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What is This?

Public health programs as surrogates for social action in Suriname, South America

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Abstract
This paper addresses the merits of public health activism that advocates for social change in which health is the outcome of interest. We acknowledge that while efforts at the individual level are important, social network models consider the underlying mechanisms that lie outside the public health sector. This paper considers the inequitable health of Indigenous people who bear a disproportionate share of the negative health consequences due to economic development programs that follow an assimilation model. This paper discusses a combination of theoretical constructs to understand and solve the problems at hand. It concludes that while the attention paid to technological and behavioral solutions at the individual level yields important health outcomes, attention should also be paid to structural causes that address social, political and economic barriers to prevent disease, disability and premature death.

Keywords
globalization of science and technology, health policy, participation in health policy, social responsibility of scientists

1. Introduction

Problem statement. A classic problem in public health is that it exists at a crossroads that leads in two directions: one way addresses the social and political foundations of health at the environmental level, and the other more traditional approach is more narrowly focused on proximal risk factors that are technical in nature (Hamlin, 1995; Bartholomew et al., 2011). Among the Indigenous people in Suriname, the factors controlling health and well-being lie outside the health sector and are socially and economically formed. This reality suggests that our fundamental attention in public health policy and prevention should not be directed solely towards a search for technical or

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behavioral solutions to health problems at the individual level, but rather towards breaking existing social, political and policy barriers to minimizing disease, disability and premature death.

The case

We will explore the case of Indigenous peoples in Suriname who are experiencing adverse health impacts that are linked to economic development processes, including both small- and large-scale mineral extraction.

Setting. Suriname is located on the northeast coast of South America. There is little that distinguishes the Indigenous people in Southeast Suriname from the other native Amazonian peoples. They live in small communities, fish daily, hunt, and rely on subsistence farming. Also, the Indigenous people in Suriname are gravely affected by economic development projects that follow an assimilation model leading to indirect forced relocation, environmental degradation, and the deterioration of community health.

Since the mid-1980s, the mineral-rich watersheds in Southeast Suriname have attracted large numbers of artisanal and small-scale gold miners (ASGM) (Heemskerk et al., 2007). These gold miners use mercury, which amalgamates with gold, to separate gold particles from the soil and waste materials. The process is effective, simple and cheap. Most of the mercury used ends up in creeks and rivers where the inorganic form used by miners is being taken in by micro-organisms and transformed into the toxic organic or methylmercury form. Small fish eat the micro-organisms and in turn are eaten by larger fish. Mercury moves up the food chain until it ultimately ends up at the highest trophic level which includes humans. By this process mercury bio-accumulates, which means that it builds up in individuals' bodies, and biomagnifies, indicating that it becomes more concentrated as it moves up the food chain. Indigenous people are vulnerable to mercury contamination owing to their high levels of fish consumption: Most Indigenous families leading traditional lifestyles consume fresh fish daily and they prefer eating top predator fish.

We have performed community-directed risk and health assessment studies since 2004 (Peplow and Augustine, 2007, 2012, 2013). These studies, which combined clinical examinations and scoring of individual performance on a battery of neurological tests in conjunction with hair mercury data, conclusively showed that the participating individuals exhibited neurologic dysfunction consistent with mercury poisoning. Exposure to mercury causes serious health problems and it especially threatens the development of children *in utero* and early in life. For everybody who is exposed to toxic levels, mercury affects the nervous, digestive and immune systems and has effects on the lungs, kidneys, skin and eyes. For fetuses, infants and children, the primary health effect of methylmercury is impaired neurological development (U.S. Environmental Protection Agency, 2001).

Context. The government of Suriname faces the long-term twin problems of capital shortages and the high fiscal debts that result from an attempt to modernize state bureaucracies, and the economic and financial relations left by colonialism. Throughout its recent history, Suriname has adopted policies designed to attract foreign investment. These structural adjustment policies created a modernized political superstructure that occurs together with a backward economic infrastructure which causes Suriname to fall into the trap of "modernizing" while leaving the institutional cost to the Indigenous people and the environment, including the Indigenous people displaced by economic expansion activities.

In general terms, current structural adjustment and economic development models are failing to fully achieve their goals of institutional assimilation for the Indigenous people. Although some "cultural assimilation" is taking place as these groups adopt the economic values and norms of

mainstream Surinamese culture, institutional assimilation has failed to take place because corresponding rewards in terms of political, social and economic equality are inadequate.

