# Digital Divide:
# Conceptual Problems, Empirical Evidence and Public Policies [1]

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**Introduction**

This article seeks to contribute to the development of digital inclusion-oriented public policies based on empirical analysis of computer and Internet access in the poorest sectors of the population of Rio de Janeiro slums. The ideas discussed here are rooted in quantitative and qualitative research conducted in low-income communities of Rio de Janeiro during the second semester of 2003. The research was carried out in two rounds of 1,500 interviews each,[4] and represents a universe of nearly 1,200,000 people. Eight separate focal groups, made up of a range of age groups and gender, complemented the research.

In this study, the term digital divide refers to the social, economic and cultural consequences of the unequal distribution of access to computers and the Internet. Therefore, the study does not look specifically at telephone access.[5] Although telephony belongs to the same set of information communication technologies, even sharing the same infrastructure, from a sociological perspective, these products have quite different characteristics. Telephones are part of the family of 'illiterate friendly' products – that is, products that can be used by individuals who have very low reading and writing skills – while computers and Internet demand basic educational skills. Although it is possible to send messages through mobiles phones, this is still a secondary function. If in the future convergence of technologies changes the uses of mobiles phones by increasing the need to process written information, we will probably find a new internal divide among mobile phone users.

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4 In the first survey we used a universe representative of the total number of *favela* residents. In the second, six *favelas* were researched, two with higher income, two with a medium income, and two with a medium-low income, using a more detailed questionnaire. The first survey included the population above 15 years of age that do or do not use computers. The second included children from 10 years old and up, and all those interviewed did use computers, in order to deepen our understanding of this universe.

[5] For a broader discussion on the digital divide see: Sorj, Bernardo, Brazil@digitaldivide -Confronting Inequality in the Information Society, UNESCO, 2003 (available at www.centroedelsteing.org/ ).

This article will focus on individual access to computers and the Internet, that is, the digital divide *strictu sensu.* Although related, this should not be confused with the issue of information communications technologies (from here on, these will be referred to as ICTs) as a tool for economic growth and development.

Although most of the literature on digital inclusion, especially reports produced by international agencies, emphasize the potential of ICTs to reduce poverty and social inequality, the social dynamic is quite the reverse: the introduction of new ICTs increases social exclusion and inequality. Universalization of access can limit the damage from a social inequality perspective. Why?

a) Poverty is not an isolated phenomenon. How poverty is defined and perceived depends on a given level of cultural/economic/technological/political development in each society. The introduction of a new product that becomes a condition of 'civilized' life (be it a telephone, electricity, a refrigerator, radio or TV) raises the minimum standard by which one is defined as poor. Richer sectors of society are generally the first to access new products, and it takes a long time before these products are made available to the poor – if at all. Therefore, the introduction of new 'essential' products increases inequality.

b)  Because richer sectors of society are the first to have access to new products, they have the benefit of a decisive competitive advantage when they master using them. At the same time, those who are excluded face new, or greater, disadvantages.

In both cases, new ICT products increase, in principle, poverty and social exclusion. Public policies may use some technologies to improve the general conditions of the poor population but digital inclusion policies main aim is to diminish the negative impact of new ICTs on wealth distribution and life opportunities.

## Digital Exclusion is Multi-dimensional[6]

Most studies on digital exclusion focus on small communities or local experiences; they often have limited explanatory value because they do not integrate studies based on quantitative data.[7] On the other hand, statistical studies – in particular those on developing countries – have as a central and generally unique parameter the division between those who have and those who do not have access to computers and to the Internet. Although important, this measurement is insufficient to understand the broader social dynamics and define policies to make access universal, because of three important factors:

a) They do not identify the quality of access, whether in terms of connection speed or cost/access time available, in particular for the poorest groups of the population.

b) When quantitative studies do distinguish between socioeconomic strata, they use possession of a computer in the home as the basic criterion.

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[6] The 'new wave' of literature on the digital divides converges on the need to consider different levels of digital inclusion. See, *inter alia*, "Digital Divides: Past, Present and Future", IT&Society, Vol. 1, Issue 5, Summer 2003 and Mark Warschauer, "Reconceptualizing the Digital Divide", First Monday, Vol. 7, no. 7, 2002. Still, there are few quantitative studies that go beyond the access/non access parameter, especially for developing countries. See, for the United States , "The UCLA Internet Report - Surveying the Digital Future, Year Three", UCLA Center for Communication Policy, February 2003 (www.ccp.ucla.edu); and on Europe, see, Eurostat "ICT usage in household and by individuals", 2004, (http://europa.eu.int/information_society/activities/statistics/index_en.htm). These types of studies allow us to carry out meaningful cross-country comparative analyses on the impact of ICTs.

[7] A common opposition is reproduced among quantitative studies, carried out generally by economists, and qualitative studies, conducted by sociologists and anthropologists.

c) They do not give information on different types of uses, and the relevance of digital inclusion for users.

Digital exclusion is not a simple phenomenon of those who have access to computers or the Internet versus those who do not – of those who are included versus those who are excluded. While this is a real polarity, it sometimes masks the multiple aspects of digital exclusion. This criterion would work well, for example, if we were looking at traditional intermediary consumer goods, (although the type of TV, refrigerator or car can be better or worse; and for the poor population the cost of the call limits the use of the telephone, or the cost of gasoline the use of the car.)

Thus, the number of computer owners or people with access to the Internet is not a sufficient measure of digital exclusion. Why? Because: a) the quantity of time available and the quality of access decisively affect Internet use; b) ICTs are very dynamic and require constant updating of hardware, software and access systems – which in turn requires constant investment by the user so the technology does not become obsolete; and c) the potential for use depends on the ability of the user (in the case of Internet) and their social network (in the case of email).

In the next section we present some of the main results of the research, and implications for policies and social projects on digital inclusion. We should indicate that in this article we have emphasized digital inclusion of individuals. Other aspects of digital inclusion, however, must also be mentioned. In certain contexts, digital inclusion of community institutions can become an important instrument to improve the collective quality of life in low-income populations. This is especially true for areas that are spatially isolated, as access to computers and the Internet in these contexts makes available information and services of great cultural, social and economic utility.

