CHAPTER 15
SOCIAL NETWORKS AND URBAN POVERTY REDUCTION: A CRITICAL ASSESSMENT OF PROGRAMS IN BRAZIL AND THE UNITED STATES WITH RECOMMENDATIONS FOR THE FUTURE

Jeffrey Goldstein & Rodrigo M. Zeidan

Policies to reduce urban poverty are increasingly important, not only in developing but also in developed countries. Yet, urban poverty seems invariant in relation to economic growth. Although different methodologies and conceptual frameworks have surfaced to deal with poverty reduction, the way to effectively achieve this objective is not clear. In this paper we develop a comprehensive approach to deal with urban poverty reduction policies by making up for the lack of attention to social networks in nearly all poverty reduction programs or policies. We critically assess this neglect of social network connectivity in two case studies, Favela-Bairro, or slum revitalization, in the city of Rio de Janeiro and a program in workforce development in New York City. We then discuss several of the most important elements of a social network perspective. The aim here is to show why it is necessary for urban poverty production policies to incorporate social network connectivity with the marginalized and disenfranchised poor. We offer guidelines as to how this kind of social network connection of the poor with the non-poor populations of our urban environments may proceed.

Introduction: Inattention to Social Network Connectivity as a Common Lack Across a Hemispheric Divide

Although many and varied poverty reduction programs have been implemented in developing as well as developed countries, urban poverty, in absolute numbers, nevertheless has remained mostly invariant in relation to economic growth. Haddad *et al*. (1999), for example, found that in eight developing countries not only had the absolute number of poor and undernourished in urban areas increased, so did the overall share of poor and undernourished. Strikingly, Lee (2000) found this same trend in Canada, presumably a developed country *par excellence*, as poverty increased in the early nineties and even more so in metropolitan areas. Whereas metropolitan populations grew

by 6.9 % between 1990 and 1995, the population of the poor grew by 33.8 %! Lee also found that, in relative terms, the national poverty rate increased during the early nineties and then became constant during the latter part of the decade. Even in the United States, supposedly one of the wealthiest countries on the planet, poverty is an undeniably normative condition for millions of persons, demonstrated by the fact that, using the most recent census data of a population of 300 million, 37 million Americans were living at or below the official poverty level (The Workforce Alliance, 2007). An additional 77 million Americans were struggling to make ends meet in households—together, these families comprise the "working poor" which represents an alarming 1-in-4 working families in the United States! As the international banker and founder of the Acumen Fund which is dedicated to poverty reduction through business investment, Jacqueline Novogratz (2009: 1) declares, "The gap between rich and poor is widening across the world, creating a dire situation that is neither socially just nor economically sustainable." This "gap" is not just a dramatic metaphor about income disparity, it is a tragic truth about the *growing social disconnect* between the poor and the rest of society, a situation where the poor are increasingly marginalized through *impoverished social network connectivity* which keeps them marginalized and keeps them poor.

Different approaches to urban poverty reduction that have been implemented during the past thirty years run the gamut from the mostly top-down programs emanating from such cross-national institutions as the World Bank and the International Monetary Fund to policies intentionally combining top-down and bottom-up approaches (see, e.g., Blakely & Bradshaw, 2002; Graham, 2002; Gordon & Townsend, 2000; Wolfensohn, 2001). Two conceptual problems common across these various approaches have been discerned (Wratten, 1995). The first involves the lack of consensus as to the most effective urban poverty reduction policy. Conceptual equivocation is typically found in defining specifically what constitutes urban poverty as well as which criteria to use in assessing policy efficacy. The second conceptual problem lies in the many ways that poverty reduction policies suffer influences (good and bad) from a multitude of different sources such as local political agendas, the role of development agencies, as well as the vast machinery of local, state, and federal bureaucracies. Yet, the critical role of social networks in reinforcing the marginalization that keeps the poor encapsulated into communities of poverty is ignored.

To be sure, there is consensus that to reduce urban poverty has become a social imperative. Yet the most promising means to reach this goal are simply not obvious. This chapter aims to make up for these lacks through two interrelated objectives. The first is to critically assess urban poverty reduction programs in two very different countries, one developed—the United States—and one in the process of very strenuously developing—Brazil. Moreover, these programs rely on two very different approaches: work force development (job training for marginalized populations) in the US; and, slum revitalization in Brazil. The point in comparing two programs substantially differing in both their approaches and cultural backgrounds is to demonstrate the ubiquitous but heretofore unrecognized *neglect of the highly significant role social networks play in either main-*

taining or ameliorating the conditions of poverty. Our second goal, following on the heels of the first, is to offer suggestions on how poverty reduction policies can become much more effective through transforming existing social networks into ones possessing greater potency in curbing poverty.

The importance of impoverished social networks as a key factor in urban poverty is closely related to what the economist Robert Putnam (2001) observed concerning a decline of membership in American civic organizations. Putnam interpreted this decline as a warning signal about a weakening of an active and engaged democracy in the US. Commenting on Putnam's observation, the social network researcher Gregory Todd Jones (2007) has added that the issue is not simply the decrease in social connectivity demonstrated in this decline in membership, but the specific nature of these connections. We interpret what Jones is calling attention to as the need to insure that in spite of valiant efforts to reduce urban poverty, the urban poor are becoming increasingly marginalized because of a stasis in or even abating of social connections linking the poor to rest of the non-poor populations in our urban environments. In the discourse of social network theory, what is taking place is that the "degree" or number of social connections of poor persons in relation to the rest of the population is not congruent with the ever increasing connectivities characterizing wealthier regions in our modern megalopolises. This situation is captured in the saying that the "rich are getting richer and the poor poorer." Indeed, the syndrome of the "rich getting richer," a topic we shall explore in greater depth later in the chapter, is characteristic of a particular type of social network, the so-called "scale-free" network which has the property of a power law distribution of the number of nodes with k connections in relation to the number of k connections (Barabási, 2002). In other words, on the one hand, very few nodes possess most of the linkages, e.g., in such world wide websites as google, yahoo, and facebook; on the other hand, a great many websites have very few linkages. This means that as the "rich" websites "get richer" by growing in social network connectivity, the "poor" websites "get poorer," i.e., the impoverished websites become increasingly marginalized with respect to the "enriched" sites. This finding is directly comparable to the relation of the non-poor populations to the poor in modern urban settings. The poor are not only economically impoverished they are impoverished in their social network connectivity as well, and the impoverishment of both dimensions is only getting worse.

The outcome is not just a greater amount of poverty but a vital loss in the *social capital* (Beinhocker, 2006) that social network connectivities can bring. As Hoff and Stiglitz (2001) define "social capital," it includes, among other things, informal social norms, information networks, mechanisms for reputation enhancement and degradation, and social sanctions, all which can serve as substitutes for more formal social rules This closely relates to a similar point made by Dagino (2004) that resources, capabilities and competencies are aggregated within a dynamic and complex social connectivity network and that, accordingly, the super-additivity emanating from this aggregation translates to social capital.

Hence, in this chapter we will investigate to what extent even well intentioned and richly supplied efforts to reduce urban poverty cannot accomplish much long term good if the poor are left with impoverished social networks that do not allow for the augmentation of social capital. This investigation will require that the social networks that now exist among the poor are identified, typed, and then examined for their degree and quality of connectivity. Unless urban poverty reduction programs, no matter how grand their intentions and no matter how much energy and resources are put into them, improve the social connectivities of the poor with the rest of the populations, the poor will become increasingly marginalized and thus poorer, unable to either take advantage of a revitalized living area or of improved opportunities for job training and job search. The resolution of this increasing marginalization is, of course, neither simple in terms of the program specifics required nor can it be done in a short time frame. Poverty is a complex problem and the solutions of it must also be complex.

To be sure, the crucial importance role of social networks in helping to ameliorate economic conditions is not a new idea. Two examples where social networks have proved invaluable in increasing social capital are the extensive social networking conclaves established in the poor Appalachia region of the United States (see Holley, NdA, NdB) and the very successful collective of businesses known as Mondragón in the Basque Country of Spain (Mondragón Corporación Cooperativa, Nd; Whyte, 1991). Whereas it is true that in both Appalachia and in the Basque Country the powerful role of social networks leading to greater prosperity have included connections to urban areas, for the most part these social network enclaves have been developing more among smaller cities or towns or even in rural areas. Nevertheless, these two examples provide a backdrop of inspiration to guide our efforts in offering suggestions for emphasizing and not neglecting the key role social networks can play in urban poverty reduction.

The Two Poverty Reduction Arenas

The first urban poverty reduction policy we will be examining involves the Favela-Bairro program in Rio de Janeiro, Brazil. This program was developed by the municipality of Rio de Janeiro in conjunction with the World Bank to provide urban development, instead of mere urban growth, in those very poor areas of Rio known as "favelas". The poverty characterizing favelas was dramatically articulated in a recent article in the *Economist* ("Land of Promise: A Special Report on Brazil", 2007) which pointed to the road forming a boundary line between the huge, gang-led favela Rocinha (with a startling 200,000 population) and its very wealthy neighboring community: this road marks a 9-fold difference in employment, a whopping 17-fold difference in income¸ and a 13-year difference in life expectancy.

The Favela-Bairro program is on a very large scale, spanning many years and many communities. Yet, this revitalization program has only been sparsely analyzed in the relevant international literature (with some noteworthy exceptions such as Pamuk & Cavalieri, 1998; Fiori *et. al.*, 2000; Riley *et al.*, 2001;

Acioly, Jr., 2001; Brakarz & Aduan, 2004). In our research we benefitted from an unusual access to documents regarding the planning and implementation of the program.

The second case study concerns a much smaller scale program in urban poverty reduction, this one focusing on workforce development in New York City: Medical Pathways (MedPath), funded by a wide consortium of public and private funders and operating through an urban NGO. MedPath offers technical/professional education in three health-care professions to those who have been traditionally "locked-out" of such careers because of their "high risk" status defined in terms of lower level educational and psycho-social proficiencies. The three careers are emergency medical technicians (EMT), paramedics, and radiologic technologists (X-ray techs). Since much of the training required for these careers is on a college level, the challenge of this particular workforce development program is not only to bring recruits up-to-speed through remedial education, but also to offer the requisite intensive psychological, social, and financial support that students at high risk need in order to complete such a rigorous technical education. This full range of support, what the program calls its "wrap-around" feature, of course, requires a much greater expenditure of effort, attention, and money than the education itself. Moreover, MedPath includes employers in the design and delivery of the training (Clymer, ND), an inclusion which offers the promise of a greatly enriched social network context for job training and career pathing.

We shall discuss the main features of this program against the background of legislation as well as the general nature of workforce development projects in urban areas in the United States. However, as in the case of Favela-Bairro, our main emphasis will be on the social network connectivities that this program offers in "seed" form but for which neither enough resources nor attention have been forthcoming to nourish these seeds to become vital realities for the participants of the program. However, in assessing the Favela-Bairro and the MedPath programs, although we find them both lacking in the key ingredient of social network connectivity, we don't want to give the impression that we are ignoring the good that both programs have wrought. Rather, because we want to see much greater good coming out of these and similar programs, we will emphasize the social network aspects which we believe deserve much more attention.

It is immediately obvious that there are enormous and critical differences between the poverty reduction situations in Rio and New York. The United States is a vastly wealthier country with much greater funding available on federal, state, and local levels from public and private sources. Furthermore, the Rio program is directed at poverty reduction through neighborhood infrastructure improvements while the New York program is about job training and job search. Yet, we believe that by comparing and contrasting the success and failure factors of these programs from two very different countries we can discern some commonalities that cut across the wide divergences and therefore may be applicable to other contexts as well, particularly the commonality consisting of the lack of attention paid to improving the social networks connecting the poor in both programs to the non-poor populations of both cities.

The chapter is divided as follows: in the next section we analyze the current literature on poverty reduction urban policies with the aim of pointing out certain problematic facets of such policies. In the third section we present certain facts about favelas in Rio de Janeiro in order to contextualize the analysis of the Favela-Bairro Program. The fourth section describes the workforce development program in New York City. The fifth section compares and contrasts the two cases, particularly with regard to social network theory. In this as well as in the final section we will offer several recommendations for including an awareness of social networks in the planning and implementation of urban poverty reduction policies for the future.

Poverty Reduction Policies and the Neglect of Social Network Connectivity

Policies advanced by international organization like the IMF, World Bank, and United Nations-affiliated agencies can be summarized as follows (Gordon, 2002; Blakely & Bradshaw, 2002):

- Broad-based economic growth;
- Development of human capital through employment policies;
- Increase in the participation of disadvantaged and minorities groups;
- Establishing minimum social safety nets, and;
- Improving the physical environment as a necessary component for business development.

These advocated policies are national in scope, and thus have excluded from research a multitude of different approaches to *local* policies. An example is Gordon and Towsend (2000) which concludes that ideally effective and efficient anti-poverty policies are employment creation programs through labor-intensive projects; creation of collective social insurance and public social services; and introduction of greater accountability.

Although programs based on approaches like those which Gordon (2002) emphasizes have not entirely disappeared, local planning has been gaining ground as the new orthodoxy in urban poverty reduction planning. This trend is a response to the insufficient impact on poverty reduction due to economic growth, and the mismanagement of national policies because of inefficient governments. Wolfensohn (2001), former president of the World Bank, affirms that the shift from national to local policies is a question of governance, a subject that has been becoming an increasingly important topic in policy making. Wates (2000) goes further, identifying specific reasons for local policies: additional resources; better decisions; building community; compliance with legislation; democratic credibility; easier fundraising; empowerment; more appropriate results monitoring; professional education; responsive environments; satisfying public demands; speedier development; and sustainability. The empowerment issue is a particular compelling argument for many authors (as shown, e.g., in

Wolfensohn, 2001), yet the crucial role that social networks could play in empowerment is conspicuously absent from these considerations.

To be sure, different frameworks for applying local policies have surfaced in the wake of this shift. Blakely and Bradshaw (2002) is a good example of a local planning approach, comprised of self-education first, strategy development second, and projects third. These stages can be further subdivided into six phases: gathering information; selecting a local development strategy; selecting projects; building action plans; specifying project details; and implementation. Yet, again, notice that enhancing social network connectivity is not on this list. The new local planning approaches have in common policies that are restricted geographically, focusing on communities and households rather than direct income distribution to individuals. Moser (1995) presents a typology for indicators of urban vulnerability and well-being as:

INDIVIDUAL	HOUSEHOLD	COMMUNITY
Access to adequate nutrition and health care (infant mortality)	Household type	Access to and reliability of basic needs of water, sanitation, education, health care etc.
Access to adequate education (drop-out rates)	Household structure in terms members in productive, reproductive and community work.	Personal safety from robbery and violence
Access to adequate income (per capita income)	Stage in the life-cycle	Capability and capacity of community based organizations
Personal safety from domestic violence	Access to housing	
Access to credit		

Table 1 *Determinants and Associated Indicators of Urban Vulnerability and Well-being at Different Levels (Moser, 1995: 167).*

Again, we note the lack of any appeal to social networks either directly or indirectly.

We can then summarize the approaches into three dimensions: individual; household; and community. The new local planning approaches accordingly can be ascribed to either a household or community dimension, with a strong bias towards community planning, since local planning is often regarded as a means to achieve bringing better access to basic needs to the poor. Examples of urban policies focused on the community dimension abound in the literature. Thus, in a Global conference on scaling-up poverty reduction (2004) there were case studies on Peru's Urban Land Titling Program, and transport infra-structure on Vietnam; the City Alliance Annual Report (2003, 2004, 2005); cases on Karu, Nigeria, Mumbai, India, and Tunis, Tunisia. Indeed, housing programs have been used to relocate poor individuals since the dawn of capitalism. One

might have expected that when it comes to recognize the great importance of the community dimension, the issue of social network connectivity would have naturally have shown-up but such is not the case.