As Indigenous people begin to live in larger population centers, they expect better health care, higher life expectancies, inclusion in Western education, and literacy. These benefits have not materialized. Furthermore, acculturation has caused dependency on outside manufactured goods, the loss of traditional cultural and ecological knowledge, and the over-extraction of selected natural resources.

Acculturation and change. Acculturation takes a heavy toll on Indigenous people. As traditional cultural expressions are renounced, succeeding generations are left with less traditional knowledge of their history, life skills, medicinal and healing practices, and forest management. Also, traditional subsistence activities are sustainable for small family groups that relocate periodically. The carrying capacity of the rainforest, however, cannot absorb the impacts of hunting, gathering, and planting by the current population concentrations that are fixed in place due to the relocation schemes of the government.

As Indigenous families assimilate they must travel much larger distances to find suitable agricultural land and wildlife. The related necessity for outboard motors and gasoline has increased the cost of living. A growing local dependency on Western manufactured goods is further accelerating the need to earn cash money. Income generation activities are rare, however, and many families are struggling to maintain the standard of living of their ancestors. With no other choice, many Indigenous people have abandoned their villages to seek employment.

Theory. The complexity of the social context in Suriname makes it difficult to isolate technical or behavioral solutions to health problems at the individual level. In this section, we will explore bodies of literature that will allow us to identify the underlying mechanisms responsible for events and processes that we have observed in the field.

Understanding how problems are solved in a field setting requires a strategy for action based firmly on theory. The purpose of this section is to identify theories that can be used to understand and change the conditions for health in settings where traditional Indigenous cultures are undergoing assimilation due to economic development, and to explore theory's contributions to implementation of interventions. Table 1 lays out 11 theories grounded in diverse disciplines and worldviews that have relevance to public health advocacy and policy change efforts.

This section is not meant to be comprehensive; instead we seek to introduce and illustrate theories and approaches that have been used to develop intervention plans. The question of *how* theories are used in public health practice is important for intervention development and program evaluation. We consider multiple theories to assess, to intervene in, to solve or to prevent the problems facing the Indigenous people in Suriname. We classify the theories we applied along a continuum: 1) *Informed by theory* – there is no or only limited application of the theory. Instead, it is used as a framework; 2) *Applied theory*: a theoretical framework is specified, and several of the theory's constructs are applied to the intervention program; 3) *Tested theory*: a theoretical framework is specified, measured and explicitly tested, or two or more theories are compared to one another; and 4) *Theory generation*: new, revised, or expanded theory is developed.

This paper considers only theories from the first two categories, i.e., *Informed by theory* and *Applied theory*, as necessary to identify and address the factors to achieve good health. The main focus of this paper is on problem solving and the criteria for success are defined in terms of the problem rather than the theory. For that reason, the problem-driven approach requires that the program is either informed by or applies multiple theories to assess and intervene on behalf of the Indigenous people in Suriname. This is fundamentally different from theory generation or the single theory-testing process.

Table 1. Theories that can be used to understand and change the conditions for health in settings where traditional Indigenous cultures are undergoing assimilation due to economic development.

	Theory (reference)	Principle	Application		Outcome
1	Systems Theory (Leischow and Milstein, 2006; Trochim et al., 2006)	Complex systems made up of complex systems embedded in other complex systems. Small causes can have large effects and large causes can have small effects	I	Applied internally. Useful framework for defining vision, mission, goals and objectives of health promotion organization	Provides rationale to funders, donors, staff, volunteers and associated stakeholders and explains contribution a modest program makes to society
2	Social Network Theory (Smelser, 1998)	Social networks consist of nodes (individuals, groups, or organizations) that are joined by ties (relationships among nodes). Community is a network of networks in which the nodes of the larger network comprise smaller-scale networks	I	Applied internally. Useful framework for defining goals and objectives of community-based programs	Used to engage stakeholders based on their potential to secure benefits by virtue of membership in social networks or other social structures
3	Advocacy Theory (Johnson, 2009)	Health advocacy is actions taken to bring about change on behalf of another population. Public health advocacy, often confused with activism, is rooted in democratic principles and practices and includes cooperation as well as confrontation	A	Essential when working with communities undergoing assimilation when acculturation has taken place but institutional assimilation has not or is incomplete	Advocacy ensures that the rights of disenfranchised individuals are protected, that institutions work the way they should, and that legislation and policy reflect the interests of the people
4	Media Advocacy (Wallack et al., 1993; Wallack, 2008)	A set of tactics for community groups to promote social change by using the media	I	Media advocacy is based on three steps: 1) Using the media to gain access and set the agenda; 2) Use of messaging to frame the debate; 3) Achieve a policy goal	Media as a forum surfaces issues, identifies topics for discussion, and sets the agenda for policymakers and the public. Media advocacy influences the selection and presentation of topics by the media in order to set and achieve a public health agenda
5	Empowerment Theory (Minkler et al., 2008)	Describes how to transfer power (a process) and the consequences of that process (an outcome)	I	Useful in marginalized communities undergoing assimilation into a market driven society	People gain mastery over their lives and the lives of their communities

