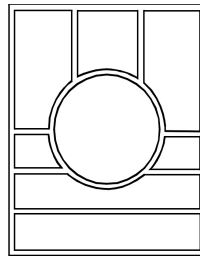


**Broadband Internet Access Among Latinos:
Status, Issues and Opportunities**



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A. Introduction and Objectives

The Internet has changed the world in which we live in a comparatively short time, and as its impact continues to grow, it has become an integral component of daily life. Broadband, or high-speed connectivity, makes the Internet even more useful and convenient than narrowband, more commonly known as dial-up service. Information can be downloaded at significantly higher speeds than dial-up. The connection is always on, meaning you can access the Internet without the need to dial up an Internet service provider over a telephone line and tying up that line. Broadband Internet access increases opportunities for communication, education, economic development, health care, entertainment, telecommuting, civic participation, and e-government. Its central importance was underscored when President George W. Bush called for “universal, affordable access to broadband technology by the year 2007.” (Speech, March 26, 2004).

However, not everyone enjoys the benefits of broadband technology. Specific groups, such as lower income families and individuals, Hispanics, African Americans, those with less education, and the disabled continue to have less access to this innovative means of communicating and increasing knowledge. The Federal Communications Commission (FCC) has identified four challenges to developing and deploying broadband technology:

- The infrastructure is not yet ubiquitous
- Relative costs of deployment remain high compared to narrowband
- Access is limited in underserved areas
- Adoption rates remain low relative to availability
(FCC, 3/13/2003 available at <http://www.fcc.gov/broadband>)

This brief provides an overview of residential broadband technologies. It explores the potential benefits of broadband, under-representation of Hispanics and African Americans in this market, and existing and projected Hispanic and African American demand. It then goes on to explain the reasons for the lower market penetration rates among Hispanics. The report closes with policy recommendations to improve broadband use among Hispanics and other underserved groups.

B. What are the Major Broadband Technologies?

During the last three years, households and small businesses have increasingly relied on high-speed service, or broadband, to access the Internet. According to the Federal Communication Commission (FCC), broadband is defined as a high-speed line connecting a computer user with the Internet at a speed faster than 200 kilobits per second (kbps) in at least one direction (FCC, 2003). Broadband technology allows computer users to go online with greater ease and download information such as music, data, or software, at speeds up to 50 times faster than dial-up. Based on estimates by the Congressional Budget Office (CBO), 28% of all households with Internet connectivity were broadband subscribers in 2002 (CBO, 2003). More recent figures estimated that by March 2003, 31% of households had a high-speed connection (Horriagan, 2003).

The most popular broadband technologies in the market today are cable modem and digital subscriber line (DSL). Cable modem uses part of the television cable network owned by cable television companies to provide high-speed Internet connectivity. In contrast, DSL relies on the

excess capacity of telephone copper lines owned by local telephone providers. Far less popular technologies are satellite, which operates in the same way as television services, and terrestrial fixed-wireless systems, which employ radio spectrum to communicate with a radio transmitter at the user's home (FCC, 2002).

Cable Modem and DSL

Cable modem and DSL are by far the most popular high-speed Internet services in urban areas. Cable modem broadband is the most widely available service to households and has the largest market share, comprising 66% of all residential and small business broadband lines (FCC, December 2003). Television cable service is available to 90% of homes in the U.S., and cable modem broadband is usually also available to those same homes. DSL service is provided over telephone wires, but is not always available everywhere that regular telephone service is available. Despite the continuing dominance of the cable broadband market, the number of DSL lines has increased over the last three years as it becomes more available and very price competitive with cable.

However, cable and DSL technologies also have some drawbacks. Cable is a shared network and speed declines as more subscribers join the network. To increase transmission speed, cable system capacity has to expand by shifting regular television channels to data transmission channels or by reducing the number of users (Jackson, 2002). This problem does not affect DSL technology. With DSL, speed decreases as the customer's distance to the central telephone office providing DSL increases. To be fully effective, DSL customers must reside within 18,000 feet or about 3.5 miles from the telephone company's central office (CBO, 2003). While new technologies are reducing this limitation, the problem still affects between 25% and 35% of local telephone customers nationwide. Also, DSL service is not as widely available as is cable access. **Table 1** highlights key characteristics of the most popular technologies used to connect with the Internet.

Table 1
Comparison of Residential Broadband and Narrowband Technologies

	Broadband			Narrowband
Features	Cable Modem	DSL	Satellite	Dial-Up
Access method	Coaxial cable	Copper wire	Wireless	Copper wire
Connection	Always on	Always on	Always on	Requires dial-up
Download speed	200 to 1.5 Mbps	200 to 768 Kbps ¹	500 Kbps ²	56 Kbps
Monthly cost	\$35-\$50	\$30-\$50	\$60	\$16-\$22
Installation cost	\$100-\$150 ³	\$100-\$150 ³	\$600-\$700	None
Speed limitation	Drops as network is shared with more neighbors	Drops as distance from home to central office increases	Affected by storms and abnormal weather	Affected by congestion in the network

¹ Possibly up to 1.5 Mbps in some cases.

² Sometimes less.

³ Includes the purchase of a modem, which is most often rebated with a one-year subscription commitment

Wireless

Wireless is another broadband alternative. One type of wireless relies on satellite communication to receive and send data. It is more expensive than cable and DSL, but it is easier to be deployed in remote locations, especially rural areas, where DSL and cable are almost non-existent (Pociask, 2002b). While high-speed Satellite Internet service is available anywhere in the country that has access to the Southern sky, satellite is less feasible in urban areas where high-rise buildings often interfere with the signal (Thorne, 2002). Transmission is also affected by severe weather conditions, and the technology calls for expensive equipment expenditures by the consumer.