The individual dimension is usually viewed separately from that of the community. Poverty reduction policies based on the individual dimension usually fall into one of two categories: income-transfer or employment. In both cases the first wave of individual-based policies were national in scope, with recent plans being developed as part of local solutions. Income transfer policies range from negative income tax to social security measures, and to direct transfer (Bolsa-Escola and Bolsa-Família in Brazil, for instance). Employment policies are also well understood, with measures like unemployment benefits and employment relocation being commonly used throughout the world. The case study of workforce development that we will examine below is an example of this kind of individual poverty reduction program although it obviously has implications for community development as well. Yet even here, when employment is the issue, the critical role that social networks can play in job search is left out of consideration. It seems to us that the whole issue of social networks is taboo since to bring it up at all means having to face the fact that slums and other loci of marginalized poor have an inherent "social ceiling" that serves to maintain social barriers to keep the poor "where they belong."

One cannot help but wonder why there has been such a neglect of social networks. Is it merely an indication of the lack of specific conceptual constructs delineating the nature of dynamics of social networks? But social networks have been an area of considerable interest in sociological literature, even with economic implications in the very influential work of Granovetter as early as 1973 (Granovetter, 1973). Moreover, the intersection of sociological with economic theory has been one of the primary sources appealed to in thinking about urban poverty reduction strategies. We think there must, therefore, be another more important reason, namely, a perceived threat to the status quo that serious consideration of socially connecting the impoverished to the large community would lead. As we'll discuss below, however, socially connecting marginalized groups to the rest of society have potential pay-offs in terms of innovation generation that can produce good for the entire community and not just for the poor, a social good not otherwise attainable except through establishing enhanced social network connectivity.

Critique of Urban Poverty Reduction Policies: An Internal Focus which Further Marginalizes the Urban Poor

A new program aimed at poverty reduction is usually a cause for celebration since there is a possibility that the hoped-for panacea to solve poverty has finally arrived. However, there is no empirical evidence that poverty has been significantly reduced throughout the world as a result of such programs. One often cited reason is that simply not enough has been done, yet many arguments exist which credibly point out that many policies to alleviate poverty are inefficient. On the individual dimension the main criticisms have been that income is only one-dimension of poverty—thus handing out money does not solve the prob-

lem of long-term poverty—and that employment-based policies have not been targeted to poor individuals, or are badly designed when they do try to target poor individuals—social security, for instance, has more objectives than only to alleviate poverty. Two recent instances of direct income-transfer policies are the Bolsa-Escola and Bolsa-Família programs in Brazil. The first gives money to the family if all the children are enrolled in school, and the second gives money to poor families that fall below the absolute poverty line. Both programs have been criticized (the second more than the first) for not having a structural impact and thus achieving only short-term gains—a net result of negative social welfare due to the high costs involved. New local policies have concentrated on micro-finance, while national policies use the direct transfer approach. Indeed, in Bangladesh where Muhammad Yunus (2009) first pioneered micro-finance, social network connectivity has been one of the stated program goals (see Kayes, this volume), yet when imported into other countries this seems to have gotten short shrift.

Critiques of community and household dimensions of urban poverty reduction policies are almost non-existent in the literature, with the few extant discussions focusing mainly on the degree to which these policies are effective. Crump (2000), for instance, critiques the housing policy of the United States. The author argues that using "spatial metaphors" such as the 'concentration of poverty' actually serves to disguise social and political processes driving poverty and thereby helps to justify simplistic spatial solutions to complex social, economic, and political problems. We would add here that this same "spatial metaphor" of "concentration of poverty" is another, more disguised way of conceptually encapsulating the poor into their marginalized status of social isolation, i.e., their "concentration of poverty" simply metaphorically representing the disconnection of the poor from the dominant non-poor social networks of the modern city.

In spite of these critiques of urban poverty reduction strategies, there does seem to be a general consensus that local policies are the best way to achieve poverty reduction, and the case is being strengthened by relatively new concepts like community-building and empowerment issues, which are perceived as increasingly important (Wates, 2000). But, again, although these new concepts may seem to be a particularly apt place where the issue of social networks would be raised, they remain mute on the subject. Instead, the key word is *governance*—if local urban planning is done efficiently, i.e., "governed" efficiently, poverty reduction will surely follow. "Governed," though, at the local level puts the onus on the *internality* of the slums' own mechanisms and amidst all this talk about the merits of local-based strategies and efficient governance, there are no corollary arguments pushing for improvement in social network connections, an improvement that would by it very nature require going beyond the *internality* focus of local governance.

In fact, it's worse than that: community and housing policies possess an intrinsic and usually unobserved social cost—these policies are a *dis*incentive to social mobility. Most urban poverty reduction policies have an infrastructure dimension, with the argument being that improving infrastructure will im-

prove welfare in a community. This usually translates to a situation in which the policy is localized and then creates an area of improvement in the midst of other poor areas. But that in turn makes its residents reluctant to move out of the area due to the fact that they may not find the same reliability in basic needs as the improved area. The cost, even when it is small, can hinder long-term welfare by further segregating communities, hence hampering social mobility. Indeed, the *internal* focus of such policies actually hinders efforts to link the inhabitants of such communities to those outside the boundaries of the community. This internal bias actually works against social mobility by restricting the foci of such efforts to what is to take place inside the community's boundaries which by their very nature reinforce stasis in social mobility.

Since it is difficult to value social mobility as a social welfare function, it is likewise difficult to quantify the negative effects of community and housing poverty reduction policies, to the point where most case studies ignore these side effects altogether. However, social mobility must be a crucial feature of poverty dynamics if long term solutions are to be gained. As McNicoll (1997) affirms, research in both developed and developing countries has found substantial movement into and out of poverty so mobility must be an essential variable.

The Case of Favela-Bairro

Favelas in Brazil

The Favela Bairro program was designed by the municipality of Rio de Janeiro and financed by the municipality working with the Inter-American Development Bank. Its laudable main goal is to develop the poor favelas dotting the landscape of the otherwise beautiful city of Rio de Janeiro by mixing improvements in housing, infrastructure, and other living modalities in order to achieve the goal of normalizing the favela into just another, but non-poor, neighborhood. It is heralded as a successful case of urban planning, being cited as such an example by the World Bank, the press, and academic papers.

Six million and six hundred thousand people live in favelas in Brazil (out of a total population of almost 190 million). Favelas are something of an anomaly in terms of urban development. Whereas around the world, there is a growing tendency for poor individuals to move from the country-side of poor villages and towns to the outskirts of large cities thereby forming concentric rings of poverty around the large city, favelas have developed inside the cities of Brazil, their inhabitants living in small, quite primitive dwellings, e.g., along Rio de Janeiro's many hills and mountains. An interesting and well-known example is the favela of Rocinha mentioned above which now contains over 200,000 people existing on a hill right in the middle of the most expensive Rio de Janeiro neighborhood (bairro) of São Conrado. It is important to recognize for the purposes of our paper, that although Rocinha is literally right-next-door geographically to São Conrado, there are palpable barriers to social intercourse between the inhabitants of the two communities. Indeed, private sentinels exist in both communities disallowing entry for external "visitors." Accordingly, the favela's marginalization from the non-poor population of Rio is thereby guaranteed and

can even be said to be growing due to the lack of viable social networks connecting it to even its closest community neighbor.

Favelas are characterized by low income, high density populations and serious infra-structure problems such as low grade sanitation, poor roads, and so on. Indeed, favelas are growing as shown in Table 2, comprising 3.5% of the total city land in 2004 compared to 3.35% in 1999.

| City Zone	Favela Area (km²) 1999 (A)	Favela Area (km²) 2004 (B)	Total City Area (km²) (C)	(A) / (C) 1999	(B) / (C) 2004
AP1—Center	2,26	2,28	34,4	6.58%	6.62%
AP2—South	4,11	4,10	100,43	4.10%	4.09%
AP3—North	17,36	17,75	203,49	8.53%	8.72%
AP4—Barra & Jacarepaguá	6,01	6,29	293,78	2.05%	2.14%
AP5—West	11,71	12,47	592,46	1.98%	2.10%
City Total	41,46	42,89	1224,56	3.39%	3.50%

(IPP/DIG—SABREN e Digital Cartography)

Table 2 *Percentage of Favela Areas to the Total of Rio de Janeiro: 1999-2004.*

Some favelas have experienced a total area growth of over 100% during a five year period, e.g., Vila Beira Rio (280%), Nova Brasília (177.8%), and Pantanal (156.7%). Figure 1 shows how favelas are distributed in the city of Rio de Janeiro, with the dark brown region presenting the area with the highest favela density.

One indicator of how insular and homogeneous the dwellers of favelas tend to be is that their income distribution is less divergent than in the rest of the city, not only because the individuals in the favelas are uniformly poor but because social mobility for their inhabitants is greatly impaired in comparison to the non-favela population of Rio de Janeiro. While the average Gini coefficient (a metric for income disparity) for Rio de Janeiro is 0.60 (with small variations in the period 1998-2003), a sample of Gini coefficients in Table 3 for a few favelas in Rio de Janeiro reveals that, in general, disparity of income is not the norm in favelas:

Of course, this is not surprising since, as we'll say more about below, those types of social networks characterized as circumscribed clusters reflect homogeneity among the nodes that are densely clustered. Also, there is a significant difference in the educational background between people in favela and the whole city—data on the level of education is presented below in Table 4 which, although ten years old, most likely hasn't changed greatly since there is no indication that development programs in the favelas have had much success over the past decade.

The data in Table 4 above shows the discrepancy of education levels between individuals in favela and the city as a whole. This is to be expected given
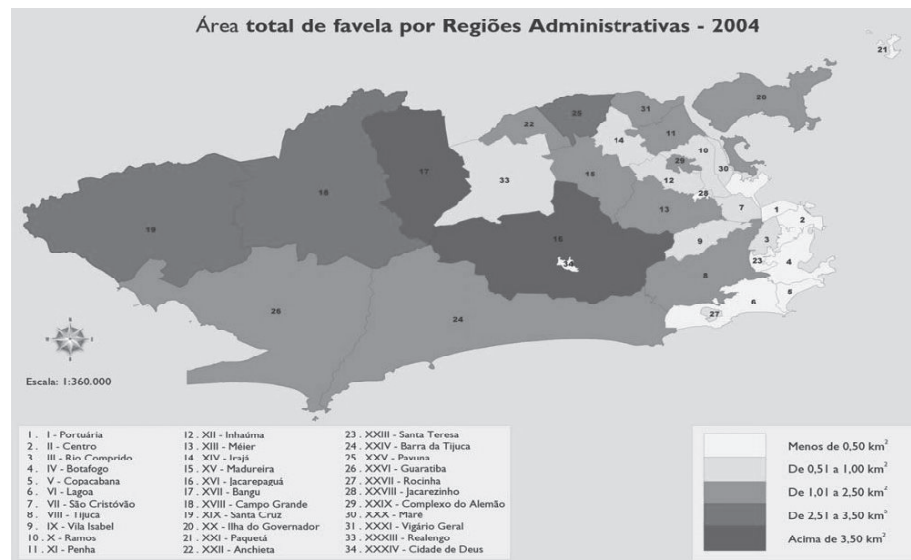
(IPP/DIG—SABREN e Digital Cartography)
Figure 1 *Total Favela Density Area by Administrative Region in Rio de Janeiro: 2004.*

Andaraí	0.408	Morro do Urubu	0.433
Bairro Nova Aliança	0.455	Morro dos Prazeres	0.418
Borel	0.424	Morro dos Telégrafos	0.422
Canal das Tachas	0.429	Morro União	0.446
Cerro Corá	0.42	Parque Boa Esperança	0.407
Complexo da Mangueira	0.443	Parque Proletário Grotão	0.446
Floresta da Barra	0.41	Salgueiro	0.477
Mata Machado	0.41	Serrinha	0.489
Mato Alto	0.421	Três Pontes	0.466
Morro da Fé	0.373	Tuiuti	0.441
Morro do Escondidinho	0.35		

Table 3 *Gini Coefficients—Favelas in Rio de Janeiro: 1999. (Adapted from Motta, 2000).*

the high correlation between education and income. However, it should be noted that the difference in educational background is decreasing, with individuals in favelas in the 10-14 age group exhibiting closer results compared to the whole city, a response due to the expansion of the educational system in Brazil. Table 5 presents data on income for working individuals in the favelas compared with the rest of the city of Rio de Janeiro in general, in terms of multiples of the monthly minimum wage ($380 as of April 1, 2007, or roughly 130 euros or $190 US using the average exchange rates for the same month). It can be observed that almost no individual in the favelas earns over 10 multiple minimum wages, either because his/her income is constrained by economic reasons or be-

Indicator	Favelas	Rio de Janeiro
Illiteracy (%) / Age	**10.8**	**4.2**
10—14 years	3.2	1.7
15—19 years	2.4	0.9
20—29 years	5.1	1.9
30 plus years	17.1	6.0
Male	9.5	3.1
Female	11.9	5.2
Number of School Years	**5.1**	**7.1**
10—14 years	3.7	3.8
15—19 years	6.3	7.2
20—29 years	6.3	8.5
30 plus years	4.6	7.2
Male	5.1	7.3
Female	5.1	7.0
Percentage of people with less than four years of school	47.3	31.8
Percentage of people with more than twelve years of school	0.4	11.8

Table 4 *Educationals Indicators by Genre and Age Group—*
Favelas and Rio de Janeiro: 1999.
(Adapated from Biblioteca, Nd)

cause, if high earnings become persistent, the individual has an opportunity of moving out of the favela. But note that the latter depends on achieving a much higher income, an unlikely event when social networks are as impoverished as the people who need them.

Favela Revitalization

Against this background, the Favela-Bairro revitalization program was designed and implemented beginning in 1994. Pamuk and Cavalieri (1998) summarized the rationale behind the project according to five main categories: projects designed to integrate *favelas* with planned neighborhoods or *bairros*; comprehensive urban redevelopment plans; an emphasis on coordination among municipal agencies; utilization of a participatory approach in which as many stakeholders as possible are included; and the use of private sector firms in executing public works projects. But again note that even though the plan included *integration* with non-favela neighborhoods as well as the *inclusion* of diverse stakeholders, in actuality both of these goals, which could have been powerful vehicles for building and enhancing social networks, were ultimately given very short shrift during program implementation.

Number of MW	Favelas (%)	Rio de Janeiro (%)
No Income	1.2	1.6
Up to 1 MW	14.2	9.9
1 to 2 MW	37.3	22.5
2 to 3 MW	26.6	16.2
3 to 5 MW	14.7	21.4
5 to 10 MW	5.1	15.2
More than 10 MW	0.8	10.7

(IPP/DIG—SABREN and SMTB.)

Table 5 *Income in Multiples of the Minimun Wage—Favelas and RJ: 2004.*

Not every favela was included in the project. The criteria for inclusion were: consolidation in the sense that no new favelas were considered in order not to provide an incentive for the creation of new favelas; favelas already part of municipal projects so that the municipality could use the already existent knowledge and resources; and the closely related category of complementarity, i.e., favelas where the municipality could utilize other ongoing projects as complements to the Favela-Bairro. These criteria offered the possibility of lowering the cost of the project without losing generality.

The comprehensive study by Fiori *et al.* (2000) shows how the program evolved, its goals, and presents some early results. The authors describe the favela-bairro program as:

The physical upgrading aimed to complement or construct basic urban infrastructure through the installation of basic sanitation and circulation systems, allowing for the free movement of people and vehicles (where possible), and better access to public services. At the same time, the program introduced urban symbols of the formal city, such as roads, squares, infrastructure and a menu of social services from day care centres, adult education, job training to advice for securing land tenure to support social inclusion in the favelas. *The underlying idea was that the 'opening up' of* favelas *to the outside world, and the creation of new public spaces, would transform the relationship between government and the local community, and trigger change at city-scale. In this way, urban integration was promoted as an instrument for comprehensive social inclusion. A key to Favela Bairro's success in meeting different causes and manifestations of urban poverty was its multi-sectoral character, and its implementation on a scale large enough to include the city as a whole* (59).