Table 1. (Continued)

	Theory (reference)	Principle	Application		Outcome
6	Stakeholder Theory (McDaniel, 1997)	Stakeholders differ in their social, political, and ethical characteristics; goals, interests; and types and amounts of power. Health promoters, their organizations, and the communities with which they work are frequently external stakeholders and exist outside the "focal organization" but have a direct interest in what that organization does	I	Applied internally to the health promotion organization to explain the relationship between Indigenous communities and the development banking sector	Increases democracy, combats exclusion of marginalized and disadvantaged populations, empowers people, mobilizes resources and energy, develops holistic and integrated approaches to problems, achieves better decisions and more effective services, and ensures the ownership and sustainability of programs
7	Grassroots or Community Organizing Theory (Rothman, 2004)	Policy change is made through collective action by members of the community who work on changing problems affecting their lives	I	This theory is useful when a distinct group of individuals is directly affected by an issue and when the advocacy organization can and is willing to play a "convener" or "capacity-builder" role rather than the "driver" role	Useful framework to address concerns regarding public health advocacy versus activism
8	Power, Power Politics or Power Elites Theory (McCallum et al., 2004)	Policy change is made by working directly with those with power to make decisions or influence decision making	I	Used internally to understand the political stream of Multiple Streams Theory as described by Kingdon (2003)	Results in more efficient and effective communication between the public health, political and international finance sectors
9	Community Participation Theory (Freire, 1968; Wallerstein and Bernstein, 1988; Cornwall and Jewkes, 1995; Smith, 1999)	A process that enables people to define the issues of concern to them, plan, develop and deliver services, make decisions, formulate and implement policies and take action to achieve change	A	Used to overcome difficulties imposed by a lack of consent or engagement by disenfranchised communities that discourages the creation of new knowledge in neglected areas of health, and concentrates new expenditures on areas that are already generously supported	Increases democracy, combats exclusion or marginalized and disadvantaged populations, empowers people, mobilizes resources and energy, develops holistic and integrated approaches to problems, achieves better decisions and more effective services and ensures the ownership and sustainability of programs

(Continued)

Table 1. (Continued)

Theory (reference)	Principle	Application		Outcome
10 Agenda Building Theory (Cobb and Elder, 1983)	Agendas contain issues that politicians see as meriting public attention and as being within the legitimate jurisdiction of existing governmental authority. Issues that merit active and serious consideration of political decision makers	A	Three models: 1) Outside-initiative model – from the public; 2) Inside-initiative model – from within the institution; 3) Mobilization model – implementation. Criteria: long-term social relevance, not technical or technocratic, and is unique	The process of moving an issue to the systemic and institutional agenda for action
11 Multiple Streams Theory (Kingdon, 2003)	Distinguishes between actors inside and outside government and the roles they play in policy formation. A participant who motivates or boosts a proposal into a more active place for consideration, is considered to be an impetus, while participants who limit the momentum of an agenda, or act as obstacles to progress, are considered to be constraints	A	Useful when a roadmap is needed to move an issue to the systemic or governmental agenda level. It recognizes that there is an element of chance that explains the fluidity and rapid change of the policymaking process	Operationalizes advocacy activities and provides a sense of control over the randomness of advocacy and the movement of an issue to the systemic and institutional agenda for action

The theories referenced in this paper were classified along a continuum that included "I" indicating work was "Informed by Theory" and "A" indicating "Applied Theory".