## Empirical Evidence

### a) Universe of users

Digital inclusion in a country is generally defined by the percentage of people, in the total population, with access to computers and/or Internet at home. To identify the people included, the criterion normally used is the number of computers per home and/or computers in the home with access to the Internet. [8] This methodology has been criticized, because in certain countries with a relatively high number of collective access points (commonly denominated tele-centers or cybercafés), the number of people who access Internet per computer is much higher than the average of accesses per home. It has also been argued that middle-class families normally have more than one computer in the home, which does not occur among poor families. This would mean that there are a greater number of users per computer among poor families and a smaller number of users per computer in middle class families.

In the case of Brazil, the statistical impact of tele-centers is secondary, given that the number on a national scale is still relatively small. However, as we will see, they are far from insignificant in the communities where they are located. At the same time, the idea that a greater number of people use the computer in poor families' homes should be qualified, since – as our research shows – in the majority poor families, few people actually use the computer.

As the following data demonstrates, the quantification of digital inclusion based on the number of computers per home produces a completely erroneous vision about access to computers and the Internet for the poorest sectors of the population. This is because for computer users in *favelas*, the workplace and other peoples' homes are the most common places to access informatics and Internet.

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[8] See, for example, the study by the Getúlio Vargas Foundation , "Map of Digital Exclusion, (in Portuguese): http://www2.fgv.br/ibre/cps/mapa_exclusao/apresentacao/apresentacao.htm

Let us take a look at the numbers:

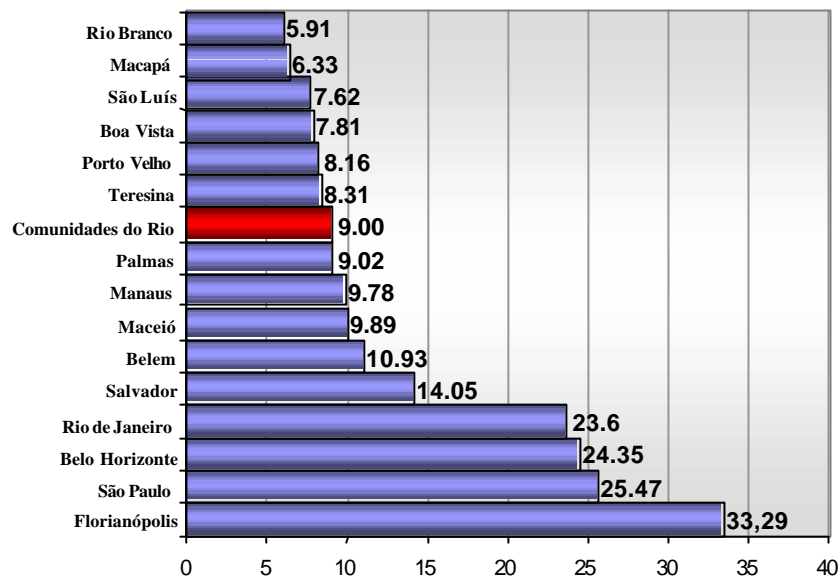According to the research, 9% of homes in *favelas* have computers.

**Figure 1: Number of residences possessing computers,
in favela communities in the City of Rio de Janeiro**
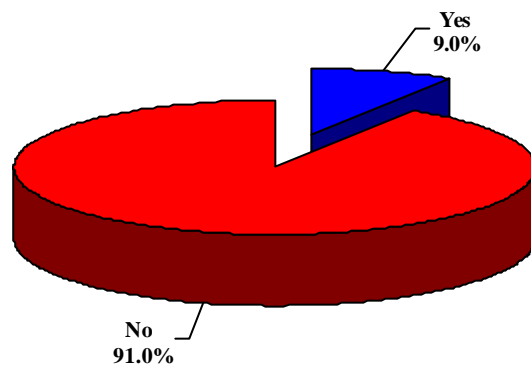


The interviews and the focal groups' participants indicate that the computer is generally seen as a good for personal consumption. At the same time, who actually has or owns the computer is often not clearly defined. Young people in particular may define the computer as "theirs," even though their parents bought it. Thus the question of ownership is directly associated with use, because in general it is the user who defines the computer as his or hers. The tendency to individualize computer ownership relates to the fact that many members of the family do not use the computer, as well as to a desire to affirm possession of the computer due to possible scheduling conflicts. The latter was an issue cited in the focus groups as a source of tensions in the family.

Computer access in *favelas,* is higher than the average for many capital cities in the north and northeast of the country. Computer access in the *favelas* of Rio de Janeiro is close to the national average, but 30% lower than the average for the state. In relation to the city of Rio de Janeiro, there are 2.6 times more computers per capita in the city than in the *favelas* (6 times more in wealthy neighborhoods).

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**Figure 2: Comparison between rates of digital inclusion in low-income communities in the City of Rio de Janeiro and selected capital cities**

| City | Value |
|------|------|
| Rio Branco | 5.91 |
| Macapá | 6.33 |
| São Luís | 7.62 |
| Boa Vista | 7.81 |
| Porto Velho | 8.16 |
| Teresina | 8.31 |
| Comunidades do Rio | 9.00 |
| Palmas | 9.02 |
| Manaus | 9.78 |
| Maceió | 9.89 |
| Belem | 10.93 |
| Salvador | 14.05 |
| Rio de Janeiro | 23.6 |
| Belo Horizonte | 24.35 |
| São Paulo | 25.47 |
| Florianópolis | 33,29 |

Note: Digital inclusion, in this case, refers to the percentage of computers in the total number of homes.

