Digital Inclusion in San Francisco

Thomas Berman
Matthew Case
Joshua Daniels
Mara Larsen-Fleming
Sun Ha Lee

June 2007

Goldman School of Public Policy
University of California, Berkeley
in collaboration with the San Francisco Department of
Telecommunications and Information Services

TABLE OF CONTENTS

I. INTRODUCTION – FRAMING THE DIGITAL DIVIDE

II. MAGNITUDE AND SCOPE OF DIGITAL DIVIDE

III. CURRENT STATE DIGITAL INCLUSION EFFORTS IN SF

IV. GAPS ANALYSIS (GIS MAPPING)

V. PROGRAMMING TRADEOFFS

VI. RECOMMENDATIONS

VII. BENCHMARKS FOR SUCCESS

VIII. SUGGESTIONS FOR FURTHER RESEARCH/ANALYSIS

APPENDIX A – MAPPING OF HOME & INTERNET ACCESS IN SAN FRANCISCO

APPENDIX B – MAPPING FOR GAPS ANALYSIS

APPENDIX C - FOCUS GROUP PROTOCOL & RESULTS

APPENDIX D – SCHOOL COMPUTER DATA

APPENDIX E – LIBRARY COMPUTER DATA

APPENDIX F – BINARY REGRESSION MODELS ON HOME USE

Executive Summary:

The digital divide is defined as the inequity of technology use by certain populations, often including low-income, African-American, Latino, Asian, and immigrant communities. This divide persists because of lower levels of access, skills and knowledge about computers and the Internet. This is problematic, because as an increasing proportion of economic, social, and government activities move online, many people in these communities are less able to experience the educational, workforce, and civic benefits of digital technology.

Based on the 2007 San Francisco City Survey, focus groups with residents from disadvantaged communities, interviews with key San Francisco stakeholders, and review of nationwide trends, we find that a digital divide does exist in San Francisco. According to the 2007 survey, low-income, elderly, and Latino residents, as well as those living in Bayview/ Hunters Point, Crocker Amazon, Chinatown, Civic Center, and Visitacion Valley neighborhoods report substantially lower levels of home computer and internet usage.

Digital inclusion efforts by public and non-profit organizations, such as schools, libraries, Community Technology Programs, and the city's Department of Telecommunications and Information Services, currently exist to close the digital divide. Despite these efforts, gaps remain in the City of San Francisco. Using GIS mapping, we found gaps for Community Technology Programs and a wide range of technology resources for schools and libraries in those neighborhoods where home computer and internet usage was low. The scarcity of public technology resources is problematic because residents in these low home usage areas will turn to public access and training programs for their technology needs.

Our recommendations include grant-making for Community Technology Programs, direct funding for city institutions to increase technology resources at schools and libraries, collaborative oversight that brings stakeholders together. The city should also serve as a coordinating clearinghouse for information and resources, keeping in mind that providers and end-users have very different information and resource needs. Finally, it is imperative that the city develop benchmarks for success to measure progress as it rolls out new programming.

I. INTRODUCTION – FRAMING THE DIGITAL DIVIDE

Personal computers and Internet access are required for full participation in the Information Age. Increasingly, information technology is the medium through which people operate in the labor market, express their creativity, and inform their civic participation. However, significant costs are associated with technology use. Individuals must spend time, money, and effort in order to access the Internet and educate themselves about new hardware devices or software programs. Given these costs, along with the accelerating integration of information technology into daily life, income inequality and poverty have produced a "digital divide." This "divide" is defined as inequities in the use of computers and access to the Internet. Across the United States, there are many underserved communities that are consistently unable to experience the benefits of technology that the rest of the nation enjoys. This is more than an inequitable distribution of technology resources: the divide results in a dearth of learning opportunities that are critical for developing computer and internet skills. Accordingly, the digital divide encompasses not only issues of access and ownership of digital technology, but also the skills and knowledge associated with using it.

This divide produces significant difficulties in many communities. For example, youth growing up in digitally underserved neighborhoods face serious disadvantages when it comes to accessing and learning about technology. Small businesses in these communities compete at a disadvantage due to their lack of access to the Internet - they are unable to reap the benefits of e-commerce and other internet-driven efficiencies. Low-income job seekers may not have the adequate knowledge and skills about digital technology to compete for higher paying job opportunities. Furthermore, the growing gap between wealth and poverty will make the digital divide increasingly worse. This creates a vicious cycle, as the digital divide itself exacerbates income inequality by denying opportunities to the people who need them most. This is the fundamental problem: as an increasing proportion of economic and social activity moves online, low-income Americans have disproportionately lower technology access and computer literacy, which presents barriers to experiencing the educational, workforce, and civic benefits of digital technology.

In response to this issue, governments and community-based organizations are seeking to create "digital inclusion" initiatives. By instituting training programs and providing low-cost access to computers and the Internet, these efforts intend to alleviate the digital divide by giving the underserved the technology, the Internet access, and the training they need to get connected. San Francisco is one of the world's hubs of high-tech development. Given the city's unique resources, technological expertise, and socioeconomic diversity, it is a natural place to test new strategies and programs

designed to foster digital inclusion. In San Francisco, citywide digital inclusion efforts are administered by SF TechConnect, an initiative of the city's Department of Telecommunications and Information Services (DTIS), which was formed in 1996 to centralize the City's IT infrastructure and support and provide policy guidance on technology issues. In January 2007, SF TechConnect's Digital Inclusion Task Force published a Digital Inclusion Strategy that emphasizes four main programmatic foci: 1) (Internet) Access, 2) Hardware Access, 3) Education and Training, and 4) Content and Other Services.

However, to address San Francisco's digital divide, we must frame the specific nature of technological inequality in the city. First, we seek to identify what demographic and geographic digital divides exist in the city. Then, we determine what public programs and resources are addressing these divides and if these programs are sufficiently closing the gaps. Finally, we make recommendations about what further digital inclusions efforts the city should pursue.

Impact of the Digital Divide

It is clear that digital technology is extremely beneficial to individuals and communities. We will keep a few key benefits in mind in order to inform our research: workforce development, education, and civic participation.

Workforce development is an important issue for any large city. The San Francisco Bay Area is often described as a hub of innovation in the information and biotechnology fields. San Francisco enjoys great economic benefits from being a creative city where an educated class versed in digital technology can generate new ideas and products (Chan 2007). Having maintaining a supply of tech savvy workers will be critical for maintaining San Francisco's status as a creative city. Further, digital inclusion will allow residents from disadvantaged communities to compete in the Bay Area's labor market and reap greater benefits from San Francisco's growing knowledge industries. Prior research has demonstrated that hourly wages are positively associated with both computer and Internet use (Freeman 2002). Finally, the low cost of spreading information over the Internet has implications for job search process and administering services. Job advertising through web sites such as Craiglist.org and Monster.com is more widespread. However, while this provides significant cost saving for business, prospective workers without access miss out on many of the city's available jobs.

Education is another critical issue related to digital inclusion. Once an individual is able to use computers and the Internet effectively, he or she can use these skills to enhance learning in any subject (Pew Internet and the American Life Project 2001). This is true

of children and adults alike. Technology not only empowers students to conduct research and compose papers more easily, it also provides unlimited possibilities for informal learning through the Web. Indeed, recent research shows that children and teens with a computer and Internet at home are more likely to stay in school, earn better grades and graduate from high school (SF Digital Inclusion Strategy 2007). Also, several other services, such as college applications, are now online. Colleges now discourage paper applications, and their web-based applications offer other services, such as spell checking and alerts for incomplete sections. Not completing a college application online may put a college applicant at a disadvantage during the admissions process.

Information technology can also promote better government and civic engagement in a well-connected (and equitably-connected) city (Mossberger et al 2003 and 2005). For example, many government services could be provided more efficiently if they were conducted over the Internet, and the Internet is especially well positioned to redefine the way citizens interact with government. This report will not explore these possibilities in-depth, but they are important to mention as an exciting potential benefit of digital inclusion.

II. MAGNITUDE AND SCOPE OF DIGITAL DIVIDE

Personal Access at Home

The digital divide can be characterized by gaps in personal access to computers and internet at home. Income, age, education, race, and geography are important factors in explaining who is connected at home. Previous studies of home pc and internet access in San Francisco suggest these divides are present in the city (SF Controller's Office 1998; 2002), and that such gaps may be larger in San Francisco than other cities in California and other states (Chan 2007).

The 2007 San Francisco City Survey conducted by the Controller's Office collected data on home pc and internet access from over 3000 San Franciscans. The survey indicates that a personal access divide still exists today. While average home computer and Internet use in San Francisco is relatively high overall, estimated at about 81.4% and 78.6% respectively, access to computers and internet at home varies widely across individual's age, income, education, age, race/ethnicity and location[1]. The following will examine the gaps along each of these dimensions. However, because of the high correlation between these socio-economic variables, we will specify binary regression

[1] The survey data did not ask about the type of internet access used at home (dial-up, DSL, Cable, etc). Recent figures from a regional survey found that among home pc users, 98% had internet access at home. 21% reported having Cable internet, 61% DSL, and 11% Dial-up (Bay Area Council 2007).

models using the dprobit command to predict the effect of each variable on the home internet and pc use (see tables in Appendix F). These models control for these and other factors measured in the survey that may impact home access, including gender, employment status, and household size and composition. Most of our analysis deals with home internet access, but the results are similar for home pc use. We find that even while controlling for socioeconomic factors, location (district/neighborhood) is still a strong predictor of home use independent of other factors. We believe that recognizing the geographic deficits in technology use and access with inform the City's design, targeting, and implementation of digital inclusion programming.

Income

According to the 2007 survey, home access rates are substantially below average for San Franciscans that earn less than $10,000 per year and $25,000 per year. Even controlling for other factors such as age, gender, education, and supervisorial district, differences in income explain a great deal of the variation in home access. Compared to San Franciscans earning slightly more ($25,000-$50,000/year), those earning less than $10,000 are 17% less likely to have home internet access. Targeting affordable hardware and internet access for low-income families based on income eligibility is possible through the San Francisco Working Families Credit. A major aim of digital inclusion should be to increase demand for technology by reducing the costs of computers and internet service and the costs of time spent learning how to use these tools.

Figure 1. PC Home Use by Income Group

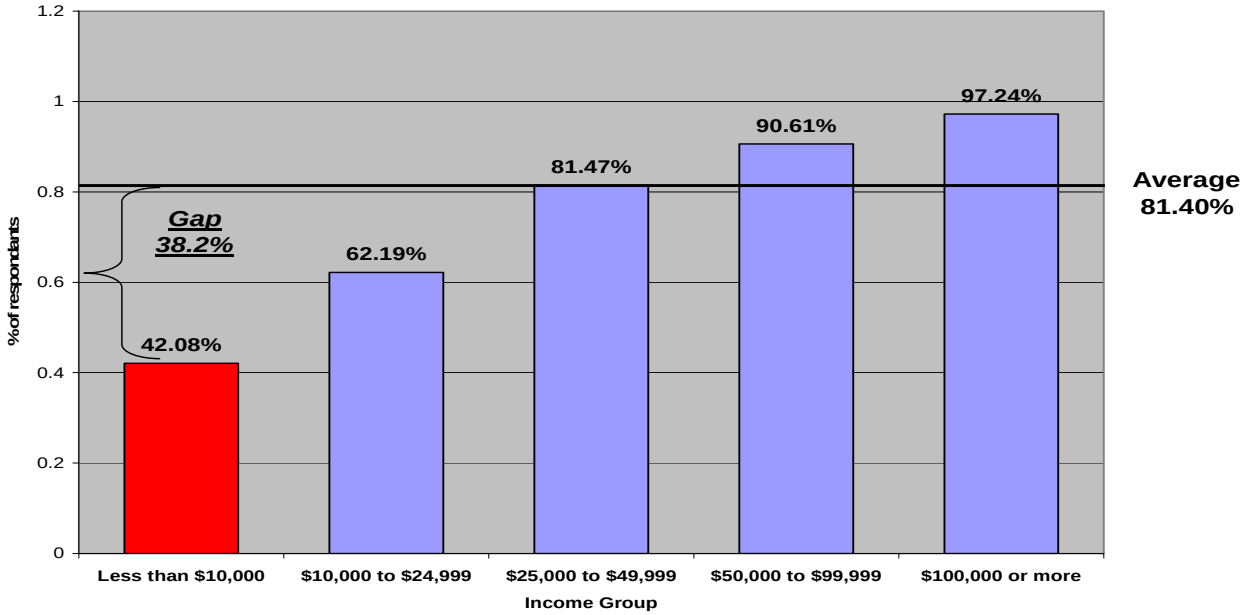
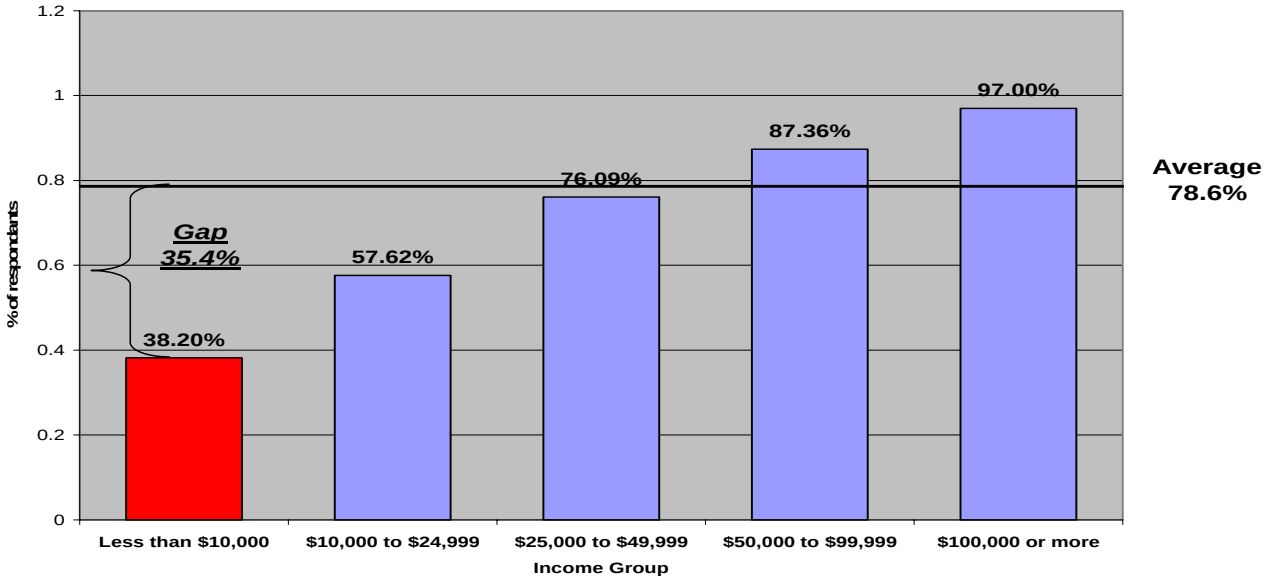


Figure 2. Home Internet Use by Income Group



Source: SF Controller's Office, 2007 City Survey

Age

Residents aged 30-44 are most likely to have pc (93.6%) and internet access at home (91.4%), with residents 75 and older reporting the lowest access across age groups (pc=43.9% internet=38.1%). Differences in average home access across all other age groups are statistically significantly different, but the substantive differences are much smaller.

The access divide among the oldest San Franciscans (75+ years) is larger than the "income divide," however the older population may be more difficult for the city to target directly through digital inclusion programming. Of those aged 65 years and older in San Francisco in single family dwellings, 65.0% (or 13,364) own their home and 35.0% (or 7,193) rent (Census 2005). However, there are 105,176 San Francisco residents reported to be 65 years and older (Census 2005), and a high proportion of this 84,542-person difference is likely to live in senior housing, skilled nursing facilities, and other housing communities not included in the 2005 American community survey. The large number of seniors residing in senior housing will likely have different accessibility barriers than those who live in single family units housing. For this reason, it would be useful to assess the extent of internet-accessible computers and the availability of classes for elders on using computers and the internet in different venues throughout San Francisco.

