the emergence of telemedicine legislation in the state, proposals that integrate cultural and linguistic needs of California’s underserved within the development and implementation of telemedicine are non-existent. Only one piece of telemedicine law specifically allocates services to California’s underserved; Executive Order S-12-06 encourages the expansion of telemedicine

![Figure III. Timeline of Telemedicine Legislation in California](image-url)
technologies for rural, urban, low-income, and disabled Californians. This proposal emphasizes connecting rural health clinics to other state medical centers.

Existing telemedicine legislation that lacks language around improving the conditions of California’s underserved has the potential to still service this community Executive Order S-23-06 created the California Broadband Task Force that convenes stakeholders to promote broadband access and usage among Californians. Although it currently lacks adequate community-input in its decision-making, its mission to expand broadband access may positively impact California’s underserved given their predominance within both the population at large and those that lack adequate internet access.

Moreover, the failure of Senator Sheila Kuehl’s 2004 SB 1341 to be signed into law, despite unanimous approval in both the California Senate and Assembly, illustrates the barriers in expanding telemedicine to California’s underserved. The bill was vetoed by Governor Schwarzenegger since it would expand telemedicine services within Medi-Cal and increase costs but would have expanded telemedicine to California’s underserved.

**Debate over Medicare Reimbursement for Telemedicine**

The existence of limited, inconsistent reimbursement policies serve as a significant barrier for telemedicine to reach California’s underserved. Currently, Medicare reimbursement is limited to providers of rural patients, preventing urban underserved communities from benefiting from telemedicine in a comparable manner as their rural counterparts.

Medicare coverage of telemedicine began with the Balanced Budget Act of 1997 (BBA), which mandated reimbursement of telemedicine care and the funding of telemedicine demonstration projects, with several restrictions over reimbursement and types of services.

The Consolidated Appropriations Act of 2001 corrected several issues with the BBA, but further restricted telemedicine to those who receive care through a rural Health Professional Shortage Area (HPSA), a rural county that is not a Metropolitan Statistical Area (MSA), or a facility participating in a Federal Telemedicine demonstration project.

Current Medicare reimbursement policies also fall short of taking into account additional expenses necessary to provide telemedicine services. Further, Medicare does not currently reimburse for equipment, associated clinical devices, training, and operational expenses; decreasing the ability of safety-net providers to implement telemedicine.
Although Medicare’s restrictive reimbursement policies continue to serve as a significant barrier to the full integration of telemedicine in health care, recent federal legislative actions show promise in this area. In July 2008, Congress passed a new Medicare appropriations bill allowing skilled nursing facilities, in-hospital dialysis centers, and community mental health centers to originate Medicare telemedicine claims.

Representative Mike Thompson’s proposal updating the Medicare Telehealth Enhancement Act of 2008 provides a current example of legislation that expands telemedicine to underserved communities. Specifically, the proposed bill seeks to expand access and utilization among low-income and minority communities by:

- Eliminating current geographic restrictions on Medicare,
- Expanding Medicare reimbursements to include all telemedicine providers and sites e.g., state hospitals, schools, and locations in rural and underserved areas,
- Creating an advisory committee on telehealth reimbursements, and
- Reauthorizing and expand two current HRSA grant programs for telemedicine.

Reimbursement policies at the Federal level have lead California to adopt telemedicine reimbursement policies under its Medi-Cal fee-for-service program. In 1996, the California Medi-Cal program created policy that limited reimbursement to video conferencing, which was an indicator of some formal type of interaction between the patients and doctor.

In 2005, California expanded its reimbursement policy to include teledermatology and teleophthalmology via store-and-forward, and in 2006, consulting doctors reviewing ophthalmology records via store-and-forward became eligible for Medi-Cal reimbursement. More recently, in 2007, teleoptometry was included in the definition of healthcare practitioners for reimbursement purposes.

In California, Anthem Blue Cross, the largest private payer of telemedicine, administers telemedicine reimbursement claims that have relatively greater administrative flexibility in modifying their reimbursement policies; Blue Cross reimbursements are not restricted to teledermatology, teleophthalmology, teleoptometry, but additional specialty care services such as: nutrition counseling, endocrinology, podiatry, and orthopedics, are also included in telemedicine reimbursement.

California lacks the resources to cover the level of telemedicine services provided through private-insurers, increasing the scope of Medi-Cal reimbursements will expand telemedicine to California’s underserved. Given the impact of Medicaid and Medi-Cal reimbursement on the accessibility and adaptation of telemedicine for California’s underserved, future legislation in this area may expand or limit their access. The limitation of reimbursement to patients in rural areas excludes urban low-income and minority communities’ access to telemedicine services. Although private insurers have implemented expanded telemedicine reimbursement policies, their beneficiaries do not include the same levels of California’s uninsured as Medicaid and Medi-Cal beneficiaries.
Improving Rural and Urban Health

Rural populations face significant challenges in obtaining access to health care services. The National Health Policy Forum notes the difficulty in recruiting and retaining health professionals to provide emergency medical services, oral health services, and mental health and substance abuse services in rural areas. The barriers to access directly affect health outcomes of rural populations.