Wi-Fi

A promising wireless technology is wireless high fidelity (Wi-Fi), technically known as wireless Ethernet (802.11b). It works as a cordless telephone does, transmitting wireless signals from a base station to a device (Verizon, 2003). Data and information are sent over a wireless network at broadband speed. Since this technology has a limited range of about 300 feet, it is most effective in small areas called “hotspots”, such as hotels, airport lounges, and coffee houses. Many Silicon Valley corporate campuses already have Wi-Fi access, and it also is being installed in key city government and university buildings (Granelli, 2003b).

Despite all the excitement, industry experts recognize that the technology is very new and still not optimal. The speed of a Wi-Fi connection varies with the number of active users at a hotspot, the distance the device is to the base station, obstructions that can block the signal, and the type of software being used. While Wi-Fi transmits well through glass and many wall types, it is not very effective through metal, concrete or buildings (Verizon, 2003). Wi-Fi technology is not ready to compete head-to-head with DSL and cable services (Kay, 2003). Moreover, Wi-Fi pricing varies significantly between providers (Boyle, 2003).

As problems with Wi-Fi technology and pricing are resolved and the popularity of this service increases, the number of Wi-Fi hotspots continues to expand rapidly. At the end of 2003, there were more than 28,600 public Wi-Fi hotspots available in the U.S., up from 3,000 in 2002, and the number is expected to jump considerably this year (Boyle, 2003; Business Wire, Inc., 2004). Verizon Telecommunications has already established Wi-Fi in multiple locations in New York City.

Wider-Fi Wireless

As Suzukamo (2003) reports, wide-area wireless broadband or Wider-Fi is another new broadband technology that shows great potential. Unlike Wi-Fi that can only operate within a 300 foot radius, Wider-Fi signals can travel as far as 10 miles. This technology relies on radio waves to transmit information and it shows great promise to reach customers in rural areas, well beyond cable or DSL boundaries, at prices lower than satellite connection. Verizon is currently experimenting with Wider-Fi in San Diego and Washington D.C.

C. How Fast Is Broadband Increasing and Why?

The number of broadband users in the U.S. is up significantly in the past few years. There were 20.6 million households and small businesses subscribing to broadband services as of June 2003 compared to 3.1 million in June 2000 (FCC, Dec 2003). The rising popularity of broadband can be seen in **Table 2**. From 2000 to 2003, the number of broadband subscribers grew at an annual rate of 86.8%. During that same period, DSL grew at 102.7%, faster than any other high-speed technology. While the number of cable subscribers grew less rapidly, use of this technology also posted impressive gains during the same three-year period and it continues to dominate the broadband residential and small business market, bringing high-speed Internet connectivity to approximately two-thirds of broadband subscribers in 2003 (ibid).

Table 2
Residential and Small Business Broadband Lines: Growth and Market Share (2000-2003)

Type	June 2000	June 2003	Annual % Change	Market Share 2000	Market Share 2003
DSL	772,272	6,429,938	102.7	24%	31%
Cable	2,215,259	13,660,541	83.4	70%	66%
Satellite or Fixed Wireless	64,320	288,786	65.0	2%	1%
Other	111,490	250,372	30.9	4%	1%
Total	3,163,341	20,629,637	86.8	100%	100%

Source: Federal Communication Commission. High Speed Services for Internet Access: Status as of June 30, 2003, Table 3 (<http://www.fcc.gov/wcb/iatd/comp.html>)

Although still dominant, the cable market share declined by 4 percentage points in the past three-year period. In comparison, DSL increased its market share from 24% to 31%. The use of satellite and wireless high-speed connections is also on the rise, but their market share shrank from 2% to 1%. These two broadband alternatives constitute a small and rather insignificant share of the market, and for the time being, they do not pose a competitive threat for cable modem or DSL.

Broadband Benefits

Broadband use is rising rapidly because of the benefits it generates. As mentioned earlier, the biggest advantage of broadband over narrowband is higher speed. Cable and DSL, for example, enable consumers to access voice, high-speed data, video-on-demand, and interactive delivery services far more efficiently and conveniently than narrowband. The user is always connected and can use the phone and surf the web at the same time. Households with more than one computer (estimated to be 45% of all households with PCs) can easily “share” their broadband Internet access and computer peripherals (printers, scanners, etc.) through a home network, which simply requires the addition of a router also called a “gateway.” A gateway is an always-on appliance that connects devices in a small office or home to create a network. A gateway device allows users to protect, store, and access data.

Based on a nationwide survey of 1,500 Internet users, broadband subscribers are more satisfied with speed connectivity and online support than narrowband users (Consumer Reports, 2002). In contrast to 55% of dial-up subscribers who reported connection interruptions, only 18% of

broadband customers reported interruptions (ibid.) Thus, broadband seems to yield substantial advantages to Internet users, but at a higher cost. However, this cost may be offset by the elimination of the need for a second phone line, which some consumers often have so that a phone line is dedicated solely for dial-up Internet access.

Broadband Internet connectivity is apparently having a beneficial effect on individual and family lives as well. A nationwide survey of over 500 Internet users shows that broadband users (76%) were more likely than narrowband users (68%) to report a positive impact on connecting with family and friends. Compared to those who rely on dial-up to connect with the Internet, high-speed subscribers reported greater ability to learn new things, shop, do their job, obtain health care information, manage personal finances, and connect to community organizations (Horrihan and Rainie, 2002).