Figure 3. PC Home Use by Age

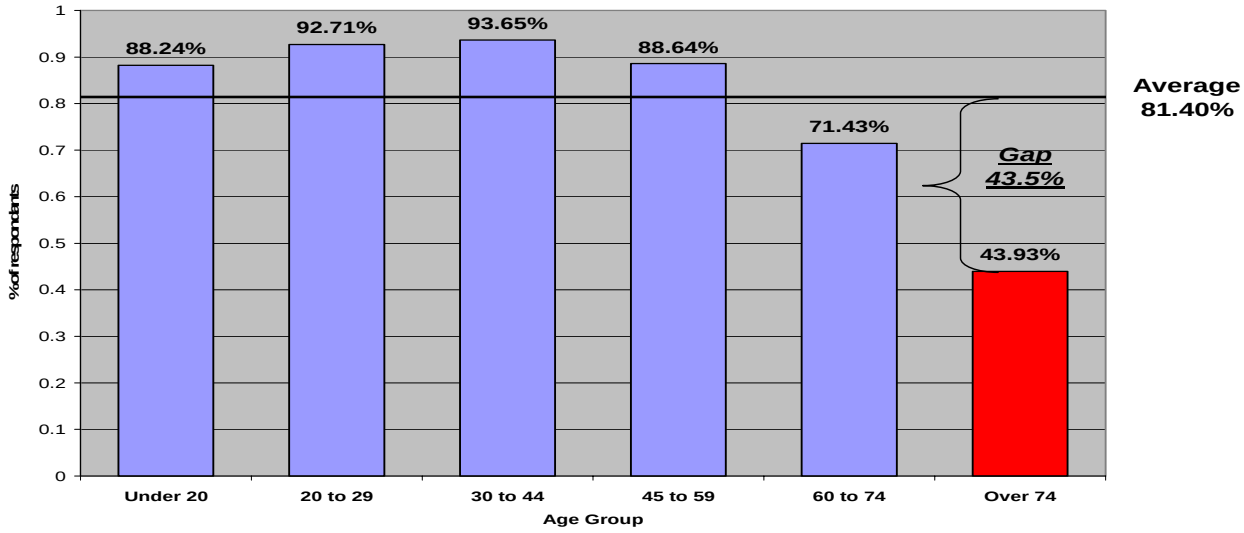
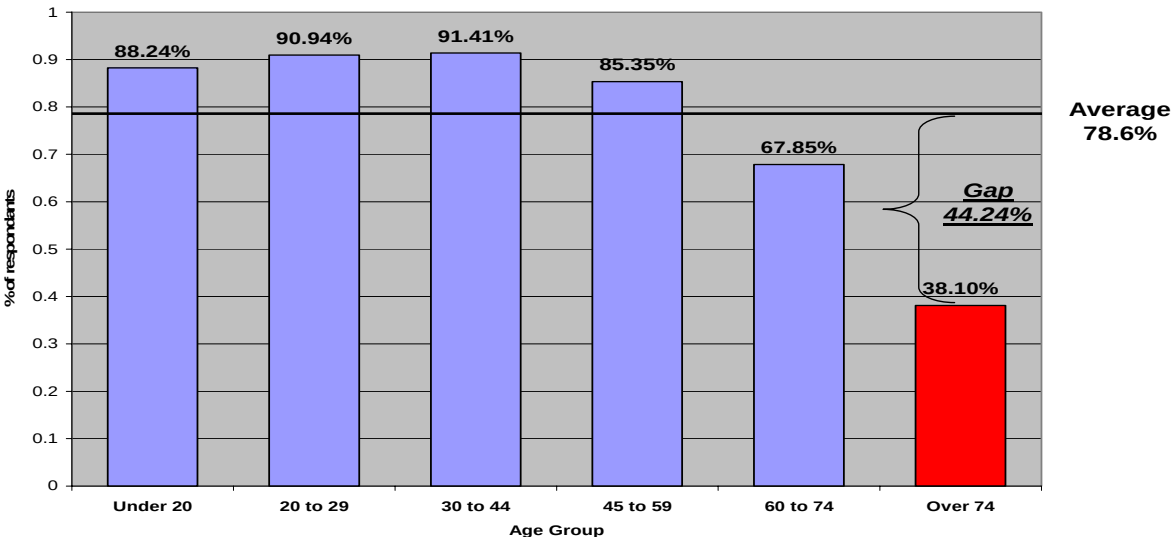


Figure 4. Home Internet Use by Age.



Source: SF Controller's Office, 2007 City Survey

Education

The home access gap is also large between college graduates, high school graduates and those who have not completed high school. Looking at use among high school completers, the proportional gap is 5% larger on internet use than pc ownership (26.1% vs. 31.1%). This result also holds in the regression analysis. The model predicts that those with a college degree are 19% more likely to have internet access at home and 15.7% more likely to use a pc from home than those without a high school degree.

Figure 5. PC Home Use by Education

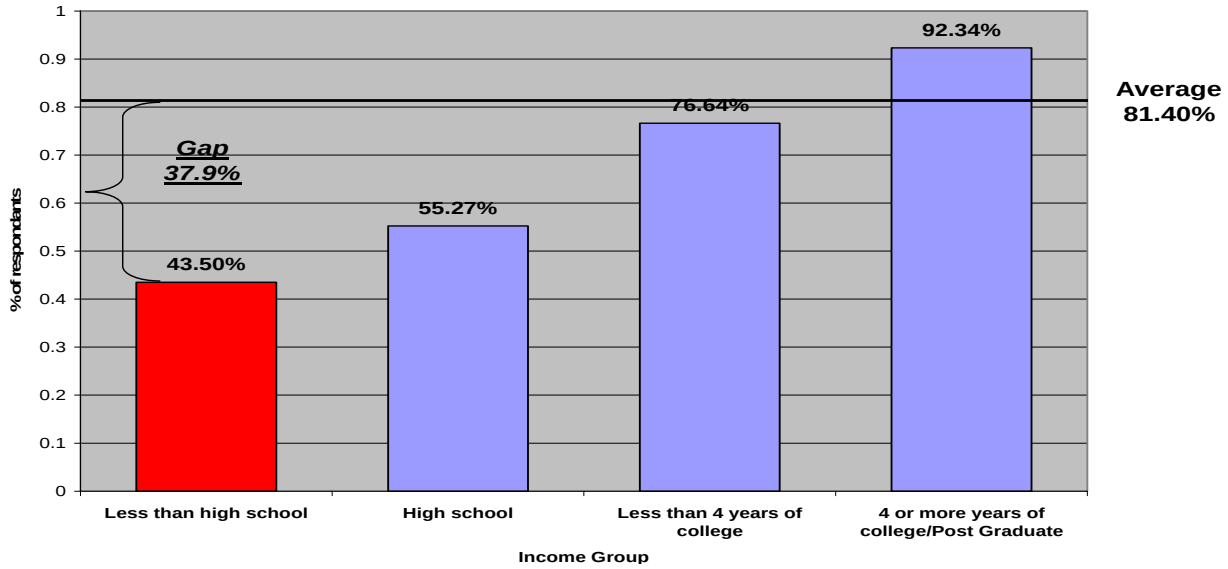
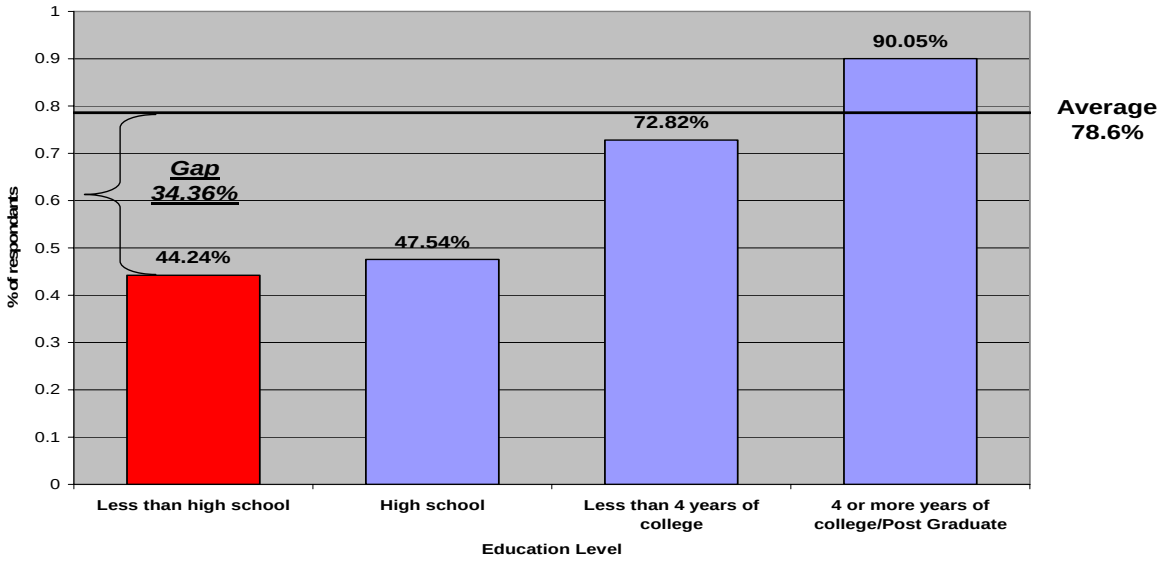


Figure 6. Home Internet Use by Education



Source: SF Controller's Office, 2007 City Survey

Race/Ethnicity

Whites report greater home pc and internet use than African-Americans, Latinos, and Asian-Americans, but the gaps based on race were relatively smaller than other socioeconomic variables, such as income and education. The largest gap is between Whites and Latinos, and there is evidence that this gap is growing. A major finding of the Controller's report was that whites were 3.9 times more likely to have internet access at home than Latinos, controlling for location, age, and education. This represents an increase since 1998, when whites were only 1.8 times as likely as Latinos

to be online (SF Controller's Office 2007). Whites were 2.1 times more likely than African-Americans to have home internet access in both 1998 and 2007. However, controlling for other factors such as income, race does not appear to be contributing to lower levels of home access for African Americans. Latinos, however, have significantly lower access across all of the models we estimated. Other studies confirm these trends in Latino access and use at the national level (Fox and Livingstone 2007). The findings for Asian Americans/Pacific Islanders are less conclusive, and the results are sensitive to regression specification. In the two models we used to predict home internet access, Asians were 3%-4% less likely than comparable whites to have internet access at home (See Appendix F).

Related to gaps between whites versus Asians and Hispanics is being an immigrant and/or non-English speaker. In San Francisco, a significant portion of the population are monolingual Spanish and Chinese speakers For those San Franciscans 5 years and older, 46% (or 312,412) speak a language other than English at home according to the 2005 American Community Survey. A Pew study found that English language proficiency among Latinos was a major determinant of technology use nationwide (Pew Internet & American Life Project 2007). While conducted in both Spanish and Chinese, the City Survey did not include enough of observations among these populations to generalize to these groups. There is some national data to show that immigrants and non-English speakers face unique barriers to computer and internet use, possibly as a result of language barriers, though country of origin and higher rates of use in those countries are correlated with higher use in the US (Center for Justice 2006).

Figure 7. PC Home Use by Race/Ethnicity

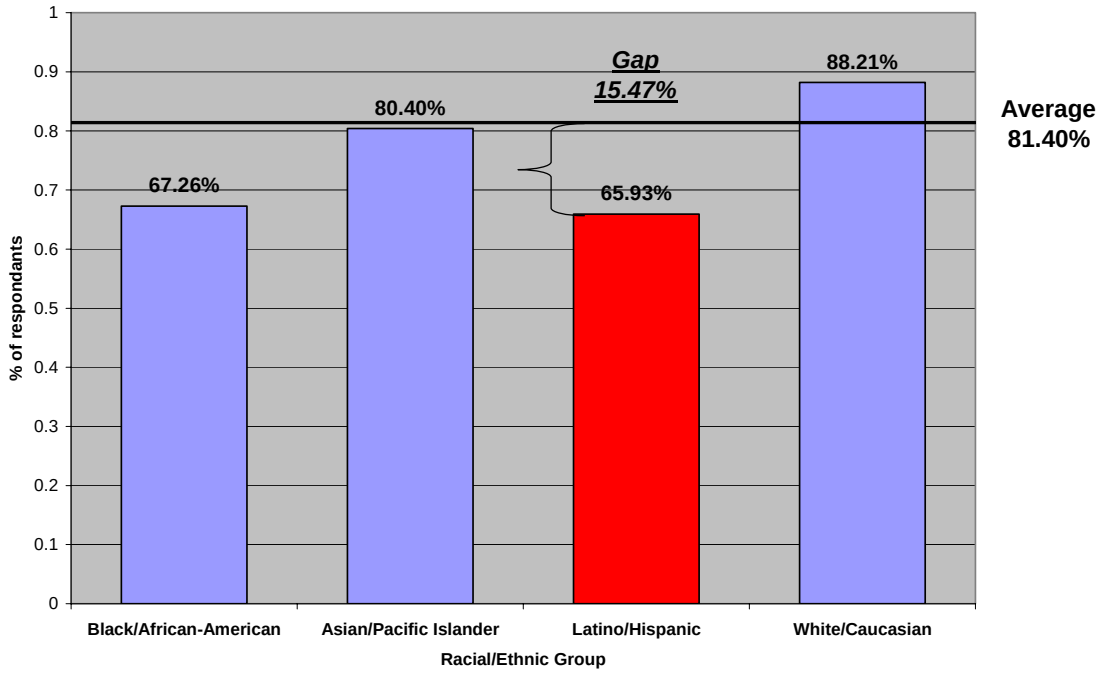
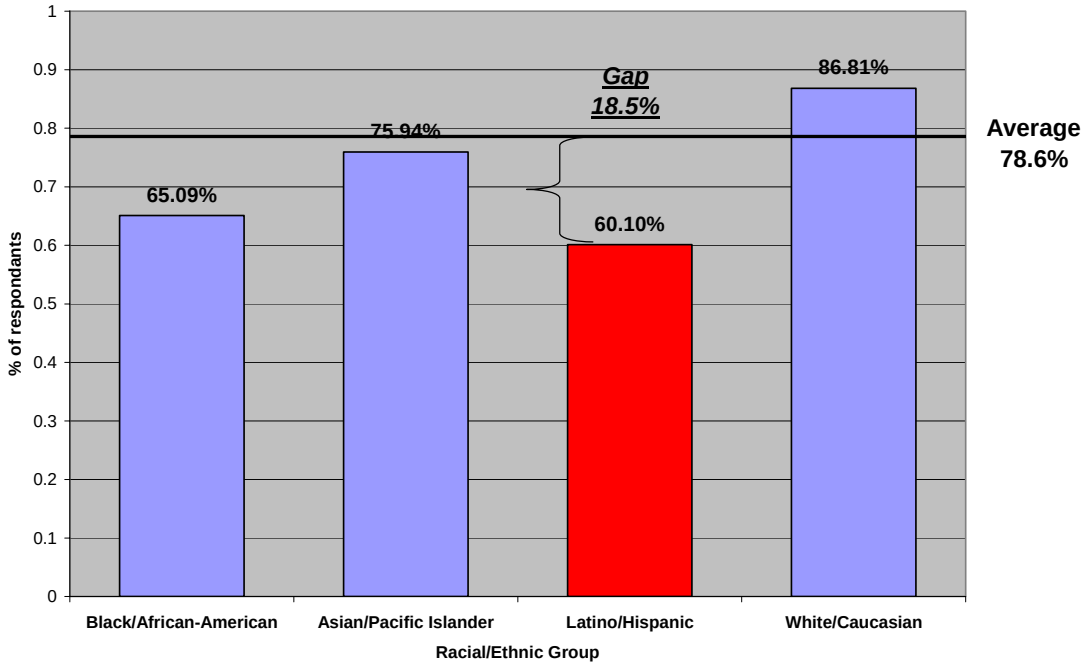


Figure 8. Home Internet Use by Race/Ethnicity



Source: SF Controller's Office, 2007 City Survey

Location

Research on the digital divide that has focused on low-income communities has also found the significant role that place plays in who is "connected" and who is "disconnected" (K. Mossberger, Tolbert, & Gilbert, 2006). A recent study of geographic distribution of technology access and community perceptions in Los Angeles County found a great number of communities suffer from inadequate access to technology (Modarres and Pitkin 2006). Similarly, our analysis also considers the trends across location and utilizes Geographic Information Systems (GIS) to map San Francisco neighborhoods to assess the variation in home use reported in the 2007 San Francisco City Survey (See Appendix A).

Gaps in access at home vary by location and geographic unit of analysis (district vs. neighborhood). Home pc and internet use by supervisoral district and neighborhood are summarized below (Tables 1.1. and 1.2. At the district level, residents in **District 8** (Noe Valley and the Castro) and **District 2** (Cow Hollow, Marina, Pacific Heights, and the Presidio) report the highest average levels of home access while **District 10** (Potrero Hill, Visitacion Valley, Portola, and Bayview/Hunters Point) and **District 6** (Civic Center, SOMA, and the Tenderloin) report the lowest, with a range of about 20%. When controlling for other factors, District 10 residents had a slightly lower probability (5-7%) of home use compared to Districts 4, 5, 7, and 8. As we would expect, this predicted effect is smaller than the absolute difference in the proportion of home users across these districts, but district remains a statistically significant predictor of home use.