The impact of the West on Indigenous societies generally has been theorized as a phased progression from: initial discovery and contact; population decline; acculturation; assimilation; and "reinvention" as a hybrid, ethnic culture (Smith, 1999). By necessity, the Indigenous people of Suriname are merging into the mainstream society. Although some "acculturation" is taking place as these groups adopt the economic values and norms of mainstream Surinamese culture, institutional assimilation has failed to take place because corresponding rewards in terms of political, social and economic equality are inadequate (SIHF, 2012a, 2012b, 2013).

An example of the failure to fully assimilate Indigenous communities is the frequency with which they are over-studied in their settings (Peplow et al., 2010). As scientists collect samples and study risk, Indigenous individuals and communities become frustrated because they are not benefiting from the results. As researchers, we faced the consequences of this "research pollution" including reticence, despair, mistrust and non-disclosure. This project asked the question, "How can Western researchers engage traditional Indigenous communities that have been disenfranchised by economic development projects in Suriname, South America, in public health research?" In response, we used an approach combining Participatory Action Research methods (Mergler, 1988; Biggs, 1989; Rahman and Fals-Borda, 1991; Cornwall and Jewkes, 1995; Bartholomew et al., 2011) and the methods described by Linda Smith in *Decolonizing Methodologies* (1999). The Community-Based Participatory Action Research (CBPAR) approach used employed a research framework where "Western" researchers became participating observers in an Indigenous-led research initiative.

Cornwall and Jewkes (1995) describe participatory research methods as those that enable local people to seek their own solutions according to their priorities. These methods draw on a Freirean approach (Freire, 1968; Wallerstein and Bernstein, 1988) and are directly concerned with the balance of power which permeates relations between the researcher and the subject. While some conventional research projects involve limited interactions with people, others achieve a high level of in-depth participation, at certain prescribed stages, in order to co-opt local people into the agendas of others. This is often done to justify research within a top-down, market-based process (Sarewitz, 1996; Beauchamp, 1999).

There is a direct relationship between the conventional approach to research and the global expansion of trade (Bush, 1945; Beauchamp, 1999). We define globalization as the relationship between economic expansion and national security as it pertains to the West. From the perspective of the United States, fundamental to US science policy today is a concept described in a letter from President Roosevelt to Vannevar Bush in which Roosevelt asserted that the scientific and technical accomplishments that provided solutions to the problems of World War II could be profitably employed in times of peace (Bush, 1945: ii):

> "New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life." Franklin D. Roosevelt, November 17, 1944.

Since our first collaboration with Indigenous communities on public health projects in Suriname in 2004, we have encountered a growing state of turmoil brought about by Indigenous peoples' reactions to research conducted by scientists from outside their society. According to Daniel Sarewitz (1996), the idea that curiosity-driven research should be carried out in isolation from society is not justified on the grounds that it is necessary to protect scientists from the whims of politicians and the public. Instead, it is a rationale for preserving the existing power structure and priorities. In accordance with Sarewitz' assertions, unfettered research by Western scientists is being scorned by non-Western Indigenous communities in developing countries (Peplow et al., 2010).

This dynamic of distrust has created problems within the research community. The difficulty imposed by a lack of consent or engagement by disenfranchised communities has the effect of discouraging the creation of new knowledge in neglected areas of public health, thereby concentrating new efforts and expenditures on areas that are already generously supported. This situation further stifles democratic discourse over research priorities, and insulates the scientific research system.

Under these circumstances, while Western academics describe the serial demise of specific Indigenous cultures (Kloos, 1977), Indigenous peoples are having their lands and resources systematically stripped by the state (Peplow and Augustine, 2008). The failure of the research community to address the real social issues of Indigenous people makes the scientific community appear to be detached and insensitive. This failure is responsible for the confrontations between Indigenous people and the academic community and could lead to broader social consequences if the polarization process continues. At the same time, Indigenous communities are becoming more politicized and sophisticated. While many practitioners adopt participatory research for ethical reasons, we have adopted it for very pragmatic reasons to overcome the inadequacies of conventional research in the Indigenous setting.

The most striking difference between participatory and conventional methodologies is in who defines research problems and who generates, analyzes, represents, owns and acts on the information collected (Cornwall and Jewkes, 1995). Arguably, participatory research does not merely involve the community's participation in data collection but rather in setting agendas, defining ownership of results, and establishing power and control for the community.