Dr. Jorge Cuadros, a clinical professor at the UC Berkeley Optometric Eye Center, has developed EyePACS (Picture Archive Communication System for Eye Care), a license-free, Web-based store-and-forward clinical communication system for diabetic retinopathy (DR) screening in diverse clinical settings. According to the Center, most clinics find a high rate of non-compliance with yearly eye exams for diabetic patients. Consequently, while early detection and treatment of DR-related sight complications can prevent blindness, almost half of all diabetics are not examined in a timely manner.

Through EyePACS, local community clinics store and send eye-related patient information, images, and diagnostic data to staff at the UC Berkeley School of Optometry, who interpret the retinal images. Optometrists at UC Berkeley initially reviewed the images on a voluntary basis. Fortunately, the enactment of the Store and Forward Telemedicine bill (AB 354) in 2006, this service is now eligible for Medi-Cal reimbursement, contributing to the economic sustainability and expansion of eye care delivery via telemedicine.

Over their initial 2005-2007 grant period, more than 12,000 patients, half of whom are Latino, received screenings at one of the 13 rural clinics included in the pilot program, and half of the patients were diagnosed with some level of retinopathy. Fifteen percent of the patients were referred for treatment of retinopathy, glaucoma or cataracts. In addition, 10% of the patients referred would have gone blind if they had not received treatment.

As a result of the success of the pilot program in a short time frame, the California HealthCare Foundation (CHCF) funded a $1.8 million expansion of the project to include an additional 29 clinics and centers throughout the state of California, and a second cycle of funding in November 2008 by CHCF supported access to the service for an additional 14 organizations.

Cuadros stresses the impact of teleophthalmology in improving the quality of health care in California because, without teleophthalmology, most patients would fall through the cracks and end up at an eye care provider’s office after losing vision in an eye, instead of being diagnosed early on, when preventive measures can still help.

Improving Urban Children’s Health through Telemedicine in Schools and Child Care
To date, California has about 150 school health centers, the majority in underserved neighborhoods. In September 2008, Governor Schwarzenegger signed SB 564, the School Health Centers Expansion Act, which increases the number of school health centers to 500. Further, access to an adequate broadband connection can be leveraged to provide health services to children by implementing telemedicine programs in schools. Pilot telemedicine demonstration projects in several states, including California, have already demonstrated how telemedicine can serve as an effective tool to complement and expand the capacity of school health centers to meet the health needs of children.

Helping Manage Chronic Health Conditions
Asthma is the most common chronic childhood disease; affecting 8.7% of children aged 0-17 nationwide and is the leading cause of school absences, accounting for more than 14 million missed days annually. The burden of the disease is disproportionately borne by low-income, inner-city populations, and communities of color, particularly African Americans.

To address this chronic health concern, in 2002, Dr. David Bergman, an associate professor of pediatrics in the Stanford School of Medicine, and co-investigator, Dr. Paul Sharek, staff physician in pediatrics, designed and implemented a two-year pilot program to provide asthma education and to assist in improved asthma management for children living in the Bayview-Hunter’s Point neighborhood of San Francisco.
Asthma rates among children living in the predominantly low-income, African-American area are as high as 17%, about twice the national average, due to a combination of ethnic, economic, and environmental factors. The Asthma Telemedicine Project came into fruition through a partnership between the San Francisco Unified School District (SFUSD), the Asthma Resource Center of San Francisco (ARC, Inc.), The Health and Environment Resource Center (HERC) of the Bayview Hunter’s Point Community, Stanford University, Department of Pediatrics, and San Francisco General Hospital, Pediatric Asthma Clinic.

The school-based asthma project served 96 students from three elementary schools in the Bayview-Hunter’s Point Area. Students at the test schools visited with the school nurse and had several real-time consultations via videoconferencing with asthma specialists at San Francisco General Hospital and Packard Children’s Hospital. During various “visits”, the specialist assesses the student’s health through pulmonary function and medical histories, design personalized disease management plans for students, and reviews proper inhaler and peak flow meter technique.

Examination results, medications, and the specialist’s comments were integrated into a Web-based asthma management plan that was made available to the student’s primary care provider. The program also enlisted community health workers to visit students’ homes and assess environmental factors triggering asthma and educate parents about asthma management. The program was shown to significantly improve both the students’ and their respective families’ quality of life as it relates to the students’ asthma, and increase asthma knowledge for both parties.

Engaging and Empowering Communities through Telemedicine
The urban underserved face many of the same barriers to healthcare access that telemedicine has already proven to successfully address in rural populations. Transportation, travel time, and a lack of linguistically and culturally trained health providers are a few of the overlapping challenges found in both rural and urban settings. Similar to the implementation of telemedicine in schools, community-based organizations have also initiated additional telemedicine programs to address the health needs of underserved populations in urban settings.