Table 1.1 Home Access by Supervisorial District

Supervisorial District	% of Home PC Users	% of Home Internet Users	95% Confidence Intervals (Home PC)		Sample Size (Unweighted)	95% Confidence Intervals (Home Internet)	
1	83.28%	77.96%	78.46%	88.08%	274	72.61%	83.45%
2	88.89%	88.56% **(Highest)**	85.75%	92.22%	402	85.17%	91.83%
3	76.10%	72.89%	71.53%	80.67%	388	68.05%	77.64%
4	84.59%	81.45%	80.25%	89.05%	273	76.57%	86.16%
5	87.54%	85.54%	83.57%	91.44%	338	81.26%	89.80%
6	73.81%	71.24%	68.48%	78.97%	336	65.80%	76.72%
7	85.35%	84.21%	80.75%	89.72%	284	79.61%	88.90%
8	**90.44% (Highest)**	**87.57%**	87.33%	93.74%	**479**	**84.03%**	**91.07%**
9	76.83%	75.78%	71.47%	82.45%	305	70.25%	81.47%
10	**67.99% (Lowest)**	**63.84% (Lowest)**	62.32%	73.74%	**286**	**57.98%**	**69.86%**
11	77.20%	70.76%	70.67%	83.70%	174	63.37%	77.85%

Source: San Francisco City Survey 2007 Dataset

Table 1.2 Home Access by Planning Neighborhood

Planning Neighborhood	% of Home PC Users	% of Home Internet Users	95% Confidence Intervals (Home PC)		Sample Size (Unweighted)	95% Confidence Intervals (Home Internet)	
Bayview	**56.50% (Lowest)**	**51.85%**	47.81%	65.19%	**130**	**42.86%**	**60.84%**
Bernal Heights	86.54%	85.44%	79.44%	93.64%	133	78.22%	92.66%
Castro/Upper Market	92.85%	89.81%	88.06%	97.64%	154	84.46%	95.16%
Chinatown++	**61.31%**	**56.21%**	49.75%	76.28%	**56**	42.66%	69.76%
Crocker Amazon	**58.34%**	**47.69% (Lowest)**	40.43%	76.26%	**34**	**29.76%**	**65.62%**
Downtown/Civic Center++	**72.92%**	**66.95%**	65.90%	79.93%	**183**	**59.38%**	**74.53%**
Excelsior++	79.87%	76.02%	71.66%	88.08%	113	67.12%	84.92%
Financial District++	78.17%	76.67%	62.51%	93.82%	35	60.93%	92.66%
Glen Park++	87.48%	82.21%	72.71%	102.25%	30	65.42%	99.00%
Haight Ashbury	**96.39% (Highest)**	**96.39% (Highest)**	92.79%	100.00%	**105**	**92.79%**	**100.00%**
Inner Richmond++	80.72%	75.04%	73.11%	88.34%	121	66.63%	83.45%
Inner Sunset	92.55%	90.61%	87.72%	97.37%	128	85.17%	96.05%
Lakeshore++	81.90%	77.09%	72.15%	91.66%	63	66.51%	87.66%
Marina	91.28%	90.00%	86.01%	96.55%	118	84.28%	95.73%
Mission++	**75.76%**	**71.89%**	69.39%	82.14%	**252**	**65.27%**	**78.52%**
Nob Hill	78.82%	75.20%	71.26%	86.38%	129	67.10%	83.31%
Noe Valley	91.00%	87.59%	85.11%	96.89%	148	80.96%	94.21%
North Beach++	78.73%	77.97%	68.10%	89.37%	67	67.05%	88.90%
Ocean View++	80.84%	79.04%	71.01%	90.68%	65	68.64%	89.44%
Outer Mission++	84.95%	78.89%	76.60%	93.30%	77	68.93%	88.84%
Outer Richmond++	86.38%	82.25%	80.61%	92.15%	153	75.62%	88.88%
Outer Sunset++	84.85%	81.17%	79.65%	90.04%	196	75.49%	86.86%
Pacific Heights++	85.06%	85.44%	78.29%	91.83%	124	78.64%	92.25%
Parkside	81.44%	80.38%	73.62%	89.26%	97	72.19%	88.57%
Potrero Hill++	90.77%	88.93%	80.51%	101.03%	50	78.24%	99.62%
Presidio Heights++	81.46%	81.46%	66.46%	96.46%	30	66.46%	96.46%
Russian Hill	83.79%	83.46%	76.42%	91.17%	109	75.95%	90.97%
South of Market++	**71.19%**	**71.49%**	**61.99%**	**80.38%**	**111**	**62.21%**	**80.78%**
Twin Peaks	83.30%	80.58%	68.99%	97.60%	34	65.72%	95.44%
Visitacion Valley	**68.82%**	**65.81%**	57.61%	79.69%	**76**	**54.33%**	**76.92%**
Western Addition	83.86%	82.77%	79.01%	88.71%	266	77.75%	87.78%
West of Twin Peaks++	82.53%	82.60%	73.82%	91.24%	89	73.87%	91.33%

Source: San Francisco City Survey 2007 Dataset

Notes: ++Denotes large Confidence Interval. All neighborhoods with less than 30 observations in the sample (Diamond Heights, Golden Gate Park, Seacliff, Presidio, and Treasure Island) are not reported in the neighborhood analysis. Proportions were calculated using survey weights.

At the neighborhood level, absolute and relative gaps become larger and more apparent (see Appendix A for GIS mapping by neighborhood).

Neighborhoods with the lowest levels of internet access at home (less than 64%) include: **Bayview/Hunter's Point (52%), Chinatown (56%), and Crocker Amazon (48%).** Other neighborhoods with low levels include: **Downtown/Civic Center (67%), the Mission (72%), South of Market (71%), and Visitacion Valley (66%)**.

Some methodological issues arise from data analysis at the neighborhood level that should be considered. The neighborhood analysis suffers from restricted sample sizes. Several neighborhoods (Diamond Heights, Golden Gate Park, Seacliff, Presidio, and Treasure Island) had very few (<30) respondents. We did not attempt to generalize about home access in these areas.

Nearly half of the remaining neighborhoods have sample sizes less than 100 in the survey. Several percentage estimates shown in Table 1.2 have large confidence intervals (denoted by ++) of up to 30%[2]. For example, South of Market has an estimated home internet access rate of about 72%; however, the predicted range is between 62% and 80%.[3] Similarly, regression coefficients for neighborhood variables have larger standard errors which may limit the ability to detect statistically significant impacts of some of the neighborhood variables. For example, while the Chinatown neighborhood had the third lowest level of home internet access in the survey at 56%, Chinatown residents were not shown to have statistically lower levels of home internet access controlling for other factors. It is not possible to assess this quantitatively using the survey data.

Additionally, the Crocker Amazon neighborhood had the lowest level of internet access at 48%, but this is based on only 34 respondents. However, in the neighboring Excelsior neighborhood, which is similar yet lower income, the rate is much higher at 79%. Again, we cannot determine how much of this difference is due to the limited sample. Finally, the sample weights used in calculating the absolute percentages are based at the zip code level. Thus, there may have been differential sampling within certain neighborhoods that introduces some additional bias into the survey results.

[3] The statistical interpretation of the confidence interval is that assuming only sampling error, we can be 95% sure that the actual percentage of South of Market residents who use the internet at home is between 62% and 80%.

However, given the lack of more suitable dataset that would allow for more precise analysis at the SF neighborhood level, we believe that these percentages are reasonable estimates for many neighborhoods for program planning purposes. Neighborhood effects in the regression analysis suggest that Bayview/Hunters Point residents were between 7%-11% less likely to be home internet users compared to residents with similar socio-economic status in other neighborhoods throughout the city, including the Excelsior (~9.4%), Lakeshore (~8.9%), Parkside (~9.5%), Bernal Heights (~9.6%), Castro/Upper Market(~8.1%), Haight Ashbury (11.1%), Inner Sunset (8.4%), Noe Valley (~8.2%), Outer Mission (~9.2%), Outer Richmond (~9.3%), Outer Sunset(~7.7%), Russian Hill (~8.6%), and Western Addition (~8.7%). Such findings demonstrate the importance of separating out and controlling for the various effects of geographic, demographic, and socio-economic factors that may impact technology access at home for designing and targeting digital inclusion programs in San Francisco.

Given the limited resources for citywide digital inclusion programs, targeting and marketing digital inclusion programs geographically may be a more effective way to engage communities than other individual criteria, such as income. It also offers some guidance for implementing the community-based approach outlined in the Digital Inclusion Strategy.

Skills

The disparities in home computer and Internet usage found in the San Francisco City Survey gives us some indication of disparities in digital technology knowledge and skills. Skills include both technical tasks, such as operating a mouse and turning on a computer, and information literacy abilities such as knowing how to perform research on the internet. Individuals without home and work access will generally have less overall access to computers and the Internet. With less regular access these individuals will not have sufficient time utilizing digital technology to build up skills and capabilities. Hence, for those San Franciscans who do not have a computer and internet access at home, we can surmise that these individuals have lower skill levels than residents who are digitally connected at home.

There is a scarcity of concrete survey data regarding these potential skill gaps among different San Francisco populations. The City Survey digital technology questions exclusively concern home computer ownership and internet access. Further, assessing and measuring skill level is a more difficult and challenging task. Access is more concrete and measurable than skill which is a broader and more intangible notion. Further, survey data about skills would have to rely on self-reporting or testing the computer skills of respondents. Directly testing skill levels is costly and highly

impractical because of administrative difficulties. However, self-reportage may be an inaccurate way of measuring skills as respondents inconsistently and imprecisely report their skill levels. These are some of the general challenges of measuring and accounting for skills disparities.

Some national level data that uses self-reportage by respondents does exist regarding the skill levels of low-income, disadvantaged communities. A national study assessing the computer and internet access and use of low-income individuals from high-poverty census tracts determined that individuals who are low-income and less educated, do have lower skill levels (Mossberger, Tolbert, & Stansbury, 2003). For example, higher proportions of African Americans, Latinos, elderly, and less-educated individuals report that they need assistance with basic technical activities such as using a mouse and starting up a computer. More individuals from these groups also said they needed help finding information on the internet. These findings hold for urban populations as well and there is little reason to think that San Francisco would be an exception to this national data.

Table 2. Who is Most Likely to Need Assistance (technical competence and information literacy)?

- Old (52% for 61-year-olds vs. 20% for 28-year-olds) – 32-point difference
- Less-educated (43% for high school diploma vs. 25% for bachelor's degree) – 18 point difference
- Poor (42% vs. 30% for affluent) – 12 point difference
- African Americans (45% vs. 34% for whites) – 11 point difference
- Latinos (42% vs. 34% for non-Latinos) – 8 point difference

Who is Most Likely to Need Assistance for Technical Competence?

- Females (34% vs. 33 for males) – 1 point difference
- NO gender difference for information literacy

Note: Estimates are based on a hypothetical respondent who is female, white, and a library patron, with education, income and age set at their means. The only statistically significant differences are the ones reported above (see tables A3.1 and A3.2 in book). We have calculated the probability that respondents agree with the above statements, controlling for other factors.

Tables From Virtual Inequality: Beyond the Digital Divide

Some may argue that a skill divide does not exist in a city with such concentrated high technology resources. However, while there is no hard data on this issue for San Francisco, one can look at a similar high-tech city like Seattle which has survey data regarding resident skill levels. Seattle's 2004 Technology Survey found that skill divides do exist for certain underserved populations, particularly for African-American, low-income residents (City of Seattle 2004 Information Technology Residential Survey 51 Final Report). Skill divides were particularly correlated with age and with education levels with older and less education residents reporting less comfort with computers.

Given that it was desirable to establish more concrete detail regarding skill divides in San Francisco, we conducted focus groups of community members and service providers from low-income, underserved neighborhoods. While focus groups do not offer the scientific rigor of randomized surveys, focus groups are an appropriate way to assess and understand a phenomenon as difficult to quantify as skill and knowledge. One focus group consisted of 6 adult participants and the other of high schools students. Appendix C shows the demographic breakdowns of each focus group. We asked participants not only about their own technology usage but about the access and skills of their friend and relatives.

There were three central findings about skills from the focus groups. First, adults expressed interest in and need for computer training. Second, teens reported they were very comfortable with digital technology and could learn new skills through their social networks. Finally, there is intergenerational transmission of computer skills and knowledge but also cultural, language, and generational difference between youth and parents that prevent higher levels of transmission.

The focus groups confirmed that low-income and disadvantaged adults have low levels of skills and knowledge about computers (Appendix C). Adults noted that they needed help when they initially began to learn how to use computers. After they developed certain skills, they could become more independent and make the leap toward owning their own computer. However, they emphasized, they needed assistance in the beginning stages of their technology education.

Teen focus group participants reported that they felt very comfortable with computer technology. If they encountered any difficulties, they used their social network and relied on their friends to learn about new capabilities. However, while teens report high skill levels with computers and internet, further assessment must be made of how adept they may be with a variety of computing capabilities. National data also has shown that youth with computers at home are more likely to use the internet to research for schools and get homework help compared to teens without such home access (Pew Internet &

American Life Project). Finally, parents who are less educated and tech savvy may be less able to supervise the internet activities of their children and less able to ensure that their children are safe when participating in internet social networking.

Based on comments from both the youth and adult focus groups, parents and older adults look to their children for assistance with computers and young people do provide some advice and help. Senior participants sought assistance from their adult children for instruction on computers. However, often generational, cultural, and language barriers impeded adequate instruction. Some teens also noted that while they are willing to help their parents with computers, they get frustrated as their parents have very basic questions and very limited understanding of computers (i.e. parents do not know what a mouse is).

III. CURRENT STATE OF DIGITAL INCLUSION EFFORTS IN SAN FRANCISCO

While the City of San Francisco's Digital Inclusion Strategy was published in January 2007, the digital divide is not a new phenomenon. The following are programs and city institutions currently working to close the digital divide.

1. Digital Efforts Focusing on Home Computer Ownership and Internet Access

San Francisco is attempting to build a city-wide broadband network that would offer free wireless internet access with upgrades at cost. Similar programs are being developed in cities such as Philadelphia, Minneapolis, Boston, and Seattle. In San Francisco this effort is overseen and administered by SF TechConnect, an initiative of the City's Department of Telecommunications and Information Services (DTIS).[4] However, evidence from other cities indicates that the technical issues will require time to resolve before adequate coverage is possible. In addition, the natural terrain of San Francisco is likely to further inhibit easy implementation of such a plan.

The City has partnered with EarthLink and Google to roll out a tiered, universal wireless network that would include $600,000 in revenues for programs related to closing the digital divide.[5] Recently, members of the San Francisco County Board of Supervisors have also proposed spending millions to fund similar programs.

[4] SF TechConnect was formed in 1996 to centralize the San Francisco's IT infrastructure and to provide policy guidance and support to the City on technology issues.

[5] SF TechConnect has contracted with EarthLink and Google to roll out a tiered wireless network that would provide free Internet access at 300 kilobytes per second and high-speed Internet access at 1 megabyte per second at $20 per month. Under the terms of the agreement, 5% of EarthLink's subscription revenues or $600,000, whichever is greater, would go to the City.

SF TechConnect is also partnering with nonprofit organizations that specialize in computer refurbishing to provide restored computers to low-income individuals. In addition, SF TechConnect is working with Dell and Intel to develop low-cost PC purchase loan programs for low-income residents. Families eligible for the Working Family Tax Credit would be eligible to purchase PCs at a highly reduced rate.

While lowering the cost barriers for hardware and Internet access may help to close some of the gaps, the lack of technological literacy and of adequate public infrastructure could undermine these mitigation programs. In particular, hardware access may not be effective at addressing the skill gaps noted above, as well as the resource barriers of the very poor. As a result, there are additional public and private programs that specifically address the challenges of public access and technological training and education.

2. *Public Access and Training Programs*

A number of digital inclusion programs that provide public access and training are currently available in San Francisco. A diverse group of organizations provide these services, ranging from city agencies to non-profit, community-based organizations. In general, these public programs struggle to close the digital divide due to inadequate infrastructure and equipment, dwindling funding sources, and lack of coordination. While some efforts to leverage resources across organizations do exist (e.g. collaborations between SF TechConnect and SFUSD such as the Wifi Anywhere project), in some cases, limited staffing and resources prevent greater ongoing coordination on digital inclusion efforts.

<u>SF TechConnect</u>

Currently, SF TechConnect is working to promote digital inclusion through a series of events designed to share information, raise awareness about services offered by CTPs, and provide training directly to city residents. This program follows the SF Connect model, which has addressed issues including homelessness and the environment. The city is presently hosts three types of events: 1) technology fairs, which community-based organizations and businesses use to provide information and answer questions about their programs; 2) Internet mentoring sessions, where volunteer computer mentors work directly with San Franciscans and help them enhance different aspects of their Internet skills on request; and 3) hands-on workshops, which are used to demonstrate specific software applications or hardware devices.

Public Schools

The SFUSD has recently published its Master Plan for Instructional Technology, a comprehensive strategic technology plan for San Francisco public schools. The plan accounts for many key aspects of technology in schools, such as equipment, infrastructure, professional development of teachers, and improvement of technology curriculum. However, due to a budgetary shortfall that is estimated to be a minimum of $4 million, the *Master Plan* has not been sufficiently implemented.[6] While the plan recommends an executive director for educational technology, this position has not been filled. In terms of equipment, the vast majority of school computers are over four years old. For computers that are four years old or younger, the average student-to-computer ratio is 13:1 whereas the Master Plan target is 5:1. A related challenge is that there is incredible variation between schools regarding the ratio of students to computers that are four years old or less (see Appendices B and D). When it comes to Internet access via school computers, students also complain about firewalls that prevent access to popular sites and services such as MySpace.com and Google Image Search. One positive aspect of the technology infrastructure is that schools do have an adequate level of Internet connections due to past efforts in this area.

The Master Plan also looked at the degree to which technology is integrated into class curricula, thereby using class time as an opportunity for digital literacy training.[7] The results from the youth focus indicate that some schools do incorporate a significant amount of Internet research. However, with the wide variation in students-to-computer ratios, it is unlikely that this exists in a significant number of schools.

City Colleges

City College of San Francisco provides free, non-credit computer classes at the following campuses: Mission District, Alemany, Chinatown, Downtown, John Adams, Mission, Ocean (main campus) and Southeast. These classes range from general computer skills to more specialized content, such as using spreadsheet and database software. As these classes take place on City College campuses, there are a limited number of sites. Also, only one or two classes are offered in Chinese and no classes are conducted in Spanish. Therefore, limited-English speakers cannot take advantage of these offerings. Finally, City College offers computer science and information technology courses for credit as well as technology-intensive courses in medical

[6] There is currently a proposed ballot measure that would use revenue from a parcel tax increase create a consistent technology budget for the District.

[7] It should also be noted that school such as Mission High School are used for adult digital literacy programs.

services. The latter courses are funded through workforce development funding (Chan 2007).

