A Locational Approach to Providing HIV-Testing Services:
São Paulo, Brazil

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ABSTRACT

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The city of São Paulo, Brazil presents an interesting case for the study of location. Previous works on industrial location in São Paulo (Hamer 1985; Hansen 1983, 1987), Brazil's varied geography (Dickenson, 1978), classical location theory (Losch, 1959; Weber, 1929), and non-traditional theories of location (Rothenberg, 1987) have highlighted the importance of space in a city like São Paulo. These works, as well as my own research in São Paulo, have neatly complemented my commitment to planning for effective AIDS service-delivery programs.

São Paulo (city) currently has seven free HIV-testing centers. They are located around the city center, without regard to disease pattern or public accessibility. They are, understandably, located at seven of the best-equipped public hospitals in São Paulo. The city of São Paulo is a region in which space matters, and in which the quality and consistency of transport systems, electrical power, water and sewage, and existing health clinics over that space varies significantly. A person on the periphery of São Paulo, as compared to a person on the periphery of one of New York City's outer boroughs, experiences a much greater opportunity cost in getting to the city center. A strategy that moves voluntary HIV-testing closer to the "market" (of potentially HIV-infected people), without sacrificing adherence to standards of confidentiality, counseling, education, and informed consent would be an invaluable strategy for São Paulo. Furthermore, an HIV-testing technology with increased mobility would provide a necessary requirement for such a strategy.

There are currently several new HIV-testing technologies either about to enter the market or already on the market. Many of them utilize a "card" on which a drop of blood can be placed. One such test in the final FDA review stage, the Latex Agglutination Test (developed by Cambridge Bioscience in Worcester, MA), appears to have mobility representative of "card tests", in general. The test requires only a refrigerator, sterile needle-pricks, and the latex agglutination cards themselves. The per-test cost has been estimated to be about US$2.00. Given the test's portability, its potential for providing HIV-testing closer to the market in a city like São Paulo is great.

HIV-testing can have many purposes: (a) to screen the blood supply; (b) to estimate seroprevalence rates in the general population or in specific risk groups; (c) to attempt to effect behavior change in those tested. The proposed plan is to increase the availability and accessibility of HIV-test sites where
people can be tested voluntarily, in order to accomplish (c) and assist epidemiologists in (b). The voluntary participation of those choosing to be tested is a key ingredient in this strategy. People must perceive their costs of voluntary participation to be very low (short travel and waiting times, assured confidentiality, quality counseling). But home-testing, for instance, is not acceptable because of the complete lack of counseling involved. Thus, a balance between the desire to move HIV-testing closer to the market and the need to adhere to public health and civil rights standards must be struck.

This thesis proposes a locational strategy (using the Latex Agglutination Test as an example) for the city of Sâo Paulo that will: 1) maximize the potential of a "card test" for HIV-antibodies—that is, allow HIV-testing to occur as close to the market as possible—and; 2) provide the strongest programmatic components of a comprehensive HIV-testing program.

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Chapter 1 - Introduction

Since the late 1970's, but quite possibly earlier, the world has experienced the ravages of AIDS in many forms. The virus that infiltrates the human body and renders the immune system defenseless against opportunistic infection is known as HIV (human immunodeficiency virus), although it has been referred to in the past as LAV, ARV, and HTLV-III. The virus is now estimated to infect between 5 and 10 million people worldwide (World Health Organization estimate). Most people who have the virus have not yet begun to show the symptoms of AIDS, due to an incubation period that averages 8-10 years (Bogarts 1988). Thus, one can realistically assume that the numbers to be referred to immediately below will increase in great proportions in the near future, especially given the fact that "asymptomatic infected persons can transmit the infection to others and will probably remain infectious for as long as they live" (Hopkins 1987).

The number of reported cases of AIDS is not only sure to undergo a rapid increase, but there is reason to question the validity of the numbers, given the political and social sensitivity of AIDS and the lack of standardized reporting mechanisms in many developing countries. There is a need to look beyond the numbers, which show over 50,000 cases in the United States, almost 2,500 cases in Brazil, nearly 2,000 cases in France, and no reported cases in Zaire, a country that, along with many Central and East African countries, is apparently experiencing a large unreported incidence of AIDS.

Beyond the numbers, one sees and can foresee the consequences of a disease which present us with mortality figures to date of 50% and with the
likelihood that anyone who gets AIDS will die. The pain, physical and mental depletion, and effects upon an economy are global as well as country-specific. The brunt of the illness on men and women in their prime working years is not unique to one country, region, or population group. The growing numbers of children with AIDS are in our daily view. Perinatal transmission (a mother passing the virus on to her baby either in the womb or at birth) is preventable, and education of health professionals and the public must begin.

Concern exists over whether urban population growth rates in parts of Africa will turn negative. However, such theories have been shown to hold little validity, through mathematical modelling and demographic predictions (McLean 1988). Examining the rates of HIV-transmission, the replacement rate (how fast dying newborns are replaced), and the rate of birth of infected newborns are integral to this epidemiological process. Close analysis of the characteristics of age-sex pyramids over time can assist the researcher in this endeavor. It may be significant enough, though, for grave concern even if growth rates approach zero, rather than crossing the "zero threshold".

In both the developed and developing worlds, laws, policies, and customs have changed, or at least been challenged, as a result of the AIDS pandemic. Witness:

- the fight over closing gay bath houses in San Francisco, a city where possibly 5% of the total population is HIV-infected;
- the provision of sterile free needles to intravenous drug abusers (IVDA's) in New York City, where IVDA's now officially make up more than one-half of the city's AIDS victims;
- the tension in an African village surrounding the traditional custom for a widow (in this case, the widow of a man who died of AIDS) to have sexual intercourse with her husband's brother;
- the Brazilian Health Ministry's recent order that all blood banks test their supply for HIV, in a country that has one of the highest
rates of transfusion-related AIDS, 14%, versus 2.3% in the U.S.;

- China’s recent decisions to test all foreigners as well as Chinese returning from abroad for HIV-infection, in a country that reports only 11 cases of AIDS in the last two years; and

- the Congo’s largest foreign company, Elf Congo, annual testing of all employees for HIV-infection, in a country that may have 5% of its population infected.

Cases much like these are sure to be at the forefront of human awareness for years to come.

The ability to prevent HIV-infection, and therefore AIDS, will rest on the acceptance of AIDS education and behavior change. AIDS is a disease that is spread as a result of human behavior and actions—by "the public", physicians, and health workers. HIV-infection is spread as a result of the social and sexual behavior of people, the clinical behavior of health care professionals who use unsterilized vaccination needles, the institutional behavior of blood banks that do not screen blood supplies for HIV-infection, and newly-reported intravenous drug abuse behavior in parts of Nigeria and southeast Asia. Much like the eradication of typhoid from the streets of New York City, for example, which was correlated with a greater level of sanitary conditions, the "vaccine" of immediate hope is change in behavior. In order to effect such change, especially in a developing country, a more immediate challenge is to know to what degree the country is affected and may be affected by HIV-infection. Through this awareness, health care planners in a developing country can better target their prevention efforts and maximize the benefit of their scarce resources.

In a developing country, many of the health reporting mechanisms we take for granted in the United States are not in place, due to a lack of financial, technological, and human resources. "Case reporting" entails hospitals or
health centers routinely reporting the number of AIDS cases to a centralized body; it can be difficult without appropriate recording, information storage, and communication systems. Estimating the number of asymptomatic infected persons is a task difficult for even the United States. Estimating the prevalence of infection (a percentage rate) in a given risk group has been a manageable task in the United States; estimating the size of that population is much more difficult. For example, we can estimate that 5% of bisexual men are HIV-infected (Centers for Disease Control 1987); but it is a nearly impossible task to know how many bisexual men there are in the country (the CDC estimates between 2.5 and 7.5 million). In a developing country, the former task--identifying risk groups and estimating the prevalence within risk groups--become the priorities with a health system that has inadequate access to HIV-testing equipment, a lack of testing sites, and no current method of providing voluntary testing at locations which do not have adequate supportive infrastructure (e.g., energy sources, transport, storage).