In 2003, the Promotora Telemedicine Project was launched in Santa Clara County where diabetes is the third leading cause of hospitalization and the sixth leading cause of death among all older adults in this area. The Promotora Telemedicine Project aimed to address the shortage of endocrinologists in the area, through real-time videoconferencing, to treat diabetic patients, the majority of whom were non-English speaking, uninsured Mexican immigrants in safety-net clinics.

The Project connects several of these clinics to the Endocrine Metabolic Medical Center in Redwood City, California. During videoconferencing sessions, patients assisted by promotoras, or Spanish-speaking community health workers, underwent intensive training in diabetes care to help patients comply with treatment regimens and to recognize early signs of complications. The use of promotoras helps ensure that doctors’ advice is culturally and medically appropriate, comprehensible and allows for best practice care.

A Closer Look at King Drew: Pioneers in Urban Telemedicine
The Los Angeles Urban Telemedicine Centers of Excellence (Drew Urban Telemedicine Program) is currently the only program in the nation that is serving a specific urban network. The program began in 1996 with five ophthalmologists at King/Drew Medical Center who were frustrated with patient waiting times of up to six months for ophthalmology appointments and wanted to find a better way of caring for 1.5 million people in South Central Los Angeles.

Dr. Richard Baker, one of the co-pioneers of the program, touted the benefits of TM in not only reducing health costs, but also delivering “culture specific” healthcare. He believes healthcare delivery can occur within the patient’s community to best ensure linguistically and culturally appropriate care and utilize existing alternative and traditional allopathic approaches within the community.

From 1996-2004, the program served over 12,000 patients while operating on a limited budget, and has significantly reduced patient waiting time from months, days, and in some cases, even hours. Although the program began with teleophthalmology, it is committed to expanding its service in other specialties such as cardiology, asthma/allergy, and dental.
Recommendations

INFRASTRUCTURE
The California Legislature should enact policy that supports broadband expansion.
Broadband expansion addresses both the digital divide, and gaps in health care access and health outcomes through telemedicine. The practice and success of telemedicine in underserved populations is contingent upon adequate telecommunications infrastructure. This ensures reliable, uninterrupted real-time transmission of patient data and delivery of health services that is comparable to in-person care. California legislation should require investment by telecommunication providers to address Internet congestion as interest and practice of telemedicine increases.

The California Legislature should establish a state agency level office responsible for coordinating and tracking telemedicine programs in both rural and urban areas.
Although a significant number of rural-based telemedicine programs are linked to major telemedicine/telehealth networks, i.e., UC Davis, Northern Sierra Rural Health Network, there is still a lack of coordination and transparency of all telemedicine hub and spoke sites that exist throughout the State. Such efforts could promote greater dialogue and mentoring among existing and prospective telemedicine providers, as well as identify areas of need where telemedicine can improve access to care.

WORKFORCE
The California Community Colleges should incorporate telemedicine education into existing allied health training programs.
Health care delivery depends on both trained physicians and allied health professionals—telemedicine is no different. Given the scope of health occupation programs offered through the California Community Colleges (CCC) system, including, but not limited to, Community Health Care Worker, Medical Laboratory Technician, and Registered Nurse, CCC could serve as a key player in supporting the inclusion of telemedicine within the current health care system as well as ensuring a sizable, adequately trained telemedicine workforce.

The American Medical Association should establish a centralized clearinghouse of training and funding opportunities in telemedicine.
These efforts may include telemedicine training opportunities by specialty, geographic area, or population of interest, and can also include webcast and webinar courses. This will reduce the inconvenience of tracking down opportunities to learn more about this innovation, thereby expanding the current and future workforce that is trained, or at least knowledgeable, of telemedicine.

The U.S. Department of Health and Human Services should establish a loan forgiveness program for health professionals delivering telemedicine.
This can serve as an extension of the Department’s current loan forgiveness program that encourages medical personnel to practice in Federally-designated health profession shortage areas (HPSAs). Although a majority of HPSAs are rural, the Department should make an effort to offer a loan repayment program as a means of bolstering telemedicine services in urban underserved communities.

FUNDING
Federal agencies and foundations should provide grants for research that evaluates the effectiveness of telemedicine.
A large amount of telemedicine-related funding, as noted in our discussion of telemedicine funding mechanisms, has been allocated towards providing services through this technology. In addition, most evidence supporting the use of telemedicine has been based on physician and patient feedback. Evaluation of telemedicine’s efficacy in improving health care access and outcomes while reducing costs can help overcome skepticism and increase physician buy-in.

Funders should provide assistance that promotes the expansion of the scope of specialty services offered through telemedicine.
Telemedicine has been more commonly used in dermatology, ophthalmology/optometry, psychiatry, and radiology. Funders should provide financial incentives to encourage the use of telemedicine in other specialties, as demonstrated by the VA and DoD, which includes, but not limited to, cardiology, pathology, and surgery.
Federal agencies and foundations should offer financial incentives to encourage residents at VA hospitals to practice telemedicine. This will work in tandem with current efforts to incorporate telemedicine in medical school curriculum, thereby establishing a telemedicine pipeline.