Libraries

Libraries offer both free Internet access and digital technology training programs to the general public on an equal basis. Ideally, the libraries in San Francisco want the Internet access at San Francisco's Public Libraries to be comparable to the average home internet access. Nationwide, libraries require ongoing investment and support to overcome challenges to the provision of public access.[8] However, even with a strict one hour time limit to use computers, many of San Francisco's public libraries have too few public access computers to meet demand as evidenced by lines and wait times (see Appendix E for detailed inventory of library computers by branch library). This is especially true in the hours following students' release from school (Pisano 2007). Still, library administrators note that the main obstacles are not the number of computers but the technology infrastructure; the connection speed is not fast enough and has insufficient bandwidth to meet demand. Resources to make these necessary upgrades are slim in part because the library system has chosen to allow complete Internet access—i.e., no firewall such as the one that the District has. This makes San Francisco libraries noncompliant with the Child Internet Protection Act (CIPA), and thus ineligible to apply for certain federal funding sources.

Most libraries provide training programs, although space constraints prevent some branch libraries from doing so. The programs are usually offered in English, Spanish and Chinese on topics such as how to use a computer, keyboard, and mouse as well as how to access library databases and resources. The instructors are usually the library staff.

Community Technology Programs

There are an estimated 140 nonprofit organizations, referred to as Community Technology Programs (CTPs), which provide digital technology services to underserved communities in San Francisco. They not only provide access to hardware and the Web, but many also provide training, apprenticeships, and employment opportunities through public-private partnerships. In particular, these CTPs offer services unique to the communities in which they exist: non-English language

[8] The Gates Foundation report identified 5 key areas for support, including upgrades to hardware and software, internet connectivity, maintaining systems, professional development for library staff and keeping libraries open (Toward Equality of Access: The Role of Public Libraries in Addressing the Digital Divide, Bill and Melinda Gates Foundation, 2003).

instruction, courses is particular computer programs, low-cost computer and Internet access, etc. Some CTPs operate networks and services out of the city's public housing projects, including Westside Court in the Western Addition and Alice Griffiths in Bayview/Hunter's Point. Such projects can have a large impact and change behavior, as well as perceptions and attitudes.

These organizations are funded predominantly through state and local philanthropic organizations. However, these funded sources are limited, which results in limited Internet access and program availability.

IV. GAPS ANALYSIS

As shown above, while there are a number of digital inclusion efforts in San Francisco, these programs face serious challenges in closing the digital divide due to funding scarcity and lack of coordinated efforts. We proceed further and map out these public resources as location is such an important factor in San Francisco's digital divide. Mapping provides us a systematic and comprehensive way of knowing what and where public resources exist and what gaps remain. Also, mapping allows us to assess the city's resources and divides along two dimensions: coverage and concentration of resources. First, do public sites and programs exist in the areas where technology access and use disparities exist? Distance may play an important role in usage at public sites because residents who are located far from public access points may be less likely to frequent these sites. Second, are these resources adequate given the density of population and the density of need? Certain areas of the city such as Chinatown have high population density and have higher numbers of people who need public access and training per square mile.

Our mapping of all public sites and resources in which we layer on schools, libraries, CTPs, and other public access sites shows us that:

1. School student-to-computer ratios are not correlated with low home internet use.
2. There are low library resources in a number of neighborhoods with low home usage, such as Hunters Point/Bayview and Visitacion Valley.
3. CTPs are present in low home use areas but these resources are surprisingly low in Hunters Point/Bayview and Visitacion Valley areas.

While there are a number of public access sites and programs in the low home use areas, some areas have only a few number of programs given the number of residents in these neighborhoods without home computers and internet access. Areas with low levels of public and non-profit resources are Hunters Point/Bayview and Visitacion Valley.

However, each neighborhood has its own particular demographic and technology needs. Therefore, we highlight two neighborhoods, Bayview/Hunters Point and Chinatown, so we can have a better understanding of the digital inclusion needs of each neighborhood. This analysis is not exhaustive, however, and does not focus on all low home use neighborhoods. Rather than providing an exhaustive analysis of all gaps throughout the city, we offer a template for neighborhood gaps analysis that the city can engage in when targeting its digital inclusion efforts.

Bayview/Hunters Point has a surprisingly low number of public access points and programs given that only about 56.5% of its residents have a computer at home and only about 51% have internet access at home. About 20,000 residents live in the neighborhood and based on the survey, about 9,000 individuals do not have a computer at home and about 10,000 has no internet access at home[9]. There are about 255 public access computers in this area, excluding the school resources given that school computers are not available to all community members and that these computers are not available after school hours (see Appendix B)[10]. The number of computers is not adequate for the potential number of individuals who could benefit from public access and training. This scarcity of public resources in the face of high demand is corroborated by community members who note that there are long lines for library computers, particularly after school.

Chinatown has about 255 computers which includes a high number of computers in its public libraries[11]. It must be noted that Chinatown is one of the most crowded neighborhoods in the city (over 80,000 individuals per square mile, see Appendix B). The area is small, less than an area of a square mile but it has concentrated population. While Chinatown has a high number of public resources, these resources are still low relative to demand (see Appendix B). Again, this is corroborated by reportage of long lines at the libraries. Also, it must be noted that Chinatown is home to many monolingual Chinese speakers. There are many technology resources in nearby neighborhoods outside of Chinatown. However, these programs do not cater to the

[9] These numbers are drawn from city planning documents and estimations are made based off district level data. However, we recommend that more precise information be gathered regarding the population numbers in Bayview/Hunters Point and in Chinatown to have better estimation about how many residents do not have home computer and internet access.

[10] The number of computers is calculated based off a 2005 listing of CTPs in San Francisco. We found the average number of computers at these CTPs and use to average to estimate how many computers are available at the 10 CTPs located in the Bayview/Hunters Point neighborhood (see Appendix B).

[11] See Note 6. Chinatown has about 7 CTPs in its immediate area.

needs of Chinese speakers and Chinese residents must rely exclusively on the technology resources in the Chinatown area[12].

V. RECOMMENDATIONS

As with most government programming, limited resources require strategic allocation. The major tradeoff to consider in realizing digital inclusion in the City of San Francisco is between efficiency and equity. By efficiency, we mean the most efficient allocation of resources to realize the goal of inclusion. By equity, we mean the equal distribution of resources across the city. The gaps analysis conducted in section IV provides the foundation for our recommendations to confront this tradeoff. With schools and libraries, location does not appear to predict technology access. Thus, we propose that the City ensures that there is adequate funding to increase resources across all schools and libraries. Alternatively, we propose targeted funding where location of resources is more critical, as with Community Technology Programs.

Efficiency is also an important consideration of citywide wireless Internet. Currently, various city departments pay for their own wireless networks. This includes "permanent" Wireless networks for city business, as well as temporary networks for events, such as the ones used for SF Homeless Connect Events. From an efficiency standpoint, a city-wide wireless network may obviate the need for these redundant wireless networks (San Francisco Budget Analyst's Office 2007).

The following are specific recommendations for the City of San Francisco in advancing their digital inclusion effort:

1. Grant-Making to Community Technology Programs:

As discussed in section III, Community Technology Programs play an important role in San Francisco's digital inclusion effort, not only as providers of training and education to close the skills divide, but also as public access sites. There is very limited city funding currently for digital inclusion programming. The Community Technology Foundation of California estimates it will cost $1.6 million to adequately fund for Community Technology Programs in the City. The Foundation recommends allocating roughly $100,000 to 10-15 organizations that ensure the availability of training and support for geographically underserved areas or populations. Given the limited amount

[12] In fact, Chinatown may a resource of Chinese-speaking San Franciscans who live outside Chinatown. One of our focus group participated lived in Sunset Park and attended computer classes provided in Chinese. He explained that there were no such classes in his neighborhood.

of funds, this would require strategic allocation. As the gaps analysis indicated, there is currently inconsistent geographical coverage of Community Technology Programs throughout San Francisco. These programs are concentrated in the Northeastern quadrant of San Francisco, with some coverage in the Southeast and very limited coverage in the Western portion of the city, especially in the Sunset, Richmond districts.

The City of San Francisco should use grant-making to target funding for Community Technology Programs in high-need communities, in order to provide more even distribution of resources throughout the city. This might include start up programs or expansion of current projects/programs to areas with poor coverage. Results from GIS mapping indicate that priority neighborhoods should be Hunters Point/Bayview, Chinatown, Civic Center, and Visitacion Valley.

The city should also consider establishing funding requirements that provide incentives for participation in the city-wide digital inclusion strategy. For example, as community-based programs and facilities are constantly changing, past attempts to update information have been labor intensive and the information is out of date almost as fast as it is collected. A partial solution is the use of Web 2.0, which allows for de-centralized updating, and does not rely on phone calls or questionnaires. However, this will still take some involvement from Community Technology Programs to ensure that this information remains up to date for city staff, other referring providers and end-users. For this reason, the city might require that grant recipients update center information for the city database quarterly. To further encourage provider networking, the city might also require attendance at provider conferences hosted by the city.

2. Increased Funding and Support for City Institutions:

Unlike Community Technology Programs, schools and libraries are spread relatively evenly by design throughout San Francisco. Hence, the distribution of library and school resources is not a problem. For schools, the issue lies in lack of maintenance and age of computers. For libraries the primary issues are bandwidth and lack of space for expanding public use equipment and training programs. For these reasons, we recommend that the city focus on the leveraging of resources across schools, libraries and other city institutions. This will mean working with SFUSD and library technology personnel to set baseline standards and use funding to meet these standards.

Resources provided by the city should encourage continued investment from schools. Matching grants are a good way to ensure some commitment from schools, while enabling schools to leverage the site-based resources to expand technology resources.

Furthermore, we recommend working with libraries to expand user time beyond the current allowance of one hour per day. For many of San Francisco residents, libraries are the primary source of access, and an hour is likely to limit the ability to take full advantage of the benefits of computer and internet use. Because the insatiable demands for bandwidth and space seem to be the major prohibitive factor, we recommend working with libraries to find creative solutions, which might include increasing the number of laptops and finding alternate funding for bandwidth expansion.

3. Resource Clearinghouse:

The resource information needs in San Francisco are varied, as providers have very different needs from end-users. For this reason, one city resource portal is unlikely to meet everyone's unique needs. We recommend two different ways in which the city can serve as a clearinghouse for information about technology resources in San Francisco.

First, develop a provider network for resource sharing among Community Technology Program providers. This network would allow CTPs to share information about technology programs in San Francisco, as well as funding options and shared best-practices. In addition to a sharing this information online, the city should consider hosting events, such as provider conferences.

As an alternative to one central resource portal, the city should focus resources toward funding initiatives to publicize available resources for specific communities. The city is currently considering the feasibility of an RSS feed that could house data that could be funneled into different formats depending on the needs of the various end-users the city wishes to target. This might include initiatives for resource guides in Spanish and Chinese, for youth, for the disabled community, for specific neighborhoods and geographical communities. This will ensure that end-users do not have to sort through information that is not applicable to them, but rather will have access to culturally appropriate resources and content.

Regardless of the format, one overarching recommendation is that the city promote resource guides that are available on and offline. This will ensure access for San Francisco residents without computers and internet. These resources should also be provided in Spanish and English at a minimum.

4. Explore Revival of Technology Commission:

The current level of collaboration between city institutions on digital inclusion is limited. There is much overlap between goals, as well as communities served. Yet, while some formal and informal partnerships exist, for example between libraries and the school district (Herrera, 2007), San Francisco's schools, libraries, workforce development department, other city institutions with digital inclusion efforts, like public housing, have little institutionalized communication. We recommend exploration of bringing together stakeholders to provide collaborative oversight of the digital inclusion strategy. To build on current efforts, this could be the expansion of a current collaborative body, revival of a defunct one (technology commission) or the development of a new one. This might also facilitate the monitoring and measurement of progress in each of the segments, and allow for better documentation of city-wide progress as a whole, rather than compartmentalization.

VI. BENCHMARKS FOR SUCCESS

It is fundamental that evaluation be built-in to any expansion of digital inclusion programs in the City of San Francisco, in order to measure progress. This is no easy task, as the impact of increased access, as well as the measurement of skills, is very difficult. The more thinking that is done up front about how the city wants to measure progress, the better San Francisco will be at determining what the most effective means to realizing digital inclusion are.

We recommend the following measures of progress as the city builds its city-wide strategy:

- Increase percentage of low-income households with a computer (above current trend)
- Increase percentage of low-income homes with internet
- Increase computer/internet program access as function of population density
- Decrease physical distance to nearest public access sites
- Increase student to computer ratio in specific neighborhoods (also comparing to other cities)
- Increase percentage of computers that are a certain number of years old (schools & libraries)
- Increase percentage of CTPs that participate in citywide strategy (i.e. updated information in city provider network/attendance at conferences)

VII. SUGGESTIONS FOR FURTHER RESEARCH/ANALYSIS

There are a number of areas where the data was limited. The following are suggestions for further research the city might conduct in order to better understand how the digital divide impacts residents. These areas include the role of attitudes in persistence of the digital divide, the level of skills and knowledge about computers and internet of San Francisco residents, and the needs of particular high-need neighborhoods and communities in San Francisco (including elderly, immigrant and disabled communities). Also, in terms of citywide wireless, the city will need to conduct extensive research into privacy and security issues.

Role of Attitudes in Persistence of Divide

People's perception of computers and the Internet is likely to play a role in their desire and willingness to educate themselves in order to use computers or the Internet. According to the CPUC Survey, more than 30% of Californians who do not use the Internet claim to have no interest in using it. Our research turned up little conclusive evidence on this issue in San Francisco. Some comments from the adult focus group revealed similar findings: one participant mentioned that residents of his neighborhood (Chinatown) felt that they had no need for the Internet and thus never used it (see Appendix C). In contrast, the youth focus group demonstrated that youth appear to want better access at least in part because they feel very comfortable using the Internet (see Appendix C). However, more research in this area is necessary in order to confirm that attitudes do play an important role in computer and Internet use. In particular, it is unclear whether attitude impacts uses differently depending on age, language, and other demographic characteristics. Alternately, it is possible that attitudes simply differ based on these attributes. Further research is also recommended because it is unclear how to best counteract such attitudes, especially if such countermeasures should differ depending on demographics.

Knowledge & Skills

Given the importance of the skills and training aspect of the digital inclusion challenge, the city must quantitatively assess the level of computer and Internet knowledge of San Francisco residents. Currently, the City Controller's survey asks questions about computer ownership, internet access, internet shopping. In future iterations of the survey, questions about computer knowledge should be included. These questions should seek to gain information about the following issues:

- Hardware: Can the respondent set up a computer? Can the respondent install peripheral devices? Is the respondent comfortable connecting a computer to a wireless network? Where does the respondent go when he or she faces difficulties making hardware function properly?
- Software: Can the respondent use Office software for writing, spreadsheets, or presentations? Does the respondent feel comfortable installing new programs? Is the respondent able to change operating system settings (such as changing the screen resolution)? Where does the respondent go when he or she faced difficulties making software function properly?
- The Internet: does the respondent use basic Internet applications, such as e-mail and the web? Does the respondent communicate with others via instant messaging? Does the respondent use the internet for creative endeavors, such as photography, video production, or blogging? Where does the respondent go to when he or she wants to learn how to use something new on the Internet?
- Education: Where did the respondent learn about technology? Did his education come from parents, peers, or formal schooling? Are most of the respondent's skills self-taught?

A potential problem with this approach is that survey respondents may feel embarrassed about admitting that they lack certain technology skills. In order to offset this possibility, survey questions could be framed to ask about an individual's habits, in place of knowledge.

Targeted Assessment

The city should augment the aforementioned studies with qualitative research targeted at specific constituencies with special needs. This research can be conducted in the form of focus groups or interviews with individual San Francisco residents. When focus groups are conducted, researchers should hold sessions in the communities they are seeking to assess in order to have the best chance of attracting a diverse and representative sample of participants.

Limited English Speakers

A digital inclusion initiative will only be truly successful if it makes significant strides towards connecting San Franciscans with limited ability to speak English. Accordingly, the city should work to identify the specific obstacles that prevent limited English speakers from using information technology. Focus group moderators and interviewers should focus on the following issues:

- Availability of computers with operating systems in Spanish

- Availability of technology training classes in Chinese and Spanish, either through educational institutions or CTPs
- Barriers that prevent limited English speakers from making use of city programs and services offered by community-based organizations and CTPs
- Attitudes and habits regarding information technology in families where the children are fluent English speakers but the parents are not

Disabled Community

Disabled San Franciscans also face unique difficulties in getting connected. Further research regarding the needs of the disabled community should combine standard assessments of access and skills with questions regarding the availability of tools that assist users with specific disabilities (such as text-to-speech applications for the vision impaired or special interface devices for people with limited mobility). Furthermore, the city should assess whether city and CTP-provided technology resources are housed in locations that are accessible for the disabled.

Older Adults

Survey research shows that San Francisco's elderly is the segment of the population least likely to use information technology. When the city works to assess the needs of this community, they should focus inquiries on the subject of training and education. Specifically, researchers should work to discern whether negative attitudes about technology plays a factor in preventing older San Franciscans from learning more about computers and the Internet. Additionally, it would be useful to gain more information as to how training programs or inclusion efforts can be designed in order to attract as many older city residents as possible. Finally, interviewers and moderators should ask questions about the prevalence of information technology resources in senior housing and adult day health centers.