The keywords of "opening up" and "multi-sectoral" do indeed connote greater social network connectivity yet, as we will see, infrastructure improvement and housing became the actual drivers of the program, in the process of which the focus became more and more internal and not about connecting the inhabitants of the favelas to the rest of the city. Also, it is important to note social mobility as such is clearly disregarded since the explicit goal of the project was decidedly internal in the sense of keeping the individuals within the favela in question:

"Favela-Bairro had innovative characteristics for that time. Its basic approach was to maintain the residents in the areas they currently occupied and bring to them the services available to the rest of the city" (Brakarz & Aduan, 2004: 6). Even the attempt to create a micro-Rio inside the favela, in terms of constructing public spaces mimicking what's found in other sections of Rio de Janeiro, had an internal focus with a consequence that social networks that could connect the inside to the outside were put aside in favor of symbolically taking what was outside and placing it inside the favela.

A typical plan for development in the Favela-Bairro program takes the form of a PASI (Programa de Ação Social Integrada—Integrated Social Action Plan). It divides the actions into three types: housing and infra-structure; actions to the children and young; and employment and education. An example is the PASI of the favela Morro do Dendê. The favela housed 13,924 individuals in 1999, and the plan was designed for implementation in the years 2002-2004. The total projected cost of the Favela-Bairro program in Morro do Dendê is presented below, divided by its type of action:

Municipal Agency	Dimension	US$
SMH	Integrated Urbanization and Institutional Development.	804,837.66
SMDS	Children and Young	754,140.00
SMTb	Employment and Income Generation	207,100.00
	TOTAL	1,766,077.66

SMTb (2006)

Table 6 *Projected Cost of Favela-Bairro in Morro do Dendê.*

The cost then is roughly U$127 per individual, a not inconsiderable sum for Brazil but as, we shall see below, approximately only 1/100th the US$12,000 cost per individual for the MedPath workforce development program in New York. As for the different dimensions of the program, urbanization and development is the main focus, and attention to children and young also receives a relatively large part of the investment, with disbursements concentrated on child-care and some projects for first income to young adults. Employment and income generation is the individual dimension of the project, a dimension that is usually overlooked since analysis of Favela-Bairro is concentrated on housing and infra-structure. The actions of employment and income generation, however, are usually short-term goals, and are further divided between primary education and employment measures. Since primary education costs are a complement to regular educational policy in the area, and thus should not strictly be included in Favela-Bairro, the individual dimension costs are those of employment generation as can be observed in Table 7 which shows the different training courses open to the community. These different courses were determined through means of community participation in that inhabitants of Morro do Dendê, as in every favela in Favela-Bairro, were asked to participate in meetings to help determine the critical areas for the program to tackle.

Course	U$
Industry Technician	8,400
Waitressing	8,400
Education and Culture	4,200
Handicraft	4,200
Retail	18,940
Auto mechanic	4,200
Civil	8,400
Services	31,760
Telecom	4,200
Introduction to IT	16,500
Management	40,000
Social entrepreneurship	6,800
Total	156,000

Smtb (2006)

Table 7 *Projected Cost of Employment Programs in Morro do Dendê.*

This portfolio of courses gets individuals ready for low-paying jobs, e.g., in waitressing and making handicrafts. The courses serve, at best, to improve short-term income, since the target jobs require no great specialization, have a high turnover, and do next to nothing in providing social network connectivities for aspiring workers. Indeed, because of the latter, it can be concluded that the individual dimension of the Favela-Bairro does not address long-term effects via the establishment of the appropriate social networks by which jobs exhibiting some degree of social mobility could be possible.

Poverty and Workforce Development in the US

One of the chief strategies of poverty reduction in the US involves various means for increasing employment, generally known under the phrase "workforce development," particularly among the 1 in 4 families defined above as constituting the "working poor" in the United States. An important place to start examining factors involved in workforce development involves the relation of employment to educational backgrounds (The Working Alliance, 2007). In 2003, when the national unemployment rate averaged 4.8%, the unemployment rate for adults *without* a high school degree was 8.8% with mean 2003 earnings at $22,200. In contrast, the unemployment rate for adults with an Associates Degree (usually earned at two year community colleges) averaged 4.8% with their mean earnings at $37,482. However, those with a four-year college/university degree were even better off, averaging earnings of $53,356 and an unemployment rate of only 3.1%.

In 2001, approximately 20 million adults—or about half of all workers who earn less than $15,000 per year—were low-wage workers who were also

members of low income families earning less than $25,000 per year (Carnevale and Rose, 2001). In 2004 the poverty rate among working people was 6.1 percent, an increase from the 5.8 percent rate of 2003 while in 2004, 2,896,000 adults worked full time and for a full year yet were still under the poverty line (U.S. Bureau of the Census, 2005, quoted in Osterman, 2005).

Even more striking, 5,062,000 families had a member who worked full-time/full year yet had a household income below 150 percent of the poverty line and 9,230,000 families with full time/full year workers were below 200 percent of the poverty line! In addition, in 2001 21.6 percent of all hours worked in the economy were in jobs that paid less than two thirds of the median wage (i.e. less than $8.67) so that if the cut-off is set at $8 an hour or less, then 16.3% of all hours were in these jobs (Bernstein & Gittleman, 2003). As Figure 2 below illustrates, in the United States the predominant distribution of the working poor lack a college education:
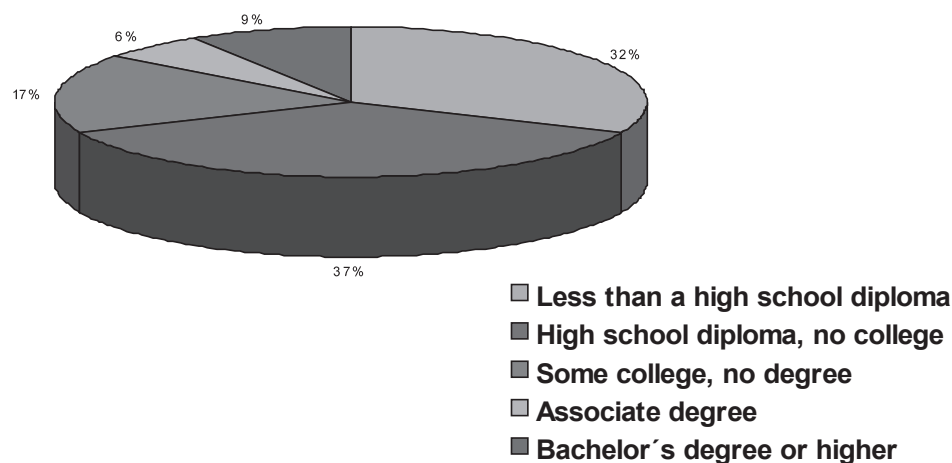

- 9%
- 6%
- 17%
- 32%
- 37%

☐ **Less than a high school diploma**
☐ **High school diploma, no college**
☐ **Some college, no degree**
☐ **Associate degree**
☐ **Bachelor´s degree or higher**

Figure 2 *Working Poor in US by Level of Education—*
% Distribution of working poor: 2001.
(Adapted from U.S. Department of Labor.
A Profile of the Working Poor, 2003).

69% of the working poor possess only a high school diploma or less whereas only 9% have graduated college (The Working Poor Families Project, 2007). This clearly indicates that one of the chief barriers to rising out of poverty in the U.S. hinges on the lack of adequate education. Yet, the United States has over 5,000 colleges and universities, some of which have up to 100,000 students! 25 million workers aged 18 to 64 lack a high school diploma or equivalent. Another 52 million adults have no postsecondary educational experience. This constitutes almost one-half of the adult workforce in the United States. It must be recognized that the positive affects of postsecondary educations rest not only on training in specific proficiency areas but perhaps as important or even more important in the social networks that are established during these years.

Furthermore, it is also evident that students from low income backgrounds are at the highest risk for successfully completing the kind of education that would boost them out of poverty—see Figure 3 below (analyzed in Cook & King, 2004).
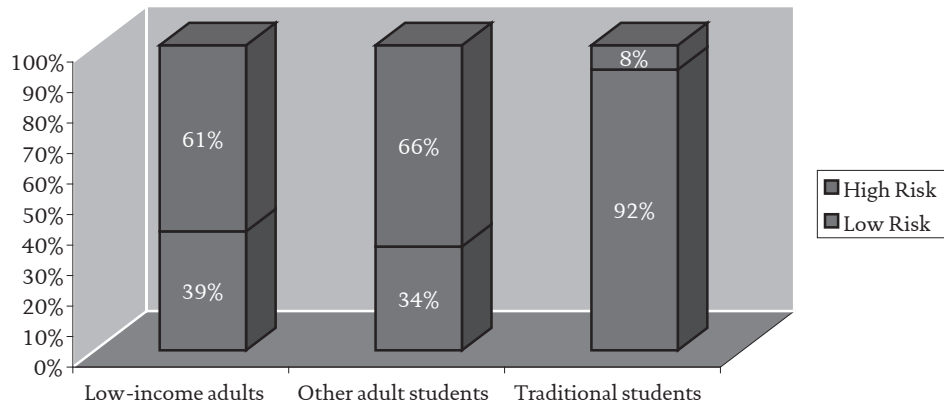

Figure 3 *Percentage distribution of students, by risk of academic difficulty: 1999. (Adapted from U.S Department of Education in Cook and King, 2004).*

Federal Legislation and Workforce Development in the United States

It must be kept in mind that the United States is a federalist form of government, meaning that much of the governmental services offered are the province of the 50 state governments as well as municipalities. Funding therefore is usually an amalgam of national, state, and local municipalities. In addition, in more recent years there has been a tendency of public/private partnerships in which foundations, wealthy donors, and private businesses contribute to the government funding stream. Because of citizens' preference for decentralized government, most efforts at work force development have been sporadic and localized. From the 1960s until the early 1990s, Congress enacted 175 narrowly-focused categorical employment training programs administered by over 20 federal agencies (Halperin, 1995).

In order to appreciate the kinds of funding issues and types of programs offered by the federal government in the US which address employment as a way to ameliorate poverty, we offer here a very brief review of legislation relating to workforce development, training and education, and related programs over the past 50 years (Allard, Maguire & Spaulding, 2007). In 1962 the Manpower Development and Training Act (MDTA) was enacted by the administration of JFK, mostly as a response to the bad reputation of vocational education programs for meeting the needs of the poor. MDTA was considered a kind of "second chance" outside of the formal education system. In 1973, the Comprehensive Employment and Training Act (CETA) was passed which consolidated burgeoning federal programs and provided block grants to state and local governments for job training. CETA also supported public service employment for marginalized workers (somewhat reminiscent of the WPA programs of the 1930s under

President Franklin Delano Roosevelt enacted as a response to the world-wide economic depression). Under CETA, stipends were given for job training.

CETA was replaced by the 1983 Job Training and Partnership Act (JTPA). Private Industry Councils were established consisting of business and industry leaders to oversee the tie-in of government funded training to the needs of employers. Although JTPA continued an emphasis on disadvantaged youth and adults, overall investment in the latter declined. In addition, JTPA established accountability standards whereby contracts contained stipulations in which pay was tagged to actual job performance. Under the Clinton administration, the 1998 Workforce Investment Act (WIA) was established to streamline the many government jobs-related programs, following the example of the successes on the part of streamlining that had taken place in Texas and other states. WIA created "One-Stop" employment centers which are open to any job seeker seeking a connection to employment opportunities. Specific industry-led Workforce Investment Boards (WIBs) operate centers where job seekers and workers have access to job services in a central location and are connected to local employment needs. This has led to a model which links workforce and economic development.

During this same period a related movement in government developed to get people off of welfare and into employment. In 1988 the Family Support Act established Job Opportunities and Basic Skills Training (JOBS), which required training, education and work experience for those on welfare. In 1996 President Clinton signed the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) into law which ended federal entitlement to welfare and established Temporary Assistance for Needy Families (TANF), a federal block grant program that funds states to help move recipients into the workplace.

The "Work First" initiative under TANF focused on strategies having to do with education and training as a path to work. Work requirements under TANF demand that recipients work as soon as they are job ready or no later than two years. The proportion of TANF participants working at least part-time tripled between 1996 and 1999, from 11 to 33 percent; work participation by single mothers jumped from 58 percent to 74 percent by 2000; and by 2001, the national TANF caseload had dropped from 5 million cases to 2.1 million cases.

While TANF legislation resulted in the largest decline in welfare caseloads, many welfare recipients (those who were able to be tracked) have joined the ranks of the working poor. Studies suggest that of those leaving welfare, up to 20 percent either have no income or are being supported by other people. And, those that have found work are working at jobs that do not provide enough income to lift them out of poverty. In the meantime there has also been the development of community-based Job Training Grants that serve to strengthen community colleges' role in developing workforce talent, particularly to fulfill the staffing demands of high growth/high demand industries.

In 2000, the administration of President George W. Bush unveiled the Community and Faith Based Initiative. Although the Initiative raised concern

about the issues of separation of church and state, it brought a new set of players—community-based and faith-based organizations—into the contracted provider mix. In 2001, with almost every state outsourcing workforce services, faith-based organizations received 7% of outsourced federal and state TANF contracts with 8% of the total TANF funding ($1 billion). Secular nonprofits received 66% of the contracts with 79% of the total funding; and for-profits received 27% of contracts with 13% of the funding.

Early assessments of for-profit service delivery have not been particularly positive. For-profits were termed "poverty pimps" (a throwback to Reagan's caricature of the "welfare queen") and several companies, including Maximus, Lockheed Martin, Curtis & Associates and America Works were accused of misuse of welfare funds, racial and gender discrimination, failure to provide benefits for eligible clients, and corrupt bidding processes.

One success story has been the State of California's $4 billion community college system, comprised of 108 community colleges, the largest college level education system in the world. These community colleges provide degree and certificate programs, workforce development and training, developmental and basic skills education, and development of transfer programs to the California State University and University of California systems. Apart from running the nation's largest community college system, the State Government of California is one of the most open systems in the country for state and municipal government, with no requirement of a high school degree or GED for entry. As a result, the system plays an even greater role than most community colleges in serving low skilled individuals and, prior to the most recent welfare reform, educated a large number of individuals referred from the welfare system.

The aim of current workforce development programs which have evolved under the federal and state programs described above is to provide education to prepare low-income background students for viable jobs with the potential of lifting them out of the status of the working poor. However, because of the educationally high risks students who are recruited to go through workforce development-inspired technical/vocational training, such programs face a much greater challenge than the more traditional education found in normal high schools or universities. These high risk students must receive, not only a high degree of economic support, but also an intensive amount of social and psychological support. The latter includes the need for workforce development programs to retain counseling and study skills staff in addition to the technical experts who will be training the students in the required technical skills and knowledge. The staff of these programs must accordingly possess expertise in a great many areas including: recruitment; selection; remediation; counseling; group dynamics; pedagogy; technical proficiency; and networking skills to help place students in appropriate jobs upon graduation from the programs. It has been found that if any of these areas of expertise are lacking, too many students will either drop out because of the personal stress engendered by the concentrated training or will have to be let go because of poor academic or social performance.

In other words, to succeed, workforce development programs require a highly integrated and multi-pronged approach which connects neighborhoods,

educational resources, and future employers. All too often, however, weak links in this social network chain lead to program failure. Hence in this paper, we will explore the requisite integration of people and resources by considering one such workforce development program in New York City.

Medical Pathways: A Workforce Development Program in New York City

One of the authors (Goldstein) has been a consultant for a workforce development initiative in New York City (including the five boroughs). This initiative, named Medical Pathways ("Medpath"for short) because it offers education for careers in healthcare, has been directed at educating low income and high risk or marginal job seekers in three different medical careers: radiation technologists (X-ray technicians in hospitals); EMT's (emergency medical technicians who ride ambulances and report to sites where accidents or other medical emergences are taking place); and paramedics (who go to the same sites as EMT's but are trained to provide actual medical interventions of which EMT's are not allowed). All three medical careers are in great need in the NY City area and are considered gateway careers in that they start at salaries from two to three times above the poverty line for a family of four. Rad-techs can earn close to six figures in a couple of years. It is important to note that major hospital employers of all three careers were among the consortium which implemented and funded the program. At the completion of the technical training program, the participants are not guaranteed a job since they must pass through the same application process as other potential new hires but because these specific medical jobs are in high demand in New York and other cities throughout the United States, it is close to certainty they will get a job in the field for which they were trained.