California Legislature should enact policy that encourages corporate citizenship in telemedicine. State policymakers should pass legislation that provides incentives for telecommunications, biotech, and technology industries to use a portion of profits made from telemedicine to establish a mini-grant program and support development and sustainability of telemedicine care in underserved areas.

Funders should offer grants that support the sustainability of telemedicine programs. Successful telemedicine programs are still in operation as a result of having reliable funding streams, whereas other programs cease once financial resources dry up. Philanthropy should communicate with current and prospective telemedicine providers to understand the importance of factors such as the duration of funding, in ensuring that telemedicine programs are sustainable and continue in the long-run.

The California Head Start Association (CHSA) should establish a mini-grant program that encourages school and community health centers to include telemedicine care in their services. The medical, dental, and mental health services already offered by Head Start programs can be expanded to reach a larger population of children facing barriers of time and distance, as has been demonstrated in other youth-centered telemedicine projects. CHSA financial support for developing telemedicine projects and/or serving as a spoke site for major hub i.e., UC Davis, Drew, can help Head Start programs meet their goals of addressing health care needs of children they serve.

REIMBURSEMENT
Public and private insurers should partner with The Center for Telehealth and eHealth Law to create a one-stop hub for telemedicine reimbursement policy. The current lack of clear and consistent reimbursement policy serves as a barrier to implementation and buy-in. The Center should act as a clearinghouse of information and operate as a resource for providers to easily verify reimbursement policies of different insurers.

Public and private insurers should include equipment purchase and staff training in telemedicine reimbursement. Medicare does not currently reimburse for purchase of equipment and staff training in telemedicine, which poses as a major barrier to adoption of this health innovation. Medi-Cal and to a lesser extent, private health insurers, have similar restrictions. This is problematic given that 44 million Americans, mostly seniors, are covered under Medicare and may not have access to the advantages, such as home telemonitoring, that telemedicine affords.

Medicare should revise its current reimbursement policies to cover urban telemedicine services. This will serve as an additional incentive for health providers to offer telemedicine care to underserved populations in metropolitan sites.

The U.S. Department of Health and Human Services should work with states to revise Title V, Medicare, Head Start and SCHIP (State Children’s Health Insurance Program) reimbursement policies to cover telemedicine services in maternal and child health. The shortage of pediatric subspecialists affects low-income children in both rural and urban areas. Given that the primary goal of the stated safety-net insurance programs is to increase health care access, the Department should include telemedicine in the reimbursement policies of the respective programs as a means of realizing their purpose. The recent expansion of SCHIP and passage of the Children’s Reauthorization Act of 2009 should be leveraged to attract health care workers to train and provide telemedicine services in child psychiatry, oral health, pediatrics, and other subspecialty care for children with special needs, e.g., autism.
Appendices

Appendix I: Federally Funded Telemedicine Agencies

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<thead>
<tr>
<th>Department</th>
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<tbody>
<tr>
<td>Department of Homeland Security</td>
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<tr>
<td>Department of Health and Human Services</td>
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<tr>
<td>Department of Defense</td>
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<tr>
<td>Department of Veterans Affairs</td>
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<tr>
<td>Department of Commerce</td>
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<td>Department of Agriculture</td>
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<td>Department of Energy</td>
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<td>Department of Justice</td>
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<td>Department of Interior</td>
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<td>Department of Education</td>
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<tr>
<td>Department of Labor</td>
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<tr>
<td>Department of State</td>
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<tr>
<td>Department of Transportation</td>
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Appendix II: List of Federally Funded Telemedicine Independent Agencies and Commissions

<table>
<thead>
<tr>
<th>Agency</th>
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<tbody>
<tr>
<td>National Aeronautics and Space Administration</td>
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<tr>
<td>National Science Foundation</td>
</tr>
<tr>
<td>Federal Communications Commission</td>
</tr>
<tr>
<td>Social Security Administration</td>
</tr>
<tr>
<td>Federal Trade Commission</td>
</tr>
<tr>
<td>Office of Personnel Management</td>
</tr>
<tr>
<td>Consumer Products Safety Commission</td>
</tr>
<tr>
<td>Appalachian Regional Commission</td>
</tr>
<tr>
<td>General Services Administration</td>
</tr>
<tr>
<td>Small Business Administration</td>
</tr>
<tr>
<td>US Agency for International Development</td>
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Appendix III: Qualitative Description of System Equipment