Testing the blood of people who may have been exposed or are at risk of being exposed to the virus, referred to as serosurveillance, is one of the most important steps in effective action against the spread of HIV-infection. The results of such HIV-testing can establish a framework for efficient government interventions in the areas of public education, family planning, and management of logistics and supplies. The resources for brochures, posters, and door-to-door HIV-prevention campaigns will be most efficiently used if planners are aware of the demographic and geographic characteristics of HIV-infection. Likewise, scarce resources for ordering, receiving, storing, and transporting supplies such as syringes and needles, condoms, and lab supplies will be most efficiently utilized with such increased understanding. A variety of approaches to HIV-testing can be considered:

a) the blood supply can be screened in order to prevent HIV-transmission through blood transfusions.
b) the public can be tested systematically, in sample clusters or at sample sentinel sites, in order to acquire a more accurate epidemiological picture of HIV-infection within a region.

c) testing can be mandatory for certain risk groups, so that governments can plan their next steps or allay public concern.

d) voluntary testing can be made more available to the residents of a region, through an increase in locations and accessibility. Along with education and counseling, such an approach may effect behavior change as well as provide epidemiologists with an increased understanding of HIV-infection in the region.

It is the last approach--location and accessibility--that will be the focus of the work to follow.

Planning for innovative approaches to HIV-testing in a city has intra-urban, inter-urban, inter-regional, and international significance. AIDS is a disease whose spread is dependent upon concentrations of people and movements of people. A city is a concentration of people, and people do move within, into and out of cities. If urban health planners in a developing country can be prepared to implement an innovative program of voluntary HIV-testing, then their initiatives will push the city that much closer to the goal of AIDS surveillance--limiting or controlling the spread of HIV-infection.
DEFINITIONS OF TERMS

AIDS: Acquired Immune Deficiency Syndrome, a physical condition in which the human immune system has been rendered defenseless against opportunistic infections, such as *Pneumocystis carinii pneumonia* and *Kaposi's Sarcoma*.

HIV: Human immune deficiency virus, the virus that has been determined to cause AIDS; also has been referred to as HTLV-III, LAV, and ARV.

HIV-antibodies: Substances developed in response to infection by HIV which are detectable in blood by biochemical methods. If detected in someone's blood, that person is determined be HIV-positive. There is neither a test for AIDS, nor for HIV itself.

Confirmatory testing: Performing a second, and sometimes a third, HIV-antibody test on a person.

Serosurveillance: A systematic program of collecting blood from selected persons and testing that blood for HIV-antibodies.

Seropositivity: Showing the presence of, in this case, HIV-antibodies in one's blood.

Incidence: The number of cases of AIDS, or the number of HIV-infected people (e.g., an estimated 600,000 people HIV-infected in Brazil).

Prevalence: The rate or percentage of AIDS or HIV-infection within a given population (e.g., an HIV-infection prevalence of 0.5% in Brazil).

Specificity (of an HIV-antibody testing method): Refers to the percent of false-positives a test will yield (e.g., 98% specificity means that 2 of 100 results will incorrectly be HIV-positive).

Sensitivity (of an HIV-antibody testing method): Refers to the percent of false-negatives a test will yield (e.g., 99% sensitivity means that 1 of 100 results will incorrectly be HIV-negative).
Chapter 2 - Comparison of Testing Technologies

Several technologies to detect HIV-antibodies exist. The most commonly used throughout the world is the Enzyme-Linked Immunosorbant Assay (ELISA). The Western Blot, a confirmatory test, has the highest specificity and sensitivity and is much more expensive than any HIV-test; because of its high cost, it is a scarce resource in developing countries. Other methods of HIV-testing include the Indirect Fluorescent Assay and a range of recently developed technologies.

One HIV-testing technology that is currently awaiting final approval by the United States Food and Drug Administration (FDA) is called the Latex Agglutination Test. There are several other "card tests" waiting for approval that have similar implementation characteristics. To use a card test, once it is on the market, will be a prudent decision by health planners in developing countries. As will be seen below, the Latex Agglutination Test, as an example, is a test that is very much unconstrained by the need for consistent transportation networks, sources of energy, and supportive equipment.

Thus, this thesis begins with the assumption that in São Paulo, Brazil, a city that is home to more than 50% of Brazil's 2,500 reported cases of AIDS, health care planners will want to use a card test for detecting HIV-antibodies. The author also assumes that health planners will consider a variety of locational strategies for the use of this test, and that each strategy will in some way not maximize the potential of the card test. The alternate strategies would, in turn, merely enable the technological advantage of the new test to work for itself. For, as will be demonstrated below in a comparison of two testing technologies, the use of the Latex Agglutination Test, as an example of a card test, allows greater market orientation than the ELISA. The work to be presented proposes a strategy of location that will: 1) maximize the benefit of a "card test" for detecting HIV-antibodies—that is, one that will allow HIV-testing to occur as close to the market as possible—and; 2) provide the strongest programmatic components of a comprehensive HIV-testing program.
At this point, it is necessary to conduct a technological comparison of the Latex Agglutination Test with the ELISA—the purpose of this chapter. The ELISA is chosen as the basis for comparison, because it is the HIV-test that:

1) is the most commonly-used; and 2) is most typical of existing medical technology, in terms of its potential and constraints. The choice of the Latex Agglutination Test is based on available data. Before comparing the two tests, which will show the clear advantages of the Latex Agglutination Test, a discussion of the necessary mechanics of HIV-testing will be helpful.

Several steps are required in testing blood for HIV-antibodies. First, blood must be collected from individuals. Most often, this is done through the use of a sterile needle and syringe, and some form of container with a top (a test tube with a cap). But, as the reader will see, the Latex Agglutination Test presents new possibilities. Second, if a syringe of blood is drawn, that blood must be "spun down" in a centrifuge. Third, blood must be refrigerated until the time it can be tested for HIV-antibodies. Fourth, the blood will be tested for the presence of HIV-antibodies. Fifth, on the condition that a person tests positive (meaning the apparent presence of HIV-antibodies), the initial test must be repeated two more times, once through the use of an ELISA test, the results of which will be read with a highly sophisticated piece of equipment (a spectrophotometer), and again, through a Western Blot test. Confirmatory tests, in the ideal world, represent a way for health planners to be sure about "the numbers" and for patients to be sure about their diagnoses. In a developing country, widespread testing should not occur in isolation, without proper social, psychological, and administrative supports. But in reality, a developing country may need to ask itself about the desirability of confirmatory tests due to the country's lack of resources to provide the necessary support for AIDS victims. This thesis will include a plan for confirmatory testing, within a larger approach to HIV-testing, in São Paulo.

As mentioned in the Introduction, there is no AIDS Test. Determining the presence of HIV-antibodies, after initial and confirmatory testing, is in most cases valid basis for a diagnosis of AIDS. Detecting HIV-antibodies presents some
problems. It has been shown that HIV-antibodies sometimes do not show up in an infected person's blood for anywhere from 3 to 12 months ("window period") after the time of infection. That is to say, someone could be infected in January, tested in March (told he was HIV-negative), and would not have HIV-antibodies until June. The possibility of such "false-negatives", even with a confirmatory test, underlies the programmatic stance that HIV-testing requires initial testing, periodic re-testing, and a lot of counseling. Counseling becomes important in this instance in order to educate the patient about the "window" so that he or she will not interpret their test result as a license to engage in high-risk behavior. In fact, it has been shown through a number of studies that a correlation does exist between an HIV-negative test result and an increase in high-risk sexual behavior. This thesis will also present, as part of a greater approach for São Paulo, a plan incorporating these program components.