Although little has been published that specifically operationalizes CBPAR in Indigenous settings, specific guidelines for working with Indigenous peoples have been adopted by several institutions that achieve the same end. The "Principles for Community-based Research", produced by the University of Washington (2013), provides guidelines for socially responsible research and a framework for mutually beneficial relationships between researchers and community members. Additional guidelines (Scott and Receveur, 1995; Callahan and Jennings, 2002; Henderson et al., 2002) for working with communities of Indigenous peoples which describe the ethical principles that promote cooperation and mutual respect between researchers and communities of Indigenous peoples, identified core principles for Community-Based Research (CBR) that serve as a starting point for defining the relationship between researchers and community members: 1) Community partners should be involved at the earliest stages of the project, helping to define research objectives and having input into how the project will be organized; 2) Community partners should have real influence on project direction, that is, enough leverage to ensure that the original goals, mission and methods of the project are adhered to; 3) Research processes and outcomes should benefit the community. Community members should be trained whenever possible and appropriate, and the research should help build and enhance community assets; 4) Community members should be part of the analysis and interpretation of data and should have input into how the results are distributed. This does not imply censorship of data or of publication, but rather, the opportunity to make clear the community's views about the interpretation prior to final publication; 5) Productive partnerships between researchers and community members should be encouraged to last beyond the life of the project. This will make it more likely that research findings will be incorporated into ongoing community programs, and therefore, provide the greatest possible benefit to the community from the research; and 6) Community members should be empowered to initiate their own research projects that address needs they identify themselves.

Within the community-based theory there are different interventions acting on a system of multiple layers that interact with one another, each of which has different objectives and methods. In general, theories 1, 2, 6–8 in Table 1 can be used to inform the design of community-based

implementation interventions. Although there are multiple theories and frameworks that describe behavior change for both individuals and organizations, there is currently no systematic basis for determining which among the various theories predicts a desired outcome.

There is, however, a long history linking social justice and human rights to public health. Social justice has even been described as the field's core value (Gostin and Powers, 2006). The recognition that the causes of health and well-being lie outside the health sector and are socially and economically formed can be traced back to the formative period of modern public health and the Chadwick–Farr controversy in the 1830s in Great Britain (Hamlin, 1995). This conflict concerned causes-of-death data, which began to be collected in 1837 and focused on what kinds of information should be collected, what to do with the information once it was collected, what such information indicated about the state of society, and ultimately, how "social" public health should be. The story of the Chadwick–Farr controversy illustrates how difficult it is to reduce complicated health information and circumstances to a single category and the ways in which political, legal, and moral decisions can rely on public health data.

The national registration of deaths began in England in 1837. Sir Edwin Chadwick, noted for his work to reform the Poor Laws and improve sanitary conditions and public health, hired William Farr to include cause of death, occupation and age on English death records. This opened up the potential to classify variation in the risk of death in different population subgroups. Over the forty years that followed, Farr developed different methods for studying mortality; he was also the first to use standardized mortality rates that adjusted for differences in age distributions in different subgroups. These methods are essentially unchanged to this day (Whitehead, 2000).

For more than a century since then, public health has drawn on Farr's work to address the social inequalities of health as a major challenge facing the field of public health. Whereas it is the mandate of clinical practitioners to improve the health of individuals, for over 100 years, the field of contemporary public health has existed to improve the health of communities and populations. Callahan and Jennings (2002) locate contemporary public health practice within social, political, economic and historical contexts.

Dan Beauchamp (1999) notes that our most intractable public health problems are the results of arrangements that provide benefits and advantages to a powerful minority at the expense of a powerless minority. This suggests that our fundamental attention in public health policy and prevention should be directed toward breaking existing political and policy barriers to minimizing disease, disability and premature death. This paper describes a social and ecological approach that implements intervention programs at three levels: 1) the organization level to ensure that non-Indigenous researchers work in culturally appropriate and non-exploitative ways; 2) the community level using community participation, engagement, capacity and empowerment to overcome difficulties imposed by a lack of consent or engagement by disenfranchised and marginalized communities; and 3) the supranational level with a focus on academics, policy and human rights that addresses the causes of disease, disability and premature death that lie outside the public health sector.