Privacy & Security

Citywide wireless is positioned to significantly increase the level of access to the internet across San Francisco. However, this poses many challenges for maintaining an appropriate level of security and privacy for those who use the network. For residents who lack knowledge about the internet, significant effort will have to go into researching the training needs so that people are able protect themselves. This might include training for parents on child internet safety, training for residents on firewalls and other measures for privacy protection, as wells as other issues that the city will

have to attempt to anticipate for the safety of their residents. Additionally, as the city considers use of citywide wireless for its government business, this will require research into the safeguarding sensitive information (San Francisco Budget Analyst's Office 2007).

Overall, San Francisco is well-positioned to promote digital inclusion through the implementation of carefully crafted policies and programs. This report highlights current issues that affect the formation of a holistic digital inclusion strategy for the city. It is important to note, however, that given the rapidly changing nature of digital technology, realizing "digital inclusion" is going to take an ongoing commitment from San Francisco to ensure that communities that are currently disconnected are able to keep up as technologies continue to advance.

Bibliography

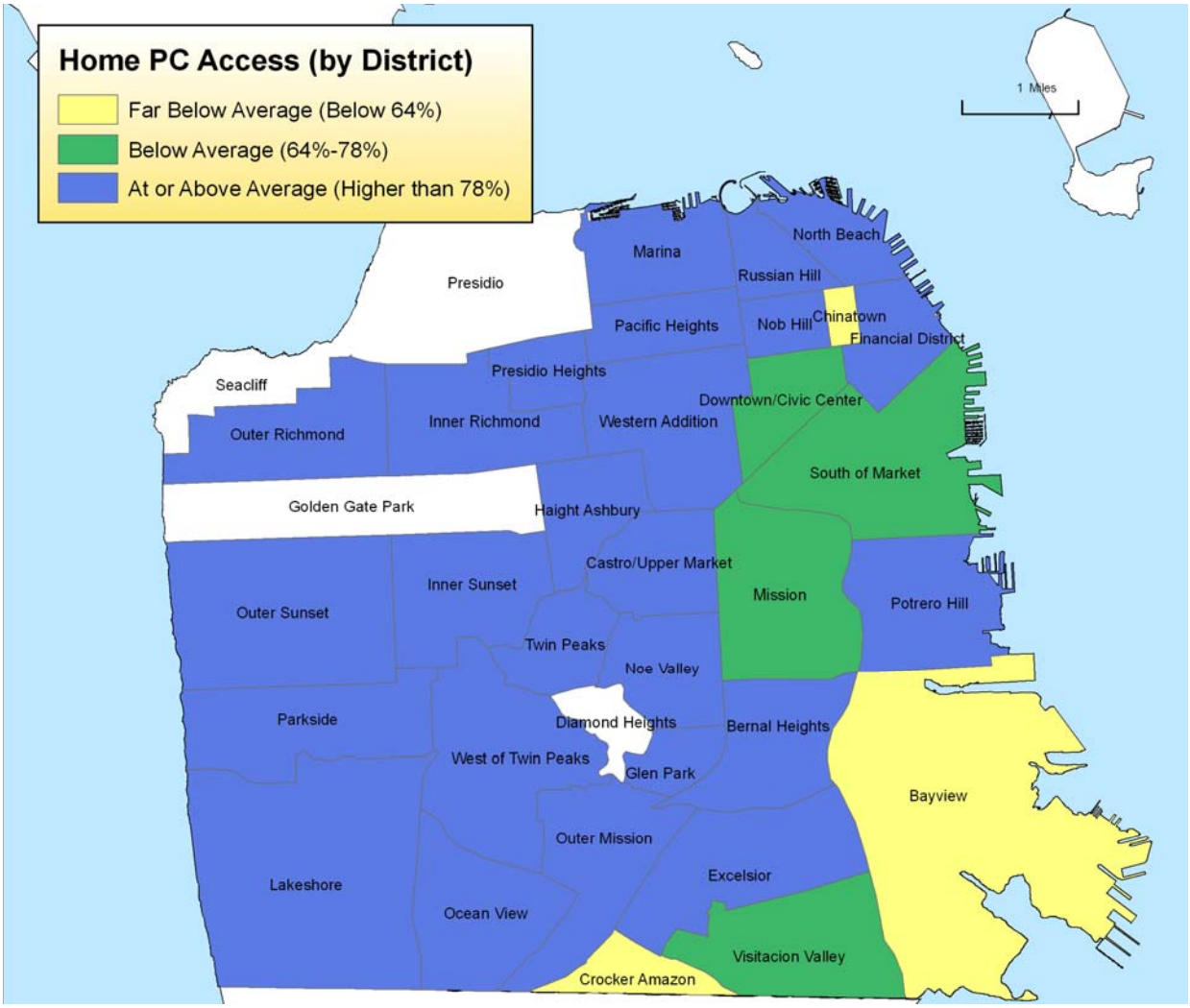
1. Barzilai-Nahon, Karine (October 2006). Gaps and Bits: Conceptualizing Measurements for Digital Divide/s in The Information Society, Vol. 22(5). Available at http://projects.ischool.washington.edu/karineb/html/pub/DDI.pdf.
2. Bay Area Council (2007). Regional Indicators Poll. Available at www.bayareacouncil.org/site/pp.asp?c=dkLRK7MMIqG&b=242083.
3. Bergeron, Lauri (2007). Interview with Manager of Technical Support for the San Francisco Unified District.
4. Borden, Gwyneth (2006). Bridging the Digital Divide: IBM Corporate Community Relations Programs. IBM Corporation. Available at www.sfgov.org/site/uploadedfiles/dtis/tech_connect/IBM%20Presentation.pdf.
5. Bourne, Jill (2007). Interview with Deputy City Librarian for the San Francisco Public Libraries.
6. Bradshaw, Ana (August 2006). Filling in the Broadband Gaps: The Role of the California Emerging Technology Fund in Closing California's Digital Divide Report to PUC Commissioner Rachelle Chong. Available at www.cfee.net/docs/conference_presentations/CETF_Final_ReportfillingGAPS.pdf.
7. Chan, Andre (2007). The Digital Divide in San Francisco. San Francisco Economic Strategy and Technology and Innovation Foundations Report, Department of City and Regional Planning, University of California. Available at www.andrechan.com/DigitalDivide/Digital-Divide-San-Francisco.pdf.

8. Chappel, Karen (2006). Moving Beyond the Divide: Workforce Development and Upward Mobility in Information Technology. PolicyLink. Available at http://www.policylink.org/pdfs/Moving_Beyond_the_Divide.pdf.
9. Columbia Telecommunications Corporation (January 2007 Draft). Fiber Optics for Government and Public Broadband: A Feasibility Study. Available at: www.sfgov.org/site/uploadedfiles/dtis/tech_connect/SFFiberFeasibility.pdf.
10. Digital Inclusion Task Force (2007). San Francisco Digital Inclusion Strategy. Available at www.sfgov.org/site/tech_connect_index.asp?id=53143.
11. Fairlie, Robert, et. al. (September 2006). Crossing the Divide: Immigrant Youth and Digital Disparity in California. Community Technology Foundation of California. Available at http://cjtc.ucsc.edu/docs/digital.pdf.
12. Fox, Susannah & Livingston, Gretchen (March 14, 2007). Latinos Online: Hispanics with lower levels of education and English proficiency remain largely disconnected from the internet. Pew Internet & American Life Project, Pew Hispanic Center. Available at www.pewinternet.org/pdfs/Latinos_Online_March_14_2007.pdf.
13. Freeman, Richard (2002). The Labour Market in the New Information Economy in NBER Working Papers 9254. National Bureau of Economic Research, Inc. Available at www.nber.org/papers/w9254.pdf.
14. Harrington, Ed (2007). City Survey 2007. City and County of San Francisco. Available at www.sfgov.org/site/controller_csa_index.asp?id=59064.
15. Harrington, Ed (May 2002). City and County of San Francisco: Results of the 2002 Citizen Survey. Available at www.sfgov.org/site/uploadedfiles/controller/reports/2002citizensurveyreport.pdf.
16. Herrera, Luis (2007). Interview with City Librarian for the San Francisco Public Libraries.
17. Horrigan, John (2006). Home Broadband Adoption 2006: Home broadband adoption is going mainstream and that means user-generated content is coming from all kinds of internet users. Pew Internet & American Life Project. Available at www.pewinternet.org/pdfs/PIP_Broadband_trends2006.pdf.
18. Katz, J.E. & Rice, R.E (2003). Comparing internet and mobile phone usage: digital divides of usage, adoption, and dropouts in Telecommunications Policy 27(8-9): 597-623. Available at www.scils.rutgers.edu/ci/cmcs/publications/articles/comparing%20internet%20and%20mobile%20phone%20usage.pdf.
19. Kruger, Lennard & Gilroy, Angele (2006). Broadband Internet Access and the Digital Divide: Federal Assistance Programs. Congressional Research Service. Available at http://digital.library.unt.edu/govdocs/crs//data//2006/upl-meta-crs-8576/RL30719_2006Jan17.pdf.

20. Madden, Mary (April 2006). Data Memo: Internet penetration and impact. Pew Internet & American Life Project. Available at www.pewinternet.org/pdfs/PIP_Internet_Impact.pdf.
21. Master Plan for Instructional Technology. San Francisco Unified School District. Available at http://portal.sfusd.edu/data/IT/MTP/SFUSD%20Tech%20Plan%20Final.pdf.
22. Maya Simon, Mike Graziano, & Amanda Lenhart. The Internet and Education: Findings of the Pew Internet & American Life Project. Available at http://www.pewinternet.org/PPF/r/39/report_display.asp
23. Modarres, Ali and Bill Pitkin (2006). "Technology and the Geography of Inequality in Los Angeles". Edmund G. Pat" Brown Institute of Public Affairs. Available at :http://www.patbrowninstitute.org/publications/documents/CTF_Report.pdf
24. Moore, Elizabeth, Gordon, Andrew & Rosenkranz, Mark (2004). Information Technology Residential Survey: Final Report. City of Seattle. Available at http://seattle.gov/tech/indicators/ITIndicatorsResSurveyReport2004Full.pdf.
25. Mossberger, K., Tolbert, C. J., & Gilbert, M. (2006). Race, Place, and Information Technology. Urban Affairs Review, 41(5), 583.
26. Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). Virtual inequality : beyond the digital divide. Washington, D.C.: Georgetown University Press.
27. Pisano, Vivian (2007). Interview with Chief of Information Technology for the San Francisco Public Libraries.
28. San Francisco Budget Analyst (January 11, 2007). Fiscal Feasibility Analysis of a Municipally-Owned Citywide Wireless Broadband. Available at www.sfgov.org/site/budanalyst_page.asp?id=53280.
29. Toward Equality of Access: The Role of Libraries in Addressing the Digital Divide. Gates Foundation. Available at www.gatesfoundation.org/nr/Downloads/libraries/uslibraries/reports/TowardEqualityofAccess.pdf.
30. U.S. Census Bureau (2005). American Community Survey 2005. Available at http://factfinder.census.gov/jsp/saff/SAFFInfo.jsp?_pageId=sp1_acs.
31. Wireless Broadband Internet Access Network Agreement between the City and County of San Francisco and EarthLink, Inc. (January 2005). Available at www.sfgov.org/site/uploadedfiles/dtis/tech_connect/process/SanFranciscoWirelessNetworkAreementFinal.pdf.

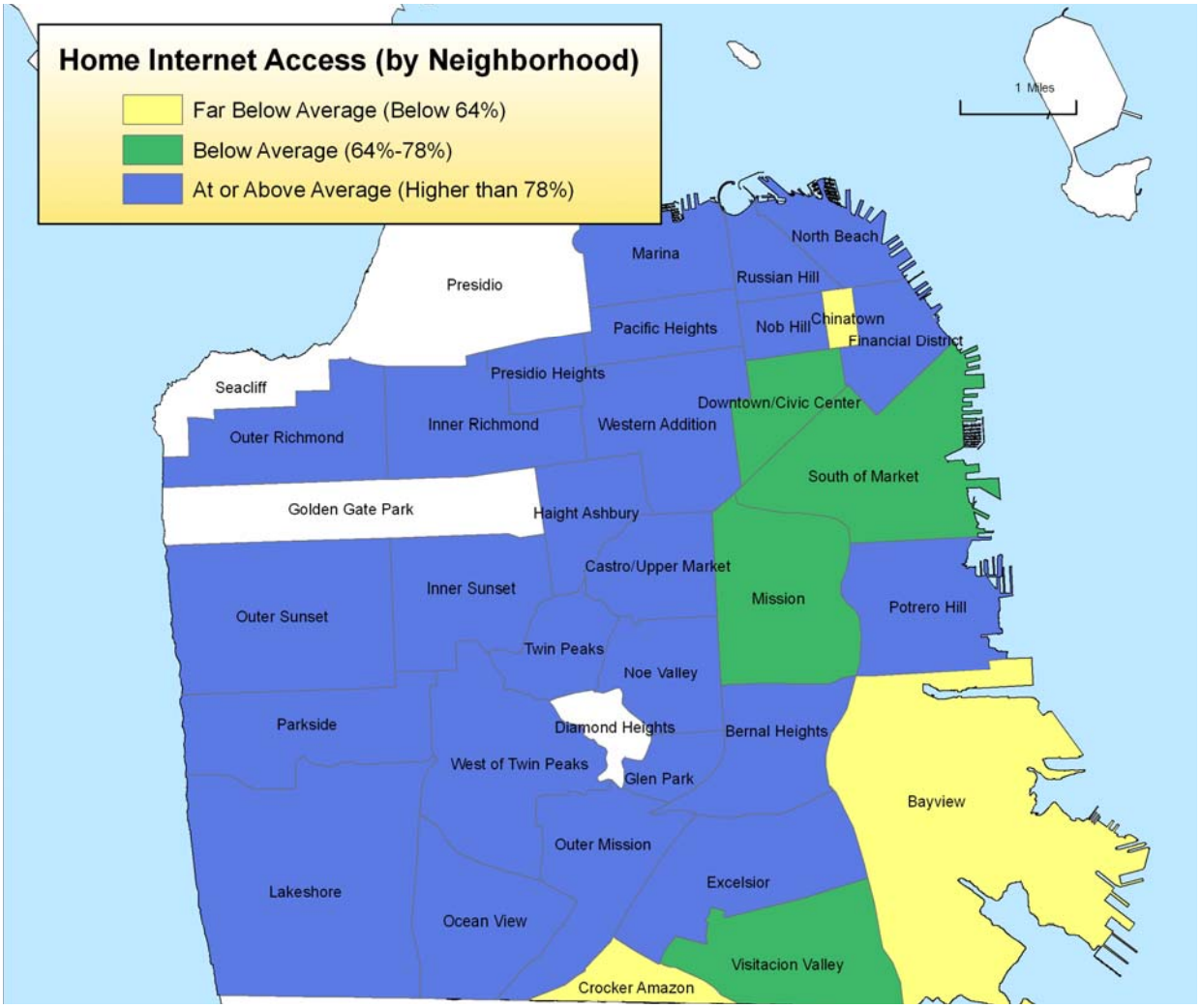
APPENDIX A: MAPPING OF HOME PC & INTERNET ACCESS IN SAN FRANCISCO

MAP 1. HOME PC ACCESS IN SAN FRANCISCO BY NEIGHBORHOOD



Source: San Francisco City Survey 2007

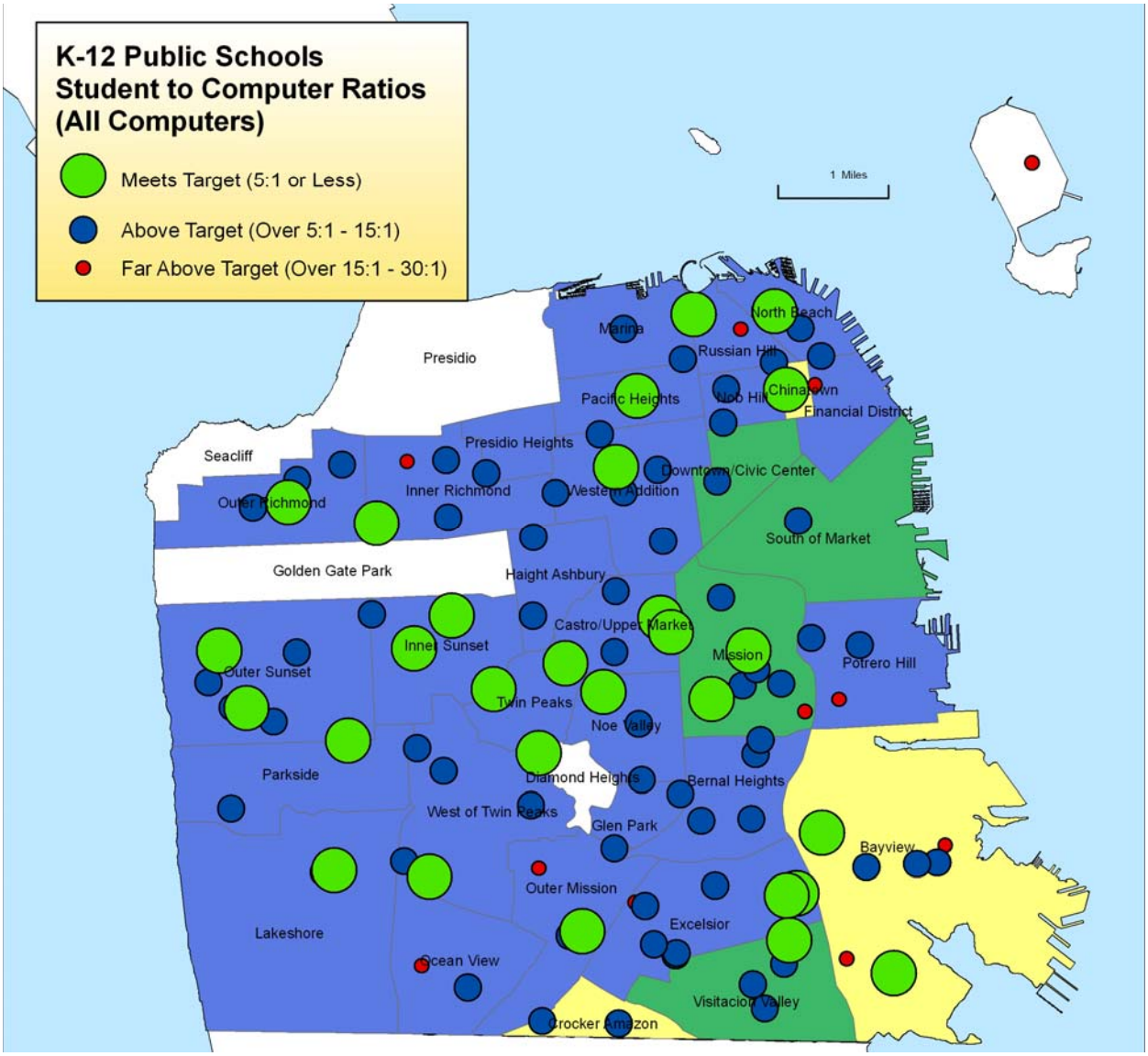
MAP 2. HOME INTERNET ACCESS IN SAN FRANCISCO BY NEIGHBORHOOD