THE ELISA TEST

The ELISA is a test now produced and supplied by several United States companies that requires several pieces of supporting medical equipment. The results of the test can be read by the human eye or by a spectrophotometer (cost: $10,000). An ELISA test kit that contains 500 tests (@$1.50 per test) will cost $750. For 50,000 annual tests, 100 ELISA kits will cost $75,000. The kits are also sold in packages of 250 tests and 750 tests. As mentioned, the ELISA test necessitates supporting equipment: a plate washer (a 60-pound, $500 piece of equipment); a magnetic transfer device (a 60-pound, $200 item); an incubator (a 40-pound, $200 item); and pipettes with disposable tips (Management Sciences for Health 1987).

Labor Requirements

The ELISA requires skilled labor for many interrelated jobs. First, blood
must be taken from a person's vein through the use of a sterile needle and syringe. The tasks of drawing blood, spinning down the blood, properly handling the blood, and ensuring refrigeration are ones that require a fairly high level of training. Some health workers may already have such training, but the distribution of those skilled workers is sure to be uneven over an urban space. Second, the use of the ELISA requires training in both conducting the test and interpreting the results. These tasks are not of a very high level, but the fact that a certain level of training must occur inhibits footloose location or complete market orientation, given an uneven distribution of potential trainees. Third, the supporting equipment will require maintenance, and the skills needed for that are not evenly distributed over space. For all these labor constraints of the ELISA, economies of scale exist in HIV-testing, worker training, and maintenance. These constraints indicate that the degree of closeness between HIV-testing sites and the market will be adversely affected by the labor force requirements of using the ELISA test in an urban setting.

Material Input Requirements

The supporting equipment to be used with the ELISA must be transported from an input source to some point along a continuum between that source and the market. The weight, packing, and handling requirements of these pieces of equipment will also adversely affect the degree of closeness between an HIV-testing site and those to be tested.

The weights of the plate washer, magnetic transfer device, and incubator each fall in the 40-60 pound range. Special handling is required--each must be packed and shipped in a tri-wall shock-absorbent carton to prevent damage. Each HIV-testing site that uses the ELISA must have one of each. Thus, in order for a testing site to be located close to the market, a quality road network and reliable ground transportation services must exist. But even in a city such as São Paulo, these characteristics are not evenly distributed over space.
In addition, the ELISA test kits themselves must be shipped to the country in question, and then from a trans-shipment point (a port, most probably) to the HIV-testing site. For HIV-testing in São Paulo, even though the Instituto Adolfo Lutz in São Paulo is developing an HIV-test, the city will need to rely on imported test kits coming through the port city of Santos. ELISA test kits, after port clearances and the time to reach the testing site, have about a four-month shelf-life—that is, the length of time from the date a kit reaches a storage room to its expiration date is approximately four months. Such a constraint leads to very small economies of scale and necessitates smaller more frequent shipments of ELISA test kits. Therefore, the greater the distance between an HIV-testing site and a trans-shipment point, the more trips and vehicles will be required; the consistency and continuity of transportation services will also need to be stronger.

**Output Requirements**

The outputs of an HIV-testing site are, initially, the collected blood, and subsequently, the HIV-positive blood that must undergo the two confirmatory tests. The use of the ELISA will necessitate that blood collection sites be separate from HIV-testing sites, since, as has been shown, the input transportation requirements and labor requirements preclude a great degree of closeness to the market. But, blood collection sites can be closer to the market. Therefore, in the initial stage, blood must be refrigerated and ice-packed for transport to the HIV-testing site. In the subsequent stage, any blood determined to be HIV-positive must be ice-packed and transported to the one confirmatory testing site in the city. The need to refrigerate and ice-pack for shipping requires, once again, consistent and continuous ground transportation services and a road network—the more unevenly these are distributed over space, the more the location of HIV-testing sites will be constrained by transportation needs.

**Energy Requirements**
In addition to the standard refrigerator that should be present at all health posts, the use of the ELISA will require additional power for the operation of several pieces of equipment. Since power sources and availability are not evenly distributed over an urban space, the location of HIV-testing sites requiring such power will tend more toward an energy orientation than a market orientation.

THE LATEX AGGLUTINATION TEST

In August 1987, the Latex Agglutination Test was approved for clinical field trials by the United States FDA. The test was developed by a Worcester, Massachusetts-based biotechnology company, Cambridge Bioscience, which has now completed the clinical trials. The company is in the process of compiling data from the test trials in order to submit an application to the FDA to market the test. The test is much less dependent upon instrumentation than the ELISA. The test is performed by putting a finger-stick of blood onto a latex agglutination card. It requires only a refrigerator, in order to store the chemical reagents needed to perform the test. The cards can be stored at room temperature. The characteristics of such a test in a city in a developing country, in addition to the fact that it can be done for under US$2.00 per test, present many possibilities.

Labor Requirements

The Latex Agglutination Test requires less advanced skills in many areas than the ELISA. For one, taking blood is simpler--a finger-stick with a clean sterile pin versus drawing blood from a vein. Secondly, the amount of equipment maintenance needed when using the agglutination test is minimal--the only required piece of equipment is a refrigerator. But the one area in which problems may certainly arise is in data storage and communication. Information systems in developing countries, even in the large cities, will need
to adapt to a new type of HIV-test and to moving the results of those tests through the system. In general, however, the use of the latex agglutination test would not be constrained by the need for skilled labor. Thus, HIV-testing sites using this testing method can be located closer to the market.

Material Input Requirements

The supporting equipment to be used with the Latex Agglutination Test consists of a refrigerator for each testing site. Each health post or potential health post in a city in a developing country can be assumed to have at least a small under-the-counter refrigerator. Disposable sterile needles or pins are required as well and can be transported in bulk and with little special handling to a testing site.

The latex agglutination cards are used at a rate of one per test. They can be stored at room temperature and they have an expected shelf-life much longer than that of the ELISA test kits. Greater economies of scale will result, from larger bulk shipments to the testing site. Only the chemical reagents needed (which "treat" the card before it can be used for the test) will require special handling, special labeling, and refrigeration en route and at the site.

The use of the Latex Agglutination Test does not require strong orientation to either the transportation system or material input sources. Therefore, the test will allow HIV-testing sites to be located closer to the market than will the ELISA.

Output Requirements

The outputs of an HIV-testing site using the Latex Agglutination Test will be the cards (or the test results indicated by the cards). Since blood can be collected and tested by the same worker at the same point in time, the use of this
test does not require that blood be transported to an initial HIV-testing site (if one assumes that the blood collection point and testing site are in different locations). If, however, a city decides that confirmatory testing is warranted, some mechanism of obtaining blood from those who had tested HIV-positive initially must be devised. I will suggest such a mechanism as part of a comprehensive testing approach in São Paulo. Confirmatory testing is more constrained by transportation, material inputs, and energy--therefore, HIV-testing sites (if the city is conducting confirmatory testing) may feel a pull away from the market.

Energy Requirements

The energy requirements of an HIV-testing site using the Latex Agglutination Test are for one refrigerator per site. The degree of closeness to the market will not be constrained by the need for energy sources.

THE CHOICE AT HAND

As can be seen through the technological comparison, the Latex Agglutination Test offers exciting advantages over the ELISA. The choice for health planners, then, is to work toward a locational model for implementing an HIV-testing program using the Latex Agglutination Test. This work strives to meet that challenge for São Paulo, Brazil, a city that could serve as an urban model of HIV-testing and prevention in the developing world.
Chapter 3 - The City of São Paulo

The characteristics of the city of São Paulo that are of significance to this study are its: 1) population; 2) physical size; 3) infrastructure; 4) pattern of HIV-infection; and 5) health system structure. The most instructive approach to understanding the above elements is to use three forms of presentation: written text; charts and tables; and maps.