Kingdon's (2003) Multiple Streams Theory provides a framework that describes how issues can be raised to systemic or governmental agenda status. Most importantly, it acknowledges how the element of chance is responsible for the fluidity of the policymaking process. Kingdon views policy advocacy in terms of three streams: politics, problems, and policies. According to Kingdon, policy can be changed during a window of opportunity when the three streams are joined.

2. Methods

There is little guidance about how best to systematically operationalize and develop complex interventions using multiple theories. We used a four-step approach, consisting of guiding questions, to

direct the choice of the most appropriate components of an implementation intervention: 1) Who needs to do what, differently?; 2) Using a theoretical framework, what political barriers to disease, disability and premature death need to be addressed?; 3) What intervention methods, derived from theory components, could overcome the barriers?; and 4) How can change be measured and understood?

Implementing the program at the organization level

In addition to existing professional codes of ethics, guidelines that were specific for conducting research and public health advocacy among the Indigenous people in Suriname were developed using Advocacy Theory, Empowerment Theory, Community Organizing Theory, Community Participation Theory, and Systems Theory (Table 1). Using these theories as a framework, the following guidelines were used to achieve CBPAR in which public health researchers and local people would work together as colleagues in a process of mutual learning where local people have control over the process:

1. Teams worked only by invitation. Teams must receive a written invitation from a representative of the community that requests their participation in a "community-directed" project. The team must agree that both the community and individuals within the community are free to participate in or withdraw from a project at any time without reprisal.
2. The project must be owned and led by the communities and designed to conform to their preferences. Communities must formulate the direction of the work included in the study.
3. Final results are the property of the communities and individuals that participate in the project.
4. Results are not to be published or disseminated in a form that permits the identification of individuals.
5. Participating communities shall participate in the interpretation of the data. Conclusions shall be made within their social and cultural context. Before any publication of data or reports, draft texts must be translated, presented, discussed (in person) and approved by the participating communities.
6. Reports and academic publications shall be prepared only when specifically requested by the participating communities. The reports acknowledge and include credit to the participating community and individuals for their contributions.

Implementing the program at the community level

The approach used to address community needs was a collegiate form of Community-Based Participatory Action Research (CBPAR) in which control and ownership of the process is relinquished to those to whom the research concerns. This project employed a research framework where "Western" researchers became participating observers in an Indigenous-led research initiative. This framework was devised based on Advocacy Theory, Empowerment Theory, Community Organizing Theory, Community Participation Theory, and Systems Theory (Table 1).

CBPAR research focused on a cyclical process of action and reflection, carried out with and by local people rather than "on them". The Community-Based Participatory Research (CBPR) approach used in this project relied on horizontal relationships between the various partners through a democratic participatory process. It was built on a broad base of partnerships in which various types of knowledge were brought together to illuminate issues identified by the community. Relevant actors were mobilized to create local solutions. Six sequential steps were identified

and used to organize the CBPR program: 1) facilitated discussion and planning; 2) training; 3) data collection; 4) facilitated discussion, reflection and planning; 5) data analysis and communication; and 6) facilitated discussion, reflection and planning. This sequence was repeated continuously to create a cyclical process of community-based planning, collaborative action and reflection.

> Risk assessment: Community members were trained to collect hair samples for analysis. Hair samples were analyzed using a portable Lumex Zeeman Mercury analyzer (Peplow and Augustine, 2007, 2012, 2013). Individual, community and hazard quotient indices were used to quantify risk. Following the analysis of hair sample data, meetings were held to reflect on the process, outcome and future needs.
>
> Signs of neurological impact from exposure to mercury: Standard clinical neurological exams were performed in the presence of a translator to determine whether participants exhibited signs consistent with mercury toxicity (Peplow and Augustine, 2013).

Implementing the program at the supranational level

As a consequence of their declining health and well-being, Indigenous people in Suriname are filing a series of human rights petitions to the United Nations Special Rapporteur on the Rights of Indigenous Peoples; Special Rapporteur on the Adverse Effects of the Movement and Dumping of Toxic and Dangerous Products and Waste on the Enjoyment of Human Rights; UN Committee on the Elimination of Racial Discrimination (UNOG-OHCHR); and the IACHR Executive Secretary Inter-American Commission on Human Rights (SIHF, 2012a, 2012b, 2013). Our team has joined with Indigenous communities in undertaking this work. We have built a framework for intervention at the supranational level based on Advocacy Theory, Empowerment Theory, Community Organizing Theory, Community Participation Theory, and Systems Theory (Table 1). Although appealing to international tribunals for legal justice is an appropriate mechanism to reinforce international law and bridge the divide between economic development and public health, legal justice alone cannot determine the "correct" policy or supply an answer to every question regarding the broad direction of economic development and public health. Neither can any other single organizing principle.