According to some experts, expansion of broadband technology can continue the revolution on information technology partly responsible for the economic growth of the 1990s. Faster deployment and adoption of high-speed Internet connectivity, along with more sophisticated applications in education, health care, research and development, home and security, and national defense can provide significant stimulus to national and local economies in the next decade (Crandall, Jackson and Singer, 2003; TA, 2002). These benefits multiply if network externalities are considered. A network externality occurs when a greater use of a product or service increases its benefits for someone else. The telephone is the classic textbook example of a good with positive external effects. A telephone would be useless to a person unless others have it too. Due to the presence of network externalities, the larger the number of applications and users of broadband technology the greater the economic and social benefits generated.

The longer download time associated with the slower speed of dial-up connection has its economic costs. Consumer benefits afforded by the use of broadband are estimated at \$500 billion annually (Crandall, Jackson and Singer, 2003). The delayed deployment of broadband could reduce national productivity by at least 1% annually, according to some experts (Ferguson, 2002). According to several experts, (Crandall, Jackson and Singer, 2003; Posciask, 2002a), universal diffusion of broadband will create 1.2 million new and permanent jobs in the United States alone.

Advanced Broadband Applications

The largest benefits of broadband technology will come with greater use of more sophisticated applications whose popularity is still limited at present. The Alliance for Public Technology and the Benton Foundation (2003), as well as the Telecommunication Industry Association (2003) describe these advanced functions and discuss several case studies. Only telemedicine, distance learning, employee training, and voice over Internet protocol (VoIP) are briefly described here. Telemedicine, for example, connects patients and medical care providers electronically. The physician can examine the patient and check vital signs from a remote location, or access patient charts in another city. In more advanced telemedicine systems, the doctor and the patient are able to communicate online through video conferencing.

Distance learning is another broadband application with great potential that is not yet widely used. Students and teachers no longer need to be in the same physical location to communicate. Before broadband, low-speed connectivity limited the distance learning experience significantly.

Now, lectures and educational materials can be made available online and through video transmission, and can be accessed at any time. Thus, no longer are students prevented from enhancing their educational experience because of a medical, physical or distance limitation, or for any other barrier. Broadband is also being used to train workers and teach them new job skills. Oftentimes, employees cannot obtain advanced training or learn additional job skills because family or job responsibilities restrict their time. The Communication Workers of America, for instance, is successfully sponsoring online education and training programs for member employees.

Another application is voice over Internet protocol, which allows telephone conversations to be transmitted over the high-speed lines used to send data over the Internet. This innovation may well lead to lower telephone rates and no additional charges for international calls, and it may be offered with other features such as telephone conferencing from alternative locations and the capability of switching from a home-based telephone to a cellular phone in the middle of a call (Granelli, 2003c). VoIP is a new concept that should prove to be very attractive to Hispanics with close family ties and friends abroad.

D. Is Broadband Reaching Everyone?

Deployment and use of broadband have continued to increase across the country, but the technology has some way to go to reach the underserved fully, especially Hispanics and African Americans, inner city residents, rural inhabitants, and the disabled (Horrigan and Rainie, 2002; NTIA and ESA, 2002). These groups continue to be largely underrepresented in the broadband market and have yet to exploit the benefits of high-speed Internet connectivity and its countless possibilities to the extent that non-Hispanic Whites and Asian Americans do. While data on the use of broadband technology by Hispanics and African Americans is scarce, the NTIA and ESA (2002) and the Pew Internet & American Life Project (May, 2002) provide a glimpse of Internet and broadband use among ethnic minorities. This section relies on these reports and the Current Population Survey (U.S. Bureau of the Census, 2002a) to present information on broadband connectivity and related data for ethnic minorities, Hispanics in particular.

Table 3 shows that regardless of race or ethnicity, the majority of individuals, 3 and older, with an Internet connection at home still relied on regular dial-up connectivity. Non-Hispanic Whites are overwhelmingly dominant in both broadband and narrowband markets. In 2001, the latest year for which U.S. government data is available, they made up 82% and 81% of the broadband and dial-up markets, respectively. Hispanics constituted only 5% of all broadband and 6% of all dial-up users. Considering that non-Hispanic Whites, Hispanics, African Americans, and Asian Americans constitute approximately 69%, 13%, 13%, and 4% of the total population, respectively, the data indicate overrepresentation of non-Hispanic Whites and Asian Americans, and underrepresentation of Hispanics and African Americans.

Table 3
Percent of U.S. Internet Users by Type of Internet Connection by Ethnicity: 2001

	Broadband	Dial-Up	% of Total Population
White (non-Hispanic)	82%	81%	69%
African American (non-Hispanic)	6%	8%	13%
Hispanic	5%	6%	13%
Asian Americans	6%	5%	4%

Source: U.S. Bureau of the Census Current Population Survey. Computer and Internet Use Supplement: 2002. Microdata and Table Access via Ferret (<http://ferret.bls.census.gov>)

To provide estimates of market losses associated with the low broadband market penetration rates among Hispanics and African Americans, the authors assumed a household size of 2.8 and 4.0 for African Americans and Hispanics, respectively, and converted the population of broadband nonusers into household data. An average price range between \$35 and \$45 for a high-speed connection was further assumed. The resulting calculations, while estimates, indicate that Hispanic and African American underrepresentation in the broadband market is costing providers of broadband technology between \$57.6 and \$74.0 million of potential revenues per month.¹

Based on the Bureau of the Census' Current Population Survey (2002), the authors also found that Hispanics who have broadband connectivity engage in various Internet activities: Broadband is used overwhelmingly for emailing (89%), doing school work (88%), seeking product information (72%), finding out about news, weather, and sports (72%), and playing games (64%). This selective group also goes online for viewing television or movies, purchasing goods and services, and seeking health or government information. To a minor extent, Hispanics also use broadband for online banking, job searching, course taking, and stock trading.