POPULATION

The city of São Paulo, Brazil, the focus of the current analysis, has an estimated population of more than 10 million people (1988). It is the largest municipality in the state of São Paulo, and the most populous in Brazil. The city is set within Greater São Paulo metropolitan area (GSP), with an estimated population of more than 14 million. Brazil's total population is approximately 140 million (EMPLASA 1988). The borders of São Paulo City and GSP are clearly defined and noted on MAP #1.

The City of São Paulo is divided into fifty-six subdistritos, which comprise eight ERSA's (Escritório Regional de Saúde, or health districts). The subdistritos range in population from 7,000 (Se) to over 1,000,000 (Santo Amaro). MAP #2 shows the delineation of subdistritos in the city and the population of each ERSA (Health District). The center of the city, which includes 19 or 20 subdistritos, is densely populated, with high-rise apartment and commercial buildings, and is faced with massive traffic congestion.

Income distribution in the city is characterized by a wide disparity between rich and poor. Large spatial inequalities in living standards have persisted in the face of an uneven economic growth process for Brazil as a
whole, São Paulo State, and the city of São Paulo (Thomas 1987). Between two
and three million city residents live in either favelas (squatter-settlements) or
cortizos (illegally-subdivided tenements). Many of the wealthiest inhabitants
of the city live in multi-room high-rise apartments in the center, or on the
periphery of the city in homes on large lots.

Population density within the city of São Paulo varies greatly, as well. In
1980, the most densely populated subdistritos were Bela Vista, Santa Cecilia,
Cerqueira Cesar, and Liberdade (each with more than 27,000 residents per
square kilometer). All four are in the "expanded center" (as opposed to the
smaller "historic center"). Of importance, however, is that two of these four
subdistritos have close to the lowest incidence (absolute number) of AIDS cases
in the city and the other two have the highest incidence of AIDS cases in the
city. The prevalence (rate) of AIDS cases in these subdistritos (1988 data)--Bela
Vista: 8.27 cases/10,000 residents, Santa Cecilia: 8.57 cases/10,000 residents,
Cerqueira Cesar: 2.61 cases/10,000 residents, Liberdade: 2.29 cases/10,000
residents--shows very clearly that population concentration and concentration
of AIDS do not match up. Thus, mapping disease concentration is of primary
importance in trying to understand the nature of AIDS in São Paulo in an effort
to control the spread of HIV-infection.

MAP #3 shows population density, by subdistrito, within the city of São
Paulo. One can see, by comparing MAPS #2 and #3, that the ERSA’s with the
largest number of residents are away from the center and that the subdistritos
within them are the largest in area.

SIZE

The physical size of São Paulo city is one of the most important
characteristics of the city in terms of location. Not only is the city a great
expanse--almost 1500 square kilometers, or more than 580 square
miles--(Ingram 1981), but the differences in the quality and consistency of the
transportation network, infrastructure, and availability of adaptable structures
over that space are far more pronounced than one sees in more industrialized cities. The following section, "Infrastructure", will discuss these differences.

The geography of the São Paulo and the spatial nature of the city should be examined not only from the viewpoint of absolute size, but the relative size of spaces between neighborhoods and concentrations of people. Some of the most populous subdistritos (e.g., Itaquera, Guiaianazes, Itaim Paulista, São Miguel Paulista) are more than 18 kilometers from the physical center of the city (Se). But the area that is becoming the new functional center of the city (around Avenida Paulista) is even further west from the most populous subdistritos. In any event, the prevalence of reported AIDS cases in these outlying, populous areas is relatively low, although the incidence in Itaquera and São Miguel Paulista is at the upper end of the scale in the city.

INFRASTRUCTURE

For the purposes of this analysis, infrastructure in the city of São Paulo consists of the following: a) the transportation network, which includes mass transit, roadways, waterways; b) the availability of existing health unit structures (i.e., clinics, mini-posts, hospitals); and c) consistent sources of energy, which may be a determinant of (b).

MAP #4 shows the two existing Metro lines (North-South; East-West), the CMTC public bus lines, the public trolley lines, and their respective terminals. The city bus company, CMTC, contracts out with 50 private bus companies in the metropolitan area. Public transport from the west to the center is one of the best systems in the city. The public transport system to the east is admittedly the system in the worst working condition. In addition, its stations and terminals are difficult for the region's unevenly distributed population to reach. It is only in the last seven or eight years that transport planners in the city have made a conscious decision to integrate the bus and train lines.

MAP #4 also shows the two main rivers in the city (Tiete and Pinheiros)
and the highway, called the "Marginal", that follows their path. The city does not have a beltway that would complete a full circle of highway around to the southeast and east.

MAP #5 shows existing general hospitals in the city of São Paulo. One can clearly see that they are concentrated in the center and slightly southwest of center. It is significant to note the absence of general hospitals east and north of the center--areas with large populations, limited transportation access, and a high incidence of reported AIDS cases.

EPIDEMIOLOGY OF HIV-INFECTION

Brazil currently has reported nearly 2,500 cases of AIDS since its first reported case in 1983. São Paulo State is home to 1,672 of these cases (as of 2/29/88); the city of São Paulo has 1,130 of the state's AIDS cases--or 68% (Secretaria de Saúde 1988). The use of the word "reported" is important; many cases can go unreported in a city like São Paulo, as mentioned in Chapter 1.

In the city, 98% of the reported cases have been in persons 15 years of age and older. The transmission category breakdown for all ages is as follows (Secretaria de Saúde 1988):

<table>
<thead>
<tr>
<th>Category</th>
<th>Cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>male homosexual contact</td>
<td>615</td>
<td>54%</td>
</tr>
<tr>
<td>male bisexual contact</td>
<td>227</td>
<td>20%</td>
</tr>
<tr>
<td>heterosexual contact</td>
<td>84</td>
<td>7%</td>
</tr>
<tr>
<td>intravenous drug use</td>
<td>82</td>
<td>7%</td>
</tr>
<tr>
<td>blood/blood products</td>
<td>35</td>
<td>3%</td>
</tr>
<tr>
<td>unknown origin</td>
<td>87</td>
<td>9%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1130</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

It is most instructive to look at the prevalence of reported AIDS cases, not
by subdistrito, but by health district--ERSA. The prevalence of AIDS cases in subdistritos would offer an analysis based only upon delineations that are not responsive to population concentrations. The prevalence of AIDS cases by ERSA--see MAP #6--shows the number of reported AIDS cases per 10,000 inhabitants for each of the eight ERSA's. The population of each ERSA, except for ERSA's 5 and 8, is between 880,000 and 1,300,000. The population of ERSA 5 is approximately 1,800,000 while that of ERSA 8 is approximately 2,000,000. ERSA's 5 and 8 also have the lowest prevalence of reported AIDS cases--again, careful attention is to be paid to the difficulties of case reporting.

Preliminary studies of HIV-infection rates in Brazil show that possibly 600,000 Brazilians are infected with the AIDS virus, which translates into a general population infection rate of 0.5%--similar to that which is estimated for the United States. São Paulo State is thought to be home to the plurality of the 600,000, but estimates of the number are not strongly grounded. Approximately one-half of the hemophiliacs in the country are infected with HIV; 10% of those patients with chronic renal failure; and 0.3% of army personnel (based on 800 samples as of September 1987) (Veja 1988). Health planners need to have a better understanding of the nature and spread of HIV-infection in São Paulo and Brazil as a whole.

THE HEALTH SYSTEM

Three categories of health providers exist in Brazil today: 1) the private sub-sector; 2) the official sub-sector; and 3) the social security system (Kisil 1985). The private sub-sector covers about 20% of the country's population, and includes private physicians who service patients directly or through employer contracts. It is an unregulated sector which is difficult to monitor.