3. Results

Implementing a research and intervention framework within our own organization (Suriname Indigenous Health Fund) consistent with the theories described above has shifted the locus of all project decision-making to the people who live in Indigenous communities. This has profoundly impacted all internal decision-making mechanisms, from board selection to organizational priorities. It has also affected our relationship with funders, peers, the peer-review process, and both private and public institutions. Most notably, a community-centered framework has shifted our focus to the structural determinants of health.

Implementing intervention strategies at the community level consistent with the theories described above also gave Indigenous community partners ownership and control of technical information about their own health and their environment. Historically, these communities have been isolated from environmental and public health projects, where practitioners who conducted research in their region did not share data or information with local communities. Ownership and control of data and the interpretation of results has empowered community members to engage in decision making at the regional, national and international levels. It has further allowed them access to political levers, from government bodies to local and international press agencies. Shifting the responsibility for interpreting and presenting data has changed the tenor of the discussion, the

audiences, and the gravity of the stories presented. Environmental health is not simply a dispassionate technical problem when viewed through the lens of the community; it is the fundamental basis for all social, economic and political life.

Implementing intervention strategies at the supranational level consistent with the theories described above has also shifted the conversation between our research team and our community partners from the local level to the international level. This shift in scale has redefined the problem of environmental pollution caused by economic development from a technical problem with behavioral solutions to a human rights issue. By considering the problem at this macro-scale, different mechanisms are available to address it using different language, tools and institutions. This has changed the perceived identity of both our organization and Indigenous community partners to international actors working within a global context.

4. Discussion

Between 2004 and 2013 we have observed that many Indigenous people in Suriname have tried to adopt the Western way of life. Most notably, there is a dramatic shift in behavior. People who have excess food are selling it to their neighbors for money. Sharing is no longer taken for granted. This shift in values is responsible for the increasing incidence of hunger and a declining sense of security among women, children and the elderly.

The goal of assimilation is to move people affected by development to a state of sustainable livelihood. It is assumed that assimilation will be successful if Indigenous people are 1) able (there are no barriers), 2) have access to knowledge, and 3) can find new and sustainable livelihoods for their people. The impact of economic development spans far beyond the inputs of environmental pollutants; it is changing every aspect of life for Indigenous communities.

Suriname is just one of 74 countries world-wide in which the ASGM sector uses and discharges a total of over 1600 tonnes of mercury annually. In order to address the risks posed by mercury exposure, the Minamata Convention on Mercury was negotiated. The Convention calls for a multi-sectoral approach and encourages relevant parties to cooperate and exchange information with the World Health Organization (WHO). The WHO is considered key to providing guidance in adopting health-based policies. The WHO encourages parties to focus on the "proximal" causes and effects of mercury exposure and promote programs that identify at-risk populations, adopt science-based health guidelines, set targets for mercury exposure reduction, and implement public health education programs.

A classic problem in public health

The Minamata Convention operates at a crossroads that leads public health planners in two directions (Glass and McAtee, 2006): a broad direction, addressing the sociocultural foundations of health, and a narrow direction, focusing on more proximal risk factors. A problem with this situation is that instead of addressing fundamental social causes, the Minamata Convention highlights individual characteristics that obscure rather than illuminate the social and economic causes (Leischow and Milstein, 2006; Trochim et al., 2006).

Also, by institutionalizing mercury risk as a public health problem a research paradigm develops, followed by the application of the scientific method (e.g., the epidemiologic study of risk factors). This leads to the creation of a large body of literature with its language, common assumptions, methods, and sets of legitimate constructs. Once this category of public health research, i.e. "mercury or the Minamata Convention", is constructed and "facts" about risk or health impacts due to mercury exposure become widely accepted, the research question and its method

of investigation become validated and institutionalized. The body of literature that accumulates creates the need for further research which calls for governmental resources in the form of research grants and contracts. This scientific discourse establishes mercury as a public health research question. Solutions are now sought from within this discourse. This situation reduces the possibility of remedying the problem by limiting the focus to a narrow clinical, individual or biomedical perspective. Technical interventions help but they do not reduce or address directly the overarching social determinants that are the root causes of the public health problem.