Source: San Francisco City Survey 2007

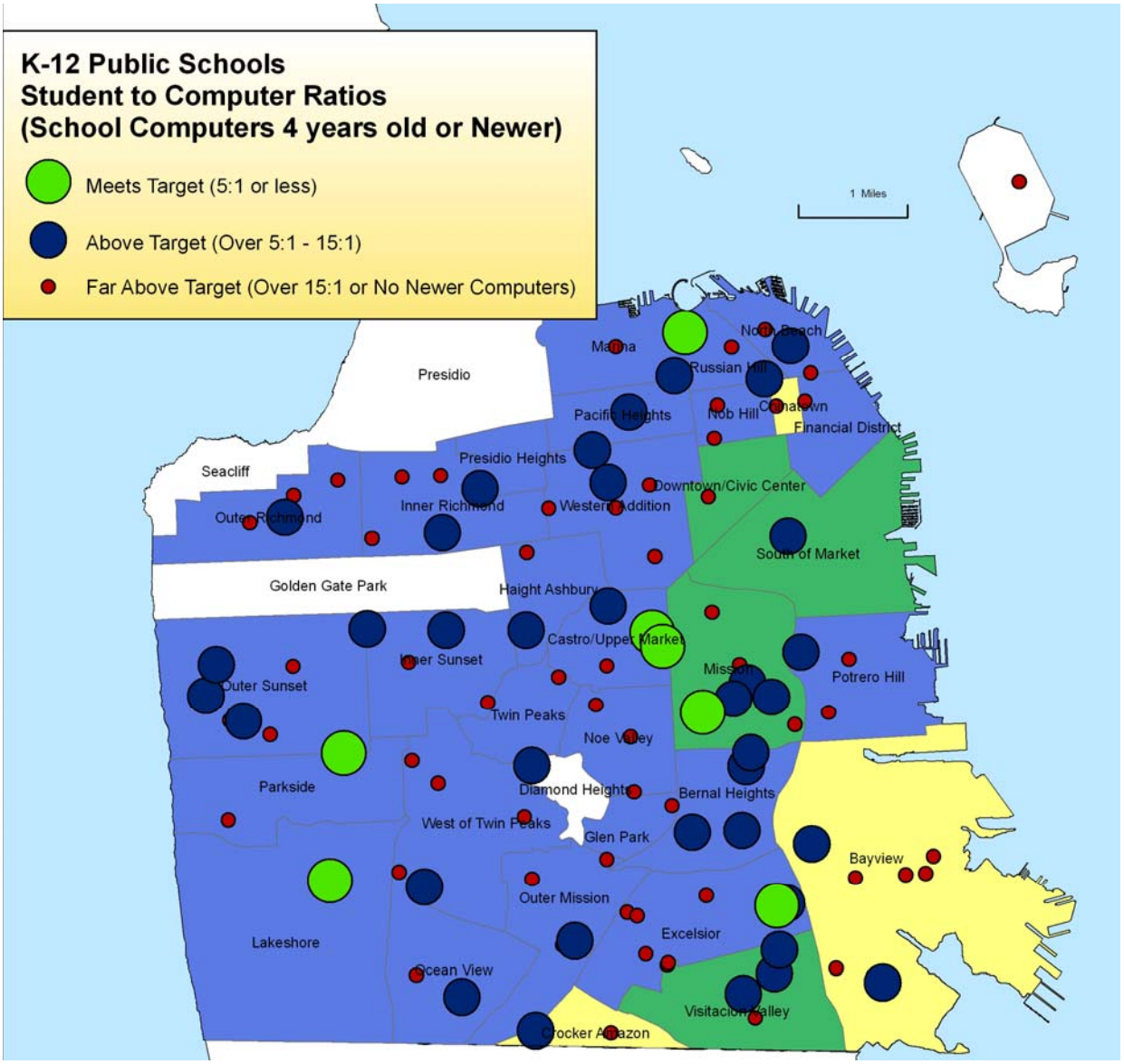
APPENDIX B. GAPS ANALYSIS OF PUBLIC RESOURCES IN SAN FRANCISCO

MAP 1. STUDENT-TO-COMPUTER RATIOS IN SAN FRANCISCO BY NEIGHBORHOOD (ALL COMPUTERS)

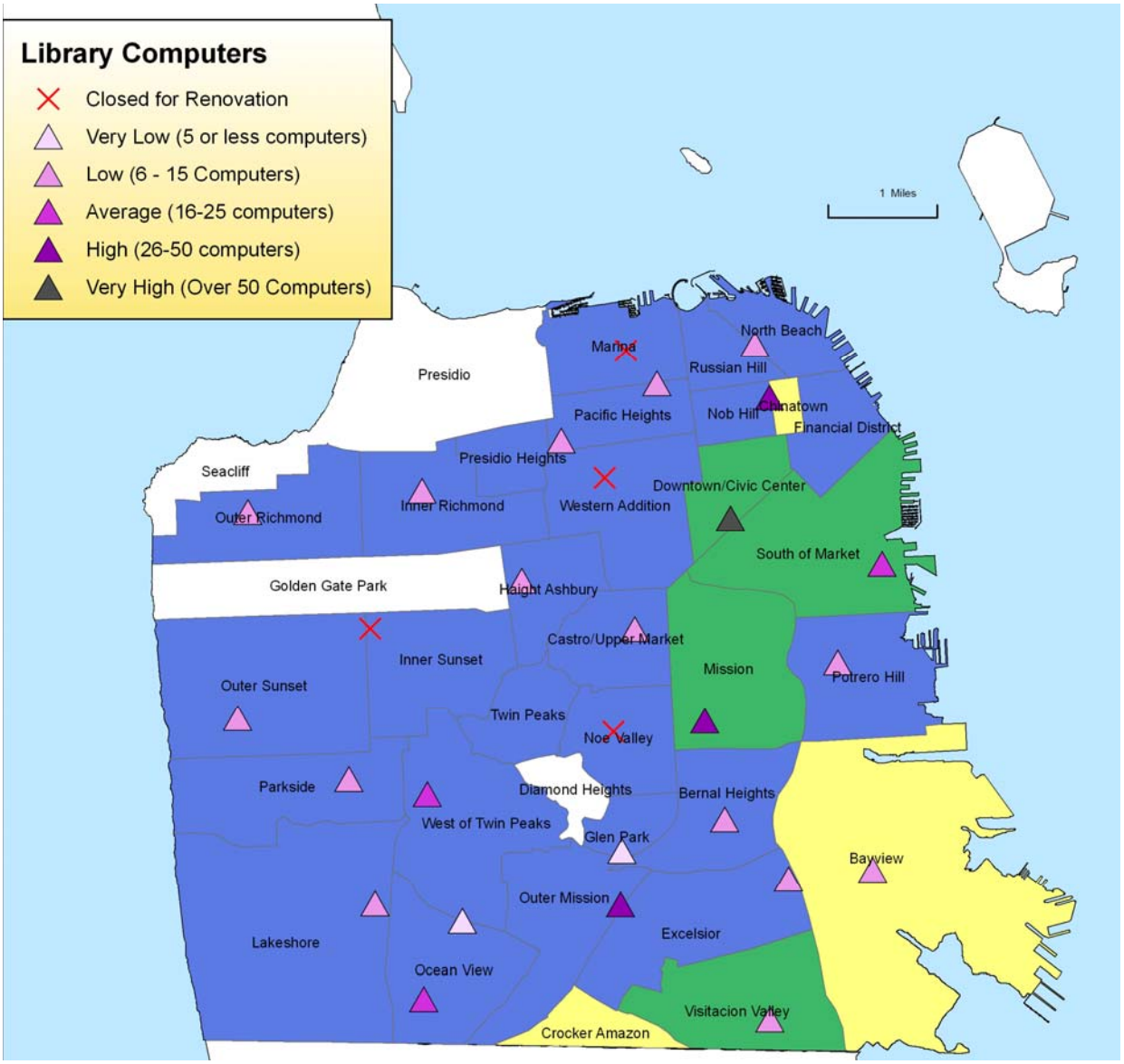


Source: California Department of Education Technology Survey 2006

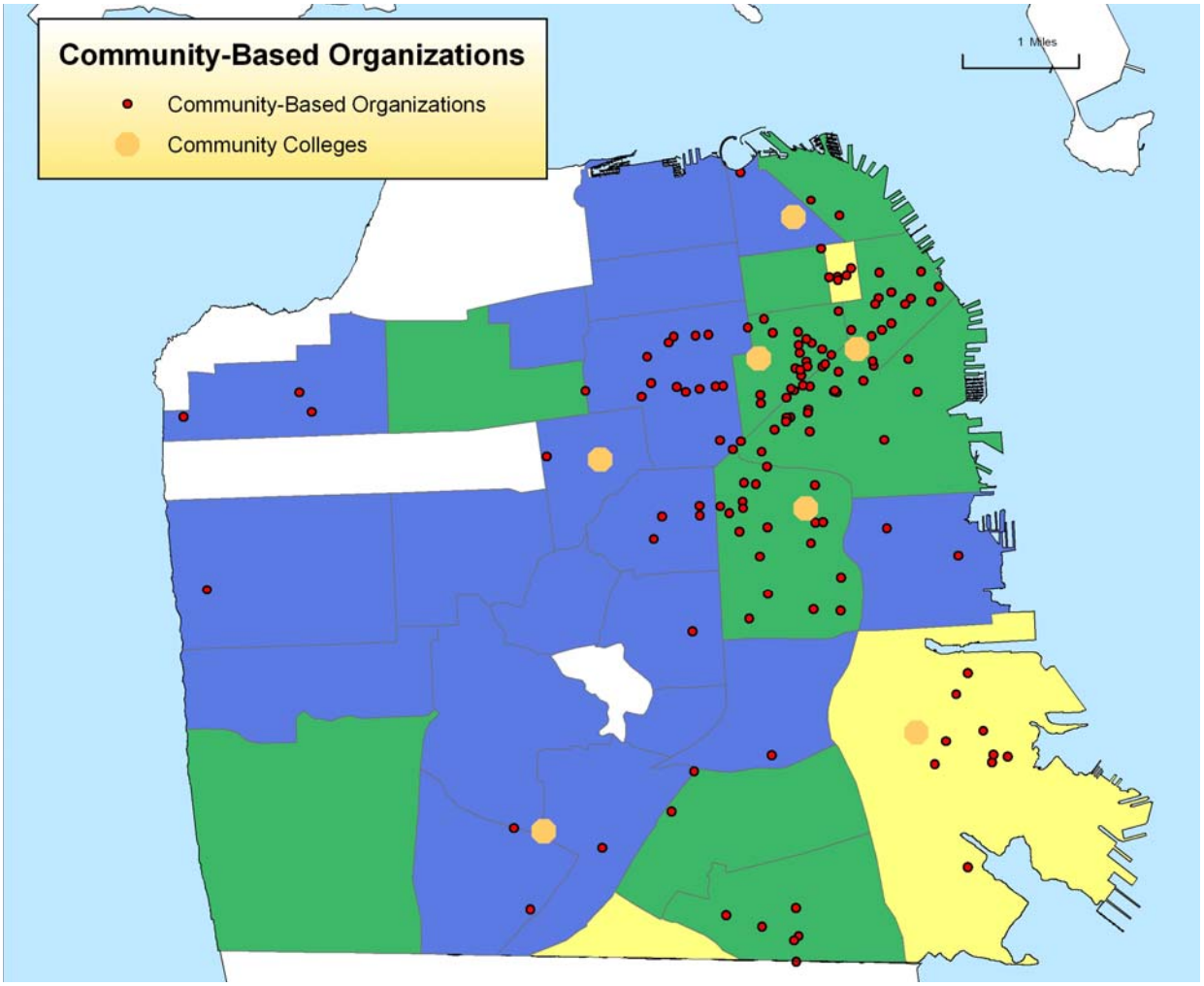
MAP 2. STUDENT-TO-COMPUTER RATIOS IN SAN FRANCISCO BY NEIGHBORHOOD (COMPUTERS 4 YEARS OLD OR LESS)