The official sub-sector covers about 20% of the population and consists of three levels: a) the Federal Ministry of Health--MOH; b) the State Secretariat of Health; and c) the municipal government health secretariat. The MOH possesses regulatory powers, is responsible for national health campaigns,
and holds de jure control over national agencies. The State Secretariat of Health maintains full day-to-day responsibility for health services in each state, but faces the often insurmountable problem of attaining state government support for health initiatives. The São Paulo State Health Secretariat is located in the city of São Paulo and is responsible for most of the AIDS planning in the city; it is, accordingly, the source of a large amount of this work's data on AIDS incidence in the city population. The AIDS Control Program in São Paulo State was severely derailed when, in 1986, the newly-elected Governor of the State removed the person who had been coordinating the program since the country's first AIDS case in 1983.

The social security system covers about 40% of the population—leaving 20% of the country's population without access to modern health care. Its services are provided by INAMPS, the health branch of the Ministry of Welfare and Social Security. INAMPS acts as an umbrella organization for previously separate urban, rural, and special health care funds. It is financed by employer and employee contributions—not through revenue allocations, as with the MOH and the State Secretariat of Health. In 1982, the INAMPS share of public health expenditures in Brazil was 85% (compared to 13% in 1949). This system uses its own facilities, its own private physicians, and private hospitals; almost all the care it provides is curative, not preventive.

Primary, secondary, and tertiary care are provided within the above three sectors (Kisil 1985). Primary care includes the services of: private physicians; health services staffed by private physicians; health posts (small
primary health care centers often open half the days of the week); *ambulatorios* (out-patient departments of large private and public hospitals); and urban emergency units. Secondary care is provided by public and private hospitals, as well as *unidades mistas* (rural referral health centers). Tertiary care is provided by larger referral hospitals, and university hospitals in urban centers.
Chapter 4 - Locations for HIV-Testing in São Paulo

The city of São Paulo presents a challenging case for studying the importance of location. It is a city in which space matters. Specifically, the characteristics of that space differ greatly: the quality and consistency of transportation systems, the availability of existing health units, the availability of HIV-testing sites, and the distribution of HIV-infection all vary over space within the city.

Location of public health services in a city like New York is not as critical an issue as it is in a city like São Paulo--a city with a much more uneven distribution of transport options. The degree of closeness between the market (those who choose to be tested) and sites where they can be tested is one factor that separates New York from São Paulo.

The locational strategy for São Paulo that will follow is designed to decrease individuals' costs of voluntary participation in an HIV-testing program. Those who choose to be tested are volunteering for much more than a blood test. In the eyes of public health practitioners, they are enlisting in a program of on-going supportive interventions regarding HIV. Thus, those tested are volunteering their travel time, their waiting time, their face-to-face time with a health worker, and the time they will spend in the months to come dealing with the possibility of HIV-infection. Accordingly, the costs to their voluntary participation must be kept very low.

The optimal locational strategy is one that will allow testing to occur as close to the market as possible, while simultaneously maximizing the programmatic components of a comprehensive HIV-testing program. In other words, this means that the desire for full-market orientation (e.g., testing at people's residence, their place of work, or their points of transit) must be balanced against the need to adhere to a number of programmatic components:
voluntary testing: a program that makes HIV-testing available to those who choose to be tested.

confidentiality: ensuring that the test and the results are known only to the patient and the health worker, and that the HIV-test is "de-coupled" from a routine official medical exam.

frequent testing: which is important for:
the patient, given the delay in antibody detection;
the epidemiologist, to track the progression of infection;
the planner, to understand the effects of new in-migration.

coverage rates: the percentage of the targeted population to whom HIV-testing will be made available.

informed consent: ensuring that the patient knows he is being tested for HIV-antibodies.

counseling: assisting the patient in understanding the implications of being tested, of being HIV-negative, or of being HIV-positive. Counseling needs to occur before, during, and after testing.

education: providing the patient with on-going education about modes of HIV-transmission and prevention.

confirmatory testing: testing HIV-positive persons a second time (with the ELISA) and a third time (with the Western Blot).

CURRENT HIV-TESTING SITES USING THE ELISA

In the city of São Paulo, seven sites for free HIV-testing (using the ELISA) exist (Secretaria de Saúde 1988). Six are at hospitals where in-patient AIDS care is provided. Of those six, three are state hospitals, two are municipal hospitals, and one is a federal facility. The seventh site, Hospital Cruz Azul, is a hospital for state civil servants which does not offer in-patient AIDS care. All are apparently among the best equipped and staffed public hospitals in the city. MAP #7 shows the seven locations. Several other locations where one can pay for HIV-testing do exist in the city; but this analysis is restricted to the
availability of free services.

**POSSIBLE LOCATIONAL STRATEGIES USING A "CARD TEST"**

Interviews with a variety of public officials and planners in São Paulo lead me to posit that three different locational strategies for the use of a technology like a card test are currently foreseen. One would be to provide HIV-testing using a card test at the existing test sites. The second would be to provide testing using the a card test at points of the heaviest transportation use (e.g., metro stations, integration terminals). The third would be to provide testing using a card test according to general population concentration—at existing and proposed health clinics throughout the city, which are sited according to population numbers. Each of these strategies, if employed as a sole strategy, would lead to a variety of access-related and programmatic pitfalls. I will discuss the advantages and disadvantages of each strategy. Then, one locational strategy will be proposed that draws from these and other theories of location. That strategy will: a) maximize the technological advantage of a card test; and b) provide the strongest programmatic components of a comprehensive HIV-testing program.

**Existing-Site Orientation**

This approach would offer HIV-testing using a card test at the seven current sites in São Paulo. There are many reasons for so doing. The fixed costs of a card test are cheaper than those of the ELISA; the per test cost (approximately US$2.00) is similar to the ELISA; the personnel familiar with HIV-testing are already on-site; and new start-up costs (associated with new sites) can be avoided. MAP #7, referred to above, shows the existing-site locations using the ELISA, and, thus, sites using a card test if such an approach were to be employed.
One problem with this approach is access. Very little incentive to be tested for HIV-antibodies exists--there is no treatment, no vaccine, and a great deal of emotional stress associated with being tested. The current sites are not easily accessible by mass transit for all those throughout the city who might choose to be tested. The sites are at hospitals filled with symptomatic AIDS patients and those with other diseases. These hospitals are also symbols of bureaucracy and formal state influence. Prostitutes, for example, have not been integrated into the health care system and may require less formal outreach interventions. The costs to the voluntary participants are quite high with this approach.

Another problem is that the technological advantage of a card test would not be maximized. It is a very mobile and portable type of test (as shown through the example of the Latex Agglutination Test)--much more so than the ELISA. A locational strategy that does not entail moving the test, at all, toward the market falls far short of an optimal strategy.

Transportation Orientation

The goal of an approach that utilizes a transportation orientation would be to find the points which have the greatest number of people passing through, so as to increase the probability that a person who wants to be tested for HIV-antibodies will be among that group of passers-by. In São Paulo, these points are Metro terminals, bus-trolley-Metro terminals ("integration terminals" that serve three modes of transit), and the functional core of the transportation network. MAP #8 shows the outcome of such a locational strategy.

The advantages of such an approach are that a great number of people could be reached in a short period of time with a minimal amount of effort. Metro stations are existing structures. Public awareness of AIDS, through posters and pamphlets, could be expanded.
But there are disadvantages. The first problem with a transportation approach is a programmatic one. HIV-testing is not an end in itself. It should be part of a comprehensive outreach, education, counseling, and supportive program. The technology of a card test would allow testing to be done in the span of one minute, as passers-by pause on the way to their final destinations. It would be difficult, to say the least, to engage them in a more time-consuming contact, at that point in their day. It also would be difficult, and would increase the costs of voluntary participation, to ask them to come back at another time for supportive intervention.