The unequal distribution of computers among the population in different cities in Brazil is a reflection of the unequal levels of wealth and education between regions and states. This is particularly striking for the poor population of the northern and northeastern regions as compared to the wealthier southeastern region. But having a computer is also associated with something more intangible: it reinforces the notion that computer skills are a valuable asset and can be a key to obtaining employment and success in education. In other words, as the productive system becomes more computerized, the idea that it is important to master this tool quickly 'infiltrates' among the diverse social sectors: using computers comes to be seen as a prerequisite for getting work and to doing well in school.
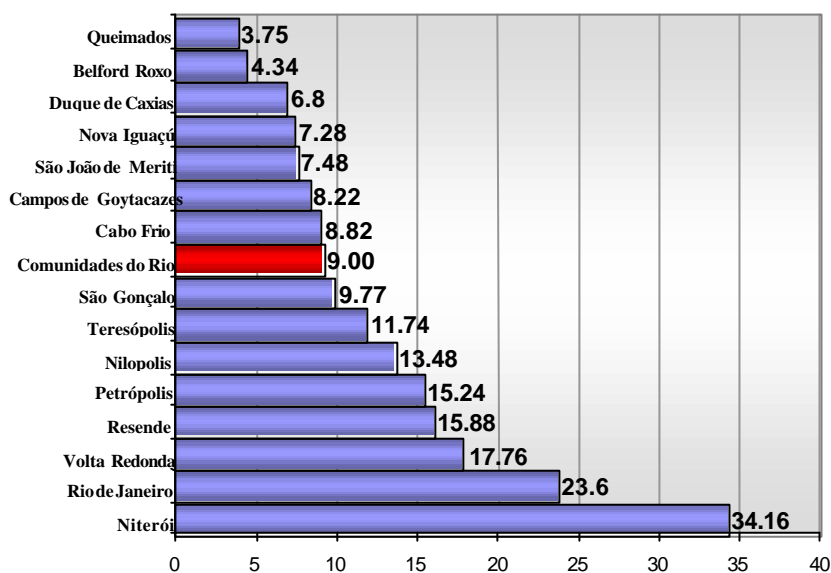
 If the use of computers has an obvious correlation with the level of income and education, it is equally associated with wider cultural patterns of    penetration of

informatics in the social and economic environment. In fact, in the survey and in the focal groups, the only question, for which we found a consensual answer, independent of education level, ethnicity, or gender was that nearly all of those interviewed indicated that having computer skills helps get a job.

Digital divides between gender, race, and age groups reproduce themselves within the poorest sectors of the population as well as among different slums. Making reference to 'poor communities' can lead us to imagine a homogenous group, when in reality, there are differences within each poor community and among them:

**Figure 3: Comparison of the rates of digital inclusion in low-income communities in the City of Rio de Janeiro and selected other cities in the state of Rio de Janeiro**

| Community | Value |
|-----------|-------|
| Queimados | 3.75 |
| Belford Roxo | 4.34 |
| Duque de Caxias | 6.8 |
| Nova Iguaçú | 7.28 |
| São João de Meriti | 7.48 |
| Campos de Goytacazes | 8.22 |
| Cabo Frio | 8.82 |
| Comunidades do Rio | 9.00 |
| São Gonçalo | 9.77 |
| Teresópolis | 11.74 |
| Nilopolis | 13.48 |
| Petrópolis | 15.24 |
| Resende | 15.88 |
| Volta Redonda | 17.76 |
| Rio de Janeiro | 23.6 |
| Niterói | 34.16 |

Note: Digital inclusion, in this case, refers to the percentage of computers in the total number of homes

However, the number of people with computers in the home does not define the number of users, which is more than double the number of those who have a computer:

**Figure 4: Percentage of people who have and use computers in low-income communities in the City of Rio de Janeiro**
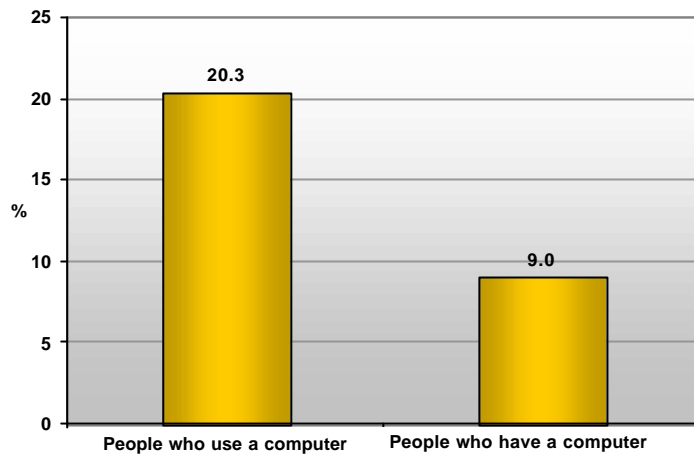


A possible explanation as to why the number of computer users is higher than the number of homes with computers is that several family members use each computer. But this explanation does not fully explain the difference, because only 27.6% of those interviewed indicated that the main place they use a computer is in the home.

**Figure 6: Main place to use computers in low-income communities in the City of Rio de Janeiro**
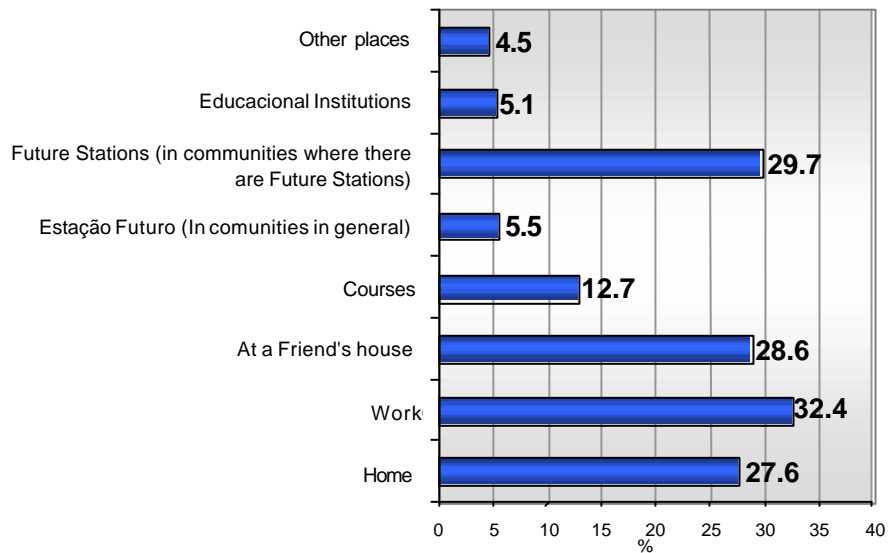
The high number of users in relation to owners is mainly a consequence of the fact that the workplace, not the home, is the main place where *favela* residents use computers, followed by the homes of friends and acquaintances. Home is the third most common place where people use computers. In *favelas* where they exist, Future Stations (tele-centers) set up by a local NGO called Viva Rio, are the second most frequent place where people access computers, with nearly 30% of computer users interviewed so responding. This data contradicts the normal expectation that in the poorest sectors of the population the number of users per computer in the home is high.