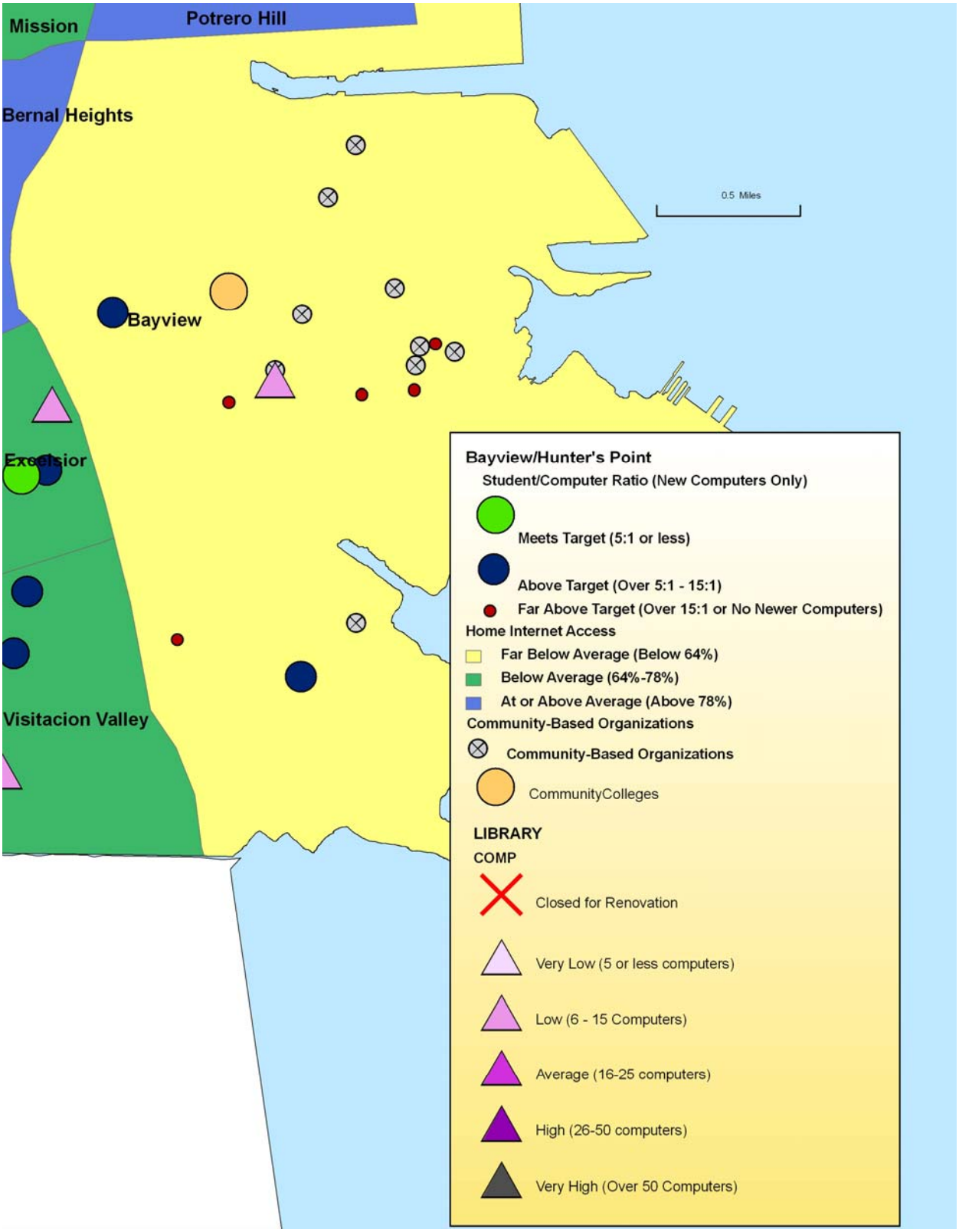
MAP 3. LIBRARY COMPUTER RESOURCES IN SAN FRANCISCO BY NEIGHBORHOOD



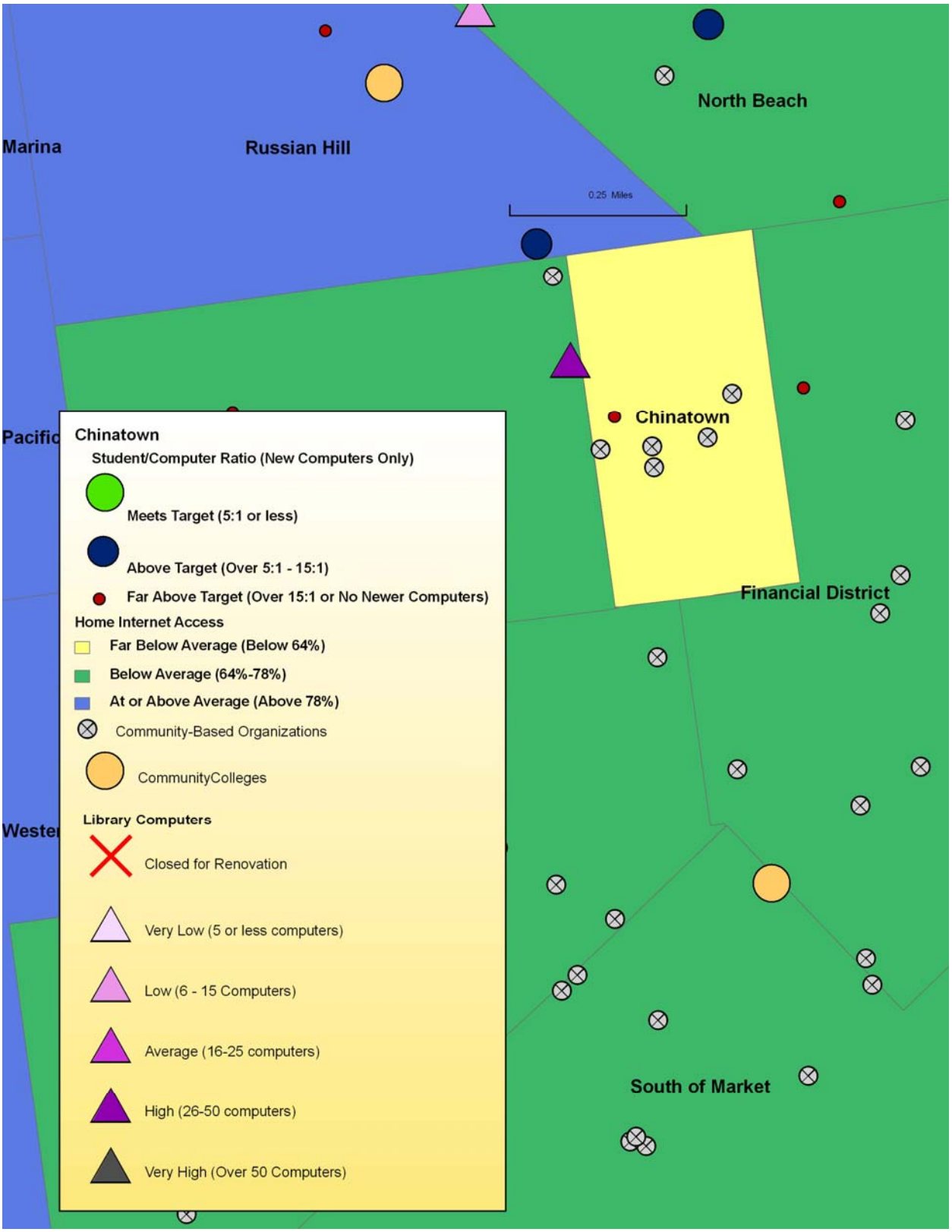
MAP 4. COMMUNITY TECHNOLOGY PROGRAMS IN SAN FRANCISCO BY NEIGHBORHOOD



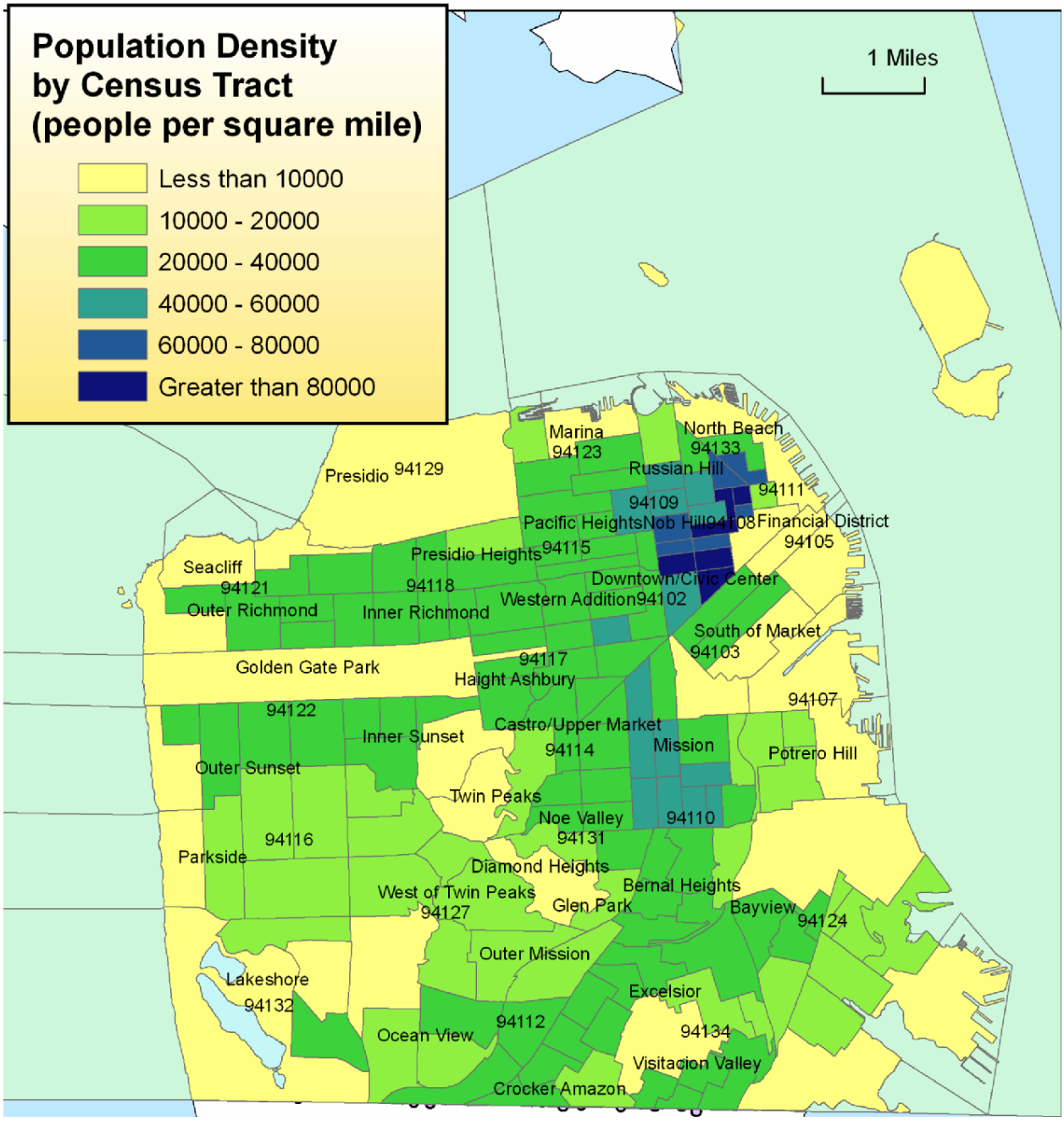
MAP 5. PUBLIC TECHNOLOGY RESOURCES OF BAYVIEW/HUNTER'S POINT



MAP 6. PUBLIC TECHNOLOGY RESOURCES OF CHINATOWN



MAP 7: POPULATION DENSITY IN SAN FRANCISCO BY CENSUS TRACT



APPENDIX C – Focus Group Protocol & Results

Focus Group Write-Up

Background

We administered two focus groups - one for adults and one for youth.[13] The first group (6 adults) took place on April 19, 2007 at the offices of DITS; the second group (12 youth) took place on April 20, 2007 at John O'Connell High School in San Francisco. Our goal was to better understanding of the need that exists in San Francisco regarding perception/access, use, and knowledge of computers and the Internet.[14]

Adult Group Findings

The adult group generally had positive impressions of computers and the Internet. Many participants felt that once they were educated about the benefits of the Internet they felt compelled to purchase a computer. Those who did not have a computer accessed the Internet through nonprofit organizations. They also use libraries, which had the benefit of no firewalls. (The nonprofit organizations had firewalls due to funding restrictions.)

In the primary uses of the Internet were e-mail (to contact relatives out of the country), public transportation information, some government services, and some healthcare information. One participant used a computer to upload photographs. Most had concerns about using the Internet for shopping; the class instructor had warned them against shopping online using the nonprofit organization's computers.

All the participants learned how to use computers and browse the Internet from classes (both formal and informal) at nonprofit organizations. Some would ask their children for help, but their children would rarely have the patience to explain everything the adults wanted them to. Some participants also took classes at City College. The benefit of this was that they received a certificate of completion. The benefit was both psychological, in that they were proud of their accomplishments, and professional, and that they could put the certificate on their resumes.

Youth Group Findings

[13] We also administered a practice focus group to seven GSPP students in order to test run our protocol and receive feedback on the substance of our questions and the manner in which we conducted the focus group.

[14] In our conversations with DITS, it was clear that these two focus groups or implement every part of a larger effort that would include additional focus groups for these populations as well as focus groups aimed at non-English speakers and individuals with disabilities.

The youth group also had positive impressions of computers and the Internet, although there was some concern about privacy. All of them felt very comfortable using a computer and browsing the Internet. These teenagers accessed the Internet primarily at school (although it had a firewall) and at home, although some accessed the Internet through cell phones or gaming devices such as the PSP and the Nintendo Wii. Their main desire was for greater and faster access—i.e., their own computers with Internet connection with connection speeds at least those of cable.

The first thing the students said they used the Internet for was MySpace.com. (Although the districts of firewall block direct access to this site, the students had figured out a way around it.) Most also used it for games, music downloads, sharing pictures, video, and email (to contact friends and family outside the Bay Area). Some used it for shopping, for information on public transportation, for banking, and to pay bills on the Internet.

The majority of students said that they remember learning about computers and the Internet in elementary school. They continued to learn about the Internet primarily on their own or from friends. If they wanted to do something on the Internet and their most tech-savvy friend could not help them, most said that they would just give up. A few students had parents who knew more than they did about the Internet, but most parents actually asked their kids for help. Most students said that they were willing to help their parents for a little while, but their patience quickly ran out.

Adult Focus Group

Location: DITS Offices
Date: April 19, 2007
Participants: 6

Background

Participant 1: She lives in the East Bay, but works in San Francisco. She is originally from China. She works for *Self-Help for the Elderly* in Chinatown as an instructor of computer and Internet literacy classes.

Participant 2: He is retired and has lived in San Francisco for 30 years. But he is originally from Hong Kong. He is currently working to learn more from the nonprofit organization about computers and the Internet through Participant 1's class.

Participant 3: He is retired and has lived in San Francisco for 30 years. But he is originally from Hong Kong. He uses computer to edit his photography projects.

Participant 4: He is an Oakland native but now lives and works in Visitation Valley as a tech coordinator and contractor for nonprofits. In the computer classes he taught, the age range was wide: from 18 to 60. He has worked in Visitation Valley for 6 years now, and currently teaches an adult computer class primarily serving immigrants.

Participant 5: He came from Hong Kong at 13 to Visitation Valley, but now he lives in Richmond. He has DSL with a wireless router and shares it with others. He works at Participant 4's organization.

Participant 6: She lives in Visitation Valley which where she grew up. Her access to the Internet is a "so-so thing". She has older laptop at home with DSL. She can't use the printer and the Internet at the same time because they both use her only USB port. She works at Participant 4's organization.

Access/Perceptions

Participant 1: She sees education and language as the main barriers to Internet use. She says many people in her community have a computer, but no one to teach them. Many in her community seek training, but won't take the class unless it is free. Many of her students are older and do not have someone to teach them how to use a computer or access the Internet. Another challenge is that many potential students do not speak English so language becomes a barrier. She also says many in her community are seeking classes for beginner and classes in Chinese.

Participant 6: Many people in her community are without access. She says a barrier for people in her community is the fact that most donated computers are useless. They are so old and poorly maintained that they can't be used for much of anything. Generally, attitudes about the Internet among these individuals are positive. One negative impression is worries about the risks associated with using personal information on the Internet.

Participant 2: The primary reason people don't use Internet is that it's expensive and they do not speak English. He says it is very expensive for retirees to get tech support and computers. Location is also another problem. Sometimes he had to take the bus all the way to City College. He knows some people who won't make the trip. It would be easier if there was something at Participant 1's organization.

Participant 3: He believes computers and the Internet are useful and important for everybody, but is worried that limited English ability prevents more Internet usage for many. He says that language is also a barrier, because it prevents youth in Chinese communities from teaching their parents, as the

younger people primarily speak English and can't explain technology concepts in Chinese.

Participant 5: He identifies Internet service as a barrier for people in his community. There are areas of the city that don't get DSL, or the DSL they get is extremely slow. The DSL in his area needed to be shut off for a month. While cable is available, it's very expensive.

Participant 4: There are behavior barriers too. When users get frustrated because they don't know how to do something (either with hardware or software), they just give up. Individuals recognize that there are programs in place to support them but they don't have time to go and use them, or have a reason to avoid the areas where they are held. Their children might help at first but then they get frustrated and won't continue to help. He says the majority of participants in his program lack resources: particularly computers and Internet access at home. Many don't understand the difference between software and hardware.

When asked if anyone in their communities thinks computers and Internet use aren't important or are a waste of time, everyone in the group says no.

Use

Participant 1: She teaches her students to use the Internet to get information on Medicare and Social Security. She warns against entering private information into public computers. Her students often use her center's computers to email friends and family in Hong Kong and to get bus information.

Participant 2: He uses a computer at home, mainly for uploading photographs. He bought a computer when he realized how much he needed it after taking Participant 1's class. He also uses the Internet to get medical information. Most recently he used the Internet to learn more about the risks associated with the drug Vioxx.

Participant 3: He uses search engines, reads news, does shopping, and writes and reads email. He likes the informal setting of Participant 1's computer classes.

Participant 4: He says people in his community use the Internet to get information on music and lyrics as well as maps, directions, and public transportation information. They tend to use the computers at libraries because they can access more sites than the firewalled computers at schools and his organization. He wants to see a citywide program committed to expanding usage housed in locations in every city district. He says that nonprofits are limited because they are always fighting for

resources and funding. Ideally, a citywide program should combine access with education.

Participant 5: He says people use the computers at his CTP primarily for email and reading news. He says the center recommends against shopping on their machines for security purposes. He also mentions that the Beacon Center's school-based servers block instant messaging.

Participant 6: She says that people in her community like to use the Internet to listen to music and to look up lyrics for songs they hear on the radio. She personally uses it for work – her employer requires her to record her work hours online. She also uses it for entertainment. She agrees with Participant 5 that access and education should come hand-in-hand. This would expand usage among people who aren't online.

Knowledge

Participant 1: Her students will tend to ask their children when they have computer problems – if they live elsewhere, they will call them up. Sometimes, though, such assistance is difficult for sons and daughters to give because the parents don't understand fundamental aspects of computers. Her students will come to her if they continue to have problems, and usually she will ask them questions to help them work through the process.

Participant 3: He says that language is the main barrier to greater education. This is important because of the quick pace of change—as soon as you buy the computer it is already out of date. He says that in order to learn more about using computers, he will go to Participant 1's class or call her to get information because she speaks Chinese. He says that among all ages in the Chinese community many don't have the ability to read instructions on the Internet. He says other people who want more advanced training will go to a school and seek a technology-related degree. But people in his community can't make use of city college classes because they are taught in English. He thinks the best way to use money to expand Internet usage is to create classes for computer education, because people can't use technology without training. He thinks nonprofit organizations do the best job with training because they aren't out to make money. He thinks libraries are also a good setting.

Participant 2: He calls his son when he has computer trouble. He says that some people like going to a class to learn because they can receive a certificate. This makes them feel proud of their accomplishments and it also enables them to put it on their resume. Others like a more informal class. Location of the class is very important to attendance.

Participant 4: He says that people's ability to educate themselves depends on their behavior. If they are comfortable searching and navigating the web, they will be able to find what they want. In his classes, he puts a big emphasis on do-it-yourself learning. He teaches students how to identify specific words and use them in searches. For the most part this is successful, although some people still struggle. He also identifies a dynamic regarding education between parents and children. Young kids love to share information, but once they get to middle school age they are increasingly reluctant to share with their parents. Also, parents who are struggling are sometimes reluctant to take instruction from their children. He says most peer information sharing about the Internet is informal. He also takes care to teach students about virus protection. He speaks positively of the Digital Connectors program, which trains students to provide tech support and work on refurbished computers. However, this program is still a "work in progress" in his community. Many of his students lacked a high school education and sought to learn the fundamentals of computer use. He agrees that education should be a priority for anyone looking to expand Internet usage. He says that it's important that classes be open and easily accessible. If it takes too many bus lines to reach a class, people won't make use of it.