The other problem is also a programmatic one. Confidentiality is of the utmost importance. Even though Metro stations are structures with areas that can be adapted to special uses, such an approach might jeopardize total confidentiality as each person who wants to be tested would have to wait in line with others.

Population Orientation

Traditionally, health services have been located according to general population concentrations. Using such an approach, one would locate HIV-testing services according to the highest densities of residents. The advantages of this approach in São Paulo is that health planners could use existing and proposed health clinics, already sited according to general population numbers. Also, just as in the case of using existing HIV-testing sites, equipment and relevant health technology are already present.

The fundamental disadvantage is that this strategy does not disaggregate the population in terms of disease or risk-group concentration. Areas with three- or four-children families would receive preferential services over areas with single-person households. Residential areas with high-rise apartment buildings (and high floor-to-area ratios) might include many older married couples. Population concentration does not always correspond to disease
concentration—a case that holds true for AIDS.

Another problem relates to access. When populations are not evenly distributed—and they are not in any city—locating according to population concentration (in an effort to minimize total travel distances) will actually cause hardship for some at distant localities (Smith 1983). In São Paulo, where the inadequate East-West Metro line must respond to large population numbers in Itaquera, the cost of overcoming distance is even greater than it would be in other circumstances.

**PROPOSED LOCATIONAL STRATEGY FOR HIV-TESTING USING A "CARD TEST"**

The locations to be specified in the proposed plan are ones that will enable the highest quality HIV-testing program to occur—one that will provide patients with education and counseling in order to help them prevent HIV-transmission. In most instances, it will be prudent and efficient to locate HIV-testing sites using a card test at existing ELISA-based sites. But alternative, less formal sites must be utilized in order to reduce the costs to voluntary participation. The need to integrate any testing center, and the data it generates, with the formal health bureaucracy is a barrier to "setting up shop" randomly. The selection of alternative sites, though, can most certainly be based on pedestrian/traffic flows, transport accessibility, and program goals. Non-profit advocacy groups must be integral links in a system of offering voluntary HIV-testing: GAPA (Grupo de Apoio a Prevencion de AIDS), the one AIDS advocacy group in the city; FEBEM, an association for runaway and abandoned children; and the one hemophiliac association, for example. In all, the proposed plan is meant to serve as a plan in itself and as a springboard from which continued innovative planning can result.

As a necessary adjunct to mapping the proposed locations (MAP #9) to complement the existing ELISA-based testing sites, I will discuss the rationale for selecting each location—how the location allows card test-based testing to occur as close to the market as possible without jeopardizing the programmatic
components of the HIV-testing program. Some proposed locations will not be specific, in terms of exact siting, but specific to only the area or type of establishment or institution (e.g., Cidade Universitaria, not specifying any particular building in which to locate HIV-testing). All locations put forth are based on the existing structure of São Paulo, not on proposed buildings, Metro lines, or roadways. In addition, some proposed locations may not be feasible to implement because of site-specific administrative barriers to implementation. Finally, arrangements for confirmatory testing (for those who initially test HIV-positive) will be discussed as a general approach at the conclusion of this section. The locations are as follows:

(A) Cidade Universitaria: "University City" is the location of all but three of the University of São Paulo's schools (Faculdades). The area of Cidade Universitaria is six square kilometers, and contains Faculdades and Institutos. In all, Cidade Universitaria encompasses about forty-six schools, institutes, activity centers, and other structural clusters, including its own hospital for the students, faculty, and staff of the University. The site is west of the Rio Pinheiros, about eleven kilometers from the city center and only about three kilometers from a western boundary of the city. It is a city unto itself, with concentrations of people, plenty of open space, a variety of structural types, a bus system run by the city, and a diverse population in its staff, faculty, and students.

The University would be an easy environment in which to publicize the availability of HIV-testing, with its bulletin boards, newspapers, and student groups. Large banners, in full view of the campus community and visitors, are already on campus, saying "Don't Die of Ignorance" and publicizing an "AIDS Information Week". The key is to find one specific site on campus that will afford people confidentiality (from others getting tested and from the rest of the university community), supportive counseling at all phases of the intervention program, and ample opportunity for AIDS education activities. The ideal building would be one that welcomes a lot of people through its front doors for a variety of reasons, so those to be tested are not automatically stigmatized just for walking into a building. The building should also be
accessible by the campus bus line. The selected building should also have several different corridors or ramps once within the building, so as to disperse those who enter in a variety of different directions.

The actual "HIV-testing room" should be publicized as an "AIDS Education Center". Any person requesting information, counseling, or referral could come into the center and speak to a staff member in a private room. If the service recipient wanted an HIV-test, the implications of that decision would be discussed with the person. The test could be provided on-site by the same trained staff member with the assurance of confidentiality. The actual room should not be so isolated that all observers know people's destinations once in the "HIV-testing corridor"; at the same time, it does need to offer service recipients privacy from the major centers of activity in the building. The room need not be equipped with anything more than a refrigerator, given the extreme mobility of a card test for HIV-antibodies.

The "AIDS Education Center" should not be staffed by University personnel, students, or faculty for any job role. Confidentiality within Cidade Universitaria must be maintained. The HIV-test should not be part of any other medical exam, in order to keep the HIV-test out of school records. If some faculty or students want to offer supportive services in terms of counseling, through a University Counseling center, then such a referral can be made only with the person's consent.

(B) Motels located on Rodavia Pres. Dutra: A "motel" in Brazil is most often a place where discrete sexual encounters occur. Along Rodavia Pres. Dutra, which runs for about fourteen kilometers from the central area of the city to the major international airport, several motels are located. Each advertises, with neon signs, its special convenience, atmosphere, and seclusion in order to attract customers. There is one three-kilometer span of highway from which one can see five or six motels.
By virtue of their role, the motels offer seclusion and privacy to their patrons. Businessmen, travellers, local residents, and prostitutes can all be somewhat assured of not being "found out" if they use the motels. For this reason, this specific neighborhood of motels might be a very effective area in which to offer confidential HIV-testing--through an "AIDS Education Center"--in a separate structure. Motel patrons are most certainly engaging in high-risk behavior; and that repeated sexual behavior serves only to increase the likelihood of HIV-transmission. Also, the population could be assured that no one in their family or social network would know they were being tested for the AIDS virus.

The ideal structure would be one that was sited on a road en route to the motels. This type of non-traditional setting can be used because of the technical nature of a card test. People could get tested on their way to a motel, or on their way home. In any event, the testing should be conducted by trained public employees who will have no other contact, outside of the HIV-testing program, with the people. Testing should be offered during non-traditional work hours (i.e., other than between 9:00 am and 5:00 pm), since the motels receive much of their business during the evening, night, and weekend. By offering HIV-testing at a site not associated with any of the motels, one is able to avoid several possible unfortunate consequences: the possibility of a motel becoming "the AIDS motel"; the state getting into the business of issuing a "clean bill of health" to motels and people; motel proprietors fearing a decline in business.

(C) Terminal Santo Amaro: This site is the one mass transit terminal mentioned most often by health officials and planners in São Paulo as a desirable site for HIV-testing using a new technology like the Latex Agglutination Test, or any card test. It is on the east side of the Rio Pinheiros, almost fifteen kilometers from the center. It serves as the terminal for the trolley and city bus lines; the "executive omnibus" line, which runs from the city center to the extreme southern part of the city, passes within one kilometer of the terminal. The volume of passengers using Terminal Santo Amaro surpasses that of most other terminals, according to planners in São Paulo.
The two major concerns when taking HIV-testing this close to the market are: a) ensuring confidentiality; and b) ensuring that HIV-testing is not an end in itself. Confidentiality can be best protected if testing is conducted within the main structure of the terminal, but in a specially-adapted area. Much like the approach to setting up HIV-testing at Cidade Universitaria, the exact siting within the structure must allow for patient privacy and confidentiality while not calling attention to the "special area".