A solution to the conundrum may be found in an exploration of the WHO's proposed "Health in All Policies (HiAP) Framework for Country Action". We seek to operationalize HiAP, which is a strategy of the European Union that reflects the close linkages that exist between policy and health. The challenge is to identify specific methods that address the community and social health needs that accompany the economic development and assimilation processes in Suriname. Our goal is to use the HiAP as a guide to find cooperative solutions across sectors at the policy level and facilitate more equitable patterns of growth and development leading to measurably improved health outcomes. We ask these specific questions:

1. How can we operationalize the HiAP to address the situation in Suriname?
2. Does the Multiple Streams Theory provide a methodology to operationalize the HiAP framework?
3. Is it possible to create a roadmap, identify obstacles and suggest solutions including those related to institutional constraints and internal policy restrictions that obstruct the effective collaboration between external stakeholders?
4. How would a HiAP initiative, using Suriname as a case example, be administered and funded?

In this case study, we found that John Kingdon's (2003) Multiple Streams Model was a useful tool to organize our work and answer the above questions. The Multiple Streams Model identifies independent streams and suggests that policy changes occur when the streams align. We are using the Multiple Streams Model to identify the stakeholders relevant to the Suriname case, evaluate whether the streams could be joined, and determine what conditions are necessary to bridge the divide between economic development and public health. We then recommend enhancements to current structural adjustment programs in Suriname that will address the economic and public health challenges encountered in Suriname's interior region.

Finally, when social problems are expressed simply as public health issues then the measured health outcomes become the evidence for and definition of the wrongfulness of policies. As a consequence, research results are then used as a moral battleground. Where development policy is ultimately responsible for the mercury problem, expressing the issue as a public health problem detracts from the underlying question: Should the assimilation process be divorced from its health impact and considered on its own merit? Should an argument against inequality be dependent on research findings that document the negative health outcomes of inequality due to economic development practices? In a democratic society, the demise of an entire ethnic group of Indigenous people in the name of economic growth should be adequate evidence of a wrong that needs no further justification for action.

5. Conclusions

The case study described in this paper illustrates an intervention approach that changes public health practice within a complex theoretical framework. While this framework should be iteratively

adjusted and refined to suit other contexts and settings, we believe that the process could be maintained as the primary framework to guide researchers through a comprehensive intervention development process.

While the CBPAR approach used was an effective means for addressing the health crisis among participants, it did not follow the smooth pathway implied by theoretical writings. Communities do not automatically gain from public health projects unless they also include social action plans when poor health has its roots in social phenomena. Also, because CBPAR took place in a complex social and political setting it brought up many questions about relating to government officials, the media and communities when there existed a potential that study results could reflect poorly on government policies.

In complex social systems that are made up of complex sub-systems including public health, which are in turn embedded in other complex systems, we recognize the possibility that small causes can have large effects. Although the WHO's Health in All Policies Framework is intended to provide countries with a practical means of addressing public policies with health implications across sectors at the country level, it is also suited for application at the supranational level and for governance structures at the international level.

Analyzing policy formation through the Multiple Streams Model is recommended because it provides a flexible framework for considering the variability that is inherent in the political processes involved. The Multiple Streams Theory covers a wide range of concepts, some more relevant than others when applied to a public health topic. In general, we encourage the development of theory that unites causes of disease with the sociocultural foundations of health to interpret and apply international conventions such as HiAP at local, national and supranational levels. Such theory would provide tools for both practitioners and policymakers to engage in forming practical, adaptive solutions to complex problems that are not restricted to the confines of any one discipline or approach.

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Daniel Peplow and Sarah Augustine, co-directors of the Suriname Indigenous Health Fund (SIHF), use a collegiate form of Participatory Action Research to provide Indigenous communities with the materials and technical support they need to self-diagnose the effects of economic development programs on their community's and their environment's health. Suriname Indigenous Health Fund supports Indigenous communities as they define their own priorities and initiatives concerning the structural determinants of health.