Participant 5: He says learning about new sites or programs is usually self-explanatory. People can just go to the website and figure it out. He says that ease of learning is often negatively correlated with age, and that it can get frustrating trying to teach people who are uncomfortable with technology. He also advises people in his community about solving problems and preventing viruses. He puts an emphasis on prevention. He says computer classes in nonprofit organizations are not very structured. He says this is good and bad. On one hand, they are flexible and students can learn through experience. However, they don't always teach students the most effective or "correct" methods for using the Internet.

Participant 6: There is also a great variance in the amount of knowledge. Some know a great deal about the Internet, others know very little.

Youth Focus Group

Location: John O'Connell High School

Date: April 20, 2007

Participants: 12 (Given the large number of participants in this focus group, we were not able to attribute comments to a particular participant. Therefore, the feedback is organized by subject.)

Demographics

Participants: Participants were a mix of boys and girls from the 9th and 10th grade in a public high school in the Mission. The students were from the Mission, the East Bay, and Hunter's Point. Many had moved from other locations before settling into their current neighborhoods. These areas included Stockton, Hayward, Richmond, Oakland, and Treasure Island. A few of the male students were on the school's wrestling team. One of the student's brothers worked at the Booker T. Washington community service center in the Western Addition and has a high level of knowledge regarding networking and WiFi. Another student said her mom works with computers and has a high level of knowledge of the Internet.

High School: The high school had one of the highest ratios of students to computers in the city.

Internet: When asked to freely associate with the word "internet," students said: type, Internet, Myspace, fun, useful, download, outstanding, games.

Computer: With the word computer: laptop, music, complex, research, download, Microsoft, screen.

Access/Perceptions

Positive: Most of the subjects said they are "100% comfortable" with the Internet. All of the students want to use the Internet more and have very positive impressions of the web. They say they can learn faster – that it makes it easier to write and research papers. One student said that it's "universal," that you can do anything that you want with it.

Negative: Some students had a negative perception. They don't like it when computers would freeze or crash, especially when it meant a loss of information or work. (There had been a power outage in the neighborhood and a number of students had lost their work.) They also said that they hate spam. A few of the girls said they didn't understand the term "Wi-Fi". They wanted wireless access, and they wanted it to be faster than DSL. The students wanted faster Internet access. "Fast like

Comcast." A few students had specific complaints about Comcast though. One said that they hooked their home up for high-speed Internet, only to later discover that their computer was too old to use it. Others complained about poor support and lack of guidance from Comcast/SBC.

At School: At the school technology center, the students' Internet use is restricted by a firewall. They can't download files or use the "Images" section of search engines. They also aren't supposed to be able to access MySpace.com. However, one of the students bragged that he could bypass into the school system to access Myspace.com. The students complained about the speed of the computers at school. They say they cannot use it for multimedia applications. The students say that their school has enough computers though.

Libraries: Some make use of the computers at public libraries, and say that the speed of computers varies widely at different libraries.

Home: All students said that they have computers at home, but many said that they were not fast enough. The student who knew how to bypass the school firewall also said that he used a program called "Web Accelerator" to speed up his browser. All of the students agreed that access at home is extremely important. Most complained about sharing the computer with siblings and said that conflict between family members often arose over this issue. In their home, they want more technology access. They want a choice between desktop and laptops, faster Wi-Fi, more choices of operating systems, and virus/pop-up blockers.

Other Access: Some students said they access the Internet over their cell phone. Many students actually preferred cell phone access because it can be used anywhere. Some of the boys said they access the Internet over video game consoles including PSP, Nintendo DS, XBOX, PlayStation 3, and the Nintendo Wii. Some use fee-charging Wi-Fi hotspots at McDonalds or Starbucks. When asked what they would say if they could send a message to Gavin Newsom, students said they want Bluetooth applications, and free wireless Internet that anyone can access. They want better computers with video chat capability. They want landlines that are faster than wireless.

Use

At School: They primarily used the Internet to access MySpace.com (almost all participants had MySpace.com pages) and for research projects for school. Other Internet uses included games, music downloads, sharing pictures, video and email (all had email accounts). Some used it for shopping. Some wanted image editing software such as Photoshop (but they want this to come with a manual). Most used email to contact friends and family outside the state. Students also use the Internet for information on public transportation, banking, and to pay bills on the Internet. However, not all of the students were aware that it was possible to pay bills. The students on the wrestling team said they used a physical fitness tracking site. The site gave recommendations on diet and exercise based on age, weight, and other factors.

Knowledge

Learning: The students say they learned to use computers through educational games and typing classes in 4th/5th grade. The students learn about new applications through experimentation and asking others. Some read manuals. Most say they are almost always successful figuring it out on their own.

Help: They say their friends call them up to ask them for help with websites and applications. When unable to figure out problems with computers or the Internet, the students would talk to their friends, or call Comcast. Usually, they would give up if their friend who's best with technology didn't know the answer. A few would call the technical support line for whatever program they are having trouble with, but most would not bother.

Parents: Some parents knew how to track what websites their children are looking at. Others said their parents had a low level of knowledge of computers and the Internet. These students said they get irritated when their parents ask for help, especially when they ask many questions are asked. Some said their parents ask extremely basic questions, such as: "what is a mouse?" When a family acquired a new computer, most students said that they would be the one to set it up. Many students said that in order to get new technology they paid half the cost and while their parents paid the other half.

Appendix D. School Technology Resources in 2006		
School	Student to Computer Ratio	Personnel
Aim High Academy	3	0.7
Alamo Elementary	No computers 4 years or less	0
Alvarado Elementary	No computers 4 years or less	0
Aptos Middle	54	1
Argonne Elementary	20	0.2
Balboa High	10	0.2
Bryant Elementary	3	1
Buena Vista Annex	9	0
Burton (Phillip and Sala) Academic High	40	1
Carmichael (Bessie) Elementary	21	0.2
Carver (George Washington) Elementary	42	0
Chavez (Cesar) Elementary	11	0.5
Chin (John Yehall) (Elem)	12	0
Chinese Education Center	9	1
City Arts and Tech High	48	0
Clarendon Elementary	5	0.9
Cleveland Elementary	32	0
Cobb (William L.) Elementary	No computers 4 years or less	0
Commodore Sloat Elementary	7	0
Creative Arts Charter	20	1
Davis (Gloria R.) Middle	13	0
Denman (James) Middle	11	0
Drew (Charles R.) Elementary	8	0
El Dorado Elementary	26	0
Everett Middle	5	1
Fairmount Elementary	21	0
Five Keys Charter	19	0
Flynn (Leonard R.) Elementary	113	0.6
Francis Scott Key Elementary	5	1
Galileo High	9	0
Garfield Elementary	No computers 4 years or less	0.6
Gateway High	31	0
Giannini (A. P.) Middle	13	0
Glen Park Elementary	8	0

Grattan Elementary	18	0
Guadalupe Elementary	17	0.5
Harte (Bret) Elementary	41	0.57
Hillcrest Elementary	No computers 4 years or less	0
Hoover (Herbert) Middle	15	0
Independence High (Alternative)	No computers 4 years or less	1
International Studies Academy	10	0
Jefferson Elementary	18	0.375
Jordan (June) School for Equity	No computers 4 years or less	0.2
KIPP Bayview Academy	44	0
KIPP San Francisco Bay Academy	12	0.2
Lafayette Elementary	No computers 4 years or less	0
Lakeshore Elementary	21	0
Lau (Gordon J.) Elementary	98	0
Lawton Elementary	31	1.5
Leadership High	4	1
Lick (James) Middle	13	0
Life Learning Academy Charter #140	No computers 4 years or less	0
Lilienthal (Claire B.) Elementary	21	0
Lincoln (Abraham) High	405	0
Longfellow Elementary	13	0.4
Lowell High	4	1
Malcolm X Academy	11	0.4
Mann (Horace) Middle	34	0
Marina Middle	142	0
Marshall (Thurgood) Academic High	8	0.5
Marshall Elementary	15	0.2
Martin Luther King Jr. Academic Middle	7	0
McCoppin (Frank) Elementary	61	0
McKinley Elementary	2	1.2
Metropolitan Arts & Technology High	120	1
Milk (Harvey) Civil Rights Elementary	34	0.2
Miraloma Elementary	33	0
Mission Education Center	7	0
Mission High	17	0
Monroe Elementary	21	1
Moscone (George R.) Elementary	241	0.2
Muir (John) Elementary	13	0

New Traditions Elementary	16	0
Newcomer High	18	0
O'Connell (John A.) High	54	1
Ortega (Jose) Elementary	11	0
Parker (Participant 1) Elementary	6	0
Parks (Rosa) Elementary	No computers 4 years or less	0
Peabody (George) Elementary	21	0.75
Presidio Middle	12	0.8
Redding Elementary	12	0.2
Revere (Paul) Elementary	11	1
Rooftop Elementary	No computers 4 years or less	0
Roosevelt Middle	80	0
San Francisco Community Alternative	20	0
Sanchez Elementary	41	0.2
School of the Arts	14	0
Serra (Junipero) Elementary	23	0
Sheridan Elementary	21	1
Sherman Elementary	23	1
Spring Valley Elementary	12	1
Starr King Elementary	No computers 4 years or less	0.75
Stevenson (Robert Louis) Elementary	7	1
Sunnyside Elementary	120	0.5
Sunset Elementary	10	1.2
Sutro Elementary	13	0.6
Taylor (Edward R.) Elementary	11	0
Tenderloin Community	12	1.5
Ulloa Elementary	24	1.2
Visitacion Valley Elementary	27	0
Visitacion Valley Middle	7	1.5
Wallenberg (Raoul) Traditional High	No computers 4 years or less	1
Washington (George) High	48	0
Webster (Daniel) Elementary	9	0
Wells (Ida B.) High (Cont./Alt.)	11	0
West Portal Elementary	18	0
Yick Wo Elementary	16	0.87
Yu (Alice Fong) Elementary	3	1

Appendix E. Public PCs in the Main & Branch Libraries

Mar-07	Internet + Office	Express Internet	Catalog	ADA	EDC	CD ROM	Laptop	Total
Main - 1st		8	8					16
Main - 1st (DS)	2							2
Main - 2nd (MCD)	2		5		12			19
Main - 2nd (LBPH)				3				3
Main - 3rd GEN	22	1	7			1		31
Main - 3rd INT	9	1	3	3		1		17
Main - 3rd Teen	2							2
Main - 4th BTC	16	1	8			2		27
Main - 4th AMC	9	1	6	3		1		20
Main - 5th MNC	18	1	5					24
Main - 5th GIC	11	1	4	2				18
Main - 5th Training rm	21							21
Main - 6th HIS	2		4	1				7
Main - 6th Training rm	19							19
Total	133	14	50	12	12	5		226

Appendix C cont. Public PCs in the Main & Branch Libraries

	Internet + Office	Express Internet	Catalog	ADA	EDC	CD ROM	Laptop	Total
ANZ	4	1	3		2			10
BAY	7	1	1		2			11
BHE	4	1	1					6
CHI	19	4	7		2		10	42
CHI Training Lab	8							8
EVA	2	2	2					6
EXC	15	1	2				14	32
GPA	2	1						3
GGV	2	2	2					6
ING	2	1	2					5
INC			2					2
MER	4	2	2					8
MIS	10	2	7		2		10	31
MBA	11	3	3	1				18
NBE	2	2	2					6
OVI	4	1	1		2			8
OVI Training Lab	9							9
ORT	2	2	2					6
PAR	3	2	1					6
PSI	5	2	3					10
POR	4	1	1					6
POT	4	1	1					6
PRE	5	1	1					7
RIC	4	1	5		2			12
SUN								
VVA	4	1	1					6
WPO	10	3	3					16
Total	146	38	55	1	12		34	286
Grand Total	**279**	**52**	**105**	**13**	**24**	**5**	**34**	**512**

APPENDIX F – BINARY REGRESSION MODELS ON HOME USE

DProbit Regressions (reporting marginal effects)	**Dependant variable: Home Internet Use**		**Dependant variable: Home PC Use**	
Predictor	**dF/dx**	**Std. Error (Robust)**	**dF/dx**	**Std. Error (Robust)**
Single person household	-0.1066****	0.0203	-0.0994****	0.0187
Age: 60-74	-0.1072****	0.0252	-0.1160****	0.0241
Age: 75 or over	-0.3412****	0.0536	-0.2962****	0.0506
Not Employed	-0.0260	0.0202	-0.0112	0.0165
Kids 18 or under in household	0.0475**	0.0176	0.0335	0.0159
Female	-0.0350**	0.0143	-0.0264**	0.0123
Annual Income				
Less than $10,000	-0.1726****	0.0472	-0.1902****	0.0471
$10,000-$24,999	-0.0451**	0.0261	-0.0467**	0.0235
$50,000-$99,999	0.0385**	0.0173	0.0268**	0.0152
$100,000 or more	0.1005****	0.0174	0.0601***	0.0163
Educational Attainment				
Less than high school degree	0.0457	0.0254	-0.0003	0.0289
Some College	0.0880****	0.0154	0.0638****	0.0131
College Graduate or Higher	0.1936****	0.0306	0.1569****	0.0266
Race/Ethnicity				
African American	-0.0536	0.0378	-0.0150	0.0275
Asian American/Pacific Islander	-0.0405**	0.0209	-0.0163	0.0173
Latino (Non-White)	-0.1678****	0.0388	-0.1220****	0.0348
Other Race/ethnicity	-0.0680**	0.0367	-0.0413	0.0333
Supervisorial District				
District 1	0.0382	0.0266	0.0403	0.0206
District 2	0.0537	0.0235	0.0364	0.0201
District 3	0.0367	0.0249	0.0388	0.0187
District 4	0.0725**	0.0205	0.0625***	0.0151
District 5	0.0782***	0.0183	0.0612***	0.0148
District 6	0.0437	0.0229	0.0354	0.0190
District 7	0.0753***	0.0201	0.0572**	0.0169
District 8	0.0563**	0.0227	0.0529**	0.0177
District 9	0.0333	0.0261	0.0215	0.0227
District 11	0.0531	0.0238	0.0512**	0.0169
Psuedo-R2	**0.3434**		**0.3612**	
Number of Observations	**2751**		**2774**	

Source: San Francisco Controller's Office, 2007 City Survey Dataset.

**p < .05 ***p < .01 ****p < .001 Omitted dummy controls: 1) Income=$25,000-49,999; 2) Education: High School Graduate; 3) Race: White/Caucasian; 4) District: District 10

Coefficients computed using the Stata dprobit command yield the predicted change in home internet/home pc use based on the presence of the predictor, evaluated at the mean of the rest of the predictors.

APPENDIX F – BINARY REGRESSION MODELS ON HOME USE

DProbit Regression (reporting marginal effects)	**Dependant variable: Home Internet Use**	
Predictor	**dF/dx**	**Std. Error (Robust)**
Single person household	-0.0967****	0.0199
Age: 60-74	-0.1225****	0.0260
Age: 75 or over	-0.3687****	0.0543
Not Employed	-0.0168	0.0187
Kids 18 or under in household	0.0469**	0.0172
Female	-0.0342**	0.0141
Annual Income		
Less than $10,000	-0.1796****	0.0466
$10,000-$24,999	-0.0369	0.0247
$50,000-$99,999	0.0406**	0.0168
$100,000 or more	0.0994****	0.0172
Educational Attainment		
Less than high school degree	0.0433	0.0244
Some College	0.0874****	0.0148
College Graduate or Higher	0.2012****	0.0309
Race/Ethnicity		
African American	-0.0381	0.0358
Asian American/Pacific Islander	-0.0395**	0.0208
Latino (Non-White)	-0.1637****	0.0393
Other Race/ethnicity	-0.0692**	0.0376
San Francisco Neighborhood Dummy Variables (Selected)[a]		
Excelsior	0.0944***	0.0133
Lakeshore	0.0893**	0.0181
Parkside	0.0953***	0.0142
Bernal Heights	0.0959***	0.0140
Castro/Upper Market	0.0815**	0.0209
Haight Ashbury	0.1108****	0.0091
Inner Sunset	0.0843**	0.0206
Noe Valley	0.0818**	0.0192
Outer Mission	0.0916**	0.0171
Outer Richmond	0.0927***	0.0143
Outer Sunset	0.0773**	0.0210
Russian Hill	0.0862***	0.0178
Western Addition	0.0867***	0.0175
West of Twin Peaks	0.0732**	0.0233
Psuedo-R2	**0.3608**	

APPENDIX F – BINARY REGRESSION MODELS ON HOME USE

Number of Observations	2719
Source: San Francisco Controller's Office, 2007 City Survey Dataset.	
*p < .1 **p < .05. ***p < .01. ****p < .001.	
Omitted dummy controls: 1) Income=$25,000-49,999; 2) Education: High School Graduate; 3) Race: White/Caucasian; 4) Neighborhood: Bayview/Hunter's Point.	
Coefficients computed using the Stata dprobit command yield the predicted change in home internet/home pc use based on the presence of the predictor, evaluated at the mean of the rest of the predictors.	
a) Observations for the Presidio, Seacliff, and Golden Gate Park neighborhoods were omitted from the model due to lack of variation in home internet use. Only neighborhood coefficients with p<.01 are reported here.	

Note: All regressions were performed by the authors with data provided by the San Francisco Controller's Office. The regression analysis presented in this report reflects the sole work of the authors and not the San Francisco Controller's Office.