In addition to racial and ethnic differences, there are other demographic correlates of broadband use according to Lenhart, Horrigan, Rainie, et al. (2003). The following groups are more likely to use high-speed connectivity to access the Internet:

- Males (56%)
- Suburban residents (60%)
- College graduates (59%)
- Upper income individuals (45%)
- Persons with at least six years of Internet experience

Some of these factors probably combine in a unique way to produce lower demand for broadband connection by Hispanics and African Americans.

E. Why Are Hispanics Underrepresented in the Broadband Market?

There are various factors responsible for the low representation of Hispanics in the broadband market. These factors are grouped into four major categories depending on whether they affect the demand or supply side of the market. These factors may influence access to the technology, its rapid deployment, or both.

Demand-Side Factors

The most relevant factors that account for the low broadband penetration rates among minorities, especially Hispanics and African Americans, discussed in this report are: factors such as socioeconomic status, education levels, and race and ethnicity that fall under the rubric of the digital divide; prices of broadband services; and market failures such as imperfect information and network externalities.

The Digital Divide

The digital divide refers to the gap in access to technologies between different populations: individuals and households with lower incomes and educational attainment, Hispanics and African Americans are less likely to own or use a computer, or to have Internet access (**Table 4a**). They have fewer opportunities to interact with the rest of the world, increase their realm of economic possibilities, and acquire new knowledge and relevant information to improve their welfare. Likewise, these same underserved groups have lower broadband penetration rates.

Table 4a
2001 Computer Ownership and Home Internet Use by Household

	Number (millions)	Home Computer	Home Internet Use
Whites	38.2	61%	55%
African Americans	9.5	37%	31%
Asian Americans	2.6	73%	68%
Hispanic	9.9	40%	32%

Source: U.S Department of Commerce, A Nation Online, (www.ntia.doc.gov)

The digital divide is well documented in the NTIA and ESA's A Nation Online (2002). For example, young Hispanics are almost two times less likely than non-Hispanic Whites and Asian Americans to have a home computer. Compared with non-Hispanic Whites and Asian Americans, Hispanics have the lowest proportion of Internet users at home. Outside the home, Internet use also is much lower for Hispanic children than for any other group, including African Americans (**Table 4b**).

Table 4b
2001 Computer Ownership and Home Internet Use (3-17 Years Old)

	Number (millions)	Home Computer	Home Internet Use	Internet Use Outside Home
Whites	38.2	83%	50%	45%
African Americans	9.5	46%	25%	32%
Asian Americans	2.6	81%	52%	37%
Hispanic	9.9	47%	20%	25%

Source: U.S Department of Commerce, A Nation Online, Table 5-1 (www.ntia.doc.gov)

Most broadband subscribers are experienced computer users and have done some online surfing by the time they decide to try a high-speed Internet connection (see Lenhart, Horrigan, Rainie, et al., 2003). Not having access to a computer or familiarity with the Web makes it difficult for Hispanics to be part of the digital revolution and slows their adoption of more advanced Internet technologies such as broadband. A lack of culturally sensitive, Spanish and bilingual content that is relevant to a particular community has also been identified as a negative factor in the adoption of Internet access. (TRPI, 2002a; TRPI, 2002b).

When they do select broadband, Hispanics select high-speed Internet connections in much the same way as non-Hispanic Whites (**Table 5**). They tend to rely more on DSL and less on cable relative to non-Hispanic Whites, and although these differences are small, they do widen between Hispanics and Asian Americans, who are generally more likely to use cable than Hispanics. However, regardless of race or ethnicity, the overwhelming majority of Internet home users continue to depend on regular dial-up to surf the web.

Table 5
Home Internet Users by Type of Connection by Race and Ethnicity: 2001

	Whites	African Americans	Hispanics	Asian Americans
Dial-Up	80%	84%	83%	75%
DSL	6%	7%	8%	9%
Cable	13%	8%	10%	16%
Other	1%	1%	0%	1%

Source: U.S. Bureau of the Census Current Population Survey. Computer and Internet Use Supplement: 2002. Microdata and Table Access via Ferret (<http://ferret.bls.census.gov>)

Although the digital divide continues to be a problem, there are reasons to be optimistic. The rates of computer and Internet use grew faster for Hispanics and African Americans than for any other group. For example, from October of 1997 to September 2001, the number of Hispanics (age 3 and older) who use computers from any location grew at an annual rate of 6.6%, from 38% to 48%. Internet use rates from any location among Hispanics tripled from 11% to 32% (NTIA and ESA, 2002). While Hispanic and African American children, age 10-17, have lower computer use rates at home (39% and 45%, respectively) relative to non-Hispanic Whites (72%) and Asian Americans (71%), they have higher rates of exposure in school and libraries. The same is true for Internet use (NTIA and ESA, 2002). Thus, schools and libraries are playing an important role in the battle to conquer the digital divide.

However, household Internet access continues to be the best standard for determining whether different populations are fully benefiting from the digital revolution. While public access points are important, access from the home generally affords more time to gain digital skills, and to engage in all the activities that are possible online. Libraries and schools often impose time limits as short as 30 minutes per day in order to make their computers available to all their patrons and students (TRPI, 2003b). These data demonstrate a large disparity in computer ownership and Internet access between Hispanic and African American households and non-Hispanic, white households.

Socioeconomic Status

While socioeconomic factors, primarily education and income, are strong determinants of the digital divide, their role appears to be less important in explaining the use of broadband technology. A survey of 4,500 Internet users suggests that income and education alone cannot explain the use of broadband services since low-income households can be high users of broadband access depending upon intensity and type of use (Rappoport, Kridel, and Taylor, 2002). For example, narrowband users are more likely to visit sites offering e-cards, e-mails, subscriptions, and web applications. In contrast, broadband users are more likely to visit sites providing financial information. Broadband users also spend more time online.