The first phase consisted of a planning grant funded by a combination of private funders and the New York City municipal government. During this planning phase, job demand in New York was researched, hospital employers were interviewed, and assistance was provided by a research organization called Public/Private Ventures (PPV) which conducts and compiles research on workforce development initiatives throughout the US and other countries. Their research is a powerful source of information on what's happening in workforce development through the US and other countries (see PPV website information in References below where a great deal of downloadable research studies are available for free). PPV also acts as a go-between the private and public sectors regarding workforce development.

The MedPath program represents an innovative governing and funding stream, being supported by a consortium of technical training Institutes (some stand alone and some associated with universities), career and employment service organizations (profit and non-profit), several community based organizations (called "NGOs" in other countries), 17 hospital employers, several other local universities in NY City, and 10 private and corporate foundations. With a budget of $US 1,555,000 for three years, there are two cohort groups of radiation technologists totaling 26 persons, 5 cohort groups of EMTs totaling 74, and 3 cohort groups of paramedics for totaling 31. This makes up a total of 131 job

seekers. Costs then come to approximately $11,900 per person. Also, participants pay tuition to go through the program, but at a reduced amount in relation to comparable training (and scholarships are also available). It is crucial to keep in mind that many funders have come together to financially support this program and as a new program, it has attendant start-up costs which will shrink as time goes by several hundred thousand dollars.

Medpath is among only a half dozen similar programs in the US characterized by this kind of public/private multi-stream funding, aimed at particular sectors of the economy (in this case health care), and focused on high risk or marginal students/trainees. This is seen as the new wave of such workforce development activities in the US. Also, it needs to be kept in mind that there is a strong demand for all three healthcare careers in New York City and many other places in the US as well.

Participants in the program tend to represent the multi-ethnic backgrounds of the population of New York City although no formal quota system is in place to achieve this mix. Rather, recruitment efforts take place in diverse neighborhoods so that an ethnic mix is a natural outcome. Recruitment aims at high risk individuals defined as unemployed or underemployed, as not having completed university (except for a couple of exceptions), and not having other sources of incomes besides their families.

The beginning of each training cycle of a cohort group includes a special intensive pre-training: four months for radiation technologists; six weeks for EMT's; and one month for paramedics. This pre-training is one aspect of the innovative nature of Medical Pathways and has several functions: first, it prepares students for the rigorous training to come by providing introductions to course material (e.g., in the rad-tech programs, the students receive classes in the mathematics and physics they will encounter later on as well as medical terminology and anatomy and physiology); it provides training in study skills on both individual and group levels since it has been found that many marginal students never learned such skills in traditional educational institutions; it provides intensive psycho-social support by way of individual counseling as well as carefully prepared progress reports of each students that are discussed in regular meetings by all staff; and, finally, it provides a venue for assessing students via tests and general parameters of psycho-social aptitudes in order to determine if the students will be able to enter the actual training program. During the regular training programs, there is additional communication and language skills training, personal, career, and financial planning, assistance with applications for scholarships, grants, loans, job mentoring consisting of help in resume writing, interview skills, and networking, job placement assistance, and the use of computer and internet resource facilities.

Those students who are deemed incapable of completing the regular program are given additional counseling and job finding help or are referred to other similar programs but in other fields. For example, the radiation technology program is heavy in physics and mathematics and some students just can't perform adequately in those fields even with all the pre-training and psycho-social support given (as one of the instructors in math and physics during the pre-training, in which unique approaches to these two subjects were taken quite

different than the normal fare in public schools, it became clear to Goldstein that a couple of students out of the starting 23 just couldn't grasp the basics of the math and physics section even with extensive tutoring and counseling—such students were then guided in other career directions where physics and math were not requirements).

Medical Pathways is so far proving a successful workforce development project, particularly because it is multi-sourced, has guaranteed employment as an outcome of the program, has a multi-skilled committed staff, provides intensive tutoring and psycho-social support, employs innovative teaching techniques, and is being assessed closely by the funding sources through the auspices of Public/Private Ventures, an organization devoted to careful assessment of such public/private ventures in the United States. Yet, it is on a very small scale, in fact, its success hinges in many ways on its small scale, and as such obviously cannot by itself do much in the way of alleviating urban poverty.

Towards a New Framework for Urban Poverty Reduction Policies

To develop a comprehensive framework for poverty reduction policy we not only need to consider the three dimensions presented by Moser (1995), with all its costs and benefits but also to take into consideration the neglected importance of social network connectivity and how it is implicated in all three dimensions. First, concerning the problem of reconciling the individual with the other two dimensions is that many authors have disqualified income policies as a source of poverty reduction *per se* (see, for instance, Perry, 2006). However, those critiques have not considered the inter-temporal choices regarding life-cycle consumption choices by the individuals, and many studies have shown that life-cycle concerns are relevant to characterize poverty dynamics (e.g., Bane & Ellwood, 1986; Lee, 1997; Choudhury & Leonesio, 1997). Moreover, life-cycle concerns are intimately related to the issue of social networks since life-cycle presumably covers any opportunities to move out from an isolated, marginalized social existence. Yet, life-cycle permanent income studies have not been particularly useful in helping to build poverty reduction policies. Even the influence of micro-finance programs, developed to foster entrepreneurship, are not easily related to life-cycle concerns.

Modigliani and Friedman respectively and famously revived Fisher's theory of lifetime planning, showing the importance of how individuals efficiently allocate their lifetime income to improve their well-being. To try to link life-cycle permanent income with social networks and the subsequent social mobility made possible via enhanced social networks, we develop a very simple graphical argument based on the difference between life-cycle permanent income patterns of poor and non-poor individuals or households (we take these differences in the extreme as an illustrative measure). A normal life-cycle permanent income model takes the form of a quadratic income function over time and a constant pattern of expenditures (Blinder, 1976): income rises with the productivity of individual, and then declines at the end of the individual eco-

nomic life; constant expenditures means that the individual averages its life-cycle income to have a constant quality of life. Individuals save when income is higher than expenditures and receive credit or spend savings when income is lower:
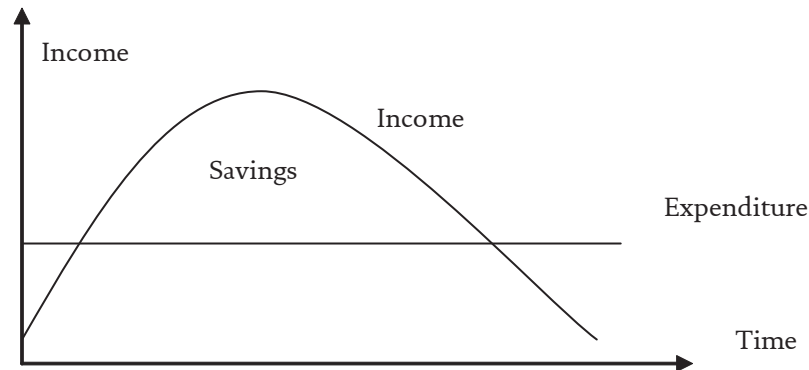

Figure 4 *Life-cycle Permanent Income Model.*

  The model for a poor individual (or household) is slightly different. Generalizing for this effect, those poor individuals that supposedly are the beneficiaries of poverty reduction policies are usually *not short-term poor*, but rather are assumed to be structurally poor. In fact, Bane and Ellwood (1986) find that the majority of poor people at any time are in the midst of a rather long spell of poverty, indeed, what would be expected given the marginalization of the poor perpetuated by their social network disconnect from the opportunities of the wider society. Also, the financial resources available in old age, in turn, depend very much on their long-term economic status throughout much of their adult lives (Choudhury & Leonesio, 1997). Hubbard *et al.* (2003) have shown that the fact that individuals accumulate so little wealth during their lives is due to the small difference between income and expenditures. The implication is that the income function does not present itself as a quadratic function but a linear one, as shown in Figure 5 below:

  For individuals in the midst of a long spell of poverty, income is a linear function with individuals expecting, at most, small increments in income over time. Since this income is, at best, the bare minimum for adequate survival, if that, expenditures are made in a first-in first-out method—individuals spend what little income they have without access to savings for old-age or efficient lifetime planning. That is why in a poor community income distribution is uniform—it is not just because individuals tend to have similar income, it is because individuals have linear income function, i.e., they have *constant* similar income. This is also easily interpreted as a lack of sufficient social mobility due to the social network isolation of the marginalized poor, and the latter, we have been arguing, is largely due to impoverished social networks which only contribute to this linearization of income, a fact not nearly adequately addressed in the urban poverty reduction programs we have been examining. If the income function for poor individuals had a quadratic slope like a normal life-cycle in-
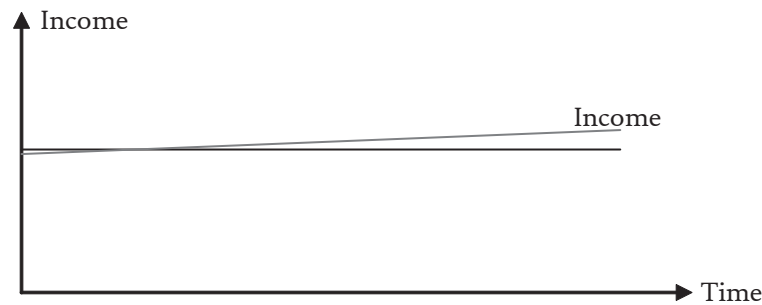
Figure 5 *Life-Cycle Permanent Income Model of a Poor Individual.*

come function, poor individuals in a community would have different income in instant time, since it would be expected that different individuals would be at different points in their life-cycle income function. As Ziliak (2003) observed, low-lifetime-income households tend to accumulate little real wealth relative to their incomes as compared to those households with a high lifetime income.

With this model in mind, the effect of improvements in exogenous variables like those of the housing and household dimension would have a positive but not long-term effect on individual lifetime planning. Lifetime planning would still be constrained by the impossibility of saving, hence individuals would still be structurally poor, that is, would effectively remain in their current social status with little ability to move beyond that social structure. Thus, the net direct-transfer income policies would not work in this case, as it can be shown in the Figure 6 below:
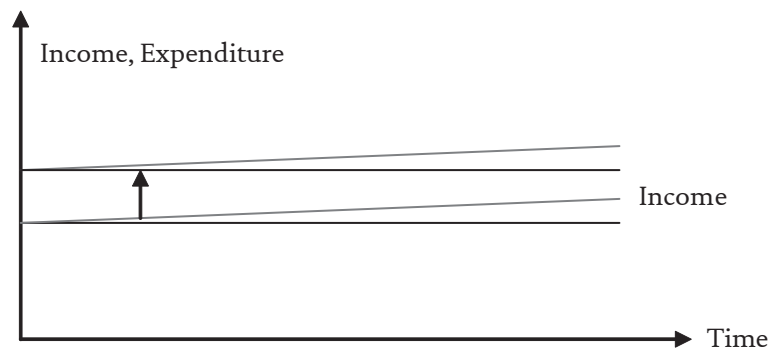

Figure 6 *Effect of Constant Income Transfer on Life-cycle Permanent Income Model of a Poor Individual.*

The effect of direct-transfer income policies is that although welfare is improved due to the individuals being able to expend more money, hence having a better life, it still does not allow for efficient lifetime planning. Policies that work on the individual dimension of poverty are those associated with improving income over time, mainly through education. Although heavily discussed in the literature, education policies are usually viewed as an end-all be-all policy. In our case study on workforce development education, education in general is not

the goal but rather specific technical training program aimed at three different health related careers. Furthermore, as also mentioned above, technical proficiency is only one desirable outcome of education/training programs, the other being the access to novel social networks not generally available to the poor. In general, by not considering the other dimensions of poverty, many investments in education can prove ineffective over time. Examples abound, with many cases where individuals drop out of education programs because of short-term concerns involving community, household or individual dimensions.

But long-term income policies have the added benefit that they generate externalities to the other dimensions of poverty. When individuals come out of poverty, if they have formed bonds in the community, they can choose not to get out of the community but stay in it. This could lead to the formation of stronger internal social networks that would naturally improve the community through infrastructure investments. These market-based improvements are usually overlooked in the development of poverty reduction policies since it is assumed that poor communities only improve through the presence of state mandated programs.

This simple textbook analysis of lifetime income is the basis of an increasingly important literature, that of income and consumption smoothing. A good example is that of Morduch (1995). The argument is simple: since in developing countries many markets do not exist or work imperfectly, holes in effective insurance and credit markets affect especially poor households. The effects of those holes are less clear, however. Morduch (1995) suggests that if alternative markets surface to deal with credit constraints, then public policies would crowd out private enterprises. However, for really poor households there is no empirical evidence of alternative markets that help smooth income and savings in developing countries. Another way to say the same thing is that no new social networks come into being that could provide the means to alternative markets.

A new framework for poverty reduction policies has to take into account the lifetime planning of the individual within the context of enhanced social networks, alongside the other dimensions and market-based incentives for it to be effective. Considering many dimensions of expenditures and income can be useful, since community and household policies can reduce the necessary expenditures for adequate survival and adequate income policies can have a long term effect on lifetime planning of poor individuals. Considering a comprehensive framework is not new, however, since many debates have arisen regarding comprehensive planning, dating back to the 1960s (e.g., Altshuler, 1965, for critiques of the comprehensive planning idea and Innes, 1996, for a survey of the debate and a rebuttal). But no formal model has developed from the early debates and poverty reduction policies are still in their infancy, being drawn as developments on perceived successful case studies. Developing a model that takes into consideration all costs and benefits of said policies is imperative if net welfare is to be properly measured. Hence, we are proposing a much more promising line of attack for urban poverty reduction policies and programs, one that, in addition to the other approaches described above, places the enhancement of social networks as a paramount goal as well as parameter of success.

The Dynamics of Social Networks and Poverty Reduction

One of the most exciting developments in complexity science involves the study of social networks, whether formally as in the networks underlying the use of cellular telephones, electrical grids, or organizational systems or more informally as in friendship and acquaintance circles, communities and neighborhoods, ethnic relationships, marketing strategies, social contacts leading to the spread of sexual transmitted diseases, and so on (see Newman, Barabási & Watts, 2006). In this chapter we are proposing that the issue of social networks is directly relevant in thinking through more effective urban poverty reduction programs since a salient but mostly neglected aspect of economic poverty is the concomitant impoverishment of the social networks connecting the poor to the non-poor populations of cities, a sparseness in social networks that in turn leads to a greater marginalization of the poor in an ever augmenting vicious circle of economic destitution and social marginalization.

The fundamental unit of a social network consists of a node or agent connected to other nodes or agents by edges or links. The primary objects of interest in the study of social networks is the *structure* or *topology* of the network, that is, the nature and dynamics of the connectivity brought about by links connecting nodes. The rather abstract domain of topology is brought in since what is mostly attended to is whether or not a direct link exists, i.e., continuity or discontinuity, essential elements in topology, and not the physical length of the connection or the specific medium of the channel of the connection, e.g., whether it is a wireless cellular telephone link or an actual electrical wire which connects nodes. We will introduce the subject by first describing several of the more common metrics utilized in the study of social networks. Then we will explore several types of social networks focusing particularly on those relevant to urban poverty reduction policies. Along the way, we will be offering suggestions of how insights from the science of networks can be incorporated into a new framework with the promise of enabling urban poverty reduction policies to be more effective.

The Complex Dynamics of Social Networks

The connections comprising a network enable the flow of information and other resources within the system and between the system and its various environments. Using Bateson's famous definition of information as a "difference that makes a difference" (cited in Goldstein, 1994), information flow in a network can only take place when the nodes or agents being connected by linkages are different with respect to each other in important respects. This aspect of information flow as a *current of difference* has very important ramifications, not the least of which is how network linkages bridging across differences have been proven, in actual social-psychological experiments as well as in mathematical theorems and computer simulations, to generate not only more effective problem-solving and decision-making, but even more correct prediction of trends (see Page, 2007; Eoyang & Olsen, 2001).