Probably one of the main findings of the research is that the workplace and not the home is the main point of access for computers and the Internet. The workplace is also a place to learn to use computers and the main source of motivation to do so). This implies important changes not only in the number of people digitally included, but also has implications for the profile of the user.

As we will see, women – because they most commonly work as domestic help or in cleaning services – have the most to lose and present a higher level of digital exclusion than men in the poorest sectors of society. On the other hand, the black male population, which has an average of computer ownership per household that is much lower than that of the white population in *favelas,* finds a mechanism for social integration in work. Just as access to computers outside of the home has a general democratizing impact, although unequal, this allows people with lower educational levels to enter into the world of computers.

This phenomenon of disassociation between ownership and use of computers is reproduced in relation to the Internet. Although only half of those who have computers at home have access to the Internet, the number of Internet users is more than triple those who have access at home:

**Figure 6: Percentage of people who have and who use computers and Internet in low-income communities in the City of Rio de Janeiro**
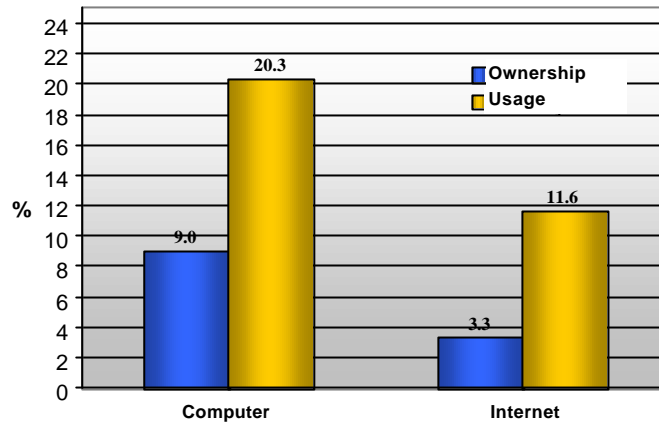


Note: The percentages refer to the total in this sample.

## b) *Factors for integration / exclusion*

Among computer users in the *favela*, as in the general population, there is a tendency for computer use to decrease as age increases. In the *favela,* however, this tendency is especially notable. The lowest educational levels, as well as the lowest chances to learn on the job, generally occur in the most elderly sectors of the population,:

**Figure 7: Percentage of those who use computers by age group**
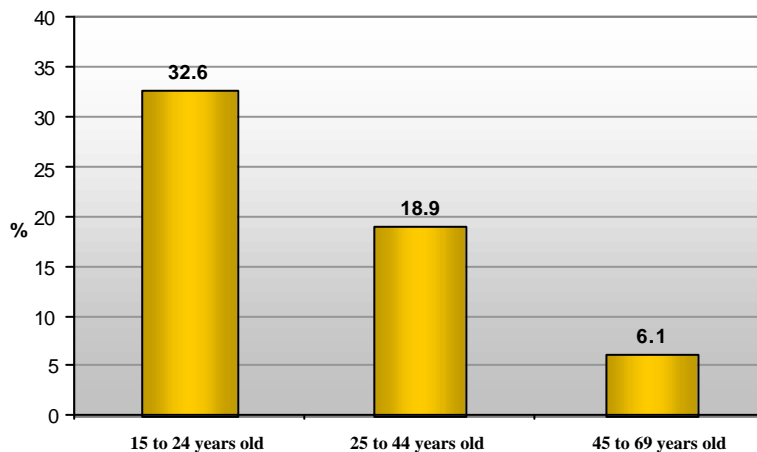
Not surprisingly, the following graphs indicate that there is a clear correlation between income and computer ownership:

**Figure 8: Average individual and household per capita income in relation to computer ownership in _favelas_ in the City of Rio de Janeiro**
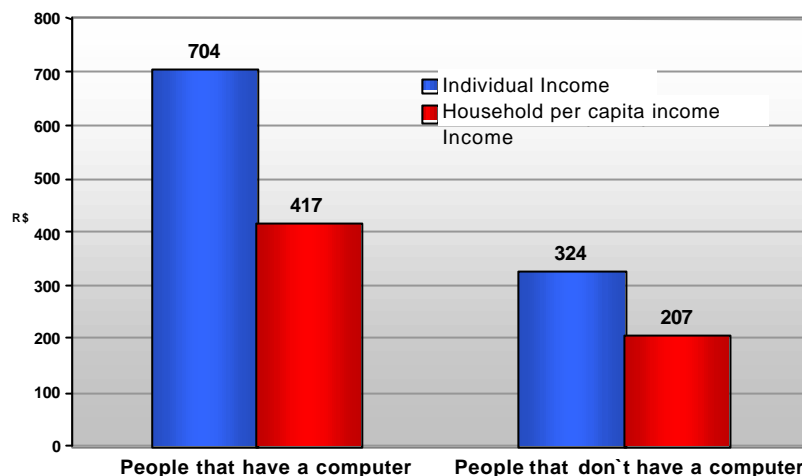


However educational levels are fundamental: among those who have studied for 1 to 3 years, we find 2 computers per 100 homes; among people who have studied for more than 15 years, computer ownership reaches 48.6 per 100 homes. Among computer users, within or outside the home, the pattern that associates educational levels with computer use is maintained, but the distance tends to grow smaller. This indicates that it is possible that people with lower education levels find in computers outside their home a mechanism to equalize social status.