More support for the above hypothesis is found in the NTIA and ESA study (2002). Households with annual income of at least \$75,000 (25.1%) are more likely to access the Internet with a high-speed line than those (16.7%) with annual income below \$15,000 (NTIA and ESA, 2002). This 10% gap is not as wide as expected, and it is much smaller than that found between the income extremes of Internet nonusers. For instance, 75% of Internet nonusers live in families with annual incomes of less than \$15,000, but only 21% of nonusers are found in families with incomes of at least \$75,000, a gap exceeding 50 percentage points.

Table 6
Hispanic Broadband Users at Home by Household Income: 2001

Household Income	Broadband	Narrowband
Less than \$19,999	12%	88%
\$20,000 To \$24,999	18%	82%
\$25,000 To \$34,999	11%	89%
\$35,000 To \$49,999	14%	86%
\$50,000 To \$74,999	19%	81%
\$75,000 Or More	26%	74%

Source: U.S. Bureau of the Census Current Population Survey. Computer and Internet Use Supplement: 2002. Microdata and Table Access via Ferret (<http://ferret.bls.census.gov>)

Thus, once a person is connected to the Internet, the high-speed digital divide seems to shrink considerably. This is true for Hispanics as well. **Table 6** shows Hispanic Internet home users, age 3 and older, by household income. About 12% live in families with annual incomes of less than \$20,000. This number rises to 18% in the \$20,000-\$24,999 bracket, it drops to 11% in the next income bracket, but it increases steadily to 26% for those with family incomes above \$75,000. The high-speed access gap between the lowest and highest income brackets is 14 percentage points. This implies that socioeconomic status in broadband use is still important for Hispanics, but its effect may not be as large as it is in the case of computer ownership or Internet use. A similar relationship is detected between broadband use and education. Broadband home use increases with education. As **Table 7** shows, Hispanics with a college education (25%) are more likely to rely on high-speed connectivity than those who have not completed high school (15%). In addition, broadband is used even in households where Spanish is the only language spoken, where 17% of households have broadband access.

Table 7
Hispanic Broadband Users at Home by Head of Household Education: 2001

Education	Broadband	Narrowband
Less than high school	15%	85%
High school graduate, no college	13%	87%
Some college or associate degree	21%	79%
College graduate or higher	25%	75%

Source: U.S. Bureau of the Census Current Population Survey. Computer and Internet Use Supplement: 2002. Microdata and Table Access via Ferret (<http://ferret.bls.census.gov>)

Prices

Cost plays a role in access to high-speed Internet services, especially among low-income households. While monthly charges for DSL and cable modem connectivity are converging, they are generally twice as much as the monthly fee paid for a dial-up Internet connection, ranging from \$40 to \$50 per month. These monthly fees are prohibitive for many low-income families, for whom even the lower cost of dial-up Internet access is problematic (The UCLA Internet Report, 2003; Lenhart, 2003). Broadband technology is not universally affordable for many consumers, regardless of race or ethnicity, and the benefit of high-speed connectivity may not be worth the additional cost.

However, about 85% of high-speed users reported in a survey that the extra money spent is worth the cost (Horrigan and Rainie, 2002). This suggests that the service is considered worth the cost only once users experience the benefits and convenience first-hand. Two recent strategies by broadband providers, particularly cable broadband providers, to reach new subscribers are: low-cost introductory offers and tiered service programs that offer lower-speed service at prices close to that of dial-up service. Whether either of these strategies will impact the number of lower-income subscribers remains to be seen.

Imperfect Information

Adoption of a new technology is slowed when consumers are not aware of or do not have enough information about it. Many consumers may have imperfect knowledge about high-speed Internet services and the benefits they can bring. The technology also may be viewed as too complicated. So, they may be hesitant to buy it and prefer to wait until they know more about it.

While a great deal of information about broadband services is available in English, much less is available in Spanish. That lack of information in English may be one reason for the low Internet use and broadband penetration rates among Hispanics. As many as 86% of Spanish speaking households with a home computer do not use the Internet (NTIA and ESA, 2002), and over 80% of individuals in these household who have a home Internet connection rely on narrowband to access the Internet (U.S. Bureau of the Census, 2002a). Thus, adoption of broadband technology may be slower in Hispanic communities where residents lack English language skills in reading and writing

The Hispanic community has been much quicker in adopting other technologies because they may find them more useful or more convenient. The levels of television ownership in general, and prime time viewing, for example, are about the same for Hispanics and non-Hispanic Whites (U.S. Bureau of the Census, 2002b). Schement suggests that the difference in diffusion is due to whether the technology is considered an information good or service. Information services such as Internet access and telephone services diffuse more slowly because they require monthly payments that can be difficult for low-income households, whereas information goods such as television and VCRs require a one-time purchase (Schement, 2003).

Positive Network Externalities

As discussed earlier in this report, a positive externality occurs when the effect of an economic transaction between two parties has a beneficial effect on others. This beneficial effect is not taken into account by the market and is not reflected in the cost of the transaction. A network externality arises when a greater use of the service increases the benefit of that service to everyone. Communication technologies, such as the telephone, and the Internet, exhibit network externalities. As the number of people adopting the communication technology increases, its social value explodes. The more an individual's relatives, friends and the community at large use the Internet, the greater the incentive to go online. The opposite is also true. This concept can be added to other factors that explain underrepresentation of Hispanics in the broadband market. Since there is no empirical evidence on this subject, all one can do at this point is to assume that lower broadband subscription rates among Hispanics also stem from lower use of the technology by family and friends and the Hispanic community at large (NTIA and ESA, 2002).

Supply-Side Factors

It has been argued that broadband deployment has been slow primarily for two reasons: imperfect competition and government regulations. Other factors affecting the supply side of the market briefly mentioned in this report are the lack of advanced or “killer” broadband applications, confidentiality concerns, objectionable content, and poor service.