<table>
<thead>
<tr>
<th>Type of Equipment</th>
<th>Description</th>
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<tbody>
<tr>
<td>Document Scanners</td>
<td>Allows non-electronic patient data to be scanned into computer for electronic transmission</td>
</tr>
<tr>
<td>Live Document Camera</td>
<td>Similar to an overhead projector, capable of transmitting images, including x-rays</td>
</tr>
<tr>
<td>Digital Cameras</td>
<td>Captures high-resolution images for diagnosis and transmission to a consulting physician</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td>Incorporates multiple types of data ports and allows PC to serve as link to other data peripherals</td>
</tr>
<tr>
<td>Video Medical Scopes</td>
<td>Conveys greater amount of information than what is available with simple video conferencing and digital cameras</td>
</tr>
<tr>
<td>Electronic Stethoscope</td>
<td>Allows heart and lung sounds to be transmitted during a telehealth encounter</td>
</tr>
<tr>
<td>Headphones</td>
<td>Prevent violation of patient’s privacy; studio-quality with noise-canceling ability</td>
</tr>
<tr>
<td>Sound Equipment</td>
<td>Greater control over audio output of stethoscope systems and other types of sounds</td>
</tr>
<tr>
<td>Computers</td>
<td>Main apparatus to transmit and store information</td>
</tr>
<tr>
<td>Monitors</td>
<td>Display both computer and video conferencing data</td>
</tr>
<tr>
<td>Encryption Software</td>
<td>Ensure privacy and security of the telehealth encounter</td>
</tr>
<tr>
<td>Cables</td>
<td>Connect monitoring devices to a PC or video conferencing equipment</td>
</tr>
<tr>
<td>AV Cart</td>
<td>Store the computer, monitor, video conferencing equipment, and other devices</td>
</tr>
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### Appendix IV: Telemedicine System Components

<table>
<thead>
<tr>
<th>Type of Data Transmission</th>
<th>Store-and-Forward</th>
<th>Real-Time Video</th>
<th>Hybrid</th>
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<tbody>
<tr>
<td>Patient Textual Data</td>
<td>Document Scanner</td>
<td>N/A</td>
<td>Live Document Camera</td>
</tr>
<tr>
<td>Still Images</td>
<td>Digital Camera</td>
<td>N/A</td>
<td>Digital Camera</td>
</tr>
<tr>
<td>Live Images</td>
<td>N/A</td>
<td>Video Conferencing Video Medical Scope</td>
<td>Video Conferencing Video Medical Scope</td>
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<tr>
<td>Audio Data</td>
<td>N/A</td>
<td>Stethoscope Headphones Sound Equipment</td>
<td>Stethoscope Headphones Sound Equipment</td>
</tr>
<tr>
<td>Other</td>
<td>PC, Monitors, Encryption Software, Cables, AV Cart</td>
<td>PC, Monitors, Cables, AV Cart</td>
<td>PC, Monitors, Cables, AV Cart</td>
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</table>

### Appendix V: Costs for Low-, Mid-, and High-End Equipment

<table>
<thead>
<tr>
<th>Type of Data Transmission</th>
<th>Type of Equipment</th>
<th>Low</th>
<th>Mid</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Textual Data</td>
<td>Document Scanners</td>
<td>$99.99</td>
<td>$149.00</td>
<td>$349.99</td>
</tr>
<tr>
<td></td>
<td>Live Document Camera</td>
<td>$350.00</td>
<td>$577.00</td>
<td>$775.00</td>
</tr>
<tr>
<td>Still Images</td>
<td>Digital Cameras</td>
<td>$129.00</td>
<td>$249.99</td>
<td>$777.00</td>
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<tr>
<td>Live Images</td>
<td>Video Conferencing</td>
<td>$269.00</td>
<td>$1,404.00</td>
<td>$4,822.00</td>
</tr>
<tr>
<td></td>
<td>Video Medical Scopes</td>
<td>$826.00</td>
<td>$10,450.00</td>
<td>$13,855.00</td>
</tr>
<tr>
<td>Audio</td>
<td>Electronic Stethoscope</td>
<td>$199.00</td>
<td>$445.00</td>
<td>$2,695.00</td>
</tr>
<tr>
<td></td>
<td>Headphones</td>
<td>$19.99</td>
<td>$49.99</td>
<td>$349.00</td>
</tr>
<tr>
<td></td>
<td>Sound Equipment</td>
<td>N/A</td>
<td>N/A</td>
<td>$489.00</td>
</tr>
<tr>
<td>Other</td>
<td>Computers</td>
<td>$339.00</td>
<td>$538.00</td>
<td>$688.00</td>
</tr>
<tr>
<td></td>
<td>Monitors</td>
<td>$145.00</td>
<td>$277.50</td>
<td>$395.00</td>
</tr>
<tr>
<td></td>
<td>Encryption Software</td>
<td>$60.00</td>
<td>$60.00</td>
<td>$60.00</td>
</tr>
<tr>
<td></td>
<td>Cables</td>
<td>$74.00</td>
<td>$74.00</td>
<td>$74.00</td>
</tr>
<tr>
<td></td>
<td>AV Cart</td>
<td>$129.00</td>
<td>$129.00</td>
<td>$129.00</td>
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</table>
## Appendix VI: Installation Duration and Technician Fee