Such improvements coming out of networking across differences are evident in research conducted in the late 1990's concerning social networks within large organizations (cited in Krebs & Holley, Nd.):

- Work teams with better linkages to other teams inside and outside the organization finished their assignments faster;

- Teams with heightened social connectivity discovered better ways of getting their jobs done and then were able to more effectively transfer their newly discovered knowledge;

- Managers with 'better connections' both inside and outside the organization spotted and then developed more opportunities both for their departments as well as the organization as a whole, and;

- Project managers with better network connections were more successful in reaching project goals within time and financial parameters.

Moreover, social network building has been proven to be of great value in building business alliances (see, e.g., Gulati, 1999).

It needs to be recognized that the efficacy of the social networks studied in the above mentioned research hinges on a <u>bi</u>-directionality of influence, that is, these are linkages whereby the flow of information is *reciprocal*. This need not be the case in a social network, however, where *uni*-directional information flows characterize the network, e.g., what one sees for the most part in vertical linkages characterizing formal organizational hierarchies. But when the information flow in a network is bi-directional or reciprocal, the term usually used to describe the network is "heterarchy" in contrast to the vertical "hierarchy" (for more on heterarchy see Goldstein, Hazy, and Silberstang, this volume).

The science of social networks investigates such network indicators as (see Newman, 2003): the *degree* of nodes, i.e., how many links to other nodes a particular node possesses; the related property of *centrality* which indicates which nodes are more connected to others and thus tend to have more influence; the *topology* of the network as mentioned above and be discussed in greater depth below; the path *lengths* in the networks or how many intermediate nodes connect one node to another; *filters* on nodes, that is, the way nodes modify the information or resources that are received or sent; *clustering* or the way that *dense* networks form, that is, the manner by which several or more nodes can be more highly connected to each other than to the rest of the network (using Newman's metaphor, clusters form in the sense that the friend of your friend is likely also to be your friend); and the *local rules* of nodes and links or the way that what flows in the network is controlled by the specific nature of the nodes and links.

In regard to the last property, the local rules of nodes, it is important to point out that much of the earlier network models such as Kauffman's well-known N/K approach were almost embarrassingly simplistic and have fortunately since been superseded by much richer perspectives on nodal rules. An example of the latter is Trofimova's (2001) addition of two other dimensions in her agent-based models, namely, *compatibility* and *sociability*. Compatibility of nodes indicates amenability to cooperative agendas on the part of connected

nodes. To be sure, if we are talking about links as connections across differences, then it might seem at first impression that compatibility as such could be quite hard to attain given the fact that nodes can be very different in interests, traits, and so on. However, this interpretation of compatibility evaporates within the context of the *differences* framework we are adopting in this chapter. That is, it is in precisely *the bridging across differences* that networks possess the capacity for enriched decision-making and problem-solving. That is, compatibility as a local nodal rule can and does coexist with differences among the nodes in a social network.

Sociability of nodes has to do with the constraints on the number of possible links each node can have with other nodes—in other words, each node cannot have the same level of contact with every node in the world. Trofimova states that one of the implications of her research is that when the sociability rule is varied, a deficit of contacts may lead to the nodes or agents choosing less adequate types of linkages. This finding has relevance to linkages found in marginalized populations such as those in a favela or among the marginalized students for which MedPath is aimed, since the less-than-adequate type of connectivity found in these two examples of marginalized populations can lead to a greater tendency for nodes to form linkages with less than desirable other nodes, e.g., criminal nodes linked together to spread information on how to more effectively conduct drug sales rather than on linkages formed in order to spread information on how to better find a legal job, assuming such legal jobs are available of course. The fact is that people will naturally form social linkages but the purposes to which such linkages are put are determined in large measure by what opportunities for social connectivity exist.

Emergence, Innovation, the Marginal, and "Weak Ties"

Another significant feature of social networks is their nexus for the phenomena of *emergence* in complex systems (see Goldstein, 1999), the arising of new structures with new properties. An example is the emergence of cooperation among nodes in social networks. Emergence is crucial to the success of urban poverty reduction programs since the latter's success hinges on the possibility of genuine innovations and the diffusion of these innovations through social systems. One of the failings of traditional urban poverty reduction proposals is the belief that final outcomes are mostly the result of ample pre-program planning and then implementation through planned phases and events. This reliance on planning and sticking to the initial plan, though, is fraught with as much potential failure as conducting a war through an over commitment to plans in spite of the inevitable unforeseen circumstances known as the "fog of war" that inescapably enmeshes even the best laid plans. This is one of the reasons that modern warfare strategists have turned to the study of complex systems, in particular the study of social networks and emergence, in order to generate strategies that have a built-in adaptability to changing "ground" tactics in response to changed environmental conditions.

Indeed, a close look at urban poverty reduction policies reveals such an over reliance on planning to the neglect of processes allowing for emergence that

could enable rapid changes of direction, even the overall shape of the program in the face of unavoidable contingencies. Following a plan at all costs is simply not the way to generate the sustainable emergence of an effective poverty reduction policy. Moreover, most of the time planning is done in a top-down hierarchical manner by so-called "experts" and plan administrators without the heterarchical involvement of the recipients of the policy. Some poverty reduction policies of course pay lip service to such contingencies but even if they are mentioned from the outset, there is the decided sense that the major impetus and overall "shape" of the project must continue on in the same form as initially planned for. Accordingly, one of the benefits of understanding urban poverty policies within the framework of social networks is the inclusion of the possibility for the much needed emergence of unexpected new activities in the presence of new contingencies as the plan is being implemented.

That the innovation associated with emergence could not take place without the involvement of heterarchical social networks should of course be obvious since innovation is, by definition, a matter of novel social actions and directions made possible by the flow of new information and resources flowing through a network. Below, we will be taking a look at how the actual structure of connectivies in social networks can aid or hinder emergence. Yet, there is a surprising aspect to innovation in relation to social networks that should be mentioned here that needs to be appropriated in our new social network framework for urban poverty reduction policies. This is Granovetter's (1973, 2004) striking insight that more novel information flows to individuals not through the strong ties/links of a network cluster such as a close neighborhood/friendship group but instead through the *weak ties/links* that the nodes of this cluster may have with the "outside" world.

The reason for the crucial role of weak ties in innovation is as follows. The strength of a tie or link is related to both the idea of clustering mentioned above as well as Trofimova's aforementioned compatibility rule. Strong ties are found mostly within clusters in social networks that tend to form among like minded persons or nodes linked by their compatibility. According to Granovetter, it is because the nodes or agents in clusters tend to move in the same circles and thus reinforce what holds them in common, the information received by the nodes in such a cluster is pretty much a rehash of what is already known. Acquaintances which exist outside the cluster, that is, linkages from those inside a cluster to those outside it tend to be weaker than the strong ties existing among the social network within a cluster. These acquaintances linked by weak ties, however, themselves interact with people not within the cluster and thereby have the possibility of receiving more novel information than is circulated around inside a cluster. This novelty arises because those connected by weak ties are less similar to those within a cluster or clique. As an example, Granovetter (1983) points to advances in scientific fields where novel ideas have been found to be more likely diffused through weak ties. Moreover, there are vastly more weak ties than strong in very large networks. Although most of these weak links carry insignificant information, the ones that do indeed carry significant information are still prevalent because of their large number. The key is in, first, being

connected by weak links to the outside and, second, in being open to the "weak" signal carried along the weak tie (on weak signals, see the preface by Schultz in this volume). These weak signals are what Novogratz (2009: 2), the aforementioned founder of the social entrepreneurial-based "The Acumen Fund" is getting at when she describes the social entrepreneurs her fund invests in as having a vision to deliver essential services like affordable health care, clean water, where governments and charities are typically failing to do so since these entrepreneurs exhibit "what can happen when an entrepreneur looks to the market as a listening device, tailoring services and products to the preferences of low-income people who are viewed as consumers, not victims."

Granovetter's ideas on innovation as arising more from weak ties parallels the well-known research on the diffusion of innovation conducted by Rogers (2003) who found that innovators make-up a very small percentage of the population in a social system and that this percentage should be understood as inhabiting only a small region of the farthest limit of the tails in a normal distribution curve. In this case, Rogers was influenced by Granovetter's insights that novelty could have a source among the marginal who may not only be the source of innovation but are better placed to break away from established standard practices since the connections of the norm to the marginal is usually through weak ties. In this context Granovetter (2004) cites Day's (1994) findings that that the lower an innovation's champion is in a corporate hierarchy (which is after all one type of social network), the more *radical* the innovation tends to be. Furthermore, these points about emergent innovation's source in weak ties, the marginal, and the hierarchically lowly, are essential to the method of *positive deviance* developed by Sternin (Bertels & Sternin, 2003) which traces the source of remarkably innovative solutions to long standing social problems to very small minorities in the community, i.e., the "positive deviants" (we will return to an application of Sternin's method of positive deviance using social networks below).

In all these cases, if the seeds of innovation come from the outliers, then the trick to generating and then diffusing innovation is in making sure the outliers are connected and then allowing for a directionality of influence from the "lower" or the marginal to the "higher" and the non-marginal, that is, the aforementioned bi-directionality or reciprocity of information flow. This implies that the emergence of innovative processes and actions in an effective urban poverty program would come out of establishing enriched heterarchical social linkages among all the stakeholders and not a downward imposition from the province of some upper echelon planners onto the marginalized poor. Furthermore, in coming up with his insights into the origin of innovation via weak ties/link Granovetter (2004) explicitly appealed to Schumpeter's famous definition of entrepreneurship as the generation of new opportunities by connecting previously unconnected resources now for a new economic purpose (see Dal Forno and Merlone, in this volume, for a mathematical model of how entrepreneurs may be able to do this and in the process embed their knowledge in the social networks that are created during entrepreneurial endeavors). Indeed, Granovetter backs-up his appeal to Schumpeter's definition by describing a capacity for breaching across separated social regions of exchange on the part of entrepreneurs.

In relation to emergence, mathematical models have also revealed the possibility of a type of *phase transition* that can take place in networks, the new phase, as in other cases of emergence, exhibiting new structures with new attributes (Newman, Barabási & Watts, 2006). These phase transitions in networks are analogous to the phase transitions researched by solid state physicists, e.g., the transformations seen as matter goes from the state of a gas to a liquid and then to a solid, or when magnetism ensues in a ferromagnet when cooled, or when the remarkable properties of superconductivity and superfluidity arise in certain substances when sufficiently cooled.

An example of a phase transition in a social network is the emergence of a "giant cluster" when all the nodes or agents in the system become connected to each other (Barabási, 2002). For instance, a giant cluster can emerge at a party when the host introduces enough single individuals and couples to each other that everyone at the party becomes connected to everyone else, albeit some of the connections are indirect through intermediary nodes or agents. Having everyone in the giant cluster connected implies that information has the possibility of flowing to every one of the nodes. When we are urging the incorporation of social network connectivity into urban poverty reduction programs, it is exactly this kind of phase transition into a "giant cluster" which can enable the potency of information exchange required for success.

However, just enabling the flow of information to all the players by itself doesn't insure that all nodes will receive the same richness of information due to the existence of filters at nodes which modify the information (e.g., think of the "rumor" game in which someone whispers a salacious rumor into the ear of the person they are talking with at the party, and soon enough, the last person hearing the rumor no doubt is hearing something quite different than what the first whisper suggested). Such filters are, of course, quite common in hierarchical social networks. Thus, in corporations it is a tradition for those at the top to "filter" financial information for consumption on down the chain as well as for information originating lower in the hierarchy to be filtered by the "mum effect" in which lower level employees mask what they say to upper level managers so as to avoid possible punishing consequences resulting from "speaking truth to power." Thus, filters can be a serious impediment to the full utilization of the connectivity offered by a phase transition to a giant cluster. Clearly, the existence of information filters in social networks is a ubiquitous phenomenon that implementers of an effective urban poverty program must be heedful of if the full efficacy of information flow is to be a factor of success in such a program.

What we have been discussing so far concerning innovation and emergence in social networks is for the most part neglected by urban poverty reduction strategies which instead presume it is the higher-ups or the external "experts" planning and implementing the policy on which the success of the program hinges. In our reworking of urban poverty reduction policy along the lines of social networks, we are emphasizing reciprocal linkages and the bridging over differences so that the successful poverty reduction program will require input from all levels, a vital interchange of information. In this revised scenario, the marginalized populations served by the programs will themselves play

as important a role in innovating the programs as the top down planners and outside experts. In addition, it should not be assumed that this vital exchange of information will happen by means of some supposedly spontaneous, "natural," "self-organizational" fashion as rather silly-minded early complexity aficionados maintained once hierarchical command and control was dismantled. Instead, we are proposing that the heterarchical reciprocal flow of information, which enables the emergence of innovation and adaptability of the program as it is being implemented, needs to be *constructed* into the plan and the processes of implementation right from the very beginning as well as further constructed along the way of implementation (on the role of construction and constraints in emergence, see Goldstein, 2007).

Types of Social Networks

Various types of social networks have been identified but here we will only go over several types that are relevant to the purpose of our chapter. One of the main differences among these networks is their topology which, as stated above, refers to the structure of their connectivity, e.g., whether all nodes are connected to each other as in a very dense network, or if some nodes are only connected to others through intermediary nodes like hubs, or whether there are clusters of nodes densely connected in the midst of much sparser connected nodes. The longest studied type of network, originating in the nineteen fifties with the mathematical theory of graphs, is the so-called *random* network, a network in which the nodes and edges are laid down in a random fashion with the degree of each node distributed according to a normal binomial distribution (Newman, 2003). We can see evidence of random networks in the connections established among people mingling in a large party (without the host introducing everyone to each other) or the grid of highways in the US linking cities and towns of different sizes (Barabási, 2002). However, as Newman (2003) points out, most of the real world social networks studied in depth in recent years have not been random graphs with a normal distributions of nodes/vertices but rather the hub networks and scale-free networks that we will get to below. One important feature of the normal distribution of degree in a random network, that is, a Bell curve of nodes with k number of links in relation to the number of links (k), is that most nodes or agents have a similar number of links and there are very few nodes with either very high or very low nodes.

In a *hub* network, though, certain nodes or agents possess many links to other nodes or agents, that is, there is the presence of high degree nodes existing among many other less connected nodes or agents, the higher degree hubs connecting the lesser degree nodes. A usual example of a hub network is that of airline traffic routes such as Delta Airlines with a hub in Atlanta, US Air with a hub in Philadelphia, American Airlines with a hub in Miami, and so forth. An obvious advantage of this kind of hub network is the reduced costs resulting from having a centralized city where maintenance facilities can be housed and the fact that smaller airplanes with lower expenses can be used to go from the smaller cities and towns to get to the hub airport. A disadvantage of a hub network is that less connected nodes or agents are only connected to each other through in-

termediary hubs, which means that the length of the network is increased since there are more intermediary nodes on average among the connected nodes. Increased length in turn means that information and resources will take longer to get around the network and there is also a greater likelihood for distortion of the information due to the increased probability of filters concomitant with an increase in the number of intermediary nodes. In addition, hub networks are vulnerable in the sense that if the hub is taken-out, the network in effect becomes non-functional. That is why hubs in a hub connected network are good targets for terrorism.

Too often, in urban poverty reduction strategies, the policy is for there to be few nodes with high degree to be in control which entails, however, that only a few centralized nodes control the dissemination of information. Not only is this centralized control a problem in being biased toward only highly filtered information getting spread throughout the network, the information path length tends to be long, especially to the marginalized peripheries, thus slowing information flow. Such disadvantages can be mitigated by instead constructing many and dispersed hubs as well as many alternate links connecting the hubs to each other and to nodes more on the periphery.