Imperfect Competition

Lower penetration of broadband technology in the consumer market and the higher market share of cable over DSL have been ascribed to the relative lack of competition between these two main suppliers of high-speed connectivity. While degree of market competition is difficult to assess, cable clearly dominates the broadband market where it holds a 65% share of the high-speed service lines (FCC, Dec 2003). The FCC regularly publishes data on the number of broadband providers by zip code though it does not distinguish DSL from cable firms. As of June 2003, the presence of high-speed service subscribers was reported in all 50 states, the District of Columbia, Puerto Rico, and the Virgin Islands, and in 91% of the zip codes in the United States. The FCC's analysis indicates that 99% of the country's population lives in the 91% of zip codes where a provider reports having at least one high-speed service subscriber and 75% of the nation's zip codes have more than one high-speed provider (FCC, Dec 2003).

Despite the increase in national coverage, consumers in many cities across the U.S. still depend on a single provider to obtain high-speed Internet access. In California, the state with the highest number of high-speed lines, there are about twelve cities where broadband is not available to all

city residents (Granelli, 2003b). As of the spring of 2003, Verizon only provided service to approximately 60% of the homes in its service area (Howe, 2003). DSL service is not available to a large portion of the city of Cerritos, and cable companies have not upgraded the infrastructure to accommodate broadband service (Granelli, 2003b). Because they are small, many of these communities are not able to generate sufficient demand to justify investment in broadband infrastructure. In other words, the market has failed to provide the services.

Based on the Herfindahl Index, a measure of market power by firms, the broadband industry does not seem to be very competitive, thereby increasing the possibility of monopoly prices in markets where broadband is supplied by a single seller (Cooper, 2003). Thus, in areas where there is only one broadband provider, whether DSL or cable, monopolistic behavior is quite probable, at least in the short run. When left to its own devices, a monopoly restricts output in order to maximize profits. Thus, residential customers usually end up paying higher prices for broadband services than if the market were less concentrated or more competitive. Cable companies also have been accused of tying television to Internet services with the purpose of discouraging competition from satellite television in order to preserve cable market dominance (May, 2003).

While the FCC continues to believe that the presence of regular dial-up connectivity or narrowband diminishes the probability of monopoly and higher consumer prices charged by broadband providers, economists consider narrowband to be a very poor substitute for broadband connectivity (Brough, 2003; Hausman, Sidak, and Singer, 2001). New software, including multimedia applications, requires greater bandwidth at faster speeds. Thus, the competitive threat of narrowband is not sufficiently real to keep broadband monopoly prices and output restriction in check where there is only one provider.

In addition to yielding lower consumer rates, head-to-head competition among broadband providers is beneficial because it stimulates broadband deployment and use. Compared with the U.S., broadband deployment has been faster in South Korea, Canada, and Germany, albeit smaller countries, where there is strong competition in the broadband industry (Pociask, 2002). A study of 30 countries in the Organization for Economic Cooperation and Development found that broadband penetration is higher in countries where there is competition not only between DSL and cable but also among several DSL and cable providers (OECD, 2001). According to research conducted by Aron and Burnstein (2003), competition between cable and DSL leads to greater broadband penetration among all consumers when controlling for demand-side factors and deployment costs. Thus, availability of one broadband technology alone is insufficient to increase high-speed Internet adoption by consumers.

The Congressional Budget Office (CBO, 2003) disagrees with the view of imperfect or limited competition in the broadband market and suggests that the threat to competition is not all that serious. According to the CBO, the uneven distribution and availability of broadband are a “function of the market’s immaturity and not necessarily of permanent features.” The CBO continues to have faith in market forces and argues that the private sector will eventually bring broadband services to underserved communities.

However, competitive markets are not without disadvantages. While competition in the broadband market may lead to lower prices and higher penetration rates among consumers, including people of color, competition alone may not foster further development of the

technology and new applications. Theoretically, perfectly competitive firms have little or no incentive to invest in research and development of new technologies. Firms operating in a very competitive market earn no profits and, consequently, may not have the capital to spend on research and development. Since Joseph Schumpeter published his famous History of Economic Analysis in 1954, economists have long considered oligopoly (a market with a few sellers) the best market structure to foster technological change and development. The oligopoly firm earns profits that they can plug back into developing new technologies. Most technological advances take place in markets with a few dominant firms, and market concentration in the 30%-50% range held by the largest firms seems to yield both competition as well as a high level of research and innovation (Kamien and Schwartz, 1975; cited in Kuttner, 1998).

Government Regulations: Unbundling and Line-Sharing

DSL is provided primarily by the regional Bell operating companies, more commonly known as the Baby Bells, and which include telecommunication giants such as BellSouth, Qwest, SBC, and Verizon. These incumbent local exchange carriers (ILECs) are regulated by the Federal Communications Commission. The FCC enforced the sharing of the incumbents' networks with long distance telephone companies and other competitive local exchange carriers (CLECs) because the incumbents inherited their networks after the breakup of the old AT&T in 1984. Because the Bell networks were built under a government-sanctioned monopoly, U.S. law has required the incumbents to share elements of their facilities to competitors at below market prices. The intention of the FCC regulations was to prevent ILECs, especially the Baby Bells, from abusing their monopoly power and charging higher consumer prices for telephone services, including broadband. Regulation acted as a price ceiling to protect consumers.

Notwithstanding the FCC's good intentions, it has been argued that the present regulatory environment has discouraged local telephone providers, especially the Baby Bells, from investing in broadband infrastructure and applications at levels necessary to expand the technology and make it universally available (Hazlett, 2002; Pociask, 2002b). It also placed DSL at a competitive disadvantage with cable modem (Hausman, Sidak, and Singer, 2001). This disparity in government regulation of DSL and cable companies is known as "regulatory asymmetry" Cable companies are not regulated by the FCC, but by the state and municipal government in areas where they operate. It has been argued that because cable companies are not subject to the same regulations, they have been able to roll out their broadband services faster than ILECs.