The HIV-testing area--an "AIDS Education Center"--should not be located where people will have to make a split-second choice between taking the bus or taking the test. A person must decide to devote a significant amount of time on the day of the HIV-test, as well as in the future, to dealing with the possibility of HIV-infection. The HIV-test is voluntary and should be a well-thought-out decision. The presence of HIV-testing in the terminal can encourage people, over time, to consider getting tested. The significance and associated consequences of being tested for HIV-antibodies should not, by any means, be taken any less seriously in an alternative site such as a mass transit terminal.

HIV-testing services should be provided by public employees trained in the following: virology and epidemiology of AIDS; public health; and the psychosocial effects of HIV-testing, -transmission, and -infection. Referrals for follow-up counseling and support should be made at the time of the test. Services should be provided during peak and off-peak hours in order to maximize outreach and allow for contacts during non-rush hour times.

The approach for locations (D) and (E), below, is basically the same as for the Santo Amaro Terminal, in terms of confidentiality, counseling, and exact siting at the stations. The differences are in the following justifications for choosing each location.
(D) **Santana Metro Station**: In 1984, the number of passengers using the Santana station was 11.7% of the total riders on the North-South Metro line—more than any other station (EMPLASA 1985). In addition, the *subdistrito* of Santana is in ERSA 6, which has the third highest prevalence of AIDS cases among the eight ERSA’s (1.04 cases per 10,000 residents; see MAP #6). This is only slightly less than the prevalence for ERSA #2 (1.10 cases per 10,000 residents).

(E) **Tatuape Integration Terminal**: In 1984, the number of passengers using the Tatuape station was 33.4% of the total riders on the East-West Metro line (EMPLASA 1985). The station serves more people than any station on either Metro line. The eastern portion of the East-West line is in the worst operating condition of any section of the Metro and serves the populous region of Itaquera. From meetings with a variety of planners and economists in São Paulo, it appears that this section of the Metro line would be an effective place to offer HIV-testing using a card test.

(F) **Vila Prudente, renovated existing structure**: Vila Prudente is one of more densely-populated *subdistritos* that is somewhat distant from the center of the city (see MAP #3). It is also has one of the higher incidences of reported AIDS cases. Furthermore, its only connection to other parts of the city is by buses and trolleys that must run toward the center before turning back to neighboring districts. The Marginal, the highway that follows the two main rivers in São Paulo, does not loop around the city through Vila Prudente (see MAP #4). As a result, access from Vila Prudente to anywhere but the center is limited.

   The ideal structure in the *subdistrito* would be one that is vacant, requires very little physical repair, is equipped with a consistent source of electricity, and is on a bus or trolley line. The technology of a card test requires minimal structural alteration. HIV-testing could be conducted in the context of an "AIDS Education Center". Any person requesting information, counseling, or referral could come into the center and speak to a staff member in a private
room. If the service recipient wanted an HIV-test, the implications of that decision would be discussed with the person. The test could be provided on-site by the same trained staff member with the assurance of confidentiality.

(G) Liberdade, renovated existing structure: Liberdade is the subdistrito near the center of the city where much of the prostitution takes place. The prostitution is heterosexual, homosexual, and transvestite in nature and continues without any law enforcement intervention. São Paulo residents refer to prostitution in their city as "not illegal". HIV-testing is currently offered in the center of the city, but encouraging prostitutes to enter the formal health system poses a challenge for health planners. A prostitute can function as a reservoir of infection -- not just becoming infected him/herself, but also transmitting HIV to his/her many customers.

The potential of an HIV card test allows location in a storefront "AIDS Education Center", with a program approach much like the one proposed in Vila Prudente. The psychosocial issues for the populations are different, as they are for each individual. The methods of outreach require a more proactive strategy -- going into the streets, bars, and night clubs to publicize the new AIDS services in the neighborhood.

Mobile Testing

One other mode of HIV-testing requires serious consideration and is thus a part of this proposal--mobile testing. In accordance with the spatial distribution of people and transportation in São Paulo, it makes sense at some point to "take the test to the market". Mobile HIV-testing conducted on an itinerant basis for Itaquera, Sao Miguel Paulista, and Guaiânases would offer voluntary HIV-testing, counseling, and education, as well as AIDS education/prevention training for community health workers. Mobile teams would return every three months and offer their services within the walls of a community health center. The reason for not "de-coupling" HIV-testing from
other health services in this instance is to avoid long waiting lines for HIV-testing at otherwise visible and identifiable mobile units. However, the HIV-test should remain separate from any other medical services provided, in order to keep HIV-test information out of the hands and records of community health workers.

**Confirmatory Testing**

Any person who tests HIV-positive requires confirmatory HIV-tests, once with the ELISA and a second time with the Western Blot. Confirmatory testing is important for many reasons. For one, the patient will learn with very little question (the Western Blot is about 99% specific and sensitive) whether he or she has HIV-antibodies. Secondly, epidemiologists will receive a much truer indication of the prevalence of HIV-infection in the population (or at least in certain risk groups, since those volunteering probably have some reason to think they might be infected). Thirdly, planners, through epidemiological mapping, can better target interventions.

The two confirmatory tests can be performed on the same day in the same location. Currently, only one Western Blot site exists in São Paulo--that site will be the confirmatory testing site. The test is, and should be, at no charge to patients; all is required, once again, is their time. For this reason, it is proposed that the blood of people needing confirmatory tests be collected and transported at government expense. For those people initially tested at a site equipped with more sophisticated medical equipment, then, for the HIV-positive cases, a tube of blood can be collected at that point in time. For others requiring confirmatory testing, arrangements should be made for drawing blood at designated health centers or outposts and then taken to the confirmatory testing site. The incentive to get tested again may be even less than it was for the initial HIV-test. Thus, if necessary, people should be transported from their homes--in inconspicuous vans or cars--to the blood collection site. The fear of being a "true positive" and the confusion of being a "false positive" may be enough to deter people from returning on their own to any HIV-testing site, no matter how accessible.
One of the disadvantages of using a card test is the difficulty associated with confirmatory testing. The use of the ELISA allows one tube of blood to be drawn and tested initially with the ELISA; that same tube of blood can be sent for confirmatory testing. The voluntary participant does not need to return to any other site for confirmatory testing. The use of a card test may very well require drawing a tube of blood, at the same or another testing site, after the voluntary participant has undergone the card test.

**Migration Patterns**

It is useful to look at the effects that different intra-urban migration patterns would have on planning for the location of HIV-testing. Demographic characteristics of neighborhoods change over time, due to births, deaths, in-migration, and out-migration. In any city, new in-migration is either rural-to-urban or intra-urban; out-migration is both urban-to-rural and intra-urban.

In rural-to-urban migration, the initial urban destination is often the final destination. In other cases, a new in-migrant will settle in urban area "A", then after several months move to urban area "B" (intra-urban migration). FIGURE 4.1 illustrates these variations of in-migration.
In the former instance, when the immigrant stays in urban area "A", epidemiological characteristics of that immigrant remain associated with area "A". For instance, if the immigrant was tested in area "A", determined to be HIV-positive and continued to engage in high-risk behavior in area "A", then not only does he contribute to the area's AIDS data, but he also contributes to the increased likelihood of HIV-transmission within area "A". In the latter instance, when the immigrant moves on to area "B", an area with no HIV-testing, then he contributes to the chances of HIV-transmission in both areas. FIGURE 4.2 illustrates these scenarios.