Another type of social network which has been the subject of a great deal of recent investigation is the so-called *small-world* network which consists of linkages among agents or nodes with as few intermediaries among them as possible, thus making up a "small-world" (Watts, 1999). The small world network achieved some notoriety a few years ago with John Guare's play (and movie adaption) "Six Degrees of Separation." Stanley Milgram, otherwise known for his powerful social psychological experiments on conformity and the proclivity to violence, had earlier studied what was later termed "small world" networks by researching the path lengths in acquaintance social networks, i.e., how closely connected people were to each other (for a description, see Newman, 2003). To accomplish this goal, participants were asked to pass a letter to one of their first-name acquaintances in order to get the letter to an assigned target. Although most of the letters never reached the target, about a quarter did, passing through only an average of six intermediaries on the way (hence "six degrees of separation"). This might seem hard to believe but in many rounds of playing a "small-world" game with friends and colleagues, one of the authors (Goldstein) managed to find even less than six intermediaries linking a peasant in the middle of China with a politician in South America, two nodes that would presumably thought to be vastly separated from each other.

The links that tend to make networks "smaller world" ones are typically of the "weak tie" variety described by Granovetter. This is because these "small-world" making connections bridge across from one network cluster to another, the clusters constituted by the "strong ties" concomitant with close friendships, interest, religious affiliation, neighborhoods and ethnic connectivity.

Still another type of social network is known as a *scale-free* network, "scale-free" in the sense that there no one *characteristic scale* of degree or connectivity among nodes or agents, a more prevalent type of network than random ones—see Figure 7.
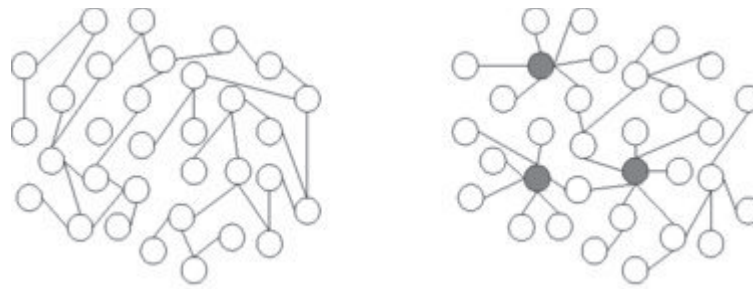
Figure 7 *(a) Random vs. (b) Scale-free Network.*
(Adapted from Scale-free, No date).

The random network shown in 7(a) lacks the nodes with higher degree shown in Figure 7(b), although 7(b) itself doesn't contain the very few and very high degree hubs of a hub network.

The lack of a characteristic scale of degree in a scale-free network means that, unlike the case of the random graph with its *normal distribution* of nodes with k number of links in relation to the number of links (k), in a scale free network there is instead a so-called *power law* distribution with many nodes having only a few links, a moderate amount of nodes with a moderate amount of links, and a few nodes with many links (Barabási, 2002)—see Figure 8:
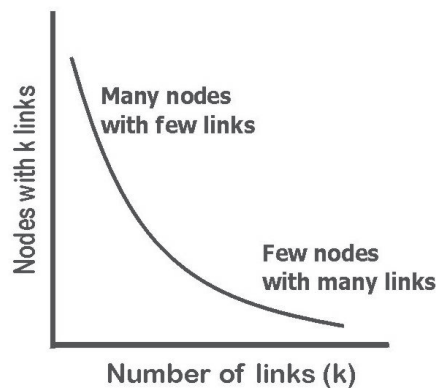

Figure 8 *Power Law Distribution of*
Degree in a Scale-free Network

Power law distributions like this have been found in such diverse types of systems as certain genetic networks, metabolic networks as found for example in *e. coli* bacteria, scientific collaboration networks, email messages, Zipf's law for distribution of cities, human sexual contacts networks, citations of scientific papers, and digital electronic circuits, to name just a few (see, Csermely, 2006).

From Figure 8, we get a glimpse of the important property of scale-free networks called the aforementioned "rich get richer" syndrome in that these kinds of networks are built-up by what's called "preferential attachment" or "cumulative advantage," that is, the nodes already possessing many links receive even more linkages, their degree growing in a much more rapid fashion

than the nodes with little degree. This had also been called the "Mathew Effect" by the preeminent sociologist Robert King Merton (cited in Newman, 2003) after *Matthew* 25:29, "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath" or as Billie Holiday memorialized in her song "God Bless the Child": "Them *thats got* shall get. Them *thats* not shall lose …" Typical examples that are supposed to be scale-free networks include the world-wide-web (consider the growth in degree of the nodes Google, Yahoo!, Facebook, YouTube), the internet in general (although this is a subject of hot debate among computer scientists), protein interactions in certain kinds of yeast, and so forth.

It has been conjectured that many natural, spontaneously growing networks, ones typically thought of as self-organizing, grow by preferential attachment. For example, in terms of the world wide web, a webpage with many incoming links will tend to attract more links than a webpage with fewer incoming linkages (Newman, 2003). Cities also seem to have this property since once a settlement begins, say, at the confluence of two rivers, more and more people prefer to settle in the same area because of the increase of services, protection, and other resources available at this site. But to the extent cities possess a scale-free social network structure, we will also expect to find in them the "poor get poorer" side of scale-free networks exhibited in an increasing impoverishment of the social networks of the already marginalized poor sub-populations, a phenomenon called attention to by Jones (2007) that was mentioned in the introduction to this chapter. We'll be coming back to this point below.

Another feature of scale-free networks is their greater resilience in the face of systemic failure since they tend not to exhibit degradation as nodes, even a huge number of them, are randomly eliminated. This follows from the power law distribution of the number of nodes with k linkages so that such networks will contain a huge prevalence of nodes with very few linkages and thus whose elimination of which will not have much affect on the network as a whole. Hence, even if some terrible computer virus wiped out a very large number of nodes including ones with huge degree like Google, Yahoo! and Facebook, the web as a whole would survive.

Although as a whole, the world-wide-web appears scale-free in its connectivity, it has been recently discovered that there are specific "local" regions or categories within the web, for instance, university and newspaper home pages, where there is the more traditional unimodal normal distribution for incoming links (Pennock *et al.*, 2002). The authors conclude that this more normal distribution could characterize "competing" regions of the same type, or, in our case, for example, different favelas in Rio "competing" for the same scarce resources. Thus, we could imagine a competition for resources among the huge favelas "Rocinha" (with its population of 200,000) and the almost as large "Cidade de Deus" (made famous in the movie by its name—in English "City of God"), although as a whole the social network of Rio would probably be closer to that of a scale-free network. That is, we can interpret the more local regions as exhibiting a clustered type of linkage structure.
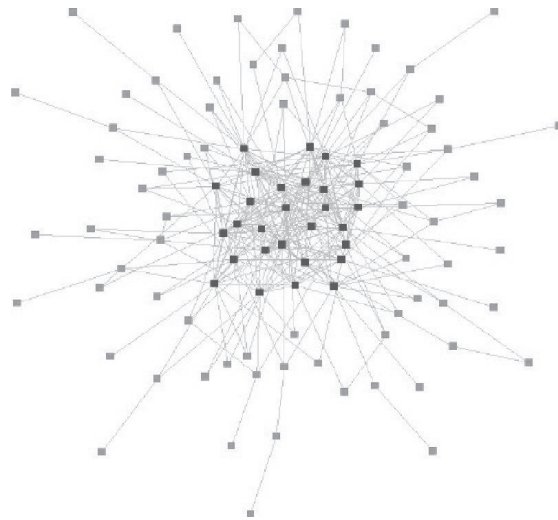
Figure 9 *Multi-hub/Periphery Networks.*
(Adapted from Krebs & Holley, Nd).

Distributed Intelligence and "Smart" Networks

Social networks built up by the Matthew Effect can contain the high-degree nodes in the "middle" connected together to form a core or module of hubs, and then connected outwards to the lesser degree nodes towards the peripheries (Scale-free, No date).

Scale-free networks can thus also include centralized hubs connecting out to peripheral clusters. Krebs and Holley (Nd) point to this kind of network structure where multi-hubs link out to peripheries (see Figure 9).

According to Krebs and Holley (Nd), this core/periphery scale-free type of network is the one favoring the development of viable and sustainable communities since a core of hubs with their spokes (links) can connect scattered clusters at the periphery. As in the above discussion where the locus of innovation can be marginalized peripheries, Krebs and Holley point to how the periphery is more porous to the new ideas (Granovetter's weak ties) which they can "feed" into the core hubs. Notice that in such a view of community development, Krebs and Holley emphasize that vitality does not just result from the direction of influence of the core to the periphery (the marginalized) but rather it is in the rich reciprocity between the core hubs and the periphery where innovation and sustainability arise. This is the bridging across differences mentioned above that leads to the greatest flow of information and resources.

A similar topologically structured network has recently been discovered in remarkable research into the neuronal network structure of the human brain (more specifically the cortex) (Hagmann *et al.*, 2008). This network structure, shown in Figure 10, is constituted by linkages of axons connecting core hub modules with more peripheral clusters:
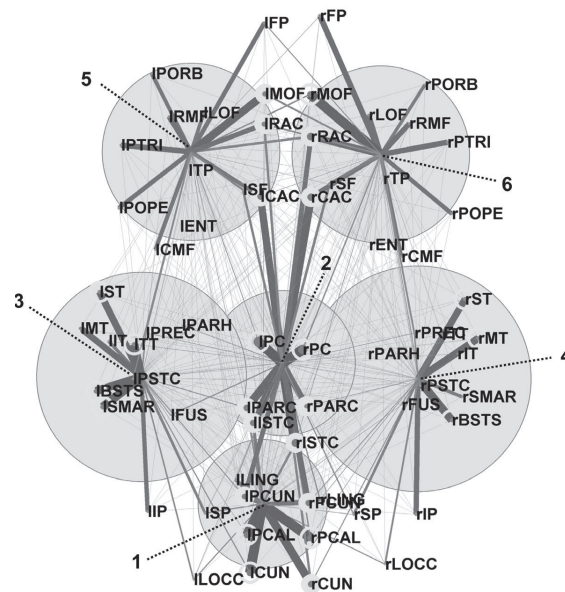
Figure 10 *Network Mapping of Axon and Core Module Connectivity in the Human Cerebral Cortex. (From Hagmann et al. 2008).*

Figure 10 was made possible by the latest imagining techniques and nonlinear mathematics of networks. Here we can see evidence of a scale-free structure along with hubs, hub clustering, and peripheral clustering.

To the extent that this particular network structure is the basis of human intelligence and has resulted from evolution, this kind of structure presents a striking picture of a network topology that favors distributed intelligence. Indeed, as said above, combined scale-free, hub, and clustered periphery networks tend to be associated with naturally growing "self-organizing" complex systems. The clustering effect makes sense in the case of self-organizing systems since "like attracts like" in the sense that clusters form around familial, friendship, and similarly interested circles of nodes, while the scale-free preferential accumulation takes place as resource nodes receive and generate and then receive more and then generate more links (for the connection of scale-free networks to self-organizing systems, see Csermely, 2006: 18ff).

It is important to note that it is possible to construct networks with this same topology. In this regard, Krebs and Holley (Nd.) propose the creation of such social networks by leaders acting in the role of what they call "network weavers." Indeed, this is exactly what Holley (NdA; NdB) herself did in the generation of a wide web of local cottage industries linked together into successful businesses in the otherwise economically depressed area of Appalachia in the US as mentioned briefly above. Such a network topology is fundamentally heterarchical in nature, multiple hubs taking over leadership responsibilities but only temporarily as peripheral clusters themselves transform into new hubs as the network keeps on expanding.
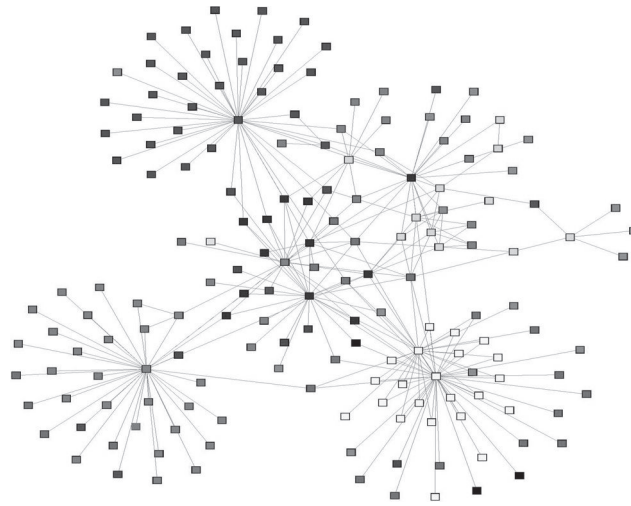
Figure 11 *Social Network of Hospital Units before the Advent of a PD Program to Inhibit the Spread of MRSA (blue nodes represent executive staff, other colors represent different hospital operational units). (Adapted from Buscell, 2008).*
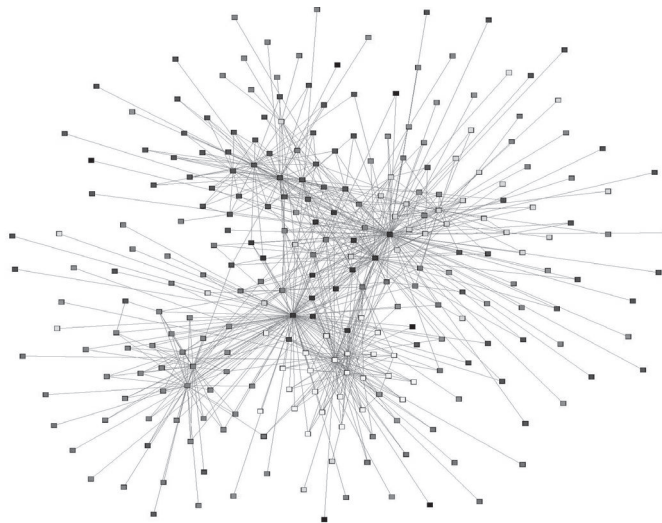

Figure 12 *The More Connected Network Topology after the PD Intervention. (Adapted from Buscell, 2008).*

The value of constructing networks in such a fashion is illustrated in the following two figures (Buscell, 2008) which depict the evolution of a network structure in a program to reduce the spread of infections caused by the antibiotic resistant bacteria MRSA of which there are 100,000 cases in the US each year and from which 20,000 persons die—84% of the infections are associated with health care worker transmission to patients (MRSA, 2007)! This program was based on Sternin's method of Positive Deviance (PD) discussed above in relation to our point that marginalized populations may be the source of innovations that can actually resolve previously considered intractable social problems. Figure 11 shows the original clustering with very weak links outside the clusters before the program was initiated.

Notice the social network topology of clustering and the lack of and weakness of connectivities among the clusters (the grey links are barely noticeable). This network topology means that even if the various units or the executive staff (presumably acting in part as "gate keepers" to retrieve relevant information from outside sources) did come up with innovative methods to halt MRSA infections, they did not possess a social network structure sufficient to effectively disseminate their innovations..

However, after the Positive Deviance program was initiated and the "network weavers" started reshaping the topology of the social networks involved, the resulting connectivities had much greater efficacy in transmitting and acting on innovative measures to halt the spread of MRSA, this novel topology depicted in Figure 12.

The hospital unit denoted by green nodes is now not only the most strongly connected cluster to other nodes and clusters outside itself, it has the lowest transmission rates for MRSA while the "red" nodes unit which is the least connected outside the cluster has the highest transmission rates. This strongly suggests that something about the new connectivities, their higher degree plus their strength (their enhanced "bandwidth"), has greatly helped to disseminate the innovations coming out of the PD intervention and thus to the halt the spread of MRSA.

Borrowing from Holley, Buscell (2008) call this a move toward a "smart network" since it has strong simultaneous connections among hubs and peripheral nodes—in fact, its topology does resemble the network of the human cerebral cortex shown in Figure 10 above. As a result of enhanced connectivity (and other aspects of the PD intervention), the metric of *awareness*, i.e., how likely that people in one part of the network know what's happening in the other units, went up 4 times what it was before the project began. Indeed, another metric termed the *connector score*, measuring overall connectivity, was 26 times greater!

Connecting the Poor and Non-poor through Greater Social Network Connectivity

The above survey of some of the main elements of social networks has been preparatory for our application of social network theory to urban poverty reduction policies.