**Figure 9: Percentage of people that have and use computers by years of study, in poor communities in the City of Rio de Janeiro**
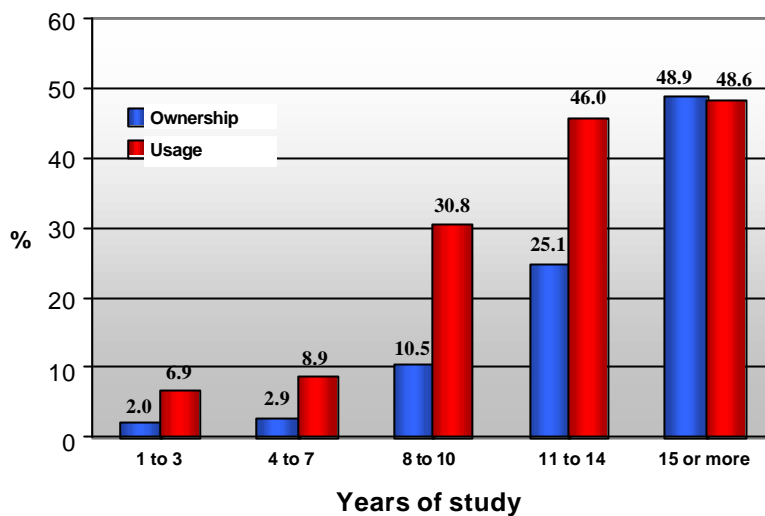


The same is true for income levels:

**Figure 10: Individual and households per capita income by ownership and usage of computer**



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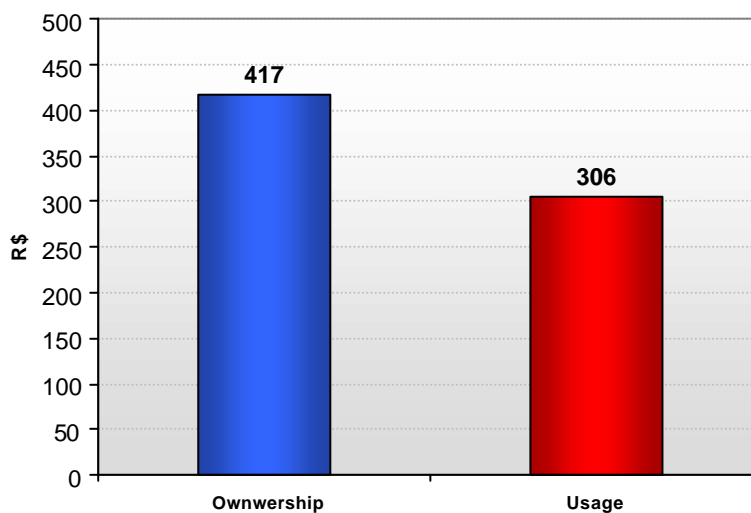
As shown in Figure 13, the percentage of white people who own a computer is higher than the average (9.0%), the percentage of mixed-race people is equal to it, and the percentage of the black population that own computers is just half of the average.

**Figure 11: Percentage of people who own a computer in their home by ethnicity, in poor communities in the City of Rio de Janeiro**
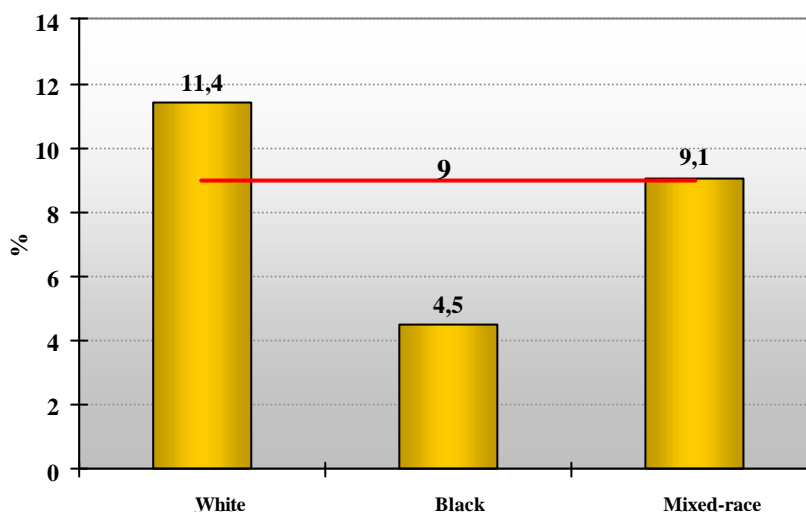


Note: The percentages were calculated in relation to the same group.

As indicated in Figure 14, this situation reflects the doubly unfavorable position of the black population in terms of income and education.

**Figure 12: Comparison of average family income *per capita* and years of study**
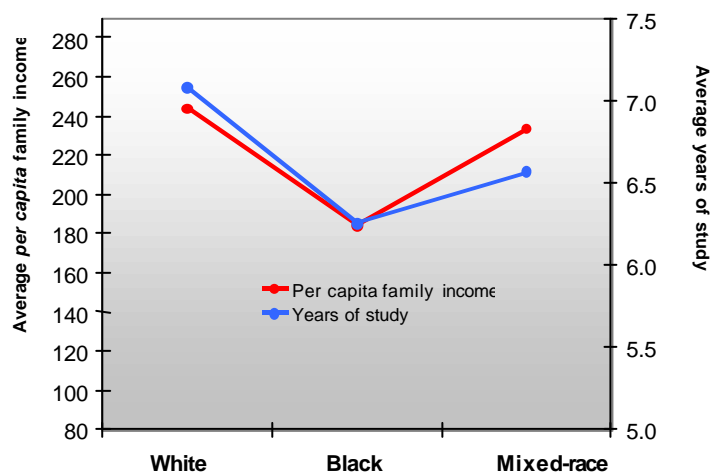
But in terms of computer users this difference tends to get smaller due to access to computers outside of the home:

**Figure 13: Percentages of ownership and use of computers by ethnicity**
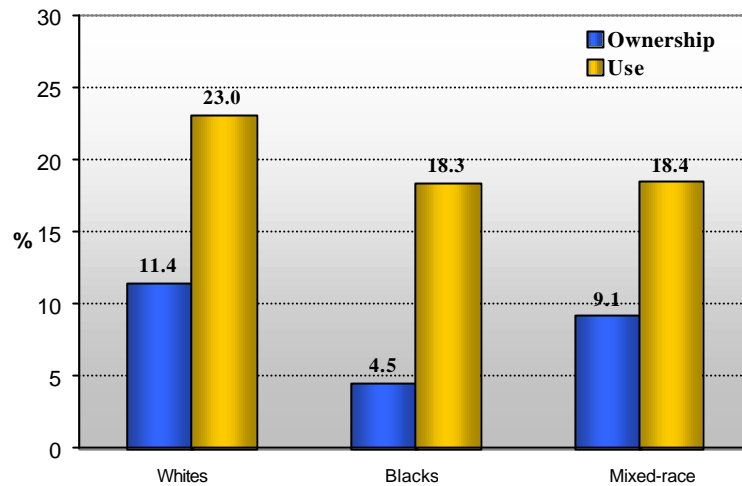


Note: percentages are of those who use computers (20.3% of the population)

It appears that access outside of the home works as a factor to create opportunities for the black male population. Outside access appears to have the opposite influence on the female population:

**Figure 14: Computer use by sex in poor communities in the City of Rio de Janeiro**
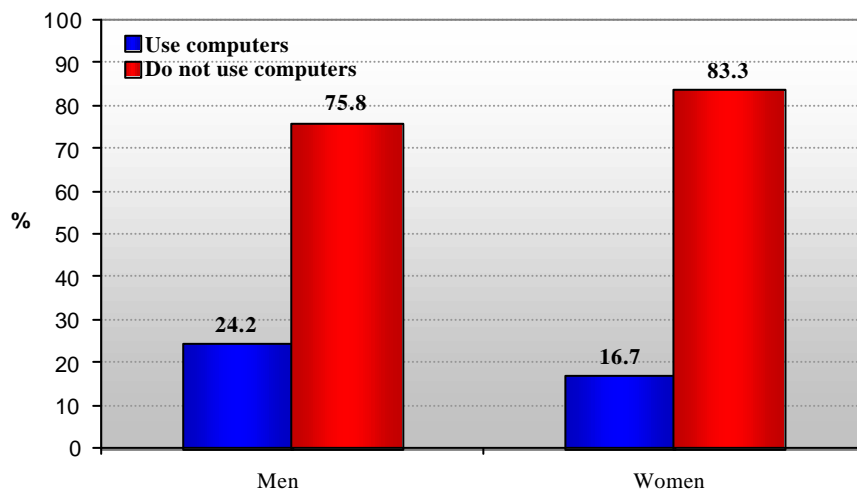
Work acts as a factor that contributes to digital exclusion in the case of women and to increased social equality for blacks. The majority of women work in cleaning services or as domestic help, and do not have opportunities to use computers, while a greater number of men, including many who work as office boys, find themselves in an environment that invites and permits them to gain basic knowledge of computers.

The tendencies related to computer use are reproduced with regard to the Internet, and are even more pronounced. Of the total of computer owners, just one-third have access to the Internet. Of the total of Internet users, just over 25% use Internet in their homes, echoing the patterns for computer use mentioned above. That is, the principal source of access is found outside of the household.
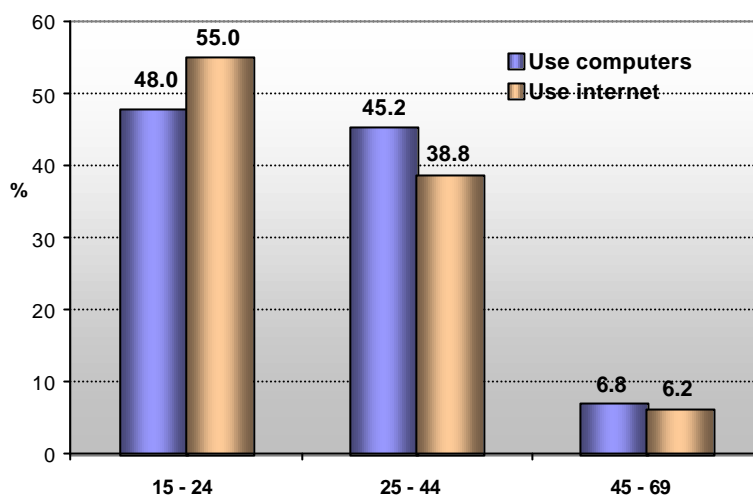
**Graph 15: Most common places to access Internet
in low-income communities in the City of Rio de Janeiro**
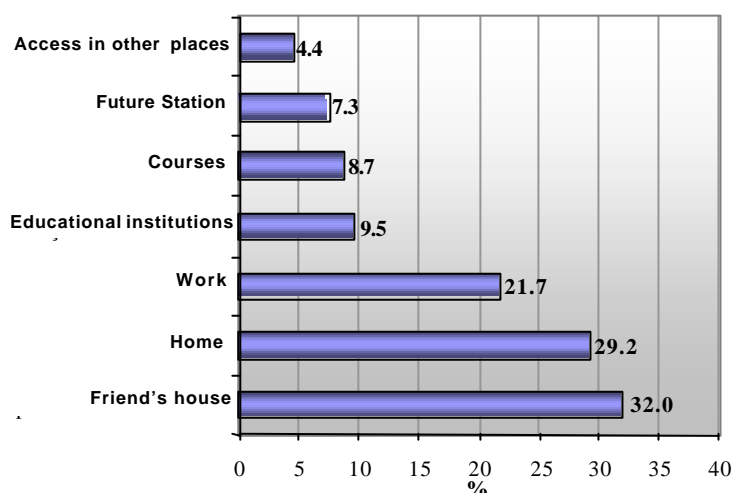


Universe: those who use Internet (11.6% of the population)

Age is a more decisive factor with regard to Internet use, as younger age groups are more likely to use the Internet:

**Graph 16: Percentage of Internet and computer use by age**



Note: The percentages were calculated in relation to the same group.