<table>
<thead>
<tr>
<th></th>
<th>Duration</th>
<th>Technician Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-End</td>
<td>Half-Day</td>
<td>$500</td>
</tr>
<tr>
<td>Mid-Range</td>
<td>One Day</td>
<td>$1,000</td>
</tr>
<tr>
<td>High-End</td>
<td>Two Days</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

## Appendix V: Costs for Low-, Mid-, and High-End Equipment

<table>
<thead>
<tr>
<th>Level of Equipment</th>
<th>Low</th>
<th>Mid</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purchase and Installation Fees</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store-and-Forward (Level IIa)</td>
<td>$976</td>
<td>$1,528</td>
<td>$2,452</td>
</tr>
<tr>
<td>Real-Time Video (Level IIb)</td>
<td>$1,991</td>
<td>$13,339</td>
<td>$23,052</td>
</tr>
<tr>
<td>Hybrid (Level III)</td>
<td>$2,470</td>
<td>$14,171</td>
<td>$24,594</td>
</tr>
<tr>
<td>Installation Costs</td>
<td>$500</td>
<td>$1,000</td>
<td>$2,000</td>
</tr>
<tr>
<td><strong>Annual Maintenance Costs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store-and-Forward (Level IIa)</td>
<td>$195</td>
<td>$306</td>
<td>$490</td>
</tr>
<tr>
<td>Real-Time Video (Level IIb)</td>
<td>$398</td>
<td>$2,670</td>
<td>$4,614</td>
</tr>
<tr>
<td>Hybrid (Level III)</td>
<td>$494</td>
<td>$2,832</td>
<td>$4,919</td>
</tr>
<tr>
<td><strong>Total Expenditures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Store-and-Forward (Level IIa)</td>
<td>$1,671</td>
<td>$2,834</td>
<td>$4,942</td>
</tr>
<tr>
<td>Real-Time Video (Level IIb)</td>
<td>$2,889</td>
<td>$17,009</td>
<td>$29,666</td>
</tr>
<tr>
<td>Hybrid (Level III)</td>
<td>$3,464</td>
<td>$18,003</td>
<td>$31,513</td>
</tr>
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</table>
## Appendix VIII: Studies Measuring Change in Physician Visits with Telemedicine

<table>
<thead>
<tr>
<th>Authors</th>
<th>Intervention</th>
<th>Disease Groups</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleland et al. (2005)</td>
<td>Physiological monitoring, telephone visits</td>
<td>Heart disease</td>
<td>Office visits increased by 71%</td>
</tr>
<tr>
<td>Johnston et al. (2000)</td>
<td>Video visits</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Outpatient costs (including ER visits) increased by 12%</td>
</tr>
<tr>
<td>Meyer, Cobb, and Ryan (2002)</td>
<td>Physiological monitoring, video visits, messaging</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>20% fewer visits relative to control</td>
</tr>
<tr>
<td>Noel et al. (2004)</td>
<td>Physiological monitoring, remote wound camera</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>10% more visits relative to control</td>
</tr>
<tr>
<td>Trappenberg et al. (2008)</td>
<td>Remote messaging</td>
<td>Lung disease</td>
<td>17% fewer outpatient visits relative to control</td>
</tr>
</tbody>
</table>

## Appendix IX: Studies Measuring Change in Emergency Room Visits with Telemedicine

<table>
<thead>
<tr>
<th>Authors</th>
<th>Intervention</th>
<th>Disease Groups</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johnston et al. (2000)</td>
<td>Video visits</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Outpatient costs (including ER visits) increased by 12%</td>
</tr>
<tr>
<td>Meyer, Cobb, and Ryan (2002)</td>
<td>Physiological monitoring, video visits, messaging</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced ER visits by 29% vs. control.</td>
</tr>
<tr>
<td>Noel et al. (2004)</td>
<td>Physiological monitoring, remote wound camera</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced ER visits by 19% vs. control</td>
</tr>
<tr>
<td>Rees and Bashshur (2007)</td>
<td>Wound camera</td>
<td>Chronic wounds</td>
<td>Reduced ER visits by 59% vs. control</td>
</tr>
<tr>
<td>Strategic Healthcare Programs, LLC (2004)</td>
<td>Physiological monitoring</td>
<td>Heart disease, lung disease, diabetes</td>
<td>Reduced ER visits by 49% for CHF patients, 66% for COPD patients, and 83% for diabetes patients</td>
</tr>
</tbody>
</table>
## Appendix X: Studies Measuring Change in Hospitalization and Bed Days of Care (BDOC) with Telemedicine