Not everyone supports this argument though. Owens (2002), and Rappoport, Kridel, and Taylor (2002), for example, are reluctant to endorse it, and maintain that residential access to broadband services is reaching consumers as fast as cable television, videocassette recorders, and personal computers, and that more advanced broadband applications are needed to increase consumer demand. Faulhaber (2002) blames the delay in DSL deployment on the "telephone companies own internal problems", but he asserts that regulation is not such a good idea either. The Baby Bells, though, claim that they are subsidizing the competition through the FCC's line sharing rules. However, leasing the local telephone networks at below market rates is not such a losing proposition as ILECs claim. While regulated prices generate lower revenues for some Baby Bells, profit margins associated with their leasing transactions range from 16% to 33% (Granelli, 2003a). Refuting evidence, however, is provided by a study in Michigan, showing significant losses on similar operations by one of the Baby Bells (Granelli, 2003c). According to Alleman

and Crandall (2002), and based on the numerous papers included in their book, there is insufficient evidence to conclude that regulatory asymmetry has negatively impacted broadband deployment.

Nonetheless, on March 2, 2004, the D.C. Circuit Court ruled on *USTA vs. FCC* and overturned much of the FCC's rules governing the sharing of networks owned by the four incumbents. The move was most welcome by the Baby Bells, which have contended all along that competitors should build their own lines or pay the market price of the leased equipment. CLECs have argued that the new rule would simply open the door for the Baby Bells to regain their monopoly power on telephone and DSL services (Gross, 2003). The Congressional Budget Office is cautious on the effect of the recent regulatory change, but it suggests that the supply of DSL services is not likely to change since ILECs already own 95% of the DSL market in the country (CBO, 2003). In late March, FCC Chairman Michael Powell called on the incumbents and CLECs to negotiate line sharing rates while the CLECs weaned themselves from using the incumbent's networks within 18 months.

Government Regulations: The Issue of Open vs. Closed Access in Cable Broadband

Unlike with DSL providers, the FCC does not require cable companies to open their high-speed Internet platform to competing ISPs. This privilege is usually reserved for the cable companies' own Internet affiliates. The open access issue is present when a monopoly, usually a cable company, also a sole provider of broadband services, is compelled by a local government to allow multiple ISPs to use the cable network to offer services to high-speed Internet subscribers. A closed access policy potentially allows for a cable company to exercise monopoly power by controlling or denying use of the cable platform to other ISPs. This market control can extend to selection or restriction of Internet services and content offered by non-affiliates.

While possibly increasing competition and protecting consumers from higher prices, open access regulation of cable modem is not without its critics either. It is argued that this policy is not economically justified because it discourages cable companies from investing in broadband infrastructure and new technologies that ultimately will accelerate the deployment of broadband cable and bring lower prices to consumers and higher penetration rates (Shelanski, 2002). Cable franchises are regulated by municipal governments instead of the federal government. The FCC, however, is vividly aware of the possibility of monopoly control by the cable firms and it has acted accordingly. While the FCC does not have regulatory power over cable companies, it has used its authority to review and approve merger applications to convince Time Warner Communications, to open its cable platform, Time Warner Cable, in exchange for merger approval with AOL (Hausman, Sidak, and Singer, 2001).

Lack of Advanced Applications

There is a great deal of consumer uncertainty about the benefits of high-speed connection (Horrigan and Rainie, 2002). The so called "killer application theory" postulates that widespread use of broadband depends on the development of sophisticated and innovative applications, such as video-on-demand, telemedicine, distance learning, and so on (Howell and Browyn, 2002). According to this theory, supply creates its own demand, meaning the availability of broadband alone is insufficient to accelerate adoption of the technology and boost market penetration rates. The increase in the number of applications appealing to young and old, rich and poor consumers alike is essential for broadband demand, deployment, and further development of the technology.

The Federal Communication Commission subscribes to this premise and attributes the low demand for broadband to the absence of rich content and bandwidth-intensive applications (Fusco, 2003).

Unfortunately, investment in the new technology and the creation of new applications are subject to business expectations as well, and the economic downturn and the dot.com bust of recent years created a negative economic climate that discouraged the flow of capital into these highly specialized information sectors. It is estimated that between \$100 and \$200 billion of new investment will be needed to increase bandwidth and develop a more capable broadband infrastructure to support more sophisticated functions.

Concerns about Confidentiality, Objectionable Content, and Poor Services

Privacy, security and objectionable or undesirable content, such as pornographic materials, are also major concerns in the use of broadband technology (TA, 2002). These concerns are an extension of existing consumer apprehension with narrowband Internet use. These concerns are listed as supply-side factors because only firms offering broadband services and ISPs can address these issues satisfactorily.

These misgivings about the Internet are manifested in a government survey. Almost one-half of Internet users are more concerned about confidentiality of information over the Internet than that of the telephone, and as many as 68% of households with children are more apprehensive regarding children's exposure to Internet material than to television programming (NTIA and ESA, 2002). Hispanics express very high levels of concern about their children's access to online pornography and the security of online transactions (TRPI, 2002b). Thus, consumer's confidence on Internet security and qualms about website content are probably affecting the use of high-speed Internet connectivity as well.

Consumers have also expressed concerns about deployment hassles and lack of plug and play equipment (TA, 2002). Dissatisfaction with service providers is always present, including waiting too long for a technician to install hard- and software. Many consumers find problems with broadband services and technical support, such as having to call the provider many times or long delays to access online support. According to a survey of broadband subscribers, about 90% lack sufficient confidence to order additional services from their providers (TA, 2002). Thus, correcting these problems could go a long way in changing the concerns about Internet use found among many consumers regardless of race or ethnicity.