The income gap visibly increases when we look at Internet users instead of computer users. This is likely related to the cost and difficulty of accessing the Internet:

**Graph 17: Household per capita income and personal income**
**by level of digital inclusion**
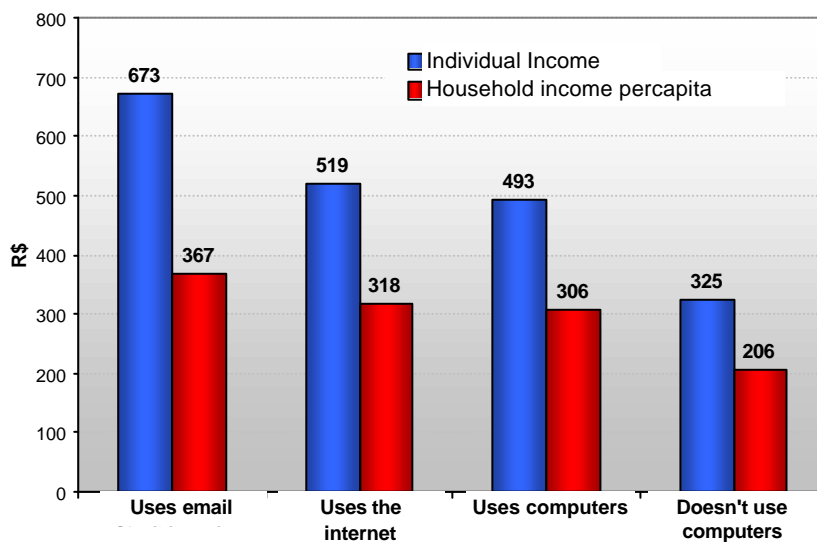


Finally, although a discussion on Internet content and e-mail use is not included in this article, we can not leave out an indication of the limits of ICTs uses for the lower-income sectors:

**Graph 18: Percentage of email use in relation to the use of computers and Internet among the total *favela* population**
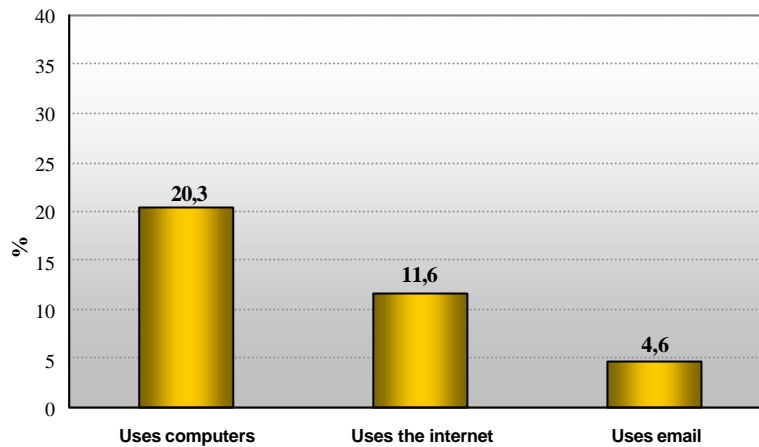


Less than half of Internet users are e-mail users. This low rate of e-mail use is related to the social context of the urban poor, in which most of their social network do not have access to Internet. For them, this decreases the usefulness of e-mail as a mean of communication.

*c) Quality of access*

If the data presented above indicate that there are multiple paths to gain access to computers and the Internet, these all converge in the sense that they indicate the limitations of available time and quality of access for low-income users:

a) Those that have a computer and access to the Internet at home are limited by the quality of access (the vast majority have practically no access to broad band). Moreover, the time they can stay connected is very limited (since they use dial-up access, and are required to pay for the time they occupy the phone line). Not being able to access fast Internet services at a fixed monthly rate, independent of the time of use, then, has two consequences: the information takes longer to access and there is also less time available to stay on-line, because the user has to pay for the time he or she is connected through the phone lines.

As the following graphs will show, the intensity of Internet use among *favela* residents is still quite low. Studies on digital exclusion, therefore, should consider not only numbers of those who use computers and those who do not, but also the quality of access (low and high speed), as well as the time that is effectively available for such use.

**Graph 19: Frequency of access to the Internet,**
**in low-income communities in the City of Rio de Janeiro**
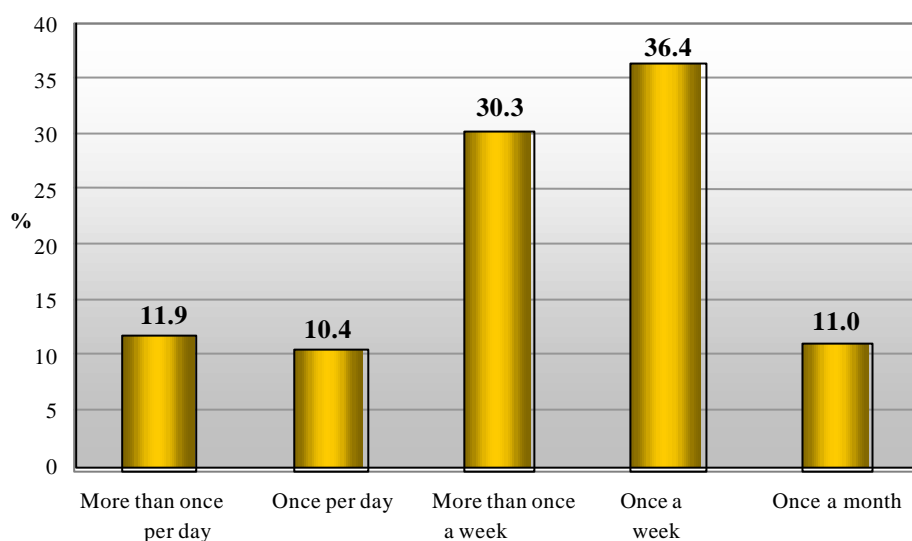


Universe: those who use Internet (11.6% of the population).

b) Those who use Internet and computers at their place of work can do so within the limits of their duties and work schedule.

c) Those who have access to computers or the Internet at their friends' or family's houses face similar difficulties because of the limited availability.