Although Granovetter's discovery of the critical role "weak ties" play in innovation by being conduits of unfamiliar novel information is indeed significant and is a discovery we will be saying more about below, one of the most important lessons to be gleaned from the study of small world networks is how marginalized strata of the urban environment can be connected to the rest of the population. This enables not only a much more rapid speed of transmission of information since there are now fewer way stations along the way where the information would have to be received and then retransmitted, it also can serve to interrupt the self-perpetuating dynamic of marginalization which is reinforced by social disconnectivity. Consequently, constructions involving connecting

links to make the urban social network a much "smaller" one will be an important step in establishing effective urban poverty reduction policies. It must be noted here that we are no way claiming that the construction of a smaller world which connects marginalized populations in our urban environments is either an easy task or one guided by precedents. In fact, it is mostly unprecedented, in other words, consists, in important respects, in a set of innovative, even *radical* actions.

Yet, the dire straits caused by poverty throughout the world calls for radically innovative solutions. Indeed, one of the first egregious impressions that arises when attempting to face the daunting challenge of poverty has to do with the contrast between the network topologies and dynamics we have been emphasizing and the typical network structure accompanying traditional Aid Programs. As Zeidan (2008) and many others have pointed out, the Aid paradigm of urban poverty reduction ultimately comes down to the more fortunate helping the less fortunate, really the traditional definition of philanthropy, and is customarily implemented through a top-down, uni-directional hierarchical social network. This paradigm not only reinforces social standing and cultural stereotypes, it doesn't come close to breaking the vicious circular, self-perpetuating marginalization of the poor. Indeed, there's no room for emergent innovation in Aid nor are the necessary conditions established whereby an increased efficacy of problem-solving can occur when differences are bridged with reciprocal social connectivity. Of course, we are not disparaging the need for philanthropy in ameliorating the lives of those less fortunate. Instead, since we are examining the long range outcomes of urban poverty reduction programs, we are more interested in the social and cultural conditions that must change if poverty is to actually decrease in the long term. We can appreciate the toughness of this challenge by looking at the increasing marginalization of the poor according to social network theory.

Social Network Clustering and Increasing Marginalization

The social network phenomenon of dense clustering is highlighted in the case of favelas. Favelas developed in Rio de Janeiro (and other Brazilian cities) through a mixture of self-organizing processes (e.g., the "like attracting like" situation mentioned above) and governmentally and culturally imposed ethnic and socio-economic segregation. Indeed, although Brazilians often tout how racism or ethnicism doesn't exist as such in their society, it is clearly the case that there is a much higher percentage of blacks and mullatoes than lighter skin "Cariocas" (as residents of Rio like to call themselves) dwelling in favelas. Thus, in terms of social network topologies, internal to a favela we would find a dense cluster network, that is, many nodes with high degrees linked to each other since certain types of nodes tend to link up more often with others of the same type such as ethnicity (this hearkens back to Trofimova's nodal rule of compatibility discussed above). Moreover, the clustering network topology found in poor communities like favelas are reinforced for a variety of reasons including how they offer protection, security, vigilance, and fast information flow concerning availability of scarce resources. The denser the network topology of the cluster is, the

fewer strong ties it has in relation to the non-poor community. Furthermore, the more inward turning the clustering becomes, the less there will be even "weak ties" to the outside non-marginalized community. Thus, the clustering effect goes to reinforce the marginalization of the inhabitants inside the favela in that inside the favela internal links multiply and strengthen whereas the character of the connectivity between the inhabitants of the favelas and the rest of the non-poor population becomes even sparser.

Indeed, whereas the social network connectivity of outsiders to the favela get richer ("the rich get richer" through preferential attachment and cumulative advantage), there is a concomitant relative weakening of the connections from outside to inside the favela. Thus the marginalized poor become more marginalized yet these marginalized clusters are in turn distributed in a scale-free manner throughout Rio de Janeiro. Indeed, we might even expect a kind of preferential attachment occurring among the different favelas themselves, that is, a joining up of favelas by strong ties between them. This is most likely what's at the basis of the spread of criminal gang control among different favelas and between favelas and criminal clusters inside Brazil's notorious prison system. In any case, social network theory would predict an increasing marginalization of the favela in relation to the non-poor populations in Brazil large urban environments. Thus, taking the Favela-Bairro revitalization program to its extreme conclusion would result in the absurd scenario that each favela becomes like a big park dotted with dwellings but with these inhabitants increasingly cut-off from the rest of Rio. Consequently, if social mobility is to be an important metric of the success of Favela-Bairro, as it should be, slum revitalization misses the mark by a long shot in curbing urban poverty in Rio de Janeiro.

By extrapolation, the same could be said for marginalized trainees in workforce development programs in the United States. Unless a much "smaller-world" social network is created that is inclusive of the marginally employed, they will inevitably retreat into greater marginalization. This puts the onus of long-term success of workforce development on whatever features of the programs like MedPath which actually construct real and viable social connectivity between the trainees and the non-marginalized employed in New York. That is why the fact that for MedPath in particular, the relationships that develop between the trainees and the employer healthcare institutions that help fund the program are more important than what is actually taught to the trainees.

Perhaps it might be supposed that over time, as cities, including their segregated slum areas, grow in population there would have to be a corollary increase in the overall number of links and therefore the possibility, at least, of enhanced connectivity and thereby reduced path length for the flow of information and resources. However, Cohen and Havlin (cited in Scale-free Networks, Nd) have proved that long path distance tends to remain somewhat constant as a scale-free network grows. This implies that the sheer growth of a an entire scale-free network, in which nodes and links are increasing, like the social networks making up Rio de Janeiro or New York City, does not by itself decrease the path distance. The result is that, left to its own devices, the sheer growth taking place in modern megalopolises at best keeps marginalization the same. A more likely

scenario, however, is that marginalization swells as the cluster networks constituting the favela becomes denser and less connected to the outside. From a social network perspective, time is not on the side of resolving poverty.

Creating Smaller out of Larger Worlds

One of the challenges affecting all urban poverty reduction strategies is the effective dissemination of information, e.g., information about housing or infrastructure improvements as in Favela-Bairro, or information about job proficiencies and job search techniques in the case of MedPath. An insight involving information spread coming out of social network research has to do with path length, or the number of intermediary nodes through which information has to flow to get from the initial sending node to the eventual receiving nodes. Above we discussed the small-world network which has as few of nodes as possible connecting all the nodes in a network, thus making it into a "small world". The less nodes that are intermediaries, the shorter the path length, and the shorter the path length not only the faster information can flow but the less affect filters will have.

To the extent that marginalization implies the existence of long path lengths between the nodes making up marginalized clusters and the nodes constituting the outside non-marginalized world, then adding links to appropriate nodes to make a smaller world can be conceived as connecting the inner and outer with shorter path lengths. Accordingly, it would make sense to inquire into how smaller worlds can be constructed.

As a matter of fact, just adding a few links can make a much smaller world as shown in Figures 13 and 14 below. Figure 13 is a stylized drawing of a "large" network, large since, for its size, it contains both a high longest path length of 5 (the network length connecting any of the opposing nodes has five intermediate nodes) and a high average path length of 2.6.

By letting the opposing nodes represent, respectively, the marginalized poor and the non-poor populations, just adding four new links can make this large world much smaller. This is portrayed in Figure 14 by the addition of placing of four new links. The large graph now becomes smaller since the new longest path length is only 2 (less than half that of the larger world) and the average path length is only 1 (again less than half of the larger world).

Of course Figures 13 and 14 are highly stylized, simplistic versions of the greatly larger and messier actual social networks of urban environments. Thus, we are immediately presented with the vexing challenge of where does one start to add links to bridge across the divide separating the huge social networks made-up of the poor and the non-poor in our urban environments while, at same time, recognizing that it simply won't be enough to just connect people by giving them computers, email, listservs, blogs, and so on. For instance, it is obviously an easy problem to know where to add a link in the networks below in Figure 15, the one on the left representing Adelphi University and the one on the right Unigranrio. The link shown as a dotted line in Figure 15 not only connects the two authors of this chapter, Jeffrey Goldstein in New York and Rodrigo Zeidan in Rio, it thereby connects the various social network clusters at
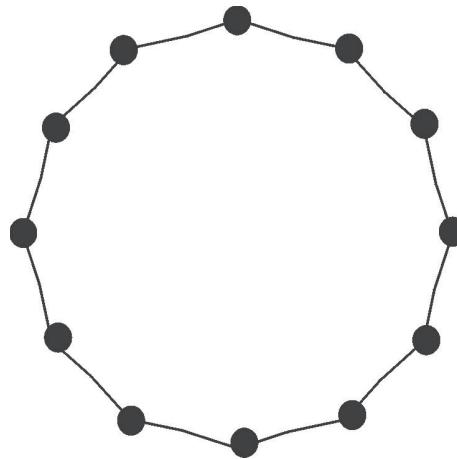
Figure 13 *Stylized Large Network.*
(longest path length = 6, average length = 3.36)
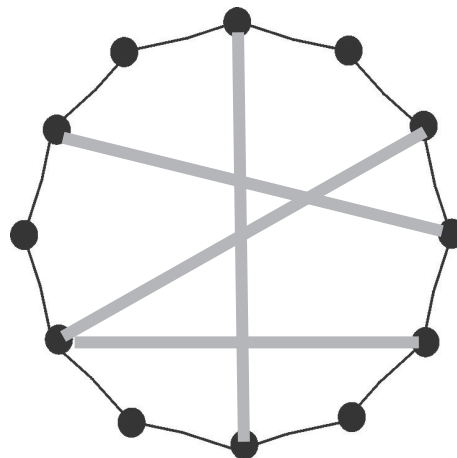*(Adapted from Goldstein, 2009).*

Figure 14 *Making the Large World of Figure 13 Smaller*
(longest path length = 4, average length = 2.11)
(Adapted from Goldstein, 2009).

Adelphi University with those at Unigranrio in Rio de Janeiro. Hence, a much smaller world can be created by adding links connecting the right nodes.

However it is not a trivial problem in graph theory (the mathematical underpinning of social network theory) as to how many links are needed to connect everyone or at least nearly everyone by a social network. The solution was discovered by the eccentric Hungarian mathematician Paul Erdös in 1959 who surprisingly found that no matter how many nodes there are, a relatively small percentage of random linkages will suffice to link nearly all nodes and that this percentage actually decreases as the number of nodes increases (Buchanan, 2002). For example, in commenting on Erdös theorem, Buchanan (2002) points out that in the case of a social network of 300 nodes, even though there are close
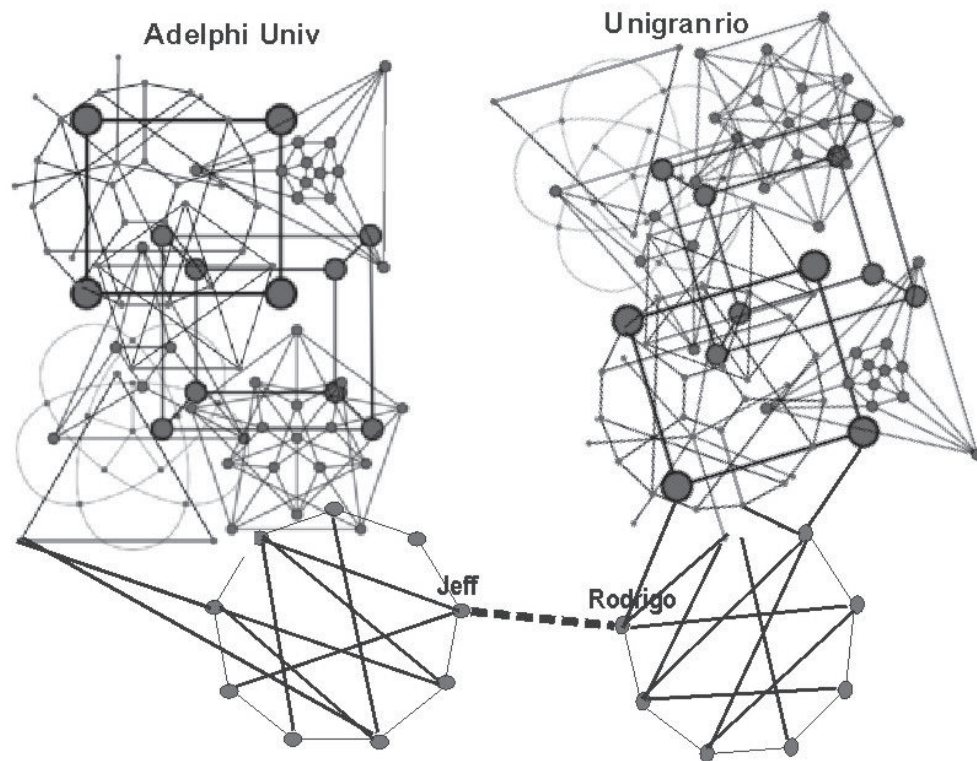
Figure 15 *Linking Clusters.*
(Adapted from Buchanan, 2002: 43).

to 50,000 possible links among these nodes, only about 2% are in actuality required (i.e., only about 1,000 linkages) to insure that nearly all 300 nodes will be connected to each other. This near connection of all nodes is an example of the emergence of a "giant cluster or component" mentioned previously.

However, Erdös's result did not deal with how "small" the connected network will be. In other words, all 300 nodes might be connected but nevertheless many of these linkages could have a very long path length, i.e., many intermediate steps. The latter fact is related to the rather silly and ultimately self-serving notion put forward a few years ago by computer manufacturers and software corporations that the way to solve all of the world's ills including poverty was through providing cheap or even free computers to the poor. Not that the poor shouldn't have computers and computer networks, but there is nothing innate to such a strategy that says that the connectivity made thereby possible will be particularly helpful in crossing the divide separating the marginalized poor from the rest of society.

Several avenues of social network theory, however, can provide insight into how to approach the issue of making the urban environment into a "smaller world." One is related to Granovetter's aforementioned notion of the "strength" of "weak ties." More specifically, in his research into how people used their social connections to land new jobs, he found that only 16% got their jobs through a "strong" tie whereas the other 84% were able to find a new job through "weak

tie" contacts they only saw "occasionally" or even "rarely" (Buchanan, 2002). Indeed, earlier research conducted by the eminent cybernetics/systems thinker Anatol Rapoport along with W. Horvath found that information spread much more by way of "weak ties" among students in a junior high school. (Buchanan, 2002). At the same time, however, other research conducted by both Granovetter as well as Killsworth and Bernard found that strong ties are more relied upon by people from either lower or higher socio-economic status (cited in Csermely, 2006), that is, clustering along strong tie links is more common among populations of the marginalized poor and the superrich. This certainly makes sense in the case of an encapsulated slum like a favela where strong cluster ties exist among favela members whereas there are only weak ties between favela dwellers and the rest of the urban population. And, again, this reliance on the strong tie of the cluster is another factor that would perpetuate marginalization.

But in spite or this even more "weakening" of weak ties among those lower in socio-economic status, such weak ties definitely exist and can be utilized as first sites for both strengthening and for adding more links between the internal and external nodes connected by these weak ties. Indeed, if it were not for the presence of these weak ties connecting favelas to the rest of the Rio's population, Brazil could not have had the success it did in curtailing the spread of AIDS in the early nineties as discussed in the chapter laying-out the main elements of complexity theory by Goldstein, Hazy & Silberstang (this volume). This is a case of not having to reinvent the wheel. That is, why not start adding and stengthening links where they currently exist? And then work outward from there in building new linkages.

Such a starting place is in fact indirectly reinforced from from research in epidemiology that focuses on the social network underpinning of the transmission of diseases, particularly infectious diseases contracted via sexual contact. Social network theory has been of great usefulness to epidemiologists both in tracking the course of the spread of infectious diseases and in devising strategies to impede the spread of such diseases (Matlis, 2002). Obviously, sexually transmitted diseases are spread through social network links. In fact, some individual nodes possess such a high degree of sexual liaisons they are implicated as "typhoid Mary's." For example, there is the supposedly true tale of the highly promiscuous Scandinavian flight attendant who in the early eighties was supposedly responsible for carrying the HIV virus through unrestrained sexual contact around the globe, that is, wherever his airline traveled. If there were a good vaccination for AIDS, it would certainly be such individuals of high social network degree who would need to be immunized first to help impede the spread of the disease for, as Matlis puts it, these individuals will continue to propagate HIV no matter how many of their less promiscuous neighbors are immunized.