<table>
<thead>
<tr>
<th>Authors</th>
<th>Intervention</th>
<th>Disease Groups</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleland et al. (2005)</td>
<td>Physiological monitoring, telephone visits</td>
<td>Heart disease</td>
<td>Reduced BDOC by 20% vs. control.</td>
</tr>
<tr>
<td>Dansky et al. (2001)</td>
<td>Video visits</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced hospitalizations by 64% vs. control</td>
</tr>
<tr>
<td>Finkelstein et al. (2006)</td>
<td>Physiological monitoring, video visits</td>
<td>Heart disease, lung disease, chronic wounds</td>
<td>Hospital and nursing home admissions reduced by 58% vs. control</td>
</tr>
<tr>
<td>Johnston et al. (2000)</td>
<td>Video visits</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced hospitalization expenses by 44% vs. control</td>
</tr>
<tr>
<td>Meyer, Cobb, and Ryan (2002)</td>
<td>Physiological monitoring, video visits, messaging</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced BDOC by 52% vs. control.</td>
</tr>
<tr>
<td>Montefiore Care Connect (interview, 2008)</td>
<td>Physiological monitoring, telephone visits, messaging</td>
<td>Heart disease, lung disease, diabetes</td>
<td>Reduced hospitalization and ER costs by 40%</td>
</tr>
<tr>
<td>Noel et al. (2004)</td>
<td>Physiological monitoring, remote wound camera</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced BDOC by 19% vs. control</td>
</tr>
<tr>
<td>Rees and Bashshur (2007)</td>
<td>Remote wound camera</td>
<td>Chronic wounds</td>
<td>Reduced BDOC by 45% vs. control</td>
</tr>
<tr>
<td>Strategic Healthcare Programs, LLC (2004)</td>
<td>Physiological monitoring</td>
<td>Heart disease, lung disease, diabetes</td>
<td>Reduced hospitalizations by 39% for CHF patients, 51% for COPD patients, 75% for diabetes patients</td>
</tr>
<tr>
<td>Trappenburg et al. (2008)</td>
<td>Remote messaging</td>
<td>Lung disease</td>
<td>Reduced hospitalization by 41% vs. control</td>
</tr>
</tbody>
</table>
Appendix XI: Studies Measuring Change in Nursing Home Admissions and Bed Days of Care (BDOC) with Telemedicine

<table>
<thead>
<tr>
<th>Authors</th>
<th>Intervention</th>
<th>Disease Groups</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finkelstein et al. (2006)</td>
<td>Physiological monitoring, video visits</td>
<td>Heart disease, lung disease, chronic wounds</td>
<td>Hospital and nursing home admissions reduced by 58% vs. control</td>
</tr>
<tr>
<td>Meyer, Cobb, and Ryan (2002)</td>
<td>Physiological monitoring, video visits, messaging</td>
<td>Heart disease, lung disease, diabetes, chronic wounds</td>
<td>Reduced nursing home BDOC by 68% vs. control.</td>
</tr>
</tbody>
</table>

Appendix XII: Healthcare Resource Utilization and Potential Annual Expenses and Savings with Telemedicine

<table>
<thead>
<tr>
<th>Primary Chronic Condition/Disease</th>
<th>Diabetes</th>
<th>Congestive Heart Failure</th>
<th>Chronic Obstructive Pulmonary Disease</th>
<th>Chronic Skin Ulcer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Potential Annual Expenses</td>
<td>($3.8 billion)</td>
<td>($2.8 billion)</td>
<td>($3.4 billion)</td>
<td>($0.1 billion)</td>
</tr>
<tr>
<td>Total Potential Annual Savings</td>
<td>$6.1 billion</td>
<td>$10.1 billion</td>
<td>$4.9 billion</td>
<td>$1.1 billion</td>
</tr>
<tr>
<td>Potential Annual Savings Breakdown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emergency Room Use</td>
<td>$0.1 billion</td>
<td>$50 million</td>
<td>$0.2 billion</td>
<td>$5 million</td>
</tr>
<tr>
<td>Hospitalizations</td>
<td>$3.5 billion</td>
<td>$7.4 billion</td>
<td>$2.9 billion</td>
<td>$800 million</td>
</tr>
<tr>
<td>Nursing Home Admissions</td>
<td>$2.5 billion</td>
<td>$2.7 billion</td>
<td>$1.8 billion</td>
<td>$270 million</td>
</tr>
<tr>
<td>Annual Net Savings</td>
<td>$2.3 billion</td>
<td>$7.3 billion</td>
<td>$1.5 billion</td>
<td>$1.0 billion</td>
</tr>
<tr>
<td>Total Net Potential Annual Savings: $12.1 billion</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

Appendix XIII: Lower-End Estimates of Initial Costs for Indian Health Program

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>$28,000</td>
<td>Hospital and nursing home admissions reduced by 58% vs. control</td>
</tr>
<tr>
<td>Training</td>
<td>$3,300</td>
<td>Reduced nursing home BDOC by 68% vs. control.</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$31,300</td>
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</tbody>
</table>
### Appendix XIV: Lower-End Estimates of Annual Maintenance Fees

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>$1,040</td>
</tr>
<tr>
<td>Technical Support</td>
<td>$540</td>
</tr>
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</table>