FIGURE 4.2
Migration and Epidemiology

How does this relate to HIV-testing? The decision not to locate HIV-testing in area "B" may have been based on the assumption that the area had seen very few AIDS cases. But, given the lag time between HIV-infection and illness, as well as the possible arrival of HIV-infected people from area "A", an epidemiologically prudent strategy would be to provide accessible HIV-testing in area "B" in order to be able to monitor the pattern of disease in area "B". Planners in São Paulo should utilize their knowledge of the region's different migration patterns to provide accessible HIV-testing that will be useful to epidemiologists and responsive to urban residents' needs.
Chapter 5 - Conclusion

The provision of accessible HIV-testing services in São Paulo is and should be a high priority. The costs of voluntary participation are what a person in the market perceives to be his costs to be--in time, money, effort, emotional strain--if he is considering getting tested for HIV-antibodies. However, the psychological and personal costs of being tested for the AIDS virus might be so grave that even an accessible, free, informal, and responsible HIV-testing program would not be able to attract voluntary participants. But, as has been stated, several factors stand in the way of minimizing even these costs to voluntary participants.

One obstacle is the degree of "closeness", defined as the cost of overcoming distance between demander and supplier (Rothenberg 1987). Smaller costs in overcoming distance result in more "closeness" and, thus, smaller cost to voluntary participation. A second obstacle is the time one must make available once one has reached the HIV-test site. Even though a card test itself takes very little time, it takes time to wait one's turn, to discuss with a counselor the implications of being tested, and to discuss the test results--not to mention the follow-up time necessary for future testing, counseling, and education. A third obstacle is the psycho-social effect of placing oneself in the continual position of worrying about HIV-infection and transmission. Not to be tested can mean not to worry about AIDS. Once someone is tested for the AIDS virus and understands what an HIV-test can and cannot determine, it then becomes quite difficult to divorce oneself from "thinking about AIDS". The final obstacle, that overrides the above three, is that very little incentive to be tested for HIV exists; no cure or vaccine has been yet discovered.

Thus, it is critical to reduce the costs to voluntary participation in São Paulo, without jeopardizing the counseling, education, and other necessary programmatic components of HIV-testing. Total market orientation--ensuring
virtually no costs to overcoming distance—is not prudent. The possibility of home-testing, which is now receiving increasing attention in the United States, is by no means acceptable. HIV-testing should not be separated from counseling. In fact, the FDA issued a recent warning against the use of home-HIV-testing for this reason. At the other end of the spectrum, location decisions that do not respond at all to the "specialized market" do not have a high probability of attracting people to a voluntary HIV-testing program.

The proposed additional HIV-test sites in São Paulo reflect several levels of analysis: epidemiologic data; social and behavioral information; accessibility; and the need to adhere to a programmatic framework. Limitations to the locational approach do exist, however. First, in some cases, the information available is either preliminary (as in epidemiologic data) or predictive (as in social and behavioral information). Second, in the case of transport access, a detailed examination of the transit system was not possible in the allotted research period. Third, in order to assess accurately people's perceived costs to voluntary participation, a more localized in-depth case study may have provided additional insight. Finally, administrative or political obstacles to program implementation may very well be the downfall of the proposed approach. But the integral role of some of the more well-defined elements in this analysis is worth reviewing.

The epidemiologic data available from the State Secretariat of Health permitted a subdistrict by subdistrict analysis of reported AIDS cases. This up-to-date information was able to be mapped onto an ERSA (health district) map to obtain prevalence of reported AIDS cases. If more time had been available, a map showing the geographic distribution of risk groups would have been most helpful in tailoring different types of HIV-testing approaches to different risk groups.

The social and behavioral information was gathered through field observations, interviews with anthropologists and AIDS planners, and informal conversations during research in São Paulo. In selecting possible HIV-test sites, one key is to understand how "the potential market" will respond. Site-specific
case studies to compare different outreach methods should most assuredly be a future research goal. But, the selection of each HIV-test site was based on information from interviews and the review of literature on health facility location.

Transportation systems are integral to the provision of HIV-testing services. The state planning agency, EMPLASA, and an interview with one of its head architects provided invaluable maps and insights into the city's transport network. The quality and consistency of the East-West Metro line, for example, is fundamental to location decisions involving the line's riders. Information about the transport system within Cidade Universitaria and the volume of users for different terminals provides necessary groundwork for location decisions involving transport.

Given the selection of sites as well as an understanding of the data's limitations and contributions, the most important element to which an HIV-testing program must respond is a programmatic standard. That standard was presented at the beginning of Chapter 4. Its components are:

- voluntary testing
- confidentiality
- frequent testing
- coverage rates
- informed consent
- counseling
- education
- confirmatory testing

The need to adhere to these aspects of HIV-testing must be balanced against the desire to move HIV-testing closer to the market.

Future HIV-testing and AIDS outreach efforts should take into account the importance of the "location decision". The demographic and geographic nature of AIDS is constantly changing. The number of new cases of AIDS among
gay men in San Francisco is declining rapidly. The number of new cases among poor urban men, women, and their children is rapidly rising. Recent reports of increased intravenous-drug-related AIDS cases in southeast Asia (Altman 1988) and in Florianopolis, a municipality 300 miles from São Paulo, ("Tragedia Familiar", Veja 1988) are evidence of the changing spatial distribution of disease. Medical technology may present us with an affordable life-extending drug, or even a vaccine in the long-term, that could create new incentives to be tested for HIV-antibodies. As a result, the need for a location that minimizes costs of voluntary participation may not be as critical. In addition, migration patterns, transit systems, and infrastructure development are sure to change over time.

The proposed locational approach has implications not only for future AIDS service delivery, but for the provision of other health care services. All too often, the decisions about locations of health centers have been out of the hands of public health planners. Health planners, equipped with epidemiologic, demographic, geographic, and socio-economic data, can play an active role in deciding where and why to locate health services. Screening for non-immunizable diseases, other than AIDS, is an example of a program that would benefit from utilizing a spatial approach in reaching its "specialized market." Space matters quite significantly in developing countries --exemplified by the uneven distribution of existing HIV-testing sites and the costs of overcoming distance in São Paulo. The benefits of a locational approach, such as the one suggested in this work, merit attention and implementation on at least a case-study level.
BIBLIOGRAPHY


Secretaria de Saúde, Estado de São Paulo. Demographic and epidemiologic data.


*Veja*, assorted articles:

"Dose de Perigo." *Veja*. 29 July 1987, p. 76.
"Guerra Interna: Campanha Contra a AIDS Chega as Empresas." *Veja*. 1 July 1987, p. 56.


MAP *2
Population by ERSA
Municipio de São Paulo (1987)

<table>
<thead>
<tr>
<th>ERSA</th>
<th>No of inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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<td>7</td>
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</tr>
<tr>
<td>8</td>
<td>2,036,687</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td></td>
<td><strong>10,552,400</strong></td>
</tr>
</tbody>
</table>

2400
MAP #3
Population Density (no. persons/km$^2$)
by Subdistrict
Municipio de São Paulo (1987)

- less than 5,000
- 5,000 - 10,000
- 10,000 - 15,000
- 15,000 - 20,000
- 20,000 or more
**MAP #6**

Prevalence and Incidence of Reported AIDS Cases by ERSAS
Municipio de São Paulo (March 1988)

<table>
<thead>
<tr>
<th>ERSAS</th>
<th>Cases/10,000 inhab.</th>
<th>Cases</th>
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</thead>
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<tr>
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</tr>
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<td>8</td>
<td>0.28</td>
<td>58</td>
</tr>
</tbody>
</table>

**Note:**
- The map shows the prevalence and incidence of reported AIDS cases by ERSAS in São Paulo, March 1988.
- Cases are reported per 10,000 inhabitants.
MAP #7
Existing HIV-Test Sites
Município de São Paulo

HIV-Test Sites
MAP #8
Possible Transportation-Oriented Sites, Municipio de Sao Paulo

- Transportation-Oriented HIV-Test Sites
Seven Proposed HIV-Testing Sites
Município de São Paulo

A - Cidade Universitária
B - Rodovia Pres. Dutra
C - Santo Amaro Terminal
D - Tatuape Integration Terminal
E - Santana Terminal
F - Vila Prudente
G - Liberdade

MAP #9