d) Those that use tele-centers depend on the following: the existence of tele-centers located near them, resources to pay for the service and availability of computers in the tele-center at the time they are interested in using them. Even the users of Viva Rio's Future Stations, who have access at relatively low price, have the same income and

educational profile as the average user of computers or Internet in the *favela*.[9] Still the the telecenters broaden the base of users and provide *favela* residents who own computers with better quality service, infrastructure and support services than they can get at home. [10]

**Graph 20: Household per capita income and individual income by usage of Future Station**
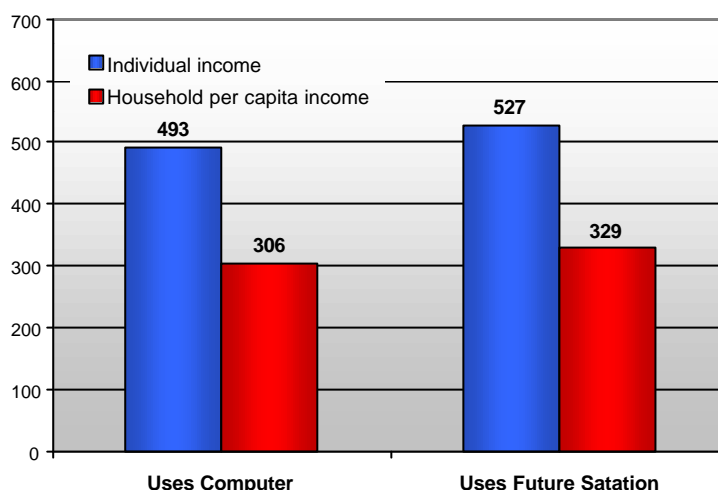


## Conclusions: Public Policies and Digital Inclusion

In considering the findings of the research and the international literature on digital exclusion, we can draw some conclusions on the objectives of universalizing access to computers and the Internet and democratizing information. Basic knowledge of ICTs increasingly becomes a precondition for employment. Universalizing basic knowledge of computers and the Internet is fundamental in order to limit the negative impact these may have on the poorest sectors in spite of several limitations of the policies to

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[9] One of the few in-depth quantitative studies on urban poor ICT users, conducted in Lima, arrives at the same conclusion: tele-center users have a higher income and education level than the average inhabitants of the slums. See, Francisco J. Proenza, Roberto Bastidas-Buch, Gullermo Montero, "Telecentros para el desarrollo socioeconómico y rural em América Latina y el Caribe", FAO/UIT/BID, 2001 (www.iadb.org/regions/telecentros/index.htm).

[10] On the Viva Rio case see Sorj, B., op. cit.

democratize information. The struggle for digital inclusion is a struggle against time. New information technologies increase existing social inequalities and policies for digital inclusion mainly a struggle to re-establish the possibilities for access to the job market.

Programs for digital inclusion need to confront the complexities of the issues involved:

1. The true value of information depends on the user's ability to interpret it. To be useful, information must be meaningful, must be transformed into knowledge which is only possible through a process of socialization and practices that build analytical capacities. Therefore confronting the digital divide cannot be separated from confronting the educational divide.

2. Policies to universalize access to the Internet in developing countries will not be successful if they are not associated with other social policies, in particular those relating to education. In developing countries, where illiteracy rates are very high (in Brazil this rate is around 30%), the struggle to increase access to public services (education, sanitation, security, health, justice) require a complex vision of the struggle against digital exclusion. Obviously, this does not mean that we must wait until we are able to eradicate illiteracy in order to develop digital inclusion policies. The demands of the economy and of job creation require interrelated policies that work with different social sectors and different rhythms to universalize public services. At the same time we can not ignore the strong inter-linkages between different social policies. The final success of these depends on an integrated program to universalize various public services: there will not be universal access to new information and communications technologies without universal access to other social goods.

3. As indicated before, it is fundamental to define priorities of target publics. This research indicates that in principle the tele-centers in poor communities are used by sectors of society that already have a basic level of education and relatively higher income. A policy to universalize access to the Internet should have as a

primary objective the educational network, as this is the only place that can effectively be reached by most of the population. As the research indicates, the workplace is an important factor in increasing digital inclusion. Digital inclusion policies should create incentives to increase the number of companies that use computers and the Internet, as well as to offer computer and Internet courses to their employees.

4. To propose that schools be used in conditioning the new generations to use computers and the Internet does *not* mean: a) to transform ICTs into a privileged instrument for the educational system, nor b) to over-invest in exaggerated quantities of computers in each school. The research on the impact of the use of computers and Internet in schools is contradictory. The adaptation of professors to this new instrument is a long process that can not be disassociated from the general improvement of professional development. Developing adequate software, adapting pedagogical systems, and developing critical teaching techniques on the use of ICTs will be a necessarily long process in the majority of developing countries. Until that time, the role of ICT labs should be to introduce students to these instruments and their uses and provide them training on basic programs, in order to motivate them to use them to facilitate future insertion in the job market. Within these limitations, a more modest ICT program consisting of a one-year course during primary education and one more during the secondary cycle would be a reasonable starting point.

5. The development of low-priced tele-centers – places where the public can access the Internet – is fundamental in any type of policy to universalize services. In spite of the efforts of NGOs to develop community tele-centers, their quantitative impact has been in practice very limited. At the same time, they do fulfill an important function in demonstrating that tele-centers can also have an important effect in the communities where they operate. But making access universal should be a concern and responsibility of public policy. The market can have direct impact, as in the Peruvian tele-centers – administrated by family owners and reducing the cost of access by using low-cost equipment and

"pirate" programs,⁻ or as a partner in implementing the policies. NGOs can also be instrumental for local implementation of public programs. However, government policies are the only way to reach a scale and sectors of the population that voluntary initiatives or the market can't achieve. Public policies will need solutions which will include to increase access to the poorest communities and individuals, with subsidized services, carried out by private companies, community associations, and/or NGOs.

6. Digital inclusion policies should have clear goals, based on what they hope and what is possible to achieve, given existing social conditions and their public effective capacity to absorb ICTs. In order to attain higher levels of social and financial efficiency, digital inclusion policies should make use of systematic in-depths quantitative and qualitative studies. The studies should use methodologies and indicators that take in consideration the various forms of access and uses of ICT, and the barriers for improving/making possible digital inclusion.