As Newman (2003) points out, there is a difficulty in identifying these promiscuous individuals in order to move forward with immunization strategies. Yet, there are viable approaches, one of which plays on the fact that the probability of reaching a particular node by following a randomly chosen edge is proportional to the node's degree (remember "degree" is the number of links a node has). Then, since one is more likely to find high-degree nodes by following

links than by choosing nodes at random, the strategy is to vaccinate someone at random and then a close social contact of that person, that is, follow the edges or links and not the nodes and continue to repeat the same process. Indeed, this has been proven to be much more effective than purely random vaccination. In a sense, this strategy "removes" the vaccinated nodes from the social network which hinders the spread of disease flowing like information through the network. In this context Newman (2003) asks the key question of what percentage of such nodes need to be "removed" in such a fashion to significantly affect network connectivity.

Furthermore, there is an important sense that high degree nodes possess more "power" in a network since by being connected to many other nodes, they in effect, by having a high "inbetweenness" in relation to the nodes with which they are connected, have a higher capacity for influencing these other nodes than nodes with low "inbetweenness" (see Hanneman & Riddle, 2005). Indeed, this property of "power" as influence is greater, the more that other nodes depend on the "inbetween" node to connect to other nodes. This "power" is even increased if the highly in-between node has alternative network pathways to the nodes considered important for decision-making, that is, if this "inbetween" node has several pathways through altenative nodes to the more powerful, in an authority sense, nodes. As Hanneman puts it, the power of a node increases to the extent the node falls "inbetween" short path length linkages among nodes.

It also must be recognized, as Bonacich (cited in Hanneman & Riddle, 2005) has pointed out, that having a higher degree doesn't by itself entail that the possessor of that high degree has more "power" in the network. The way this works is that although it might be expected that since a high degree node has more connections, and even that some of these connections themselves could be highly connected (i.e., have many links), these other nodes may be less dependent on the highly centralized or connected node in a cluster than the nodes that do not have many other connections. Hence, much of the "power" for information spread and thus influence in a clustered network depends not just on path length and "inbetweenness" but also on other factors. This means that even though social network topology can provide critical insights into social connectivity and the influence coming from a capacity to spread information and resources, it also is important to not neglect influence "power" due to other factors at work in the situation. Consequently when we're proposing adding linkages to connect the disenfranchised and marginalized poor, much thought needs to go into the issues of where to make the connections, that is, according to the network topology where the high degree exists but also where power resides because of other sources of power which, although finding expression in social network connectivity, may not be obvious from peering into social network topology alone.

We can also ask the corollary question of how many nodes and links need to be added to substantially affect network connectivity in a specific way, that is, to enlarge and enhance the social networks of the poor which will provide a vehicle out of poverty? But it is not just the amount of networks, it is their richness, *bandwidth* if you like and their reciprocity since we are holding the thesis

very seriously that because of connecting across differences, the poor can add significant insight to make an urban poverty reduction policy more effective.

However, following the path of links only follows the path of density of clustering and not outside the cluster to the non poor. Thus, rather than just adding links by following the path of already established strong cluster ties, try to add links or edges between key nodes outside the marginalized zone to key nodes within the marginalized zone. Usually, these nodal points will be hubs of clusters. These can be defined in different ways, such as community organizers, etc., even drug lords among the street gangs in the favela. It may seem a strange suggestion but it is one that is realistic in terms of who has the strongest and highest degree and most influence. Such a strategy has been effective in urban gang control in the United States and other countries, namely, connect to the gang leaders and influence through their already established power position. The point is to establish links between where the most internal metaphoric "promiscuity" centers on to where the most external metaphoric "promiscuity" centers on. If a viable linkage can be made between these two points, there will be a higher probability of the spread of "infectious" information.

Constructing Real Social Networking

The notion of "networking" to find a job or new customers has taken on the status in recent years of a buzz word but nevertheless has proven its usefulness in such web-based social networking vehicles such as Facebook or LinkedIn (which currently claims a connected network of 30 million persons or nodes). Besides all the hype surrounding networking, it does point to a cogent strategy to find a job or new clients as anyone knows who has been involved in earnest and intense job search knows by discovering along the way that success in such endeavors often comes down to *who* you know as much as or even more than *what* you know. This is a basic trait of being a member of the human community (non-human animals presumably have their own version!) even though it can manifest itself in such "undesirable" social phenomena as nepotism, cronyism, corruption, and cabals.

Yet, most of the "networking" just described are for persons who already possess viable connectivity to social networks within the non-poor areas of the urban environment, and who also recognize the value of these networks. But this is more often not the case for the marginalized communities to which urban poverty reduction programs are aimed. In researching various strategies that workforce development programs have used to teach, encourage, and provide opportunity for social networking, Spaulding (2005) reports that in one initiative serving predominantly low-income women in the US who possessed only a high-school diploma or equivalent and who were recently unemployed, the great majority, 74%, reported having fewer than five social connections they could turn to for help in finding a job! Even more striking, 40% of the participants reported job networks consisting of only two or one or even no contacts! Indeed, research has found that between 40 to 50% of new jobs in the US are found through connections via social networks. To this effect, Spaulding quotes the same Robert Putnam we quoted in the introduction to this chapter, "Whereas

physical capital refers to physical objects and human capital refers to properties of individuals, social capital refers to connections among individuals—social networks and norms of reciprocity and trustworthiness that arise from them" (see also Zeidan, this volume; and Hazy, Moskalev and Torras, this volume).

Although the immediate goal of workforce development programs, whether as part of the overall scheme of Favela-Bairro or in the case of Med-Path, includes providing training for employment for the unemployed and underemployed, long term goals are often stated in terms of opportunities to step out of poverty, with the implication that such opportunities include means for marginalized individuals and low income families to break through those existing socio-economic ceilings which serve to keep the poor entrapped in life styles where it is extremely difficult to rise above their current status. Indeed, in his work on the impact of social networks on economic issues, Granovetter (1985) also tied job search directly to social networks. He offered the following thought experiment in this context. Imagining the constituents of one's social network as balls in an urn, let those contacts with useful job information be the red balls and the others white. In a complex model based on state dependence, that is, a nonlinear one with feedback built into it, when a person finds a new job through his or her social network, many new connections come along with the new job so that at the next draw of the urn, there will be a larger proportion of red balls in the urn. Granovetter however goes even step further by pointing out that empirical data demonstrates that the proportion of red balls also depends on whether the people you now know have themselves changed their own urn's proportions by moving from one job to another, thereby enhancing their own networks which in turn feeds back and increases the number of red balls in your own urn. The relation of job search and social networks then becomes what he calls an "elaborate iterative model" (see the recursive model of social capital in Zeidan, this volume). The point is that when greater social mobility results from network connections, that itself changes the network structure which then augments future social mobility opportunities.

Furthermore, according to Granovetter, since all social network interactions transmit information, many details about employers, employees, and jobs flow through the social networks that people maintain anyway for friendship, familial, religious, interest-related, and a host of other not specifically economic reasons. In addition, because pre-existing social networks are not evenly distributed, the social processes which led to those networks in the first place will continue to generate an uneven playing field in the job social network without any intention to do so (Granovetter, 1995). This means that the connection of social networks and job search is self-perpetuating by either enhancing or impoverishing one's existing social networks and thus, by implication, ultimate job search success.

For the purposes of this chapter, we suggest that these network effects are of importance not only for getting a job but the ability to retain one, that is, because good relations with others are a key, those entering a firm through personal contacts have a head start in appearing and being more productive, and avoiding errors that might set back outsiders. In this regard, many studies

show that quit rates are lower for those who enter through social networks, even more than the ability or quality of the work (see, Fernandez, Castilla & Moore, 2000).

Consequently, what we are suggesting is that rather than allowing the current social networks of the marginalized to continue to develop "naturally" along pre-existing fault lines of ethnicity and socio-economic status, or in a self-perpetuating manner along the surface of uneven playing fields, why not design urban poverty reduction programs that aim explicitly at designing social networks connecting the poor and the non-poor along the lines of the "smart" distributed intelligence networks discussed above? The MedPath program indeed, as mentioned above, contains "seeds" of such means alongside of the training for health careers they offer. In this regard, there is the rich possibilities offered by the social networks represented in the multiple funding streams of the program, a confluence of healthcare employers, city, state and federal government, private corporations and foundations, and job developers. Medpath is also associated with other programs that involve social networking opportunities for the trainees, e.g., through volunteers from NY Cares and Goldman Sachs' Community Team Works in which wealthy "nodes" in the social network of New York City meet with trainees while visiting city landmarks, mentoring on resume writing, and so forth.

Although these are steps in the right direction by providing participants in the program with connections to social network contacts they would otherwise not have access to, the fundamental elements of both the Favella-Bairro and MedPath programs, like most other urban poverty reduction approaches, for the most part ignore the issue of social network connectivity. However, we are proposing that urban poverty reduction policies need to include community organizing activities, but ones that are not circumscribed by existing clusters. Rather, this is a type of community organizing which bridges across the gap between the poor and non-poor by establishing new and strong social network connectivities. The key is on connecting into the already established but marginalized and disenfranchised clusters. The study of social networks provides an initial road map for this and the rest is only limited by human ingenuity.

Conclusion:
Social Network Dynamics and Strategies to Reduce Urban Poverty

We summarize the various success and limitation factors, short and long term, of both Favela-Bairro slum revitalization in Rio de Janeiro and the MedPath training of the marginalized unemployed or overemployed in New York City in Table 8.

But notice the last two rows: in each program, social network connectivity is largely ignored with the result that whatever short term success the programs may have will always be curtailed by the marginalized that is not interrupted but actually reinforced by the programs' fundamentals.

The goal of this chapter has been to present a critical assessment of urban poverty reduction policies from the point of view of their ability to genuinely stop the vicious circle of marginalization, offering the framework of social networks as the way to start thinking seriously about how to do so. We argue that there are positive network externalities in poverty reduction policies that have been ignored, insofar as social immobility is a desired result of the Favela-Bairro and MedPath.

One important feature of this proposed new framework is that it is falsifiable in the grand tradition of the scientific method. Using this framework, for instance, we can predict that increases in societal well-being would be more than the sum of the parts if policies would focus on the whole social network structure instead of singular dimensions of urban poverty, such as housing, infrastructure, and job training. Moreover, a formal model to assess and test welfare improvements would, in this context, almost surely present a non-linear function involving the construction of new social network connectivities. Further advances will provide material for a formal quantitative model to test this and related predictions, indeed to come up with metrics of success concering *social mobility.*

A further feature of a social network perspective is that it takes the onus of designing urban poverty reduction policies out of the hand of top-down oriented experts and instead places it, in the words of what Prahalad (2006) has recently called attention to in the subtitle of his recent book."The Fortune at the Bottom of the Pyramid"! So it's not just a matter of enrichening the connectivities of the poor but also constructing new social connectivities right from the start by involving the poor intimately in the design of the program. Remember the remarks above concerning Page's research into how rich information is about connecting reciprocally across differences. To quote Novogratz (2009: 4) again who has been there in the trenches with poverty reduction social enterprise businesses around the world: "…our collective future rests on embracing a vision of a single world in which we are all connected. Indeed, maybe this notion of human connection is the most important-and-complex challenge of our time."

We end the chapter with an unusual example of the ameliorative effects of how genuine and intense social network connectivity can be of inestimable benefit in very difficult social situations that are worsened by vicious circles of increasing marginalization. Since the 13th Century, in the small village of Geel, Belgium, people suffering from severe mental illness, one of whose manifestations is extreme social isolation, are adopted into families, sometimes for life (Deutsch, 1946). This sort of milieu therapy has, as one of its primary aims, the normalizing of social connectivity to these largely marginalized segments of the population. Nowadays, sufferers of serious mental illness can come from far away to live within the close social network of the village. The idea is that those patients placed with suitable families may be able to resume a measure of social network embeddedness than in a hospital or living alone.

The latter part of the 19th century witnessed an international interest in the Geel system of treating the severely mentally ill as a number of mental

Favela-Bairro		Medical Pathways	
Short range	Long range	Short Range	Long range
- infrastructure investments that improve welfare.	- improving urban landscape.	- intensive psycho-social support.	- starting salaries two or three times working poor levels.
- training in low-skill, but in demand, jobs.	- low-skilled, but in demand, workers.	- training in study skills on individual and group basis.	- career and financial planning offered during program.
- investments in stages, few favelas at a time.	- large number of people affected by the program	- multi-funding stream and partnerships as set-up team.	- networking opportunities for career advancement.
- time spent in planning stages.	- ongoing effort.	- involvement of employers in set-up team.	- hiring by employers from the set-up team.
- community participation.	- empowering effect of going through the program	- research founded job demand.	- empowering effect of going through the program.
Limitations		Limitations	
- political risk, specially regarding changing of municipal administration		- lack of resources for students who fail pre-training or regular training	
- bureaucracy		- high cost per trainee	
- do not take into account the individual dimension		- limited to technical jobs in healthcare which are not be appropriate for all job seekers	
- hampers social mobility.		- need for more scholarships and stipends	
- limited low-skill job training.		- small number of trainees	
- other external factors, like violence.		- number of possible dropouts due to short-term concerns.	
- SOCIAL NETWORK CONNECTIVITY IS, FOR THE MOST PART, IGNORNED		**- SOCIAL NETWORK CONNECTIVITY IS. FOR THE MOST PART, IGNORNED**	
- IPSO FACTO, MARGINALIZATION, BY NOT BEING INTERRUPTED, IS REINFORCED		*- IPSO FACTO, MARGINALIZATION, BY NOT BEING INTERRUPTED, IS REINFORCED*	

Table 8 *Short and Long Term Success Factors and Limitations*

health reformers attempted to establish Geel-type family care systems in their own countries, e.g., one was set-up in Massachusettes in 1885 (Cross, 1998). By 1959, close to 10% of the population of Geel were mental patients, 57% mentally disabled and 29% actual schizophrenics. In Geel, being a foster family has not only even achieved the level of a status symbol in the community, more recently the government is supplying a stipend for such foster homes. The patients are treated like a new member of the family, and they are free to go about town as they wish. No matter where they may have originally hailed form, most patients formally change their legal residence to that of Geel, even choosing to be buried in the local churchyard.

Of course, by posing this extraordinary example of how establishing a much greater kind of social network connectivity can help even seemingly intractable problems, we are in no way insinuating that the poor are mentally ill or should be treated as such. Rather we are pointing to the critical role that network embeddeness in a appropriate kind of social network connectivity can play in breaking the vicious circle of marginalization. And obviously, we are not advocating an *en masse* importation of poor families into the homes of the non-poor.

What we are trying to highlight, though, is that although such urban poverty reduction policies such as slum revitalization and/or workforce development are entirely laudable goals (who can argue against improving poor people's execrable living conditions?), as long-term strategies to reduce urban poverty they simply are not working, and furthermore *cannot* work. Unless, that is, special attention is given to establishing new and powerful social network connectivities. Without the latter, it is not just like rearranging the deck chairs on Titanic but refurbishing these chairs with cheerful colors and soft new cushions so that the doomed travelers will have a much more comfortable place to sit on as the ship inevitably goes down! As Sandra Greenstein (January, 2009), a lead designer and implementer of the MedPath program in New York City has put it, "What is essential to the success of workforce development programs is not just excellent training in particular occupations with potential for social mobility. It is the whole 'wrap-around' experience for the participants, that is, the attention paid to study skills, psycho-social support including counseling, and, most importantly, the vital social connections made during the course of the programs between the funders representing the wealthier aspects of New York City and the marginalized participants of the program."

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NB: "Nd" means No date available, usually due to it being an internet citation.

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