**Total Annual Maintenance Cost**

$1,580

### Appendix XIV: Lower-End Estimates of Annual Maintenance Fees

<table>
<thead>
<tr>
<th>Sector</th>
<th>Members</th>
</tr>
</thead>
</table>
| Government | California Business, Transportation & Housing Agency  
City of Mountain View  
California Public Utilities Commission  
Senate Energy, Utilities & Communications Committee  
Assembly Utilities & Commerce Committee  
TechConnect, Dept. of Telecom. & Information Services, City & County of San Francisco |
| Private    | Cisco  
Cox Communications  
AT&T West  
8x8, Inc.  
Verizon West-Region  
M2Z Networks  
Hughes Network System  
Humboldt Area Foundation |
| Academic   | School of Information & Computer Sciences, University of California, Irvine  
Humboldt State University  
California Institute for Telecommunications & Information Technology  
University of Southern California |
| Non-Profit | Metro Area Advisory Committee Project  
Children's Partnership  
California Emerging Technology Fund |
References

2. Ibid.
5. Ibid.
6. Ibid.
7. Ibid.
8. California Telemedicine and eHealth Center, see supra note 1.
10. Ibid.
11. California Telemedicine and eHealth Center, see supra note 1.
12. Ibid.
20. Ibid.
21. Ibid.
22. Vega and Amaro 15, 39-67, see supra note 18.
23. House and Williams, see supra note 19.
25. Hofrichter, see supra note 13.
27. Ibid.
28. Ibid.
30. Ibid.
31. California Telemedicine and eHealth Center, see supra note 1.
33. Ibid.
34. Ibid.
35. McConville and Lee, see supra note 26.
39. Ibid.
40. Ibid.
41. Ibid.
42. Ibid.
44. Ibid.
45. Ibid.
47. Ibid.
48. Johnston and Solomon, see supra note 4.
54. Johnston and Solomon., see supra note 4.
58. Johnston and Solomon, see supra note 4.
59. Ibid.
63. California Telemedicine and eHealth Center, see supra note 1.
65. Johnston and Solomon, see supra note 4.


68. The role of CMS in telemedicine funding is discussed in greater detail in the reimbursement section.


70. Johnston and Solomon, see supra note 4.


73. Ibid.

75. Christine Martin, Executive Director and Irene Alvarez, Program Manager of CTEC, Personal interview, 8 Oct 2008.


77. Ibid., 56.
78. Ibid., 102.
79. Ibid., 56.
80. Ibid., 57.


84. Ibid.
85. Ibid.
86. Ibid.
87. Ibid.

89. Ibid., 64.
90. Ibid., 60.
91. Ibid.
92. Ibid.
93. These facilities include UCLA, UCR, and Drew University of Medicine and Sciences.


96. These hospitals include: Los Angeles County – USC Medical Center, Harbor – UCLA Medical Center, and Olive View – UCLA Medical Centers.

98. Ibid.


101. Ibid.


103. Ibid.


107. Litan, see supra note 83.


112. See section on telemedicine-related legislation in California for description of AB 354.


114. “Care Delivery: Diabetes Retinopathy Screening,”


121. Center for Information Technology Leadership 56. Note: CITL already assumes the use of phone, email, and fax (Levels 0 and 1) to be included in these three categories of telemedicine.

122. Hybrid telemedicine integrates both store-and-forward and real-time video technologies.

123. Center for Information Technology Leadership 102, see supra note 120.

124. Ibid., 56.

125. Ibid.

126. Litan, see supra note 83.

127. Ibid.

128. The author did not provide an explanation for the increase in outpatient/ER costs.

129. Litan, see supra note 83.

130. Ibid.
131. Ibid. Note: Information on emergency room visits, hospitalizations, and nursing home admissions are taken from 2004 to 2007, all costs are adjusted to 2008.

132. Ibid. Note: The cited studies show there would be a 30% decrease in emergency room use, mean reduction of 49% diabetes-related hospitalization expenses and bed days of care (BDOC), and 63% of patients in nursing homes could avoid nursing home care with telemedicine.

133. Ibid. Note: The cited studies indicate a 33% decrease in emergency room use, 42% reduction in hospitalization expenses and BDOC, and 63% avoidance of nursing home admissions as a result of telemedicine.

134. Ibid. Note: Based on an estimated 33% decrease in emergency room use, 46% reduction in hospitalization, and 63% of patients could avoid nursing home care with telemedicine.

135. Ibid. Note: The studies show a 33% average decrease in emergency room use, 47% mean reduction in hospitalization expenses, and 63% avoidance of nursing home admissions as a result of telemedicine.

136. Ibid. Note: The author estimated the average annual cost of $1000 per patient, which would be the equivalent of $2500 for a middle-of-the-road telemonitoring system, including maintenance over 5 years. The estimated number of patients for 2008 is based on the number of patients of the four chronic diseases/conditions noted in the 2006 National Center for Health Statistics.

137. Quade 64, see supra note 88.

138. Ibid., 65.

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