F. Conclusions and Recommendations

While use of high-speed Internet connectivity or broadband has increased steadily during the last three years, Hispanics, African Americans, and low-income groups are still underrepresented in the broadband market. The lower broadband penetration rates found among Hispanics and African Americans may be costing providers of the technology between \$58 and \$74 million in monthly revenues. Hispanic underrepresentation can be explained in terms of multiple factors, but those on the demand-side of the market are the most compelling.

In the demand side of the market, one finds a persistent but well documented digital divide. While progress has been made, Hispanic computer ownership and Internet subscription rates continue to be among the lowest in the nation. Not owning a computer or having online experience makes the possibility of broadband use less likely. Socioeconomic status, primarily family income, is another barrier that also stands in the way of higher broadband use by Hispanics. Although prices of broadband connectivity have come down somewhat, they still remain beyond the purchasing reach of many families, especially those with fewer resources. Imperfect information, lack of knowledge about the new technology, and network externalities—the fact that families and friends do not have Internet access— also result in fewer Hispanics being willing to acquire it.

In the supply side of the market, lower penetration of broadband among consumers has been blamed on slower deployment of the technology due to imperfect competition, the dominance of cable over DSL technology, and government regulations. Government regulation, especially the FCC's unbundling and line-sharing requirements imposed on DSL providers, have given a competitive advantage to cable companies. It is unclear yet what will be the effect of the lifting of the FCC's line-sharing requirements on broadband prices charged by the Baby Bells. But to the extent that DSL or cable providers can exercise some degree of control over the market, consumers may have to pay higher prices for high-speed connectivity in the future. Higher prices, in turn, can make the technology less affordable to Hispanics, African Americans, and lower income groups. To a lesser extent, consumer concern with Internet confidentiality, online content, and poor services continue and also negatively affect the demand for high-speed Internet services.

These obstacles stand in the way of greater subscription to high-speed Internet services by the Hispanic community. The critical question then is what can be done to improve the current situation. What measures can the public, private and non-profit sectors take to reduce the high-speed digital divide that separates Hispanics from non-Hispanic Whites and Asian Americans? While there are no simple answers to these questions, we have outlined some recommendations listed below:

1. Place greater emphasis on social justice and the universal service goal of the Telecommunications Act of 1996. While rationing by price is economically efficient in perfectly competitive markets, this economic principle is violated when market imperfections are present. Even when markets are competitive, they are not socially optimizing since many individuals are excluded and deprived of the benefits of universal access.

2. Improve the federal data collection system, as defined in Section 706 of the 1996 Telecommunications Act, by providing more detailed intelligence to evaluate broadband deployment, such as, the number and types of broadband providers in a market, the distinction between residential and small business use, and communities or areas without broadband connectivity.
3. Use public and private grants to develop programs (e.g., community networks, telecenters, and free nets) to increase computer and Internet access in schools, libraries, and other public places visited by Hispanics, African Americans, and low-income residents.
4. Seek private and public sector cooperation to fund and support mobile high-speed Internet labs, such as Mollie², to visit Hispanic and African American neighborhoods in order to provide computer training and classes. This alternative can expose Americans with no broadband access in their home to the new technology as well as to medical information, job search and training, continuing education, and other opportunities.
5. Increase local government participation to provide community residents with high-speed alternatives (e.g., Wi-Fi and Wider-Fi) to cable and DSL. For example, the city of Cerritos, CA has partnered with Aiirmesh Wireless Community Broadband and is using Wi-Fi to make broadband available to residents with no access to high-speed Internet connectivity.
6. Promote and help organize efforts to aggregate broadband demand. Local governments can establish buying cooperatives or aggregate demand of various department and agencies into a single buying authority to encourage broadband deployment by providers. Local jurisdictions also can use their market power to entice commercial providers of broadband services to improve broadband services and keep prices in check.
7. While removing the unbundling and line-sharing requirements may promote competition and encourage investment, the FCC should keep a close eye on the broadband market to prevent consolidation and abuse of monopoly power. State and local governments should be ready to step in to fill the void in cases where the FCC has no jurisdiction.
8. Provide tax credits to firms experimenting and testing new promising technologies (e.g., satellite, wireless high fidelity, and wide area wireless) in areas that are currently unprofitable or beyond the reach of cable or DSL.
9. Avoid taxation of new applications and online Internet services, which will increase prices of broadband services for Internet users and will add to existing price barriers already encountered by many Hispanics and African Americans.

These recommendations can stimulate broadband deployment, promote use of the technology among Hispanics and African Americans and other underserved populations, and increase access to the benefits broadband offers for all.

G. Endnotes

1. To estimate annual revenue losses, the underrepresentation of the Hispanic and African American population in the Broadband market was used as a baseline measure of market loss. Participation in the broadband market according to population would be about 14% and 13% for these two groups, respectively. Thus the underrepresentation gap was estimated at 9% (2.9 million) and 7% (2.6 million), respectively. The absolute numbers were converted to number of households by using a household size of 2.8 for African Americans and 4.0 for Hispanics. These adjustments yielded a total of 741,547 and 903,238 non-participating Hispanics and African American households due to underrepresentation in this market. Assuming broadband service charges of \$35 and \$45 per month per household would yield potential revenue losses ranging from \$58 to \$74 million per month.
2. Mollie (Mobile Learning Lab for Information Education) is a project in Grand Rapids, Michigan, to bring computer and video technology to underserved neighborhoods where the new technologies are not available (<http://mollie.grcmc.org>). Information downloaded November 30, 2003.

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